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

Agenda Order:

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

PFMC
10/15/07

***FEDERAL REGISTER* NOTICES**

Groundfish and Halibut Notices
August 30, 2007 through October 17, 2007

Documents available at NMFS Sustainable Fisheries Groundfish Web Site
http://www.nwr.noaa.gov/1sustfsh/gdfsh01.htm

72 FR 50906. Pacific Coast Groundfish Fishery. Final Rule. NMFS issues a final rule to establish catch accounting requirements for persons who receive, buy, or accept Pacific Whiting deliveries of 4,000 pounds or more from midwater trawl gear - 9/5/07

72 FR 53165. Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures; Correction - 9/18/07

72 FR 56664. Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures; Inseason Adjustments. This final rule announces inseason changes to management measures in the commercial and recreational fisheries and the re-opening of the 2007 Pacific Whiting primary season - 10/4/07

EXEMPTED FISHING PERMITS (EFPs) FOR 2008

Exempted fishing permits (EFPs) provide a process for testing innovative fishing gears and strategies to substantiate methods for prosecuting sustainable and risk-averse fishing opportunities. Applications for EFPs proposed for 2008 are provided as Agenda Item D.2.a, Attachments 1 through 4. The first two proposed EFPs are designed to test different commercial hook-and-line gear configurations and strategies to selectively harvest abundant chilipepper rockfish off central California. The third proposed EFP, sponsored by The Nature Conservancy and Environmental Defense, seeks to test hook and line and trap gears in central California in a harvesting cooperative using limited entry trawl permits purchased by The Nature Conservancy. The fourth EFP, sponsored by the Recreational Fishing Alliance and the Golden Gate Fishermen's Association, seeks to test the use of recreational hook and line gear to catch underutilized chilipepper and slope rockfish on Commercial Party Fishing Vessels in north central California in waters seaward of the non-trawl Rockfish Conservation Area (RCA) between Pigeon Point and 40°10' N latitude.

The Council reviewed all four EFP applications in June and recommended revisions for each. These revisions were communicated to the EFP applicants and revised applications were submitted. Under this agenda item, the Council will review these revised EFP applications, consider public and advisory body comments, and consider recommending 2008 EFP applications to the National Marine Fisheries Service (NMFS).

<u>Council Action</u>:

Consider the revised EFP applications for 2008 and provide final recommendations to NMFS.

<u>Reference Materials:</u>

1. Agenda Item D.2.a, Attachment 1: Application for Issuance of an Exempted Fishing Permit to Test a Sustainable Hook and Line Fishery for Chilipepper Rockfish Outside the Non Trawl RCA in Central California (40º10' N Lat.-34º27' N Lat.).
2. Agenda Item D.2.a, Attachment 2: Exempted Fishing Permit – Chilipepper Rockfish.
3. Agenda Item D.2.a, Attachment 3: Application for Issuance of an Exempted Fishing Permit (EFP) to Fish Trawl Permits with Longline, Trap, Pot, and Hook-and-Line Gear In A Community Based Fishing Association off the Central California Coast.
4. Agenda Item D.2.a, Attachment 4: RFA/GGFA Exempted Fishery Permit Proposal for 2008: Recreational Rockfish Catch Composition in the Area Seaward of Rockfish Conservation Area.
5. Agenda Item D.2.d, Public Comment.

<u>Agenda Order:</u>

a. Agenda Item Overview — John DeVore
b. Agency and Tribal Comments
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. Council Action: Adopt Final Recommendations for EFPs

PFMC 10/17/07
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APPLICATION FOR ISSUANCE OF AN EXEMPTED FISHING PERMIT TO TEST A SUSTAINABLE HOOK AND LINE FISHERY FOR CHILIPEPPER ROCKFISH OUTSIDE THE NON TRAWL RCA IN CENTRAL CALIFORNIA (40º10’ N LAT.-34º27’ N LAT.)

Date of application: 5/21/07

Applicant Name:
Josh Churchman
1 Opal Road
Bolinas, CA 94924
(415) 868-0982

Purposes and Goals of the Proposed Experiment
The goal of the exempted fishing permit is to develop a sustainable method for harvesting the abundant stocks of chilipepper rockfish in the central California region (40º10’ N Lat.-36º N Lat.). Another goal is to eliminate bycatch.

- Design a low impact, hand operated equipment only (rod and reel) fishery model that could be replicated to allow for higher trip limits for vessels in this area.

- Restore the historic method of fishing with vertical gear for shelf rockfish and re-establish a sustainable fishery that strives for total retention.

The specific goals of the experiment are to:

- Develop a harvest method that is equally accessible to vessels of all sizes

- 100 hooks maximum per vessel

- Fifty feet of empty (no hooks) line between the weight and the first hook with a vertically fished line

- No bait allowed

- All lines must stay attached to vessel

- Daylight hours only

- Must contact the port sampler prior to fishing to allow biological sampling of the landed catch on the dock

- Full observer coverage with the participants bearing the cost

All fishing will take place within two small Groundfish Fishing Areas (GFAs) known to be good chilipepper grounds.

38.07 to 38.10… 123.20 to 123.27 located on the east side of the Bodega canyon

38.25 to 38.30… 123.35 to 123.38 located on the west side of Bodega canyon

No fishing inside 100 fm

Disposition of Fish Harvested under the Exempted Fishing Permit (EFP)
Species caught may be retained and sold.
Annual caps:
Chilipepper…40,000 lbs
Boccaccio…7,000 lbs
Widow…7,000 lbs
Canary …50 lbs
Cow cod…50 lbs
Golden eye…50 lbs
Full retention of all slope rockfish

The market potential is very strong for these fish because they have been scarce for so many years. Prices of two dollars a pound are not uncommon.

Justification Explaining Why an EFP is Warranted
The traditional "fixed gear" fishery has two tragic flaws. First, is the fact that it is a bottom contact fishery. This EFP proposes a non-bottom contact fishery that could be replicated throughout California. The experiment will use a vertical line to fish for chilipepper (which swim in mid-water) that will minimize contact with the bottom.
Traditional fixed gear uses bait and bait has a higher chance of catching depleted stocks, especially if the bait is laying on or near the bottom.
This EFP hopes to demonstrate the ability of vertical gears to harvest abundant stocks while minimizing take of depressed stocks.

Another major goal of this EFP is to reduce by catch and strive toward total retention. Current regulations have created a situation where discard is inevitable. I have fished rockfish thirty years, for twenty three of those years, I never discarded a fish. Due to regulations over the past seven years, I have been forced to discard fish every time I go out. In the process of trying to catch my allotted quota of a chilipepper, I am forced to throw back un-allotted widows and bocaccio that come to the surface dead. In those seven years, I always stopped fishing before I reached my quota of chilipepper because the discard factor became too disgusting. Mandatory discard has removed the honor from what was once my favorite fishery. This experiment will explore whether discard can be virtually eliminated using the rod and reel model.

Statement of Project Significance
Historically, the three major ports in this area (Bodega Bay, San Francisco Bay, and Half Moon Bay) all had significant hook and line landings. The ex-vessel values of hook and line caught fish have always been much higher than trawl caught fish of the same species. If this EFP is successful, it could restore a vibrant hook and line fishery to these ports. An increase in boats using hook and line to catch fewer fish of higher value will be more efficient, have less

environmental impact, and benefit local economies with a high quality, high value product. Prior to the turn of the century all fish were harvested with hook and line. This EFP has the potential to restore a truly “historic” method of take for shelf rockfish.

Vessels to be Covered by the EFP

FV Palo FG 27309 GF 0056 Josh Churchman
FV Hazel A Ed Paasch

Both vessels have fished these waters for over twenty years and were chosen because of their local knowledge of the fishery and the markets.

Other EFP Specifications

- All fishing will take place seaward of 100 fm.

- All vessels will declare the time and place of landing to allow access to interested biologists.

- All vessels will have a VMS system.

- A standardized data collection and reporting format will be coordinated by the California Department of Fish and Game, NMFS Northwest Fisheries Science Center, and Pacific States Marine Fisheries who currently is monitoring all fish from FV Palo

- All vessels will be subject to the current observer requirements.

Contact person:
Josh Churchman
1 Opal Road
Box 5 Ocean Parkway
Bolinas, CA94924
(415) 868 0982

EXEMPTED FISHING PERMIT – CHILIPEPPER ROCKFISH

Request for an exempted fishing permit (EFP).

Project Title: Evaluation of an epibenthic trolled longline to selectively catch chilipepper rockfish (*Sebastes goodei*).

Date of Application: October 17, 2007

Applicant: Steven Fosmark
PO Box 1338
Pebble Beach, CA 93953

Phone: 831-601-4074
Email: fvseeadler@aol.com

Scientist: Kirk Lynn
California Department of Fish and Game
4949 Viewridge Ave
San Diego, CA 92123

Phone: 858-636-3179
Email: klynn@dfg.ca.gov

Purpose and Goals

Chilipepper rockfish stocks on the west coast are considered healthy. However, because of weak stock management, the OY for this species cannot be taken. In 2006, chilipepper landings were 39.7 mt (http://www.psmfc.org/pacfin/data/r001.p06) of a 2000 mt OY. Area closures to protect overfished rockfish species have effectively closed access to this resource. *Italics are suggestions.*

The long-term objective of this project is to describe and evaluate the effectiveness of a species-selective longline technique, which if proven effective, will allow commercial fishermen access to chilipepper rockfish, a relatively abundant species of rockfish. This fishery is constrained by the current rockfish area closures (Rockfish Conservation Areas, RCA), implemented to protect overfished rockfish species. Despite the depressed condition of some west coast groundfish stocks, there are other stocks that remain healthy. These healthier stocks could safely sustain increased harvest levels if they could be fished more cleanly and without bycatch of more depleted stocks. If stronger stocks could be targeted without increasing fishing mortality on depressed stocks, the California commercial fishing fleet would have alternative fishing opportunities that would provide some economic relief to the industry while providing the public with a highly desirable product.

The objective of the research for which we are requesting an EFP would be to establish the performance characteristics of the gear and to rigorously document the catch and bycatch when deployed in areas where chilipepper are abundant and bycatch species are not, under commercial fishing conditions. The objectives would be: 1) to test the trolled gear and fishing strategy with vertical lines and artificial flies, and 2) determine Groundfish Fishing Areas that are abundant with chilipepper rockfish, and that correspond to low densities of overfished species. The second objective may better help to answer the question of how EFP results can potentially be translated into future fleet-wide fishing opportunities.

The location, gear characteristics (number of hooks, length of mainline, etc.), species composition, size distribution, and sex ratio (of chilipepper) of each set of gear will be recorded by onboard observers.

The EFP that we are requesting would allow up to three (3) vessels. Each would be limited to a bimonthly landing as established for 2008 to fish inside the current RCA using otherwise legal open access fixed gear. It is suggested limitations same as for fixed gear, and for bocaccio and widow, etc. Possible bimonthly limits for other than bocaccio. Suggest chilipepper limitation same as either open access, or trawl.

This EFP for chilipeppers is a mid-water project and will use a test line with a couple of hooks; prospecting is useful to avoid bocaccio. Prior to setting the gear, a test set will be made with vertical gear in which the gear is set vertically. This will be with no hooks closer than 3 fm of the bottom, based on acoustic soundings, to ensure that the target species is present and to minimize the chance of encountering any of the overfished rockfish species. Line will be an off-the-bottom longline with corks attached close to line, consisting of drop line, main line, and wire attached to a reel (see Diagrams 1-3, pp. 4-5). The gear will consist of a maximum of 500-750 hooks per set. Gear consists of open access troll fly and vertical hook and line gear that is set and fished in a unique way such that the hooks sink to near, but not hard on bottom

Once the test set establishes the presence of chilipepper rockfish, the gear will be deployed as follows: the vessel moves slowly ahead as the gear is deployed. The gear remains attached to the vessel at all times. Artificial "flies" are used in lieu of bait. The mainline consists of 200-600 lb. test monofilament, and may be spooled on a hydraulic drum. One end, with buoy and weight attached in such a way that the gear does not touch the bottom is sent overboard as the boat moves slowly ahead, and the remaining gear is deployed. The weighted buoy line length is adjusted in such a way that does not have bottom contact to reduce the likelihood of bycatch and to prevent the hooks from hanging up on bottom. Hooks are spaced approximately 18-30" apart on 12" monofilament gangions (approximately 60 lb test). Hooks are tied with artificial flies, and no bait is used. This gear is reported by the fisherman to selectively catch chilipepper rockfish when properly deployed (Steve Fosmark, Moss Landing, CA, F/V SeeAdler, Phone: 831-373-5238; cell phones: 831-601-4074; or Boat 831-601-7934 email: FVSeeAdler@aol.com).

The research would be conducted off central California (36 to 37.50 degrees), at depths of approximately 80-120 fm (chilis tend to get smaller in size and schools are thinner in shallow depths), in areas with canyon edges and walls, smooth hard bottom, with no rocks (example: canyon south of Año Nuevo). This depth range is currently within the RCA established to protect overfished rockfish species.

To ensure that this experimental fishery has a minimal impact on overfished rockfish species, we will use GMT - determined caps on the fishery for the following: [*Suggested preliminary caps for overfished species*]

Widow rockfish: *GMT* *determined* [1,440 lb *(0.7 mt)* annual cap calculated as a maximum 3% by weight of expected chilipepper take]
Bocaccio: *GMT* *determined* [7,200 lb *(3.3 mt)* annual cap calculated as a maximum 15% by weight of expected chilipepper take]
Canary: *GMT* *determined* [*20 fish* annual cap]
Cowcod: *GMT* *determined* annual cap [*at least 3 fish*]
Yelloweye: *GMT* *determined* annual cap [*at least 3 fish*]
Darkblotched: *GMT* *determined* [*50 lb* bimonthly per vessel cap, *0.4mt* annual cap for all vessels]

All species will be retained. Catch of species other than the above are expected to be uncommon although some yellowtail and perhaps other rockfish may be encountered in small numbers. The above caps would apply for each vessel during the two-month cumulative period for the entire EFP and attaining the annual caps for any one species would terminate the EFP for all vessels.

Although the caps specified above are simply recommendations, which we realize may be modified, we provide the above catch levels to illustrate the maximum potential bycatch of overfished species that could be realized under these caps with the present landing limits in place. We anticipate that fishing as described in this EFP will not be constrained by these caps.

Chilipepper rockfish caught under this EFP will be retained and sold by the permitted vessel. Although we have calculated the maximum weight of overfished rockfish that could be caught under the suggested caps, we believe this fishery will not be constrained by these caps and will have a smaller bycatch than indicated above.

The initial duration of this EFP is for one year. However, if the results of this experiment are successful, we would request that the EFP be extended.

This EFP will incorporate a standardized data collection and reporting format coordinated by the California Department of Fish and Game and the NMFS Northwest Fisheries Science Center. Under the terms of this EFP, all vessels participating in this EFP fishery each will carry an observer with the cost of observer coverage borne by the EFP participants. The observer will record all fish caught and ensure that bycatch caps are not exceeded. Vessel captains will keep records of catch by species by set for all sets under this EFP. As it is possible that the catch and bycatch will change seasonally, we expect participants to fish year round (or in each month that the fishery is permitted).

The applicant and the scientist will be responsible for data analysis. Data analysis will consist of statistical analysis of catch and bycatch of all species by set, trip, and month. Catch rates will be expressed as catch per hook, per set, per day, and per trip. Value of the catch will be recorded following sale of the catch. The final report will provide an estimate of fishing effort and total catch; absolute and relative species composition summarized by set, trip, and month; size composition of catch and bycatch; and sex ratio and stage of maturity for chilipepper.

Vessels to participate in this EFP fishery will be chosen on their ability to accommodate an observer, their willingness to maintain detailed catch data and their willingness to fish during the time when fish are available.

Areas to be selected for high-density target species will be between 37.20 degrees (Pigeon Point) and 36 degrees (Point Lopez). Other areas may be selected as needed.

Equipment needed:

Hydraulic reel, 1000 feet of conveyor belting or reel with wide runner, fly-hooks, line, wire, snaps, small buoys, one large buoy, 3 and 5 lb. weights, fish finder, fathometer, or sonar.

Description:

500 to 750 hooks are needed for three or four sets in the morning and afternoon; 1,000 would be the best as the sets are limited.

Design:

Determine depth: if 90 fm deep, use 85 fm of drop line, deployed first and 5 pound weight at the end with attached long line to drop line 1 fm above weight. Buoy attached to line at surface to sustain depth. If long line is 1,000 feet, 750 leaders and hooks with small floats attached to long line between leaders. Floats have short lines and are attached to the long line with short tethers.

Time to fish is short. During the day chilipepper come off the bottom and once they are mid-water one cannot catch them by this method. Therefore the morning and evening are the best times. Otherwise sonar is needed.

Diagram 1.

```
BOAT                                                    O      surface buoy
    \wire                                               / nylon line
     \          float                                   \
      \ __/___@___/______/___@__/______/___@__/______/
       / 1fm                                            \  1 fm line
      0 … 30 lb. weight    ( line is 4 fm from bottom)   0 …. 5 lb.weight
```

Line is 1,000 feet long and weight is 3 fm from bottom and 1 fm to where it attaches to provide control. The long line then is 4 fm from the bottom. When the line reacts to bites, take the boat out of gear and the line will float between floats and fish will climb the line to the floats as they do with vertical gear on up and as line is pulled, line rises to the surface. Boat must then be going ahead while pulled to keep the fish on. The tail drop line remains at 85 fathoms. As the boat moves forward the drop line moves close to the end of the boat tight and fish continue to climb the line. As the line is towed in, fish stay in area of line where school is thicker, (pull through spot of fish). As line is pulled on board it becomes vertical.

Diagram 2. Retrieved

Pulled aboard vessel the line becomes vertical. Buoy holds line and weight above floor.

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Surface_____________________________________________BOAT         O  buoy
                                                       \         /
                                                        \/       /
><((((º>`·.¸¸.·´¯`·.¸.·´¯`·...¸><((((º>¸.               \      /   nylon line
    ·´¯`·.¸. ¸ . . ·´¯`·.. ><((((º>`·.¸¸.·´¯`·.¸.·´¯`·...¸><((((º>     \/     /
                                                           \    /
                                                            \ /
                                                            /   1 fm drop line to weight
                                                           0   5 lb.weight
                                                               4 fm, to ocean floor

Ocean floor______________        line, hooks and floats not less than 4 fm from ocean floor
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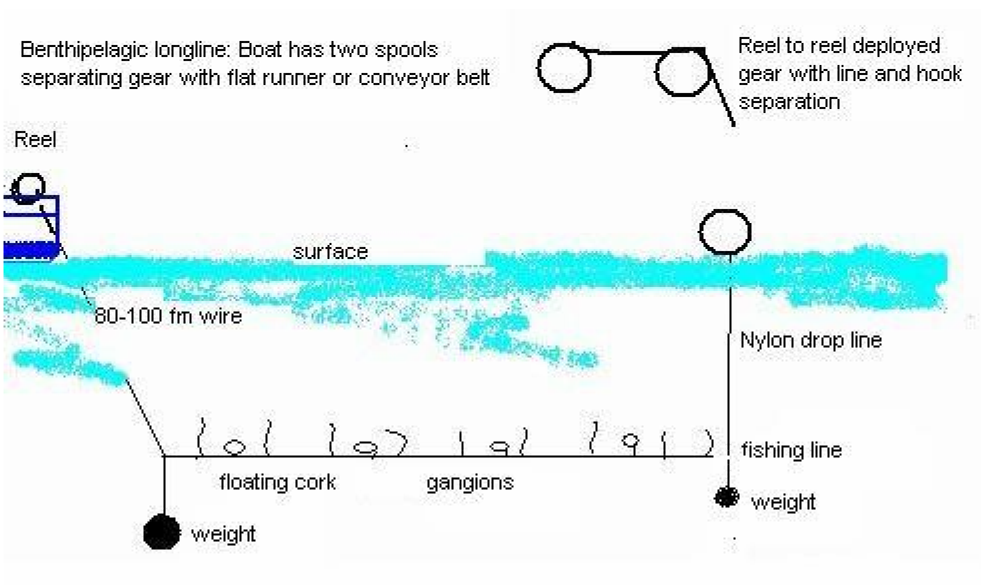

Diagram 3. Deploy: Midwater Longline Fly Fishery.

Reel to reel deployed over belt. Forward reel has coiled line gear over a conveyor belt and is deployed over stern by a powered stern reel. Conveyor belt is coiled from the forward reel over a stern reel and line spools off into water. Pull line back with powered forward reel by rolling line and conveyor belt onto forward reel. Line revolves over stern reel with belt onto forward reel, the conveyor belt is moving with it. Line is never coiled onto stern reel, only over the conveyor belt. The line always goes from water over the stern reel, and coiled back onto the forward reel. Belt acts as a protection from entanglement for gear separation. Stern reel acts as a roller to hold coiled belt.

The Nature Conservancy
Protecting nature. Preserving life.™

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201 Mission Street, 4th Floor
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nature.org

October 17, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen:

On behalf of all six sponsors, we are pleased to submit the attached application for an exempted fishing permit (EFP) to test the merits of utilizing six Limited Entry trawl permits with hook-and-line, longline, trap and pot gear under shared hard harvest and bycatch caps within the structure of a community based fishing association. This EFP is designed to provide the Pacific Fishery Management Council ("Council") with practical experience and data that could inform decisions relevant to future management of the limited entry groundfish trawl fishery. The applicants and the supporters of this EFP believe that both gear-switching and cooperatively-managed community-based fishing arrangements or associations hold the promise of reducing the unintended consequences of fishery rationalization. These tools might be of particular importance to smaller and more remote fishing communities, such as those throughout the Central Coast, that have long relied on access to the groundfish resource. Finally, the use of these tools may help the Council to meet the goals and objectives of the Pacific Coast Groundfish Fishery Management Plan (PCGFMP).

In June, the Council voted to forward the EFP for consideration at the November meeting and several members of the Council and its advisory bodies expressed strong interest in this project. However, the sponsors of this project received clear guidance that several issues needed to be addressed prior to the November meeting. We took that guidance seriously and have spent the time since the June meeting revising the proposal to address those issues. Attached to this letter is a list of specific changes.

We strongly support the Council's current management efforts to rebuild stocks, protect habitat, promote fishery sustainability and address overcapacity. This EFP will complement those efforts and serve as a test of useful tools that may help align economic incentives with resource conservation objectives.

We deeply appreciate the interest that members of the Council and its advisory bodies have shown in this project. We hereby submit it for the Council's consideration at the November Council meeting and respectfully request your favorable consideration.

Sincerely,

Margaret Spring, Director
California Coastal and Marine Program
The Nature Conservancy

Specific changes to EFP proposal in response to Council Members' comments:

The purpose and goals of the project are unchanged. However, we have listed below are the major specific issues raised by the Council in June, with an explanation of how the EFP has been modified to address each topic:

Sablefish: Two issues were identified related to sablefish in the June Council meeting. The first was in regards to the request for an upfront set-aside or allocation of sablefish for the EFP project. To address this issue, we propose that no special set-aside be made for fishing under the EFP. The current proposal requests that fishing be constrained by not-to-exceed hard caps that will limit the total potential catch of all species.

The second issue related to the total potential catch of sablefish within the Conception Area. The June version of the EFP requested that up to half of the Conception Area OY for sablefish (112.4 metric tons) as the hard cap for fishing under this EFP. During the Council meeting, it was made clear to the sponsors that this proposed hard cap was high enough to negatively impact other fishing efforts in the Conception Area. Based on this feedback, we have drastically reduced the proposed hard cap for this species to 50 metric tons or 30% of the average Conception Area landings over the period of 1998 to 2006. In order to accommodate this change, we also significantly reduced the overall scope of the EFP so that we might still run a meaningful experiment, while decreasing the total potential catch of this important species.

We feel this sablefish hard cap is a modest reflection of the catch history of the six permits purchased by The Nature Conservancy, and the history of trawl landings in Morro Bay. From 1994 to 2004, Morro Bay trawl landings represented on average 46% of Conception Area landings of sablefish. Together, when the TNC permits were active, they accounted for approximately 30% of Conception Area landings for sablefish. Average total Conception Area landings of sablefish between 1998 and 2006 were 168 metric tons. The proposed hard cap is derived by taking 30% of the average or 50 metric tons.

Locations of fishing and fishery landings and participant selection: During the June Council meeting, questions were raised about the area that would be fished, whether the EFP would specify a port or ports where landings must take place. Others were concerned about how fishermen would be selected to participate.

This revision clarifies that fishing under the EFP would be restricted to the area between Point Lopez and Point Conception and outside the seaward boundary of the Rockfish Conservation Area and would require fish to be landed in Morro Bay or Port San Luis, California.

The sponsors have developed an application process that is being used to identify interested and eligible fishermen and will report on that progress at the November Council meeting. Early indications are that there are likely more interested fishermen than there will be slots available under the EFP. Eligible fishermen are Central Coast fishermen that meet regulatory requirements for participation, who have experience with the gear to be used in this EFP, who are willing to land in Morro Bay or Port San Luis, and who are interested in contributing to this experiment. In the event the EFP is approved, the sponsors will select six fishermen to participate from those that are interested and eligible and begin work with them to establish the association.

Monitoring and Enforcement: During the June Council meeting, members of the Council asked for more specificity about how the EFP would be monitored and its conditions enforced.

The EFP will require 100% human observer coverage on all fishing trips and, we intend to take this opportunity to work with the NOAA Observer program to test the relative usefulness of Electronic Monitoring Systems for monitoring fixed gear groundfish vessels. EMS might offer a similarly effective but less costly option for monitoring the fishery.

TNC, as the owner of the permits that are the subject of this EFP, will take primary responsibility for developing lease agreements under which fisherman may participate that are consistent with the requirements and the goals of the EFP and for enforcing the terms of those leases. The terms of the leases will reflect the conditions of the EFP and require that participants abide by the rules of the fishing association. Those who fail to comply with these terms will have their leases revoked.

TNC will also be responsible for ensuring the project is fully accountable and meets all regulatory and reporting requirements.

Bycatch caps: A question was raised at the June Council meeting of whether the hard caps for bycatch of overfished species proposed in the EFP were appropriate in the context of rebuilding.

The hard caps for bycatch of overfished species included in this proposal are relatively unchanged from June, with the exception of bocaccio. These requests were based on recommendations from the California Department of Fish and Game and were reviewed by the Groundfish Management Team in September. The modified bocaccio recommendation is based on GMT recommendation. We recognize that these numbers are contingent upon the 2008 scorecard and we would be pleased to work with the Council and its advisory bodies to further refine these numbers.

Application for Issuance of an Exempted Fishing Permit (EFP) to Fish Trawl Permits with Longline, Trap, Pot, and Hook-and-Line Gear In A Community Based Fishing Association off the Central California Coast

October 17, 2007

1. Applicant Contact Information

California Department of Fish & Game
Contact: Marija Vojkovich and Joanna Grebel
1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109
Phone: (805) 568-1246
Fax: (805) 568-1235

City of Morro Bay & Port San Luis Harbor District
Contact: Rick Algert, Harbor Director, CMB
Kirk Sturm, Harbor Manager, PSL HD
Harbor Department
1275 Embarcadero
Morro Bay, California 93442
Phone: (805) 772-6254
Fax: (805) 772-6258

Morro Bay Commercial Fishermen's Organization, Inc.
Contact: Jeremiah O'Brien
Post Office Box 450
Morro Bay, California 93443
Phone: (805) 441-7468

Port San Luis Commercial Fishermen's Association
Contact: Bill Ward
Post Office Box 513
Avila Beach, California 93424
Phone: (805) 441-1374

The Nature Conservancy
Contacts: Michael Bell and Erika Feller
75 Higuera Street, Suite 200
San Luis Obispo, CA 93401
Phone: (805) 594-1658
Cell: (805) 441-1460
Fax: (805) 544-2209

Environmental Defense
Contact: Rod Fujita and Kate Bonzon
California Regional Office
5655 College Avenue; Suite 304
Oakland, CA 94618
Phone: (510) 658-8008
Fax: (510) 658-0630

2. Statement of 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

2.1 Purpose and Goals

We request approval by the Pacific Fisheries Management Council (PFMC) for The Nature Conservancy to employ its six Limited Entry Trawl "A" permits using fixed gear (longline, trap, pot, and hook-and-line gear) by leasing those permits to not more than six fishermen. Further, we request permission to use these permits under shared hard caps for target and bycatch species (described in section 7 of this proposal), not subject to existing trawl trip limits, but subject to a harvest plan that will include measures to manage the pace of the EFP fishery (section 12). These exemptions to the rules governing Limited Entry Trawl permits are necessary to conduct the experiment proposed in this EFP.

This Exempted Fishing Permit (EFP) will test the proposition that establishing a cooperatively managed, community based fishing association that employs trawl licenses to use longline, trap, pot, and hook-and-line gear off the Central California coast, under shared hard caps for target and bycatch species, can provide several important benefits. Under the EFP, the applicants will test whether granting the option of switching from trawl gear to fixed gear types can be manageable and, perhaps, desirable within the larger groundfish fishery management structure. The EFP will also test whether forming relationships among fishermen under a cooperative structure with shared catch limits and several unique elements would mitigate the impact of trawl effort reduction or removal on associated communities and fishermen in these areas.

The applicants' hypothesis is that reduced bycatch of overfished species and higher value of target species caught with longline, trap, pot, and hook-and-line gear relative to trawl gear will improve both the environmental and economic performance of this fishery. Because the six trawl permits based in Morro Bay were purchased by The Nature Conservancy (TNC), and trawling effort has not been replaced in the area, the permits could be re-deployed without severe impacts on other fishermen. In addition, the EFP offers the opportunity to compare the economic performance of a fixed gear groundfish fishery under the EFP to baseline conditions during a trawl fishery operating recently in the same area.

Cooperative-based management has been identified as a tool for enhancing management and economic benefits in fisheries. The trawl fishery of the Central Coast of California provides a unique opportunity to test this idea in a real-world situation with features not found in current cooperatively-managed fisheries. These features include:

1. Possible future rationalization that could include gear switching opportunities;
2. Multi-species fishery with several severely depressed stocks and constraining catch limits;
3. Single owner of multiple permits who can facilitate formation of a cooperative fishing arrangement; and,
4. Approved, economically viable, more selective alternative gear technologies available.

To conduct this test, TNC will lease up to six of its Limited Entry Trawl "A" permits, under the exemptions and requirements described in this proposal, to no more than six fishermen to fish using longline, trap, pot, and hook-and-line gear under shared hard caps for target species and bycatch. TNC will be the entity responsible for developing the lease arrangements under which fishermen will participate in this EFP and for enforcing the terms of their use, and for ensuring that implementation of this EFP is accountable to state and federal regulatory and reporting requirements.

Further, TNC proposes to work with fishermen participating in the EFP and the Morro Bay Commercial Fishermen's Organization, the Port San Luis Commercial Fishermen's Association, the City of Morro Bay, the Port San Luis Harbor District, the Department of Fish and Game, and Environmental Defense to develop the terms of the arrangement under which these fishermen will operate on a cooperative basis pursuant to the terms of the EFP. This arrangement will be referred to throughout this proposal as a "community based fishing association." Several options exist for formalizing the cooperative relationships described in this proposal, including the use of the enforceable lease agreement terms and/or the creation of a new fishing association. The EFP parties and participants will reach a decision on how to formalize these relationships following approval of this proposal by the PFMC and prior to commencement of fishing under the EFP and will document the decision in our report to the Council.

2.2 Disposition of species to be harvested under the EFP

Target species caught within the limits authorized for the EFP may be retained and sold by the vessel. Overfished species may not be retained.

3. Justification for issuance of the EFP, including potential impacts of issuing the EFP.

There are three main points that justify the issuance of this EFP:

1. It will further the goals and objectives of the Pacific Coast Groundfish Fishery Management Plan.
2. It will provide information regarding the mechanics of trawl IFQ process by providing experience with gear switching, RFA-based management, and improving monitoring efforts – all of which are or could be important elements of the trawl IFQ program.
3. It will test ways to reduce impacts on small fishing communities of the trawl IFQ program.

Furthering the Goals of the Pacific Coast Groundfish Fishery Management Plan: This EFP will test the ability of a community based fishing association that uses gear-switching and shared hard caps to better achieve Pacific Coast Groundfish Fishery Management Plan (PCGFMP) goals and objectives. The goals of the PCGFMP are to prevent overfishing and rebuild overfished stocks, prevent habitat loss, maximize the value of the groundfish resource, and to provide opportunities to utilize abundant stocks to the extent possible within the constraints of overfished species rebuilding requirements. However, the current management system provides few positive incentives or opportunities for fishermen to change the way they do business to meet the PCGFMP rebuilding or habitat protection objectives. In addition, regulatory obstructions exist to fishermen being allowed the flexibility to manage their fishing operations in a way that would enhance the value of their catch while reducing their costs. By permitting the use of trawl permits with fixed gear (which will likely offer some improvements in habitat impacts and selectivity), with shared hard caps, under collective decision-making on pooled access to the resource, this EFP will test the efficacy of a community based fishing association and gear switching as mechanisms for better aligning management and fishing incentives.

Informing Trawl Rationalization: This EFP will approximate some of the conditions that could follow implementation of IFQs for the West Coast trawl fishery. Fishermen will likely be confronted with highly constrained limits on target species and on bycatch of overfished species, as well as additional regulatory costs (i.e. monitoring). Fishermen may choose a number of strategies to maximize the value of their catch while staying within constraints, including switching gears (currently an option in the draft Environmental Impact Statement[1]) and pooling effort through a Regional Fishing Association (RFA, an option under the MSFCMA). An RFA could be charged with making decisions regarding deployment of fishing effort within constraints established by the Council, for determining distribution of limited human observer coverage across this fishery, and for developing strategies and incentives to achieve harvest targets while remaining below hard caps for overfished species. Managing quota under an IFQ program collectively may provide additional conservation and economic benefits.

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[1] See http://www.pcouncil.org/groundfish/gfifq/Trat_Alt_0709.pdf.

The trawl IFQ options currently under review call for 100% on-board observer coverage. This EFP will similarly utilize 100% observer coverage and will provide practical and valuable information regarding how a community would employ and manage observers. By acting in a coordinated manner, fishermen may be able to reduce costs while still providing required information to managers. Furthermore, the EFP will illuminate the challenges of monitoring and managing a community based fishing association in the context of the larger west coast groundfish fishery. The EFP will also provide useful information on costs of management under a rationalized fishery.

In addition, the EFP will provide practical experience in developing a working relationship between a community based fishing association, the PFMC, and NOAA Fisheries. Through lease agreements, The Nature Conservancy will hold participants to constraints specified in the EFP, and ensure compliance with the regulatory and reporting requirements established by the PFMC the regulatory and reporting processes established by the PFMC, the State of California, and NOAA Fisheries. This will provide insights as to how community based organizations in the future might be used to assist managers in getting timely information about the fishery including members compliance with regulatory requirements.

<u>Reducing Impacts on Fishing Communities:</u> Evidence suggests that cooperative, community based fishing associations offer an opportunity to strengthen fisheries on the West Coast. Regulations to rebuild stocks and protect habitat promote fisheries sustainability and address the consequences of overcapacity, but at a very high economic and social price to fishing communities. Public perceptions about trawl fishing practices, market dislocations, increasing costs and diminishing harvest opportunities, as well as buyouts to reduce capacity have taken their toll on communities that rely on the groundfish trawl fleet. On a large scale, rationalization of the trawl fleet is likely a net benefit, but its effects on a community scale are much less clear. Regionally based fishing associations could provide an opportunity for fishermen to coordinate their efforts, pool resources, and make collective investments in fishery infrastructure, in order to optimize the value of the resource, meet rebuilding and habitat conservation requirements, and preserve fishing heritage. This part of the experiment is consistent with PCGFMP objectives to provide for the sustained participation of fishing communities, and minimize adverse economic impacts.

The use of shared hard caps for target species and bycatch proposed by this EFP will also allow the fishing association to take a number of steps which are likely to improve the opportunity offered to fishermen and the community, including through the following means:

1. Enhancing harvest efficiency– by coordinating on harvest, members can reduce costs of harvest by sharing information, eliminating redundant effort, and reducing the incentive to stuff capital.
2. Commanding increased price – switching to longline, trap, pot, or hook-and-line gear is likely to deliver a higher quality or preferred product which may command a higher price.
3. Pooling risk – by sharing a hard cap for bycatch, fishing association members are able to spread compliance risk across members and minimize effort associated with individual fishing operations, including the race to fish. This could enable more targeted harvesting, and has the potential to raise revenues and reduce costs.

While community based fishing associations that operate under shared caps and facilitate gear switching will likely prove to be a valuable approach in many places around the country, actual practical experience in creating this type of organization in these circumstances is extremely limited. Morro Bay and Port San Luis have many attributes that lend themselves to testing this approach:

- Extensive outreach to area fishermen has already occurred, including a survey to establish interest in leasing TNC trawl permits in order to fish them with fixed gear, and several fishermen have already requested to participate in this EFP.
- The City of Morro Bay and the Port San Luis Harbor District are sponsors of this EFP along with the Morro Bay Commercial Fishermen's Organization and the Port San Luis Commercial Fishermen's Association. Strong local support, coupled with investments in necessary infrastructure, is essential to running a successful experiment.
- One of the project partners, The Nature Conservancy, purchased six limited entry trawl permits from Morro Bay fishermen, removing trawl capacity that has not been replaced by trawl fishermen from other places. This presents an opportunity to target some species without substantial negative consequences for other communities relying on the same resource. In addition there is the opportunity to compare the economic performance of a fixed gear groundfish fishery under the EFP to baseline conditions during a trawl fishery operating recently in the same area.

4. **Statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.**

While cooperative management has been used successfully in fisheries throughout the world, there is less knowledge about how such an approach could work on the West Coast, in a constrained multispecies fishery, within the management options created by new provisions of the MSFCMA which allow the establishment of RFAs as part of Limited Access Privilege Programs, such as IFQ programs. This EFP will provide managers with insights into how a fishing association could work to achieve PFMC/NOAA Fisheries' strategic goals for groundfish and FMP objectives; information that will be useful in development of regulations or guidelines governing establishment of RFAs pursuant to language in the Magnuson-Stevens Fishery Conservation and Management Act (Sec. 303A(c)(4)).

Management measures related to rationalization, such as the trawl IFQ program, will require enhanced monitoring, because such programs emphasize individual accountability to catch limits. This EFP will explore how to structure a more cost-effective monitoring system - from the perspective of both fishermen and fishery managers. The EFP will require 100% human observer monitoring of catch, and the applicants will take this opportunity to compare human observers with Electronic Monitoring Systems as an alternative. A separate experiment to compare Electronic Monitoring Systems (EMS) with the human observers required for operation of a fishery under an EFP will be run in conjunction with this EFP. This will be the first test of EMS on non-whiting groundfish vessels on the West Coast.

5. **Expected Total Duration of the EFP**

This EFP will be for one year, with the option to apply to the Council for renewal the following year.

6. **Number of Vessels Covered under the EFP**

This EFP will include no more than six fishery participants and will employ no more than six vessels.

7. **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.**

This proposal requests an Exempted Fishing Permit be issued to The Nature Conservancy to employ six Limited Entry Trawl "A" permits using longline, trap, pot, and hook-and-line gear. Further, we request permission to use these permits under a shared hard cap and, rather than be subject to existing trawl trip limits, be subject to measures established by the fishing association to pace fishing effort throughout the year. (see section 12)

Under this EFP, TNC will lease its six permits to a specified set of participants in the fishing association who will have the opportunity to fish up to specified hard caps of target species and bycatch species. If the fishing association is on track to exceed its bycatch cap prior to reaching its target species cap, then fishing under the EFP will end (prior to its reaching the target species hard caps).

7.1. <u>Target species request.</u>

The following species have been identified, through an examination of catch histories of the six permits that are the subject of this proposal, Morro Bay ex-vessel revenue data, and interviews with Central Coast fishermen, to have been historically harvested under the six trawl permits used for this experiment and to be catchable in commercially viable amounts using gear specified in this proposal. There is one exception to this statement – flatfish are not conventionally caught with the gear types specified in this EFP, but a likely participant has expressed interest in using traps for flatfish. They are included here in greatly reduced amounts compared to trawl landings and it is unlikely that these caps will be reached during the course of this EFP.

Species:	**Hard cap proposed for EFP:**
Sablefish	50 mt
Southern Slope Rockfish	50 mt
Blackgill Rockfish	20 mt
Longspine thornyhead	60 mt
Shortspine thornyhead	60 mt
Lingcod	15 mt
Other:	
Chilipepper rockfish	20 mt
Spiny dogfish	10 mt
Splitnose Rockfish	1000 lbs
Flatfish:	
Dover sole	10 mt
Petrale sole	10 mt
Other flatfish	10 mt

This hard cap request for sablefish is based on the catch history of the six permits purchased by The Nature Conservancy in 2006, which provides a good starting point because this trawl capacity was removed very recently from the Conception Area and has not been replaced. From 1994 to 2004, Morro Bay trawl landings represented on average 46% of Conception Area landings of sablefish. Together, when the TNC permits were active, they accounted for approximately 30% of Conception Area landings for sablefish. Average total Conception Area landings of sablefish between 1998 and 2006 were 168 metric tons. The proposed hard cap is derived by taking 30% of the average or 50 metric tons.

Catch of species other than sablefish is expected to be under the proposed hard cap figures listed above. These hard cap proposals are based on amounts potential catch deemed necessary by the applicants to effectively prosecute the EFP, interest from fishermen likely to participate in catching these species, and the need to minimize negative impacts on other fishermen and areas.

7.2. Total bycatch caps for overfished species requested for the EFP are requested to be as follows:

Species:	Hard cap proposed for EFP:
Canary Rockfish	300 lbs
Yelloweye Rockfish	150lbs
Widow Rockfish	2 mt
Darkblotched Rockfish	1000 lbs
Pacific Ocean Perch	300 lbs
Cowcod	300 lbs
Bocaccio	5 mt

Bycatch hard caps were supplied by the Department of Fish and Game.

All caps will be apportioned to individual vessels within the fishing association to achieve the goals of the EFP.

8. Infrastructure to monitor, process data, and administer the EFP

The Nature Conservancy will be the entity to which the EFP, if approved, is issued and the entity principally responsible for managing implementation of this EFP.

8.1. The Nature Conservancy will manage all fishing leases and will be responsible for enforcing the terms that govern their use. This will include working with fishermen to establish lease terms that reflect the purposes and goals of this EFP and setting lease rates. TNC will be responsible for ensuring accountability to relevant state and federal regulatory and legal requirements.

8.2. Data collection, analysis, and reporting will be managed by a dedicated project manager under contract to The Nature Conservancy and who works closely with a local community based fishery association committee ("the Committee") that is comprised of representatives of the sponsors of this proposal and the participants in this EFP.

The project manager's responsibilities include but are not limited to the following tasks:

- Reporting landings under the EFP to NOAA-Fisheries;
- Coordinating with enforcement, management and science staff;
- Facilitating communication among EFP participants;

- Ensuring that no vessel fishes without an observer and that observer work guidelines are complied with;
- Monitoring and enforcing compliance of vessels with rules under the EFP;
- Collecting and compiling socioeconomic and behavioral data; and,
- Preparing, in cooperation with the Committee and others, as appropriate, reports to the Council on progress under this EFP.

8.3. At-sea monitoring will be done by NOAA observers with costs covered jointly by project sponsors.

8.4. Data collection and processing for the research questions presented in the proposal will be managed as follows:

- Information regarding the operation of the community based fishing association will be compiled by the project manager working in close coordination with the participants and the Committee, as specified in section 7.2.
- Economic data will be collected by the project manager and analyzed by an economist under contract to The Nature Conservancy for this purpose, as specified in section 7.1.

8.5. A Committee has been formed that will serve as the board of the proposed community based fishing association. This Committee includes representatives from the Morro Bay Commercial Fishermen's Organization, the Port San Luis Commercial Fishermen's Association, the City of Morro Bay, the Port San Luis Harbor District, The Nature Conservancy, and Environmental Defense. The Committee's responsibilities include:

- Implementing a process to choose participants including, developing the application, distributing to likely participants, screening for eligibility, and – in the event more than six eligible fishermen indicate interest – the Committee will convene an impartial selection panel to make the final determination regarding selection;
- Overseeing development of the fishing plan with participating fishermen;
- Overseeing the budget;
- Overseeing the project manager; and,
- Ensuring compliance with all EFP reporting requirements.

8.6. A science advisory committee comprised of experts with relevant scientific and technical expertise to advise on development of the harvest plan and other matters related to implementation of this EFP will be convened if the EFP is approved. Specific areas of expertise that will be sought include economic analysis, groundfish fishery management, and fishery monitoring.

9. Mechanism to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted

All participating vessels will be required to land fish in Morro Bay or Port San Luis. Harvest limits for each vessel will be established by the fishing association. Landings information will be monitored by landing tickets. All participants will enter into data sharing agreements as a condition of participation in the EFP to facilitate access to fishery information and will be required to submit copies of catch information within 48 hours after each fishing trip taken under this EFP to the project manager.

Discards of all species, including overfished species, will be tracked using human observer monitoring, which will be present on every fishing trip under this EFP.

Total landings and discard of all species will be accounted for by the project manager who will regularly report to the Council. For in-season monitoring relative to catch limits, data on catches will be collected on a by-permit and cumulatively for the EFP from landing ticket data and tracked relative to hard caps, and reported weekly to NOAA Fisheries. The project manager will move to more frequent tracking as the EFP approaches its catch limits. All fishing will cease prior to attaining the caps associated with this EFP. Any unintentional overages will be reported to the Council as soon as the project manager is aware of them.

Although this proposal requests an exemption from trip limits, the purposes for establishing trip limits including pacing and maintaining the fishery throughout the year, reducing discards, and protecting overfished species, are extremely important. Before fishing may commence, the fishing association will work cooperatively to develop specific guidelines for the association in a harvest plan that describes how fishing under the EFP will proceed to achieve these purposes, as described in Section 12.

10. Description of the proposed data collection and analysis methodology

10.1. Economic viability of an community based fishing association with gear switching

A major focus of the project will be to study the socioeconomic consequences of gear switching and of a cooperative, community based fishing association using shared hard caps. This evaluation will use data collected from members (costs, revenues, effort, behavior, beliefs, etc.) as well information on non-members (both historical data from fishermen in the area and contemporary data from non-members).

Data required for testing economic viability will be collected as follows:

1. Extensive trip-level data from fishermen participating in the EFP through survey and self-reporting of: daily effort, expenditures, expectations, location-specific harvest, etc., as well as less quantitative data on fishermen's perceptions of their profitability. Data will be collected through a survey adapted from a survey developed and implemented to track the economic performance of the salmon cooperative in Chignik, Alaska in 2002.[2] The survey and subsequent analysis measured both objective (e.g. harvest, effort, price received) and subjective (e.g. whether a fisherman enjoyed the fishing experience more) criteria for both coop and non-coop members. As our focus is on performance within the fishing association, our surveys will focus on, but will not be limited to that group.
2. Perceptions and effects on non-participants. We will survey local fishermen, buyers, processors, consumers, etc. to determine the consequences on non-participants.
3. Objective data on effort and harvest of non-members. Using the Chignik survey as a starting point, we will use routine management data collected by the NOAA Fisheries and the State of California Department of Fish and Game.
4. Historical data on trawl fishery effort, bycatch, and revenues, by location, as collected by the NOAA Fisheries and the State of California Department of Fish and Game.

[2] See http://www.iser.uaa.alaska.edu/Publications/ISERChignikSurveyReportpt1.pdf

Analysis of these four data sets will allow us to determine whether the fishing association with gear switching is an economically viable venture on the Central Coast, i.e. whether its revenues exceed its costs.

Through this project, we will provide the Council information on changes in fishing behavior, revenue, marketing opportunities, distribution channels, product value, and costs of monitoring. In addition, we will gather information and report on the socioeconomic consequences at the community level and other relevant information. Comparisons will be made for each of these factors to when these six permits were actively trawled and to other groups of fishermen with comparable vessels.

10.2. Management of a Community Based Fishing Association

The EFP will provide practical experience in the monitoring and management of a community based fishing association within the context of the Council's coast wide management of the groundfish fishery. Creating a community based fishing association for the Central Coast should improve economic opportunities for fishermen, provide a means for a local industry to manage risk, and may present some improvements for fishery managers. However, while a number of cooperatives exist in the U.S. - with several on the West Coast – the Central Coast represents a unique set of circumstances for developing a fishing association that is focused on both economic optimization and improved conservation performance.

Through this project, we will provide the Council information on questions relevant to implementation of a fishing association that is designed to improve the economics and conservation performance of the fishery, including:

- Is it possible to develop a cost-effective monitoring program that provides for full accountability within the association while meeting the requirements of the PCGFMP, National Standards, and all applicable regulations?
- By what means do participants in the association determine how to share access to the resource among participants?
- How are hard-caps monitored and enforced within the association?
- What mechanisms does the fishing association use to pace fishing effort throughout the year?
- How are data collected and managed by the association and distributed efficiently to fishery managers?
- Is it possible to create non-regulatory incentives within the association to encourage the reduction of bycatch and take of overfished species to mitigate risk of reaching bycatch hard caps to the entire group?
- How is required observer coverage shared among participants to ensure accountability and opportunity to fish?
- What are the costs of running the fishing association and how are those distributed among participants?

Cost-of-management issues will likely be an important consideration as the PFMC transforms the groundfish trawl fishery to dedicated access with gear-switching on a coast wide scale. This EFP will result in concrete cost-of-management information and experience that can inform and improve that transition.

This information will be collected and reported by:

- Tracking costs and revenues of the fishing association;
- Tracking and reporting on how decision-making processes work in the fishing association, legal arrangements of the association, lease terms, and other aspects of creating a functioning fishing association.
- Surveys of state and federal enforcement, monitoring, and management personnel.

10.3 Reporting to the PFMC

Council Operating Procedures require that we report back to the Council on progress under the Exempted Fishing Permit in April and September of 2008 the EFP is in operation. We anticipate that the April report will be primarily concerned with documenting the establishment and organization of the community based fishing association, development of guidelines and a fishing plan, distribution of observers, and information about the budget. The September report will include more detailed documentation and analysis of the effectiveness of the fishing association and the social and economic performance.

11. Description of how vessels will be chosen to participate in the EFP

TNC will be responsible for developing the lease agreements under which the six Limited Entry Trawl "A" Permits that are the subject of this EFP will be fished and will be responsible for enforcing the terms of their use, including, but not limited to, monitoring and observer requirements, data collection and information sharing, participation in the fishing association and compliance with association guidelines regarding implementation of the fishery, distribution of target and bycatch species, and mechanisms to pace the fishery throughout the year. Failure to comply with lease conditions and agreed upon association guidelines will result in revocation of permission to fish under the EFP.

The selection process will be run by the Committee described in section 8.5. Eligible applicants are those that meet the following criteria, developed jointly by the applicants:

- Meets PFMC eligibility requirements for participating in an EFP fishery as described in Council Operating Procedure No. 19.
- Experience using specified gear, with preference given to those with experience fishing in the geographic area of study.
- Willingness and ability to land in Morro Bay or Port San Luis.
- Access to a suitable vessel that meets Coast Guard safety requirements and can carry an observer, which is well-maintained and carries appropriate insurance coverage.

Interested fishermen in the Central Coast area will be asked in October 2007 to complete an application to aid in determining their eligibility. A list of eligible participants will be available at the November PFMC meeting. In the event more than six eligible fishermen apply, a final participant selection process will take place following the November PFMC meeting if this proposal is approved. The final selection process to narrow down to six participants will be by an impartial selection committee convened and overseen by the Committee.

12. For each vessel, the approximate time and places fishing will take place, and the type, size, and amount of gear to be used

Under this EFP, no more than six vessels will use longline, trap, pot, and hook-and-line gear and will fish between January and December 2008. Fishing will be constrained to the area between 36° North latitude and 34°27' North latitude (Point Conception) and in waters outside of the seaward boundary of the rockfish conservation area.

All fishing by EFP vessels will be done in compliance with state and federal regulations.

Vessels will be required to land fish in Morro Bay or Port San Luis.

Before fishing may commence, the participants in the fishing association and the Committee will work cooperatively to develop a harvest plan for the fishing association that describes how fishing under the EFP will proceed. This plan will describe the requirements for participation in the EFP and the penalties for failure to comply. In addition to specifically describing the structure of the association, the specific goals and purposes – as described in this EFP, and the group's decision-making process, roles and responsibilities and communication requirements, the plan will specifically describe:

- Monthly and bimonthly targets for landings under this EFP;
- How the opportunity to fish under the shared target and bycatch hard caps will be distributed among participants;
- Other measures, such as trip limits, the association deems appropriate to manage the pace of fishing effort under the EFP;
- Procedures for planning and deploying human observer coverage to ensure all fishing trips include a NOAA observer;
- Procedures for reporting in real time catches of target species and bycatch species to the association – and specific procedures in the event excessive numbers of overfished species are taken by a participant;
- Measures that will be used to monitor performance against the purposes and goals of the EFP;
- Adaptive management provisions that describe measures the association will take to adapt fishing behavior under the EFP to new information;
- Additional specific geographic restrictions the association deems and necessary to achieve the goals of this EFP that are in addition to those described in this EFP and those otherwise established under federal law; and
- Additional specific restrictions on use of longline, trap, pot, and hook-and-line gear the association deems appropriate and necessary to achieve the goals of this EFP.

The harvest plan for the fishing association will reflect the outcomes of these decisions will be reported during the April report to the PFMC.

13. Signature of Applicant (on behalf of all applicants)

Margaret Spring

Margaret Spring, Director
California Coastal and Marine Program
The Nature Conservancy

GROUNDFISH ADVISORY SUBPANEL REPORT ON EXEMPTED FISHING PERMITS (EFPs) FOR 2008

The Groundfish Advisory Subpanel (GAP) discussed four applications for Exempted Fishing Permits (EFPs) for the 2008 season and has the following recommendations and comments.

General

The GAP appreciates the work that the four applicants have done to improve their proposals over the course of the last year. The GAP also values the continued efforts of fishermen and others who think creatively about ways to utilize EFPs through the Council process. With respect to all four applications, the GAP does not support implementation of any EFP that could disrupt or negatively impact existing and current fishing operations. Specifically, when balancing the 2008 scorecard for overfished species, the majority of the GAP (13 in support, 4 in opposition and 2 abstentions) believes that if other existing fisheries need to be reduced to accommodate the bycatch amounts for the EFPs then the Council should not recommend their final approval. Currently the scorecard for the start of the 2008 season is oversubscribed and these current projections do not include bycatch possibilities for the EFPs – a reallocation of overfished species impacts will have to occur at this meeting in order to accommodate the EFP proposals.

If the Council decides that the impacts to other existing fisheries are worth incurring, then the GAP has the following comments with regards to the EFPs:

Applications 1, 2 & 4.

The GAP recommends implementing applications 1, 2 and 4 with bycatch caps recommended by the GMT. Applications 1 and 2 are commercial fisheries-related and allow fishermen an opportunity to test targeting healthy chilipepper stocks with minimal impact on overfished species. Application 4 is focused on recreational charter vessels and would potentially move effort outside of current areas which could relieve pressure on overfished species. Further, the GAP's support for implementing application 4 is dependent on any enforcement issues being resolved satisfactorily to all parties.

Application 3

The majority of the GAP does not recommend final approval of The Nature Conservancy / Environmental Defense (TNC/ED) EFP for several reasons:

1. The GAP continues to believe that the amount of sablefish that the EFP seeks to capture will harm existing fishermen in the Conception area. For example, if this EFP had been in place during 2007 the fishery would have closed prematurely as the optimum yield (OY) would have already been exceeded. One can reasonably expect that the current fishing effort in the Conception area will continue in 2008. If this EFP were implemented it would disrupt and negatively impact existing current fishing operations. The applicants stated during GAP discussion that if the EFP is not approved they will likely lease the trawl permits to trawlers who will then participate in the same fishery. They argued that those permits will and can impact the sablefish OY in the area. The panel agrees, but also recognizes that those permits would then be accounted for in the modeling of trip limits for all vessels and they would not be receiving special privileges while negatively impacting current participants.

2. There are claims that fish is not being landed into Morro Bay due to the buyout of six trawl permits. However, the Quota Species Monitoring indicates and the GMT concurs that sablefish landings in the area are significantly increased from recent years. The GAP believes this EFP is mostly about sablefish and notes that there is no visible strategy described in the proposal to catch the other species (flatfish) that are traditionally delivered by trawlers.
3. The GAP has never supported an EFP proposal that was solely allocative in nature and is uncomfortable with the implications of doing so in this context. The GAP believes this EFP equates to a de facto individual quota and does not believe that the EFP process should be used to allocate fish to any one particular group. The applicants appear to believe they have guaranteed access to landings history associated with 6 trawl permits that were bought in Morro Bay. It is unclear to the GAP what the landings history associated with these permits is – while the applicants have provided an average catch of sablefish there has been no agency documentation to quantify these amounts. The GAP respectfully reminds the Council that until there is an individual trawl quota program in place, there is no guaranteed access to any amount of fish and there is no hard allocation.
4. The GAP questions what type of economic impact study the group can complete. What are the inputs to be used? What are they comparing community stability and profitability to?
5. The GAP questions where this experiment will ultimately lead. Generally EFPs are used to explore the possibilities of new types of fisheries or fishing strategies. Is this an experiment to inform the individual quota (IQ) process and then after one year it simply goes away? The GAP believes that if the applicants perform a "review" of their proposed operations after one year they will likely describe success, in that success is equal to the requested amount of fish being caught and marketed. The GAP believes they will then seek additional allocations of sablefish to this program and area.
6. If the TNC/ED partnership wishes to explore how regional fishery organizations work and report their findings to inform the IQ process they do not require special privileges or an EFP in order to do that. A Regional Fishery Association could be formed with existing limited entry fixed gear permit holders. It also appears that these are the individuals that the applicants would be working with anyway, not the trawlers whose permits were bought out. The experiment will still be ongoing when final preferred options in the trawl IQ process are selected so it is unclear how this experiment would inform the IQ program.

A minority of two GAP members believes that the TNC EFP has some benefits. They believe that the proposal would provide a local community the opportunity to examine the potential profitability with limited amounts of various commercial species. The EFP is a prototype of a gear switching option which is an option currently provided for trawlers in the TITQ options. The results could assist the Council on development of this option.

PFMC
11/06/07

Agenda Item D.2.c
Supplemental GMT Report
November 2007

GROUNDFISH MANAGEMENT TEAM REPORT ON EXEMPTED FISHING PERMITS (EFPs) FOR 2008 FISHERIES

The Groundfish Management Team (GMT) reviewed the applications relative to evaluation criteria in the Council's Operating Procedure (COP) on EFPs. EFPs are designed 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 Fishery Conservation and Management Act and the management goals of the Fishery Management Plan. EFPs are also commonly used to explore ways to reduce effort on depressed stocks, encourage innovation and efficiency in the fisheries, provide access to constrained target stocks while directly measuring the bycatch associated with those fishing strategies, and to evaluate current and proposed management measures.

The GMT only reviewed the technical merits of the EFPs and notes that the Council will likely need to make their decision based on the availability of overfished species in the November scorecard, which will contain the most up to date projection for the 2008 fisheries. If the Council adopts the EFPs, relatively more restrictive management measures may be necessary to stay within the canary and yelloweye optimum yields. To help illustrate the magnitude of restriction necessary to accommodate the EFPs, the GMT compiled estimated impacts of overfished species by EFP. These numbers are shown below.

Table 1. GMT Recommended Proposed Caps in EFP Applications

EFP	Bocaccio	Canary	Cowcod	Darkblotched	Widow	Yelloweye
Churchman	3.2 mt	<0.1 mt (50 lb)	<0.1 mt (50 lb)	0 mt	3.2 mt	<0.1 mt (50 lb)
Fosmark	3.3 mt	<0.1 mt (50 lb)	<0.1 mt (50 lb)	0.4 mt	0.7 mt	<0.1 mt (50 lb)
TNC	5.0 mt	0.1 mt (200 lb)*	0.1 mt (300 lb)	0.5 mt	2.0 mt	<0.1 mt (100 lb)*
RFA	2.7 mt*	0.1 mt (300 lb)*	<0.1 mt (50 lb)*	0.1 mt (150 lb)*	0.7 mt*	<0.1 mt (50 lb)*
Total	14.2 mt	0.3 mt	0.2 mt	1.0 mt	6.6 mt	0.1 mt

* GMT recommended bycatch limits

Churchman (Agenda Item D.2.a, Attachment 1)

This application proposes to target chilipepper, widow, and bocaccio rockfish using vertical non-bottom contact gear outside the non-trawl Rockfish Conservation Area in central California (40°10' to 36° N. lat). The EFP proposes to use two vessels and limit the number of hooks to 100 per set. This experiment will explore whether discard can be virtually eliminated by using a rod and reel method, thereby reducing bycatch.

The GMT is unable to evaluate how the success of the EFP will be evaluated because infrastructure necessary to achieve and measure the objectives have not been identified. The GMT recommends that the following additions or clarifications be made:

- Include additional areas which would provide the opportunity to investigate gear versus area effects.
- Provide more specifics on infrastructure for observer logistics.
- Provide specifics on the types of data collected, the party responsible for data analysis, and the party responsible for final report preparation.

Fosmark (Agenda Item D.2.a, Attachment 2)

This application proposes to target chilipepper rockfish using an epipelagic longline gear in central California (36° to 37°30' N. lat), with the long-term objective of evaluating the effectiveness of a species-specific longline technique for its potential of providing future economic opportunities. This EFP proposes to use up to three vessels and open access troll fly and vertical hook and line gear that is set and fished in a manner such that the hooks sink near to, but not on, the bottom.

The GMT felt that this proposal was well thought out, well detailed, and met the criteria required by the COPs. However, the GMT recommends that the applicants provide more information on infrastructure for observer logistics.

Nature Conservancy and Environmental Defense (Agenda Item D.2.a, Attachment 3)

The GMT reviewed the EFP application from The Nature Conservancy (TNC) and Environmental Defense, which proposes the initiation of a slope groundfish fishery by vessels with trawl permits that use non-trawl gear in a cooperative fashion on the central California coast. TNC designed this EFP to provide information on the economic efficacy of pooling catch limits into a harvesting cooperative that utilizes longline and traps. The EFP is intended to provide information on the socioeconomic effects of gear-switching and dedicated access in addition to informing the cost-effectiveness of managing a regional fishing association within the framework of the Council system

The GMT felt that the revised proposal was well thought out and complete. The GMT supports the technical merits of this proposal because it can provide useful information on economic efficiency, gear switching, behavior modification, and transference to co-ops as well as help inform future management decisions on a coast wide basis. This EFP will provide information towards evaluating management measures, specifically as it applies to the trawl rationalization program.

The GMT notes that, in order to prosecute this EFP, the open access sablefish fishery may have to be restricted in the Conception Area to prevent an exceedance of the OY. For several years prior to this 2007, the Conception-area sablefish OY was under-utilized. Beginning in the late summer of 2007, substantial increases in effort in the open access portion of the fishery led to a dramatic increase in the rate of sablefish catch occurring in that area. This effort appears to have come from vessels that have moved from areas north of 36 degrees latitude, where limits in the DTL fishery were reduced. Because of reductions in the northern areas, the opportunities for vessels operating in the Conception area became relatively much greater in 2007 and this appears to have been responsible – in large part – for the shift in effort to the south.

The GMT discussed this increase in catch and effort in relation to 2008 fishery opportunities if the TNC EFP goes forward and if the TNC EFP does not go forward. The GMT believes that the increase in sablefish catch that began in late summer of 2007 is likely to continue into 2008 if fishing opportunities in the Conception area remain unchanged. This higher catch rate would likely mean that the OY would be exceeded, and therefore the GMT believes that fishing opportunities in the Conception area will need to be decreased in 2008 regardless of whether the TNC EFP goes forward. If the TNC EFP goes forward, the GMT recommends that the southern and northern open access sablefish limits be aligned. The GMT does not yet have a recommendation for southern open access limits if the EFP does not go forward.

The GMT also notes that this EFP will be prosecuted seaward of 150 fm, where canary impacts are decreased. The Council will also need to weigh the value of knowledge gained from the EFP against the potential constraints to the directed fishery.

<u>Recreational Fishing Alliance (Agenda Item D.2.a, Attachment 4)</u>
This EFP proposes to investigate recreational hook and line fishing of chilipepper in north-central California (Pigeon Point to 40°10' N. lat) seaward of the RCA. The goal of this EFP is to investigate whether a recreational fishery can still occur on the slope without impacts to overfished species. If successful, this might open a new market for charter fleets during months when inshore rockfish seasons are closed.

The GMT is unable to evaluate how the success of the EFP will be evaluated because infrastructure necessary to achieve and measure the objectives have not been identified The GMT has discussed the merits of using depth contours versus management lines to delineate the fishing area for this EFP. Depth contours may provide more research information, however if the EFP were transferred into regulation the 150 fm line may be more appropriate. The GMT would recommend the following additions or clarifications made:

- Provide more information on infrastructure necessary for data analysis and report preparation.
- Provide more specifics on coordination of recreational samplers.

Comments on all proposals:
The GMT recommends that all EFPs be full retention to account for all rockfish caught under EFP bycatch limits and to allow biological sampling. The GMT also recommends that all EFPs be exempt from federal trip limits so that all EFP participants can sell target species catches in excess of trip limits and therefore provide a better measure of bycatch performance and provide greater incentives. The GMT notes that there may be concerns with allowing EFP holders to sell overfished species in excess of trip limits and the Council should consider whether or not this should be allowed under any of the proposed EFPs.

The COPs state that EFP proposals must identify whether infrastructure is in place to monitor, process data, and administer the EFP. The GMT recommends that the Churchman and RFA applicants provide more details relative to the infrastructure for observing fishing, processing and reporting data collected under the EFP. If the Council chooses to adopt the EFPs, it is the GMT's understanding that the applicant would have to work with NMFS to ensure that all the terms of the EFPs are met.

The GMT notes that all of these EFPs may be able to provide valuable information for future management.

Recommendations:

1. If the Council adopts the EFPs, the GMT recommends amendment of the EFPs as outlined above.

PFMC
11/06/07

Agenda Item D.2.d
Public Comment
November 2007

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OCT 15 2007
PFMC

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FAX: 619-223-7654

October 12, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council (PFMC)
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Attention: John D. DeVore, Staff Officer, Groundfish

> **Re**: Application for Issuance of an Exempted Fishing Permit (EEP) to Utilize Hook-and line and Traps in a Harvesting Cooperative Based on the Catch History of Select Trawl Permits off the Central California Coast proposed by Morro Bay/Port San Luis Commercial Fishing Organization, Environmental Defense, The Nature Conservancy (TNC) and the California Department of Fish & Game. ("Application")

Council Members:

POSITION

On behalf of D'Amato Commercial Fishing ("D'Amato") and Kingfisher Trading Co., Inc., ("Kingfisher") the following comments are offered **in opposition** to the Application delivered to the Council in June 2007 and as reported in the Pacific Council News, Summer 2007.

We understand that during the June Council meeting, the Council adopted the Application for public review with recommendations that significant revisions be made to this proposal. Due to time constraints imposed by the Council's procedure, our comments are not based upon a revised Application.[1]

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[1] We are informed and believe that the Briefing Book deadline is the close of business on October 17, that any revised Application for insertion in the Briefing Book must be submitted by this date. This same deadline applies to this letter of opposition. The Briefing Book will not be distributed to the general public until on or about October 26. We are further informed that we may submit a supplemental public comment letter, but that it must be submitted by the close of business on October 30. Also, that we have the option of presenting oral testimony before the Council.

Background Information on D'Amato. D'Amato fishes south of 36° N. Latitude, off the coast of Southern California and below Point Conception. Their fishery targets are Sablefish and Shortspine thornyhead, but on rare occasions they land small incidental catches of Longspine thornyhead. Presently in 2007, the daily limit for Sablefish is 350 lb/day, or 1 landing per week of up to 1,050 lb., and for Shortspine thornyhead, a landing limit of 3,000 lb/2 months. [For most of 2007, the landing limit for Shortspine thornyhead was 2,000 lb/2 months.] D'Amato is not engaged in what is generally known as the "Primary Sablefish Fishery." [2]

D'Amato lands live Sablefish and Shortspine thornyhead by using baited hooks attached to a longline stretched about the ocean floor that is secured with two anchors and two buoys. D'Amato is composed of four individuals who are members of the D'Amato family living in Orange County, California. Because of the economics of the live-fish fishery, these four individuals operate 18 permitted fishing vessels on a rotation arrangement. [3] Only one person is aboard one permitted vessel at the time of fishing. Two members of the Family each operate 5 vessels and the two remaining members each operate 4 vessels. Over a period of time, particularly during 2001-2003, D'Amato purchased permitted vessels as their live-fish fishery for Sablefish and Shortspine thornyhead developed. This was the only means available to them in the Groundfish FMP to attain their current efficient and profitable live-fish fishing operation. D'Amato's opinion is that their operation is limited because of the existing regulations and not because of harvest inefficiencies. Nor do they consider Sablefish or Shortspine thornyhead underutilized species in their fishery.

The maximum number of vessels fishing by D'Amato on any fishing day is 4 vessels. The economics of the fishery do not justify the operation of more than 4 vessels on any fishing day. The vessels are registered by the California Department of Motor Vehicles (DMV) because none are large enough to be documented by the U.S. Coast Guard. None of the vessels exceed 26 feet in length. They are taken to public operated shore-side ramps by trailers. The vessels and trailers are located at the homes of the individuals. Each of the vessels is operated with VMS, and all four fishermen have been on fishing trips with NMFS Observers recording their fishing activity.

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[2] "Primary Sablefish Fishery: The limited entry fixed gear sablefish fishery during which 85% of the sablefish allocated to the limited entry fixed gear vessels is taken. Each vessel must have a sablefish endorsement to participate in this fishery. Historically, federal regulations have referred to the primary fishery as including the "regular" (or derby) fishery plus the mop-up fishery." PageViii, "Permit Stacking, Season Extension and Other Modifications to the Limited Entry Fixed Gear Sablefish Fishery," (March 2001, PFMC.

[3] Based upon data received 04 October 07 from the Northwest Regional Office, NOAA/NMFS, there are 63 "Fixed gear, non- Sablefish Permits."

<u>Background Information on Kingfisher</u>. Kingfisher buys live fish from D'Amato and then sells the live fish to restaurants located in the counties of Los Angeles and Orange County. Kingfisher estimates that its share of the market for live Sablefish and Shortspine thornyhead is about 60%. Kingfisher refuses to buy any live fish caught in trawls because of poor quality reasons and historic market rejection. D'Amato is a significant and very reliable supplier to Kingfisher of high quality live Sablefish and Shortspine thornyhead. [4] This characteristic of reliability throughout the calendar year is extremely important to Kingfisher in servicing and maintaining his customers in Southern California, particularly Asian operated restaurants.

Our opposition is based primarily on the belief that the Application will not achieve or promote the purpose and objectives of issuing Exempted Fishing Permits (EFPs) for Groundfish Fisheries:

> "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 " [5]

<u>A. The Applicant has failed to provide information to the Council showing that the Sablefish and Shortspine thornyhead fisheries for vessels engaged in the "Daily Trip Limit (DTL) Fishery" south of 36 degrees North Latitude are underutilized and/or that these fisheries are not realizing their expansion potential and/or that there exists a need to increase harvest efficiencies in these fisheries.</u>

B. <u>We believe that the Application fails to provide information that would be reasonably adequate for the Council to determine and identify the "potential impacts of the exempted activity." Without this information, the Council is in no position to determine that there exists adequate justification for the EFP, as required by Rule 19, Council Operating Procedure, Protocol for Consideration of Exempted Fishing Permits for Groundfish Fisheries.</u> [6]

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[4] "Unlike most rockfish, sablefish do not have swim bladders that explode when the fish are retrieved rapidly from great depth. Consequently, if handled properly, discarded sablefish can experience high rates of survival (Olla, et al. 1998)." Dr. James Hastie, p.1, PFMC Exhibit C.4.a. Attachment 2, April 2004, "Modeling Sablefish Discard and Bycatch of Overfished Species in the 2004 Limited Entry Fixed Gear Sablefish Fishery."

[5] Council Operating Procedures-COP 19, page 1.

[6] COP 19, Protocol B-1 states that the contents of all EFP proposals "contain certain information so as to permit 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."

GENERAL COMMENT

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The Application claims that it will provide an experience that will be helpful to the Council relative to a new provision in the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This provision allows "Regional Fishery Associations" to hold and manage fish allocations. [7] However, the Application does not provide sufficient information on who will be responsible to the Council for an experiment designed: (1) to operate a fish marketing association "in the context of a trawl IFQ program with the opportunity for gear-switching;" (2) to help achieve "a larger vision of transforming the fisheries of Morro Bay/Port San Luis "to be economically and environmentally sustainable;" and (3) to provide data "on the economic efficiency of pooling catch limits into a harvesting cooperative or a regional fishery association that utilize longline and traps".

The Application states that TNC is the owner of six groundfish trawl permits, and that it is willing to lease these permits but that it also intends to manage these permits. Importantly, the Application is unclear on the current and future relationship between TNC and an existing or proposed "community-based fishing cooperative." I

The Application states that the goal for the EFP is to have "a community-based fishing cooperative that utilizes hook-and-line and traps in the Central California area "that will manage itself " within catch limits "and in concert with (and complementary to) the Council process." However, the Application provides insufficient information to determine whether such an association has been organized under the laws of California or whether one is a party to the Application. [8] Insufficient information is provided to determine whether the "Morro Bay/Port San Luis Commercial Fishing Organizations" are corporations organized under the Fish Marketing Act of the State of California.

Because of the inadequacy of the information in the Application, we respectfully request the Council to determine who is or who should be the party responsible to the Council under this EFP? TNC? Environmental Defense? Morro Bay/Port San Luis Commercial Fishing Organizations? California Department of Fish and Game?

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[7] Section 303A(c)(4), P.L. 109-479

[8] Residents of the State of California engaged in the production of fishery products may voluntarily associate in the formation of a non-profit cooperative association, without shares of stock, under the provisions of "The Fish Marketing Act" (Part 3, Division 3, Title 1, of the California Corporation Code)

SPECIFIC COMMENTS

1. The Applicant on page 3 of the Application claims that the "open access sablefish quota (is) going unutilized "in the project area because fishermen are not able to profit at such low catch levels (300 lbs per day)." D'Amato is engaged in a profitable "Daily Trip Limit (DTL) Fishery."

2. The Applicant at page 2 requests that the "fishing privileges" associated with the groundfish trawl permits owned by the Nature Conservancy (see page 12 of appendix F to the EIS for Amendment 19)," be used by the lessees/holders of these trawl permits to pool the quotas associated with these permits and harvest "that quota" with gear other than trawl, e.g. longline and/or traps. However, the Application is unclear on how the EFP will impact the Sablefish allocations as stated in 50 CFR §660.322. Under this rule, tribal tribes are allocated 10% of the sablefish OY; the remainder is allocated between the limited entry and open access fisheries pursuant to the procedure in 50 CFR §660.320(a): 58% to the trawl sector and 42% to the nontrawl (longline and pot/trap) sector.

We assume that the Applicant is seeking to obtain a significant portion of the 15% allocation for the limited entry daily trip limit fishery described in 50 CFR §660.372(c). If this assumption is correct, then D'Amato and Kingfisher would be substantially damaged.[9] In the limited entry fixed gear Sablefish fishery, 85% of the Optimum Yield (OY) is allocated to vessels that have Sablefish endorsements and that are engaged in the "Primary Sablefish Fishery." The remaining 15% is allocated to 60 plus vessels in the DTL that are without Sablefish endorsements. As stated above, D'Amato is engaged in the limited DTL fishery; therefore, it has no Sablefish endorsements.

For Sablefish directly, the EFP presents two options that claim 60 day cumulative trip limits. One option stated on page 4 is indefinite as to limits on catch, except to say that the "EFP will pool trip limits associated with the 6 TNC trawl permits and fish them cooperatively." The other option stated on page 5 is to "fish under the 60 day trawl cumulative trip limits based on the weekly fixed gear limit (currently 1,050 pounds)." The Application does not explain how "fish already authorized for harvest under the Nature Conservancy permits" can be shifted from an allocation of Sablefish available for the Limited Entry Trawl Fisheries to an allocation of Sablefish available to the Limited Entry Fixed-gear fisheries and

[9] The other options available to the Applicant appear to be the following: (1) a portion of the allocation granted to both the limited entry trawl and limited entry non-trawl sectors; (2) a portion only of the 58% allocated to the limited trawl sector; (3) a portion only of the 42% allocated to non-trawl (longline and pot/trap) sector, and (4) a portion only of the sablefish OY for the area north of 36° N. Latitude, before making tribal-non-tribal allocations.

Open Access-Directed Groundfish Fishery. Presently, the OY for Sablefish in the Limited Entry Fixed gear fisheries is allocated 85% to vessels with Sablefish endorsements and 15% to vessels engaged in the DTL fishery. How will this rule be impacted by the EFP? How will the EFP impact the current allocation of Sablefish to the Limited Entry Trawl Fisheries? Further, no historic information on the catch of trawl-caught Sablefish under the Nature Conservancy permits and the marketing of such landings is presented by the Applicant for evaluation.

3. The Application provides no information on how to measure the project's impact on the profitability, productivity, and marketing of the existing live-Sablefish/Shortspine thornyhead fishery located south of 36° N. Latitude. Based upon our knowledge and experience of this fishery, we believe that the EFP will cause more problems than solutions for the fishermen and ports presently benefiting from the live-Sablefish/Shortspine thornyhead fishery located south of 36° N. Latitude.

4. The Application does not contain adequate information on the number of vessels covered under the EFP, other than stating that the Project Manager has the discretion to make this determination, subject to "goals and objectives described elsewhere in this application."

5. The Application states that the vessels will fish "throughout the year," and that the area of fishing will be "constrained south of 36 degrees North Latitude and deeper than the 150 fathoms (as approximated in the regulations that define the rockfish conservation area). " From this statement, it is assumed that the southern border of the fishing area under the EFP is the USA/Mexico border. This fishing area is a very large geographic sub-set of the groundfish fishery within the Council's management. The Application contains inconsistent statements regarding the fishing area under the EFP, namely that the EFP fishery will be limited to the "Central California area" for purposes of seeking a long-term ecologically and economically stable fishery. . .' D'Amato is of the opinion, based upon these inconsistent statements in the Application, that the EFP will directly compete with its operations on the fishing grounds off Southern California when taking live-Sablefish and Shortspine Thornyhead.

6. The Application does not provide information on how to evaluate the claim that the EFP's goal of minimizing impacts on the other fishing operations in the Conception Area will be achieved by using longline and trap gear for live Sablefish. The Application, at pages 4 and 5, does not provide information on the projected Sablefish catch of each EFP vessel involved under each of the two options; therefore, evaluation of how the two fishing options of fishing Sablefish would impact the "unique "Conception Area OY" and high demand for this species" is not possible.

For the above specific reasons, we urge the Council to reject the Application.

However, D'Amato and Kingfisher recognize the harmful economic distress presently confronting the commercial fishing communities of Port San Luis and Morro Bay. In an effort to be helpful to these communities, D'Amato and Kingfisher will reconsider their opposition to a revised Application if it contains the following conditions:

That during the duration of the EFP, no fishing shall be conducted by the vessels covered by the EFP south of Point Conception, California (34°27 N. Latitude)

That during the duration of the EFP, no fishing shall be conducted by the vessels covered by the EFP in the live-fishery for Sablefish, Shortspine thornyhead and other fish species, and

That the allocation of Sablefish and other fish species made available to the vessels covered by the EFP shall come from the limited entry trawl sector and not from the limited entry non-trawl sector that includes the daily trip limit fisheries.

It is our intention to submit a supplemental letter after reviewing the revised Application and to present oral testimony before the Council during the November meeting. It is our understanding that "Final Action on EFPs may occur at the November Council meeting." COP 19 C1.

Respectfully,

August Felando

August Felando

cc: Morro Bay/Port San Luis Commercial Fishing Operations
Jeremiah O'Brien and Bill Ward
Gerry Richter

Subject: Agenda Item D.2 Exempted Fishing Permits (EFPs) for 2008
From: Tom Stickel <reginatom@charter.net>
Date: Wed, 17 Oct 2007 10:25:56 -0700
To: pfmc.comments@noaa.gov
Return-path: <reginatom@charter.net>
Received: from relay-east.nems.noaa.gov ([140.90.121.175]) by vmail4.nems.noaa.gov (Sun Java System Messaging Server 6.2-7.05 (built Sep 5 2006)) with ESMTP id <0JQ20099TGFFNB50@vmail4.nems.noaa.gov> for pfmc.comments@noaa.gov; Wed, 17 Oct 2007 10:26:03 -0700 (PDT)
Received: from noaa01.nems.noaa.gov ([206.112.93.12]) by relay-east.nems.noaa.gov (Sun Java System Messaging Server 6.2-3.04 (built Jul 15 2005)) with ESMTP id <0JQ200943GFE7K00@relay-east.nems.noaa.gov> for pfmc.comments@noaa.gov (ORCPT pfmc.comments@noaa.gov); Wed, 17 Oct 2007 13:26:03 -0400 (EDT)
Received: from noaa01.nems.noaa.gov (unknown [127.0.0.1]) by noaa01.nems.noaa.gov (Symantec Mail Security) with ESMTP id CB423398012 for <pfmc.comments@noaa.gov>; Wed, 17 Oct 2007 13:26:02 -0400 (EDT)
Received: from noaa08.nems.noaa.gov (unknown [192.168.1.5]) by noaa01.nems.noaa.gov (Symantec Mail Security) with ESMTP id AD77C3E001B for <pfmc.comments@noaa.gov>; Wed, 17 Oct 2007 13:26:02 -0400 (EDT)
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Received: from SchoolDaze ([66.215.60.224]) by aarprv02.charter.net with ESMTP id <20071017172601.MFET495.aarprv02.charter.net@SchoolDaze>; Wed, 17 Oct 2007 13:26:01 -0400
Message-ID: <001401c810e2$c869cf50$e03cd742@SchoolDaze>
MIME-Version: 1.0
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Thread-index: AcgQ4saWbNkyVCWpR9a7V3wDRX5Rog==
X-AuditID: c0a8010c-afcc5bb000005fcd-b8-471645aa4880
X-Chzlrs: 0
X-Brightmail: Whitelisted1
X-Brightmail-Tracker: AAAAAA==
Original-recipient: rfc822;pfmc.comments@noaa.gov

As a long-time vertical hook-and-line fisherman from Morro Bay, I've watched my fishing opportunities dwindle since the creation of the open access fishery. At the same time, I've watched my once-vibrant port be idled, the boats today seeming to function merely as tourist attractions. Therefore, I'm writing to express my support of the gear-switching EFP proposed by Morro Bay Commercial Fishermen's Organization, Port San Luis Commercial Fisherman's Association and The Nature Conservancy.

I believe that not only will the proposed EFP demonstrate its objectives, but in the long run it will pave the way toward the creation of more fishing opportunities for hook-and-line and trap fishermen. Morro Bay was once home to dozens of fishermen who utilized vertical gear to fish for groundfish, and I believe this proposal to be a step in the right direction toward restoring our local fisheries.

Sincerely,

Thomas J. Stickel
F/V Regina
938 Pacific Street
Morro Bay, CA 93442
(805) 801-2664

Subject: Exempted Fishery Permits , The Nature Conservancy
From: wdiller@sbcglobal.net
Date: Sun, 21 Oct 2007 08:20:49 -0700
To: pfmc.comments@noaa.gov
Return-path: <wdiller@sbcglobal.net>
Received: from relay-west.nems.noaa.gov ([161.55.16.17]) by vmail4.nems.noaa.gov (Sun Java System Messaging Server 6.2-7.05 (built Sep 5 2006)) with ESMTP id <0JQ900
pfmc.comments@noaa.gov; Sun, 21 Oct 2007 08:20:44 -0700 (PDT)
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Original-recipient: rfc822;pfmc.comments@noaa.gov

Dear Council Members, I am not sure if this is the avenue to comment, but here I go. I am opposed to the Nature Conservancy EFP to switch their purchased trawl landing histories/permits to hook and line and trap fisheries. I was the owner of a trawl permit and vessel until they bought me out of the business. Now I have bought a longline vessel and Groundfish "A" longline permit. My reason for doing so is that without the trawl effort in our area, longline fishing will become more financially feasable. They bought trawl permits, why should they now be allowed to inject new effort into the longline and trap fishery? The markets for some spieces, primarily live thorneyheads, are limited. They are trying to cover the damage that occured to the regional economy of Morro Bay by removing the trawlers from the fishery. They continue to throw their money around and they are going to mess up another fishery. I did the normal capitalist thing of spending my own money to buy the appropriate permit, vessel, and gear to participate in the longline fishery. Now they want to take their trawl permits and start competeing with me. Let them buy longline permits. If this is going to be the way the system works from here on out, I would like to change my longline permit to a Top Tier Sablefish Permit! Thank You. William Diller

PORT SAN LUIS HARBOR DISTRICT

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October 23, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen,

The Port San Luis Harbor District is a public entity that supports public safety, fishing, boating, recreation, natural resources, and cultural resources. As a small public entity, PSLHD has a significant interest in maintaining the viability of our ports by supporting coastal dependent activities such as commercial fishing.

I am asking you to include the adaptive management trust as one option to consider in the upcoming DEIS for the groundfish trawl fishery.

- ✓ This option will serve as an insurance policy for the program and will help ensure that social and conservation goals are met.
- ✓ The adaptive management trust option would also tend to minimize impacts to small ports and help ensure the transition to the quota system creates tangible benefits for the greatest number of people.

Again, please include the adaptive management trust as one option to consider in the upcoming DEIS for the groundfish trawl fishery.

Sincerely,

KIRK

Kirk Sturm
Harbor Manager

KS:al

cc: Board of Commissioners
Rick Algert, Harbor Director, Morro Bay

THE BOARD OF HARBOR COMMISSIONERS OF
PORT SAN LUIS HARBOR DISTRICT
COUNTY OF SAN LUIS OBISPO
STATE OF CALIFORNIA

Port San Luis, Avila Beach

October 23, 2007

RESOLUTION 07-19

RESOLUTION SUPPORTING THE CENTRAL COAST COMMUNITY BASED FISHING ASSOCIATION AND RECOMMENDING THE PACIFIC FISHERIES MANAGEMENT COUNCIL APPROVE AN EXEMPTED FISHING PERMIT

WHEREAS, the Port San Luis Harbor District desires to support and enhance coastal dependent, coastal related, and visitor serving opportunities, including commercial fishing; and,

WHEREAS, there is a local effort by and between the Commercial Fishing Organization in Port San Luis, the Commercial Fishing Organization in Morro Bay, the Morro Bay Harbor Department, the Port San Luis Harbor District, the Nature Conservancy, Environmental Defense, and the Department of Fish and Game to form a Community Based Fishing Association; and,

WHEREAS, the local Community Based Fishing Association desires to petition the Pacific Fisheries Management Council to grant an Exempted Fishing Permit; and,

WHEREAS, if granted by the Pacific Fisheries Management Council, the Exempted Fishing Permit would, among other things:

1. Create the need for an RFA (Regional Fishing Association) in the Central Coast area.
2. Explore the feasibility of switching from trawl gear to fixed gear allowing commercial fishermen greater options in gear type. This could reduce by-catch and reduce fuel costs.
3. Explore the feasibility of "pooling" fishing permits instead of using the bi-monthly landing limits. This would allow the Regional Fishing Association to

achieve the Pacific Fisheries Management Council federal fishery management objectives while allowing the Regional Fishing Association to do day-to-day management that emphasizes flexibility, cooperation, and accountability at the local level.

4. Explore the "mechanics" of proposed IFQ requirements for our multi-species fisheries, before they are implemented in the future. Our goal is to work out the IFQ "bugs" by doing a trial run. The mistakes and issues we address will inform the PFMC as they create and implement the proposed IFQ requirements.

NOW, THEREFORE, BE IT RESOLVED that the Harbor Commission hereby supports the Community Based Fishing Association concept because it advances and improves a Coastal Dependent activity: Commercial Fishing.

BE IT FURTHER RESOLVED that the Harbor Commission hereby supports the Exempted Fishing Permit, including the goals, outcomes, and usefulness of the data to future Commercial Fishermen.

BE IT FURTHER RESOLVED that the Harbor Commission hereby urges the Pacific Fisheries Management Council to approve the Exempted Fishing Permit.

BE IT FURTHER RESOLVED by the Harbor Commission that the Harbor Manager is authorized to take what ever steps are necessary or desirable to implement this Resolution.

On a motion duly made and carried, the foregoing Resolution is hereby adopted on this 23rd day of October, 2007.

Jim Blecha, President

Attest:

Jack Scarbrough, Secretary

** via email, sent to pfmc.comments@noaa.gov **

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Dear Chairman Hansen:

I am writing to strongly support the Exempted Fishing Permit (EFP) to fish trawl permits with longline, trap, pot, and hook-and-line gear in a community based fishing association, and to urge the Pacific Fishery Management Council to approve this application at its November meeting. Environmental Defense is a sponsor of this EFP and is fully committed to making it work.

I have been working with the PFMC for 17 years, with a focus on closely examining management issues that create conservation and economic problems and developing workable solutions.

This EFP will test some critical elements of the reform strategy that the Council has embarked upon. First, the EFP will allow trawl permits to be fished with fixed gear, effectively converting trawl effort into effort that we anticipate will have much lower habitat impacts and reduced bycatch, in turn resulting in greater fishing opportunity.

Second, the EFP will test the ability of a community-based group of fishermen, community leaders, and environmentalists to work together towards the goal of a fishery that is environmentally-friendly AND that improves economic performance, in a defined geographic management area. This EFP is not just about dialogue, it is about pooling our assets, developing trust, and solving real-world problems.

Last but certainly not least, this EFP will shed light on how to reduce monitoring costs without compromising the goal of 100% observer coverage (by pooling several observers and judiciously deploying them). In addition, the associated NOAA monitoring experiment will test the performance of electronic monitoring (video camera systems) against the human observers.

By approving this EFP, the Council will not only greatly increase access to fish along the central California coast, where access has been reduced dramatically in recent years. Approval will also yield invaluable information that will help guide the Council toward the best possible groundfish IFQ program and beyond to a future of regional management.

Sincerely
Rod Fujita, Ph.D – Senior Scientist

AUGUST FELANDO
Proctor in Admiralty
Attorney at Law

870 SAN ANTONIO PLACE
SAN DIEGO, CALIFORNIA, 92106
TELEPHONE: 619-223-7654
FAX: 619-223-7654

October 25, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council (PFMC)
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Attention: John D. DeVore, Staff Officer, Groundfish

> **Re**: Application for Issuance of an Exempted Fishing Permit (EEP) to Utilize Hook-and line and Traps in a Harvesting Cooperative Based on the Catch History of Select Trawl Permits off the Central California Coast proposed by Morro Bay/Port San Luis Commercial Fishing Organization, Environmental Defense, The Nature Conservancy (TNC) and the California Department of Fish & Game. ("Application")

Council Members:

POSITION

On behalf of D'Amato Commercial Fishing ("D'Amato") and Kingfisher Trading Co., Inc., ("Kingfisher") the following comments are offered **<u>in opposition</u>** to the <u>Revised Application</u> delivered to the Council on October 17, 2007. A letter of opposing the original Application was submitted on October 12, 2007.

Our opposition is based primarily on the belief that the Revised Application will not achieve or promote the purpose and objectives of issuing Exempted Fishing Permits (EFPs) for Groundfish Fisheries:

> "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 " [1]

[1] Council Operating Procedures-COP 19, page 1.

We continue to believe that the Revised Application fails to provide information that would be reasonably adequate for the Council to determine and identify the "potential impacts of the exempted activity." Without this information, the Council is in no position to determine that there exists adequate justification for the EFP, as required by Rule 19, Council Operating Procedure, Protocol for Consideration of Exempted Fishing Permits for Groundfish Fisheries. [2]

TNC sees the EFP as testing the idea of managing a quota under an IFQ arrangement by pooling "hard cap" allocations and managing their distribution among the fishermen "through a Regional Fishing Association." We believe that there exists insufficient information in the Revised Application to conclude that the 6 vessels will be operated so as "to approximate the conditions that could follow implementation of IFQs for the West Coast trawl fishery." Therefore, no adequate justification exists for the EFP on this ground. Also, that there exists insufficient information in the Revised Application to justify the EFP on the ground that the proposed "arrangement" or "community-based fishing association" will change the way fishermen "do business to meet the PCGFMP rebuilding or habitat protection objectives."

We acknowledge the statement by TNC on page 7 that it would be "principally responsible for managing implementation of this EFP" and that it "will manage all fishing leases and will be responsible for enforcing the terms that govern their use." We also note that TNC is offering to make significant contributions in funding costs associated with the work of a "dedicated project manager," in convening a "science advisory committee," and in "formalizing the cooperative relationships described" in its proposal. Yet, we do not believe that this commendable offer can be justified as being designed for the "purpose of collecting limited experimental data" in accordance with the provisions of COP 19. We believe it is can be justified only as a collective effort by various groups to bring about sufficient groundfish landings into the ports of Morro Bay and Port San Luis for the purpose of rescuing these fishing communities from an economic disaster.

GENERAL COMMENT

TNC purchased 6 limited entry trawl permits with sablefish endorsements from 6 holders who operated vessels landing their catches almost exclusively at two fishing communities in California: Port San Luis and Morro Bay. Since the purchase, these permits have not been used by TNC. The result of no landings from these 6 vessels has been a continuing severe economic distress for those

---

[2] COP 19, Protocol B-1 states that the contents of all EFP proposals "contain certain information so as to permit 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."

50 CFR 600.10 " Exempted or experimental fishing means fishing from a vessel of the United States that involves activities otherwise prohibited by part 635 or chapter VI of this title, but that are authorized under an exempted fishing permit (EFP. . . . " p.9

residents and businesses in Morro Bay and Port San Luis that were economically and socially dependent in a substantial manner on the landings from these vessels. Now, an effort is being sponsored by TNC and others to obtain relief from this distress by having the PFMC issue an EFP to TNC that will allow TNC to lease the 6 permits to fishermen under a special "arrangement." [3]

From the details described in the Revised Application, we conclude that the following actions by PFMC are necessary elements of the EFP:

> 1. **Granting Special Permits.** For the period of the EFP, converting the 6 limited entry trawl permits to that of 6 permits to fish fixed gear (Longline, Trap, Pot, and Hook-and-line) or by amending each permit so that the vessel must use fish fixed gear exclusively during the period of the EFP.
>
> 2. **Granting an Exemption from "Trawl Trip Limits."** See: Table 3 (South) to Part 660, Subpart G-2007-2008 Trip Limited for Limed Entry Trawl Gear South of 40°10' N. Lat. 71 Federal Register (FR) 78713
>
> > NOTE: It is not clear from the Revised Application whether the Applicant is also seeking exemption from applicable "Fixed Gear Trip Limits." See: Table 4 (South) to Part 660, Subpart G-2007-2008 Trip limits for Limited Entry Fixed Gear South of 40° 10'N. Lat. 71 FR 78716
>
> 3. **Granting Special Allocations.** (1) a "hard cap" allocation of Sablefish based upon the "historical harvest" attributed to the 6 trawl permits; (2) a "hard cap" allocation of other target species based upon factors other than a "historical harvest; attributed to the 6 trawl permits; (3) a special "hard cap" allocation of flatfish not attributed to the 6 trawl permits, and (4) a "hard cap" allocation for the by-catch of over-fished species,
>
> 4. Granting TNC the right to pool the Special Allocations. [4]
>
> > NOTE: The 6 fishermen leasing the Special Permits from Applicant TNC, would be allowed to harvest the allocation of target species and by-catch of over-fished species in accordance with the

---

[3] The other parties: California Department of Fish and Game (CDFG), Environmental Defense, the City of Morro Bay, the PortSan Luis Harbor District, the Morro Bay Commercial Fishermen's Organization, and the Port San Luis Commercial Fishermen's Association.

[4] The term "regional fishery association" is defined in Magnuson-Stevens Fishery Conservation and Management Act: Section 3, par. (13A) [16 U.S.C. 1802]: "The term 'regional fishery association' means an association formed for the mutual benefit of members—(A) to meet social and economic needs in a region or subregion; and (B) comprised of persons engaging in the harvest or processing of fishery resources in that specific region or subregion or who otherwise own or operate businesses substantially dependent upon a fishery."

provisions of a lease agreement entered into between TNC and 6 fishermen and/or with the measures contained in a harvest plan developed by "participants in the fishing association and the Committee." [5]

We believe that the communities of Morro Bay and Port San Luis and the two fishermen organizations support the EFP because it is a way to again have landings of groundfish--- at least equal in quantity to that landed in the past by the 6 trawling vessels. Assuming that the Council supports this purpose and objective, should the Council use the EFP protocol to achieve this result?

Are not the provisions of the Magnuson-Stevens Act, Section 303A [16 USC 1853a} a better way to help these communities? The Applicant claims that the EFP will provide an experience that will be helpful to the Council relative to these new provisions. Helping the Council better understand new provisions in the Magnuson-Stevens Act is not a result that is designed to promote the purpose and objectives of an EFP. The proposed EFP is not designed to "**increase harvest efficiency"** in the groundfish fishery. Nor is it designed to "**promote the utilization of underutilized species.**" Nor is the EFP designed to "**realize the expansion potential"** of the groundfish fishery. The purpose of the proposed EFP is to restore the landings of groundfish lost when TNC purchased the 6 limited entry trawl permits as a minimum. Since it is this objective that is being advanced by TNC and the sponsors, the Council should address the issue of whether Section 303A can be effectively and timely utilized to help the fishing communities of Morro Bay and Port San Luis.

We believe that TNC has a negative view towards trawl gear in the groundfish fishery relative to the use of fixed gear.[6] And, that it is this view that probably explains why TNC purchased the 6 trawl permits and why the Revised Application proposes to "test the efficacy of . . . gear switching as (a) mechanism(s) for better aligning management fishing incentives." However, the proposed EFP presents a false test of the efficacy of gear switching because of its requirement for a combination of special allocations, exemptions from fishing trip limits and for the right to pool the special allocations pursuant to a harvest plan fixed to allow fishing all year. Under a "harvest plan" the 6 fishermen are guaranteed unique catch and landing opportunities as operators of fixed gear. The proposed "hard cap" of Sablefish (50mt) is based upon Conception landings and not catch locations during the period 1998 and 2006. As to the catch of fish other than sablefish and flatfish, the proposals for hard caps are not based on

[5] See: Sec. 8.5 of the Revised Application for information on the membership and operation of the "Committee."

[6] On page 3 of the Revised Application: "The applicants' hypothesis is that reduced bycatch of overfished species and higher value of target species caught with longline, trap, pot, and hook-and-line gear relative to trawl gear will improve the environmental and economic performance of this fishery." Also see: page 4: Public perceptions about trawl fishing practices . . . have taken their toll on communities that rely on the groundfish trawl fleet."

historical data but personal conjecture: The Revised Application states on page 7, as follows:

> (the) " . . .proposals are based on amounts a potential catch deemed necessary by the applicants to effectively prosecute the EFP, interest from fishermen likely to participate in catching these species, and the need to minimize negative impacts on other fishermen and areas."

How will the results of this experiment be of value to the fishermen presently subject to the trip limits set forth in Table 3 (South) and Table 4 (South)? We see no value because the "experiment" is in fact designed principally, if not exclusively, to address the social and economic distress in the fishing communities of Port San Luis and Morro Bay rather than to collect experimental data of value to the groundfish fisheries. To offset this reality, the Revised Application is expertly wrapped with claims of collecting valuable experiences related to "IFQs for the West Coast trawl fishery," to the workings of a "community based fishing association," and to the Council's need to implement Section 303A(c)(A) of the Magnuson-Stevens Act regarding "Regional Fishing Associations" (RFAs). In order to avoid a bad and dangerous precedent and misuse of the EFP option, we urge the Council to reject the Revised Application and consider action to provide guidance: (1) to the fishing communities of Morro Bay and Port San Luis that they may be eligible to participate in a limited access privilege program under Section 305A(c)(3) of the Magnuson-Stevens Act [16 USC 1853a], and (2) to the two fishing associations that they may be eligible to participate in a limited access privilege program under Section 305A(c)(4) of the Magnuson-Stevens Act.[7]

SPECIFIC COMMENTS

Sablefish Allocation. On pages 6 and 7, the Application explains that "when the TNC permits were active, they accounted for approximately 30% of Conception Area landings for Sablefish. Average total Conception Area landings of sablefish between 1998 and 2006 were 168 metric tons. The proposed hard cap is derived by taking 30% of the average or 50 metric tons."

We assume that the 168 metric tons of landing represents the **annual** average for the period 1998 and 2006 and not the total landings for such period. The Applicant should clarify this point.

Presently, for the area north of 36° N. Lat, 96.45 percent of the coast-wide OY of Sablefish (5,723 mt) or about 5,520 mt is attributed to the northern area, the remainder is attributed to the southern area. The Application is unclear as to

[7] Under Section 303A (c) (5), the Council has the authority to initiate a fishery management plan or amendment to establish a limited access privilege program to harvest fish on its own initiative. Also, the Secretary has authority to establish a program subject to an appropriate petition that has been certified.

how much Sablefish were taken in the northern area and how much was taken in the southern area.

Will the 50 mt "hard cap" be taken out of the OY presently applicable to the southern area? In this area, 3.55% of the coast-wide OY of Sablefish (5,723 mt) or about 203 mt. is attributed to the southern area. 50 mt to these 6 fishermen would represent about 25% of OY. The Application is unclear on the impact of this "hard cap" on the Limited Entry Fixed gear fishermen complying with rules set forth in Table 4 (South). We believe that this special allocation would be very harmful and disruptive to D'Amato and Kingfisher as well as other like fishermen.

Shortspine Thornyhead Allocation. The "hard cap" proposed is 60 mt. For 2007, South of 34° 27' (Point Conception), the OY is 421 mt [8] ; north of Point Conception, the OY is 1,634 mt. See: Table 1A.to Part 660, Subpart G [71 FR 78701-78705] We note in the Application at page 12 that "fishing will be constrained to the area between 36° North latitude and 34° 27' North latitude (Point Conception) and its waters outside of the seaward boundary of the rockfish conservation area." We assume that the OY of 421 mt will not be adversely impacted by the EFP's request for 60 mt. but would appreciate confirmation by the Council of our assumption.

Longspine Thornyhead Allocation. The "hard cap" is 60 mt. For 2007, South of 34°27 (Point Conception), the OY is 476 mt; north of Point Conception, the OY is 2,220 mt See Table 1A to Part 660, Subpart G [71 FR 78701-7805]. For the reason above stated, we assume that the OY of 476 mt will not be adversely impacted by the EFP's request for 60 mt. but would appreciate confirmation by the Council of this assumption.

CONCLUSION

For the above reasons, we urge the Council to reject the Revised Application.

D'Amato and Kingfisher acknowledge that the Revised Application dated 17 October 2007 does contain the following condition:

> ***That during the duration of the EFP, no fishing shall be conducted by the vessels covered by the EFP south of Point Conception, California (34°27 N. Latitude)***

D'Amato and Kingfisher request that the Revised Application dated 17 October 2007 be clarified on whether it contains the following condition:

[8] ". . . the OY of 421 mt was the portion of the ABC for the area reduced by 50 percent as a precautionary adjustment due to the short duration and amount of survey data for that area." See: footnote w/, 71 FR 7805.

That the allocation of Sablefish and other fish species made available to the vessels covered by the EFP shall come from the limited entry trawl sector and not from the limited entry non-trawl sector that includes the daily trip limit fisheries.

D'Amato and Kingfisher note that the Revised Application of 17 October 2007 does not contain the following condition:

That during the duration of the EFP, no fishing shall be conducted by the vessels covered by the EFP in the live-fishery for Sablefish, Shortspine thornyhead and other fish species.

D'Amato and Kingfisher stated in its Letter to the Council dated 12 October 2007 that it would reconsider its opposition if all three conditions were incorporated in the EFP. At this point, not all three conditions are part of the EFP; therefore, D'Amato and Kingfisher oppose the Revised Application dated 17 October 2007.

Respectfully,

August Felando

LOIS CAPPS
23RD DISTRICT, CALIFORNIA

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COMMITTEE ON
ENERGY AND COMMERCE

COMMITTEE ON
NATURAL RESOURCES

Congress of the United States
House of Representatives

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☐ 2675 NORTH VENTURA ROAD, SUITE 105
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October 29, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Dear Chairman Hansen:

I am writing to express my strong support for the Exempted Fishing Permit (EFP) to fish trawl permits with longline, trap, pot, and hook-and-line gear in a community based fishing association. I urge the Pacific Fishery Management Council to approve this application at its November meeting.

Regulations to protect habitat and overfished stocks, market dislocations, increasing costs and diminishing harvest opportunities, as well as buyouts to reduce trawl capacity have taken their toll on many small communities – such as Morro Bay and Port San Luis – that have historically fished the groundfish resource on the West Coast. This project offers a unique opportunity to turn this trend around and improve both the sustainability of the fishery and the community.

This EFP is an innovative partnership between fishermen, harbor masters, conservation organizations, and fishery managers. It will show that by allowing the switch from trawl to fixed gear and by working cooperatively at the local level, fishermen can do better both economically and environmentally. This will provide information to managers that may be useful in rationalizing the groundfish trawl fishery and particularly in developing the guidelines for cooperative management under Regional Fishing Associations.

Not only will this EFP demonstrate its objectives, but in the long run it will pave the way toward the creation of more fishing opportunities for hook-and-line and trap fishermen – starting in Morro Bay and Port San Luis. I believe this proposal to be a step in the right direction toward restoring our local fisheries.

Therefore, I urge you to approve this request, consistent with all relevant rules and regulations. Thank you for your consideration.

Sincerely,

Lois Capps

LOIS CAPPS
Member of Congress

City of Morro Bay
Morro Bay, CA 93442
(805) 772-6200

October 29, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland OR 97220-1384

RE: EXEMPTED FISHING PERMITS FOR 2008
SUPPORT FOR EXEMPTED FISHING PERMIT APPLICATION

Dear Chairman Hansen,

Access to the groundfish resource has long been a critical component of the commercial fishing industry of Morro Bay and similar communities along the Central Coast. Historically the port of Morro Bay has landed millions of pounds of groundfish annually from extremely productive fishing grounds on the central coast. Due to a combination of factors: buy-back of trawl permits, ever increasing regulation, fuel prices, and market dislocation, the local trawl-based groundfish industry has been in decline for years.

We are unwilling to give up on our fishing heritage and remaining local commercial fishing industry, so we are forging unique and creative new relationships to cooperate on improved fisheries. The Nature Conservancy, the City of Morro Bay and others have taken a proactive approach working as partners to rebuild a more sustainable, both economically and environmentally, groundfish industry and in the process provide a pilot project for the Council and the rest of the industry that will test some critical tools such as gear switching, monitoring protocols, and community based harvest cooperatives.

This kind of innovative cooperation is being presented to the PFMC in Item D.2a, Attachment 3 where we are offering to form a community based association to provide the PFMC with important information on community economics in fishery reform and monitoring and gear switching. We hope this some day leads to better regional management, more access to healthy fish stocks and more sustainably caught seafood in the United States.

We request your support for the exempted fishing permit application in agenda ITEM D.2a.

Thank you very much for your consideration.

Janice Peters

Janice Peters, Mayor

FINANCE 595 Harbor Street | **ADMINISTRATION** 595 Harbor Street | **FIRE DEPARTMENT** 715 Harbor Street | **PUBLIC SERVICES** 955 Shasta

HARBOR DEPARTMENT 1275 Embarcadero Road | **POLICE DEPARTMENT** 870 Morro Bay Boulevard | **RECREATION & PARKS** 1001 Kennedy Way

Marine Interests Group
San Luis Obispo County

Working Committee

Dan Berman
Dir., Morro Bay National Estuary Program
Tom Capen
Port San Luis Comm. Fishermen's Assn.
Ray Fields
Aquaculture
Matt Fleming
Chair, SLO Surfrider Foundation
Bruce Gibson
SLO County Supervisor
Bob Hather
recreational fishing
Tom Jones
Pacific Gas & Electric
Leslie Krinsk
at large, Sierra Club
Carolyn Moffatt
Commissioner, Port San Luis Harbor Dist.
Marla Morrissey
conservation
Jeremiah O'Brien
MB. Commercial Fishermen's Organization
Janice Peters
Mayor, City of Morro Bay
Henry Pontarelli
Morro Coast Audubon Society
Morgan Rafferty
Exec. Dir., Environmental Center SLO
John Rowley
Virg's Fishing & Whale Watching
Dave Rymal
sport fishing
Dave Sears
at large, ret'd California State Parks
Debrah Stakes
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MBNMS Advisory Council
Dean Wendt, Ph.D.
Assoc. Prof., Cal Poly State University
Patricia Wilmore
SLO Chamber of Commerce

Web site:
www.mbnep.org/mig

Don Maruska
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895 Napa Avenue, Suite A-5
Morro Bay, CA 93442

October 29, 2007 Sent via mail and pfmc.comments@noaa.gov

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Support for Exempt Fishing Permit, Item D.2.a., Attachment 3

Dear Chairman Hansen:

The Marine Interests Group of San Luis Obispo County (MIG) at its meeting of October 24, 2007, unanimously endorsed the EFP proposed by The Nature Conservancy and the Central Coast Community Based Fishing Association and urges the Pacific Fisheries Management Council to approve it. As you will note, the MIG includes elected officials, scientists, fishermen, environmental groups, businesses, and the broader public at large. For five years, this group has studied the issues and opportunities to enhance and sustain the vitally important marine resources in this region.

The MIG strongly supports the EFP for the following reasons:

- The experimental nature of the EFP will benefit all commercial fishermen and will provide the Council with valuable information on important issues regarding transitions proposed in the Magnuson-Stevens Fisheries Conservation and Management Act (MSA).

- The EFP is an opportunity to demonstrate collaborative solutions with diverse stakeholder interests in the commercial fishery.

- The proposed Community Based Fishing Association will address, resolve, and report on issues of equity, economic viability, governance, administration, compliance, communication, accountability, and reporting at the regional level.

- The EFP will benefit the community and inform the Council on the environmental and economic benefits of more selective longline, trap, pot, and hook-and-line gear.

The development of the EFP application has demonstrated successful collaboration among traditionally competing interests. This is an extraordinary opportunity to gather and evaluate important information and enable others to learn from the experience. We urge your support for a needed step to help restore our local fisheries and working waterfronts.

Thank you for your consideration of our views.

Sincerely yours,

Marine Interests Group of San Luis Obispo County

Morro Bay Commercial Fishermen's Organization Inc.

P.O. BOX 450, MORRO BAY, CALIFORNIA 93443
(805) 772-4893 • FAX (805) 772-4893 • fish@fix.net

October 21, 2007

Mr. Chairman, Donald K. Hansen
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fisheries Management Council:

The Morro Bay Commercial Fishermen's Organization that is currently involved in an Exempted Fisheries Permit application process is asking your consideration in its approval. Access to fish here in Morro Bay has been extremely limited due to distances necessary to travel, fuel costs, and catch restrictions. Our port is remote from most markets, and we find ourselves losing an industry that once made Morro Bay a proud fishing village. We are struggling to keep this heritage alive. As so much of our area is currently underutilized we hope that you will consider this EFP the beginning of a solution to these dilemmas.

Please include this letter of support for the Exempted Fisheries Permit application in the Council's briefing book.

Thank you,

Jeremiah O'Brien
President of the Morro Bay Commercial Fishermen's Organization

Morro Bay Commercial Fishermen's Organization Inc.

P.O. BOX 450, MORRO BAY, CALIFORNIA 93443
(805) 772-4893 • FAX (805) 772-4893 • fish@fix.net

October 21, 2007

Mr. Chairman, Donald K. Hansen
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

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Please include this letter of support for the Exempted Fisheries Permit application in the Council's briefing book.

Thank you,

Jeremiah O'Brien
President of the Morro Bay Commercial Fishermen's Organization

PMFC ITEM D2A

Port San Luis Commercial Fishermen's Association

P.O. Box 513
Avila Beach, CA 93424

Mailed and Faxed

October 29, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

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PFMC

Dear Chairman Hansen,

The members of the Port San Luis Commercial Fishermen's Association support the EFP that is being proposed by The Nature Conservancy and the Community Based Fishing Association.

We are asking your support as well.

In the short and long run, the EFP will benefit all commercial fishermen since it will:

- Collect data for the Council that can serve as the foundation for future decisions that benefit all commercial fishermen
- Demonstrate how to build and maintain cross-interest-cooperative-efforts
- Require the proposed community based fishing association to identify and resolve new issues regarding decision making, governance, administration, compliance, communications, accountability, and reporting
- Challenge conventional thinking and lay the groundwork for future commercial fishing

This experiment could fail. But the lessons learned will benefit the Council, environmental interests, and commercial fishing interests for future generations.

The members of the Port San Luis Commercial Fishermen's Association urge you to support the EFP and the data it will provide.

Sincerely,

Bill Ward

Bill Ward, President
Port San Luis Commercial Fishermen's Association

Copy to Jeremiah O'Brien, President, Morro Bay Commercial Fishermen's Association

ARNOLD SCHWARZENEGGER, Governor
MIKE CHRISMAN, Secretary

November 2, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

RE: Agenda Item D.2.a, Attachment 3

Dear Chairman Hansen:

I am writing to relay my strong support for the Exempted Fishing Permit (EFP) to fish trawl permits with trap, pot, hook-and-line and longline gear in a community based fishing association. I urge the Pacific Fishery Management Council to approve this application at its November meeting.

Regulations to protect habitat and overfished stocks, market dislocations, increasing costs and diminishing harvest opportunities, as well as buyouts to reduce trawl capacity have taken their toll on many small communities – such as Morro Bay and Port San Luis - that have historically fished the groundfish resource on the West Coast. This project offers a unique opportunity to turn this trend around and improve both the sustainability of the fishery and the community.

This EFP is an innovative partnership between fishermen, harbor masters, conservation organizations, and fishery managers. It will show that, by allowing the switch from trawl to fixed gear and by working cooperatively at the local level, fishermen can do better both economically and environmentally. This will provide information to fishery managers that may be useful in rationalizing the groundfish trawl fishery and particularly in developing the guidelines for cooperative management under Regional Fishing Associations.

Not only will this EFP demonstrate its objectives, but in the long run it will pave the way toward the creation of more fishing opportunities for hook-and-line and trap fishermen – starting in Morro Bay and Port San Luis. I believe this proposal to be a step in the right direction toward restoring our local fisheries and I urge the Council to approve it.

Thank you for your consideration.

Sincerely,

Mike Chrisman

Mike Chrisman
Secretary for Resources

The 2007 Assessment of Blue Rockfish (*Sebastes mystinus*) in California

November 2007

Meisha Key [1]
Alec D. MacCall [2]
John Field [2]
Debbie Aseltine-Neilson [3]
Kirk Lynn [3]

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c/o NMFS/SWFSC
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110 Shaffer Road
Santa Cruz, CA 95060

[2] National Marine Fisheries Service
Southwest Fisheries Science Center
Fisheries Ecology Division
110 Shaffer Road
Santa Cruz, CA 95060

[3] California Department of Fish & Game
NMFS/SWFSC
8604 La Jolla Shores Dr.
La Jolla, CA 92037

EXECUTIVE SUMMARY

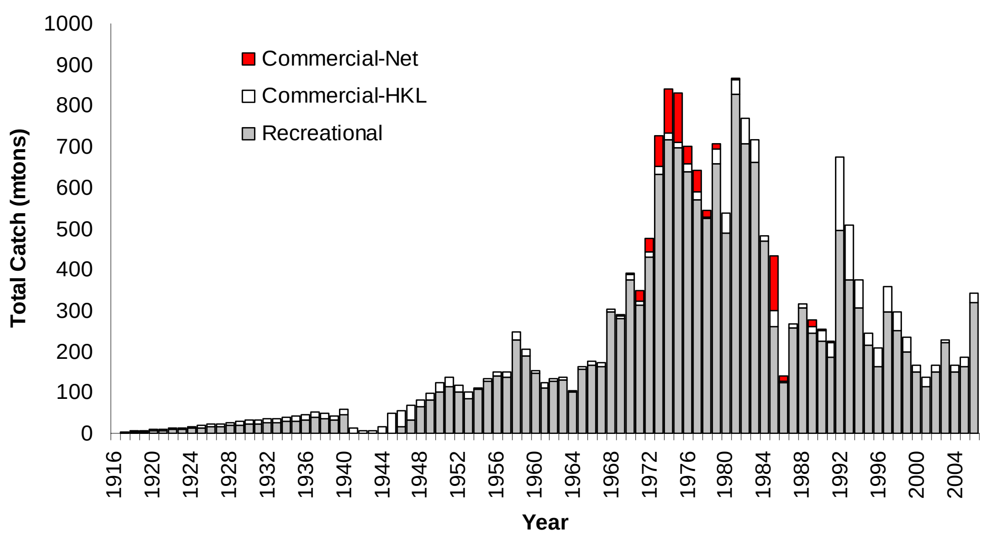
Stock

This is the first assessment of blue rockfish (*Sebastes mystinus*) on the West coast of the US. This assessment determines the status of the California stock from the Oregon border to Point Conception where blue rockfish are most commonly found, using data through 2006. This assessment treats these fish as a single stock. Blue rockfish are also harvested in Oregon and Washington, but black rockfish are more sought after in those waters. In southern California waters, the disappearance of that stock is believed to be related to environmental conditions, such as the lack of kelp in the warmer waters since the 1990s.

The variability in growth over time and between areas along the coast of California were evident while assessing this stock, but sufficient data did not allow the complex modeling needed to appropriately assess blue rockfish. Genetic evidence has also suggested two species of blue rockfish in California, so this status report is in effect an assessment of a blue rockfish "complex" instead of a single species.

Catches

Blue rockfish are the primary recreational (CPFV/private) caught species in California and is also important in the commercial fishery (mainly hook and line) even though landings from the commercial fishery are minor compared to the recreational catch. Due to the lack of historical reporting of the blue rockfish catch, estimates back to 1916 rely primarily on a proportion of total rockfish prior to 1969 in the commercial fishery (non-trawl) and prior to 1980 in the recreational fishery. Trawl landings in the commercial fishery were removed from total rockfish catches since we found no reporting of blue rockfish landed in this gear. The catch history of blue rockfish is highly uncertain, especially in the earlier years.



Recent landings (mt) of blue rockfish in California, north of Point Conception.	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Recreational	296.1	249.4	198.6	150.7	115.6	148.8	219.9	149.9	162.9	319.6
Commercial-HKL	63.7	47.7	35.7	15.6	19.7	18.5	9.2	14.8	21.7	21.9
Commercial-Net	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	359.7	297.1	234.4	166.3	135.3	167.4	229.1	164.6	184.6	341.4

Data and Assessment

This first assessment for blue rockfish used the Stock Synthesis 2 (version 2.00g) integrated length-age structured model. The model includes estimated historical catches dating back to 1916 for each fishery (recreational, commercial hook and line and setnet), length-frequency data from each fishery and conditional age at length-frequency data from the early 1980s from the recreational CPFV fishery. Two recreational CPFV CPUE indices (RecFIN and CDFG onboard observer program) were used as abundance indices, with the RecFIN CPUE index being split into two time periods (1980-1999 and 2000-2006) to allow for potential changes in catchability due to the bag limit change (from 15 to 10) in the year 2000. Lastly, a coast-wide pre-recruit mid-water trawl survey (NWFSC/SWFSC/PWCC) provided a source of recruitment strength information in recent years.

In this assessment, variation in growth over time and space were evident, however the lack of data did not allow the appropriate modeling needed to accurately assess this stock. Recent genetic studies have also shown there are two species of blue rockfish, which adds additional uncertainty to the outcome. Most of the catch was represented by females (~70%), which suggests either males have a higher natural mortality (M) or they are less selected in the fisheries. Even though there are various states of nature needed to capture the uncertainty in this assessment, the proposed states of nature were based on varying M for females and male with different steams of catch histories. Probabilities were not assigned to the states of nature, however the STAT strongly believes that the low and BASE catch stream scenarios, producing the BASE and high bracket, are more likely given the lower –log likelihoods associated with each model run.

Unresolved problems and major uncertainties

Recent genetic studies suggest that blue rockfish is two closely-related species that intermix in the area covered by the assessment. Knowing the differences (if any) in behavior, spatial distributions, and life histories between the two species may help explain some of the uncertainties in this assessment.

The variability in growth over time and space is another essential element that was not properly modeled in this assessment. The model estimated the growth curve, which appeared to be an "average" of the 1980s growth curve and the 2000s growth curve explored. There was not enough recent data to support the use of time-varying growth for a base model, even though there was an attempt to do so.

Natural mortality is highly uncertain and cannot be reliably estimated. The scarcity of males in the landings could be either due to higher male natural mortality or lower fishery selectivity for the males.

Historical catches of blue rockfish are highly uncertain and are based on, in some cases, one point in time. Taking a proportion of total rockfish to reconstruct the historical catches is very worrisome. Attention needs to be given to historical catch reconstruction in Oregon as well, so this area can be included in the next assessment of blue rockfish. A common problem in California and Oregon is the mixing of similar species (i.e. black rockfish) in the commercial fishery, which is difficult to tease apart.

This assessment had limited information on trying to measure stock abundance. The results of this assessment depend on the assumption of constant proportionality between the recreational CPFV CPUE indices and stock abundance.

Reference points

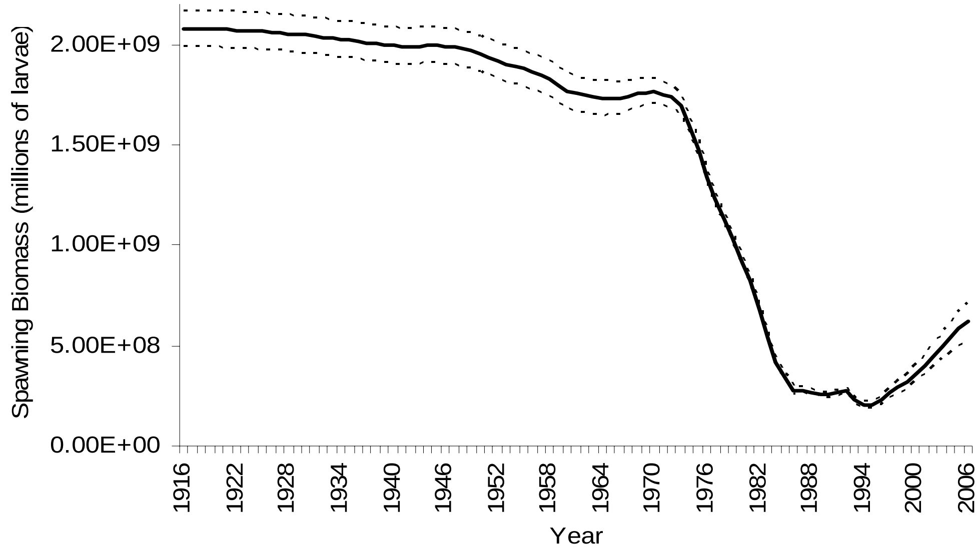
This assessment uses the default target rate of F50% used for rockfishes on the West Coast of the US. Under PFMC Groundfish management policy, if the stock's current spawning biomass falls below 25% of the unexploited biomass, the stock is considered overfished. Under the state's guidelines, the stock is considered overfished at 30% of the unexploited biomass. Unfished spawning biomass was estimated to be 2077 millions of larvae in the base model, with the target stock size at 831 millions of larvae. The base model estimated that the stock could support an MSY of 275 mtons.

	Point Estimate	Uncertainty in estimates
Unfished Spawning Stock Biomass (SB_0) (millions of larvae)	2077	1986-2167
Unfished Summary Age 1+ Biomass (B_0) (mt)	13223	
Unfished Recruitment (R_0) at age 0 (1000s)	3220	3081-3359
Reference points based on SPR proxy for MSY		
Spawning Stock Biomass at SPR (SB_{SPR})(mt)	831	
$SPR_{MSY\text{-}proxy}$	0.5	
Exploitation rate corresponding to $SPR_{MSY\text{-}proxy}$	0.0403	
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	275	

Stock biomass

Blue rockfish were not a highly sought species early on, but an increase in catches in the 1970s resulted in a continuous decline in spawning biomass through the early 1990s. Spawning biomass reached a minimum (10% of unexploited) in 1994 and 1995; however, there has been a constant increase since then. The base model estimated spawning output and relative depletion level in 2007 at 622 (millions of larvae) and 29.7%, respectively.

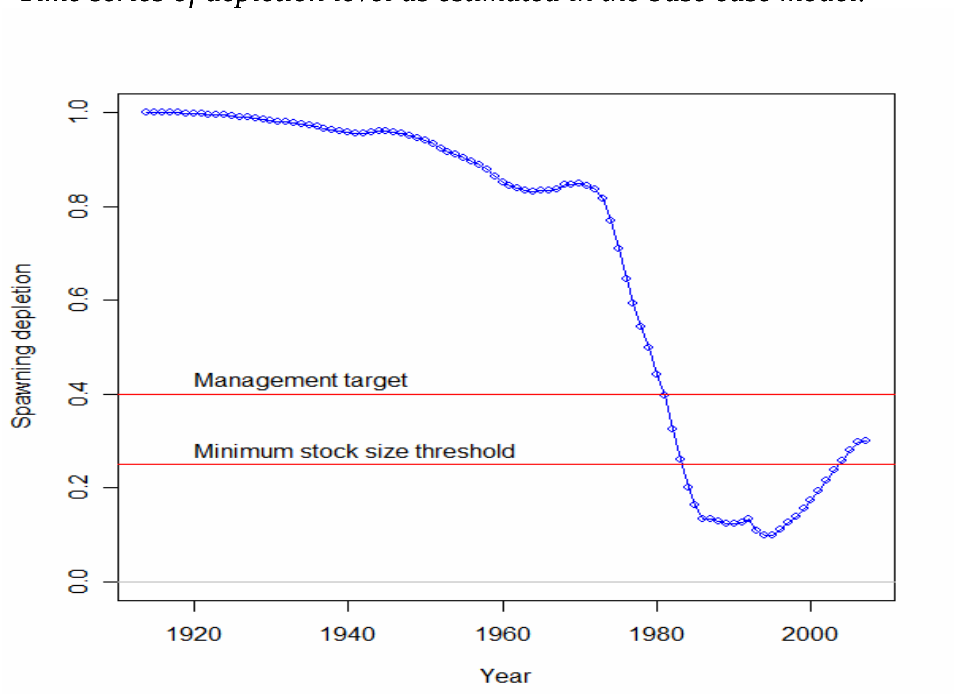
Time series of spawning biomass (~95% CI's) as estimated in the base case model



Recent trend in estimated blue rockfish spawning biomass (millions of larvae) and depletion

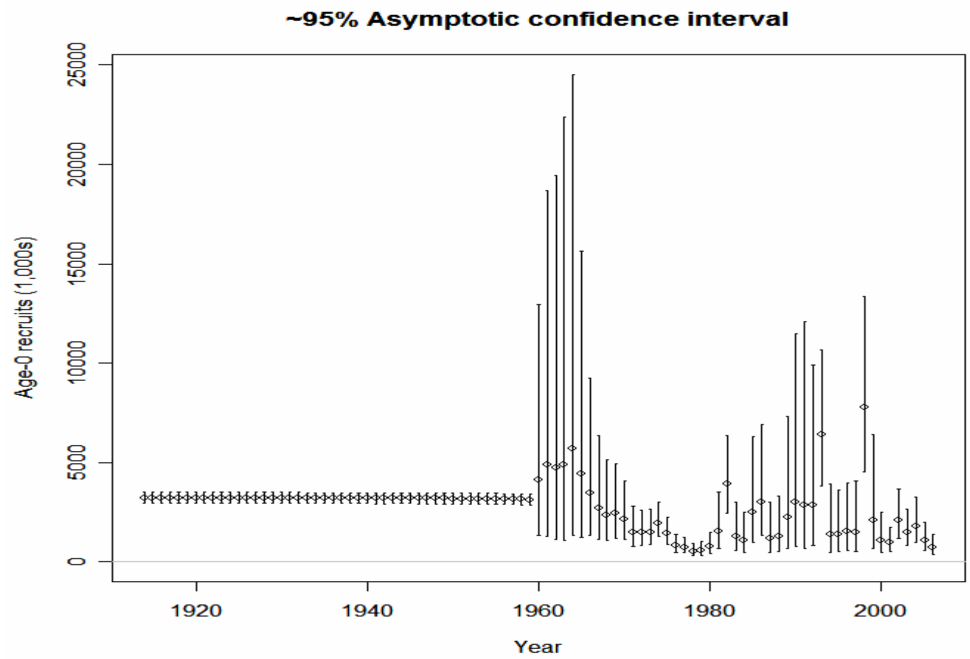
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Spawning Output	289	323	359	401	447	495	537	583	618	622
~95% CI	*259-318*	*286-359*	*317-402*	*352-450*	*391-503*	*431-559*	*464-610*	*501-665*	*528-708*	
Depletion	13.9%	15.5%	17.3%	19.3%	21.5%	23.8%	25.9%	28.1%	29.7%	29.9%

Time series of depletion level as estimated in the base case model.



Recruitment

Recruitment is variable and highly uncertain for blue rockfish. There is little information other than the pre-recruit index in the recent years to inform the assessment model about recruitments. Recruitment was high in the 1960s, with strong year classes appearing in 1993 and 1998. Considering the use of conditional age at length data in this assessment, estimated recruitment could potentially be off by a year in capturing the famous 1999 year class seen in most other groundfish stocks. The late 1970s showed all time low recruitment with the year 2006 being in the lowest 3 that recruitment was estimated.

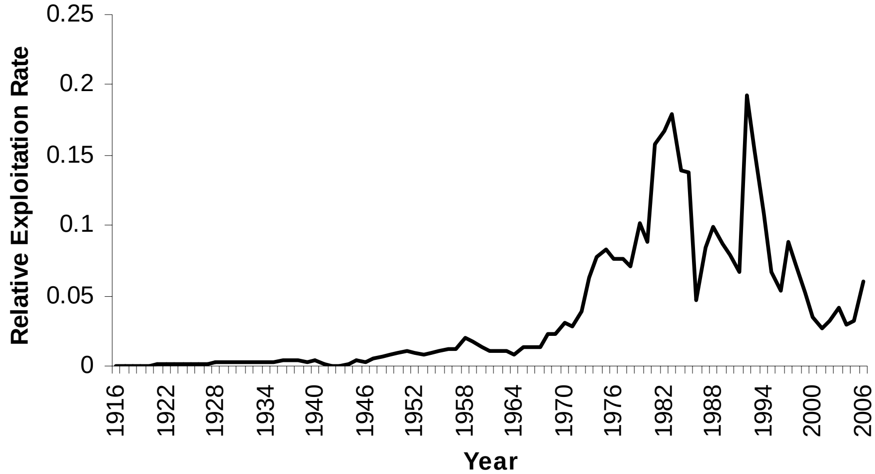


Recent trend in estimated blue rockfish recruitment (1000s)										
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Recruitment	7792	2074	1080	960	2094	1484	1806	1071	735	2261
~95% CI	*5609-9975*	*773-3374*	*592-1567*	*667-1252*	*1490-2698*	*1026-1941*	*1244-2368*	*725-1416*	*496-974*	

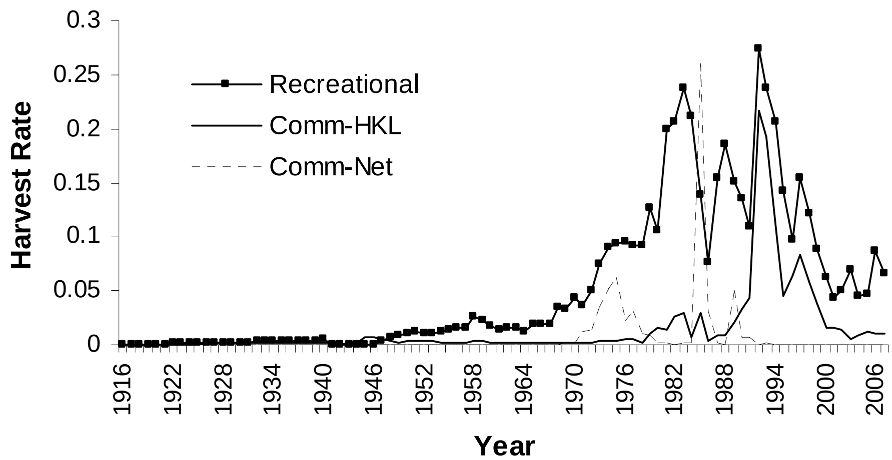
Exploitation status

Blue rockfish harvest was minor in the earlier years, but in the 1970s, recreational harvesting of blue rockfish began to increase with peaks in the early 1980s and early 1990s. The abundance of blue rockfish was at the management target ($SB_{40\%}$) in 1980 and the overfished threshold in 1982. Excess fishing of the stock has occurred since the 1970s; however, there has been an increase in abundance in recent years.

Time series of estimated relative exploitation rate for the base model.



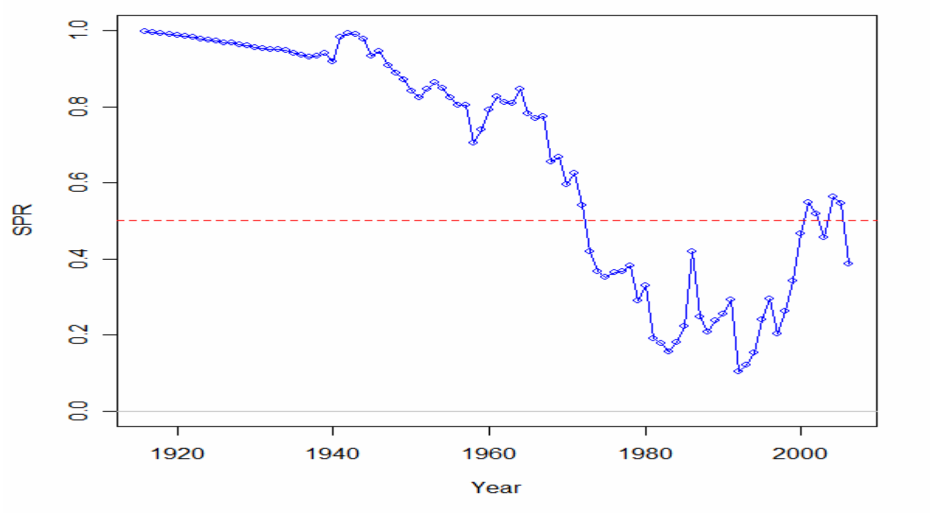
Time series of harvest rates by fishery for the base model.



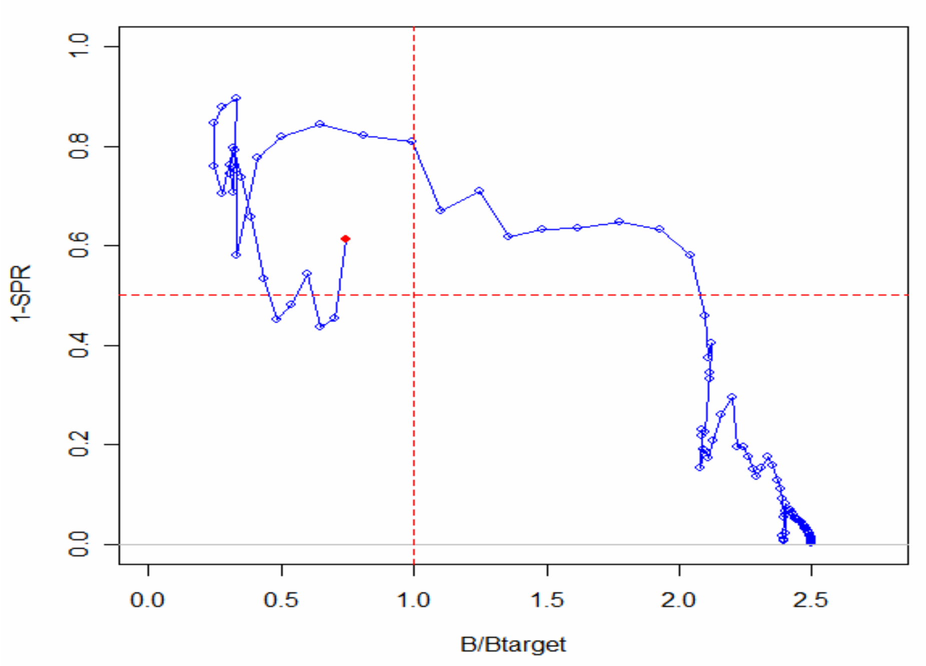
Recent trends in blue rockfish exploitation and harvest rates

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Exploitation	8.8%	7.2%	5.2%	3.4%	2.7%	3.2%	4.2%	3.0%	3.3%	6.0%
(fraction of summary biomass)										
Harvest										
(fraction of available biomass)										
Recreational	15.5%	12.1%	8.9%	6.2%	4.3%	5.1%	6.9%	4.5%	4.6%	8.7%
Comm-HKL	8.3%	5.8%	3.9%	1.5%	1.6%	1.3%	0.6%	0.9%	1.2%	1.1%
Comm-Net	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

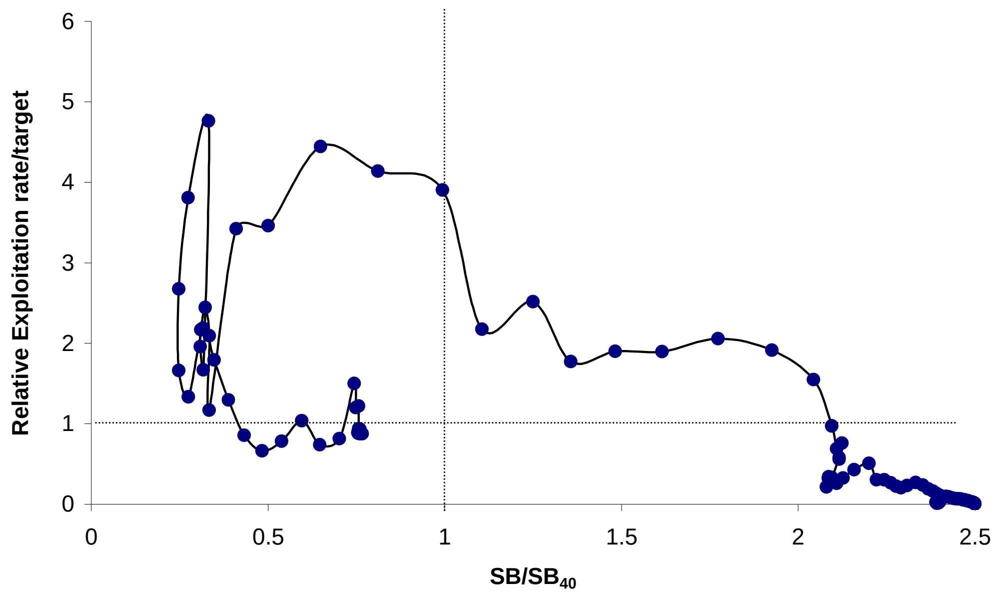
Time series of estimated spawning potential ratio (SPR) for the base case model.



Estimated spawning potential ratio relative to the proxy target of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base case model.



Estimated fishing intensity vs. relative spawning biomass for the base case model.



Management performance

This is the first assessment of blue rockfish and in the past they have been managed under a "complex." Prior to 2000, this species was managed within the *Sebastes* complex, and since then has been managed under the minor nearshore rockfish complex, north and south of Cape Mendocino (40 10' N. lat.). Blue rockfish have not been considered a "point of concern" in management; hence no ABCs or OYs have been set particularly for this species.

Forecasts

Future catch projections through 2016 were made based on an F50% fishing rate with 40:10 adjustment. The average catches from each fishery for the years 2005 and 2006 (263 mtons) were applied to the beginning projection years of 2007 and 2008. The forecasts predict a slight increase in abundance but not enough to support increase harvesting of blue rockfish in the future. However, the state of nature corresponding to higher natural mortality (M females = 0.13, M males = 0.15) remains above 40% and allows about 370 mtons to be taken in 2009.

Base model projections for blue rockfish ABC, OY, spawning biomass and depletion										
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
ABC (mtons)	*227*	*226*	223	221	219	217	215	215	216	218
OY (mtons)	*263*	*263*	199	198	196	193	192	192	193	195
Spawning Biomass (millions of larvae)	622	628	628	632	631	628	627	628	631	637
Depletion	29.9%	30.3%	30.3%	30.4%	30.4%	30.2%	30.2%	30.2%	30.4%	30.7%

According to the base model, blue rockfish may be experiencing overfishing (current F exceeds proxy F_{MSY}), and the total catch should be reduced. However overfishing is not occurring under the upper bracket scenario.

Decision tables

Even though there are many uncertainties in this assessment, the STAR panel and STAT agreed that the decision table could capture some level of uncertainty through alternate scenarios of historical catches and natural mortality (for males and females separately) of blue rockfish. The scenario that suggested a lower level of abundance was with the high catch stream (double BASE) and lower natural mortality (M female=0.07, M male=0.09). The upper level of abundance can be bracketed by the low catch stream (1/2 of BASE) and higher natural mortality (M female=0.13, M male=0.15). Even though the STAR and STAT agreed with not assigning probabilities to the states of nature, the –log likelihood values from the model runs for the BASE (1340) and high natural mortality (1338) scenarios suggest they are more likely than the scenario with lower natural mortality (1361).

Since blue rockfish are managed by the State of California under the minor nearshore rockfish complex, a second decision table with the 60:20 adjustment applied is also provided. The state, being more conservative, considers a stock to be overfished at (or below) 30% of unfished spawning biomass. However, overfishing may be occurring under both the state and federal policies.

Decision table (40:10 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

40:10			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	42	14.0%	407	30.3%	628	50.0%	827
	2010	49	14.7%	429	31.6%	656	51.6%	855
Low	2011	54	15.4%	447	32.7%	679	52.8%	875
	2012	59	15.9%	464	33.7%	700	53.8%	891
from high	2013	64	16.5%	480	34.6%	720	54.7%	906
catch stream	2014	69	17.1%	497	35.6%	740	55.6%	921
	2015	75	17.7%	515	36.7%	762	56.6%	938
	2016	80	18.3%	533	37.8%	785	57.7%	955
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	199	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	198	13.9%	404	**30.4%**	**632**	50.2%	831
Medium	2011	196	13.7%	398	**30.4%**	**631**	50.0%	828
	2012	193	13.4%	390	**30.2%**	**628**	49.7%	823
from BASE	2013	192	13.2%	384	**30.2%**	**627**	49.4%	818
catch stream	2014	192	13.0%	379	**30.2%**	**628**	49.3%	816
	2015	193	12.9%	376	**30.4%**	**631**	49.4%	817
	2016	195	12.9%	375	**30.7%**	**637**	49.6%	820
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	376	14.0%	407	30.3%	628	50.0%	827
	2010	363	12.9%	376	29.1%	604	48.6%	804
High	2011	348	11.8%	343	27.8%	577	46.9%	776
	2012	335	10.7%	311	26.5%	550	45.2%	748
from low	2013	325	9.7%	282	25.4%	527	43.7%	724
catch stream	2014	317	8.8%	257	24.5%	509	42.6%	705
	2015	311	8.1%	235	23.8%	495	41.8%	691
	2016	308	7.4%	217	23.4%	485	41.2%	682

Decision table (60:20 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

60:20			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	0	14.0%	407	30.3%	628	50.0%	827
	2010	0	15.0%	435	31.9%	663	52.0%	861
Low	2011	0	15.9%	461	33.4%	694	53.7%	889
	2012	0	16.8%	487	34.8%	723	55.2%	913
from high	2013	0	17.7%	514	36.2%	753	56.6%	937
catch stream	2014	0	18.6%	542	37.7%	784	58.1%	962
	2015	0	19.7%	572	39.3%	816	59.7%	988
	2016	8	20.7%	604	41.0%	851	61.3%	1015
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	113	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	121	14.3%	417	**31.1%**	**645**	51.0%	844
Medium	2011	125	14.6%	424	**31.6%**	**657**	51.5%	853
	2012	128	14.7%	428	**32.0%**	**665**	51.8%	858
from BASE	2013	132	14.9%	433	**32.5%**	**674**	52.1%	863
catch stream	2014	136	15.1%	438	**32.9%**	**684**	52.5%	869
	2015	142	15.3%	445	**33.5%**	**696**	53.0%	877
	2016	148	15.5%	452	**34.1%**	**708**	53.5%	885
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	339	14.0%	407	30.3%	628	50.0%	827
	2010	323	13.1%	382	29.4%	610	48.9%	810
High	2011	307	12.2%	355	28.4%	589	47.6%	788
	2012	291	11.3%	330	27.4%	569	46.3%	766
from low	2013	279	10.6%	308	26.6%	552	45.2%	748
catch stream	2014	270	9.9%	289	26.0%	541	44.4%	735
	2015	266	9.4%	274	25.7%	533	43.9%	727
	2016	263	9.0%	262	25.5%	530	43.7%	723

Research and data needs

- As with many rockfish, reconstruction of the historical landings is difficult and very time consuming. A standard method should be applied, and historical documentation should be provided to highlight major fishery events to allow more certainty in these estimates.
- Continued genetic studies to confirm that blue rockfish is two species. Some major research that is needed related to this topic include: aging to determine differences in growth and longevity, fecundity, maturation schedules and their spatial distributions.
- More biological sampling, especially age composition information, of the recreational and commercial fisheries to be able to determine changes in life history parameters over time and space.
- Research to help understand the lack of males in the catches. Is this a selectivity issue or a substantial difference in natural mortality between males and females?
- Development of a fishery independent survey to capture changes in stock abundance. Many assessments have used a recreational CPFV CPUE index to determine this, which is not as reliable considering management changes (i.e. bag limits, closures) that continue to occur.
- Sex-specific length and age information from the recreational fishery. Attempts have been made to gather sex-specific information from sampling the commercial fishery, and even though samples are small, it is informative.
- Environmental factors that affect survival of juvenile blue rockfish needs to be explored further. The lack of kelp habitat caused by increasing ocean temperatures (warmer waters) in Southern California since the 1990s led the STAT to believe that the disappearance of blue rockfish in this area was not due to fishing.

Regional Management Concerns

Blue rockfish are going to be a challenge for management considering the STAT's lack in confidence of the results of this assessment. Even though efforts were made to try and accommodate the changes in growth over time and space, sufficient data were not available to accomplish this. Not including Oregon or southern California add additional challenges for management. Lastly, the unknowns related to whether blue rockfish is two species causes concern not knowing the overlap of their spatial distributions or the degree of intermixing.

The STAT advices that this assessment for management purposes should be used with caution. Because of the numerous violations of model assumptions, the STAT does not consider the management quantities estimated in this assessment to be sufficiently reliable for quantitative fisheries management. Given the numerous levels of uncertainty, and the lack of information to assess blue rockfish appropriately throughout their range, this may be better used as a tool for guidance in monitoring blue rockfish until a more reliable assessment becomes available.

Summary Table

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Landings (mt)	297	234	166	135	167	229	165	185	341	341
Estimated Discards (included in total catch)	0	0	0	0	0	0	0	0	0	0
Estimated Total Catch (mt)	297	234	166	135	167	229	165	185	341	341
ABC (mt)										
OY (mt)										
SPR	0.22	0.25	0.36	0.48	0.56	0.53	0.45	0.58	0.56	0.41
Exploitation Rate (total catch/summary biomass)	0.07	0.05	0.03	0.03	0.03	0.04	0.03	0.03	0.06	0.06
Summary Age 1+ Biomass (B) (mt)	4114	4488	4825	5084	5298	5474	5541	5636	5649	5447
Spawning Stock Biomass (*SB*) (millions of larvae)	289	323	359	401	447	495	537	583	618	622
Uncertainty in SB estimate	259-318	286-359	317-402	352-450	391-503	431-559	464-610	501-665	528-708	
Recruitment at age 0 (1000s)	7792	2074	1080	960	2094	1484	1806	1071	735	2261
Uncertainty in Recruitment estimate	5609-9975	773-3374	592-1567	667-1252	1490-2698	1026-1941	1244-2368	725-1416	496-974	
Depletion (SB/SB0)	13.9%	15.5%	17.3%	19.3%	21.5%	23.8%	25.9%	28.1%	29.7%	29.9%
Uncertainty in Depletion estimate	na	na	na	na	na	na	na	na	na	na

INTRODUCTION

Blue rockfish (*Sebastes mystinus*) range from the Gulf of Alaska to northern Baja California, although they are most commonly found between Oregon and central California (Love et al. 2002). This assessment focuses on the stock from the Oregon border to Point Conception, California (Figure 1). They inhabit kelp forests and rocky reefs in relatively shallow depths usually to about 90 meters (50 fathoms) (Miller and Lea 1972, Reilly 2001), but have been landed as deep as 549 meters (300 fathoms) (Love et al. 2002). Blue rockfish are strongly residential, with their movements restricted to a small area, usually near the kelp canopy or pinnacles for shelter and spatial orientation (Miller and Geibel 1973, Lea et al. 1999, Jorgensen et al. 2006). Genetic evidence suggests distinct subpopulations of blue rockfish with a biogeographic barrier at Cape Mendocino, California (Cope 2004). More recently, evidence suggests the presence of two genetically distinct species in central California (Petersen et al. in review).

Blue rockfish are primarily "selective opportunity" planktivores (Gotshall et al. 1965, Love and Ebeling 1978). As juveniles, they feed on planktonic crustacea, hydroids, and algae (Miller and Geibel 1973). Adults also consume fish, squid, tunicates, scyphozoids, bull kelp nori, and pelagic gastropods (Hobson et al. 1996, Lea et al. 1999, Love et al. 2002). Many of these prey items are made available from the relaxation of upwelling or southerly winds, explaining high blue rockfish numbers in the summer off central and northern California, where these conditions are well developed (Hobson and Chess 1988, Love et al. 2002).

Blue rockfish have been an important part of the recreational fishery in California since the late 1950s (Reilly et al. 1993, Wilson-Vandenberg et al. 1996, Mason 1998). Commonly taken by Commercial Passenger Fishing Vessels (CPFVs, aka partyboats), skiffs, and divers, it is among the most frequently caught species north of Point Conception (Karpov et al. 1995). However, since the mid-1980s the California recreational catch has declined significantly, especially in the south (Figure 2). This may be a result of: overfishing from the more heavily populated southern coast (Love et al. 1998), where there is more angling opportunity due to more favorable access and ocean conditions (Bennett et al. 2004); poor recruitment resulting from a long-term shift away from preferred cold, productive waters (Love et al. 2002, Jarvis et al. 2004); or the effect of increasingly strict fishing regulations.

The California blue rockfish catch has played a relatively minor role in the commercial fishery compared to the recreational fishery. This has remained true, even with the advent of the live-fish fishery in the late 1980s (Figure 3), although the contribution of blue rockfish has been increasing in recent years. Since the preferred dinner plate-sized catch for this fishery means numbers of immature fish will be caught, there is concern over the potential implications of the increasing effort in this fishery. Selection of younger, smaller individuals has led to lower lifetime egg production and consequently, threatened population viability (O'Farrell and Botsford 2005, O'Farrell and Botsford 2006). Due to their great abundance in kelp forests, blue rockfish juveniles are recognized as a key species in the piscivore trophic web of these ecosystems (Hallacher and Roberts 1985). Careful monitoring of blue rockfish populations, and of the factors impacting them, is needed to maintain the species and the kelp forest ecosystems they inhabit.

This assessment focuses on the northern and central California population of blue rockfish (north of Point Conception, Figure 1) where blue rockfish are most commonly found and abundant. There has been a significant decrease in catch and effort in southern California, most likely due to unfavorable habitat associated with the warmer waters since the 1990s. Mason (1998) noted size reductions in CPFV catch as evidence of less successful recruitment during warmer years. A decrease in kelp abundance could be the main reason why blue rockfish have not been abundant in southern California in over 15 years. Kelp is an important habitat for both recruiting and adult blue rockfish, and can also be affected by the warmer waters. Blue rockfish caught in southern California have mainly come from the Santa Barbara Channel region, and historically, kelp has been abundant in this region. Long-term data on southern California kelp beds have been collected by ISP Alginates (formerly Kelco Co.), and have been made available as database SBCLTER: Reef Historical Kelp Database for giant kelp (*Macrocystis pyrifera)* biomass in California and Mexico by the Santa Barbara Coastal Long Term Ecological Research Project (<http://metadata.nbii.gov/>). The database provided approximate monthly values of the area of 16 discrete persistent kelp beds between Ventura and Point Conception. The area of each bed is expressed as a fraction of its long-term mean, and the overall index (Figure 4) is the annual average of these standardized values.

Regulation History

Prior to the adoption of the Pacific Coast Groundfish Fishery Management Plan (FMP) in 1982, blue rockfish (*Sebastes mystinus*) were managed through a regulatory process that included the California Department of Fish and Game (CDFG) along with either the California State Legislature or the Fish and Game Commission (FGC) depending on the fishery and sector (recreational or commercial). With implementation of the Pacific Coast Groundfish FMP, blue rockfish came under the management authority of the Pacific Fishery Management Council (PFMC), being incorporated, along with all genera and species of the family Scorpaenidae, into a federal rockfish classification (PFMC 2004) and was then jointly managed with the state.

Under the Pacific Coast Groundfish FMP, groundfish species and species groups were managed using estimates of Allowable Biological Catch (ABC). Starting in 1992, some of the rockfish species and species groups also began to be managed using harvest guidelines followed in 1999 by the use of Optimum Yields (OY). To keep landings within these adopted harvest targets, the Pacific Coast Groundfish FMP provided the Council with a variety of management tools including area closures, season closures, gear restrictions, and, for the commercial sector, cumulative limits (generally for two-month periods). With the implementation of a federal groundfish restricted access program in 1994, allocations of total catch and cumulative limits began to be specifically set for open access (including most of California's commercial fisheries that target nearshore rockfish) and limited entry fisheries (PFMC 2002; 2004).

During most of this time frame, management also concentrated on the commercial groundfish sector primarily because harvest from the recreational sector was considerably smaller than that from the commercial sector. This approach began to change in the later 1990's as commercial landings decreased and recreational harvest became a greater proportion of the available harvest.

The PFMC's rockfish management structure changed significantly in 2000 with the replacement of the *Sebastes* complex –north and –south areas with Minor Rockfish North (Vancouver, Columbia, and Eureka, International North Pacific Fisheries Commission (INPFC) areas) and Minor Rockfish South (Monterey and Conception INPFC areas only). The OY for these two groups was further divided (between north and south of 40º10' N. lat. ~ Cape Mendocino, Humboldt County, California) into nearshore, shelf, and slope rockfish categories with allocations set for Limited Entry and Open Access fisheries within each of these three categories (January 4, 2000, 65 FR 221; PFMC 2002, Tables 54-55). Species were parceled into these new categories depending on primary catch depths and geographical distribution.

Also, in 2000, seasonal 2-month closures were adopted in California for the first time for both commercial and recreational fisheries. In addition, the bag limit in California for rockfish was reduced from 15 to 10 rockfish, in combination, and recreational gear was limited to one line with three hooks.

Cowcod Conservation Areas (CCAs) were established in 2001 to reduce fishing effort for cowcod rockfish in southern California (PFMC 2002, Table 29). More importantly for blue rockfish management, Rockfish Conservation Areas (RCAs) were established in 2003 to allow for the closure of large areas based on depth for particular fishing sectors or gears. The trawl and non-trawl gear RCAs were two of these groundfish conservation areas established in 2003 with the purpose of reducing fishing effort on shelf and slope rockfish, including overfished species such as canary rockfish, while providing some limited bottom fishing opportunities in adjacent waters.

During the late 1990's and early 2000's, major changes also occurred in the way that California managed its nearshore fishery. The Marine Life Management Act (MLMA), which was enacted in 1999, gave authority to the FGC to regulate commercial and recreational nearshore fisheries through FMPs and provided broad authority to adopt regulations for the nearshore fishery during the time prior to adoption of a nearshore finfish FMP.

Following adoption of the Nearshore FMP in fall of 2002, the FGC adopted a nearshore restricted access program for the commercial fishery to be effective starting in the 2003 fishing year, including the establishment of a Deeper Nearshore Permit (DNP). Since blue rockfish was categorized in the Nearshore FMP as a deeper nearshore rockfish, commercial fishermen taking this species were required to possess a DNP.

Although the Nearshore FMP provided for the management of the nearshore rockfish, joint management authority for these species continued to reside with the Council and the State. Even so, for the 2003 and subsequent fishery seasons, the State provided recommendations to the Council specific to the nearshore species that followed the directives set out in the Nearshore FMP. These recommendations, which the Council incorporated into the 2003 management specifications, included a division of the Minor Rockfish North – Nearshore into two groups (black and blue rockfish; and other nearshore rockfish), recalculation and division of the OY for Minor Rockfish South - Nearshore into three groups (shallow nearshore rockfish; deeper nearshore rockfish; and California scorpionfish). The Council also incorporated specific harvest targets and recreational and commercial allocations for each of the above groups and adopted various management specifications to keep harvest within harvest targets.

Starting in 2004, management specifications adopted by the Council and State also included recreational RCAs which limited the maximum allowable fishing depth such as the California Rockfish Conservation Area (CRCA) (for more information on the CRCA, see Title 14 of the California Code of Regulations, Section 27.51). Also in 2004, black rockfish were removed from both the Minor Rockfish North and Minor Rockfish South ABCs and OYs. As a consequence, the groupings and harvest targets for the Minor Rockfish North – Nearshore changed; the blue rockfish proportion of the black and blue rockfish group harvest target was combined with that from the other nearshore rockfish and placed under a new group category, minor nearshore rockfish.

A timeline covering California regulations that applied to blue rockfish from 1990-2006 is provided in Table 1. Table 2 provides the commercial regulations and related gear changes from 1950-2006.

BIOLOGICAL PARAMETERS

Lea et al. (1999) found the following relationships between length (TL, mm) and weight (grams) of blue rockfish in California

Combined sex:	$W = 0.000009774 * TL^{3.09}$	(1)
Males:	$W = 0.00002934 * TL^{2.889}$	(2)
Females:	$W = 0.00003408 * TL^{2.874}$	(3)

Echeverria and Lenarz (1984) provide the following length (mm) conversion equations we use in this assessment

$FL = -2.164 + 0.962\ (TL)$	(4)
$FL = 0.352 + 1.192\ (SL)$	(5)
$TL = 2.495 + 1.039\ (FL)$	(6)

The units of length for this assessment are in fork length, so Equations 4 & 5 were used to convert all lengths to fork length. The length to weight relationships (male and female) can be seen in Figure 5.

Parturition and Recruitment

Mating of blue rockfish occurs in October, and eggs are fertilized a few months later. Parturition occurs from November to March, with a peak in mid-January (Lea et al. 1999, Reilly 2001). Larval blue rockfish spend a few months in the water column before settling (April-June) in nearshore rocky habitats when they are about 1.5 inches in length (Love et al. 2002). Annual recruitment is highly variable, as temperature has a negative correlation with rockfish recruitment (Gundelfinger 2005). Year-class strength is dependent on physical factors occurring at the larval stage (Ralston and Howard 1995). Settlement numbers and spatial variability also depend on geographic features (Field and Ralston 2005), or oceanic conditions such as El Niño, which can lead to starvation of juveniles, increased exposure to predation, or diminished reproductive condition (VenTresca et al. 1995, Moser et al. 2000, Sakuma et al. 2006).

Age, growth and natural mortality

Maximum lifespan has been estimated to be 44 years for male blue rockfish and 41 years for females (Laidig et al. 2003), using otoliths and the break-and-burn technique for aging. Miller and Geibel (1973) reported the oldest fish to be 24 years of age; however scales were used in this study for aging, which are not as reliable as otoliths. Blue rockfish attain a maximum length of 53cm TL (50cm FL, 21 in), with females growing slower but attaining larger sizes (Mason 1998, Love et al. 2002). Figure 6 shows the differences in growth between the sexes (Laidig et al 2003).

Most studies have shown that growth of blue rockfish (among individuals, sexes, geographic areas and depths) is highly variable. Due to the wide variation among individuals, the residential behavior of blue rockfish in shallow water and the relatively slow growth, Miller and Geibel (1973) were not able to construct an age-length curve from aging data. We also found this difficult to accomplish for this assessment.

Based on maximum ages of 41 (females) and 44 (males) (Laidig et al. 2003) and Hoenig (1983), natural mortality is estimated at M = 0.10. Tenera (2000) reported natural mortality for blue rockfish to be 0.14.

Maturity and Fecundity

Half of blue rockfish males mature at about 10 inches (25.4 cm, 5-6 years) and females at 11 inches (27.9 cm, 6 years), although this can vary considerably (Miller and Geibel 1973, Reilly 2001). Wyllie Echeverria (1987) derived maturity estimates (0%, 50% and 100%) for both male and female blue rockfish. For females, the first size and age at maturity was determined to be 22cm TL (19cm FL) and 5 years old, 50% were mature at 29cm TL (26cm FL) and 6 years old, and 100% were mature at 35cm TL (32cm FL) and 11 years old. We used these estimates to fit the spawning ogive curve (converted to fork length, Equation 4) which can be seen in Figure 7. Laidig et al (2003) concluded younger ages from their study. They found that 50% maturity for females was age 5 instead of age 6 and the youngest were mature at 3 years instead of 4 or 5. This could be the result of a change in size and age at maturity over time.

No size-specific fecundity equation has been published; however a female at 9.8 inches TL (25 cm) is estimated to produce about 50,000 eggs, where a 15.9 inch TL (40 cm) female can produce about 524,000 eggs (CDFG 2002). Using Equations 3 and 6, we determined the spawning potential (eggs per kg) for female blue rockfish (Figure 8).

DATA and ASSESSMENT

Available data used in this assessment consist of historical commercial and recreational landings information (1916-2006), age composition data (1980-1984) from the recreational CPFV fishery, and length compositions from the recreational and commercial fisheries (1978-2006). We were able to calculate two indices of abundance based on CPFV CPUE in the recreational fishery (1980-2006), and a third was also considered (CalPOLY) but it only represented the Morro Bay area for the past few years. Lastly, we used a pre-recruitment index of abundance from the juvenile rockfish mid-water trawl survey (SWFSC/NWFSC/PWCC).

Removals

At the first STAR panel of blue rockfish in May 2007, the panel recommended reconstructing the catch history back to 1916, where the previous assessment used the estimated landings that were available back to 1968. Even though blue rockfish have not been specifically identified in the catches back to that date, a great amount of time and effort was put into the historical reconstruction, mainly based on proportions of total rockfish removals. Table 3 provides the values of the reconstructed catch series and Figure 9 shows a visual representation of the estimated blue rockfish removals used in this assessment. Table 4 provides a summary of data sources and assumptions made during the catch reconstruction.

Recreational Catch

The first reportings of the recreational CPFV (partyboat) rockfish catch were given for the state of California in numbers of fish from 1936-1940 (Best 1963). Based on the 1947-1949 average proportion of total rockfish taken north of Point Conception (0.72), we could estimate total rockfish take for the assessment area during this time period. Miller and Gotshall (1965) reported that blue rockfish accounted for 31.5% of the total rockfish take on CPFVs in the Monterey area, and this mode of fishing represented about 70.5% of the total rockfish catch. Miller and Gotshall (1965) also reported the mean weight for blue rockfish was between 1.0 pound (CPFVs) and 1.3 pounds (all modes combined), so we converted numbers of fish to weight based on these estimates. Lastly, Miller and Gotshall (1965) reported discards at 6.8% from Bodega Bay to Avila, and that the abundance of blue rockfish drops considerably north of Fort Ross and is only of minor importance. Using the above information, we were able to estimate total blue rockfish removals for this time period. Prior to 1936, recreational catches were "ramped up" beginning in 1916, the same year the first commercial landings were reported.

No estimates were reported from 1941-1946 during World War II. The war ended in 1945, so the Mop-Up STAR panel insisted that a value be included for 1946, so they suggested 16 mtons (half of 1947 catch) be used. Beginning in 1947, Young (1969) reported CPFV estimates by major port area for rockfish in numbers of fish until 1967. We used the estimated catch from Crescent City to Morro Bay to account for total rockfish catch north of Point Conception. We then used the same method (as stated above) to come up with the total blue rockfish catch for these years. Landings in central and northern California during this time period were primarily blues, yellowtail, olive and bocaccio (Young 1969).

The recreational estimates from 1968-1979 were derived similarly to the previous years with two minor changes. Due to shifts in total rockfish take between northern and southern California, we evaluated the proportion of northern CPFV take in the 1947-1967 time period. The average proportion north of Conception for the previous three years (1965-1967) was 0.46, and this was applied to the years 1968-1972. The overall average from 1947-1967 was 0.58, and that was applied to the years 1973-1979. We assumed that other modes of fishing were starting to pick up around this time period as well, so we used a 50% CPFV take of rockfish instead of the initial 70% reported in Miller and Gotshall (1965).

The Marine Recreational Fisheries Statistical Survey (MRFSS) estimated landings, effort, and discards for California from 1980 to 2003 (with a hiatus from 1990-1992 and missing CPFV data from 1993 through 1995. For the years 2004-2006, catch estimates came from the California Recreational Fisheries Survey (CRFS), a newly implemented state program that also estimates catch, effort and discards in California. Data from each survey is available on the RecFIN website (http://www.psmfc.org/recfin).

For the years 1990-1995, there were missing CPFV estimates in RecFIN, so we used estimates generated by California Department of Fish and Game (CDFG), using CPFV onboard observer survey data in conjunction with CPFV logbook information (Deb Wilson-Vandenberg, CDFG pers. comm.). Historically, the CPFV and private recreational anglers landed similar proportions of the blue rockfish catch, so for years where there was missing private landings information (1990-1992), we used the same estimate provided for the CPFV fleet. The 1993 private sector estimate appeared to be an outlier at 450.97 mtons compared to the estimated 182.41 mtons in the CPFV fishery. The large estimate could potentially be the outcome of a large recruitment event observed in 1988 (Figure 28). VenTresca et al (1995) also reported an exceptionally strong year class in central California in 1988. Even though this event appeared to occur, we did not feel it would change the catch for blue rockfish to such numbers, hence we felt using the CPFV estimate in 1993 to represent the private sector was more appropriate.

Discards were included in the total removals of the recreational fishery (RecFIN, A+B1). Evaluation of discard rates showed a decrease in discards since the 1980s, perhaps because fishermen were keeping more blue rockfish due to the lack of more preferable species (i.e. bocaccio). In 2000, California reduced the recreational bag limit for combined rockfish from 15 to 10 fish. Judging by the distribution of RecFIN-sampled bag sizes, there was compliance with this change in regulations which will be discussed further in the RecFIN CPUE index section.

We also evaluated the Central California Spearfishing Tournament (CenCAL) data from 1958-2003 (D. VenTresca, CDFG, pers. comm.). We did not directly include these selected removals (an average of 200 blue rockfish per year); however, spearfishing is covered and included in the shore modes (2% of total), which were included in total removals of the recreational catch.

The removals of blue rockfish in Oregon were not included in this assessment, but total reported landings of blue rockfish from 1980-2006 in the recreational fishery was 1209 mtons.

Commercial Landings

Heimann and Carlisle (1970) reported a historical review of commercial rockfish landings from 1916-1968, which included rockfish brought into California from Oregon and Mexico. We compared these landings to PFEL (1928-2002) which do not include landings brought in outside of California waters. Since this assessment focuses on the California stock only, we used the PFEL estimates to reconstruct the commercial catch history from 1928-1968. Since there was no significant difference between the two catch series (Figure 10), we felt using the reported landings in Heimann and Carlisle (1970) prior to 1928 were no cause for concern.

The Santa Barbara region included San Luis Obispo (SLO), Santa Barbara and Ventura counties, so we investigated total rockfish landings in Morro Bay and Avila (SLO) from Fish Bulletins when available (covering some years between 1949-1968). We calculated a proportion of total rockfish north of conception for years when that information was available, and used an average (80% in SLO) for years when information was not available.

Phillips (1939) provided information to help determine what proportion of total rockfish were blue rockfish in the Monterey Bay area. Five species (bocaccio, Chilipepper, yellowtail, vermilion and canary) accounted for 91.3% of the landings in this area. Blue rockfish were in the “all category” of < 2% of the total landings and represented 1% of the examined catch. Assuming this is equal in all regions north of Point Conception and has not changed substantially over the years, we estimated blue rockfish at 1.0% of total rockfish landings prior to 1969.

Trawl logs from 1934-1956 were found during our reconstruction of the catch history for this fishery, which was important in estimating blue rockfish take based on this 1% of total rockfish catch. As seen in Table 5, a substantial amount of rockfish were being removed by trawl gear during this time, and blue rockfish were not reported here nor in the 1950s through 1970s (Heimann and Miller 1960, Nitsos 1965, Gunderson et al 1974). Nitsos (1965) reported trawl landings from 1954-1963, and an average of 91% of the total reported rockfish landings was from trawl gears. Considering this, we felt it necessary to remove the trawl landings from the catch series before estimating blue rockfish as a proportion of the total rockfish catch. An average of 17% from 1934-1936 was used to remove trawl landings from 1916-1933, and an average of 91% from Nitsos (1965) was used to remove trawl landings from 1964-1968. All other landings were assumed to be hook and line from 1916-1976.

Commercial landing estimates from 1969-2006 come from the California Cooperative Survey (CALCOM) database (Figure 11). From 1969-1977, the estimates were based on a ratio estimator, using species compositions from the earliest sampled 3-year interval (D. Pearson, SWFSC pers. comm.). From 1978 to present, expansion procedures were used to estimate commercial landings from sampling commercial market categories (Pearson and Erwin 1997).

In a recent evaluation of market categories of the commercial fishery, the blue rockfish market category did not score high on reliability (D. Pearson, NMFS/SWFSC, pers. comm.), considering that its morphology and coloration is very similar to black rockfish, and that separation is driven by size and price factors. In more recent years, state regulations mandate that nearshore fishes be sorted by species prior to weighing and that the weight be reported separately on the CDFG fish landing receipt (Section 150.16, Title 14, California Code of Regulations). In our evaluation of market category sampling data blue rockfish represented 88% in the blue rockfish market category, 10% in the black rockfish market category, and only 2.4% in the unidentified rockfish market category (Table 6).

The National Marine Fisheries Service (NMFS - NWFSC) has been conducting an onboard survey to estimate discards in the commercial nearshore fishery in recent years; however, length and weight associated with these discards are not available at this time (Jim Hastie, NMFS/NWFSC pers. comm.). Average discards of blue rockfish in the nearshore fisheries as a percent of total catch in the years 2003-2005 is 18% (2003 - 24.9%, 2004 - 16.4%, 2005 - 12.5%). The 2003 rate is based on less than 1,000 lb of catch (as opposed to about 5,000 lb in the other 2 years). We accounted for discards in the years from 2000 on, using this 18% discard rate, but did not apply additional discards in the 1990s.

When the CALCOM estimated landings from 1969-2006 were presented to fishermen at the Data Workshop, they did not agree with the landings in the earlier years of the series (details in Appendix A). They had two major concerns: 1) trawl estimates were underestimated due to many mid-water trawlers "dumping" blues in the 1970s and 2) the non-trawl estimates were underestimated in the 1980s. Their concerns were accommodated through sensitivity analyses with high and low catch histories rather than changing the base catch history. As stated before, we found no blue rockfish reported as being taken in trawl gears from the 1950s through 1970s (Heimann and Miller 1960, Nitsos 1965, Gunderson et al 1974). Rogers (2003) also estimated the foreign trawl rockfish catch off Washington, Oregon and California from 1966-1976 and blue rockfish were nonexistent.

Abundance indices

Given the lack of survey-based abundance indexes of blue rockfish, recreational fishery catch per unit effort (CPUE) is the only available source of information on historical changes in abundance of blue rockfish. The MRFSS and subsequent CRFS samples residing in the RecFIN database provide trip-based catches and angler effort from 1980 to 2006 with some missing years. An independent CDFG CPFV onboard observer survey that targeted rockfish and lingcod also provided site-based catch and angler effort from 1987 to 1998.

Each data set was subject to record filtering in order to eliminate trips and sites that were unlikely to have been associated with blue rockfish. The CDFG samples were restricted to sites that had a history of blue rockfish presence. The RecFIN trips were filtered by the Stephens and MacCall (2004) method based on other species of fish taken on those trips. The Stephens and MacCall method was endorsed by an "off-year" workshop on the subject of recreational fishery data analysis (Recreational CPUE Statistics Workshop, June 29-30, 2004). The method has proven to be robust in previous applications to other species. Unless the STAR Panel has identified a specific problem with the application of the method to blue rockfish, asking for an extensive analysis of the robustness of a well established method is setting the standard far higher than has been the case for other assessments and for other methodologies.

RecFIN CPFV CPUE

CPUE from recreational fisheries in southern California waters is not used in this assessment, and was not calculated due to the high frequency of zero-catches in recent years. Wade VanBuskirk (PSMFC, pers. comm.) provided Northern California (north of Pt. Conception) trip-level summaries of CPFV catch and angler effort from the RecFIN database, covering years 1980-1989 and 1993-2006. These RecFIN intercept data reflect sampling and interviews conducted at the end of 3680 fishing trips, and do not include information on specific fishing locations. Because the data include both relevant trips in which blue rockfish were reasonably likely to be taken, and non-relevant trips such as trips targeting salmon or tuna, the logistic regression method of Stephens and MacCall (2004) was used to obtain a subset of the trip data that would be appropriate for calculating blue rockfish CPUE. This method uses the species composition of catches from each trip to determine whether fishing occurred in a habitat likely to be associated with the presence of blue rockfish and therefore, to determine which trips had the potential to encounter blue rockfish.

The top 50 species in frequency of occurrence were extracted, and blue rockfish (target species) were removed. The remaining 49 species served as potential explanatory variables. All trips with take of striped bass, albacore, or salmon were deleted from the data, as any catch of blue rockfish is very likely to reflect a small portion of the fishing effort on that trip. Potential explanatory species that occurred in less than 20 trips were not used in the analysis. Logistic regression of blue rockfish presence/absence on categorical presence/absence of the explanatory species provided predicted probabilities that blue rockfish would be taken on a trip, given the other species that were taken on that trip. Species associations (coefficients from the logistic regressions) are shown in Figure 12 and a cumulative-cumulative plot is shown in Figure 13. A threshold probability of 0.39 was chosen on the basis of equal probabilities of false negatives and false positives (Stephens and MacCall, 2004). Selection of the threshold probability defines the subset of RecFIN trip data to be used for calculation of the CPUE index.

Initial examination of CPUE values showed unusually high values of catch per angler hour in years 1997 and 1998 (Figure 14), similar to the anomalous patterns seen for several other species in the RecFIN data (e.g., gopher rockfish, vermilion rockfish). This problem was reported to RecFIN, and Wade VanBuskirk (pers. comm.) recommended that data for 1997 and 1998 should not be used in this stock assessment.

This analysis uses retained catch (RecFIN type A) per angler hour as the measure of CPUE. The abundance index is calculated by a delta-GLM of catch and effort data from 893 trips. Edward Dick, NMFS (pers. comm.) provided the R language code for the delta-GLM model, which uses a binomial (delta) model to describe presence-absence, and a lognormal or gamma model to describe values of CPUE if blue rockfish were present (Stefánsson 1996).

Four sets of explanatory variables (with number of levels) were initially considered, YEAR(24), WAVE(6), REGION(4), and 3MILES(2), where WAVE represents two-month intervals, REGION represents geographical county groupings (San Luis Obispo (SLO), Monterey+Santa Cruz (MONSC), San Mateo (SANMAT), and Sonoma+Mendocino (SONMEN)), and 3MILES represents inside and outside three miles from shore; estimated YEAR values provide the annual index. Because of small sample sizes, data from San Francisco Bay-area counties (San Francisco, Marin and Alameda), and from the northern counties (Humboldt and Del Norte) were not used. Based on a Bayesian Information Criterion, which favors simple models, an interaction term between REGION and 3_MILES should be included. Rather than using an interaction term, a new main effect LOC(8) was created, consisting of the eight combinations of REGION and 3_MILES, which were treated as independent locations. Sample sizes are given in Table 7.

For this revised main effects model, a delta-gamma distribution (AIC=259) was favored over a delta-lognormal distribution (AIC=318). Analysis of deviance indicated that all three main effects (Figures 15-17) were significant (Table 8).   Based on BIC, all models containing interaction terms were rejected (Table 9). Precision of the estimated YEAR effects was estimated by use of a jackknife procedure and can be seen in Table 10.

The bag limit changed from 15 to 10 in 2000, and although the regulatory change has the potential to influence an index of abundance based on CPUE, two hypotheses can be considered: Either compliance was achieved by higher discard rates, or it was achieved by shortened trip durations. Because this RecFIN CPUE index is based on catch per angler hour (rather than catch per angler trip), a shortened trip duration would preserve the validity of the CPUE ratio estimate. Because of small sample size and perhaps because the bag limit applied to all rockfish species (thus adding unexplained variability), there was no direct evidence either for or against a shortening of trip duration as catches approached 10 blue rockfish per angler in recent years. However, a RecFIN query of estimated retained and discarded blue rockfish shows no marked increase in discard rate following the change in bag limit (Figure 18).

During the Mop-Up STAR panel, we evaluated the bag frequency before and after the change in bag limit (Figure 19). It was decided to separate this index into two time periods to account for the change in catchability (half) from 2000-2006. Even though changes in assessment results were minor, the two RecFIN CPUE indices for the pre- and post- bag limit change were included in the final base model.

CDFG CPFV CPUE

The CDFG CPFV onboard observer survey provided catch and effort data to produce a second CPUE index (catch per angler hour) of relative abundance for the time period 1987 to 1998 in central and northern California. This survey provided specific location information for each stop in a trip (Table 11). Depth was calculated as an average of the minimum and maximum depths recorded at each fishing location and binned in 10 fathom bins up to 40 fathoms. Since the occurrence of blue rockfish being landed in depths greater than 40 fathoms was rare (5% in greater depths) and the CVs were very large for those depths, all depths greater than 40 fathoms were included in this bin. For locations where blue rockfish were not landed in at least 4 of the 12 years, we removed those locations from further analysis. The remaining 140 locations were mapped in ArcView (EJ Dick, NMFS/SWFSC pers. comm.) and 6 areas (Fort Bragg, Salt Point, Bodega Bay/Farralon Islands, Half Moon Bay/Santa Cruz, Monterey, San Simeon/Morro Bay) were identified to be used in the model to develop the CPUE index. Bodega Bay and the Farralon Islands were grouped together because they both had low CPAH values and there was a better fit to the model once these two areas were combined. Salt Point had the highest average CPUE and one point from that area was removed from the analysis due to its implausibly high CPUE (CPAH = 57.14).

The abundance index was calculated using the same delta-GLM approach as mentioned in the previous CPUE index description (RecFIN CPUE). Our initial run included YEAR(12), MONTH(12), AREA(6) and DEPTH(5) affects, with the best fit being lognormal (AIC=7043) over the gamma (AIC=7113). Month was shown to be insignificant, so we removed month from the model. The analysis of deviance table (Table 12) then showed the remaining main effects to be significant. Based on BIC, all models containing interaction terms were rejected (Table 13). Precision of the estimated YEAR effects was estimated by use of a jackknife procedure and can be seen in Table 14. Diagnostics, including residual plots and Q-Q plots can be seen in Figures 20-23. Figures 24-26 provide the annual index of abundance for blue rockfish as well as the main effects (AREA and DEPTH) that remained in the final model.

Pre-Recruitment Indices

In September 2006, a Pre-Recruit Survey Workshop was held in Santa Cruz, CA (NMFS-SWFSC) that concluded data collected during SWFSC (*R/V David Starr Jordan)* and PWCC/NWFSC (*F/V Excalibur)* midwater trawl surveys for young-of-the-year (YOY) pelagic juvenile groundfish could be pooled to provide a coastwide pre-recruit index from 2001-2006 for YOY *Sebastes* spp (Hastie and Ralston 2007). The SWFSC surveys have been conducted in California since 1983 and provide an index in the "core-area" waters surrounding Monterey/San Francisco (i.e., lat. 36E30', 38E20' N). PWCC/NWFSC surveys have been conducted coastwide since 2001.

The pre-recruit index used in the base model was based on the pooling of the two surveys during 2001-2006 (Figure 27). Three different methods (design-based, deltaGLM and ANOVA) were considered to evaluate the best model to be used for this pre-recruit index and the "superior" model was found to be the ANOVA (Steve Ralston, NMFS/SWFSC, pers. comm.). Based on recommendations in Hastie and Ralston (2007), the "core-area" index provided a longer time series (Figure 28) and could be used for species that have a latitudinal center around the core-area. Blue rockfish would be a good candidate for using this index, however initial attempts to use this index did not improve the model. Also, the extremely high recruitment events in 1988 and 2002 were not in agreement with other data sources.

During the Mop-Up STAR panel, the model fits to the pre-recruit index were questionable. The initial CVs had been set to the error estimates, which were extremely small and did not account for all sources of potential variability. The STAR panel recommended CVs of this index to be set to 0.35 for all years for the final base model.

Age Compositions

Our age composition data represents the recreational fishery from 1980-1984. The data were treated as an unbiased sample of fishery length and age composition. Don Pearson (NMFS/SWFSC, pers. comm.) aged nearly 2200 otoliths (break and burn method) for this assessment (Table 15). We plotted numbers at age to define ages where the majority of blue rockfish were being selected (98% between ages of 5-18) in the CPFV fishery during this time period (Figure 29) and saw no evidence of year class modes from the age composition data (Figure 30).

We also evaluated age and growth for areas where this information was collected. Although highly variable, if areas had similar mean length at age distributions, they were combined (Figure 31) to increase the sample size to determine age and growth parameters between the sexes. Monterey and Half Moon Bay/Princeton provided the best representation for this time period (Table 16).

Lastly, we evaluated age compositions from the 2003-2006 Groundfish Ecology (GE) survey (Don Pearson, NMFS/SWFSC pers. comm.) in the Monterey Bay area (n=205), and even though there was not a lot of information here, we were able to see differences in mean size at age for females between Santa Cruz (n=47) and Big Sur (n=31). Santa Cruz (more heavily fished area) consisted of younger females, where older females appeared to be in the waters around Big Sur (less fished area) (Figure 32). More importantly, this information provided sex specific lengths and ages to determine a growth curve for the 2000s which was compared to growth in Monterey during the 1980s (Figure 33). This comparison suggests a change in growth over time that led to exploration of a time-varying growth model that will be discussed in the model section.

To evaluate precision, a subset of 101 otoliths from the GE survey were subject to re-reads by the same ager. This amounts to a test of among-ager precision (Table 17). The otoliths represented an age range of approximately 3 to 25 years, and samples were fairly evenly distributed across that range (average age 10.8 yr, SD 6.2 yr). An analysis was completed to incorporate aging error into the model. The first reading was treated as the "true age" and precision was estimated as the standard deviation of the second reading relative to the first reading (SDrelage). As would be expected, the estimates of precision by individual ages are imprecise due to small sample size. Consequently, the data were divided by age range into three groups of approximately similar sample size, ages 3-6 (N=39, SDrelage = 0.42yr), ages 7-12 (N=26, SDrelage = 0.81yr), and ages 13-25 (N=39, SDrelage = 1.59yr). The values of SDrelage are approximately linear with the means of the respective age ranges (Figure 34). A linear regression of SDrelage against mean age gave the relationship SDrelage=0.0809+0.0518*age, and this was applied to individual integer ages to create the vector of age determination errors.

Minimal mean length at age data was available (Don Pearson, NWFSC pers. comm.) to evaluate potential differences between the two putative species of blue rockfish during the Mop-Up STAR panel. If the two species are demographically similar, there would be less cause for concern. Figure 35 shows similar mean age at length patterns between the two species; however, there is a need to study the two species in much greater detail.

Length Compositions

Recreational length composition information was obtained from RecFIN and the CDFG CPFV onboard observer survey. Sex specific information was not available for these sources to separate the compositions for males and females. All lengths were set up in 2 cm bins. RecFIN length data for the CPFV and private boat sectors from 1980-2006 showed compositions to be very similar (Figure 36), so we combined all lengths into one recreational fishery. Lengths from the 1980s, 1997 and 1998 were not used because they appeared to be converted from weights and were not actual lengths. Weighted length data did not provide sample sizes so the unweighted length data were used. Comparisons were made between the weighted and unweighted length compositions (Figure 37) showing minor differences, so the Mop-Up STAR panel approved the use of the unweighted samples being used.

Length compositions were also used from the CDFG CPFV onboard observer survey (Figure 38) for the years 1987-1998. Total lengths were converted to fork lengths using Equation 4. Tables 18 and 19 show the number of trips and actual lengths associated with the RecFIN and CDFG survey, respectively. Strong modal progressions were not seen in either of these data sources.

Lastly, length composition data from recreational CPFV fishery (1978-1984) were incorporated for use in this assessment. Considering we used conditional age-at-length data in the base model, concerns are minimal for using a subset from the age data used in this assessment. This will be discussed further in the model section.

Commercial length compositions were obtained from the CALCOM sampling database for years 1992 to 2006. Comparison of length compositions for the hook-and-line and net fisheries showed that net gears catch larger fish (Figure 39) so the two fisheries could not be combined. There were insufficient sample sizes for setnet gear, so they were used only to determine the selectivity of this fishery. However, there were sufficient sample sizes for the hook and line fishery since 1992, and annual length frequencies can be seen in Figure 40. Again, no evidence of strong modal-progression was seen. Table 20 provides sample sizes and actual lengths available for the commercial fishery. This table also provides an example showing females (79%) being selected more often than males (21%) in the commercial hook and line fishery.

DESCRIPTION OF MODEL

Appendix B provides the ASPIC (production) model results that were presented at the first STAR panel (May 2007) in Portland, OR.

Stock Synthesis II

We developed a size- and age-structured model using Stock Synthesis 2 (ver_ 2g) (Methot 2005) to model the population dynamics of the blue rockfish stock in California, north of Point Conception. The Synthesis model estimates and projects the survival, growth and reproduction of individual age classes and incorporates ageing errors and individual variation in growth. It allows a variety of data types to be combined and used to estimate parameters in one formulation. The data and control files for the final base model can be seen in Appendices C and D.

Based on maximum ages of 41 (females) and 44 (males) (Laidig et al. 2003) and Hoenig (1983), natural mortality was initially assumed to be M = 0.10 for males and females in the base model. During the review process, the under-representation of males in the fishery data was consistent in all model runs. To try and capture this, a range of values for M and male offsets for M were explored, and male M was fixed at 0.12 in the final base model with female M remaining fixed at 0.10.

Considering the recommendation based on the meta-analysis by Martin Dorn (pers. comm.), steepness (*h)* was fixed at 0.58 (SD=0.181). Recruitment was estimated from 1960-2006. The logistic selectivity function was used for each fishery and survey, with a male offset also estimated from the recreational data. A convergence criterion of 0.00001 log-likelihood units was used for all runs of the model.

The final base model included the historical catch series from each fishery, age compositions from the recreational CPFV fishery (1980-1984), length compositions from the recreational (RecFIN, CDFG onboard observer survey, 1980s CPFV) and commercial (hook and line and setnet) fisheries, three recreational CPUE indices (RecFIN separated pre/post bag limit change and CDFG survey) and a pre-recruit index (2001-2006). We assumed equal likelihood weights (= 1.0) for all data sources. There were very few (n<10) samples in the commercial setnet fishery, so we used the length compositions only to determine the selectivity and did not tune between model runs. Since the recreational fishery did not have any sex information available for the length compositions, we used the sex specific age compositions from the 1980s to determine the selectivities for this fishery. We set a male offset to help in estimating the differences in selectivity between the sexes. In every data source we explored for this assessment, females were being selected much more (70-80%) than males. Depth is one potential factor that could be contributing to this selection. In three observed occasions, male numbers were greater than or equal to female numbers in depths <12 fathoms (Don Pearson, NMFS/SWFSC pers. comm.)

The growth parameters of k and Lmax were estimated in the final base model, with Lmin remaining fixed at the externally estimated value (Figure 41). Prior to the Mop-Up STAR panel, we attempted to deal with the variability of growth spatially in California using the combined area data to estimate growth outside of the model (Figures 42 a-b) based on the 1980-1984 CPFV age and length data, as well as dive data (young fish, ages 1-3) provided by Tom Laidig (NMFS/SWFSC). External fits of the Schnute (1981) parameterization of the von Bertalanffy growth equation were the following: female parameters - t_1=2 (years), L_1=17.9 (cm FL), t_2=25 (years), L_2=37.5 (cm FL) and k=0.147 (n= 2340, CV=0.089); male parameters - t_1=2 (years), L_1=15.7 (cm FL), t_2=25 (years), L_2=31.2 (cm FL) and k=0.295 (n=667, CV=0.108).

The age composition data was limited in this assessment to samples collected in the recreational fishery between 1980 and 1984. These data were fitted as conditional age-at-length data, in which length and age observations are analogous to entries in an age-length matrix with ages in the columns and lengths in the rows. This approach was implemented in SS2 in order to improve the ability to fit growth curves internally and avoid problems associated with weighting of the length and age likelihood components, particularly when age structures are collected as a subset of the measured fish (Stewart 2006; Helser and Stewart 2006; Punt et al. 2006). For blue rockfish, conditional age-at-length data represent individual fish rather than expanded age-at-length compositions, as the latter could not be derived from the recreational samples. Initial multinomial sample sizes were the number of trips sampled for each year, with this effective sample number partitioned among the length bins (rows) for any given year based on the fraction of aged fish in that length bin for that year (Figures 43 a-b). The same age composition data were included as traditional age composition data in the data file with no emphasis values in order to graphically illustrate the relative (marginal) fits to the data, a useful diagnostic for more rapidly evaluating the relative fit to all of the data and the improvement in fit gained by freeing (rather than fixing) growth rate parameters in particular.

Final model results

The total number of parameters estimated was 74, including the unfished equilibrium recruitment (R_0), eight parameters for logistic selectivity curves (two surveys and two fisheries), four parameters for growth curves (Lmin was fixed) and 47 recruitment deviation values (for the years 1960-2006). Male offset parameters for selectivity were estimated based solely on the recreational age composition data that included early 1980s CPFVs and then fixed for all fisheries, as these were the only data that had clearly identified catches to sex (and which illustrated that males were much less frequently encountered than females in these data). Table 21 provides the point estimates for these parameters, as well as the model estimated standard deviations. The base model estimates of summary biomass (age1+), spawning biomass, recruitment, total catch, exploitation and depletion are provided in Table 22.

All results shown and discussed are relative to a base model with the same parameter configuration as the final model in which the assumed sample sizes and survey

CVs were tuned to the effective sample sizes and CVs output from initial model runs. Tuning was conducted using the variance adjustment factor vectors available in SS2, such that variance was added to survey index CVs, and multipliers were used to scale the effective sample sizes for length and age composition information. The length composition information for the setnet fishery is based on extremely low sample sizes, and the length information was solely intended to provide a selectivity curve, so this index was not tuned to reflect the "more informative" effective sample sizes reflected by the model. All other indices and composition information were tuned to the point where the ratio effective and the input CVs/sample sizes were close to one.

The model estimated an unfished spawning biomass (SSB_0) of 2077 millions of larvae (mol), an unfished summary biomass of 13,222 mtons and a 2007 spawning biomass of 622 mol, which results in a relative spawning biomass estimate of 0.297 in 2006. The depletion level at its lowest point (1994 and 1995) was estimated to be 205 mol, or 10% of SSB_0. Figures 44 (a&b) shows the total spawning biomass and depletion (with reference 25% and 40% of unfished biomass). The highest exploitation rates (and greatest relative population declines) seemed to occur from the 1970s through the 1990s, (Figures 45 a&b). In recent years, fishing mortality rates have been close to the current target SPR of 50% but the biomass is below target levels. The model estimated proxy MSY based on an $F_{50\%}$ SPR is 275 metric tons. This value as associated with an exploitation rate (catch over summary biomass) of 0.06, and an equilibrium spawning output of 831 millions of larvae, which corresponds to 40.0% of the unfished larval production.

Although the length data are aggregated by sex and there are no clear modes visible in evaluating the length compositions with the eye, the model fit improved significantly with recruitment deviations estimated freely (1960-2006). Figures 46 (a-b) show estimated annual recruitment values over the time period with 95% asymptotic confidence limits, as well as the estimated recruitment deviation values and deviation variance checks (Figures 47 a&b). Importantly, the variance on most of the recruitment deviation estimates is large, consistent with the general observation that strong year classes are not obvious in the data. This suggests that although there are signs of highly variable recruitment in the data, the actual years of strong recruitment are likely to be poorly specified.

Fits to each of the relative abundance indices (in both arithmetic and log scale) as well as scatterplots of observed versus predicted indices are shown as Figures 48-51. Some serial autocorrelation is suggested in the residuals to the fits to the two recreational CPUE time series, although the fits capture the general trends reasonably well and are comparable to the type of fit often achieved to relatively noisy recreational CPUE time series. The fits to the pre-recruit survey should be interpreted with caution as there is essentially no available data to conflict with the survey predictions of year class strength. As this dataset is of short duration and the previous (core area, longer time series) failed to capture the magnitude of the 1999 year class, the results should be treated with caution. This is particularly true as the model predicts the 2001-2006 recruitments to be considerably lower than previous years; the explanation for this is unclear. However, the overall effect of including the juvenile abundance dataset is negligible with respect to estimates of reference points and biomass trend through the present period.

The estimated selectivity (length-based, sex-specific) curves for each fishery and survey are shown as Figures 52-53, and fits to catch at length data by fleet and Pearson residual plots are shown as Figures 54-59. Fits to the catch-at-length data for the recreational fishery (fleet 1), the hook and line fishery (fleet 2) and the recreational observer program (fleet 4, treated as a survey) are generally quite reasonable, although as noted previously there is little obvious suggestion of the strong year classes that are estimated in the recruitments. The setnet fishery (fleet 3) had extremely sparse data, and the length data that are included were included solely for the purpose of fitting the selectivity curve.

The fits to the conditional age at length data are shown as Figures 60-64, with the residuals shown as Figures 65-67 and the assumed and effective sample sizes of the (tuned) conditional data shown as Figures 68 (a-b). Freeing the growth parameters improved the fit to the age and length data significantly relative to the externally estimated values (approximately 120 likelihood units), primarily through the effect of reducing the K growth coefficient in order to slow the growth and better fit to the age-at-length information. However, the relative contribution to informing strong or weak cohorts was modest, as illustrated by the marginal fits to age composition data (representing the conditional age-at-length data in a more traditional format by using a “ghost” fishery and mirrored selectivity to fleet 1, the recreational fishery). This is consistent with the observation that strong cohorts are not readily apparent in either the age composition or the length composition data. This could be due to low recruitment variability, a high degree of ageing error, small sample sizes, or the combination of all of these factors. Fits to catch at age data for the early 1980s recreational data improved considerably with the changes made during the Mop-Up STAR panel (Figures 69 a-b).

Sensitivity Analysis

<u>Prior to the Mop-Up STAR panel</u> (no conditional age at length, rec devs estimated from 1980-2006 and M=0.1 for both males and females), a sensitivity test was performed turning off the recruit devs, and the result was a considerably poorer fit to all of the sources of data (indices, catch at length, and interestingly even catch at age from the period prior to which rec devs were estimated). The model result without the rec devs freely estimated was considerably more pessimistic, and suggested that the stock is below the overfished threshold. Interestingly, exclusion of the age data gave a similar (although not as extreme) result, with a more pessimistic assessment of stock status. By contrast, when both of the CPUE time series and their associated length data were removed, the results were considerably more optimistic.

Also, likelihood profiles were developed for both steepness and natural mortality, and were shown graphically as relative likelihoods for the total fit as well as the separate components (indices, length composition data, age composition data). The overall likelihood was minimized at a relatively low steepness value (~0.3), which was strongly influenced by the age and length composition information; the relative abundance indices favored a higher value (~0.5) but were less influential in the model fit. Similarly, a considerably lower natural mortality rate provided an improved fit to the age composition information, a moderately lower natural mortality rate improved the fit to the length composition information, and the fits to the indices were consistent with the base model estimate of 0.1. The model results were considerably more sensitive to changes in the estimate of natural mortality, with the model suggesting that the current biomass was well above the unfished equilibrium biomass level when a higher natural mortality rate was assumed, and suggesting considerably greater depletion when a lower rate was assumed.

During the Mop-Up STAR panel, numerous sensitivities were performed to refine the specifications of the base model. Starting year for estimating recruit devs was evaluated in 5 year increments from 1940 to 1980. Through evaluation and since our age data represented the 1980s time period, the starting year was determined to be 1960.

A sensitivity was also conducted to determine σ_R . Initially, σ_R was set at 1.0 but was believed to be too high and allowed for too much variability in recruitment. Values ranging from 0.5 (likelihood 1468) to 0.1 (likelihood 1719) were evaluated and the panel recommended setting the base model value $\sigma_R = 0.5$.

A sensitivity early on with low catches (half of BASE) and high catches (double BASE) showed little sensitivity in terminal depletion levels.

Given the evidence of a potential change in growth in blue rockfish over time, we explored a time-varying growth model. The 1980s recreational CPFV data and the sparse 2003-2006 Groundfish Ecology survey data were used to try and estimate two growth curves for differing time periods. Setting up time blocks (1916-1985, 1986-2006) for growth and selectivity resulted in model instability with the limited amount of age data in the last 20 years.

When the CVs of length at age were internally estimated, the female CVs ranged from 0.07-0.09 and the male CVs ranged from 0.07-0.16. We then let the model estimate CVs for the young and old. Based on the internal estimates just stated and the external estimates (Figure 70) provided (EJ Dick, SWFSC) it was recommended that the CVs for the young males and females be fixed at 0.085. The CV for the old females was fixed at 0.095 and the CV for the old males was fixed at 0.11.

Much effort was put into trying to determine an appropriate estimate for natural mortality (M). The lack of old males in the fishery data could be due to either selectivity or a higher natural mortality for males. The male selectivity dog leg was estimated to be much lower than females and also dome-shaped. We attempted to explore this formulation, fixing the slope and keeping the shape the same while allowing the level to vary to see if a simple offset to the female selectivity pattern would fit the data just as well. We found that this could not be accomplished in SS2 and was not explored further.

Initially, male and female natural mortality were assumed to be 0.1, based on maximum age and Hoenig (1983). Throughout numerous sensitivities, improvements in fit with a male M offset were large enough to justify differing M's between males and females. Examples of some of these sensitivities are as follows: estimating male M (0.115), fixing M based on Tenera (2000) estimate of 0.14, assuming a ramp for male M between ages 10 and 20 - estimating young (0.1) and old (0.134) M and then fixing those values. The results of the ramp in male M were ambiguous, but when comparing the likelihood values associated with the initial fixed value of 0.1 (1355), a fixed value of 0.14 (1375) and the model estimated value of 0.115 (1341), the decision was made to fix male M = 0.12, leaving female M = 0.10.

Forecasts

Future catch projections through 2016 were made based on an $F_{50\%}$ fishing rate with 40:10 adjustment. The sum of the average catches from each fishery for the years 2005 and 2006 (263 mtons) were applied to the beginning projection years of 2007 and 2008. The forecasts from the base model predict a slight increase in abundance but not enough to support increase harvesting of blue rockfish in the future. However, the state of nature corresponding to higher natural mortality (M females = 0.13, M males = 0.15) remains above 40% and allows about 370 mtons to be taken in 2009.

Decision Table

The base model assumes natural mortality (M) for females to be 0.10 and 0.12 for males. To try and bracket the uncertainty in this assessment, the STAR panel suggested the state of nature to be based on high and low estimates of M with high and low catch streams. The initial request to offset M from the base model was +-0.02 which gave equal likelihoods (1338) for the base and the higher M scenarios, with the likelihood of the low M scenario being 9 points higher (1347). Considering this did not provide enough contrast to capture the uncertainty, the STAR panel then suggested a +-0.03 offset for further investigation which was completed after the review. The results of this request proved the likelihood of low M values were even less likely (1361) than the previous offset, and the base and high M scenarios were still nearly the same (Table 23). The likelihood values for the base model and low and high M scenarios can be seen in Table 24. Even though the STAR panel did not assign probabilities to the states of nature, the STAT feels strongly that the base and high M scenarios are most likely. Decision tables of 10-year projections (under the 40:10 and 60:20 adjustments) for alternate states of nature and management options can be seen in Tables 25 and 26.

MANAGEMENT RECOMMENDATIONS

Blue rockfish are going to be a challenge for management considering the STAT's lack in confidence of the results of this assessment. Even though efforts were made to try and accommodate the changes in growth over time and space, sufficient data were not available to accomplish this. Not including the blue rockfish population in Oregon or southern California add additional challenges for management. Lastly, the unknowns related to whether blue rockfish is two species causes concern not knowing the overlap of their spatial distributions or the degree of intermixing.

The STAT advices that this assessment for management purposes should be used with caution. Because of the numerous violations of model assumptions, the STAT does not consider the management quantities estimated in this assessment to be sufficiently reliable for quantitative fisheries management. Given the numerous levels of uncertainty, and the lack of information to assess blue rockfish appropriately throughout their range, this may be better used as a tool for guidance in monitoring blue rockfish until a more reliable assessment becomes available.

RESEARCH NEEDS

- As with many rockfish, reconstruction of the historical landings is difficult and very time consuming. A standard method should be applied, and historical documentation should be provided to highlight major fishery events to allow more certainty in these estimates.
- Continued genetic studies to confirm that blue rockfish is two species. Some major research that is needed related to this topic include: aging to determine differences in growth and longevity, fecundity, maturation schedules and their spatial distributions.
- More biological sampling, especially age composition information, of the recreational and commercial fisheries to be able to determine changes in life history parameters over time and space.
- Research to help understand the lack of males in the catches. Is this a selectivity issue or a substantial difference in natural mortality between males and females?
- Development of a fishery independent survey to capture changes in stock abundance. Many assessments have used a recreational CPFV CPUE index to determine this, which is not as reliable considering management changes (i.e. bag limits, closures) that continue to occur.
- Sex-specific length and age information from the recreational fishery. Attempts have been made to gather sex-specific information from sampling the commercial fishery, and even though samples are small, it is informative.
- Environmental factors that affect survival of juvenile blue rockfish needs to be explored further. The lack of kelp habitat caused by increasing ocean temperatures (warmer waters) in Southern California since the 1990s led the STAT to believe that the disappearance of blue rockfish in this area was not due to fishing.

ACKNOWLEDGEMENTS

We would like to thank Don Pearson for determining fish ages from blue rockfish otoliths and for being overall supportive in providing help when needed. Wade VanBuskirk was very helpful in providing recreational fishery data on the spot. Dean Wendt for providing CalPOLY data for CPFV comparison purposes. Steve Ralston for providing the pre-recruitment indices from the mid-water trawl surveys. Rick Methot, who was actively developing the SS2_v2 program during this assessment. Mike Donnellan for his kelp knowledge and guidance in locating data. Fishermen who attended the Data Workshop (Brian Cutting, Ken Stagnaro, Josh Churchman, Bruce Miller, Tom Mattusch, William Smith, Jim Martin) and provided additional information (David Allan, Kenyon Hensel, Gerry Richter, Jim Webb). Tom Laidig for providing his data and wisdom of blue rockfish. EJ Dick and Jason Cope for all their help and guidance on growth parameterization. Jim Hastie, Ian Stewart and Owen Hamel at NWFSC for allowing time to review the base model. Last but not least, all CDFG staff that provided their support during this assessment.

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TABLES and FIGURES

Table 1. California regulations that applied to blue rockfish from 1990-2006.

Commercial	Year	Recreational
Limits on set line length established; Gill nets not allowed within 30 fm	**1990**	Bag limit for rockfish, 15 fish in combination; No gear restrictions
Sebastes complex split coastwide into limited entry (LE) and open access (OA); LE trip limits = 80,000 pounds per month; OA trip limits = 40,000 pounds per month; Gill nets not allowed within 3 miles of shore	**1994**	
Additional limitations for set lines established; No set line fishing on weekends north of Santa Cruz; Fishing restricted in Districts 12 & 13	**1995**	
OA trip limits (north of 40º 10' N. lat) = 3,500 pounds per month for black & blue rockfish combined; OA trip limits (south of 40º 10' N. lat) for *Sebastes* complex: Jan.–Sept. 2,000 pounds per month; Oct.-Dec. 500 pounds per month	**1999**	
	2000 *Sebastes* complex split into nearshore, shelf, and slope; Seasonal 2-month closures first adopted for some areas	Bag limit for rockfish reduced to 10 fish, in combination; Gear limited to one line with three hooks
	2001 Cowcod Conservation Area (CCA) established; In addition to seasonal closures, depth restrictions also adopted	G Gear limited to one line with two hooks
Commercial nearshore rockfish fishery closed early	**2002** Nearshore Fishery Management Plan adopted	
Formal restricted access program adopted; Deeper Nearshore Permit (DNS) required statewide; DNS holders = 278; Trawl and non-trawl gear Rockfish Conservation Areas (RCAs) established; Commercial nearshore rockfish fishery closed early	**2003** Groundfish fishing restricted by region, season, and depth; Minor Nearshore rockfish north of 40º 10' N. lat. split into black & blue rockfish, and other nearshore rockfish; Minor Nearshore rockfish south of 40º 10' N. lat. split into shallow, deeper, and California scorpionfish; Minor Nearshore rockfish OY south revised using updated commercial & recreational estimates	Recreational nearshore rockfish fishery closed Jan. – June south of 40º 10' N. lat.; Recreational nearshore rockfish fishery closed early
	2004-2006 Groundfish fishing continued to be restricted by region, season, and depth; Black rockfish removed from Minor Rockfish (north and south of 40º 10' N. lat.) in 2004 and blue rockfish north of 40º 10' N. lat. lumped with other nearshore rockfish	In 2004, recreational RCAs such as the California Rockfish Conservation Area established

Table 2. Changes in commercial regulations, 1950-2006, and related changes in gear use.

1950	
1953	Legislation prohibits trawling off coast of Santa Barbara County within 3-nautical-mile limit; entire California coast now closed to trawling within the 3-nautical-mile limit
1960	
1963	Foreign factory trawlers fishing off the West Coast; primarily targeting deeper-water rockfish
1970	Take from foreign trawlers targeting Pacific whiting, shelf rockfish (widow, bocaccio, chilipeppers) includes blue rockfish bycatch; local trawlers and California trawlers targeting widow rockfish also catch blue rockfish
1976	Magnuson Act passed; gives U.S. jurisdiction over fisheries within 200 miles of the coast
1980	With waning of trawl fisheries, commercial hook-and-line and gill net fisheries expanded
1989	Live fin-fish fishery, which initially started in the Los Angeles and San Francisco Bay areas, begins to expand to other parts of the state
1990	California Propostion 132, prohibiting gill nets within state waters, passed by voters
1991	Buyout of set gill-net vessels
1994	Gill nets prohibited within 3 miles of mainland coast, and waters less than 70 fathoms or within one nautical mile of the Channel Islands, whichever is less
2000	Seasonal 2-month closures first adopted for some areas along California coast
2001	In addition to seasonal closures, depth restrictions also adopted
2002	Nearshore Fishery Management Plan adopted
2003	Groundfish fishing restricted by region, season, and depth; formal restricted access program for nearshore rockfish adopted; Deeper Nearshore Permit required statewide
2006	

Table 3. Commercial and recreational estimated harvest (mtons) for blue rockfish, north of Point Conception, 1916-2006 used in this assessment.

	Commercial by gear			Recreational by mode				
Year	Hook & Line	Gillnet	Sub Total	Shore-based	CPFVs	Private and rental boats	Sub Total	TOTAL REMOVALS
1916	0.4	0.0	0.4				0.0	0.4
1917	1.3	0.0	1.3				1.6	2.9
1918	2.1	0.0	2.1				3.2	5.3
1919	1.8	0.0	1.8				4.8	6.6
1920	2.4	0.0	2.4				6.4	8.7
1921	2.4	0.0	2.4				8.0	10.4
1922	2.6	0.0	2.6				9.5	12.1
1923	3.5	0.0	3.5				11.1	14.6
1924	3.6	0.0	3.6				12.7	16.3
1925	4.6	0.0	4.6				14.3	19.0
1926	6.1	0.0	6.1				15.9	22.0
1927	5.9	0.0	5.9				17.5	23.4
1928	7.6	0.0	7.6				19.1	26.6
1929	7.2	0.0	7.2				20.7	27.8
1930	10.4	0.0	10.4				22.3	32.7
1931	10.1	0.0	10.1				23.9	34.0
1932	9.1	0.0	9.1				25.4	34.5
1933	8.6	0.0	8.6				27.0	35.7
1934	9.0	0.0	9.0				28.6	37.6
1935	11.8	0.0	11.8				30.2	42.0
1936	14.5	0.0	14.5				31.8	46.3
1937	12.8	0.0	12.8				37.8	50.6
1938	11.4	0.0	11.4				37.2	48.6
1939	9.7	0.0	9.7				32.6	42.3
1940	12.3	0.0	12.3				46.9	59.2
1941	11.6	0.0	11.6				0.0	11.6
1942	5.1	0.0	5.1				0.0	5.1
1943	6.6	0.0	6.6				0.0	6.6
1944	15.6	0.0	15.6				0.0	15.6
1945	49.1	0.0	49.1				0.0	49.1
1946	39.9	0.0	39.9				16.0	55.9
1947	35.8	0.0	35.8				32.0	67.8
1948	18.9	0.0	18.9				64.0	82.9
1949	14.6	0.0	14.6				82.9	97.5
1950	21.1	0.0	21.1				101.1	122.2
1951	21.9	0.0	21.9				115.5	137.4
1952	16.0	0.0	16.0				100.5	116.5
1953	15.7	0.0	15.7				85.5	101.2
1954	5.9	0.0	5.9				106.3	112.2
1955	5.4	0.0	5.4				126.8	132.2
1956	8.0	0.0	8.0				141.6	149.6
1957	10.3	0.0	10.3				138.1	148.4
1958	19.7	0.0	19.7				226.7	246.4
1959	16.9	0.0	16.9				188.2	205.1

Table 3 (continued). Commercial and recreational estimated harvest (mtons) for blue rockfish, north of Point Conception, 1916-2006 used in this assessment.

	Commercial by gear			Recreational by mode				
Year	Hook & Line	Gillnet	Sub Total	Shore-based	CPFVs	Private and rental boats	Sub Total	TOTAL REMOVALS
1960	7.5	0.0	7.5				146.7	154.2
1961	12.2	0.0	12.2				110.9	123.1
1962	7.5	0.0	7.5				127	134.5
1963	5.0	0.0	5.0				130.7	135.7
1964	6.2	0.0	6.2				99.5	105.7
1965	7.3	0.0	7.3				154.7	162.0
1966	8.1	0.0	8.1				167	175.1
1967	7.7	0.0	7.7				164	171.7
1968	7.1	0.0	7.1				296.8	303.9
1969	8.5	3.5	12.0				279.3	291.3
1970	10.5	4.5	15.0				376	391.0
1971	7.8	26.0	33.8				313.8	347.6
1972	12.2	32.2	44.5				431.2	475.7
1973	19.3	74.7	94.0				632.6	726.6
1974	15.6	106.5	122.1				716.8	838.9
1975	16.0	119.2	135.2				695.6	830.8
1976	22.2	39.1	61.3				637.4	698.7
1977	18.2	52.2	70.4				569.9	640.3
1978	4.6	16.8	21.4				523.7	545.1
1979	34.9	13.3	48.3				658	706.3
1980	49.6	2.3	51.8	6.4	371.9	108.7	487.0	538.8
1981	37.9	1.2	39.2	8.2	554.6	263.7	826.5	865.7
1982	60.6	0.5	61.1	6.1	457.9	243.7	707.7	768.8
1983	55.2	0.8	56.1	13.0	435.2	213.0	661.2	717.3
1984	11.3	1.3	12.6	6.2	264.2	198.8	469.2	481.8
1985	36.5	134.5	170.9	5.7	140.4	115.5	261.7	432.6
1986	2.8	12.8	15.7	7.8	32.9	84.0	124.7	140.4
1987	7.8	0.4	8.2	4.7	49.6	204.6	258.9	267.2
1988	7.7	0.1	7.8	15.5	109.4	182.1	307.1	314.9
1989	17.2	14.1	31.2	11.9	80.7	152.3	245.0	276.2
1990	26.8	1.5	28.4	10.8	106.8	106.8	224.4	252.8
1991	35.4	1.4	36.8	10.8	88.1	88.1	186.9	223.8
1992	181.4	0.0	181.5	10.8	241.4	241.4	493.6	675.1
1993	134.3	0.3	134.6	9.6	182.4	182.4	374.4	509.1
1994	68.8	0.0	68.8	3.1	141.0	161.7	305.8	374.7
1995	28.5	0.0	28.5	11.4	113.6	91.3	216.3	244.8
1996	44.0	0.1	44.1	1.4	89.8	72.9	164.0	208.1
1997	63.7	0.0	63.7	1.4	215.9	78.7	296.1	359.7
1998	47.7	0.0	47.7	1.9	116.8	130.6	249.4	297.1
1999	35.7	0.1	35.7	1.2	106.2	91.2	198.6	234.4
2000	15.6	0.0	15.6	3.7	100.0	47.1	150.7	166.3
2001	19.7	0.0	19.7	4.3	74.6	36.6	115.6	135.3
2002	18.5	0.0	18.5	2.5	68.8	77.5	148.8	167.4
2003	9.2	0.0	9.2	0.4	47.6	171.9	219.9	229.1
2004	14.8	0.0	14.8	7.8	98.2	43.8	149.9	164.6
2005	21.7	0.0	21.7	1.0	73.8	88.1	162.9	184.6
2006	21.9	0.0	21.9	8.2	179.5	131.9	319.6	341.4
Total	3,616.1	659.4	4,275.5	166.1	4,541.4	3,608.6	17,519.1	21,773.0

Table 4. Summary of data sources and assumptions made for reconstructing the base model catch history. Estimates of blue rockfish (pre-RecFIN and CALCOM) are based on proportions of total rockfish being landed. In the recreational fishery, blue rockfish were reported at 30% of total rockfish in the CPFV fishery, and the CPFV fishery accounted for 70% of total rockfish from Oregon to Point Arguello (FB#130). Estimates were based on an average 1 pound fish. In the commercial fishery, blue rockfish were reported at 1% of the observed total rockfish landings in the Monterey area (FB#44), which was assumed for all port areas. There were no reported blue rockfish landings in trawl gears, so trawl landings were removed from total rockfish landings prior to calculating blue rockfish proportions.

<table>
<tr><th></th><th>Recreational</th><th colspan="2">Commercial</th></tr>
<tr><th>Year</th><th>Estimate source</th><th>Estimate source</th><th>Trawl removals</th></tr>
<tr><td>1916–1933</td><td rowspan="2">linear ramp</td><td rowspan="6">PFEL - an avg (1949-1951) proportion (0.31) of Santa Barbara County removed.</td><td>ramp</td></tr>
<tr><td>1934–1935</td><td rowspan="6">trawl logs</td></tr>
<tr><td>1936–1940</td><td>FBs#121,130 & 145 - proportion north of conception (0.72), blues (0.3), modes (0.7), discards (0.068)</td></tr>
<tr><td>1941–1945</td><td>WWII - no estimates</td></tr>
<tr><td>1946</td><td>STAR recommended catch</td></tr>
<tr><td>1947–1948</td><td rowspan="4">FB#145, along with 1936-1940 FB info on blues, modes, discards</td></tr>
<tr><td>1949–1956</td><td rowspan="4">PFEL and a proportion of Santa Barbara area removed. In years where information was not available, the average proportion (0.22) was used. FBs#117, 121, 125, 129, 149</td></tr>
<tr><td>1957–1963</td><td>Heimann and Miller (1960) and Nitsos (1965)</td></tr>
<tr><td>1964–1967</td><td rowspan="2">removed avg (0.91) from total rf landings</td></tr>
<tr><td>1968</td><td rowspan="2">FBs#121,130 & 145 - proportion north of conception (0.46 avg 1965-67 and 0.58 overall avg 1937-67), blues (0.3), modes (0.7), discards (0.068)</td></tr>
<tr><td>1969–1979</td><td>CALCOM</td><td>CALCOM</td></tr>
</table>

<table>
<tr><th></th><th>Recreational</th><th colspan="2">Commercial</th></tr>
<tr><th>Year</th><th>Estimate source</th><th>Estimate source</th><th>Trawl removals</th></tr>
<tr><td>1980–1989</td><td>RecFIN</td><td rowspan="3">CALCOM
Discards (18%) were included in the 2000s based on NMFS onboard observer bycatch program</td><td rowspan="3">CALCOM</td></tr>
<tr><td>1990–1995</td><td>RecFIN - CDFG CPFV estimates and 50/50 private to CPFV ratios</td></tr>
<tr><td>1996–2006</td><td>RecFIN</td></tr>
</table>

Table 5. Reported pounds from trawl logs for total rockfish and other species, north of Point Conception (1934-1956).

	Total rockfish (n.CA)	additional species listed (n.CA)											
		boc	***chili***	***blacks***	***bolina***	***yellowtail***	***greenspot***	***red***	***pelican***	***striped***	***b&y***	***China***	**TOTAL**
1934	529,908	56,617	13,354										599,879
1935	529,691	31,337	9,385										570,413
1936	439,765	50,808	58,606										549,179
1937	523,219	73,797	67,529	300									664,845
1938	489,171	37,746	109,386	380									636,683
1939	558,299	22,840	38,451	9,371									628,961
1940	461,367	15,533	10,505	100									487,505
1941	353,068	10,275	9,602	1,650									374,595
1942	65,210	1,276	1,437	20,460		90		35,641					124,114
1943	323,546	2,510	6,640	13,588				821,699					1,167,983
1944	1,604,421	1,849	8,482	6,586				2,095,688					3,717,026
1945	3,826,680	2,014	61,059	5,789				1,215,994					5,111,536
1946	3,107,122	165	15,438	194,683				617,009					3,934,417
1947	270,990	57,254	31,196	423,877	690		566	1,009,190					1,793,763
1948	2,033,458	21,097	103,143	38,582	447	143		488,842					2,685,712
1949	936,599	901,903	25,679	105,718	30			692,214					2,662,143
1950	650,238	1,711,462	40,097	753,028	575	338		898,894	20				4,054,652
1951	3,012,329	2,703,339	393,643	287,421	2,852	265	35	668,722					7,068,606
1952	3,022,882	3,483,923	611,056	77,577	8,226			535,922		70			7,739,656
1953	2,718,909	5,104,633	688,697	278,348	8,328	4,685		734,962		75	1,985		9,540,622
1954	2,031,802	4,633,654	920,270	524,123	668			799,126		90		485	8,910,218
1955	1,070,034	3,031,919	570,945	351,389	1,185	476		1,487,839					6,513,787
1956	1,998,858	4,166,895	857,772	82,328	2,878		125	1,715,478					8,824,334

Table 6. Proportion of blue rockfish (BLUR) and other species (at least 0.1%) in the blue and black rockfish market categories (CALCOM sampling).

Blue rockfish market category (665)		Black rockfish market category (252)	
BLUR	**88.0%**	BLCK	85.6%
BLCK	5.5%	**BLUR**	**10.4%**
YTRK	2.2%	YTRK	2.1%
BANK	1.0%	CHNA	0.4%
OLVE	0.6%	WDOW	0.4%
BRWN	0.5%	KLPG	0.2%
BCAC	0.4%	BRWN	0.1%
KLPG	0.3%	BLGL	0.1%
CBZN	0.3%	YMTH	0.1%
GPHR	0.3%	GPHR	0.1%
WDOW	0.3%	QLBK	0.1%
COPP	0.2%	BYEL	0.1%
BYEL	0.2%	CNRY	0.1%
CLPR	0.1%		
RSTN	0.1%		

Table 7. Sample sizes associated with RecFIN CPUE analysis. San Luis Obispo (SLO), Monterey/Santa Cruz (MONSC), San Mateo (SANMAT) and Sonoma/Mendocino (SONMEN), along with inside (1) and outside (2) 3 miles were combined for a location (LOC) variable in the delta-GLM. The majority of the sampling takes place in MONSC/SLO areas.

YEAR	SLO1	SLO2	MONSC1	MONSC2	SANMAT1	SANMAT2	SONMEN1	SONMEN2	Total
1980	9	4	20			1	5	2	41
1981		6	5		1	3	4		19
1982	4	1	4			1	8		18
1983	3		13	2		1	8		27
1984	12	1	7	1		1	4	2	28
1985	4	6	6		3	7	6	3	35
1986	7	4	5	1	1	1	7	1	27
1987	9		3		3	5		5	25
1988	4	2	5	2	2	2	1	2	20
1989	10	1				3	2		16
1993	42	12							54
1994	61								61
1995	5		9	2		2	4		22
1996	20	2	5	17	2	14	4	1	65
1999	19	2	16	2	9	12	6	3	69
2000	4				3	7		1	15
2001	7		5	4	18	5	2		41
2002	16		14		4		1		35
2003	20		23		4		8		55
2004	28	1	35		7	1	15		87
2005	23		16		3	1	10		53
2006	22		34		18		6		80
Total	329	42	225	31	78	67	101	20	893

Table 8. Analysis of deviance in delta-gamma GLM analysis of RecFIN CPUE.

	Positive portion (gamma)				Binomial portion		
	SS	Df	F	Pr(>F)	Chisq	Df	Pr(>Chisq)
YEAR	110.8	21	5.00	3.71E-12	53.6	21	0.0001113
WAVE	6.0	5	1.14	0.3361	22.4	5	0.00043
LOC	36.1	7	4.88	2.11E-05	26.4	7	0.0004292
Residuals	778.0	737					

Table 9. Bayes Information Criterion (BIC) values for interation models (gamma portion) of RecFIN CPUE. Tabulated value is BIC (interaction model) - BIC (main effects model).

diff	WAVE	LOC
YEAR	354.2	298.7
WAVE		147.1

Table 10. Values of delta-gamma YEAR effects, and estimated precision (CV = Std. Error / Index) from RecFIN CPUE.

YEAR	Index	Std. Error	CV
1980	0.37	0.09	0.25
1981	0.51	0.15	0.29
1982	0.62	0.19	0.30
1983	0.38	0.10	0.27
1984	0.35	0.09	0.26
1985	0.34	0.09	0.28
1986	0.06	0.02	0.26
1987	0.09	0.03	0.37
1988	0.14	0.05	0.35
1989	0.08	0.03	0.33
1993	0.22	0.05	0.24
1994	0.16	0.04	0.25
1995	0.35	0.16	0.46
1996	0.25	0.05	0.19
1999	0.25	0.04	0.17
2000	0.09	0.03	0.29
2001	0.07	0.02	0.32
2002	0.32	0.06	0.20
2003	0.19	0.04	0.19
2004	0.32	0.05	0.17
2005	0.30	0.05	0.18
2006	0.41	0.06	0.15

Table 11. Samples sizes (number of stops) included in the CDFG CPFV CPUE index. Total number of trips = 1633.

	Fort Bragg	Salt Point	Bodega Bay / Farralon Isl	Half Moon Bay / Santa Cruz	Monterey	San Simeon / Morro Bay	TOTALS
1987			0	4	93		97
1988	2	5	32	38	107	50	234
1989	5	6	44	54	72	78	259
1990			14	24	8	38	84
1991	9		3	13	12	45	82
1992	22	2	14	45	59	97	239
1993	11	7	16	50	120	95	299
1994	5	13	22	54	105	96	295
1995	7	5	50	47	114	117	340
1996	6	22	34	36	101	148	347
1997		28	35	28	68	114	273
1998		10	20	31	72	67	200
TOTALS	67	98	284	424	931	945	2749

Table 12. Analysis of deviance in delta-gamma GLM analysis of CDFG CPFV onboard survey CPUE.

	Positive portion (lognormal)				Binomial portion		
	SS	DF	F	Pr(>F)	Chisq	DF	Pr(<Chisq)
YEAR	362.1	11	23.4	2.20E-16	30.5	11	0.001324
AREA	316.3	5	45.0	2.20E-16	53.4	5	2.84E-10
DEPTH	270.4	4	48.1	2.20E-16	194.6	4	2.20E-16
Residuals	2979.9	2120					

Table 13. Bayes Information Criterion (BIC) values for interation models (lognormal portion) from CPFG CPUE. Tabulated value is BIC (interaction model) - BIC (main effects model).

diff	AREA	DEPTH
YEAR	220.8	275.2
AREA		82.7

Table 14. Values of delta-lognormal YEAR effects, and estimated precision (CV = Std.Error / Index) from the CDFG CPFV CPUE.

	index	Standard Error	CV
1987	1.08	0.22	0.20
1988	0.89	0.12	0.13
1989	1.01	0.10	0.10
1990	0.88	0.13	0.14
1991	1.14	0.16	0.14
1992	2.25	0.19	0.08
1993	1.90	0.17	0.09
1994	1.33	0.12	0.09
1995	1.42	0.13	0.09
1996	1.37	0.12	0.09
1997	3.15	0.30	0.09
1998	3.76	0.35	0.09

Table 15. Number of trips and ages for recreational age compositions used in this assessment. Males represent only 30% of the total ages by sex.

	all sexes ages	all sexes trips	males & females ages	males & females trips
1980	388	99	340	97
1981	430	91	364	86
1982	488	81	403	77
1983	339	32	260	30
1984	553	66	474	64
totals	2198	369	1841	354

Table 16. Actual number of aged fish by year and area from the CPFV fishery.

AREA	1980	1981	1982	1983	1984	TOTAL
Ft. Bragg - Bodega Bay	43	61	6		148	258
SF Bay - Salt Point	122		5			127
Half Moon Bay - Princeton	190	190	329	160	191	1060
Monterey		138	148	156	141	583
San Simeon - Morro Bay	33	41		23	73	170

Table 17. Precision of first and second reads (among reader, not between readers) of the age data used in the assessment.

	AGE2																							
AGE1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	total
3	1																							1
4		7	3																					10
5			15	1																				16
6			3	9																				12
7					5	1																		6
8					2	1																		3
9						2	3	1																6
10								1	2															3
11							1	1	2															4
12								1		3														4
13											2		1											3
14												1		1										2
15												1	2	1		1								5
16													1	1										2
17														2				1						3
18															1	1								2
19														1			2		1					4
20																1	1	2						4
21																	1							1
22																1			3	1				5
23																	1				1	1		3
24																								
25																			1				1	2
total	1	7	21	10	7	4	4	4	4	3	2	2	4	6	1	4	5	3	5	1	1	1	1	101

Table 18. Sample sizes and number of lengths associated with the RecFIN length compositions used in this assessment. The 1980s and 1997, 1998 were not used because they were based on weight to length conversions.

YEAR	total lengths	total trips
1993	3197	358
1994	1425	201
1995	1110	157
1996	2951	299
1999	4097	284
2000	1029	140
2001	799	91
2002	2818	198
2003	4219	285
2004	8952	692
2005	988	128
2006	775	93
totals	32,360	2926

Table 19. Number of trips and blue rockfish lengths by area associated with the CDFG CPFV onboard survey (1987-1998).

	Cresent City		Eureka		Fort Bragg		Bodega Bay		SanFran		Monterey		Morro Bay		TOTALS	
YEAR	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths
1987											42	908			42	908
1988					3	80	7	226	39	1,064	47	1,336	35	583	131	3,289
1989			1	36	3	31	10	362	49	1,213	39	823	52	937	154	3,402
1990					1	4			21	479	6	76	23	273	51	832
1991					10	160	1	17	10	228	10	187	28	932	59	1,524
1992					22	568	9	337	29	986	36	763	67	1,800	163	4,454
1993	1	6	5	45	12	299	10	239	29	845	46	1,863	65	1,472	168	4,769
1994			1	10	8	275	8	256	36	713	53	1,675	74	1,409	180	4,338
1995					7	158	6	209	59	2,160	53	1,728	65	1,891	190	6,146
1996					5	97	14	686	43	1,532	47	1,865	57	1,541	166	5,721
1997							45	2,349	44	2,037	43	2,687	73	3,612	205	10,685
1998							24	1,332	35	1,639	39	2,063	41	2,196	139	7,230
TOTAL	1	6	7	91	71	1,672	134	6,013	394	12,896	461	15,974	580	16,646	1,648	53,298

Table 20. Sample sizes (trips) and actual lengths taken for the commercial hook and line and setnet fisheries used in this assessment. Commercial setnet samples were used only to determine selectivity for the fishery. Seen here, females (79%) are selected more often than males (21%).

	Commercial hook and line								Commercial Setnet							
	MALES		FEMALES		UNKNOWN		COMBINED		MALES		FEMALES		UNKNOWN		COMBINED	
	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips	lengths	trips
1978									6	4	79	4			85	4
1979					33	4	33	4					10	1	10	1
1980			2	1			2	1								
1981					7	1	7	1								
1982	5	2	11	3			16	3								
1983	1	1	7	2	1	1	9	3			1	1			1	1
1984	1	1	2	1			3	1								
1985	1	1	3	1			4	1			32	3			32	3
1986			4	1			4	1								
1987																
1988																
1989											16	1			16	1
1990			3	1	9	2	12	3								
1991			34	5	54	1	88	5			1	1			1	1
1992	38	5	65	7	1205	94	1308	102								
1993	19	2	36	2	3640	210	3695	212								
1994					1825	154	1825	154								
1995					604	92	604	92								
1996					1079	105	1079	105								
1997	11	2	60	4	836	63	907	67								
1998			32	3	447	27	479	30								
1999					1040	96	1040	96								
2000					111	25	111	25					14	1	14	1
2001					131	28	131	28								
2002					253	15	253	15								
2003					41	5	41	5								
2004					108	12	108	12								
2005	1	1	31	1	141	16	173	17								
2006					140	12	140	12								
totals	77	15	290	32	11705	963	12072	995	6	4	129	10	24	2	159	12

Table 21. Estimated parameter values from the base model.

param	value	std	param	value	std
R0	3219.90	139.02	1979 rec	-1.43	0.31
Rec inflect	27.11	0.35	1980 rec	-1.09	0.35
Rec width	7.38	0.28	1981 rec	-0.37	0.44
Hook inflect	32.70	0.41	1982 rec	0.65	0.26
Hook width	6.87	0.23	1983 rec	-0.37	0.44
Net inflect	37.91	1.68	1984 rec	-0.40	0.43
Net width	3.47	1.73	1985 rec	0.53	0.49
Obs. inflect	24.47	0.19	1986 rec	0.84	0.45
Obs. width	4.98	0.17	1987 rec	-0.08	0.50
1960 rec	0.40	0.64	1988 rec	0.03	0.50
1961 rec	0.57	0.78	1989 rec	0.58	0.67
1962 rec	0.55	0.82	1990 rec	0.89	0.76
1963 rec	0.58	0.90	1991 rec	0.82	0.84
1964 rec	0.73	0.87	1992 rec	0.80	0.69
1965 rec	0.48	0.72	1993 rec	1.71	0.26
1966 rec	0.24	0.53	1994 rec	0.24	0.57
1967 rec	-0.02	0.46	1995 rec	0.26	0.51
1968 rec	-0.16	0.42	1996 rec	0.29	0.51
1969 rec	-0.12	0.38	1997 rec	0.15	0.56
1970 rec	-0.24	0.34	1998 rec	1.76	0.25
1971 rec	-0.63	0.34	1999 rec	0.37	0.62
1972 rec	-0.62	0.30	2000 rec	-0.34	0.44
1973 rec	-0.59	0.29	2001 rec	-0.52	0.29
1974 rec	-0.32	0.23	2002 rec	0.20	0.27
1975 rec	-0.62	0.24	2003 rec	-0.19	0.29
1976 rec	-1.14	0.26	2004 rec	-0.03	0.30
1977 rec	-1.21	0.25	2005 rec	-0.59	0.31
1978 rec	-1.56	0.29	2006 rec	-1.00	0.31

Table 22. Biomass, spawning biomass, recruitment, catch, exploitation and depletion for the base model result (1916-1960).

year	Summary Biomass	Spawning Biomass	Recruitment	Catch	Exploitation	Depletion
Equil.	13223	2077	3220	0.0	0.000	100.0%
1916	13223	2077	3220	0.4	0.000	100.0%
1917	13223	2077	3220	2.9	0.000	100.0%
1918	13220	2076	3220	5.3	0.000	100.0%
1919	13216	2075	3219	6.6	0.000	99.9%
1920	13210	2074	3219	8.8	0.001	99.9%
1921	13203	2073	3219	10.4	0.001	99.8%
1922	13195	2071	3218	12.1	0.001	99.7%
1923	13185	2069	3218	14.6	0.001	99.6%
1924	13174	2066	3217	16.3	0.001	99.5%
1925	13162	2064	3216	18.9	0.001	99.4%
1926	13148	2060	3215	22.0	0.002	99.2%
1927	13132	2057	3214	23.4	0.002	99.0%
1928	13116	2053	3213	26.7	0.002	98.9%
1929	13098	2049	3212	27.9	0.002	98.7%
1930	13080	2045	3211	32.7	0.003	98.5%
1931	13058	2040	3209	34.0	0.003	98.2%
1932	13037	2035	3208	34.5	0.003	98.0%
1933	13016	2030	3207	35.6	0.003	97.8%
1934	12995	2026	3205	37.6	0.003	97.5%
1935	12974	2021	3204	42.0	0.003	97.3%
1936	12950	2015	3202	46.3	0.004	97.0%
1937	12923	2009	3200	50.6	0.004	96.7%
1938	12894	2003	3198	48.6	0.004	96.4%
1939	12868	1997	3197	42.3	0.003	96.1%
1940	12850	1992	3195	59.2	0.005	95.9%
1941	12817	1985	3193	11.6	0.001	95.6%
1942	12831	1987	3194	5.1	0.000	95.7%
1943	12849	1991	3195	6.6	0.001	95.9%
1944	12866	1994	3196	15.6	0.001	96.0%
1945	12874	1996	3196	49.1	0.004	96.1%
1946	12851	1990	3195	39.9	0.003	95.8%
1947	12838	1987	3194	67.8	0.005	95.7%
1948	12800	1978	3191	82.9	0.006	95.2%
1949	12749	1967	3188	97.5	0.008	94.7%
1950	12686	1954	3184	122.2	0.010	94.1%
1951	12604	1937	3178	137.4	0.011	93.3%
1952	12512	1917	3172	116.5	0.009	92.3%
1953	12444	1903	3167	101.2	0.008	91.6%
1954	12394	1892	3164	112.2	0.009	91.1%
1955	12337	1879	3160	132.2	0.011	90.5%
1956	12263	1864	3155	149.6	0.012	89.7%
1957	12178	1845	3148	148.4	0.012	88.9%
1958	12098	1828	3142	246.4	0.020	88.0%
1959	11931	1793	3130	205.1	0.017	86.3%
1960	11811	1767	4120	154.2	0.013	85.1%

Table 22 (continued). Biomass, spawning biomass, recruitment, catch, exploitation and depletion for the base model result (1961-2007).

year	Summary Biomass	Spawning Biomass	Recruitment	Catch	Exploitation	Depletion
1961	11797	1752	4867	123.1	0.010	84.4%
1962	11892	1744	4739	134.5	0.011	84.0%
1963	12026	1735	4908	135.7	0.011	83.5%
1964	12207	1728	5678	105.7	0.009	83.2%
1965	12498	1732	4428	162.0	0.013	83.4%
1966	12732	1733	3484	175.1	0.014	83.5%
1967	12904	1741	2694	171.7	0.013	83.8%
1968	13006	1757	2336	303.9	0.023	84.6%
1969	12910	1758	2439	291.3	0.023	84.7%
1970	12775	1765	2158	391.0	0.031	85.0%
1971	12487	1752	1466	347.6	0.028	84.4%
1972	12160	1740	1474	475.6	0.039	83.8%
1973	11652	1698	1509	726.6	0.062	81.7%
1974	10878	1600	1958	838.9	0.077	77.0%
1975	10012	1473	1420	830.8	0.083	70.9%
1976	9148	1342	826	698.7	0.076	64.6%
1977	8370	1231	752	640.3	0.077	59.3%
1978	7634	1127	519	545.1	0.071	54.3%
1979	6966	1038	575	706.2	0.101	50.0%
1980	6144	918	775	538.9	0.088	44.2%
1981	5502	826	1538	865.6	0.157	39.8%
1982	4610	673	3946	768.8	0.167	32.4%
1983	4002	539	1297	717.2	0.179	25.9%
1984	3456	416	1107	481.8	0.139	20.0%
1985	3136	341	2520	432.7	0.138	16.4%
1986	2979	277	3035	140.3	0.047	13.3%
1987	3170	277	1205	267.1	0.084	13.3%
1988	3199	268	1310	314.9	0.098	12.9%
1989	3162	257	2224	276.3	0.087	12.4%
1990	3204	256	3032	252.7	0.079	12.3%
1991	3331	263	2876	223.7	0.067	12.7%
1992	3518	275	2883	675.0	0.192	13.3%
1993	3316	228	6385	509.0	0.153	11.0%
1994	3477	205	1364	374.6	0.108	9.9%
1995	3655	205	1390	244.8	0.067	9.9%
1996	3867	228	1540	208.1	0.054	11.0%
1997	4082	263	1465	359.8	0.088	12.7%
1998	4114	289	7792	297.1	0.072	13.9%
1999	4488	323	2074	234.4	0.052	15.5%
2000	4825	359	1080	166.3	0.034	17.3%
2001	5084	401	960	135.3	0.027	19.3%
2002	5298	447	2094	167.3	0.032	21.5%
2003	5474	495	1484	229.1	0.042	23.8%
2004	5541	537	1806	164.7	0.030	25.9%
2005	5636	583	1071	184.6	0.033	28.1%
2006	5649	618	735	341.5	0.060	29.7%
2007	5447	622	2261	263.1	0.048	29.9%

Table 23. Offset of natural mortality (M) suggested by the Mop-Up STAR panel for bracketing uncertainty in this assessment. The initial recommendation (top, +-0.02 from BASE) did not give enough contrast, so the second table (bottom, +-0.03 from BASE) was requested and used for final decision tables.

initial request from STAR panel: +-0.02 from BASE

catch stream	natural mortality (M)	Likelihood	Depletion	MSY
LOW (1/2)	HIGH *F=0.12, M=0.14*	1338	43%	274
MEDIUM **(BASE)**	**MEDIUM** ***F=0.10, M=0.12***	**1338**	**30%**	**275**
HIGH (double)	LOW *F=0.08, M=0.1*	1347	19%	300

requested reruns for M used in BASE: +-0.03 from BASE

catch stream	natural mortality (M)	Likelihood	Depletion	MSY
LOW (1/2)	HIGH *F=0.13, M=0.15*	1340	49%	299
MEDIUM **(BASE)**	**MEDIUM** ***F=0.10, M=0.12***	**1338**	**30%**	**275**
HIGH (double)	LOW *F=0.07, M=0.09*	1361	15%	267

Table 24. Comparing likelihood values of the BASE model with a high and low bracket of uncertainty. The low bracket consists of a low natural mortality (M) and double catches and the high bracket consists of high M and low catches.

	LOW M	**BASE**	HIGH M
female M	0.07	**0.10**	0.13
male M	0.09	**0.12**	0.15
catch stream	double	**BASE**	half
LIKELIHOOD	1360.8	**1338.8**	1339.5
Indices	67.6	**61.2**	58.7
Length_comps	614.5	**625.3**	638.5
Age_comps	615.5	**603.1**	597.6
Recruitment	63.2	**49.3**	44.7
Indices			
RecFIN Index (1980-1999)	29.8	**27.7**	26.9
CDFG index	17.5	**14.2**	12.3
Juvenile survey	1.1	**1.3**	1.5
RecFIN Index (2000-2006)	19.2	**18.0**	18.0
Length comps			
Recreational Fishery	277.2	**290.4**	305.2
Hook and Line	239.0	**238.7**	238.3
Setnet	2.5	**2.5**	2.4
CDFG survey	95.8	**93.8**	92.6
Age comps			
Conditional age-at-length	615.5	**603.1**	597.6
Laidig 90s ages	*150.1*	***144.4***	*141.7*
Laidig conditional age-at-length	*115.0*	***110.3***	*107.9*
marginal ages (traditional/ghost!)	*58.8*	***52.3***	*48.0*

Table 25. Decision table (40:10 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

40:10			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	42	14.0%	407	30.3%	628	50.0%	827
	2010	49	14.7%	429	31.6%	656	51.6%	855
Low	2011	54	15.4%	447	32.7%	679	52.8%	875
	2012	59	15.9%	464	33.7%	700	53.8%	891
from high	2013	64	16.5%	480	34.6%	720	54.7%	906
catch stream	2014	69	17.1%	497	35.6%	740	55.6%	921
	2015	75	17.7%	515	36.7%	762	56.6%	938
	2016	80	18.3%	533	37.8%	785	57.7%	955
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	199	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	198	13.9%	404	**30.4%**	**632**	50.2%	831
Medium	2011	196	13.7%	398	**30.4%**	**631**	50.0%	828
	2012	193	13.4%	390	**30.2%**	**628**	49.7%	823
from BASE	2013	192	13.2%	384	**30.2%**	**627**	49.4%	818
catch stream	2014	192	13.0%	379	**30.2%**	**628**	49.3%	816
	2015	193	12.9%	376	**30.4%**	**631**	49.4%	817
	2016	195	12.9%	375	**30.7%**	**637**	49.6%	820
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	376	14.0%	407	30.3%	628	50.0%	827
	2010	363	12.9%	376	29.1%	604	48.6%	804
High	2011	348	11.8%	343	27.8%	577	46.9%	776
	2012	335	10.7%	311	26.5%	550	45.2%	748
from low	2013	325	9.7%	282	25.4%	527	43.7%	724
catch stream	2014	317	8.8%	257	24.5%	509	42.6%	705
	2015	311	8.1%	235	23.8%	495	41.8%	691
	2016	308	7.4%	217	23.4%	485	41.2%	682

Table 26. Decision table (60:20 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

60:20			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	0	14.0%	407	30.3%	628	50.0%	827
	2010	0	15.0%	435	31.9%	663	52.0%	861
Low	2011	0	15.9%	461	33.4%	694	53.7%	889
	2012	0	16.8%	487	34.8%	723	55.2%	913
from high	2013	0	17.7%	514	36.2%	753	56.6%	937
catch stream	2014	0	18.6%	542	37.7%	784	58.1%	962
	2015	0	19.7%	572	39.3%	816	59.7%	988
	2016	8	20.7%	604	41.0%	851	61.3%	1015
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	113	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	121	14.3%	417	**31.1%**	**645**	51.0%	844
Medium	2011	125	14.6%	424	**31.6%**	**657**	51.5%	853
	2012	128	14.7%	428	**32.0%**	**665**	51.8%	858
from BASE	2013	132	14.9%	433	**32.5%**	**674**	52.1%	863
catch stream	2014	136	15.1%	438	**32.9%**	**684**	52.5%	869
	2015	142	15.3%	445	**33.5%**	**696**	53.0%	877
	2016	148	15.5%	452	**34.1%**	**708**	53.5%	885
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	339	14.0%	407	30.3%	628	50.0%	827
	2010	323	13.1%	382	29.4%	610	48.9%	810
High	2011	307	12.2%	355	28.4%	589	47.6%	788
	2012	291	11.3%	330	27.4%	569	46.3%	766
from low	2013	279	10.6%	308	26.6%	552	45.2%	748
catch stream	2014	270	9.9%	289	26.0%	541	44.4%	735
	2015	266	9.4%	274	25.7%	533	43.9%	727
	2016	263	9.0%	262	25.5%	530	43.7%	723

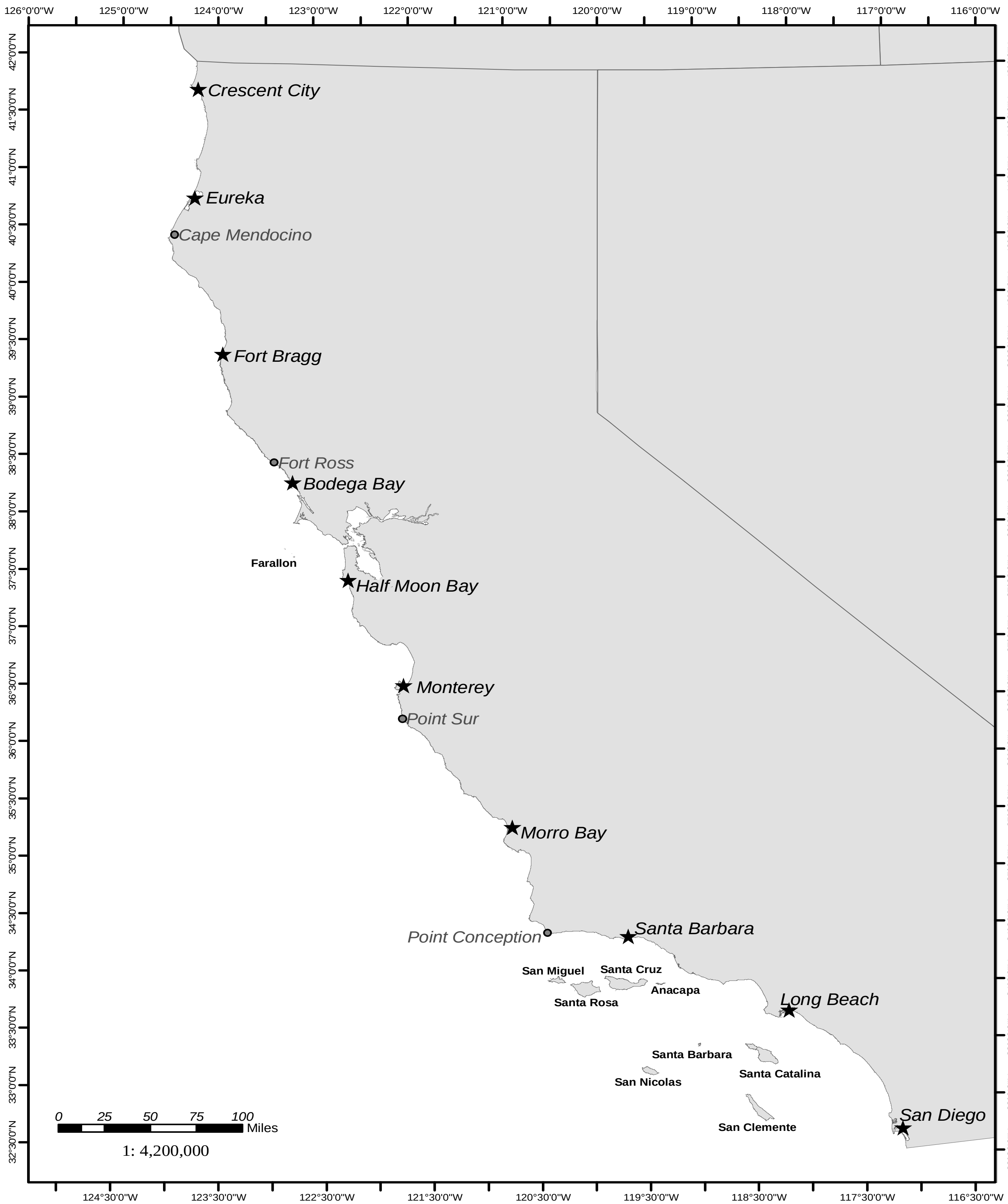

Figure 1. Map of coastal California. This assessment focuses on the area from the Oregon border to Point Conception, where blue rockfish are most commonly found (Love et al. 2002).

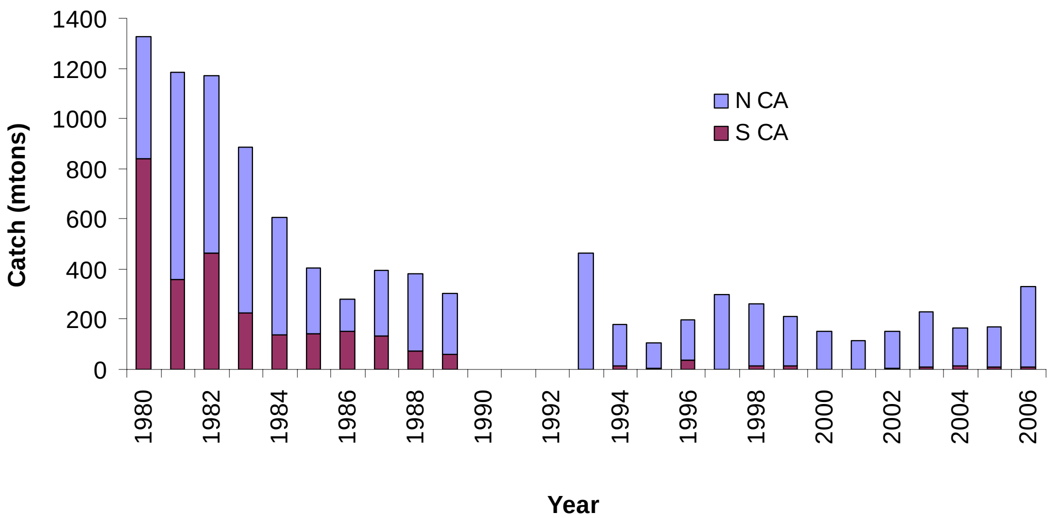

Figure 2. California blue rockfish recreational catch north and south of Point Conception from 1980-2006, sum of A (sampler examined dead) and B1 (sampler unexamined reported dead) catch. Data from Recreational Fisheries Information Network (RecFIN); no sampling from 1990-1992.

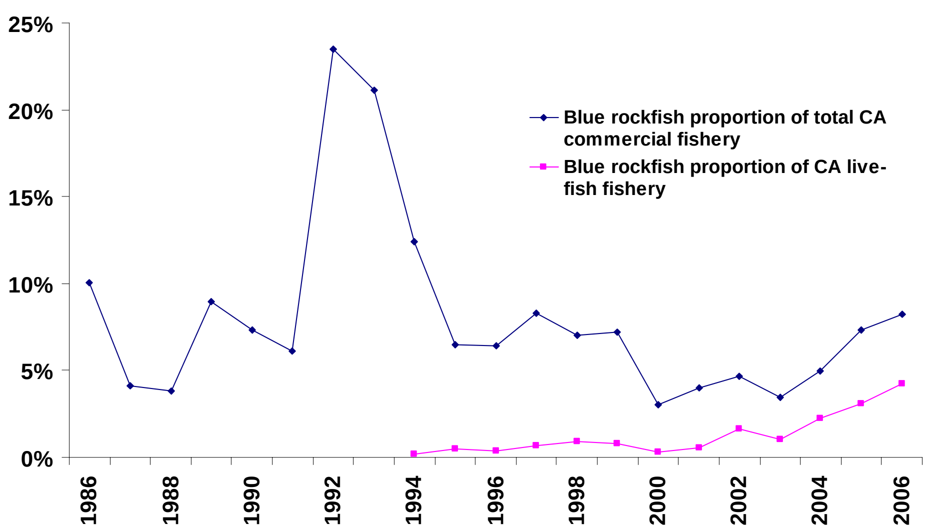

Figure 3. California blue rockfish proportions of estimated commercial and live-fish (nearshore rockfishes, cabezon, greenlings, sheephead) landings from 1986-2006. Data from California Cooperative Survey (CALCOM).

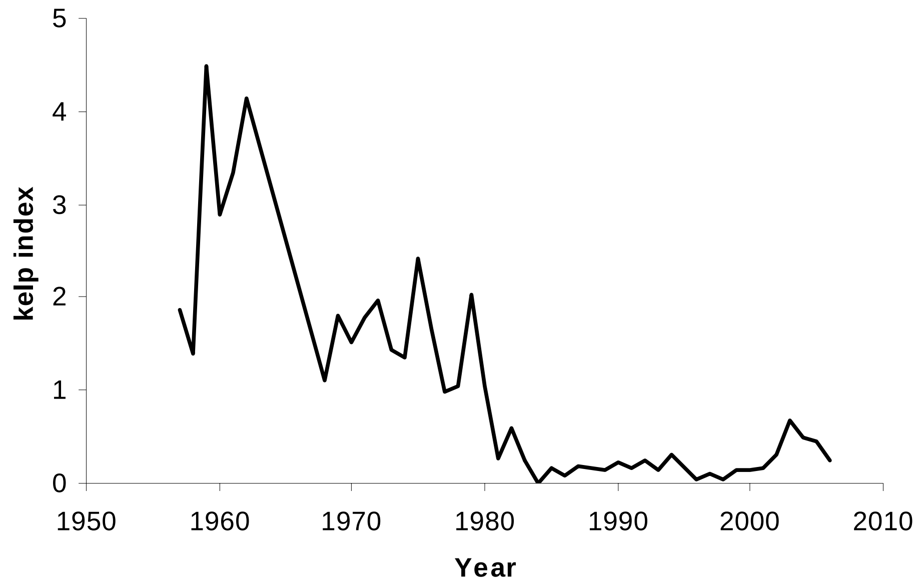

Figure 4. Standardized area of Santa Barbara area kelp beds. Kelp bed indices are annual averages of monthly fractions of long-term mean areas. Data from SBCLTER.

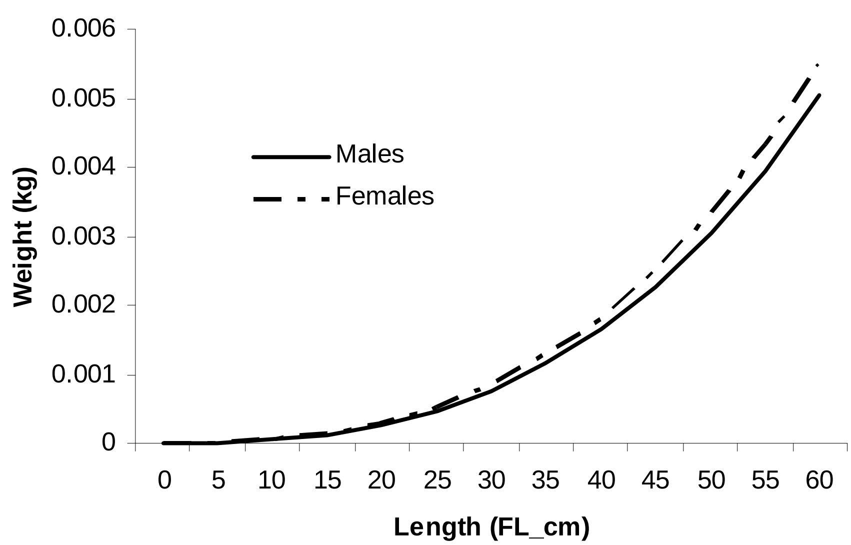

Figure 5. Male (solid line) and female (dashed line) length to weight relationships of blue rockfish in California.

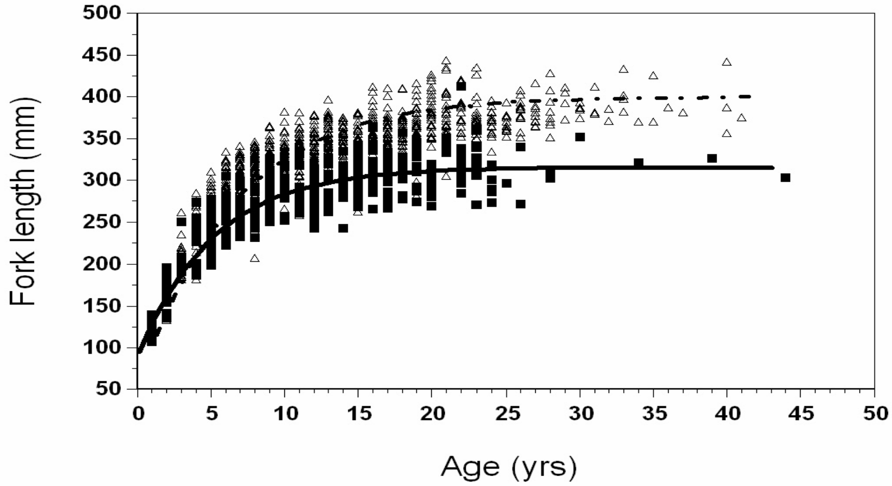

Figure 6. Length at age between male (solid line) and female (dashed line) blue rockfish (Laidig et al 2003). Female blue rockfish grow slower, but attain larger sizes.

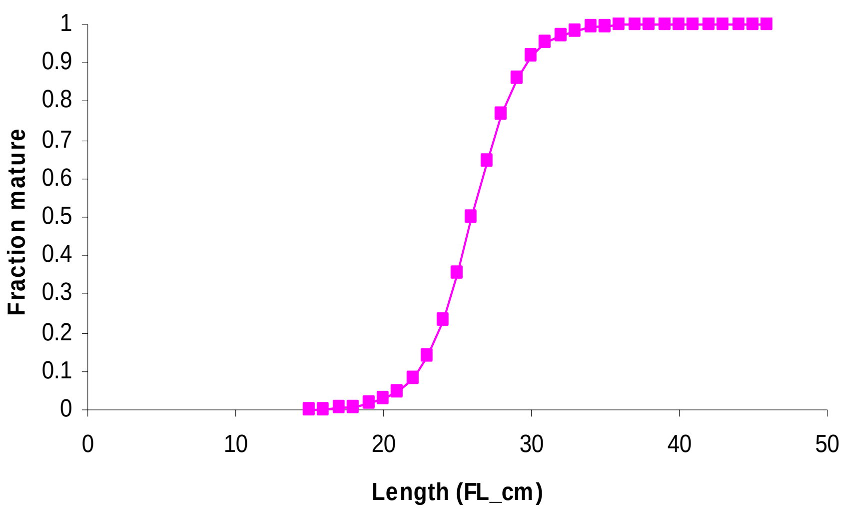

Figure 7. Spawning ogive for female blue rockfish. 50% of females are mature at 26cm (FL) and 100% at 32cm (FL).

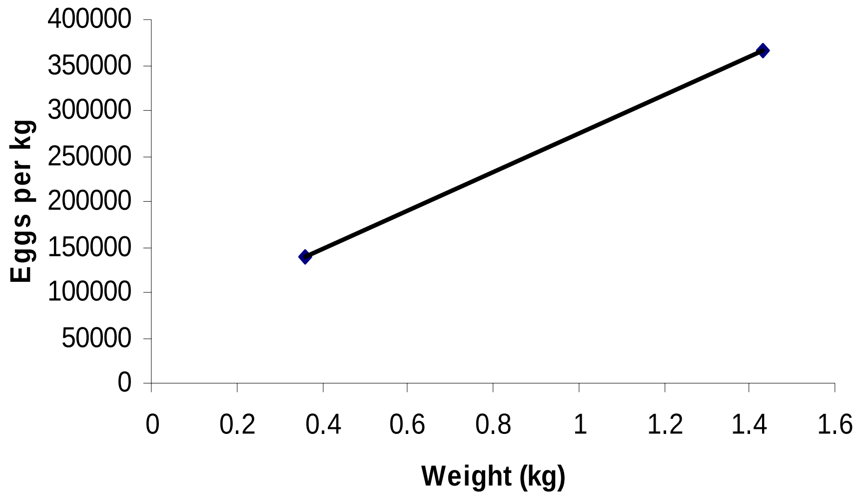

Figure 8. Spawning potential for female blue rockfish (y = 211,841x + 62,585).

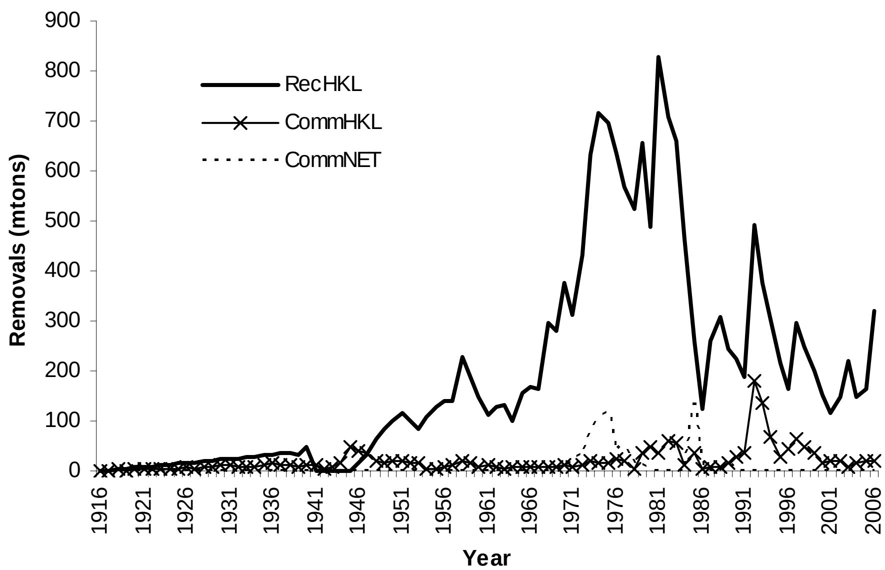

Figure 9. Reconstructed historical estimated catches for blue rockfish in California (north of Point Conception), 1916-2006.

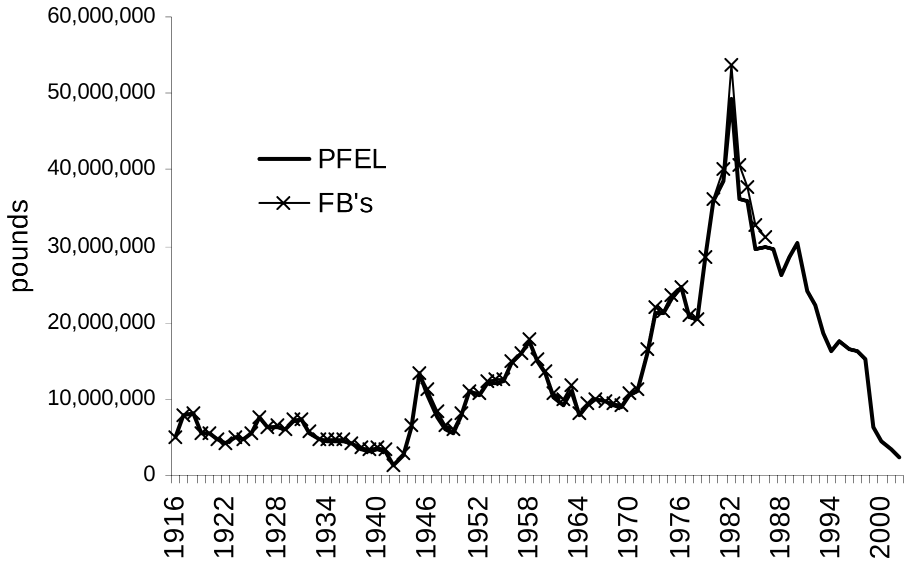

Figure 10. Comparison of reported total commercial rockfish landings between Heimann and Carlisle (1970) and PFEL. PFEL does not include rockfish brought into California, which we used for this assessment.

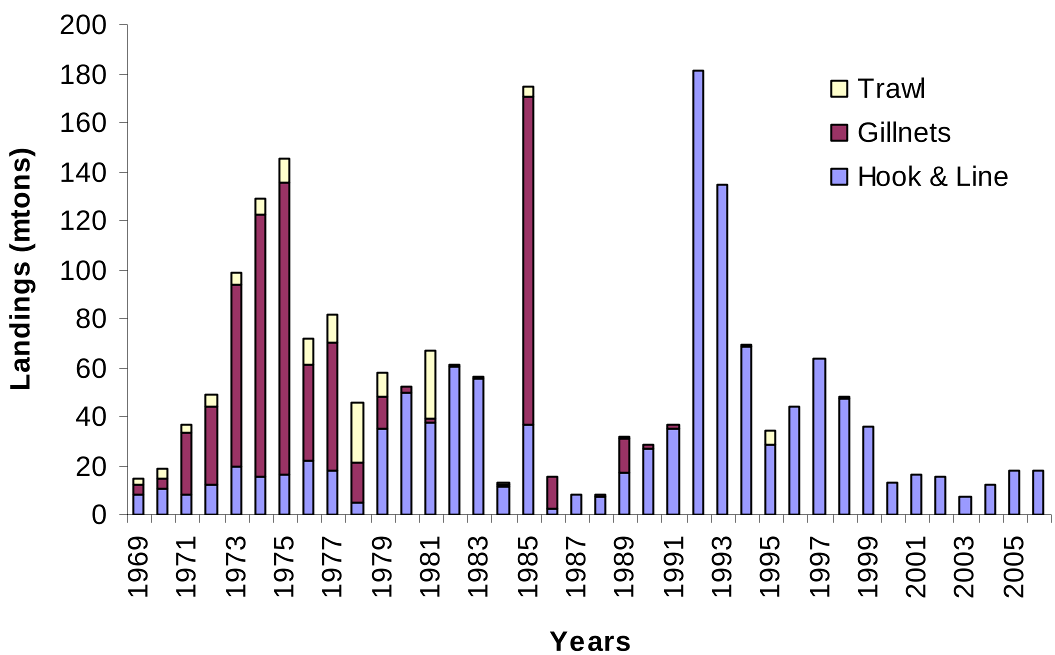

Figure 11. Estimated commercial landings by gear, 1969-2006 (CALCOM).

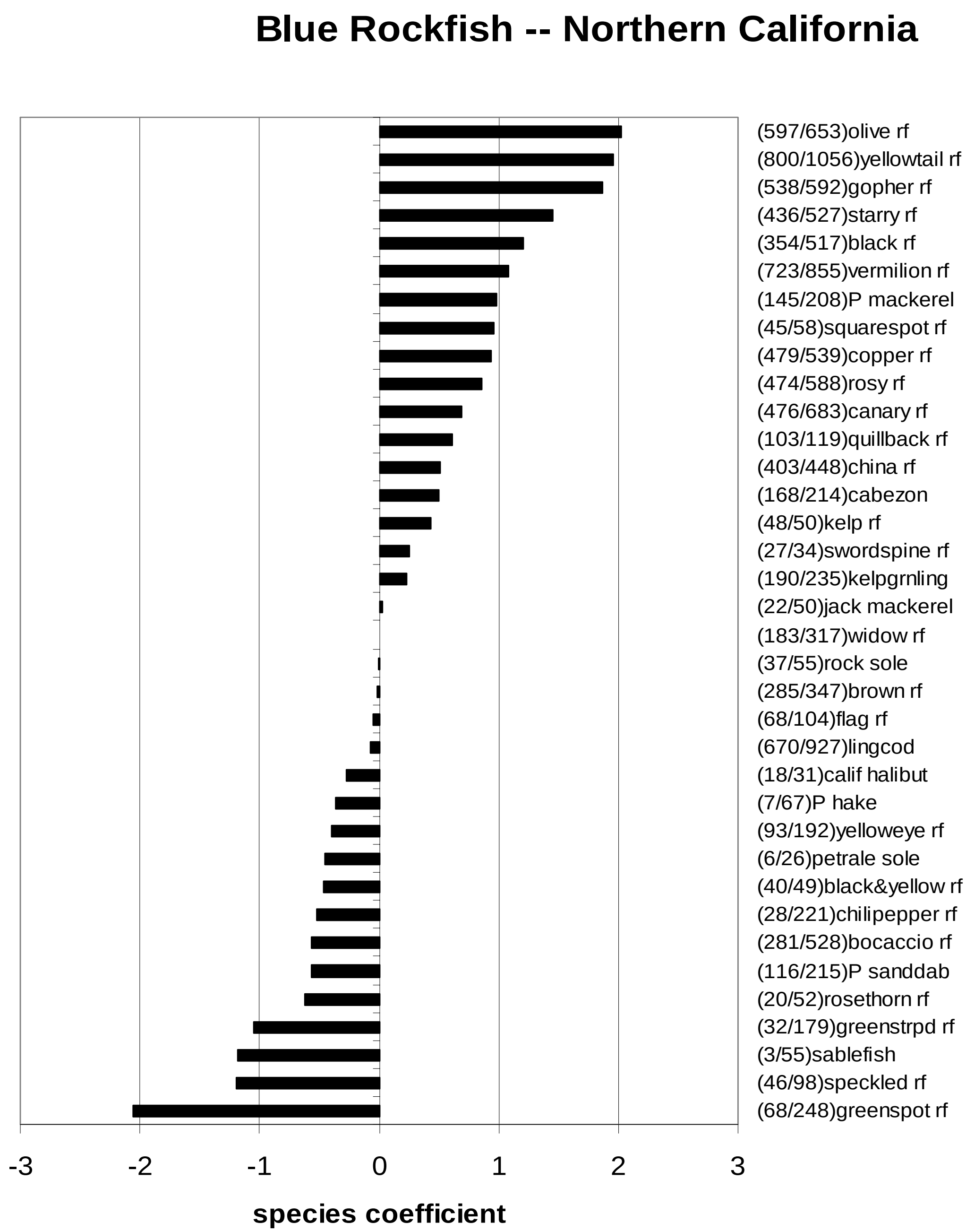

Figure 12. Coefficients from logistic regression of blue rockfish presence-absence on presence of other species in RecFIN CPFV trips. Numbers in parentheses are number of co-occurrences with blue rockfish and overall number of occurrences.

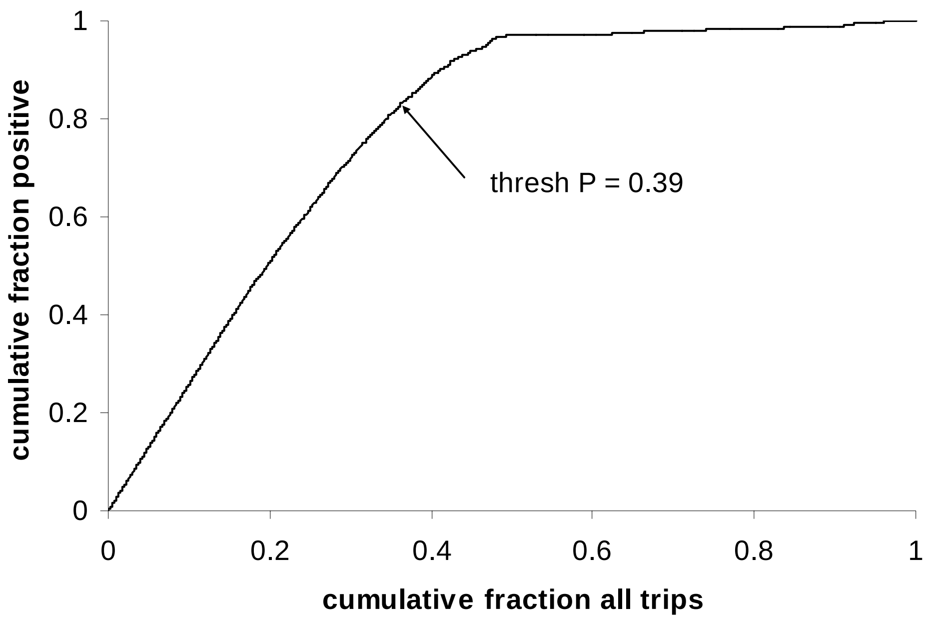

Figure 13. Cumulative-cumulative-plot of RecFIN trips. A threshold of 0.39 is used as criterion for selecting trips.

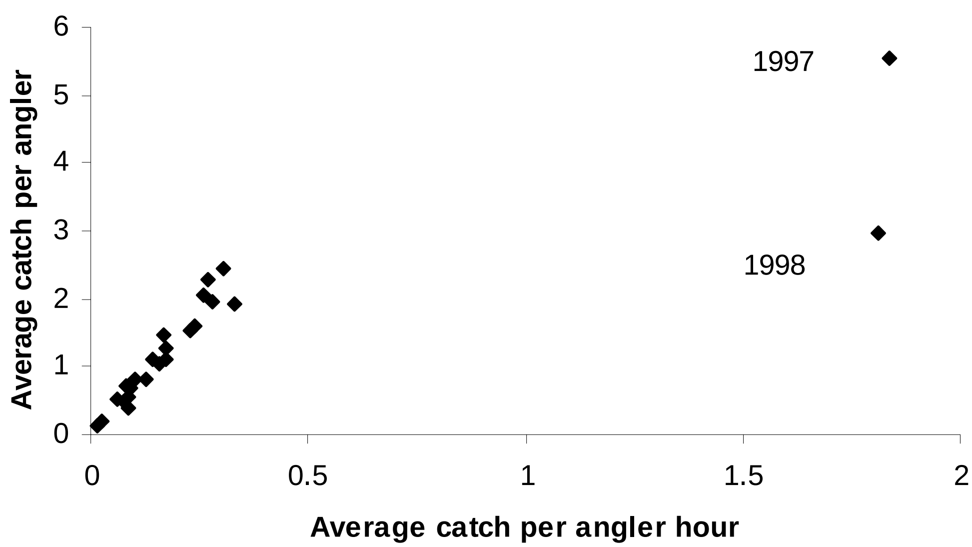

Figure 14. Relationship between annual average catch per angler and catch per angler hour. The outliers in 1997 and 1998 were not well understood and were removed from the RecFIN CPUE index.

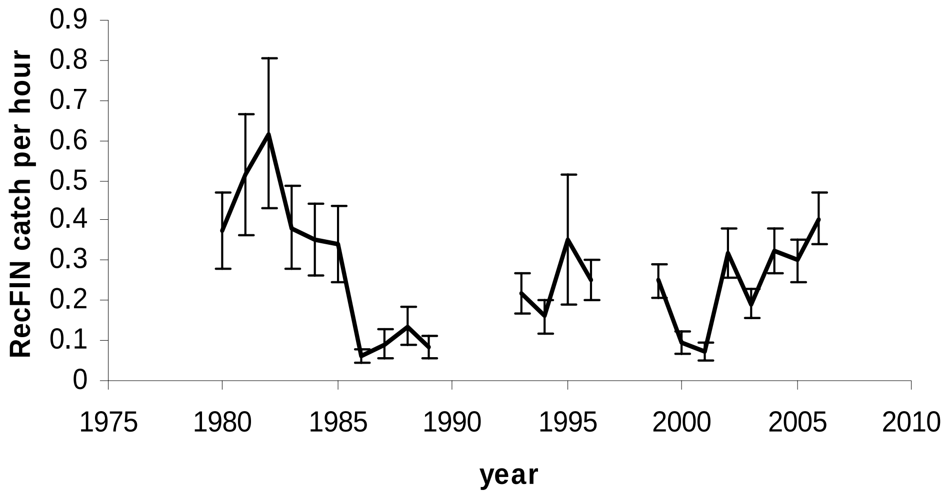

Figure 15. RecFIN CPUE index from delta-gamma GLM analysis of catches of blue rockfish on selected CPFV trips from 1980-2006.

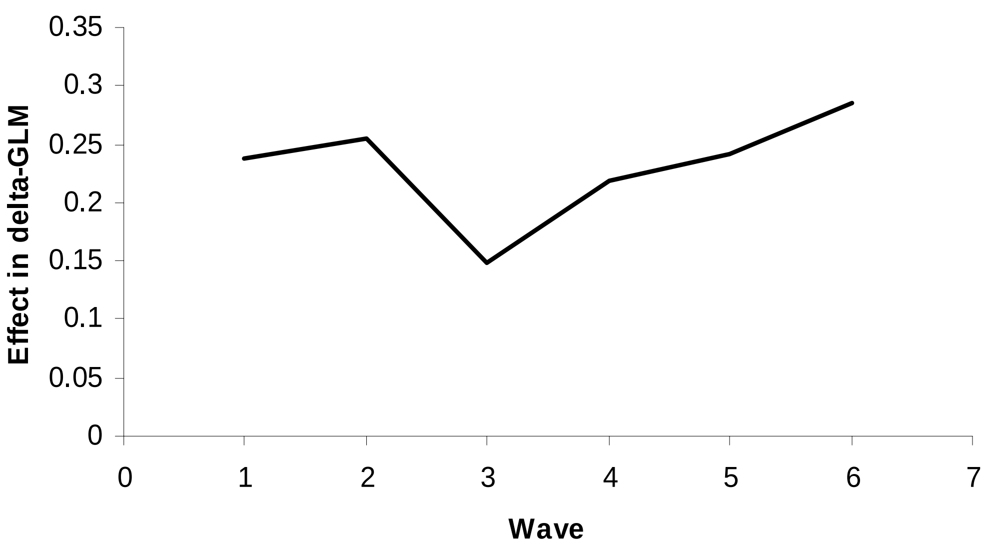

Figure 16. Wave effects from delta-gamma GLM analysis of catches of blue rockfish on selected CPFV trips from 1980-2006. Wave 3 (May-June) contributes the least to the overall CPUE estimate.

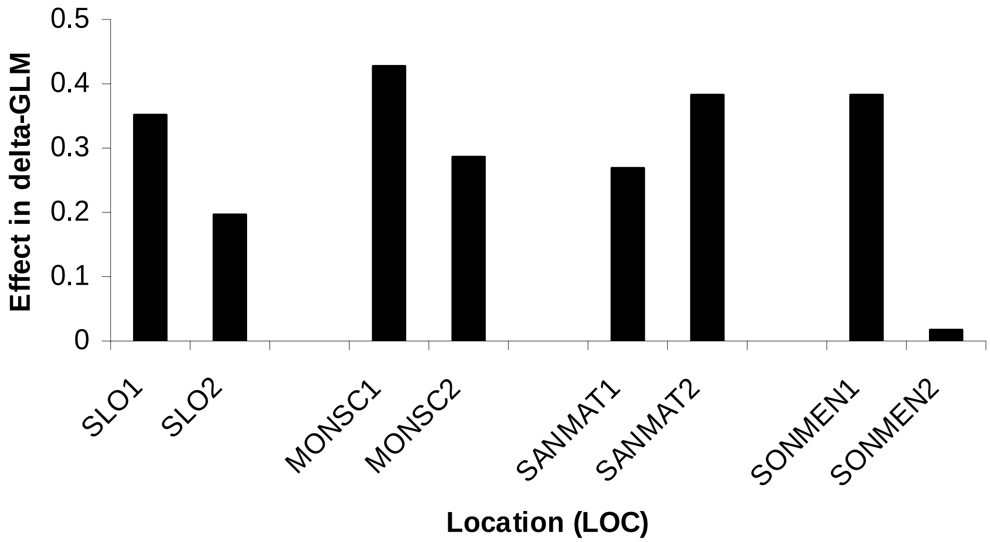

Figure 17. Region (south to north) and distance from shore (1 = < 3miles, 2 = > 3 miles) effects from delta-gamma GLM analysis of blue rockfish catches on selected CPFV trips.
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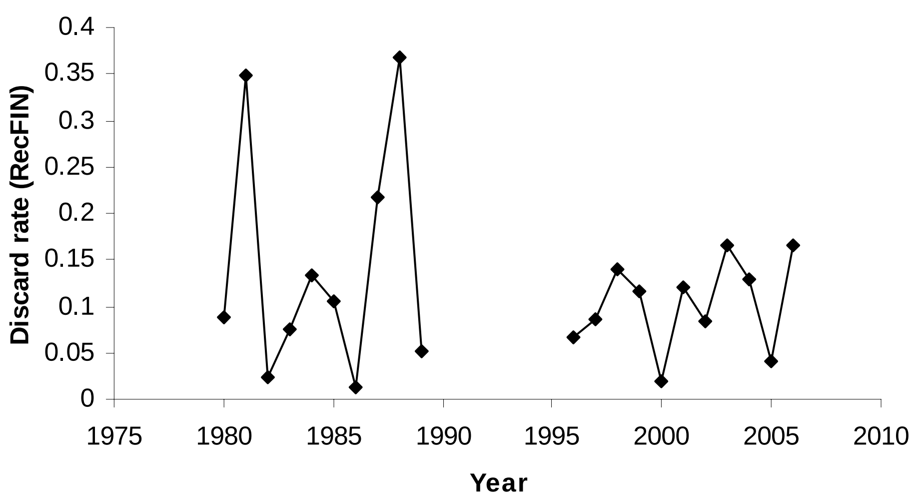


Figure 18. RecFIN estimates of discard rates (numbers) of blue rockfish, 1980-2006. Estimated discard rate is catch in numbers (B1+B2)/(A+B1+B2), where A is estimated retained catch, B1 is estimated discard "dead", and B2 is estimated discard "alive." Estimates of blue rockfish hooking mortality are not available.

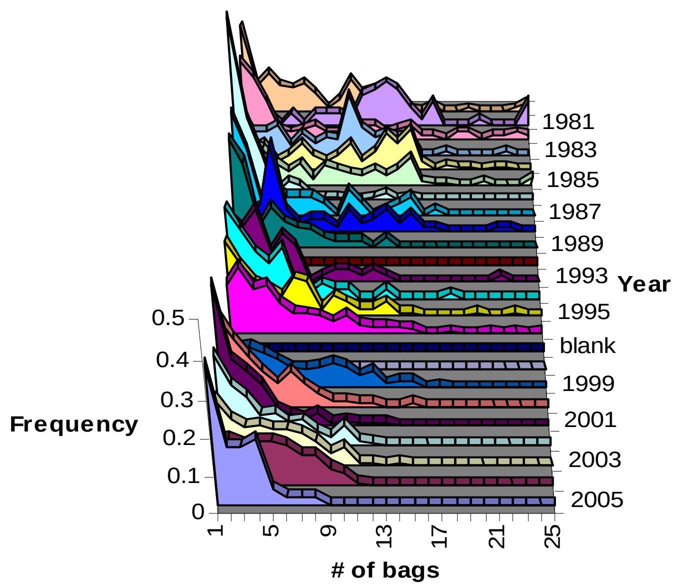


Figure 19. Recreational CPFV bag frequency before and after the reduction from 15 to 10 fish in 2000.

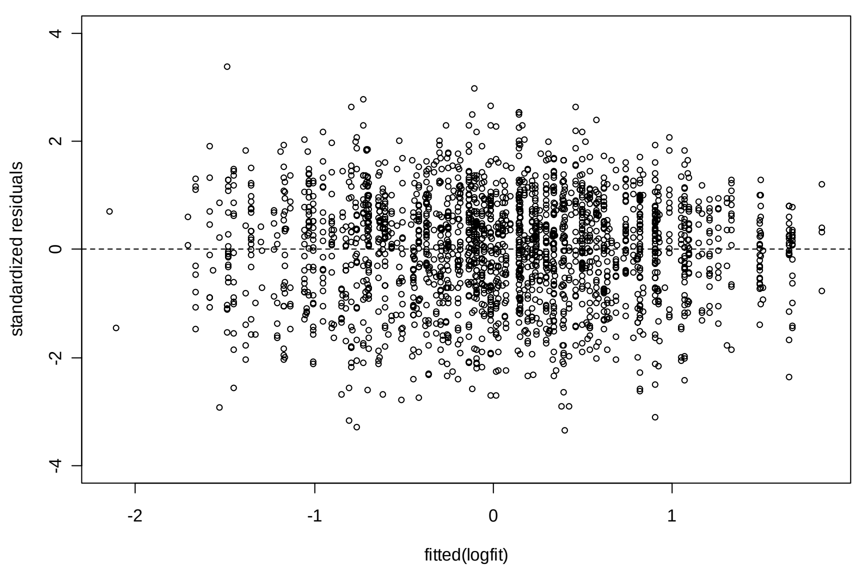


Figure 20. Standardized residual plot from the results of the delta-GLM given the CDFG CPFV onboard observer survey index.

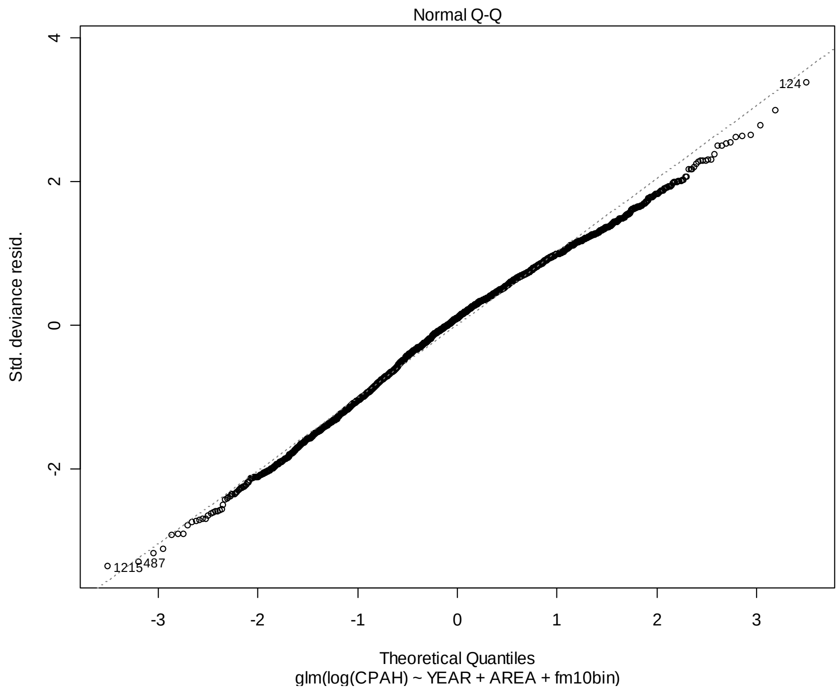
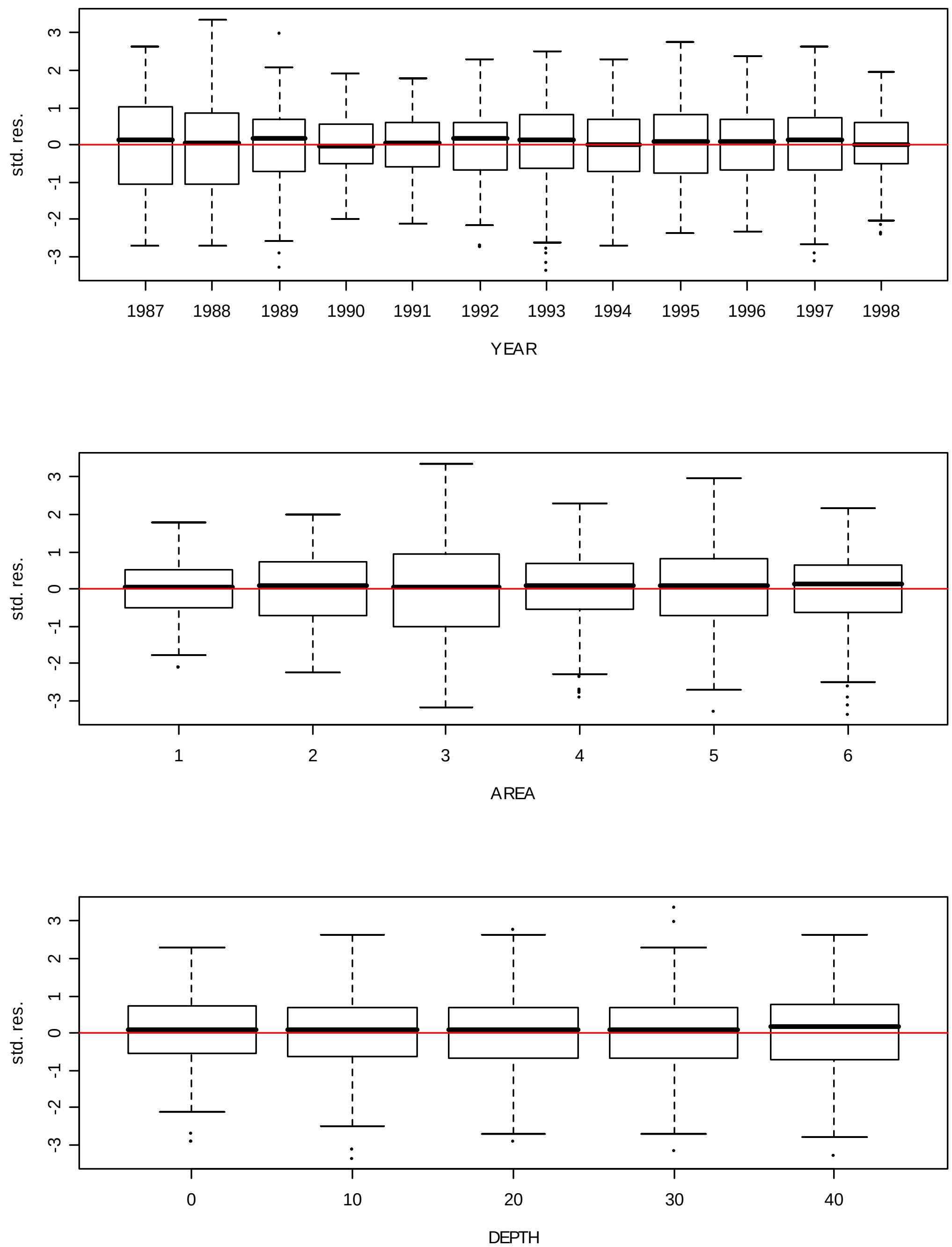


Figure 21. Q-Q plot from the results of the delta-GLM given the CDFG CPFV onboard observer survey index.



Figures 22 (a-c): Standardized residual plots for the main effects of the delta-GLM given the CPFG CPFV onboard observer survey CPUE index. (Year-top, Area-middle, Depth-bottom).

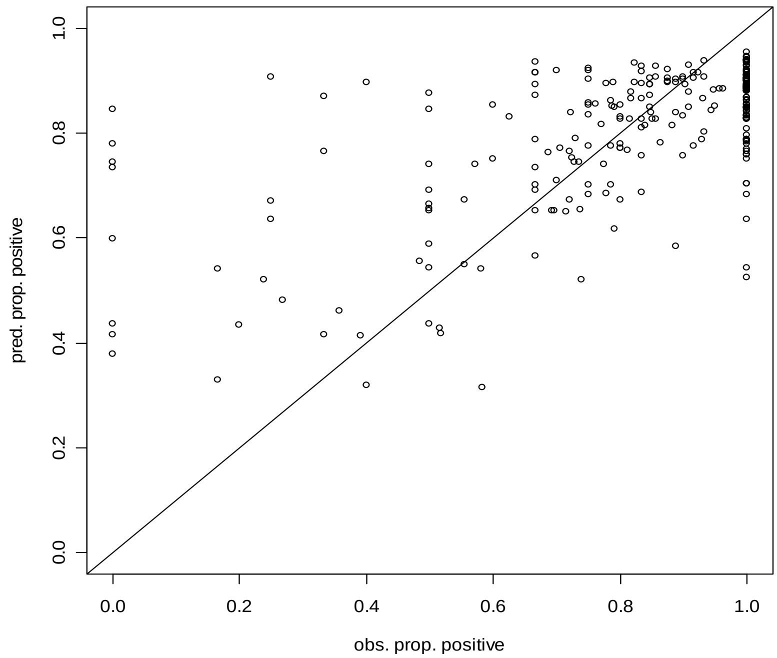


Figure 23. Observed versus predicted proportion positive as a result of the delta-GLM from the CDFG CPFV onboard observer survey CPUE index.

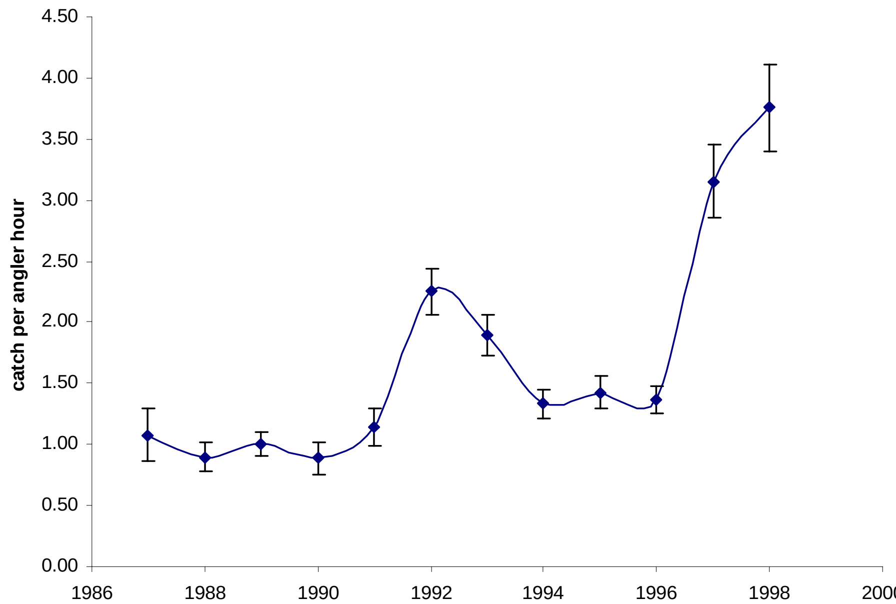


Figure 24. CDFG CPFV onboard observer survey index of abundance (+- 1SD), catch per angler hour (CPAH), 1987-1998. 1997 and 1998 are also inflated, like RecFIN, but no valid reason to exclude.

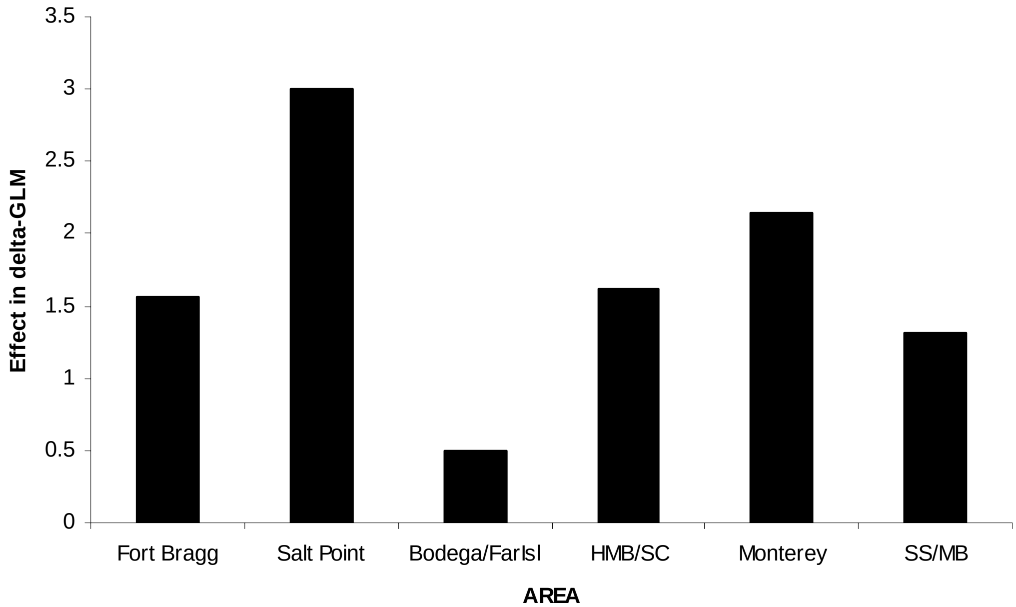


Figure 25. Area effects from the delta-lognormal GLM of the CDFG CPUE index.

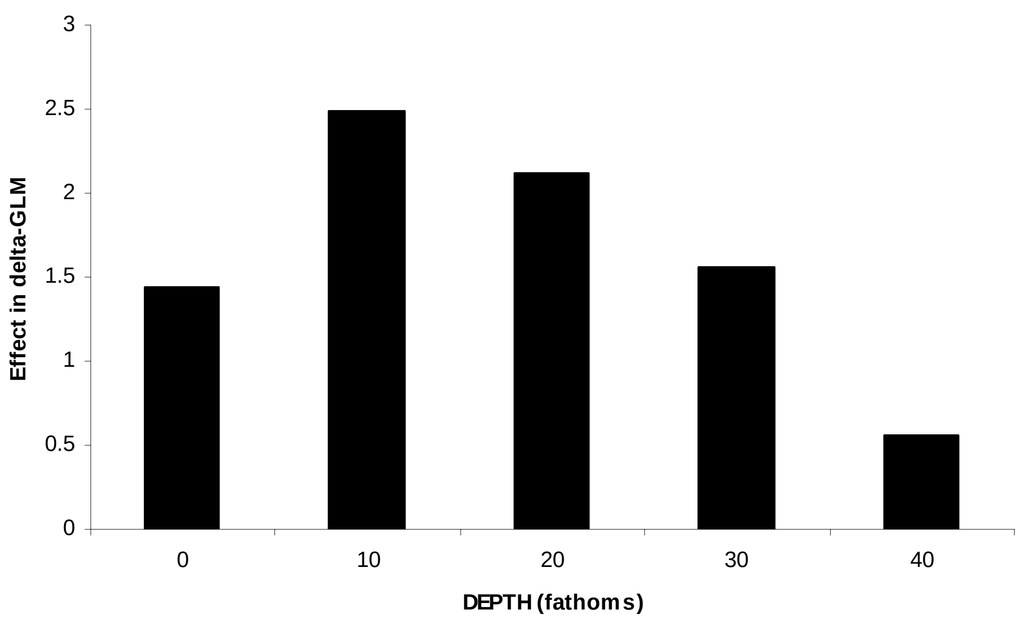


Figure 26. Depth effects from delta-lognormal GLM of the CDFG CPUE index.

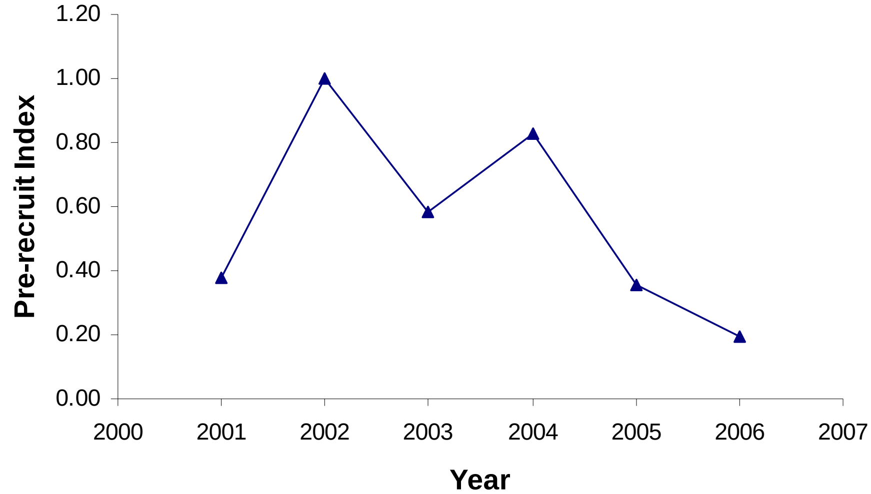


Figure 27. Coastwide juvenile rockfish midwater trawl pre-recruitment index for blue rockfish in California (north of Point Conception), 2001-2006. Indices from pooled data (SWFSC and PWCC/NWFSC surveys).

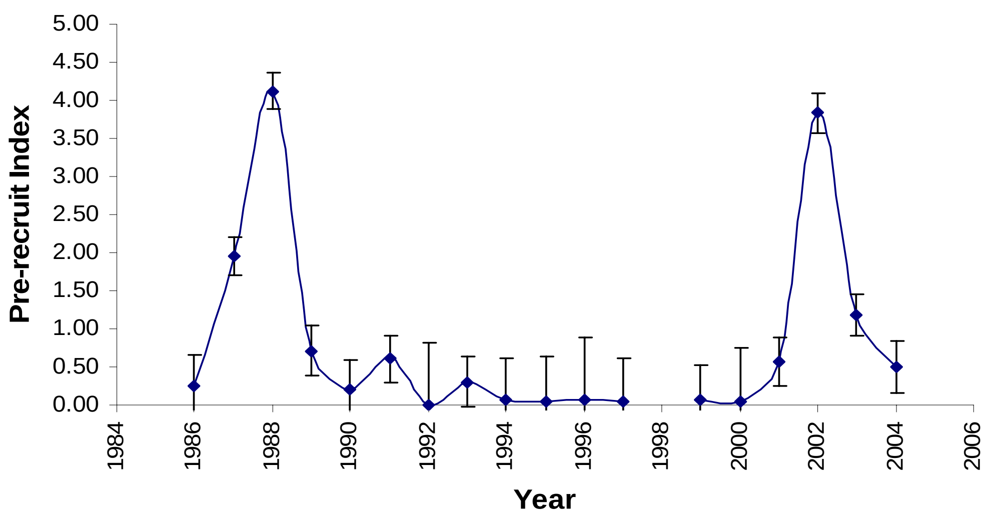


Figure 28. Juvenile rockfish midwater trawl pre-recruitment index for Monterey/San Francisco ("core") area. Extreme recruitment events appear to have occurred in 1988 and 2002. Data from SWFSC midwater trawl surveys.

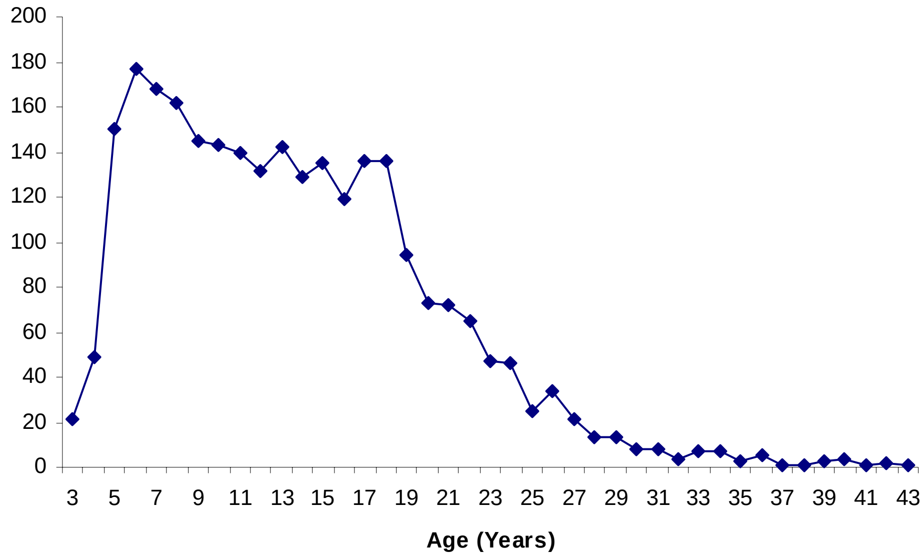


Figure 29. Age composition data (1979-1984) from the recreational CPFV fishery. Ages 5-18 were evaluated to look at year class strength. Age 30 was used as the accumulator age in the baseline model, since < 2% were older than 30.

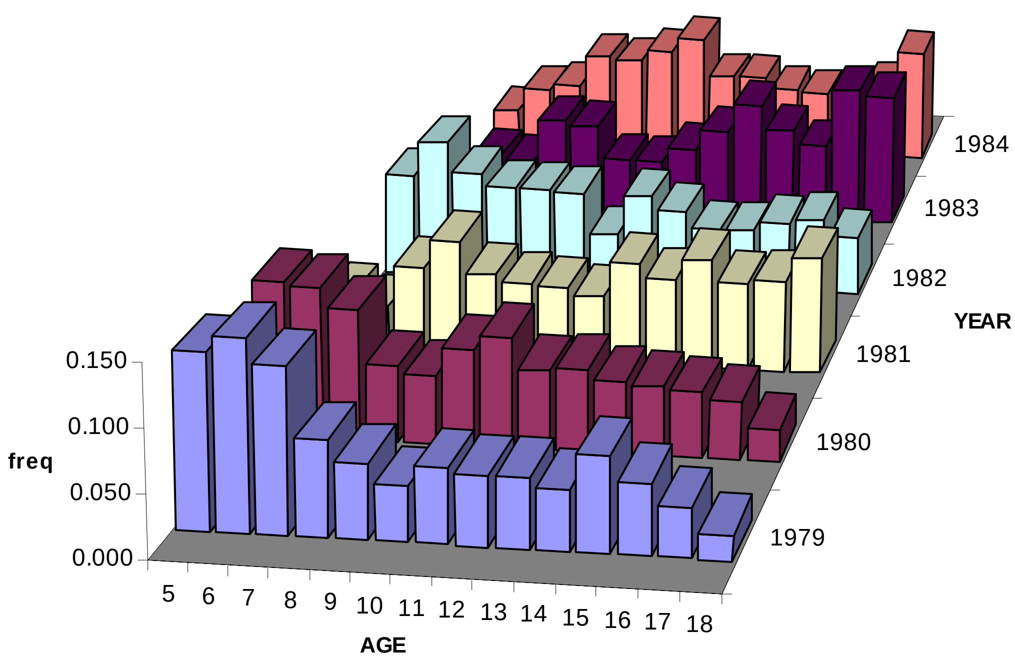


Figure 30. Age composition data (ages 5-18) from CPFVs, 1979-1984.

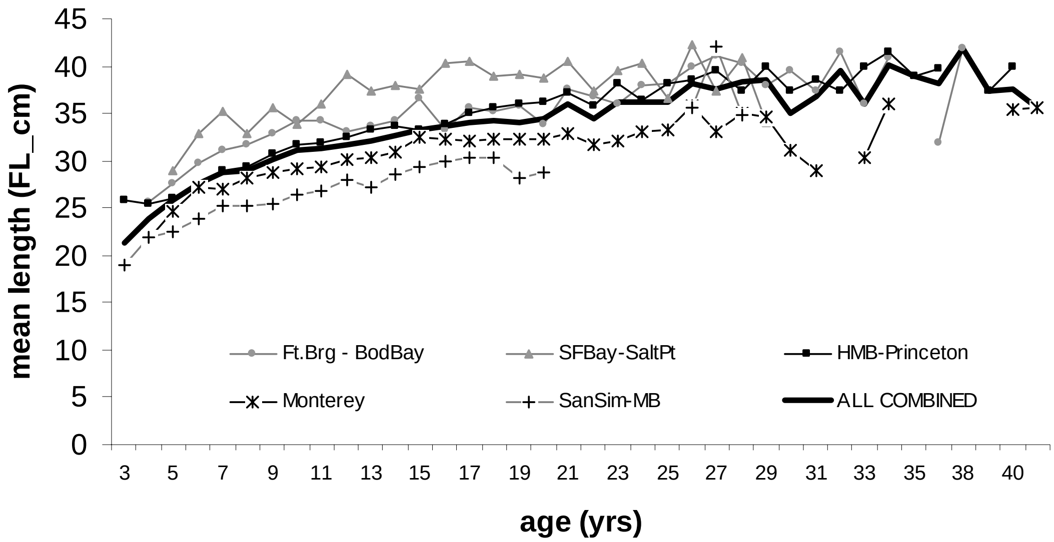


Figure 31. Mean length at age by area (Fort Bragg to Morro Bay) for 1980s CPFV recreational fishery.

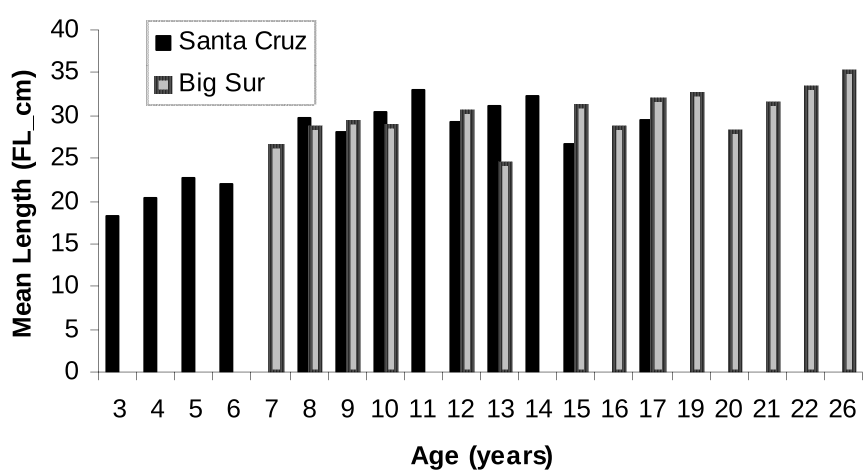


Figure 32. Mean length at age for females in Santa Cruz (heavily fished area) compared to Big Sur (less fished area). Data from Groundfish Ecology Cruises, 2003-2006.

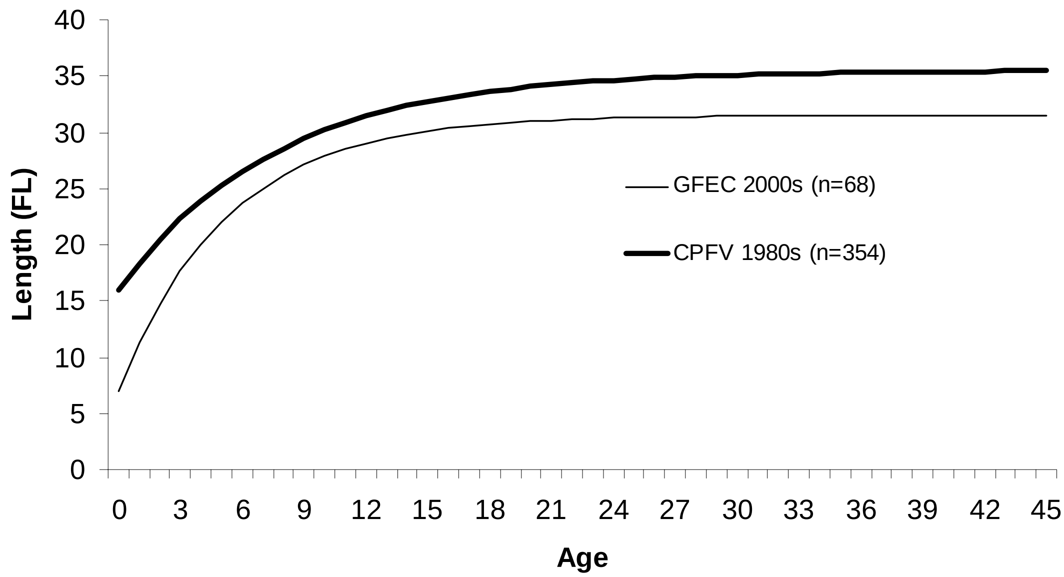


Figure 33. Representation of changes in growth from the 1980s to the 2000s of female blue rockfish in Monterey.

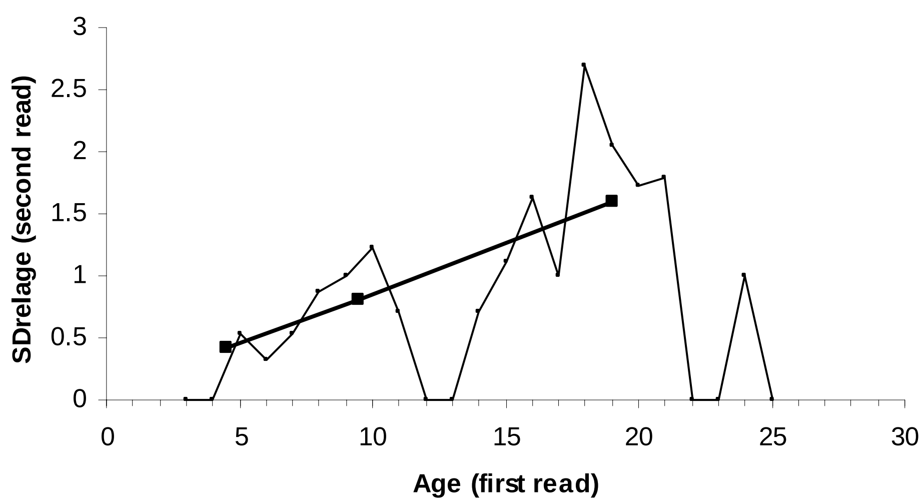


Figure 34. Precision of second otolith reading relative to first reading for individual ages and for three age ranges.

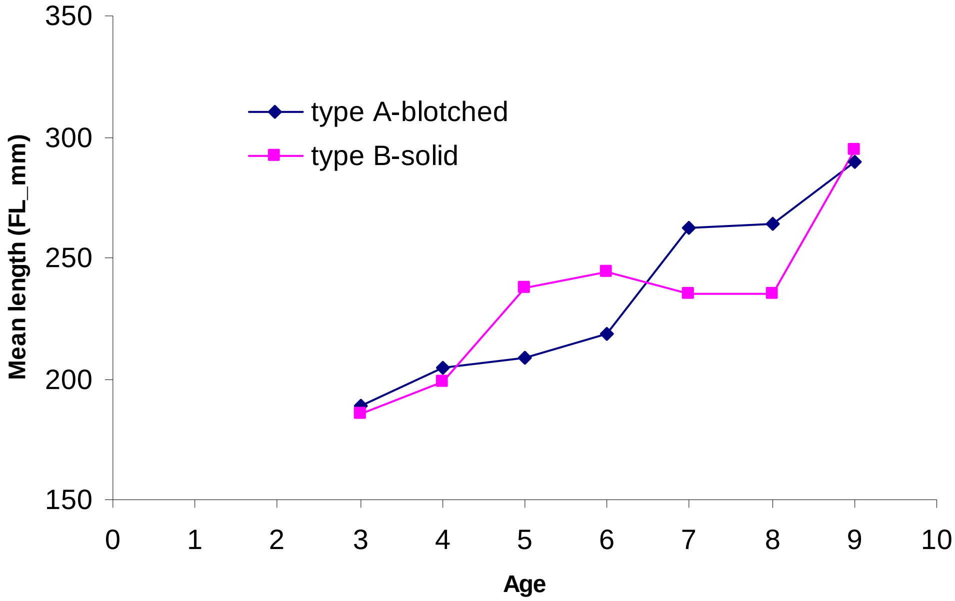


Figure 35. Comparison of mean length at age of the genetically different species of blue rockfish. Data source Don Pearson, NWFSC.

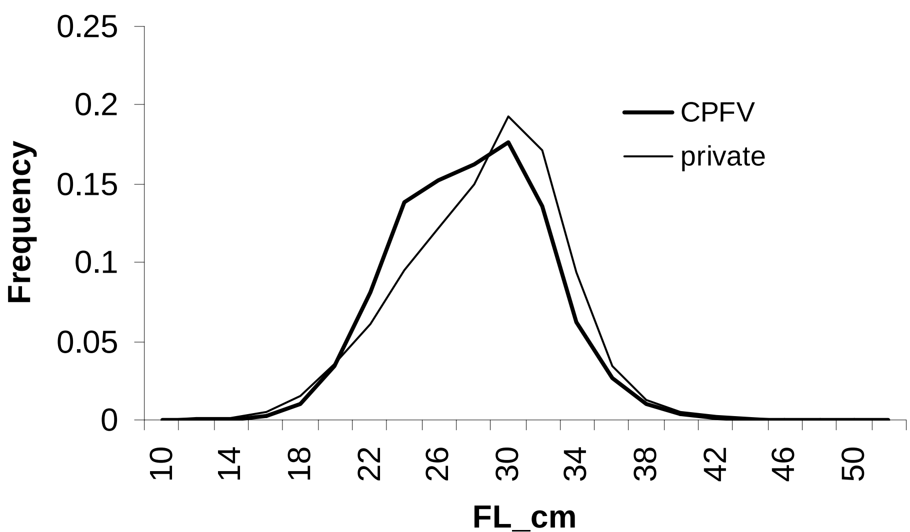


Figure 36. Comparison of length frequencies between CPFVs and private boats in the recreational fishery. The two modes were combined in this assessment since they appear to catch the same size of blue rockfish. Data from RecFIN, 1993-2006 (no 1997-1998).

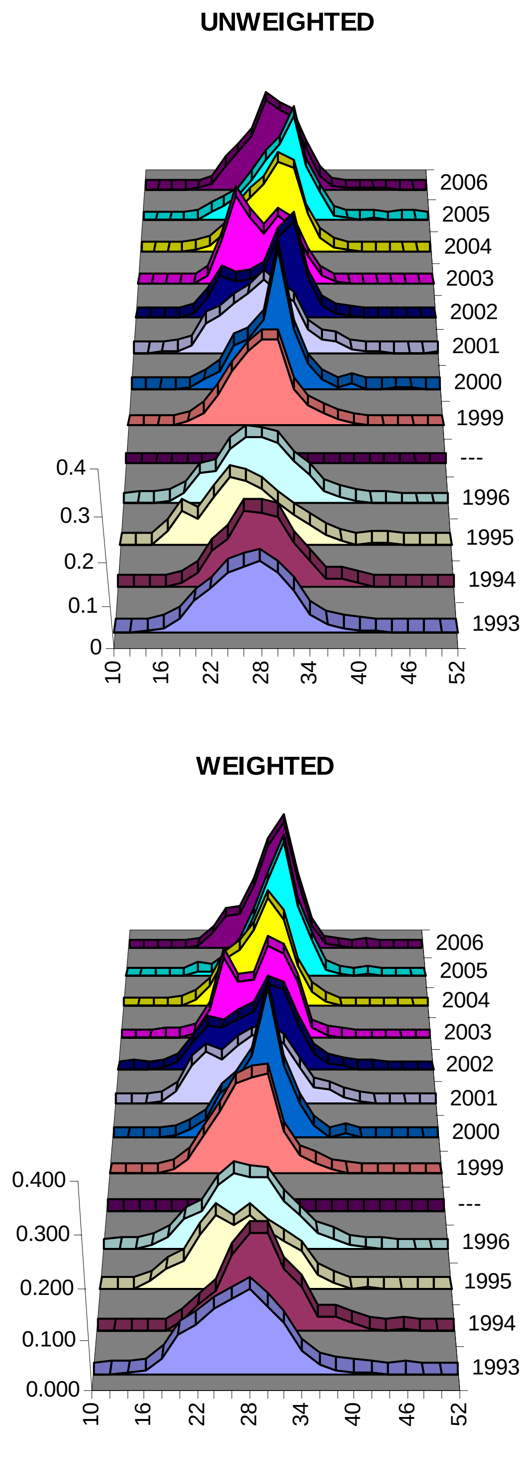


Figure 37 (a-b). Unweighted (top) and weighted (bottom) annual length compositions for the recreational fishery, CPFV and private boats combined (RecFIN). Unweighted compositions were used in this assessment. Strong modal progressions are not obvious here, as seen in other rockfish species.

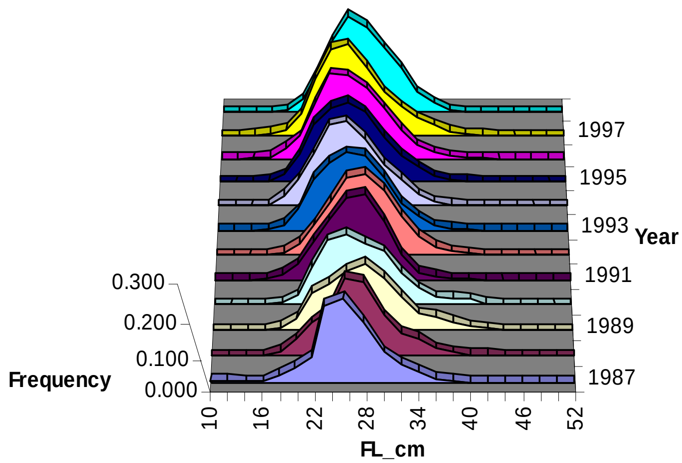


Figure 38. Annual length compositions for the recreational fishery from the CDFG CPFV onboard survey (1987-1998). Like RecFIN, strong modal progressions are not obvious, as seen in other rockfish species.

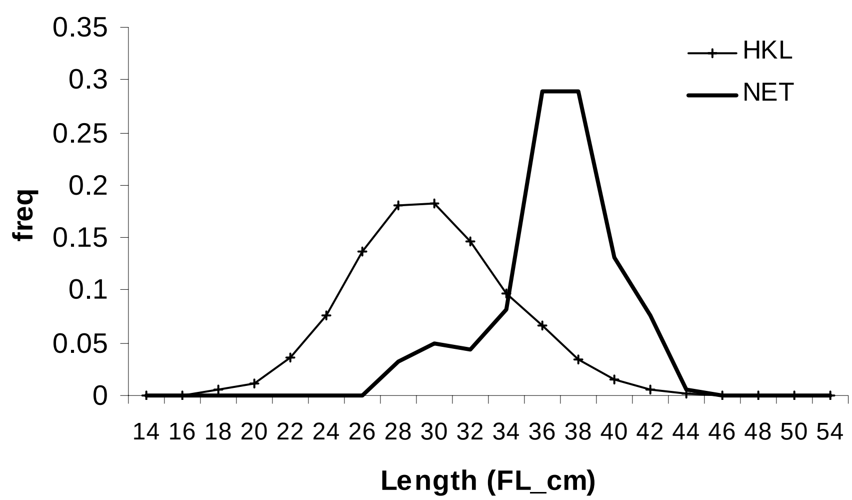


Figure 39. Comparison of length frequencies between hook and line and net gears in the commercial fishery. The two fisheries could not be combined because of differing selectivities. Data from CALCOM, 1992-2006.

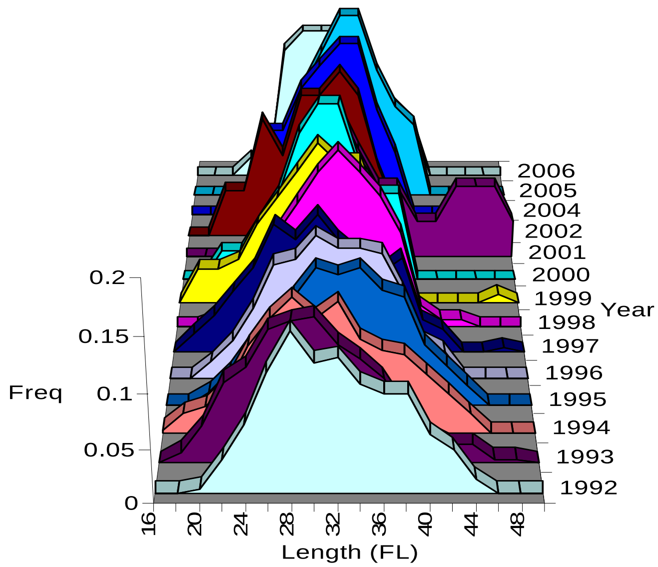


Figure 40. Annual length compositions for the commercial hook and line fishery (CALCOM). Again, strong modal progressions are not obvious here, as seen in other rockfish species.

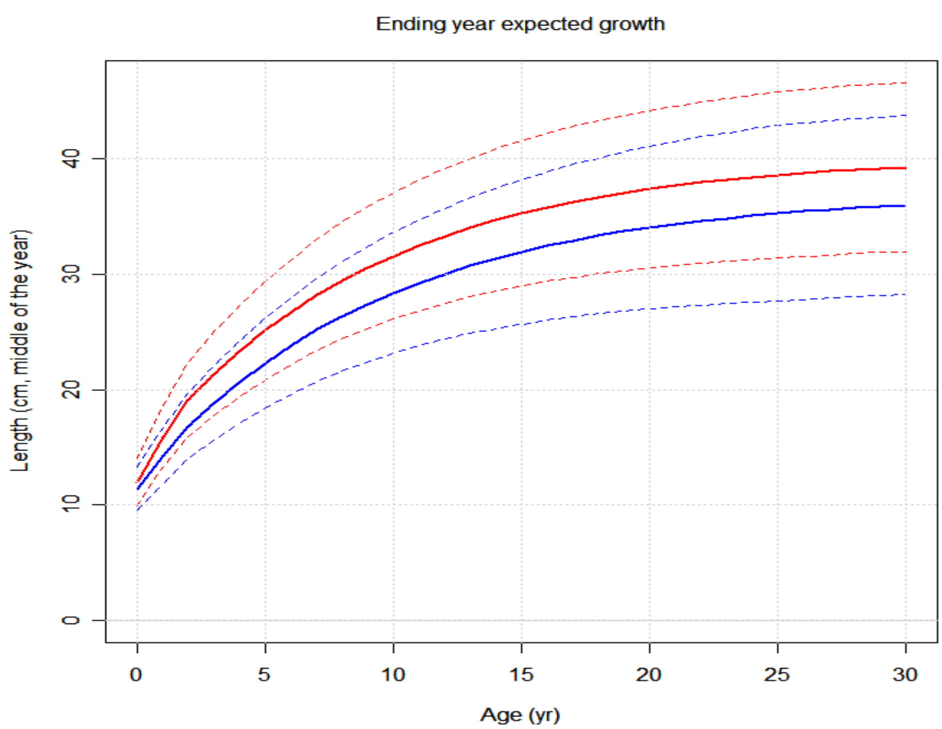
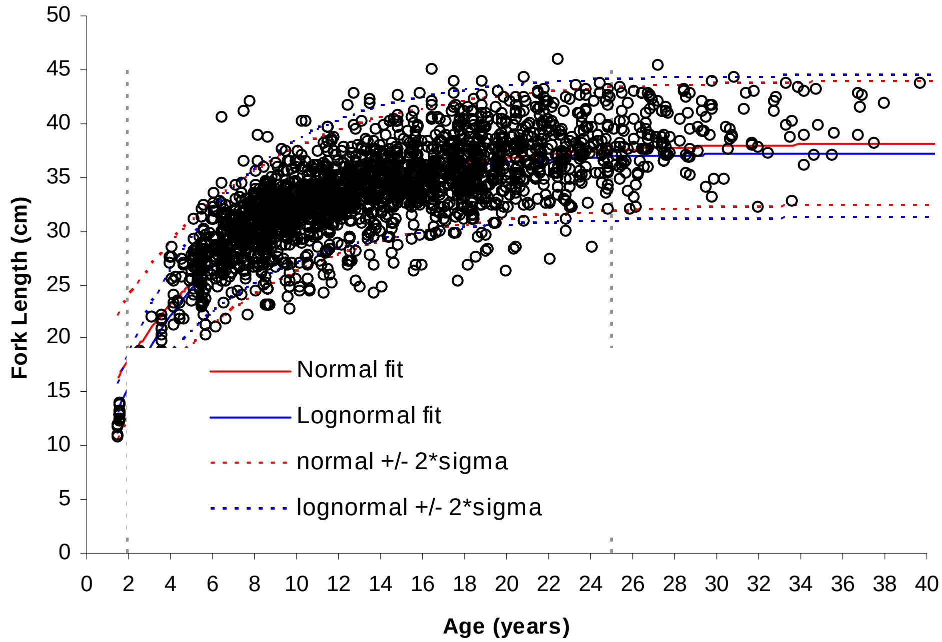


Figure 41: Estimated female (solid top, red) and male (solid bottom, blue) growth curve from the base model. Lmin was fixed.



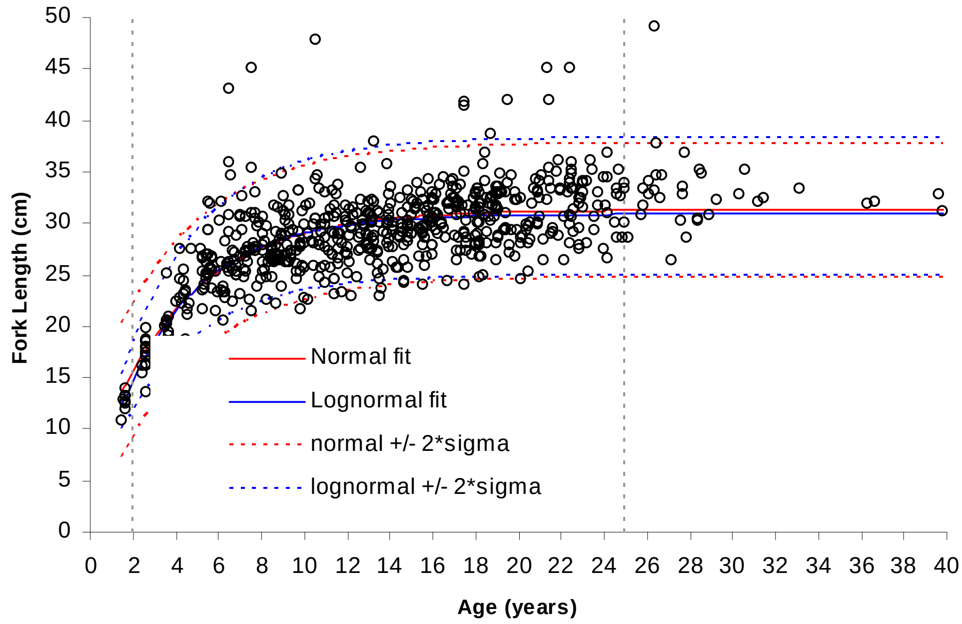
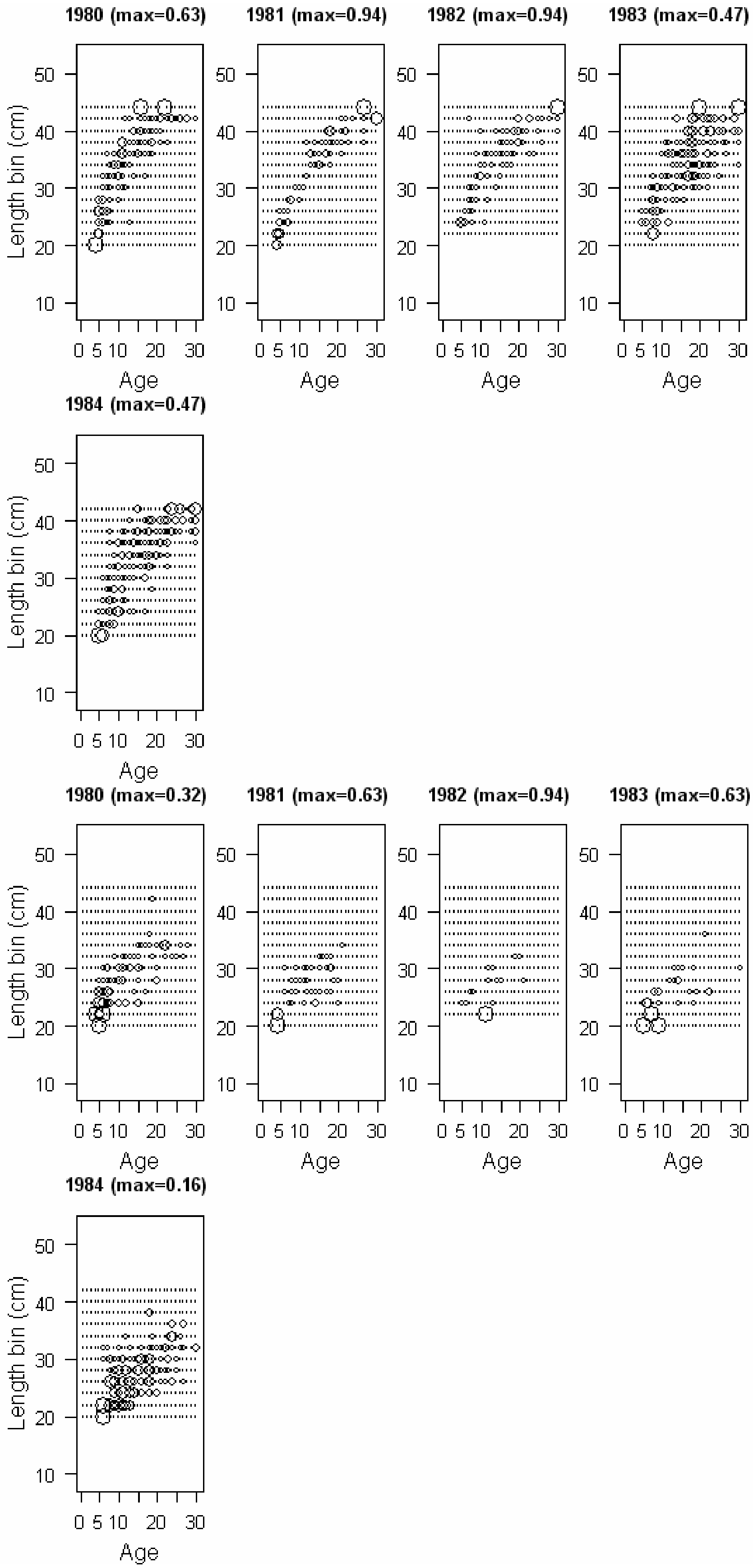
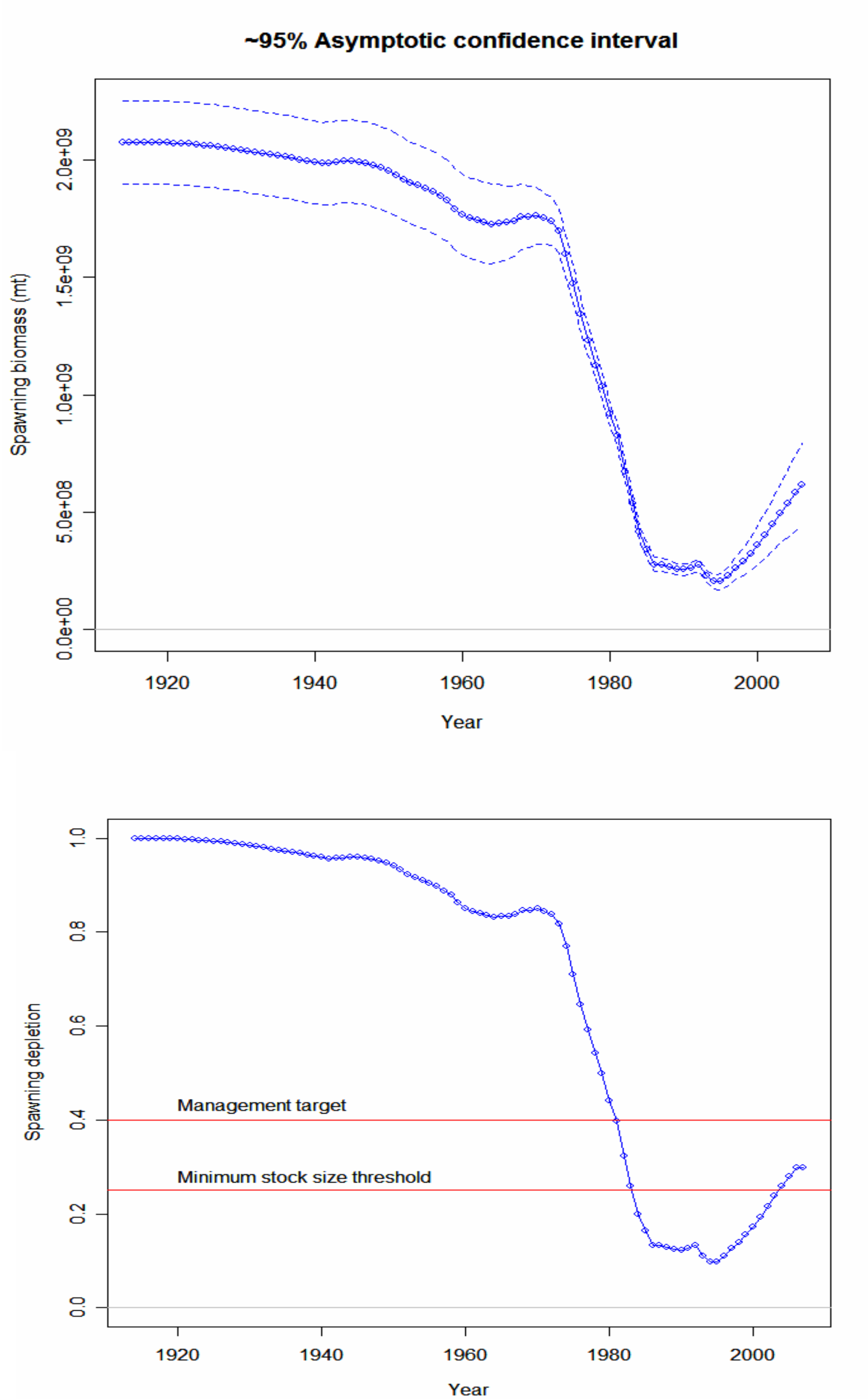


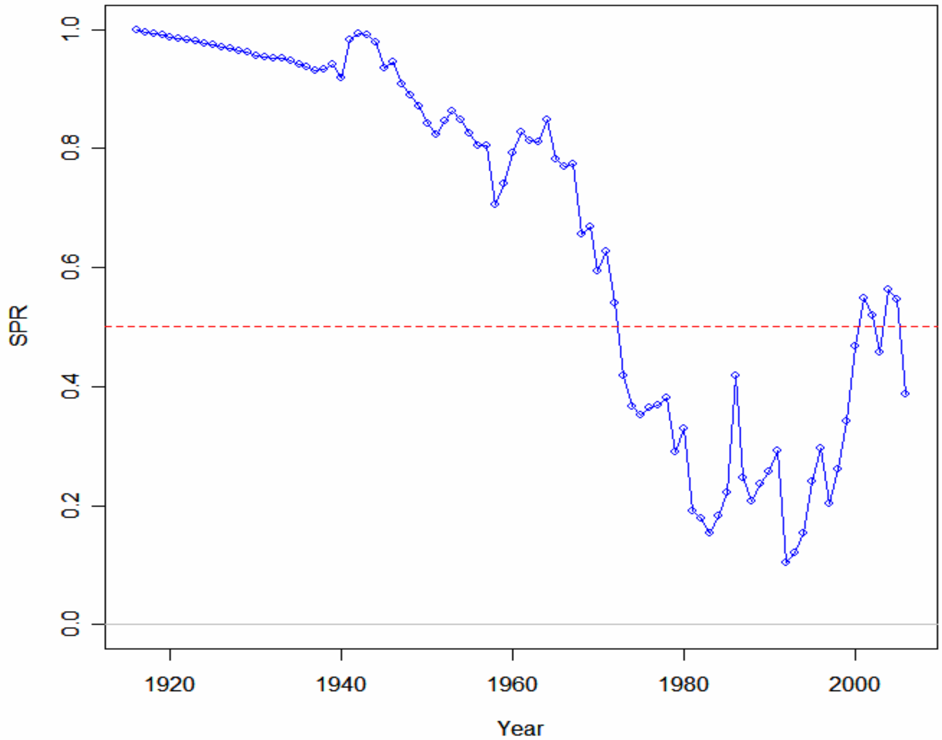
Figure 42 (a-b). External fits of the Schnute (1981) parameterization of the von Bertalanffy growth equation in the 1980s prior Mop-Up. Females (top): t_1=2 (years), L_1=17.9 (cm FL), t_2=25 (years), L_2=37.5 (cm FL) and k=0.147 (n= 2340, CV=0.089); males (bottom): t_1=2 (years), L_1=15.7 (cm FL), t_2=25 (years), L_2=31.2 (cm FL) and k=0.295 (n=667, CV=0.108).

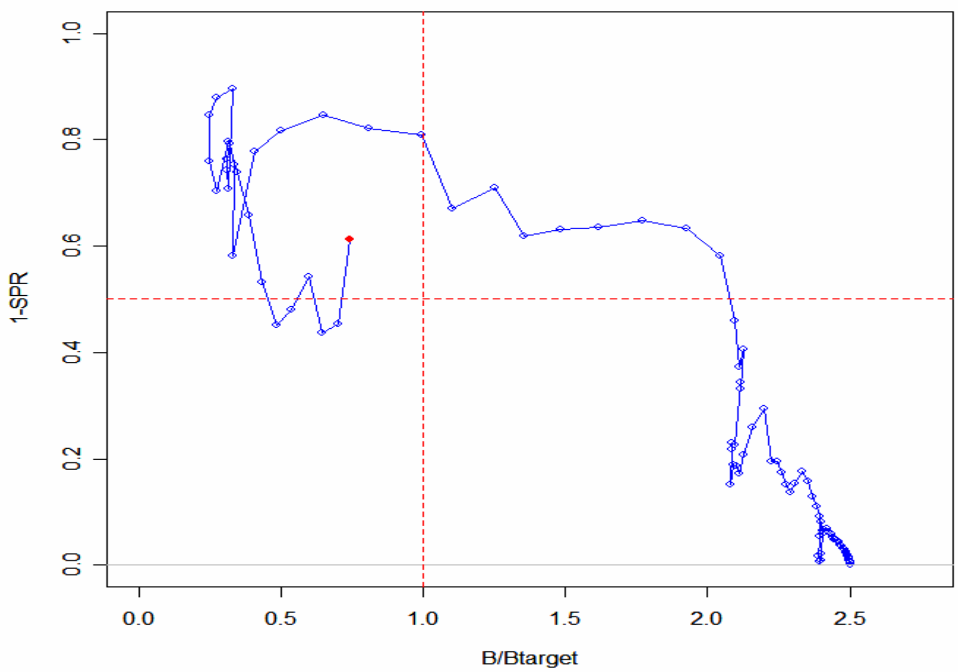


Figures 43 (a-b): Conditional age-at-length data for females (top) and males (bottom) from the 1980s recreational CPFV age data (1980-1984).

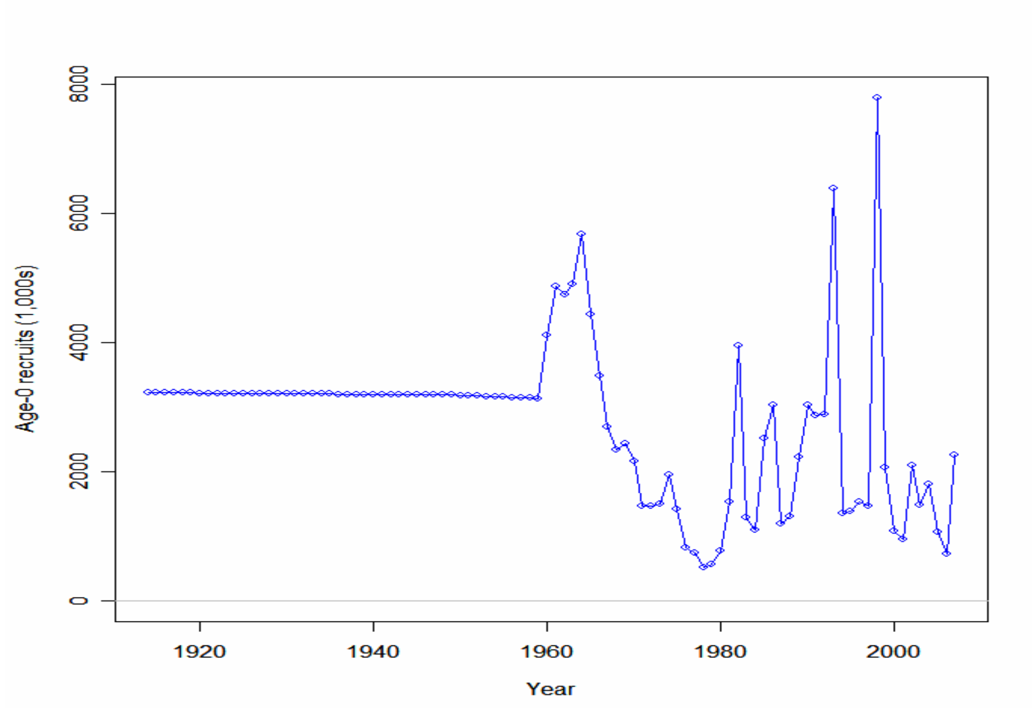


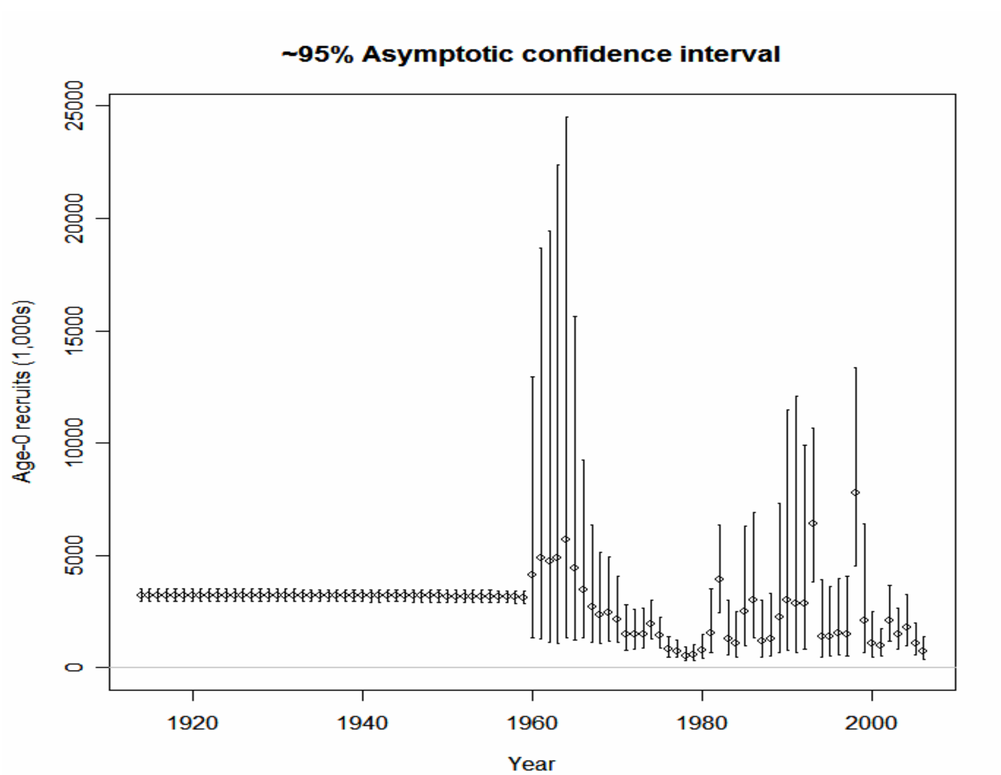
Figures 44 (a-b). Estimated spawning biomass (with approximate 95% confidence intervals) (top) and depletion (bottom) from the base model. [***Note*** that spawning biomass in this assessment is in millions of larvae, not metric tons as the figure labels.]



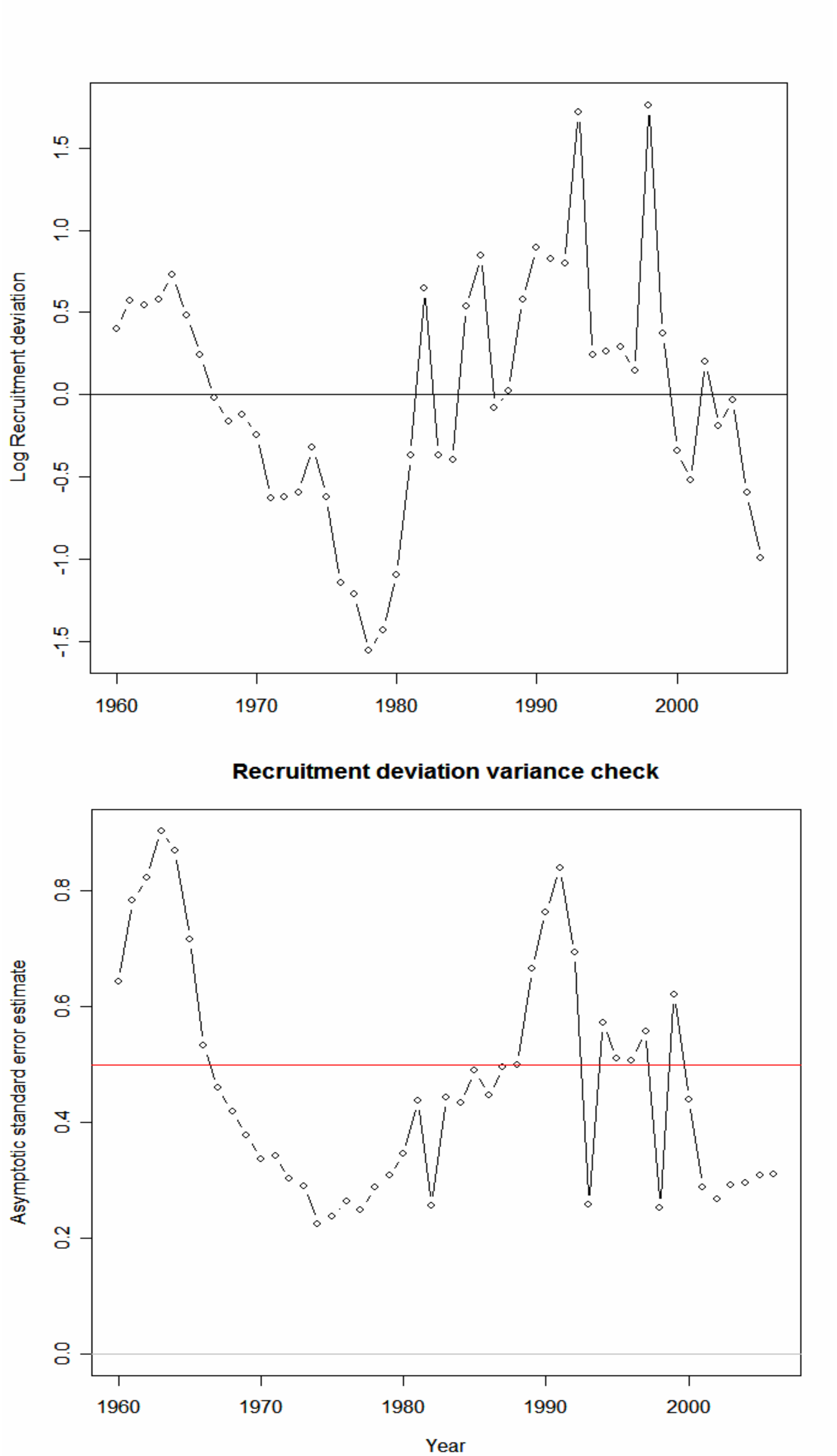


Figures 45 (a-b). Time series of estimated spawning potential ratio (SPR) for the base case model. Values of SPR below 0.5 reflect harvests in excess of the current overfishing proxy. Estimated spawning potential ratio relative to the proxy target of 50% vs. estimated spawning biomass relative to the 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.

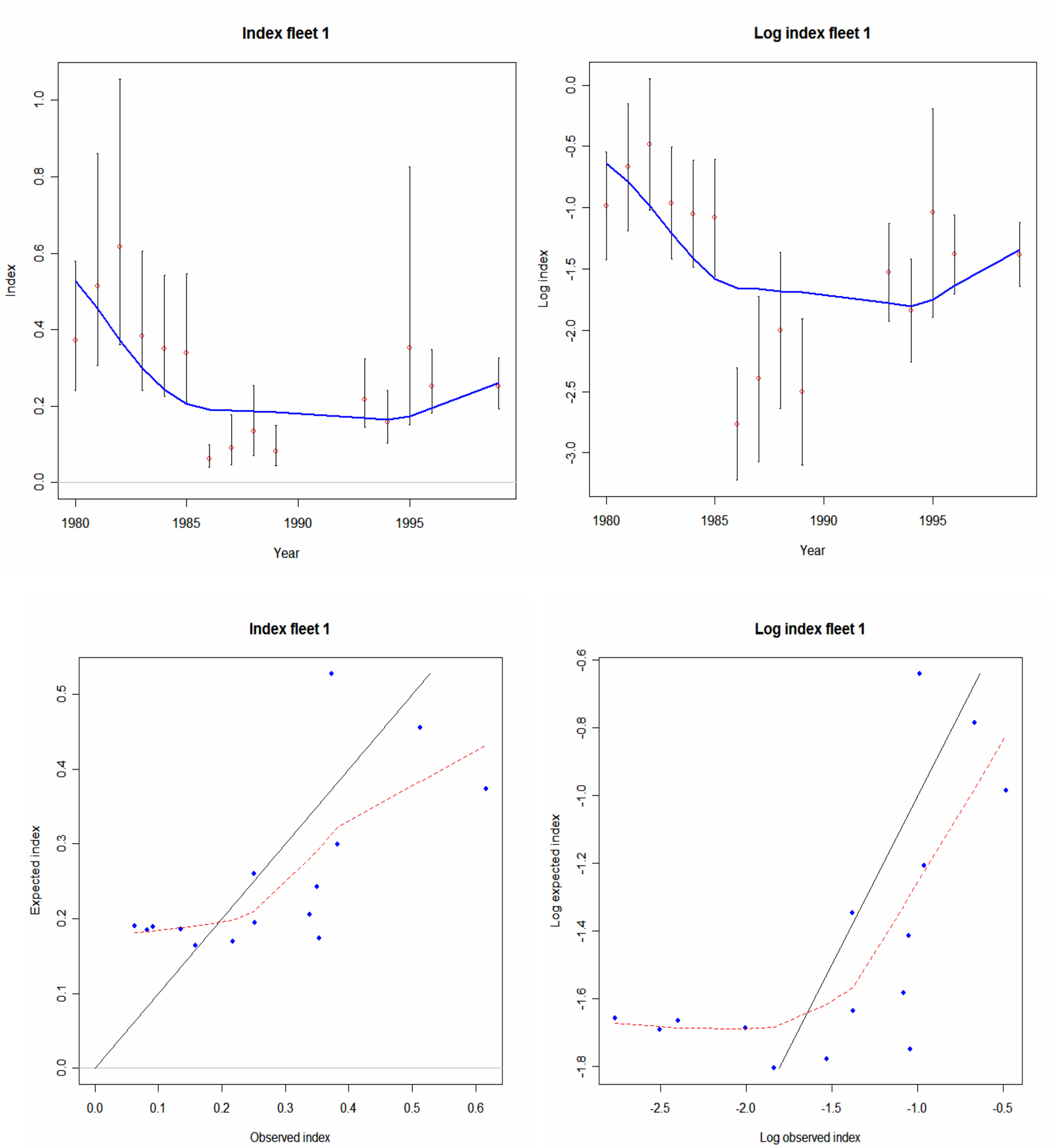




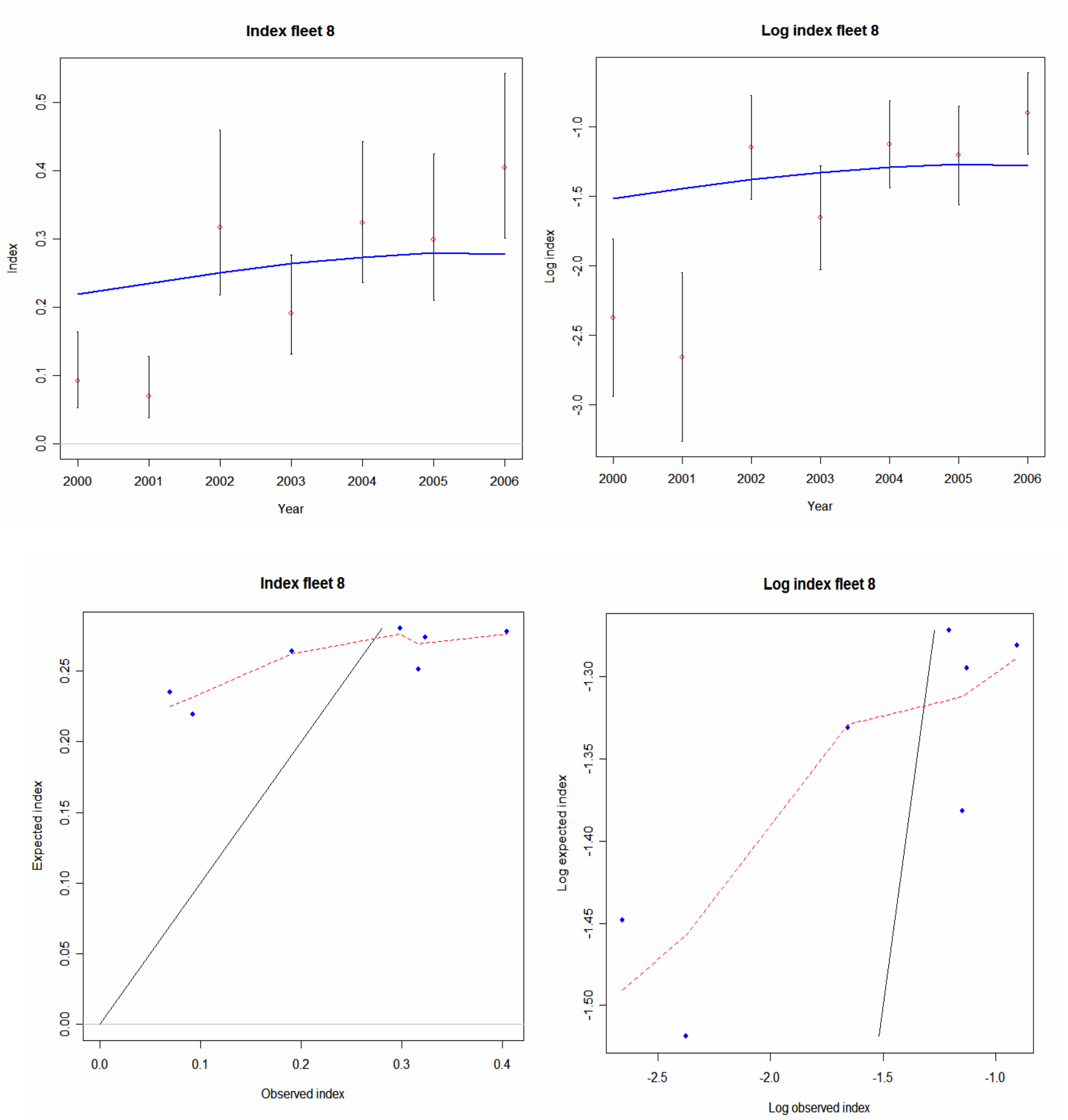
Figures 46 (a-b). Estimated age -0 recruitment (1000s) (top) and approximate 95% confidence intervals (bottom) from the base model.



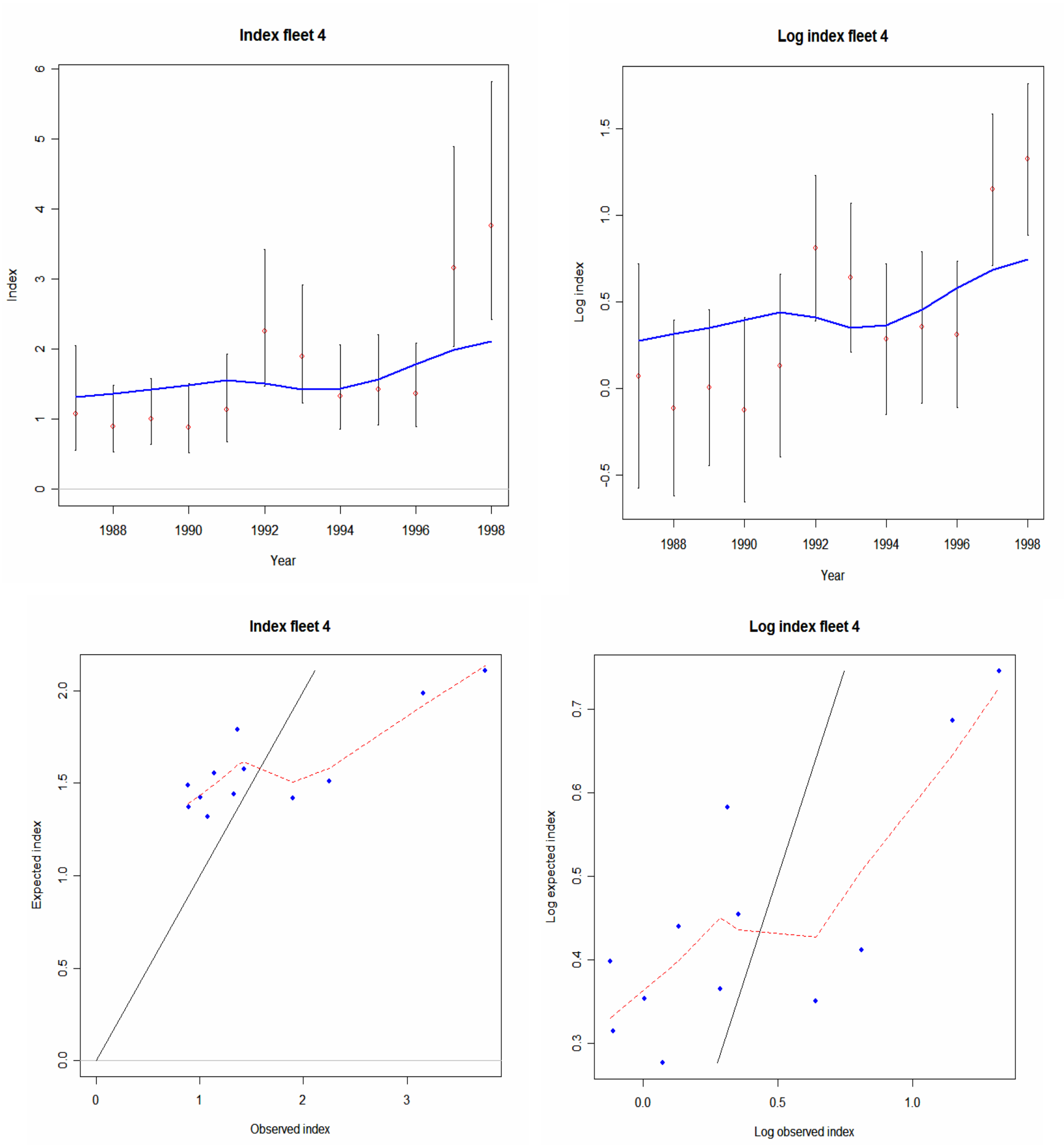
Figures 47 (a-b). Estimated log recruitment deviations (top) and variance check (sigmaR=0.5) (bottom) from the base model.



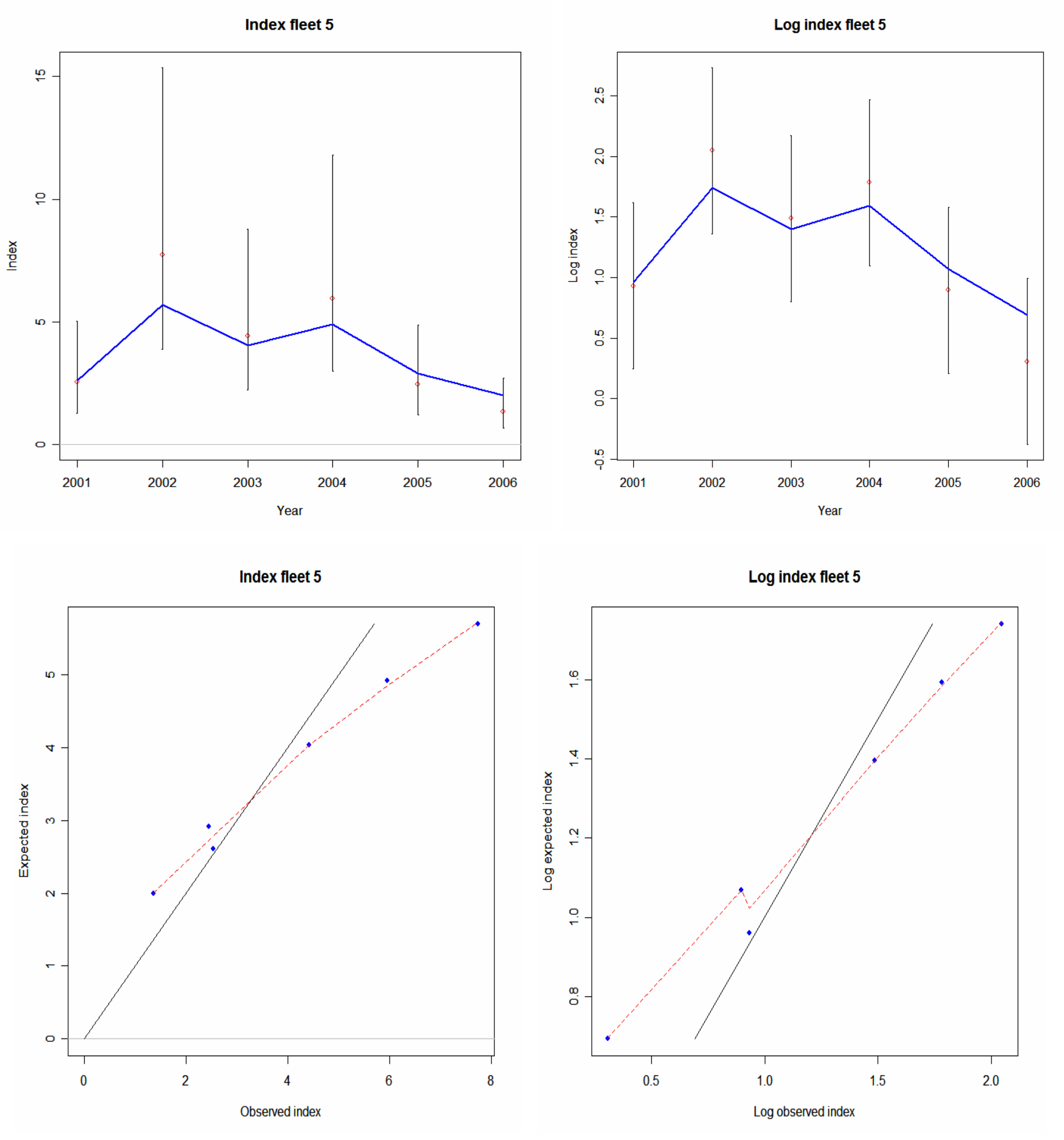
Figures 48 (a-d). Fits to 1980-1999 recreational RecFIN CPUE index (top) and the observed vs. expected sample sizes (bottom). This index was split into two separate indices to account for the change in q once the bag limit changed from 15 to 10 fish in 2000.



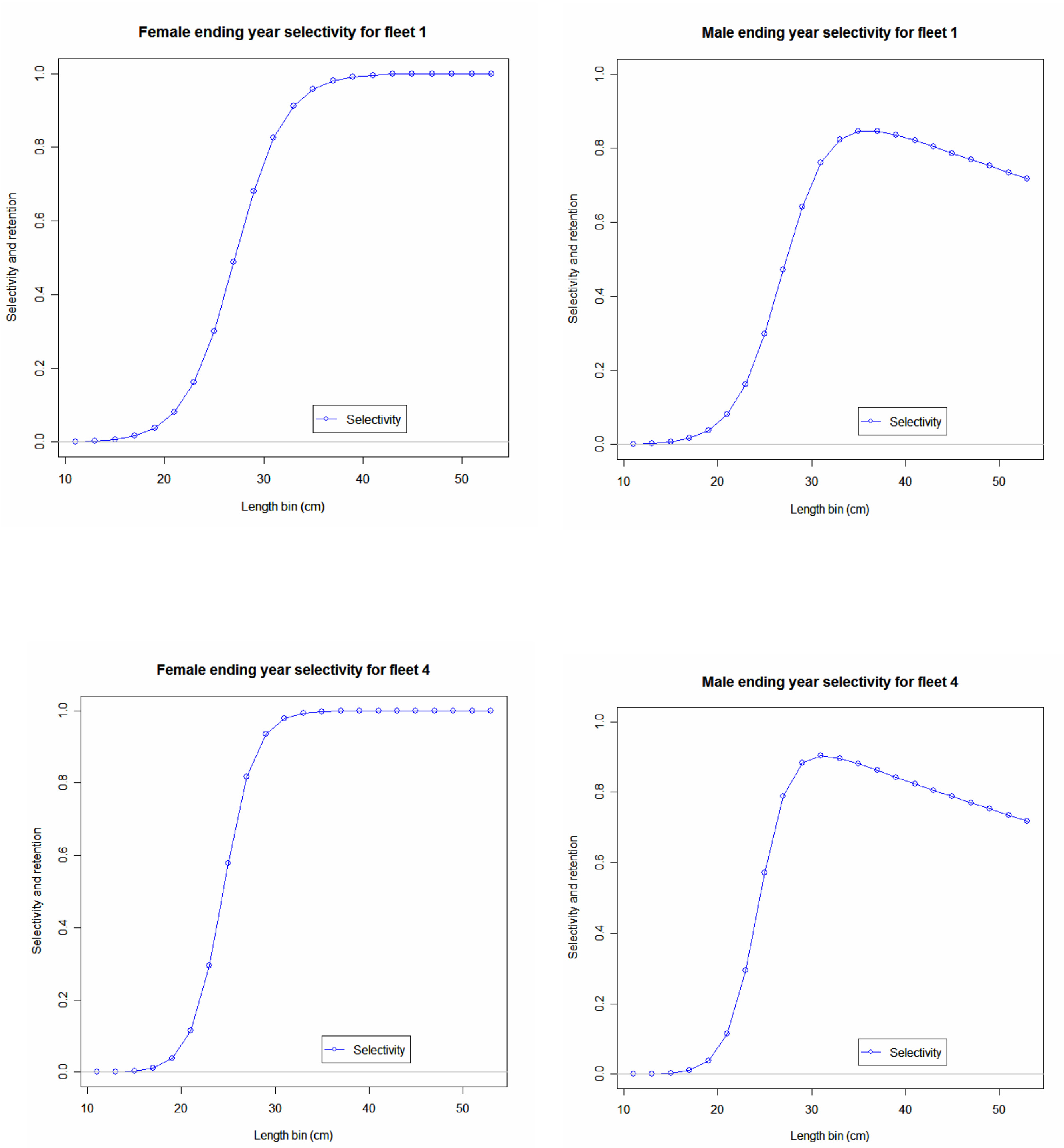
Figures 49 (a-d). Fits to 2000-2006 recreational RecFIN CPUE index (top) and the observed vs. expected sample sizes (bottom). This index was split into two separate indices to account for the change in q once the bag limit changed from 15 to 10 fish in 2000.



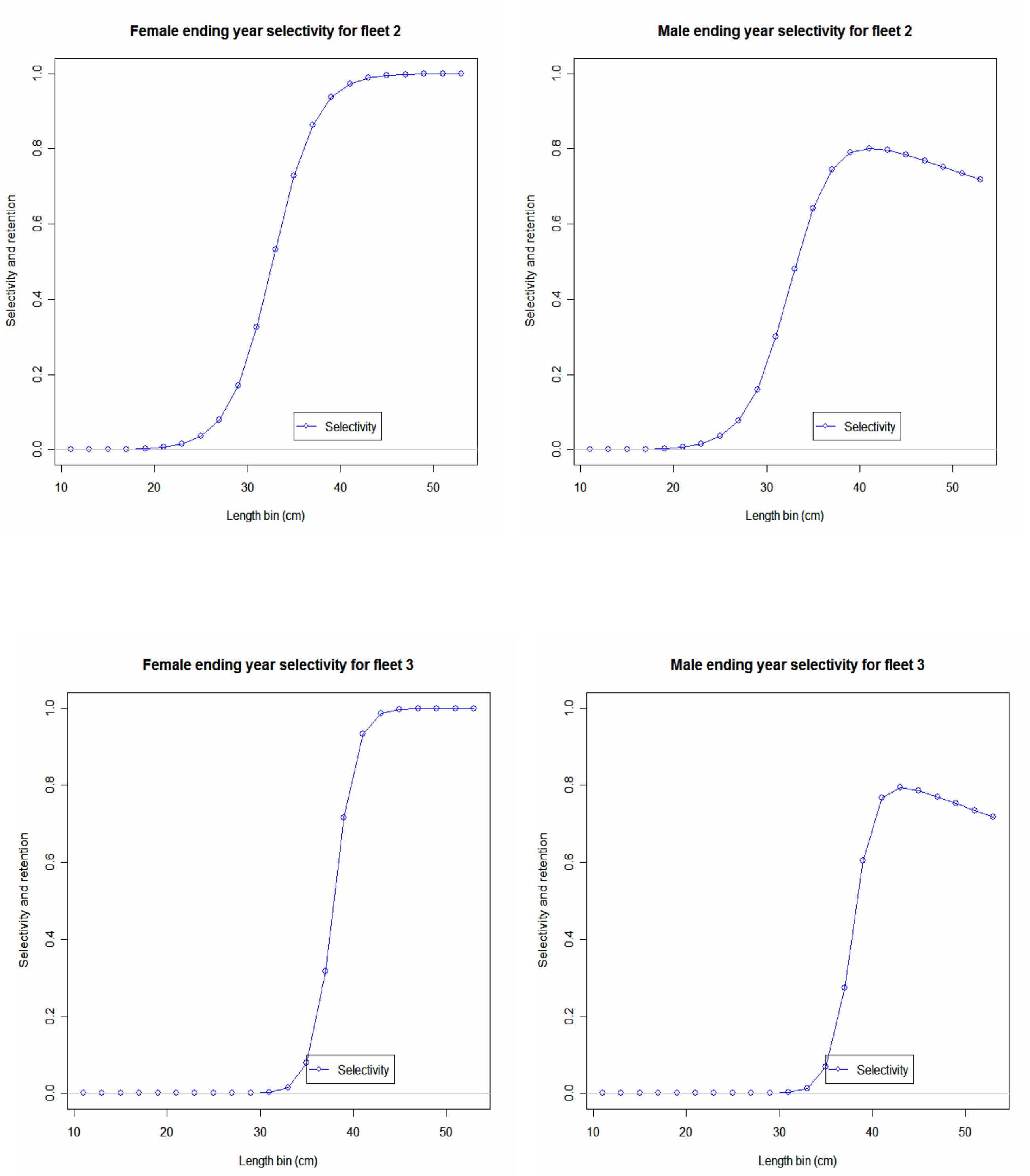
Figures 50 (a-d). Fits to recreational CDFG CPFV onboard survey CPUE index (top) and the observed vs. expected sample sizes (bottom).



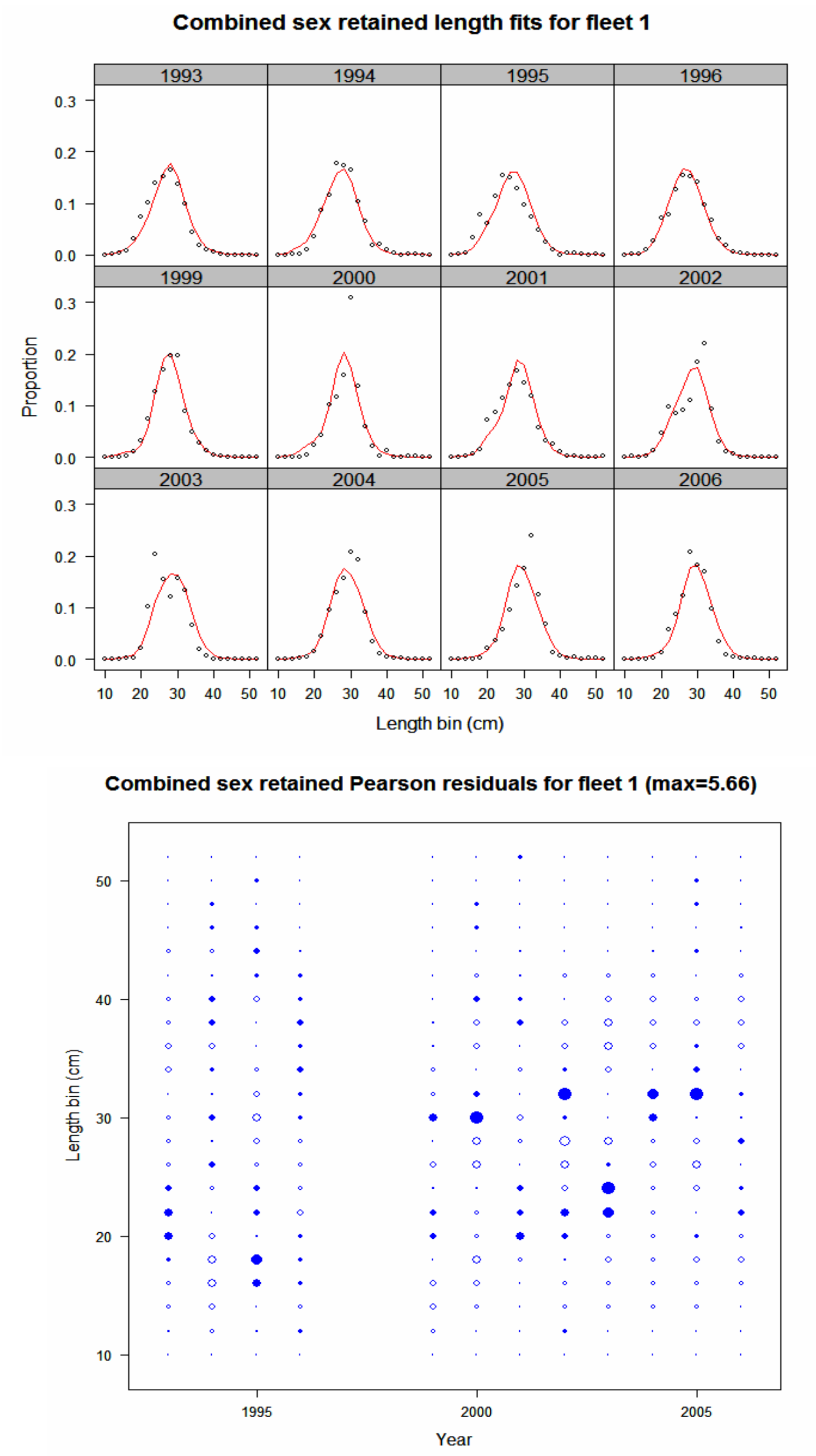
Figures 51 (a-d). Fits to juvenile rockfish midwater trawl survey (top) and the observed vs. expected sample sizes (bottom).



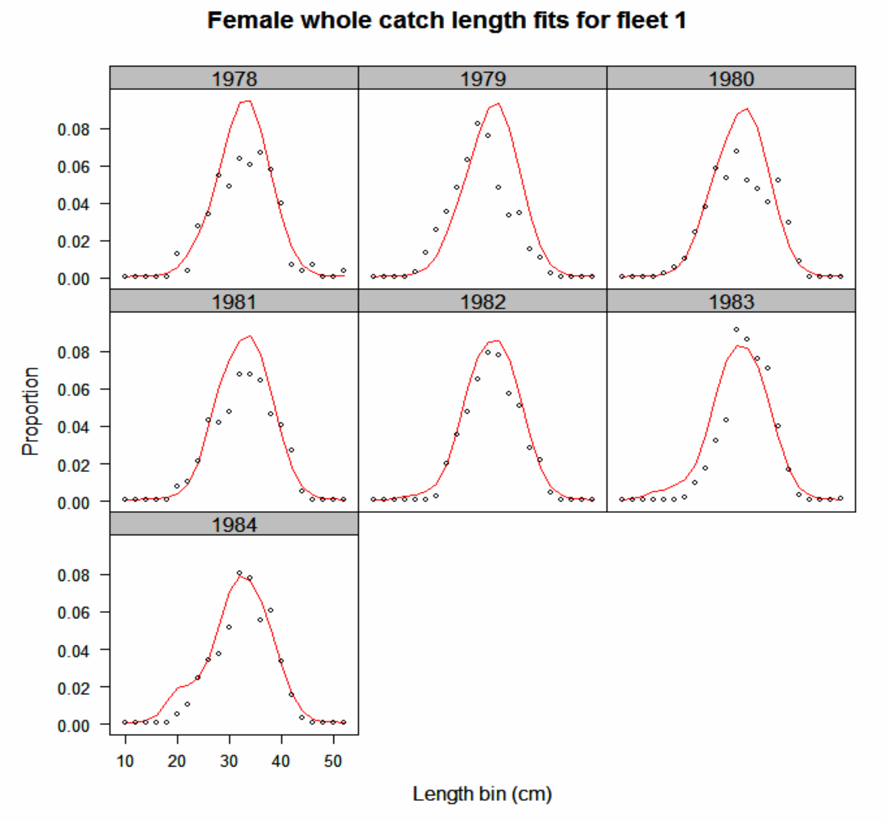
Figures 52 (a-d). Estimated selectivity curves for females and males of the recreational fishery (top, fleet 1) and the CDFG CPFV onboard observer survey (bottom, fleet 4).

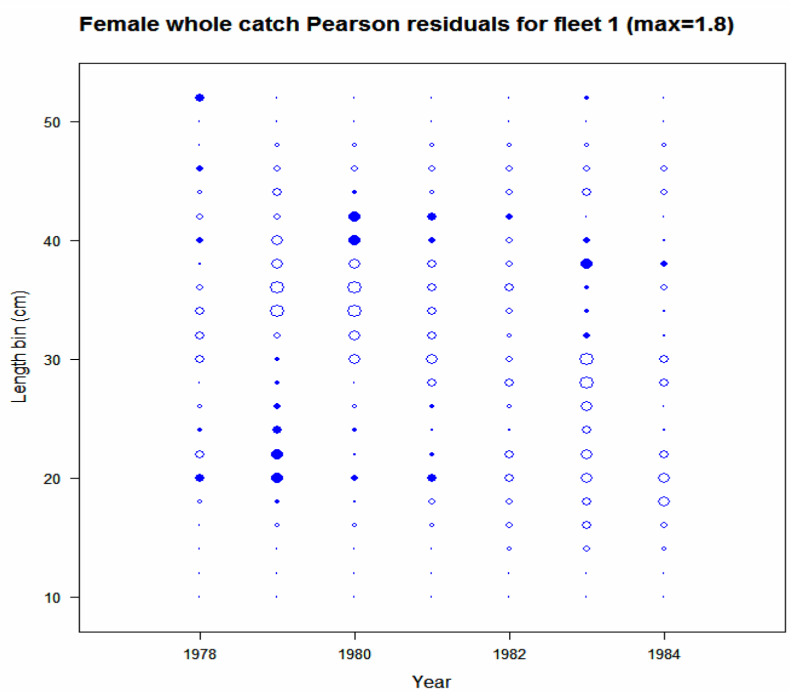


Figures 53 (a-d). Estimated selectivity curves for females and males of the commercial hook and line (top, fleet 2) and setnet (bottom, fleet 3) fisheries.

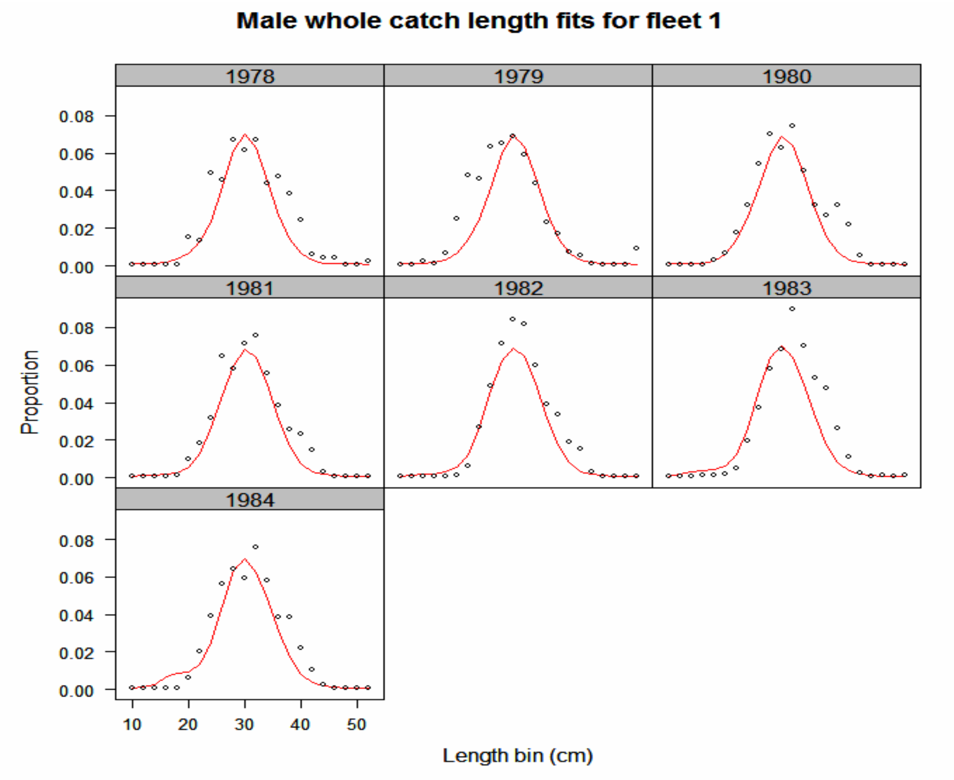


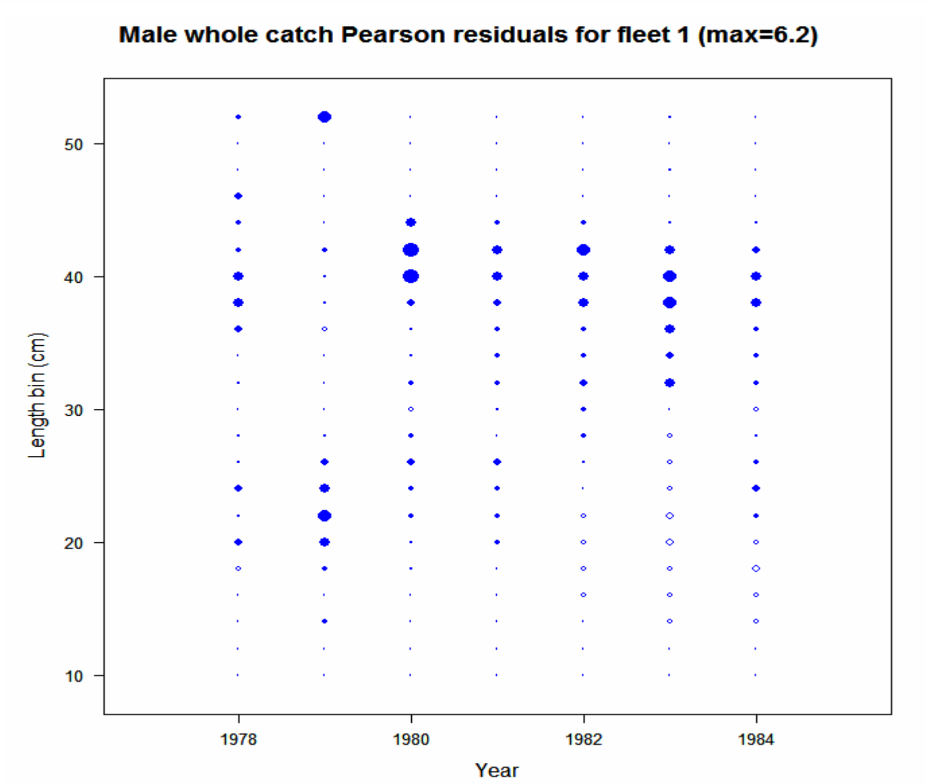
Figures 54 (a-b). Fits to the recreational (combined sex) length compositions (top) and the Pearson residual plots (bottom).



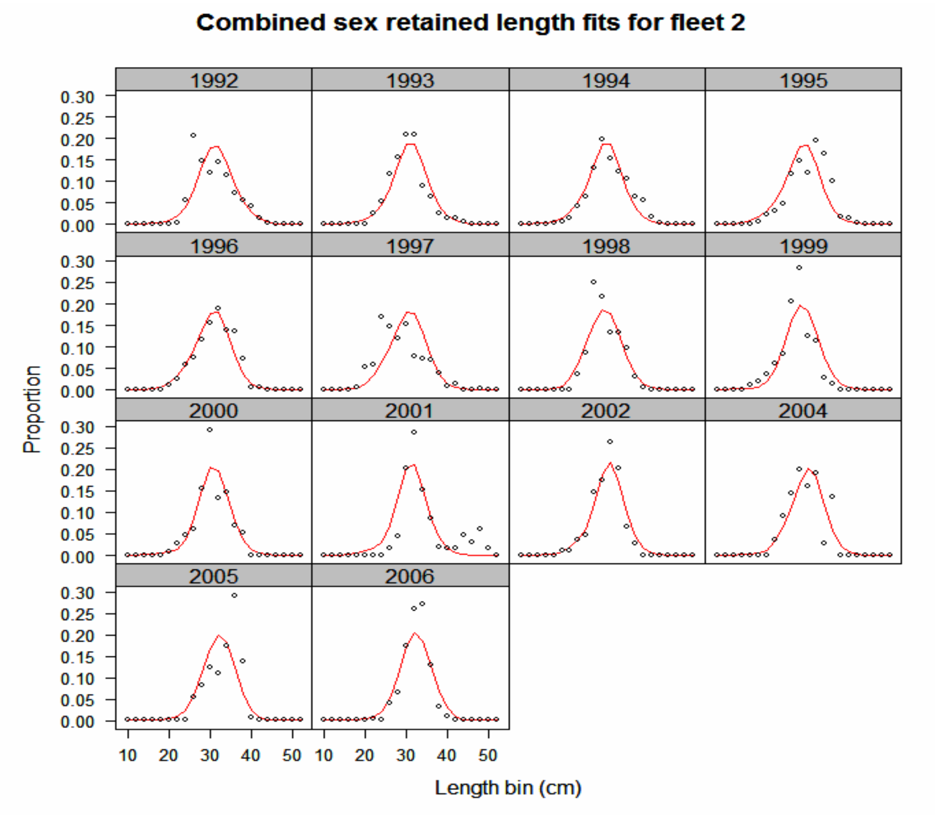


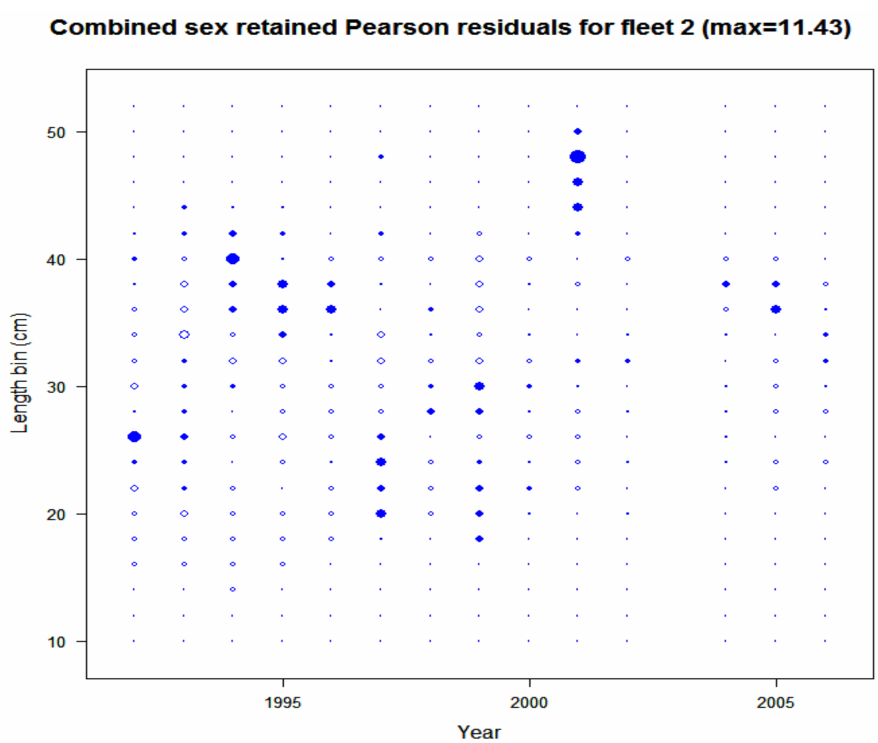
Figures 55 (a-b). Fits to the 1980s recreational CPFV length compositions for females (top) and the Pearson residual plots (bottom).



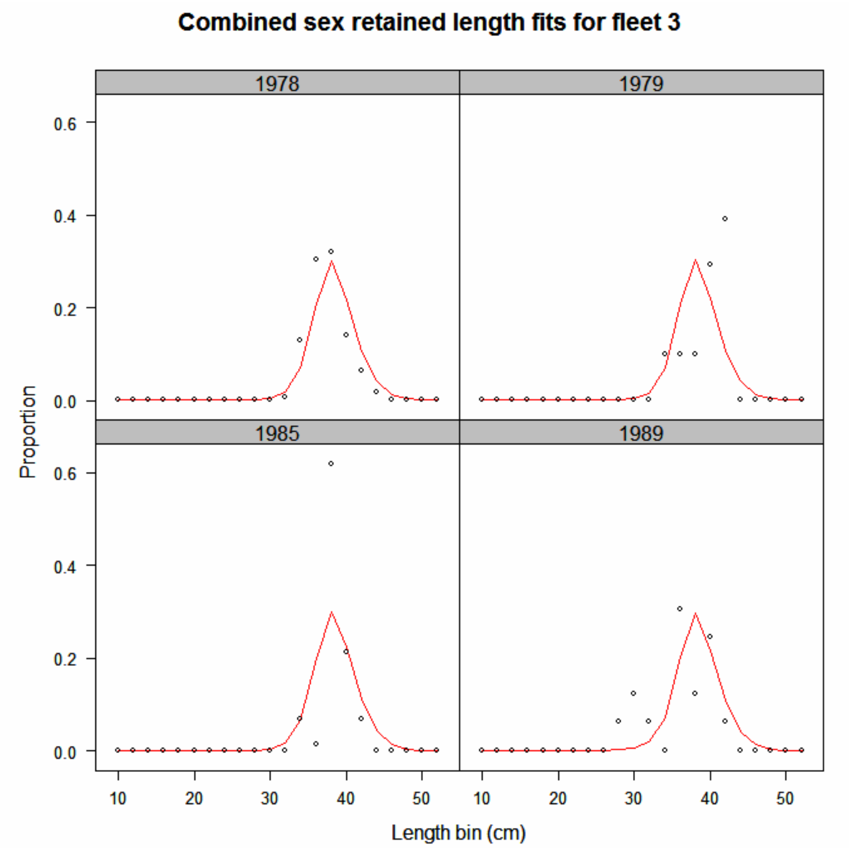


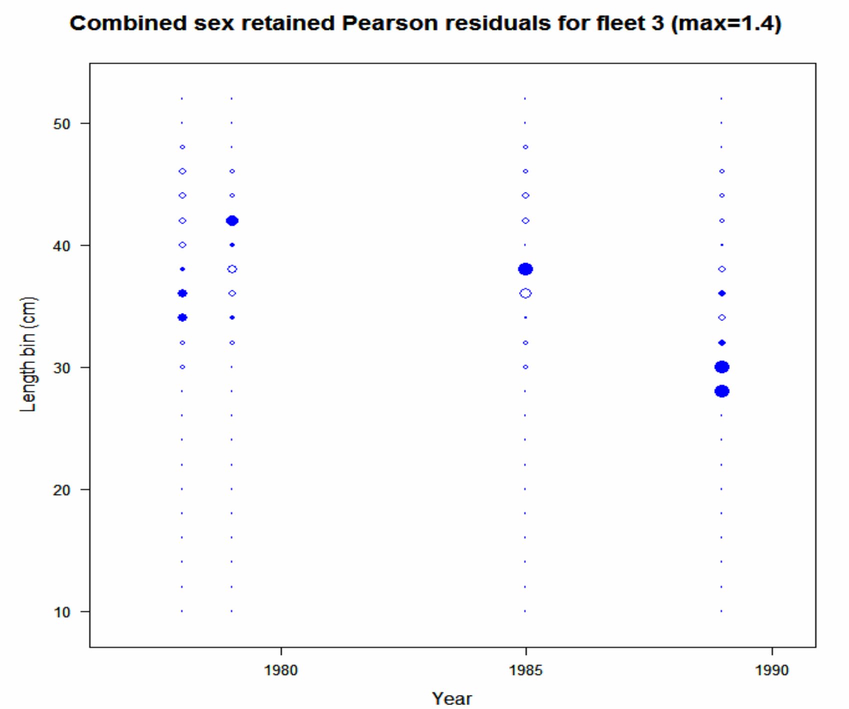
Figures 56 (a-b). Fits to the 1980s recreational CPFV length compositions for males (top) and the Pearson residual plots (bottom).



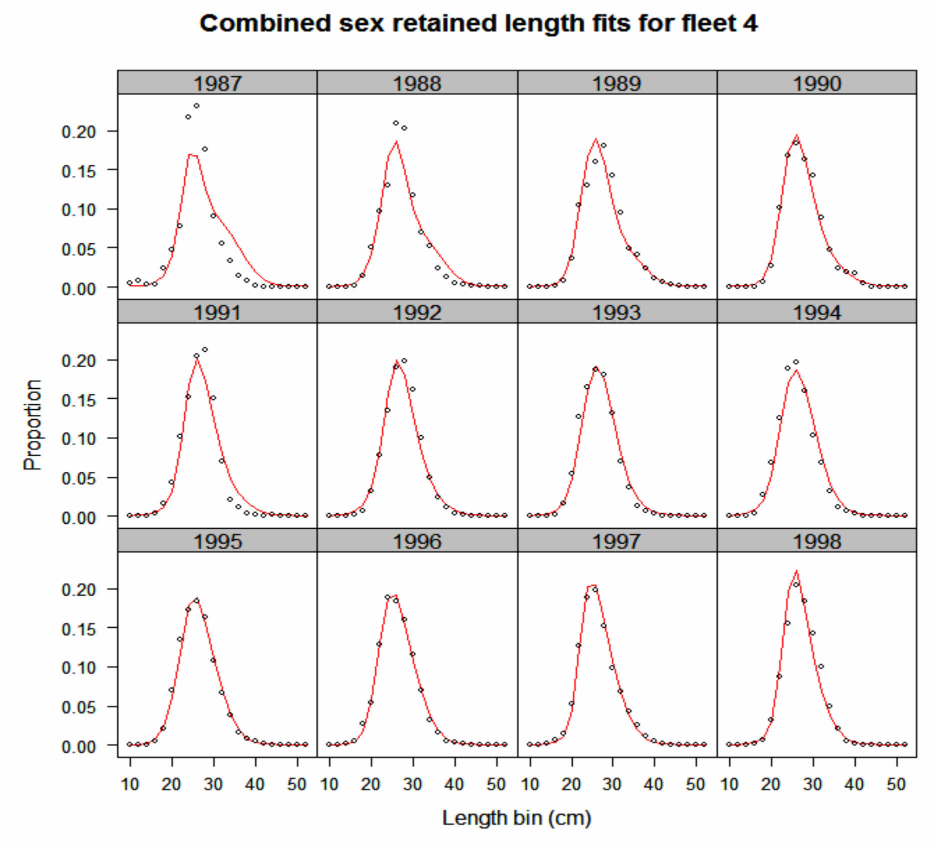


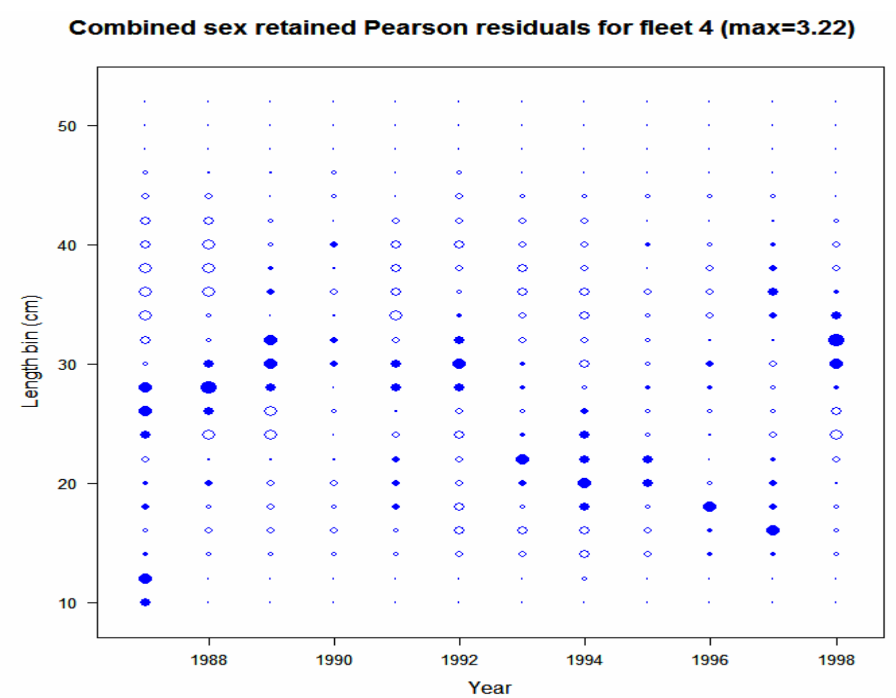
Figures 57 (a-b). Fits to the commercial hook and line (combined sex) length compositions (top) and the Pearson residual plots (bottom).



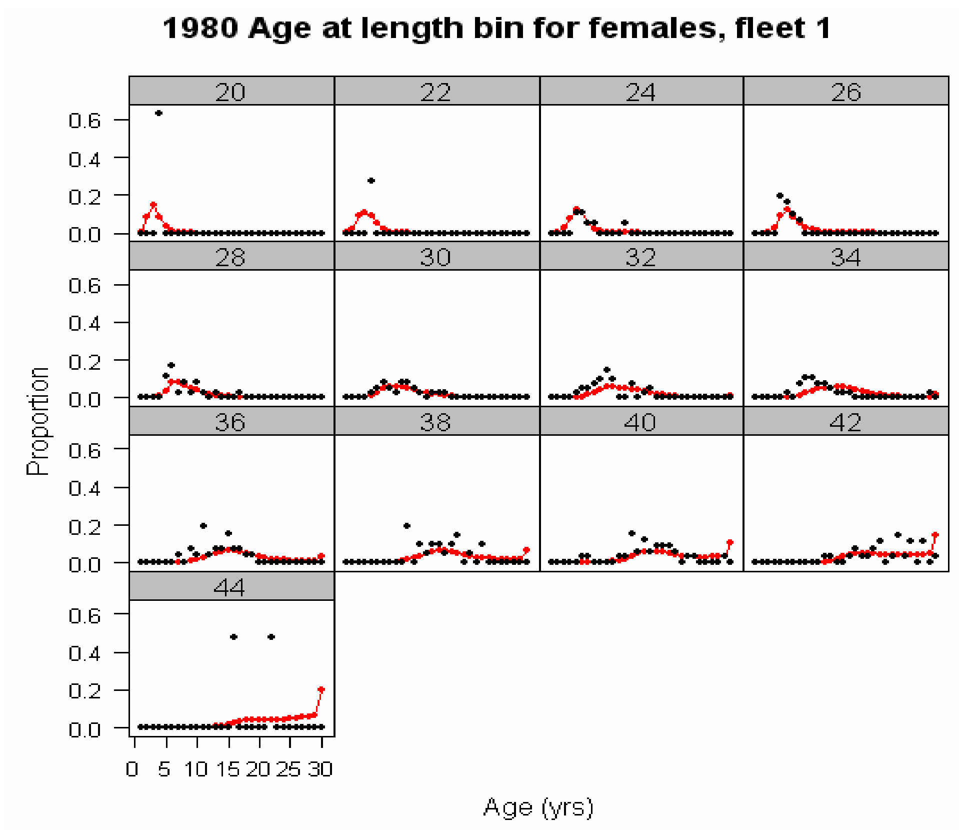


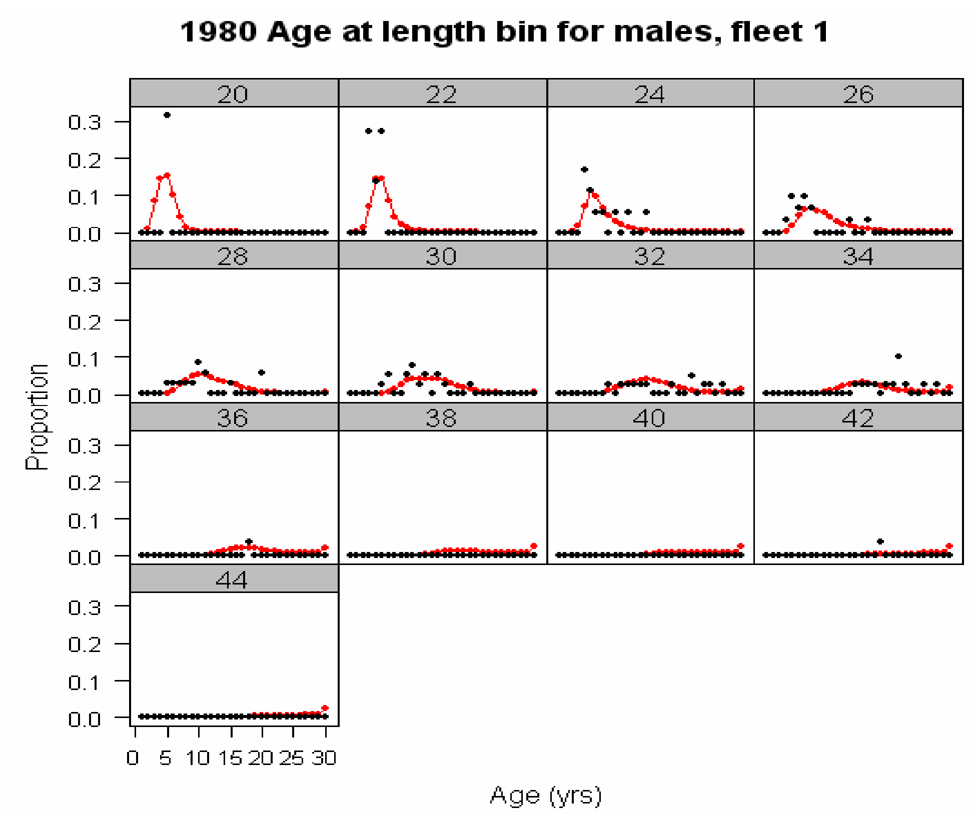
Figures 58 (a-b). Fits to the commercial setnet (combined sex) length compositions (top) and the Pearson residual plots (bottom). There were extremely low sample sizes associated with this fishery (n<10).



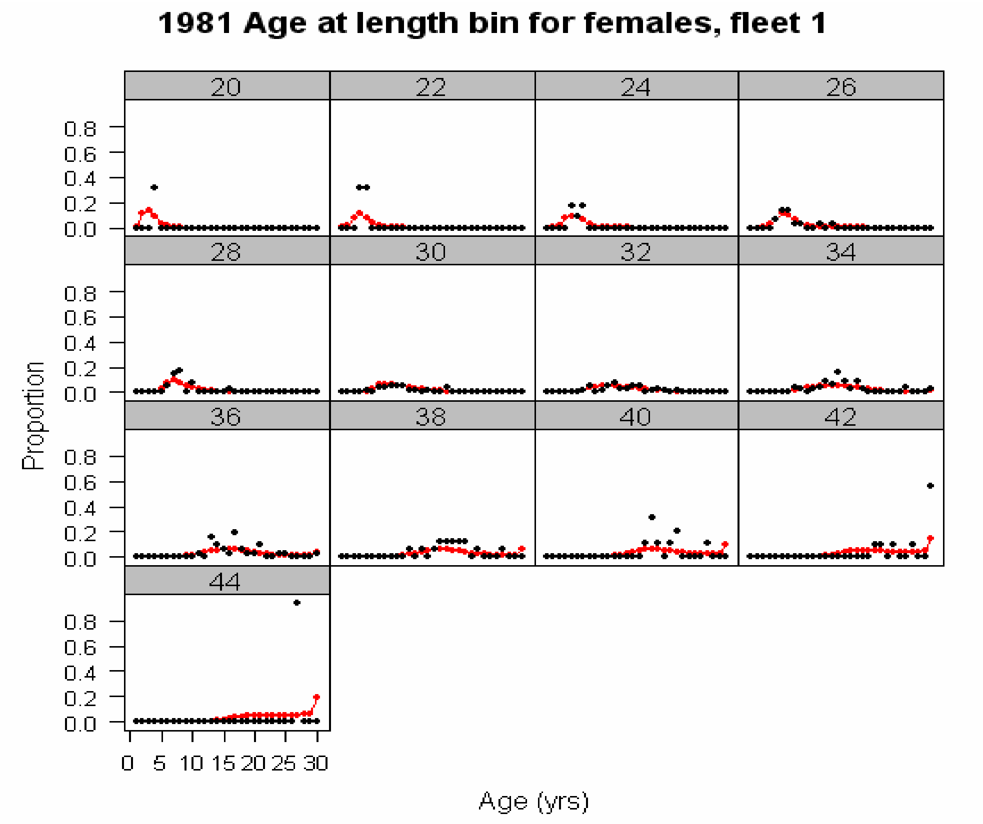


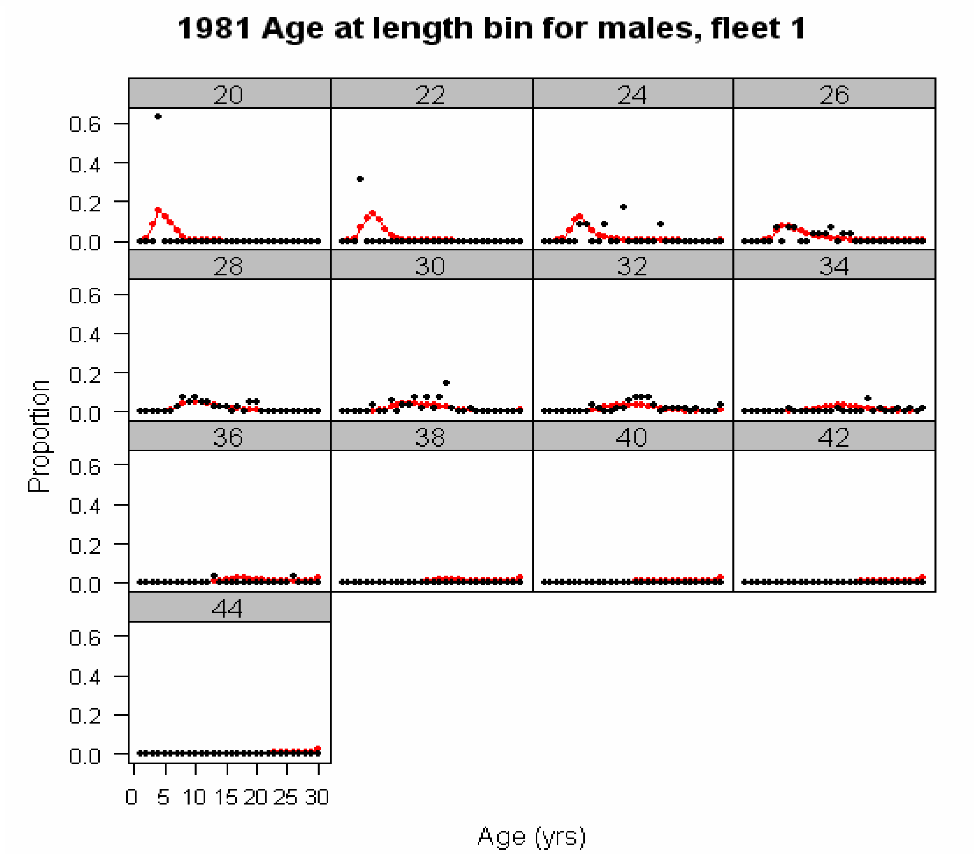
Figures 59 (a-b). Fits to the recreational (combined sex) length compositions from the CDFG CPFV onboard observer survey (top) and the Pearson residual plots (bottom).



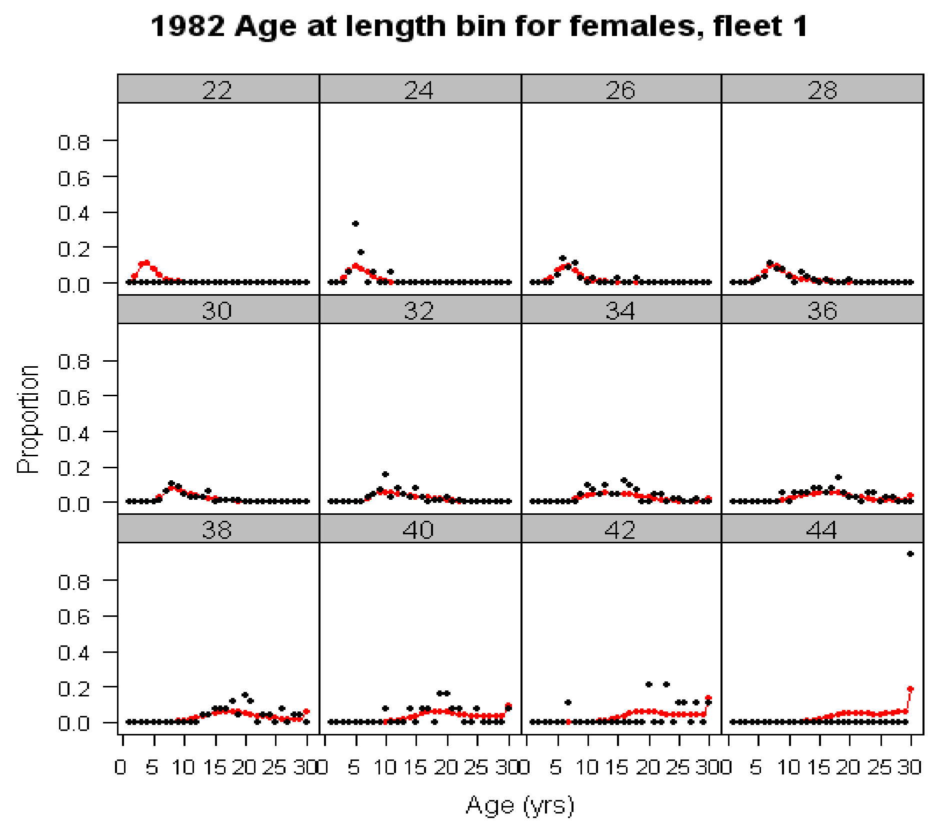


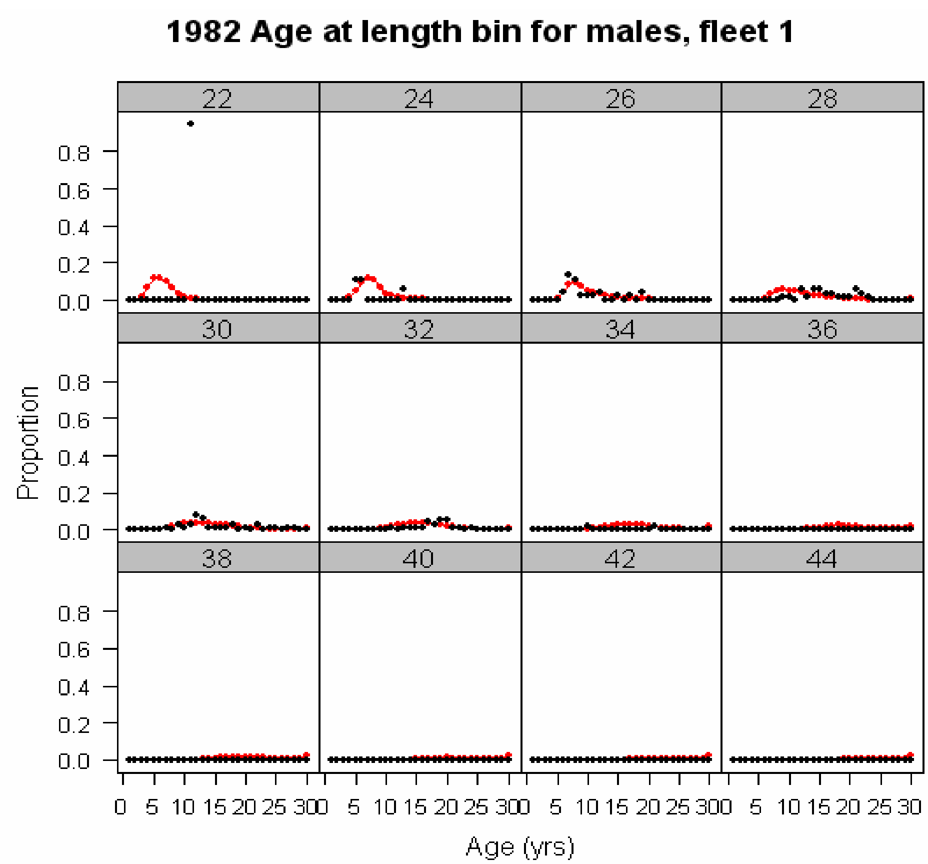
Figures 60 (a-b): Fits to conditional age-at-length data for 1980 females (top) and males (bottom).



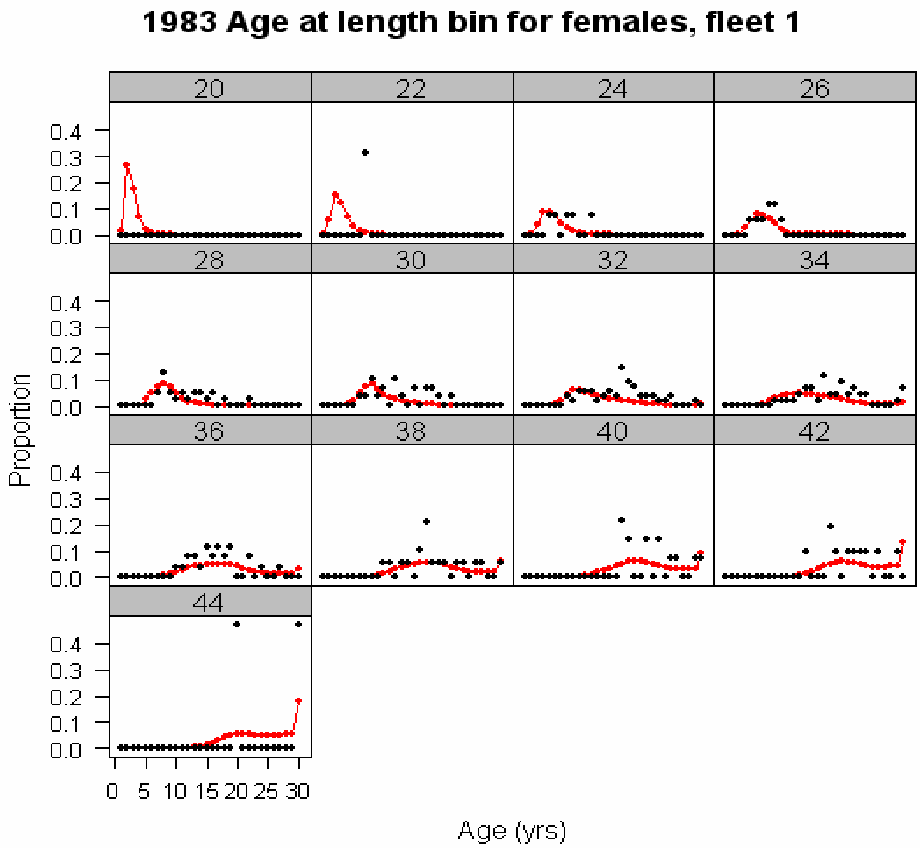


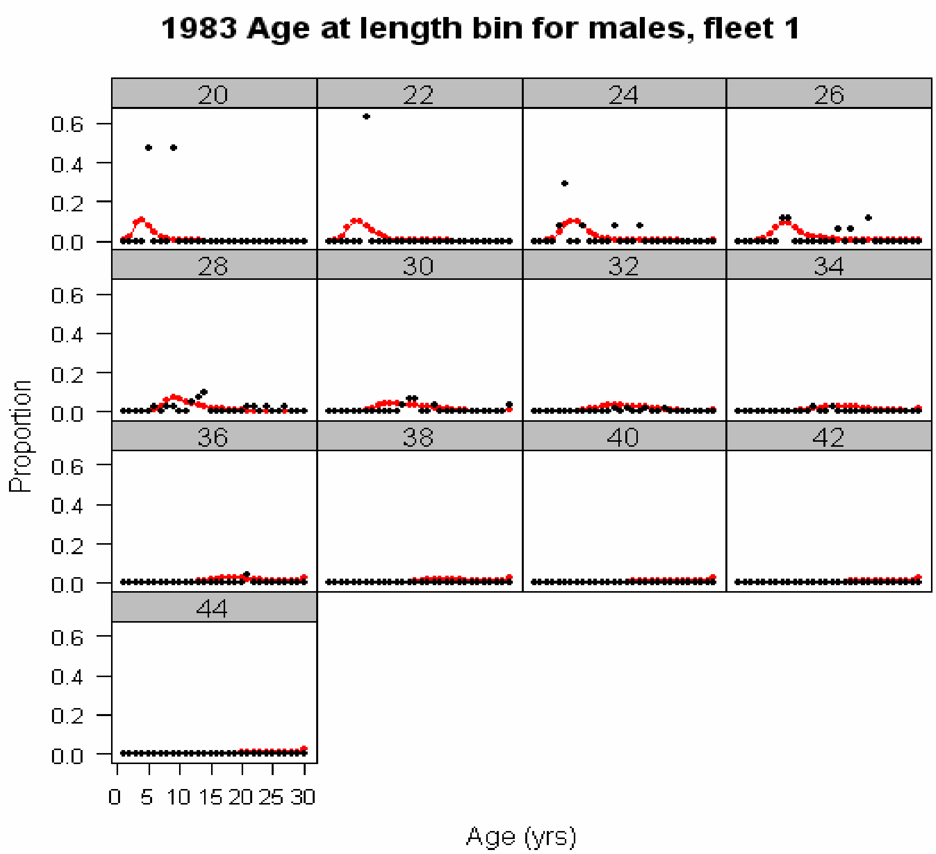
Figures 61 (a-b): Fits to conditional age-at-length data for 1981 females (top) and males (bottom).



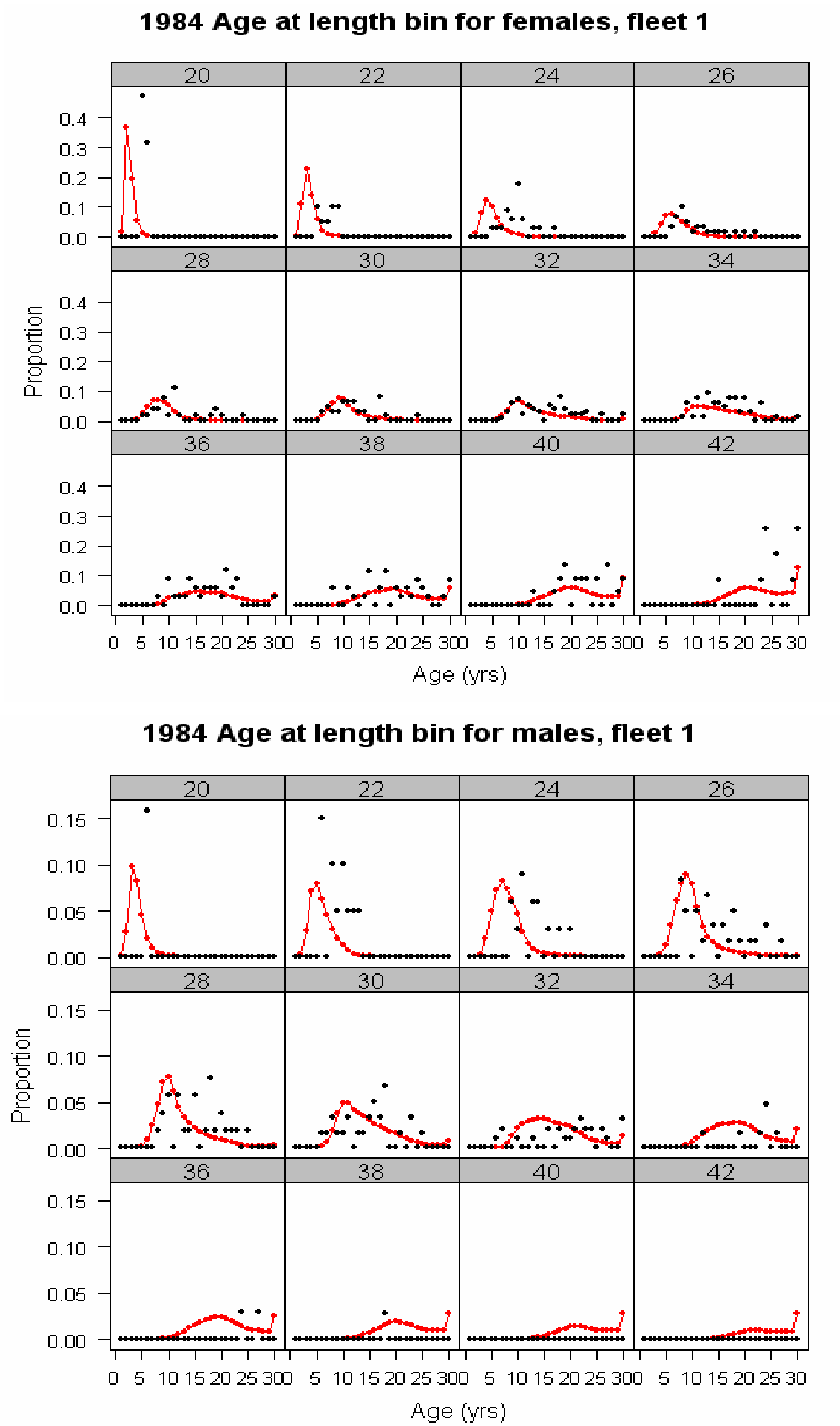


Figures 62 (a-b): Fits to conditional age-at-length data for 1982 females (top) and males (bottom).

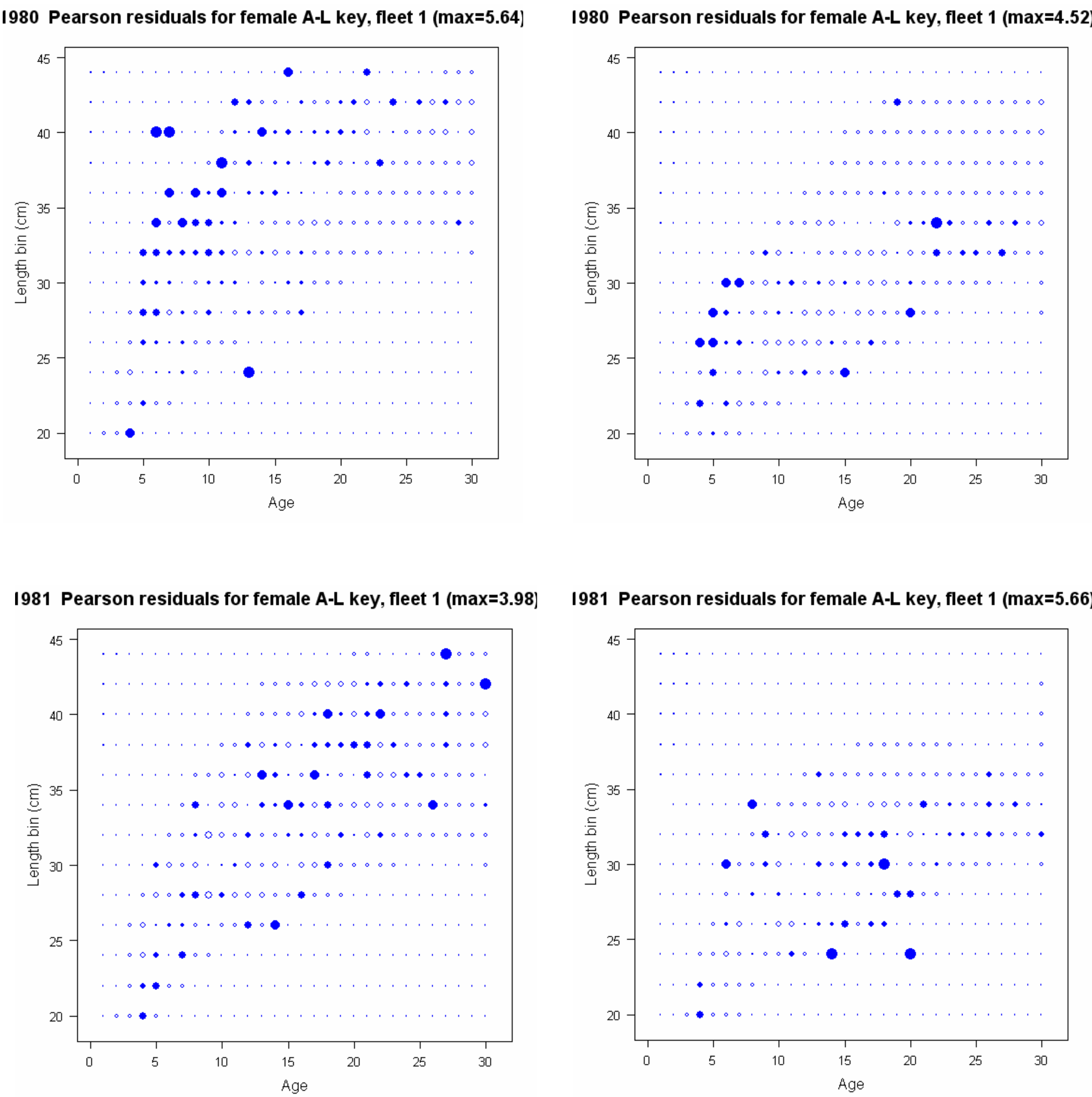




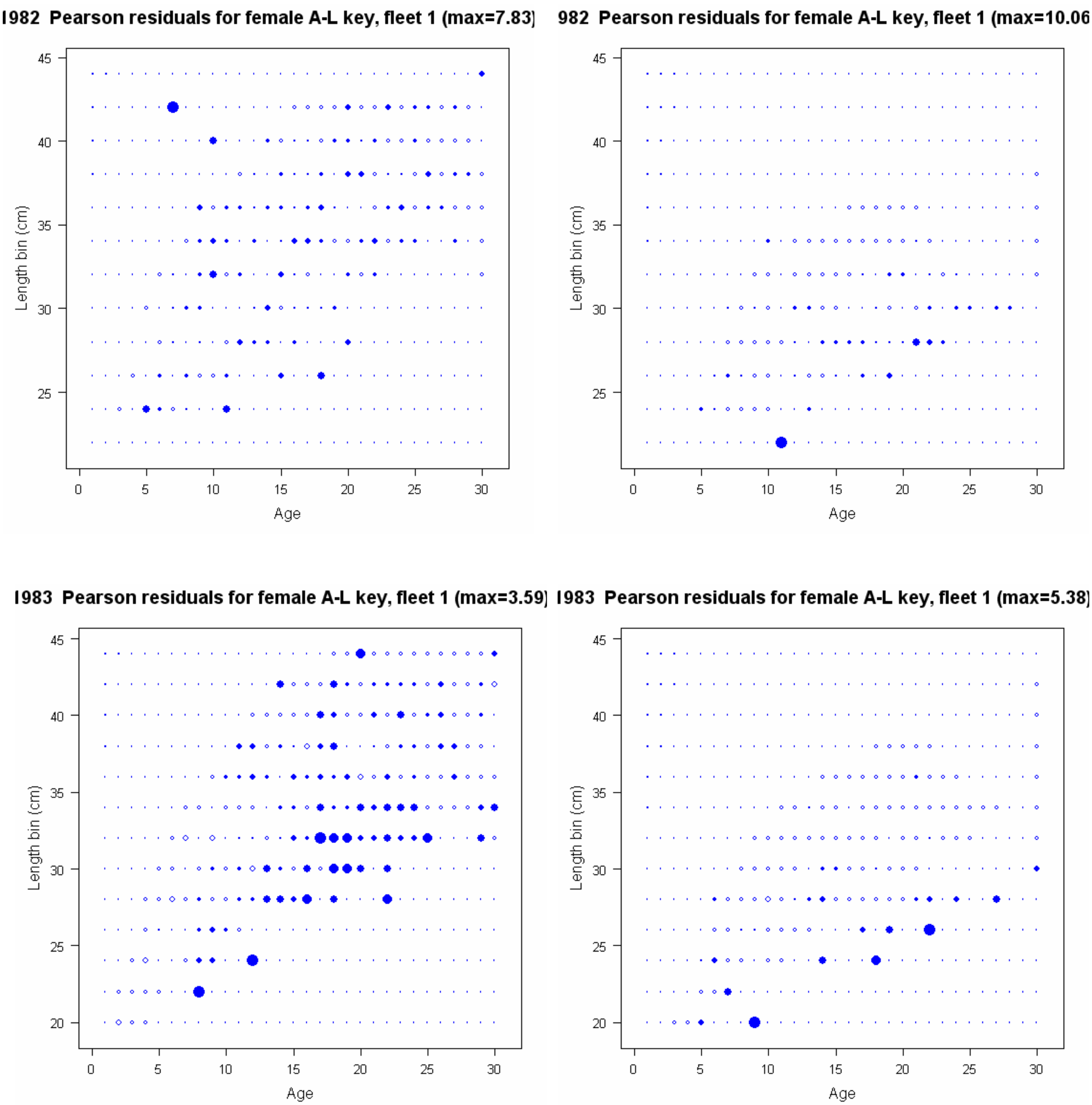
Figures 63 (a-b): Fits to conditional age-at-length data for 1983 females (top) and males (bottom).



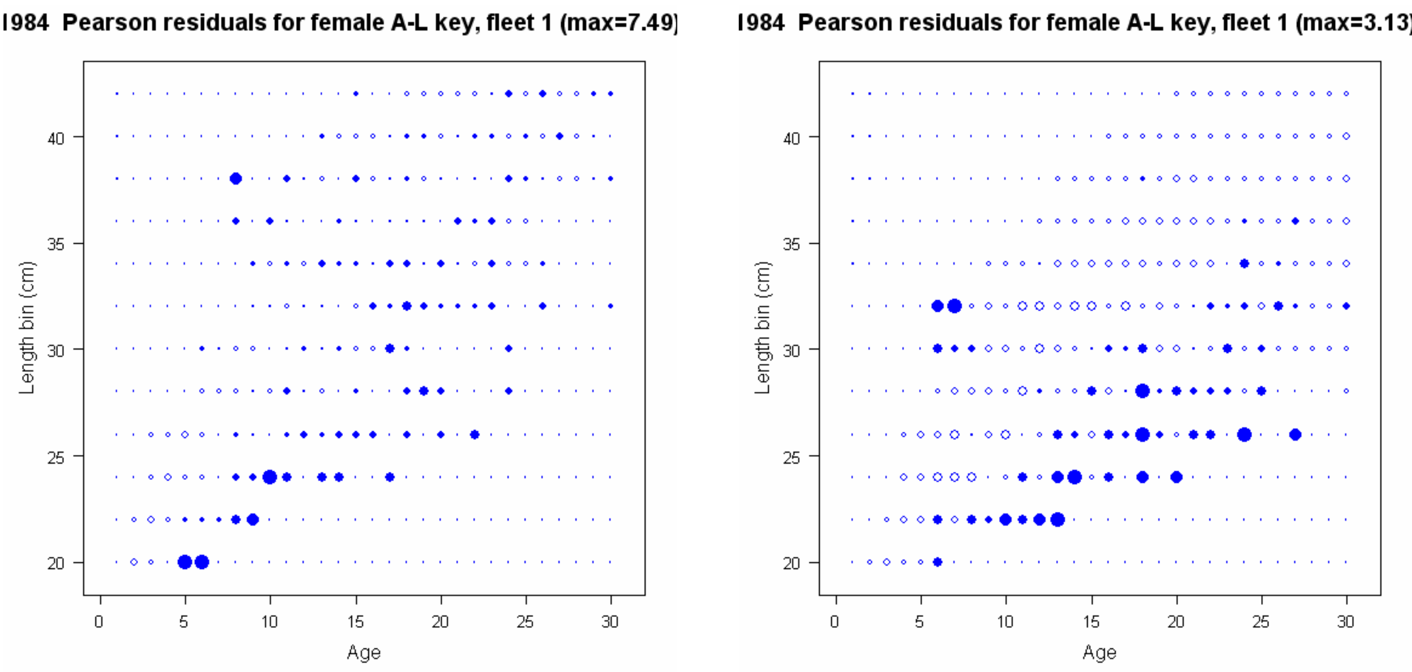
Figures 64 (a-b): Fits to conditional age-at-length data for 1984 females (top) and males (bottom).

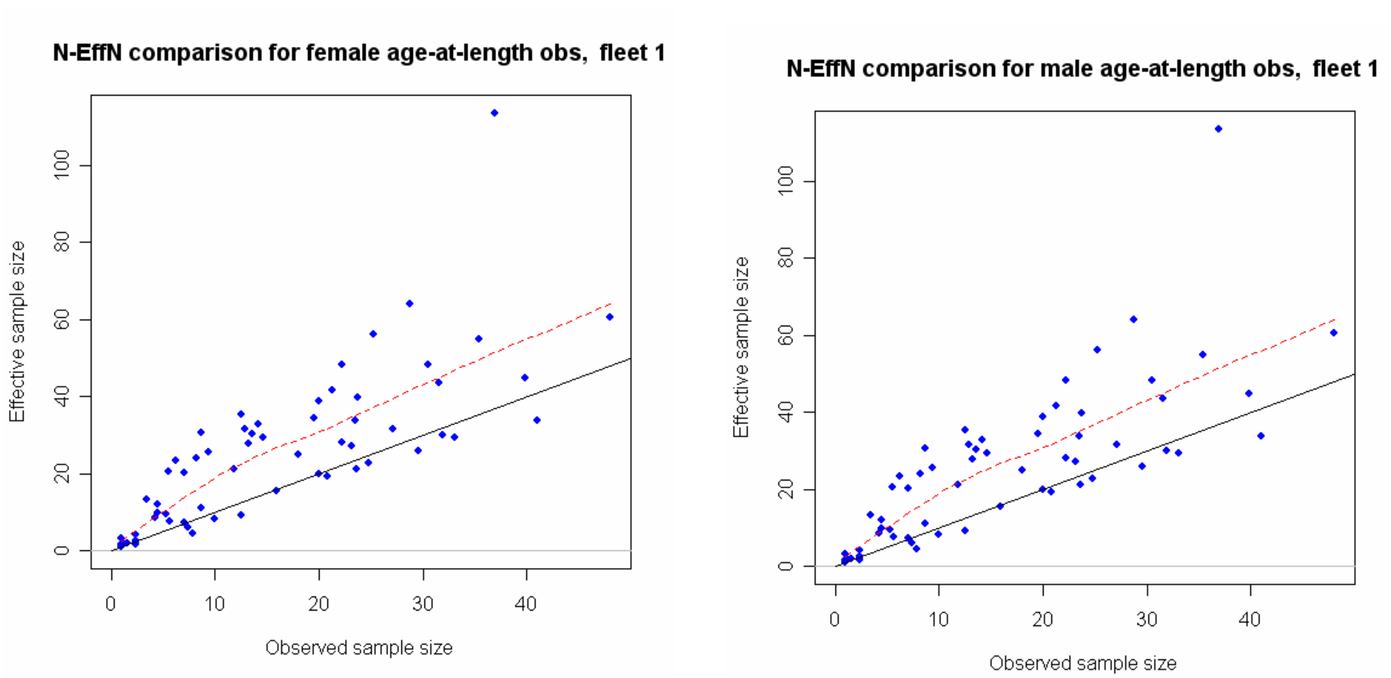


Figures 65 (a-d): Pearson residual plots from fits to age-at-length data by sex for 1980 (top) and 1981 (bottom). [***Note*** that figures on the left are for females, figures on right are for males. There was a slight labeling error in the graphics package.]

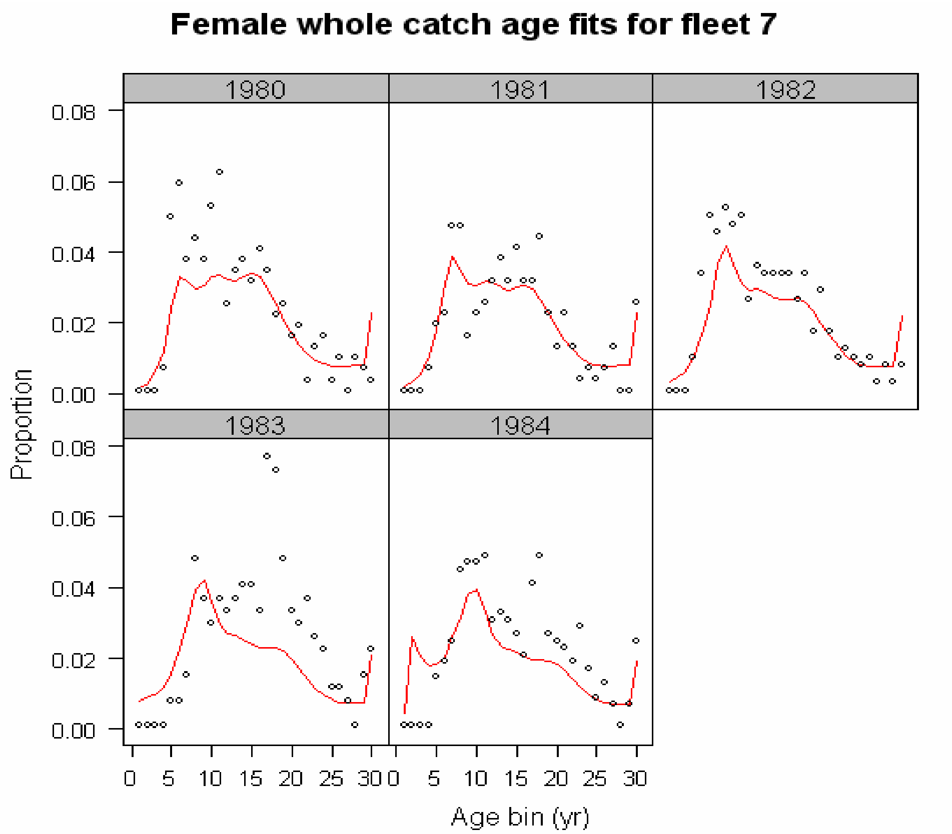


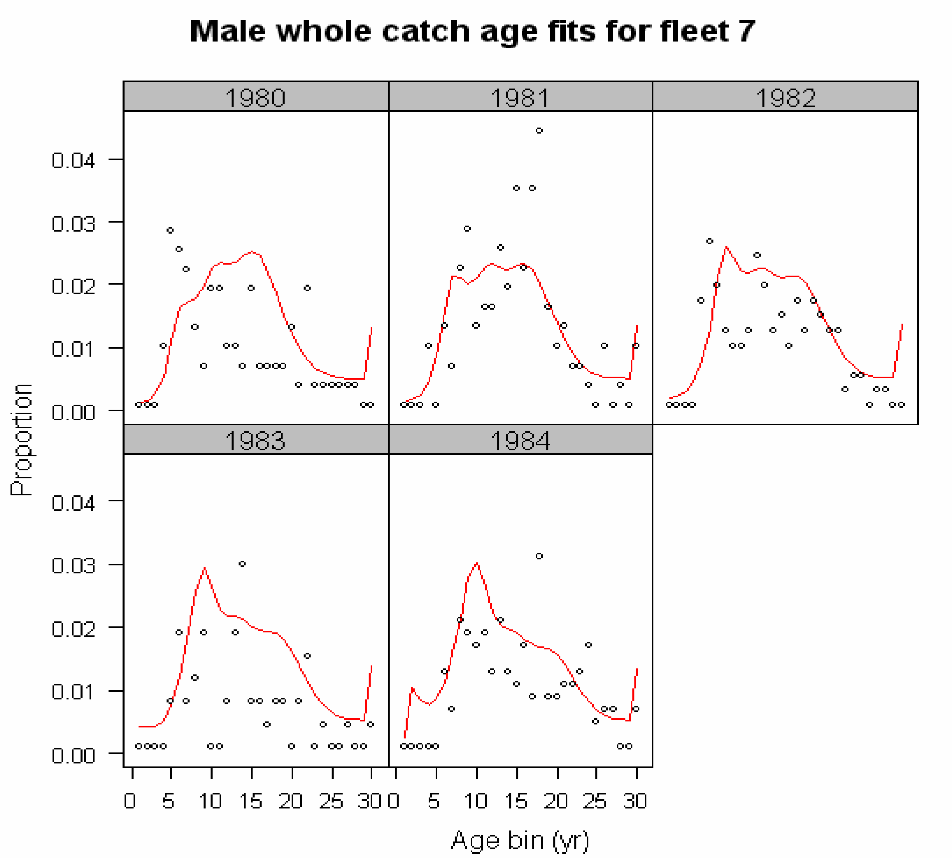
Figures 66 (a-d): Pearson residual plots from fits to age-at-length data by sex for 1982 (top) and 1983 (bottom). [***Note*** that figures on the left are for females, figures on right are for males. There was a slight labeling error in the graphics package.]





Figures 67 (a-b, top) and 68 (a-b, bottom). Pearson residual plots from fits to age-at-length data by sex for 1984 (top) and the observed and effective sample sizes for conditional age-at-length data (bottom). [***Note*** for top figures: left are for females, right are for males. There was a slight labeling error in the graphics package.]





Figures 69 (a-b) : Marginal fits to age composition data (representing the conditional age-at-length data in a more traditional format by using a "ghost" fishery and mirrored selectivity to fleet 1, the recreational fishery) for females (top) and males (bottom).

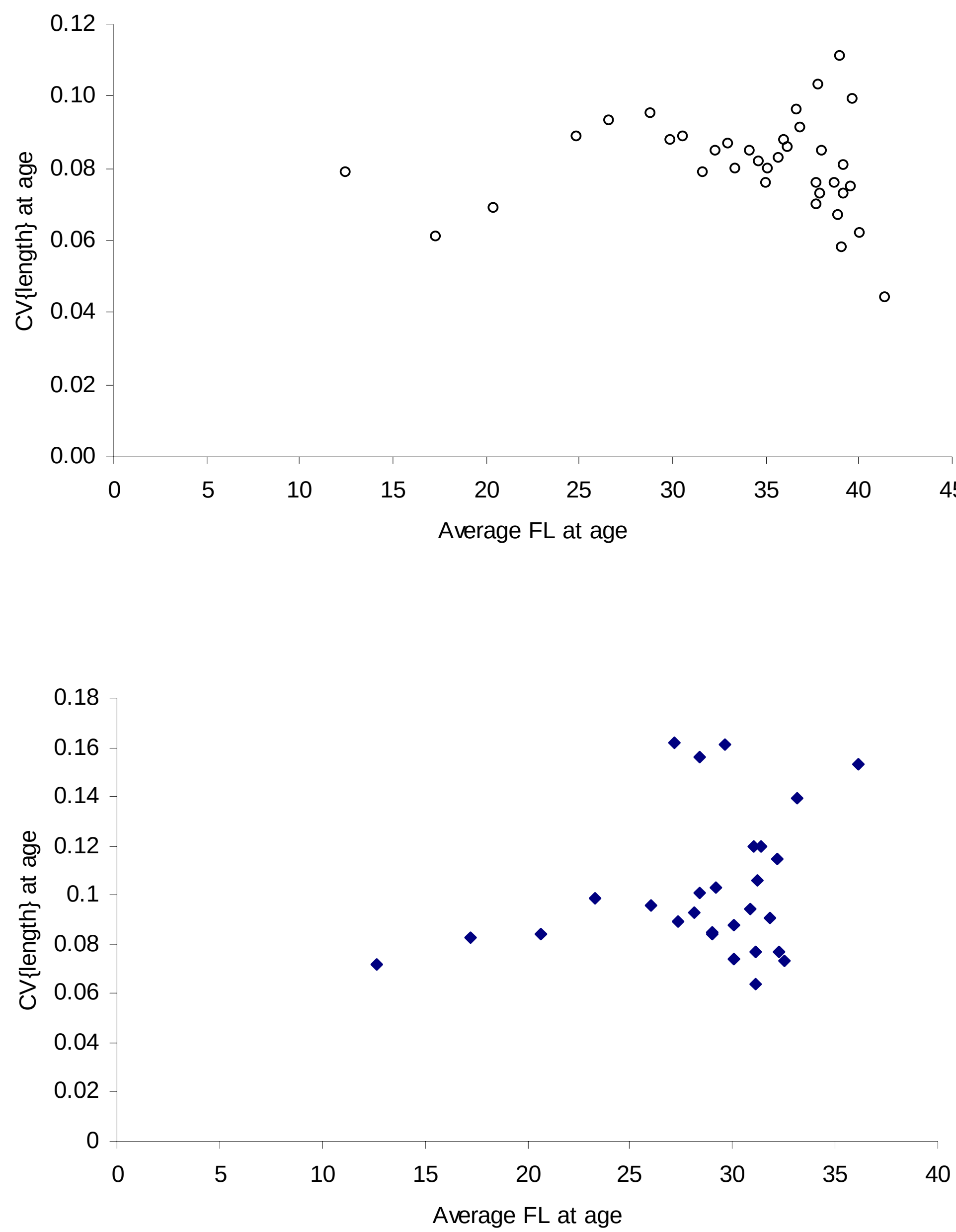


Figure 70. Externally estimated CVs for length at age for females (top) and males (bottom) using the 1980s recreational age data. The variation in growth from young to old for females appears to be more constant than males.

APPENDIX A

Pre-Assessment Data Workshop - Blue Rockfish

March 14, 2007
Monterey, CA 1:00-5:00

Participants:

Brian Cutting - Big Sur (recreational)
Ken Stagnaro - Santa Cruz (recreational)
Josh Churchman - Bolinas (commercial)
Bruce Miller - Crescent City (commercial)
Tom Mattusch - Half Moon Bay (recreational)
William Smith - Half Moon Bay (recreational)
Jim Martin - Ft. Bragg (recreational)

Meisha Key - CDFG
Alec MacCall - NMFS, SWFSC
Debbie Aseltine-Neilson - CDFG
Kirk Lynn - CDFG
Deb Wilson-Vandenberg - CDFG
Bob Leos - CDFG

Where are they?

In the Bolinas area, blue rockfish are present in offshore schools around underwater islands (pinnacles).

Near Half Moon Bay, @ Deep Reef, blues move around the reef out to 30-40 fm , with high numbers wherever found the slightest structure (e.g. small rock piles) and in shallow waters. They are all around the area in November, but by late fall had tailed off.

Groundswell surge pushes blues offshore and can also push them off reefs.

Small schools suspend ("hover") off the bottom with the swell in Santa Cruz, out to about 40-45 fm. It is the surge itself, and not the turbidity that affects them.

Also in Santa Cruz, "deepwater blues" come and go; they are lighter in color.

Off Big Sur, large blues are seen 6-7 miles offshore outside the reef.

Large numbers of variably-sized blues are seen at multiple sites at Pt. St. George (Crescent City).

Juvenile rockfish trawl data suggest northward distribution trend, but it may be difficult to verify adult populations using subsequent fishery-dependent data (with targeting of catch and depth restrictions).

BLUE numbers

Blue rockfish are as prolific as when first seen. In the late 1970s, gill nets began targeting offshore reefs and pinnacles; by 1988 there were low abundances in these areas. The population has come back. (Bolinas)

Blues are rebounding in Half Moon Bay, but numbers are cyclic (due partly to moving around?). At Deep Reef, blues are prolific in shallow waters; the fishing is better than seen in years – haven't seen such numbers since the 1970s.

Increases seen in Santa Barbara, Morro Bay in recent years.

In southern CA, there has been noticeably colder water and an increase in # of fish.

From what has been heard and seen from divers, there have been more fish around the Channel Is – "filling in" areas where once inhabited (with onset of colder waters).

BLUE Biology

An important topic is what do blue rockfish eat and what eats them (predator-prey relationships).

(Bolinas) Blues feed on ctenophores, especially in the spring. Three solid year classes were observed of large fish (up to 3 lbs). They were pelagic, in areas with no kelp.

(Santa Cruz, Deep Reef - HMB) Blues do move around.

Food availability may fluctuate – greater in bays and canyon areas vs. where the coast is straight? Tied to the urchin fishery? As urchins are depleted, there is more kelp to provide a nursery area. Is there a kelp index? Kelp increases are not seen coastwide, however. Runoff is impacting kelp beds in some areas.

Two different morphs have been seen: "Alaskan blues" are hardier, hold their scales better, have larger spots (stripe?); "California blues" can't be kept alive as easily, and have a lighter color than Alaskan blues.

Catch Data comments

During the 1970s – 1988, many blues from the gillnet fishery did not show up in CALCOM (probably listed under "spp unidentified", "rockfish spp." categories).

The number of samplers for CPFVs has decreased significantly; in 1980s – 1990s, CPFV operators saw 3+ observers / week (however, most of these observers came from the central/northern CPFV study going on at that time).

The RecFIN data from the early 1980s seem too high, should be about 400 mt from 1980-1985. Blues were not targeted; other spp. were targeted and kept (could target others easily then, use bigger hooks). There was more effort from CPFVs then, but blues make up more of the catch now.

There was more trawl poundage taken than shows during the 1970s due to many midwater trawlers dumping blues. For 2 years in the 1970s (pre-Magnuson Act) there were Russian trawlers in the San Francisco and Monterey areas targeting hake taking more than 50 tons – much of this discarded. For a short time prior to 1976, joint venture (midwater shelf for widow, bocaccio, chilipeppers, blues in 1976) trawlers also were responsible for much catch, dumping blues. After 1976 the joint venture trawlers went north. Also, there were the domestic widow trawl fleet and local trawlers, with a discard/landed catch ratio of 1:1.

The commercial data from 1980-1988 seems too low. There was "heaven to earth" in the Farallons: blues and olives (no separation), along with blacks. One boat in Bolinas would take 20-30 tons (of blues). Commercial non-gillnet took 100,000 lbs (including blacks). The graph for commercial non-gillnet should use 400 mt from 1980-1988, dropping to 100 mt in 1990 and remaining there. We also may want to look at permits from 1980-1988 for longliners and gillnetters. There were 3 times as many longliners working than CPFVs prior to 1988 - then they got pushed out. During the 1980s there should be more gill net poundage than what is shown. For commercial gillnets, the "white van" catch should be 400 mt in 1980 down to 300 mt in 1986, and then dropping from there to 0 mt from 1988 on.

CenCAL data and rules (size, bag limits) need to be checked and evaluated for analysis prior to use in assessment. Divers can only keep 4 fish, and these must be at least 14" limit (therefore only gives catch of 14"+ fish/hr). Rules were roughly the same for all areas.

Fishery issues

Many larger blue rockfish are lost because they pop off hooks due to soft mouths, so catch may consist of smaller fish. However, large fish that pop up to surface because of extended gas bladders become "floaters" and will also be picked up. The experience of the fisherman plays a part in whether the big ones fall off hooks. It also depends on how the fish are feeding, if they are hungry or swiping at the hook. Their air bladders are out even at 20 fm. The blues are feisty in shallow water, and not so in deeper water.

In Bolinas, the live finfish fishery market is good, with demand high ($1.85/lb). North of 40 10, they are close and easy to catch. The public will buy 13-14", 1-1.5 lb fish. Blacks are targeted here, as most blues ("Alaskan Blues" excepted) don't make the trip to market in good enough shape. There is a limited potential for growth of blues in the live finfish fishery due to survivability to market.

In the Channel Is., MPAs have reduced the area where can fish. It would be good to include four areas for the stock assessment analysis.

Trawl nets took larger fish – caught all sizes but discarded small fish.

Regular gill nets took narrow range of fishes (large fish bounce off net and small ones swim through). Then gill netters started using trammel gill nets more in the San Francisco area; these trammel gill nets are able to take larger fish than regular gill nets.

The CPFV fishery is now more targeted towards blues because of depth restrictions and abundance of blues.

Participants comments

1. Had an opportunity to learn about stock assessments.
2. Getting information from fishermen is important – their views and opinions on catch #'s, which provide information from the field.
3. Science has lectured fishermen – want them to provide anecdotal information, then they go back to own data after leaving room. Today I feel if we're genuinely working together w/DFG.
4. There has been a large reduction in fisheries, with infrastructure falling apart (buyers).
5. First meeting where I feel we're all working together – providing input, feel that scientists/government is listening.
6. Glad I came, good to be involved with stock assessments.
7. Out of all stock assessment people, I appreciate work by Alec. For many spp. deal with data-poor situation, starting to see shift in getting fisherman's view; "B1 factor" – estimates are not correctly capturing take, constrains and puts fishermen into a box. I see we're moving into a more "realistic" place.
8. Helpful to take anecdotal information and put into quantitative terms. Look forward to review process and reviewers' opinions on use of anecdotal data.
9. Good, interesting.
10. Chance to listen to recreational fishermen since I work more w/commercial. Nice to see the willingness for Stock Assessment Team (STAT) to hear changes regarding catch.

Written comments were received by the following who did not attend the workshop:

David Allen
Kenyon Hensel
Gerry Richter
Jim Webb

APPENDIX B

ASSESSMENT OF BLUE ROCKFISH *(Sebastes mystinus)* IN CALIFORNIA

STAR PANEL

May 21, 2007

MODEL SELECTION - Comparison of ASPIC and SS2

Initial attempts to develop an SS2 model of Blue rockfish were inconclusive. The model was set up as a stock reduction analysis, i.e., driven by a stock-recruitment relationship with no variability (recruit devs were turned off). The model did not search the parameter space effectively, probably due to combined properties of a flat response surface, and nearness of the maximum likelihood value to the region where a "crash penalty" is invoked. The "crash penalty" results from parameter sets that cause catches to exceed the model's estimate of fish available to be caught.

Aside from the fact that we resorted to the ASPIC production model because we were unable to obtain a properly functioning SS2 model (which is probably not a fault of the SS2 model), there are also some comparative virtues in the production model approach. The following discussion relates to a data-poor specification of a SS2 model as attempted for blue rockfish, and does not necessarily reflect properties of other SS2 implementations that could be attempted in more data-rich situations.

<u>Catch uncertainty:</u> The magnitude of the catch is a major uncertainty in the case of blue rockfish, even to the extent that it is the basis of our proposed decision table, which will be discussed further in this document. SS2 makes the assumption that catch is known without error, which may be an important model mis-specification in this context. In contrast, ASPIC emphasizes fitting the catch series, which is especially appropriate in the case of uncertain catches. In this regard, ASPIC may theoretically be the better specified model, but in practice, sensitivity to this aspect of model specification is not known, but is evaluated here.

<u>Model rigidity and the virtual population constraint:</u> A commonly encountered problem in stock reduction models is the SS2 "crash penalty" which is invoked when modeled abundance of available fish is insufficiently large to support the observed subsequent removals. We will call this the virtual population (VP) constraint, in that the lower bound of estimated abundance is constrained by a minimum virtual population size related to the sum of subsequent observed catches (i.e., the population could not have been smaller than the amount of fish we actually took from it). Importantly, in the absence of the "crash penalty" in SS2, or some other model specification to deal with this problem, the VP constraint can exist independently of the likelihood function, preventing an efficient search of the likelihood response surface for a maximum value. In some

cases, the "theoretical" maximum likelihood value can lie on the prohibited side of the VP constraint (A. MacCall, personal observation), resulting in severe estimation difficulties.

Although production models can also encounter the VP constraint, the detailed internal demographic structure of SS2 can make stock reduction model implementations prone to estimation problems associated with this constraint, e.g., in the 2005 cowcod assessment (Piner et al. 2005). In reality, fishery selectivity curves tend to adapt to the demographics of available fish, so that when large fish become rare, full selectivity often shifts to a smaller size. Also, geographic variability in growth curves can produce catches with size compositions that are difficult to portray in a single homogeneous SS2 representation. For blue rockfish we lack the data to model these fishery and resource behaviors in SS2, and must settle for an overly rigid treatment of time and space-invariant growth and selectivity curves. In contrast, the less explicit ASPIC model does not attempt to account for such detailed demographic differences among catch compositions from various fishery segments, which may in some ways be less realistic, but also makes it less vulnerable to estimation problems associated with the VP constraint.

Unknown demographics: Both ASPIC and SS2, in the present specification as a stock reduction analysis, model the same fundamental process of a deterministic production function based on resource abundance, and simple periodic removals of catch. ASPIC assumes that the catch and abundance index reflect similar but unspecified demographics to the extent that the absolute reduction in abundance is proportional to catch. In contrast, SS2 contains a detailed age and size-structured demographic model of the resource and individual fishery segments, which is necessarily over-simplified in the data-poor case of blue rockfish. Important demographic parameters, such as the natural mortality rate, are unknown and cannot be estimated in the present context, so values are assumed (based on conventional rules-of-thumb) but are treated as known constants in SS2. In contrast, a production model does not require some of these assumptions.

Management reference points: The detailed demographic model in SS2 allows calculation of management reference values, such as SPR that are used in the management of fishing mortality rates west coast groundfish. ASPIC produces a different but analogous measure of fishing mortality rate, relative to the Fmsy specified by the underlying production function (logistic or generalized). It can be argued that the Fmsy reference point from ASPIC is at least based on blue rockfish data, whereas the west cost groundfish proxy reference point of SPR=50% is a generic value for all rockfish, and is not based on blue rockfish data at all.

Beverton-Holt steepness: Steepness, as currently considered in assessment of west coast groundfish, is a property of the Beverton-Holt SRR, which itself is a conventionally assumed rather than objectively determined specification of groundfish models. Other stock-recruitment relationships have been considered in a meta-analytic context (Dorn 2002), and have been shown to be statistically indistinguishable. (It is interesting to note that the difference between a Beverton-Holt SRR and a Ricker SRR becomes progressively smaller as steepness declines, and the currently favored prior distribution of steepness is even lower than previously found by Dorn, and is extraordinarily low in comparison to other world fisheries.) The implicit stock-recruitment relationship underlying an ASPIC model fit would almost certainly be statistically indistinguishable from any SRR fit to blue rockfish by an SS2 model. Consideration of alternative values of steepness (including the currently favored steepness prior distribution) has an analog in exponents used in the generalized production model. However, there is no simple relationship between ASPIC and SS2 that can be compared quantitatively because each SRR is no longer invariant when it is considered in the demographic context of the alternative model. Approximate comparisons could be attempted, but time has not allowed this to be explored. In this regard, experience has shown that the logistic case of ASPIC is robust (Prager, ASPIC documentation).

ASPIC 5.10.3

The available data were well-suited for the use of a production model. We used a stock production model incorporating covariates (ASPIC_Version 5.10.3, May 2007) (Prager 1994) that was available in NOAA's toolbox: http://nft.nefsc.noaa.gov/. Where version 3 would estimate parameters of a non-equilibrium solution to a Schaefer logistic production model, version 5 has the ability to fit the Pella-Tomlinson generalized model in the revised parameterization of Fletcher (Prager 2004). Ludwig and Walters (1985) concluded that "simple production models should often be used in stock assessments based on catch/effort data, even when more realistic and structurally correct models are available to the analyst."

The estimated parameters consist of K (the stock's carrying capacity), MSY, ratio of B_1/K (beginning biomass relative to K), and a catchability coefficient for each abundance index series (q_i) for the Schaefer logistic model. When parameter B_1/K is estimated freely, the estimated biomasses are unrealistically small relative to the unfished state. Accordingly we use a value of B_1/K that was fixed at a value of 0.77, which is plausible, given the lack of a targeted fishery before 1969. We explored a range of values (0.1, 0.2, … 1.0) and found that values from 0.77 and 1.0 did not alter the ending results (Table 1). Punt (1990) determined that pre-specifying B_1 substantially improved the performance of a production model in a case like this.

Table 1. Exploration of beginning values for B1/K for the logistic (Shaefer) surplus-production model (ASPIC_v5.10.3). Average catches (|(original estimated + fishermen recommended)/2) were used for these runs.

	current biomass	unfished biomass	% unfished biomass	MSY
$B_1/K = 0.77$	1904	3999	0.48	700
$B_1/K = 0.78$	1905	3996	0.48	700
$B_1/K = 0.79$	1904	3998	0.48	700
$B_1/K = 0.8$	1902	3992	0.48	700
$B_1/K = 0.9$	1908	3986	0.48	699
$B_1/K = 1.0$	1907	3981	0.48	699

Base Model

The base model uses an intermediate catch series from 1969 to 2006, which is the average of the fishermen-supplied estimates and the documented landings from various sources. The CPUE series is based on RecFIN data from 1980 to 2006, with some missing years. This index was originally based on numbers of fish caught per angler hour, rather than biomass, and even though Prager and Goodyear (2001) found that production model performance was "surprisingly robust" to use of mixed-metric data, we multiplied each index by the average annual weight to base it on biomass. B_1/K is fixed at 0.77. Detailed results are given in the attached ASPIC output. Current biomass is estimated to be at 1905 mtons, which is 48 percent of unfished abundance. MSY is estimated to be 700 mtons, compared with a 2006 total catch of 341.5 mtons.

Baseline model results of fits and estimated F using average catches.
Number of bootstrap trials = 500.

Year	Obs CPUE	Est. CPUE	Est. F	Obs yield	Model yield	Resid in log scale
1969		0.99	0.070	223.00	223.00	0.000
1970		1.05	0.072	244.00	244.00	0.000
1971		1.06	0.097	334.00	334.00	0.000
1972		1.06	0.116	395.00	395.00	0.000
1973		1.01	0.197	643.00	643.00	0.000
1974		0.93	0.276	829.00	829.00	0.000
1975		0.83	0.353	947.00	947.00	0.000
1976		0.78	0.262	662.00	662.00	0.000
1977		0.76	0.320	786.00	786.00	0.000
1978		0.74	0.285	683.00	683.00	0.000
1979		0.72	0.353	818.00	818.00	0.000
1980	0.51	0.67	0.403	870.00	870.00	0.272
1981	0.76	0.59	0.545	1034.00	1034.00	-0.258
1982	0.80	0.49	0.605	959.00	959.00	-0.488
1983	0.51	0.40	0.705	909.00	909.00	-0.244
1984	0.40	0.32	0.745	766.00	766.00	-0.228
1985	0.34	0.25	0.796	649.00	649.00	-0.297
1986	0.07	0.23	0.560	408.00	408.00	1.171
1987	0.14	0.22	0.634	451.00	451.00	0.453
1988	0.11	0.20	0.683	449.00	449.00	0.616
1989	0.09	0.20	0.519	336.00	336.00	0.802
1990		0.23	0.387	285.00	285.00	0.000
1991		0.29	0.273	252.00	252.00	0.000
1992		0.30	0.697	672.00	672.00	0.000
1993	0.18	0.21	1.153	776.00	776.00	0.147
1994	0.15	0.14	0.829	375.00	375.00	-0.068
1995	0.30	0.13	0.611	251.00	251.00	-0.858
1996	0.23	0.14	0.464	208.00	208.00	-0.504
1997		0.14	0.820	360.00	360.00	0.000
1998		0.11	0.818	297.00	297.00	0.000
1999	0.24	0.10	0.741	234.00	234.00	-0.897
2000	0.10	0.10	0.517	166.00	166.00	-0.005
2001	0.06	0.12	0.340	135.00	135.00	0.717
2002	0.34	0.16	0.314	167.00	167.00	-0.726
2003	0.19	0.22	0.329	229.00	229.00	0.126
2004	0.32	0.29	0.173	164.00	164.00	-0.086
2005	0.34	0.41	0.137	184.00	184.00	0.199
2006	0.46	0.54	0.197	341.00	341.00	0.156

Baseline model results for F/Fmsy and B/Bmsy using average catches.
Number of bootstrap trials = 500.

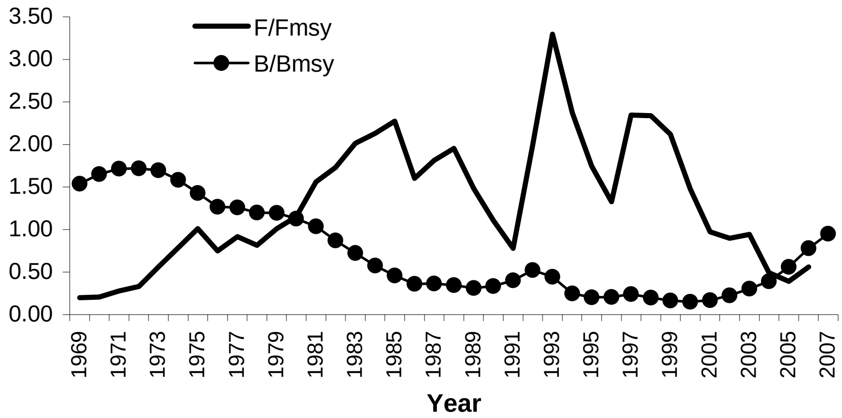
ESTIMATED POPULATION TRAJECTORY

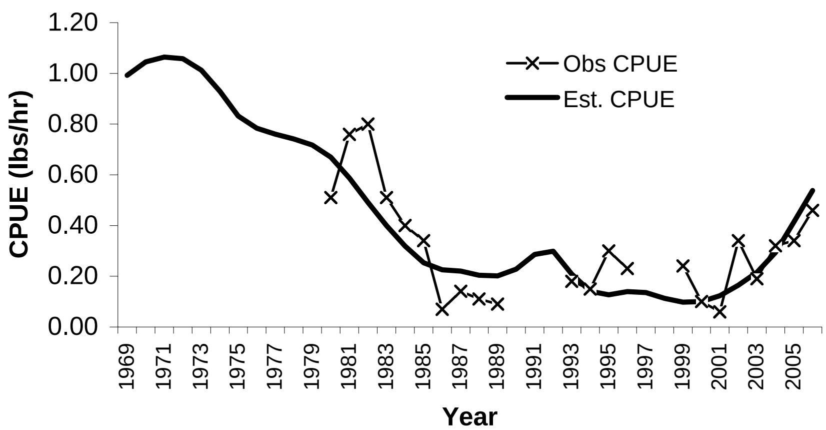
Year	Est. Total F Mort	Est. Beg. Biomass	Est. Avg Bio	Obs Tot Yield	Model Tot Yield	Est. Surplus Prod	F/Fmsy	B/Bmsy
1969	0.07	3082.00	3203.00	223.00	223.00	446.80	0.20	1.54
1970	0.072	3306.00	3375.00	244.00	244.00	370.10	0.21	1.65
1971	0.097	3432.00	3436.00	334.00	334.00	340.50	0.28	1.72
1972	0.116	3439.00	3414.00	395.00	395.00	351.00	0.33	1.72
1973	0.197	3395.00	3270.00	643.00	643.00	417.90	0.56	1.70
1974	0.276	3170.00	3001.00	829.00	829.00	523.90	0.79	1.58
1975	0.353	2864.00	2683.00	947.00	947.00	617.00	1.01	1.43
1976	0.262	2534.00	2529.00	662.00	662.00	651.20	0.75	1.27
1977	0.32	2524.00	2457.00	786.00	786.00	663.20	0.91	1.26
1978	0.285	2401.00	2395.00	683.00	683.00	672.70	0.82	1.20
1979	0.353	2391.00	2317.00	818.00	818.00	682.10	1.01	1.19
1980	0.403	2255.00	2160.00	870.00	870.00	694.90	1.15	1.13
1981	0.545	2080.00	1896.00	1034.00	1034.00	696.20	1.56	1.04
1982	0.605	1742.00	1585.00	959.00	959.00	668.30	1.73	0.87
1983	0.704	1451.00	1290.00	909.00	909.00	610.10	2.02	0.73
1984	0.745	1152.00	1028.00	766.00	766.00	533.50	2.13	0.58
1985	0.796	919.60	815.70	649.00	649.00	453.60	2.28	0.46
1986	0.56	724.20	728.70	408.00	408.00	416.80	1.60	0.36
1987	0.634	733.00	711.30	451.00	451.00	408.90	1.81	0.37
1988	0.683	690.90	657.30	449.00	449.00	384.10	1.95	0.35
1989	0.519	626.00	648.00	336.00	336.00	379.70	1.48	0.31
1990	0.387	669.70	736.60	285.00	285.00	420.00	1.11	0.33
1991	0.273	804.70	924.80	252.00	252.00	496.40	0.78	0.40
1992	0.697	1049.00	964.30	672.00	672.00	511.50	1.99	0.52
1993	1.153	888.50	673.10	776.00	776.00	389.30	3.30	0.44
1994	0.829	501.90	452.30	375.00	375.00	280.40	2.37	0.25
1995	0.611	407.30	410.60	251.00	251.00	257.70	1.75	0.20
1996	0.464	413.90	448.70	208.00	208.00	278.50	1.33	0.21
1997	0.82	484.50	439.10	360.00	360.00	273.20	2.35	0.24
1998	0.817	397.70	363.30	297.00	297.00	230.90	2.34	0.20
1999	0.741	331.60	316.00	234.00	234.00	203.50	2.12	0.17
2000	0.517	301.10	321.10	166.00	166.00	206.50	1.48	0.15
2001	0.34	341.60	396.90	135.00	135.00	249.80	0.97	0.17
2002	0.314	456.50	531.30	167.00	167.00	321.90	0.90	0.23
2003	0.329	611.30	695.70	229.00	229.00	401.50	0.94	0.31
2004	0.173	783.80	948.50	164.00	164.00	504.40	0.49	0.39
2005	0.137	1124.00	1339.00	184.00	184.00	620.30	0.39	0.56
2006	0.196	1560.00	1736.00	341.00	341.00	685.70	0.56	0.78
2007		1905.00						0.95

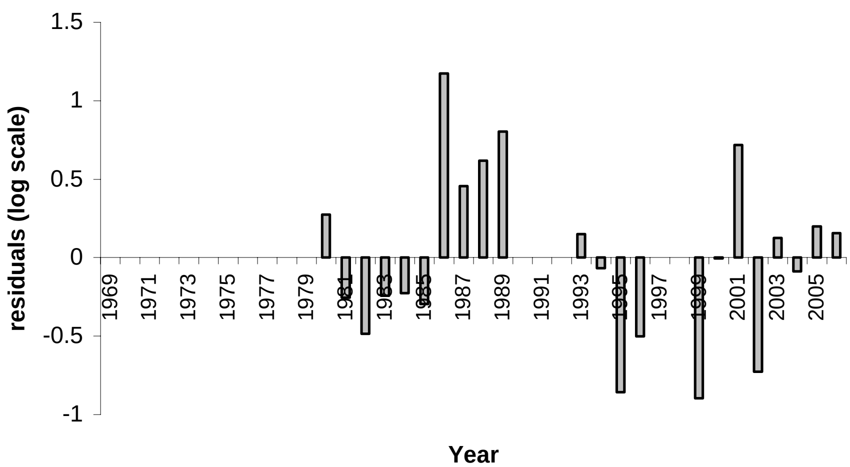
Baseline model reference point results using average catches. Number of bootstrap trials = 500.
CV from the bootstrap distribution = 0.32

	Point Est.	Est. bias in Pt. Est.	Est. rel. bias	Bias-corrected Approximate CLs 80% L	80% U	50% L	50% U	Inter-quartile range	Rel. IQ range
B1/K	0.77	0.00	0.00%	0.77	0.77	0.77	0.77	0.00	0.000
K	4003.00	256.10	6.40%	3856.00	4972.00	3881.00	4271.00	389.30	0.097
q(1)	0.00	0.00	-2.31%	0.00	0.00	0.00	0.00	0.00	0.277
MSY	699.80	-9.26	-1.32%	651.70	707.50	686.10	706.10	20.05	0.029
Ye(2007)	698.10	-53.11	-7.61%	682.80	711.00	699.30	708.60	9.30	0.013
Y.@Fmsy	666.10	-21.08	-3.16%	464.40	928.30	562.40	815.90	253.60	0.381
Bmsy	2002.00	128.00	6.40%	1928.00	2486.00	1941.00	2135.00	194.60	0.097
Fmsy	0.35	-0.02	-4.79%	0.26	0.37	0.32	0.36	0.04	0.120
fmsy(1)	1129.00	7.13	0.63%	1031.00	1480.00	1099.00	1359.00	259.40	0.230
B./Bmsy	0.95	-0.02	-2.42%	0.66	1.31	0.79	1.14	0.35	0.364
F./Fmsy	0.56	0.07	11.88%	0.39	0.82	0.46	0.67	0.21	0.373
Ye./MSY	1.00	-0.06	-6.25%	0.99	1.00	1.00	1.00	0.00	0.001

Figures for baseline model results of F/Fmsy, B/Bmsy, fit to the CPUE index and residuals. Actual values represented in previous tables.







Sensitivity Analysis

Three different catch series were considered in this assessment. First, the original estimates that were provided from various sources (ie. RecFIN, CALCOM). Secondly, recommended catches that were received during a Data Workshop with fishermen that have a history in the blue rockfish fishery (details in the draft document). Lastly, the average of the two series that were used in the baseline model. Considering there is uncertainty in all of these estimates, we ran sensitivities on the original estimates and the fishermens recommended catch series. Table ? provides the catch scenarios used in the baseline model and the described sensitivity analysis.

Catch streams considered in this assessment. Estimated catches came from RecFIN and CALCOM data sources. Fishermen's catches came from recommendations of fishermen that attended the Data Workshop for blue rockfish. Average catches is the average between the two and were used in the baseline model.

	Estimated Catches				**Fishermen's recommended Catches**				**Average Catches**			
Year	Recreational	Comm - Hook & Line	Comm - Gillnet	*total*	Recreational	Comm - Hook & Line	Comm - Gillnet	*total*	Recreational	Comm - Hook & Line	Comm - Gillnet	*total*
5 yr avg	***388.2***	***15.3***	***28.2***	*431.7*	***103.6***	***104.4***	***95.6***	*303.6*	***245.9***	***59.8***	***61.9***	*367.6*
1969	128.8	11.0	3.5	*143.3*	103.6	159.0	41.0	*303.6*	116.2	85.0	22.2	*223.4*
1970	164.9	14.0	4.5	*183.3*	103.6	159.2	40.8	*303.6*	134.2	86.6	22.6	*243.4*
1971	326.9	10.6	26.0	*363.5*	103.6	68.1	131.9	*303.6*	215.2	39.3	79.0	*333.5*
1972	436.6	16.7	32.2	*485.5*	103.6	79.1	120.9	*303.6*	270.1	47.9	76.5	*394.5*
1973	884.1	24.3	74.7	*983.1*	103.6	56.4	143.6	*303.6*	493.8	40.3	109.1	*643.3*
1974	1149.1	22.2	106.5	*1277.7*	129.4	53.3	196.7	*379.4*	639.3	37.7	151.6	*828.6*
1975	1294.3	25.7	119.2	*1439.3*	155.3	68.8	231.2	*455.3*	724.8	47.2	175.2	*947.3*
1976	644.3	33.0	39.1	*716.5*	207.1	211.4	188.6	*607.1*	425.7	122.2	113.8	*661.8*
1977	730.8	29.7	52.2	*812.7*	258.9	220.2	279.8	*758.9*	494.9	124.9	166.0	*785.8*
1978	409.3	29.1	16.8	*455.1*	310.7	456.8	143.2	*910.7*	360.0	242.9	80.0	*682.9*
1979	515.1	44.3	13.3	*572.8*	362.5	560.8	139.2	*1062.5*	438.8	302.6	76.3	*817.6*
1980	487.0	49.8	2.3	*539.1*	400.0	400.0	400.0	*1200.0*	443.5	224.9	201.1	*869.6*
1981	826.5	65.7	1.2	*893.4*	400.0	375.0	400.0	*1175.0*	613.2	220.3	200.6	*1034.2*
1982	707.7	60.6	0.5	*768.8*	400.0	350.0	400.0	*1150.0*	553.9	205.3	200.2	*959.4*
1983	661.2	55.3	0.8	*717.4*	400.0	325.0	375.0	*1100.0*	530.6	190.2	187.9	*908.7*
1984	469.2	11.5	1.3	*482.0*	400.0	300.0	350.0	*1050.0*	434.6	155.8	175.7	*766.0*
1985	261.7	39.9	134.5	*436.1*	261.7	275.0	325.0	*861.7*	261.7	157.5	229.7	*648.9*
1986	124.7	3.0	12.8	*140.6*	124.7	250.0	300.0	*674.7*	124.7	126.5	156.4	*407.7*
1987	258.9	7.8	0.4	*267.2*	258.9	225.0	150.0	*633.9*	258.9	116.4	75.2	*450.6*
1988	307.1	7.7	0.1	*314.9*	307.1	200.0	75.0	*582.1*	307.1	103.9	37.6	*448.5*
1989	245.0	17.4	14.1	*276.4*	245.0	150.0	0.0	*395.0*	245.0	83.7	7.0	*335.7*
1990	221.1	26.9	1.5	*249.6*	221.1	100.0	0.0	*321.1*	221.1	63.5	0.8	*285.3*
1991	183.7	35.4	1.4	*220.5*	183.7	100.0	0.0	*283.7*	183.7	67.7	0.7	*252.1*
1992	490.3	181.4	0.0	*671.8*	490.3	181.4	0.0	*671.8*	490.3	181.4	0.0	*671.8*
1993	643.0	134.3	0.3	*777.6*	643.0	134.3	0.0	*777.3*	643.0	134.3	0.2	*777.5*
1994	305.8	69.2	0.0	*375.1*	305.8	69.2	0.0	*375.0*	305.8	69.2	0.0	*375.1*
1995	216.3	34.7	0.0	*251.0*	216.3	34.7	0.0	*251.0*	216.3	34.7	0.0	*251.0*
1996	164.0	44.0	0.1	*208.1*	164.0	44.0	0.0	*208.0*	164.0	44.0	0.0	*208.1*
1997	296.1	63.7	0.0	*359.7*	296.1	63.7	0.0	*359.7*	296.1	63.7	0.0	*359.7*
1998	249.4	47.9	0.0	*297.3*	249.4	47.9	0.0	*297.3*	249.4	47.9	0.0	*297.3*
1999	198.6	35.7	0.1	*234.4*	198.6	35.7	0.0	*234.3*	198.6	35.7	0.0	*234.3*
2000	150.7	15.6	0.0	*166.3*	150.7	15.6	0.0	*166.3*	150.7	15.6	0.0	*166.3*
2001	115.6	19.7	0.0	*135.3*	115.6	19.7	0.0	*135.3*	115.6	19.7	0.0	*135.3*
2002	148.8	18.5	0.0	*167.4*	148.8	18.5	0.0	*167.4*	148.8	18.5	0.0	*167.4*
2003	219.9	9.2	0.0	*229.1*	219.9	9.2	0.0	*229.1*	219.9	9.2	0.0	*229.1*
2004	149.9	14.8	0.0	*164.6*	149.9	14.8	0.0	*164.6*	149.9	14.8	0.0	*164.6*
2005	162.9	21.7	0.0	*184.6*	162.9	21.7	0.0	*184.6*	162.9	21.7	0.0	*184.6*
2006	319.6	21.9	0.0	*341.4*	319.6	21.9	0.0	*341.4*	319.6	21.9	0.0	*341.4*

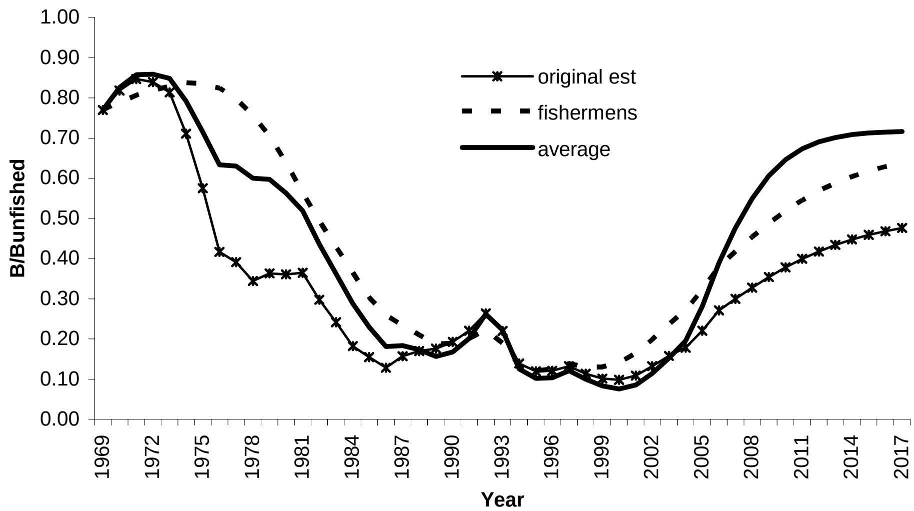
First, for each catch scenario, we attempted to fit the Pella-Tomlinson generalized model. We initially scanned values of the model shape that produced the best fit and then used that value to fit the model. In all three scenarios, it was noted that the generalized fit was not a better than the logistic fit, so the sensitivity analysis is now limited to the results of the logistic (Shaefer) model.

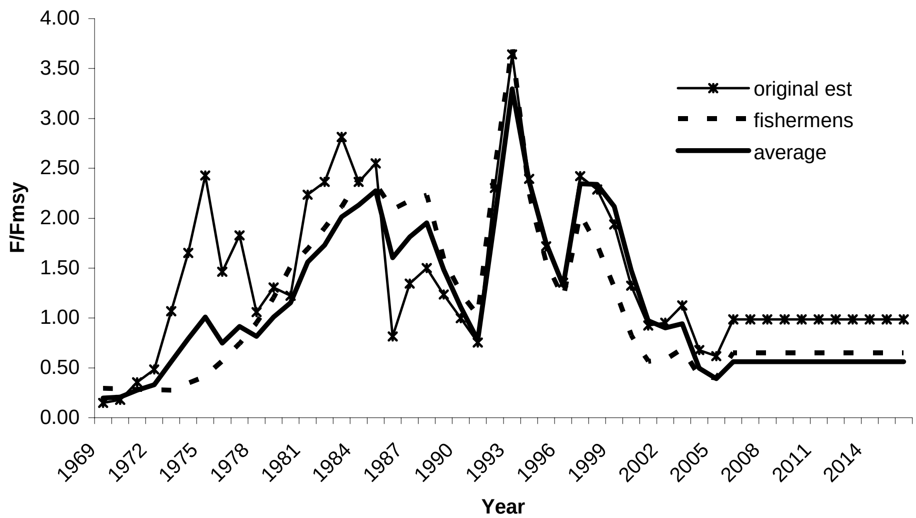
Reference points calculated from the three catch series sensitivity analysis. The base model uses the average catches of the estimated and fishermen recommended catches.

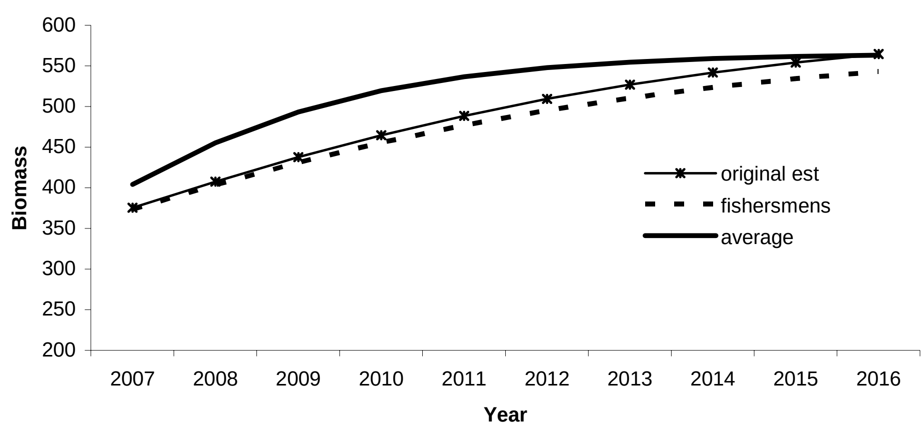
		Schaefer Logistic		
		Estimated	Fishermens	*** Average**
B1/K	Starting relative biomass	0.77	0.77	**0.77**
MSY	Maximum sustainable yield	607	659	**700**
K	Maximum population size	5281	7483	**4003**
phi	Shape of production curve	0.50	0.50	**0.50**
Bmsy	Stock biomass given MSY	2641	3742	**2002**
Yield(F_{msy})	Yield available at Fmsy in 2007	364	550	**666**
B/B_{msy}	B_{2007}/B_{msy} (as proportion on MSY)	0.60	0.83	**0.95**
$B/B_{unfished}$	(B_{2007}/B_{msy}) / 2	0.30	0.42	**0.48**
B_{2007}/K	*Depletion*	*0.30*	*0.42*	***0.48***
Yield	Equillibrium yield available in 2007	510	641	**698**
	as proportion of MSY	0.84	0.97	**1.00**
Fmsy	Fishing mortality given MSY	0.23	0.18	**0.35**
F/Fmsy	F_{2006}/F_{msy}	0.98	0.65	**0.56**
F_{msy}/F	F_{msy}/F_{2006}	1.02	1.54	**1.78**
B_{2007}	Beginning biomass in 2007	1583	3123	**1905**
C_{2006}	Total catch in 2006	342	342	**342**
R2	CPUE	0.42	0.60	**0.63**
CV	bootstrapped	0.55	0.41	**0.32**

* Baseline model - Shaefer logistic surplus-production model with average catch series.

Figures comparing the biomass, fishing mortality and projections from three catch streams: original estimates, fishermens recommended changes to those estimates, and an average (base model) of the two catch streams.







APPENDIX C - DATA FILE FOR 2007 BLUE ROCKFISH STOCK ASSESSMENT

```
# California stock, north of Point Conception
#
# SS2 Version 2.00g (July 2007)
# BASE catch stream
# M females = 0.10, M males = 0.12
# steepness = 0.58 based on Dorm recommendation
# RecFIN CPUE index split: post-2000 q as separate fishery
#
#
1916
2006
1
12
1
3
5
REC%COMMHKL%COMMNET%CDFGCPFV%juvcore%juvdive%ghost%post2000
0.5  0.5  0.5  0.5  0.5  0.5 0.5 0.5
2
30  # 30+ in this bin
# Initial Equil Catch
0       0       0.0
# Landings
0.0     0.4     0.0     #1916
1.6     1.3     0.0     #1917
3.2     2.1     0.0     #1918
4.8     1.8     0.0     #1919
6.4     2.4     0.0     #1920
8.0     2.4     0.0     #1921
9.5     2.6     0.0     #1922
11.1    3.5     0.0     #1923
12.7    3.6     0.0     #1924
14.3    4.6     0.0     #1925
15.9    6.1     0.0     #1926
17.5    5.9     0.0     #1927
19.1    7.6     0.0     #1928
20.7    7.2     0.0     #1929
22.3    10.4    0.0     #1930
23.9    10.1    0.0     #1931
25.4    9.1     0.0     #1932
27.0    8.6     0.0     #1933
28.6    9.0     0.0     #1934
30.2    11.8    0.0     #1935
31.8    14.5    0.0     #1936
37.8    12.8    0.0     #1937
37.2    11.4    0.0     #1938
32.6    9.7     0.0     #1939
46.9    12.3    0.0     #1940
0       11.6    0.0     #1941
0       5.1     0.0     #1942
0       6.6     0.0     #1943
0       15.6    0.0     #1944
0       49.1    0.0     #1945
16      39.9    0.0     #1946
32      35.8    0.0     #1947
64      18.9    0.0     #1948
82.9    14.6    0.0     #1949
101.1   21.1    0.0     #1950
115.5   21.9    0.0     #1951
100.5   16.0    0.0     #1952
85.5    15.7    0.0     #1953
106.3   5.9     0.0     #1954
126.8   5.4     0.0     #1955
141.6   8.0     0.0     #1956
138.1   10.3    0.0     #1957
226.7   19.7    0.0     #1958
188.2   16.9    0.0     #1959
146.7   7.5     0.0     #1960
110.9   12.2    0.0     #1961
```

```
127     7.5     0.0     #1962
130.7   5.0     0.0     #1963
99.5    6.2     0.0     #1964
154.7   7.3     0.0     #1965
167     8.1     0.0     #1966
164     7.7     0.0     #1967
296.8   7.1     0.0     #1968
279.3   8.5     3.5     #1969
376     10.5    4.5     #1970
313.8   7.8     26.0    #1971
431.2   12.2    32.2    #1972
632.6   19.3    74.7    #1973
716.8   15.6    106.5   #1974
695.6   16.0    119.2   #1975
637.4   22.2    39.1    #1976
569.9   18.2    52.2    #1977
523.7   4.6     16.8    #1978
658     34.9    13.3    #1979
487     49.6    2.3     #1980
826.5   37.9    1.2     #1981
707.7   60.6    0.5     #1982
661.2   55.2    0.8     #1983
469.2   11.3    1.3     #1984
261.7   36.5    134.5   #1985
124.7   2.8     12.8    #1986
258.9   7.8     0.4     #1987
307.1   7.7     0.1     #1988
245     17.2    14.1    #1989
224.4   26.8    1.5     #1990
186.9   35.4    1.4     #1991
493.6   181.4   0.0     #1992
374.4   134.3   0.3     #1993
305.8   68.8    0.0     #1994
216.3   28.5    0.0     #1995
164     44.0    0.1     #1996
296.1   63.7    0.0     #1997
249.4   47.7    0.0     #1998
198.6   35.7    0.1     #1999
150.7   15.6    0.0     #2000
115.6   19.7    0.0     #2001
148.8   18.5    0.0     #2002
219.9   9.2     0.0     #2003
149.9   14.8    0.0     #2004
162.9   21.7    0.0     #2005
319.6   21.9    0.0     #2006
56   # Surveys
#RecFIN CPUE
#split as another survey in 2000 below, bag limit change, change in q
#year   season  type    index   jack.cv
1980  1  1  0.373  0.25
1981  1  1  0.513  0.29
1982  1  1  0.617  0.30
1983  1  1  0.382  0.26
1984  1  1  0.350  0.25
1985  1  1  0.339  0.27
1986  1  1  0.063  0.26
1987  1  1  0.091  0.37
1988  1  1  0.135  0.35
1989  1  1  0.082  0.33
1990  1  1  -0.1  -1
1991  1  1  -0.1  -1
1992  1  1  -0.1  -1
1993  1  1  0.217  0.23
1994  1  1  0.159  0.24
1995  1  1  0.353  0.46
1996  1  1  0.252  0.19
1997  1  1  -0.1  -1
1998  1  1  -0.1  -1
1999  1  1  0.251  0.16
#
#CDFG CPFV onboard observer survey - central California
#year   season  type    index   jack.cv
```

```
1987    1       4       1.0751251       0.20050221
1988    1       4       0.8947557       0.12897137
1989    1       4       1.0064529       0.10044706
1990    1       4       0.8847844       0.14203142
1991    1       4       1.1419153       0.13896742
1992    1       4       2.2500415       0.08450166
1993    1       4       1.897683        0.08993578
1994    1       4       1.3319015       0.09220232
1995    1       4       1.4248993       0.0937878
1996    1       4       1.3668195       0.0853881
1997    1       4       3.1537675       0.09389103
1998    1       4       3.7558219       0.094172
#
#juvenile midwater trawl "core" area survey - did not use in final model
#year   season  type    index   jack.cv
#1986   1       5       0.2387  0.4257
#1987   1       5       1.9584  0.2526
#1988   1       5       4.1236  0.2300
#1989   1       5       0.7153  0.3365
#1990   1       5       0.1943  0.3898
#1991   1       5       0.6095  0.3096
#1992   1       5       0.0041  0.8144
#1993   1       5       0.3058  0.3337
#1994   1       5       0.0626  0.5440
#1995   1       5       0.0495  0.5945
#1996   1       5       0.0640  0.8181
#1997   1       5       0.0400  0.5784
#1999   1       5       0.0622  0.4550
#2000   1       5       0.0480  0.6980
#2001   1       5       0.5694  0.3178
#2002   1       5       3.8316  0.2586
#2003   1       5       1.1813  0.2681
#2004   1       5       0.5068  0.3442
# changed values to represent stock assessment area only
# CVs changed to 0.35 as recommended at mopup review
2001    1       5       2.54    0.35
2002    1       5       7.74    0.35
2003    1       5       4.42    0.35
2004    1       5       5.95    0.35
2005    1       5       2.45    0.35
2006    1       5       1.36    0.35
#
#average CPUE from Miller and Geibel 1973 - did not use in final model
#year   season  type    index   make up cv
#1959   1       6       1.01836394      0.25 - Monterey area only
1960    1       6       0.717757718     0.25
1961    1       6       0.367636936     0.25
1962    1       6       0.388962527     0.25
1963    1       6       0.474032959     0.25
1964    1       6       0.317549519     0.25
1965    1       6       -1      -1
1966    1       6       0.264060688     0.25
1967    1       6       0.274436168     0.25
1968    1       6       0.216010569     0.25
1969    1       6       0.430684584     0.25
1970    1       6       0.452762666     0.25
#1971   1       6       0.69063893      0.25 - Monterey area only
#
# post 2000 is new survey - RecFIN bag limit change - change in q
2000  1  8  0.093  0.29
2001  1  8  0.070  0.31
2002  1  8  0.317  0.19
2003  1  8  0.191  0.19
2004  1  8  0.324  0.16
2005  1  8  0.299  0.18
2006  1  8  0.405  0.15
1       # Discard type
0       # number of observations
0       # Mean Body Weight
# Composition Conditioners
-1
0.001
```

```
22 # Number of Length Bins
10  12  14  16  18  20  22  24  26  28  30  32  34  36  38  40  42  44  46  48  50  52
53   # Length Composition Observations
#
#year   season  type    gender  part    #samp   10      12      14      16      18      20      22      24      26      28      30      32      34      36
        38      40      42      44      46      48      50      52      10      12      14      16      18      20      22      24      26      28      30
        32      34      36      38      40      42      44      46      48      50      52
#1980s CPFV
1978    1       1       3       0       57      0       0       0       0       0       0.025   0.00625 0.05625 0.06875 0.1125  0.1     0.13125 0.125   0.137
5       0.11875 0.08125 0.0125  0.00625 0.0125  0       0       0.00625 0       0       0       0       0       0.02996 0.02621 0.10112 0.09363 0.13857 0.127
34      0.13857 0.08988 0.09737 0.07865 0.04868 0.01123 0.00749 0.00749 0       0       0.00374
1979    1       1       3       0       106     0       0       0       0       0.00412 0.02613 0.05226 0.07152 0.09903 0.12929 0.17056 0.1568  0.09903 0.067
4       0.07015 0.03026 0.02063 0.00275 0       0       0       0       0       0       0.00362 0.0012  0.01147 0.05012 0.09903 0.0948  0.13103 0.13466 0.142
51      0.12198 0.08937 0.04649 0.03321 0.01328 0.00905 0.0012  0       0       0       0.0169
1980    1       1       3       0       200     0       0       0       0       0.00301 0.01054 0.01957 0.04969 0.0768  0.12048 0.10993 0.13855 0.10692 0.097
89      0.08283 0.10692 0.06024 0.01656 0       0       0       0       0       0       0       0       0.00452 0.01268 0.03532 0.06612 0.11141 0.14402 0.129
52      0.15398 0.10326 0.06521 0.05434 0.06612 0.04347 0.00996 0       0       0       0
1981    1       1       3       0       133     0       0       0       0       0       0.01421 0.01895 0.04265 0.08767 0.0853  0.09715 0.13981 0.13981 0.132
7       0.09478 0.08293 0.0545  0.00947 0       0       0       0       0       0       0       0       0.00122 0.01838 0.03676 0.06495 0.13357 0.11887 0.147
05      0.15563 0.11397 0.07843 0.05147 0.04656 0.02818 0.0049  0       0       0       0
1982    1       1       3       0       139     0       0       0       0       0       0       0.00366 0.04029 0.07142 0.09706 0.13369 0.163   0.16117 0.117
21      0.10439 0.05677 0.04395 0.00732 0       0       0       0       0       0       0       0       0       0.00115 0.01038 0.0542  0.10034 0.14763 0.174
16      0.16839 0.12341 0.07958 0.06805 0.03806 0.02998 0.00461 0       0       0       0
1983    1       1       3       0       182     0       0       0       0       0       0       0.00266 0.01865 0.03374 0.06571 0.0888  0.18916 0.1785  0.157
19      0.14653 0.08081 0.03285 0.00444 0       0       0       0.00088 0       0       0       0.00054 0.00054 0.00164 0.00877 0.03947 0.07565 0.11951 0.140
89      0.1853  0.14473 0.10855 0.09703 0.05263 0.02083 0.00274 0       0.00054 0       0.00054
1984    1       1       3       0       92      0       0       0       0       0       0.00914 0.0201  0.04936 0.06946 0.07678 0.10603 0.16636 0.16087 0.113
34      0.12431 0.06764 0.03107 0.00548 0       0       0       0       0       0       0       0       0       0.01137 0.03981 0.07963 0.11604 0.13196 0.121
72      0.15585 0.11945 0.07849 0.07849 0.04436 0.01934 0.00341 0       0       0       0
#RecFIN
1993    1       1       0       2       200     0.000   0.001   0.003   0.008   0.031   0.075   0.103   0.141   0.154   0.167   0.139   0.100   0.044   0.019
        0.009   0.005   0.002   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
1994    1       1       0       2       200     0.000   0.000   0.001   0.002   0.010   0.035   0.087   0.118   0.181   0.176   0.168   0.104   0.065   0.019
        0.020   0.010   0.003   0.000   0.001   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
1995    1       1       0       2       157     0.000   0.001   0.003   0.033   0.079   0.062   0.116   0.158   0.152   0.131   0.099   0.074   0.049   0.025
        0.010   0.000   0.004   0.004   0.001   0.000   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
1996    1       1       0       2       200     0.000   0.002   0.001   0.009   0.028   0.072   0.078   0.129   0.157   0.155   0.143   0.099   0.068   0.031
        0.018   0.006   0.003   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
1999    1       1       0       2       200     0.000   0.000   0.000   0.001   0.009   0.031   0.074   0.129   0.172   0.201   0.201   0.089   0.048   0.028
        0.013   0.004   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2000    1       1       0       2       140     0.000   0.000   0.000   0.000   0.004   0.022   0.043   0.104   0.118   0.161   0.315   0.139   0.060   0.020
        0.002   0.011   0.000   0.000   0.001   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2001    1       1       0       2       91      0.000   0.000   0.001   0.005   0.015   0.072   0.087   0.115   0.141   0.171   0.146   0.121   0.057   0.032
        0.025   0.009   0.002   0.001   0.000   0.000   0.000   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2002    1       1       0       2       198     0.000   0.001   0.000   0.001   0.012   0.047   0.099   0.085   0.092   0.111   0.188   0.224   0.094   0.029
        0.010   0.006   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2003    1       1       0       2       200     0.000   0.000   0.000   0.001   0.002   0.021   0.104   0.207   0.157   0.122   0.160   0.135   0.067   0.019
        0.005   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2004    1       1       0       2       200     0.000   0.000   0.000   0.001   0.004   0.014   0.044   0.097   0.130   0.160   0.211   0.196   0.092   0.034
        0.011   0.003   0.001   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2005    1       1       0       2       128     0.000   0.000   0.000   0.000   0.001   0.021   0.036   0.057   0.097   0.145   0.180   0.245   0.128   0.068
        0.012   0.005   0.002   0.003   0.000   0.001   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
2006    1       1       0       2       93      0.000   0.000   0.000   0.000   0.001   0.012   0.058   0.087   0.125   0.210   0.186   0.173   0.099   0.034
        0.008   0.003   0.001   0.001   0.001   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # RecFIN
#commecial hook and line
1979    1       2       0       2       -4      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.019   0.075   0.063   0.219   0.094   0.125   0.019
        0.044   0.088   0.176   0.078   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   # commhl
1982    1       2       0       2       -2      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.083   0.083   0.400   0.000   0.083
        0.000   0.000   0.234   0.117   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
```

	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1991	1	2	0	2	-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.085	0.014	0.250	0.370	0.099	0.125
	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1992	1	2	0	2	89	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.057	0.210	0.150	0.121	0.148	0.117	0.074
	0.056	0.044	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1993	1	2	0	2	200	0.000	0.000	0.000	0.000	0.000	0.001	0.027	0.055	0.120	0.158	0.212	0.213	0.091	0.064
	0.026	0.013	0.013	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1994	1	2	0	2	135	0.000	0.000	0.000	0.000	0.003	0.005	0.014	0.044	0.065	0.134	0.202	0.156	0.126	0.109
	0.065	0.056	0.017	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1995	1	2	0	2	83	0.000	0.000	0.000	0.000	0.000	0.007	0.024	0.030	0.048	0.118	0.150	0.123	0.199	0.167
	0.103	0.016	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1996	1	2	0	2	89	0.000	0.000	0.000	0.000	0.000	0.010	0.024	0.059	0.076	0.119	0.157	0.192	0.142	0.139
	0.073	0.005	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1997	1	2	0	2	52	0.000	0.000	0.000	0.000	0.004	0.054	0.058	0.173	0.149	0.121	0.154	0.080	0.074	0.070
	0.040	0.007	0.013	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1998	1	2	0	2	23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.086	0.253	0.221	0.134	0.135	0.100
	0.030	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
1999	1	2	0	2	86	0.000	0.000	0.000	0.000	0.012	0.020	0.037	0.063	0.085	0.208	0.289	0.127	0.117	0.028
	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2000	1	2	0	2	19	0.000	0.000	0.000	0.000	0.000	0.008	0.026	0.046	0.062	0.158	0.295	0.134	0.148	0.071
	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2001	1	2	0	2	12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.045	0.206	0.289	0.154	0.088
	0.018	0.015	0.015	0.046	0.031	0.061	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2002	1	2	0	2	11	0.000	0.000	0.000	0.000	0.000	0.011	0.011	0.035	0.048	0.150	0.177	0.267	0.207	0.067
	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2003	1	2	0	2	-3	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021	0.085	0.218	0.174	0.193	0.199	0.089
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2004	1	2	0	2	10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.092	0.147	0.203	0.162	0.194	0.026
	0.139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2005	1	2	0	2	16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.083	0.127	0.113	0.176	0.297
	0.141	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
2006	1	2	0	2	9	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.041	0.066	0.177	0.265	0.276	0.131
	0.032	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commhl							
#commercial setnet																			
1978	1	3	0	2	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.131	0.309
	0.327	0.144	0.065	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commnet							
1979	1	3	0	2	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100
	0.100	0.300	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commnet							
1985	1	3	0	2	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.015
	0.630	0.216	0.068	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commnet							
1989	1	3	0	2	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063	0.125	0.063	0.000	0.313
	0.125	0.250	0.063	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# commnet							
#CDFG CPFV																			
1987	1	4	0	2	42	0.004	0.007	0.003	0.003	0.023	0.047	0.078	0.220	0.235	0.178	0.092	0.056	0.033	0.013
	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# CDFGonboard							
1988	1	4	0	2	131	0.000	0.000	0.000	0.001	0.014	0.051	0.098	0.132	0.213	0.206	0.119	0.070	0.052	0.023
	0.012	0.004	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# CDFGonboard							
1989	1	4	0	2	154	0.000	0.000	0.000	0.001	0.008	0.036	0.105	0.131	0.163	0.183	0.144	0.096	0.049	0.041
	0.024	0.011	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	# CDFGonboard							

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1990 1 4 0 2 51 0.000 0.000 0.000 0.000 0.006 0.026 0.103 0.171 0.186 0.165 0.144 0.089 0.048 0.023
0.019 0.017 0.004 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1991 1 4 0 2 59 0.000 0.000 0.000 0.002 0.016 0.043 0.102 0.154 0.208 0.216 0.153 0.070 0.021 0.010
0.003 0.001 0.000 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1992 1 4 0 2 163 0.000 0.000 0.000 0.001 0.006 0.031 0.079 0.137 0.192 0.200 0.163 0.101 0.050 0.023
0.011 0.003 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1993 1 4 0 2 168 0.000 0.000 0.000 0.001 0.015 0.054 0.129 0.167 0.189 0.183 0.133 0.070 0.036 0.013
0.005 0.003 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1994 1 4 0 2 180 0.000 0.000 0.000 0.003 0.027 0.068 0.127 0.191 0.200 0.162 0.104 0.068 0.031 0.011
0.005 0.002 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1995 1 4 0 2 190 0.000 0.000 0.000 0.004 0.021 0.070 0.137 0.175 0.186 0.165 0.109 0.067 0.038 0.015
0.008 0.004 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1996 1 4 0 2 166 0.000 0.000 0.001 0.004 0.027 0.055 0.130 0.192 0.187 0.163 0.117 0.070 0.032 0.015
0.005 0.002 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1997 1 4 0 2 200 0.000 0.000 0.001 0.006 0.014 0.052 0.128 0.191 0.201 0.154 0.100 0.068 0.043 0.026
0.010 0.004 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
1998 1 4 0 2 139 0.000 0.000 0.000 0.001 0.006 0.031 0.089 0.158 0.208 0.186 0.144 0.101 0.049 0.021
0.005 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 # CDFGonboard
#
#
30 # Number of Age Bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
1 # 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 2
6.5 27.5 28.5 29.5 30.5
0.13 0.21 0.29 0.38 0.46 0.54 0.62 0.70 0.78 0.86 0.94 1.02 1.10 1.18 1.27 1.35 1.43 1.51 1.59 1.67 1.75 1.83 1.91 1.99 2.07 2.16 2
.24 2.32 2.40 2.48 2.56
160 # Age Composition Observations
#
#conditional age at length for 1980-1984 recreational age data
#year Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp 1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
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
# bin FL 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 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
1980 1 1 3 0 1 6 6 0.8501 0 0 0 0.666666 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.333333 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
1980 1 1 3 0 1 7 7 1.9837 0 0 0 0 0.285714 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.285714 0.142857 0.285714 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1980 1 1 3 0 1 8 8 4.8175 0 0 0 0 0.117647 0.117647 0.058823 0.058
823 0 0 0 0 0.058823 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0.17647 0.117647 0.058823 0.058823 0 0.058823 0
0.058823 0 0 0.058823 0 0 0 0 0 0 0 0 0 0 0
0 0
1980 1 1 3 0 1 9 9 8.2182 0 0 0 0 0.206896 0.172413 0.103448 0.068
965 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.034482 0.103448 0.068965 0.103448 0.068965 0 0 0
0 0 0.034482 0 0 0.034482 0 0 0 0 0 0 0 0 0 0 0
0 0
1980 1 1 3 0 1 10 10 9.6351 0 0 0 0 0.117647 0.17647 0.029411 0.088235
0.029411 0.088235 0.029411 0 0.029411 0 0 0 0.029411 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0.029411 0.029411 0.029411 0.029
411 0.029411 0.088235 0.058823 0 0 0 0.029411 0 0 0 0 0.058823 0 0
0 0 0 0 0 0 0 0
1980 1 1 3 0 1 11 11 10.2019 0 0 0 0 0.027777 0.055555 0.083333 0.055
555 0.027777 0.083333 0.083333 0.055555 0.027777 0 0.027777 0.027777 0.027777 0 0
```

```
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.027777	0.055
555	0	0	0.055555	0.083333	0.027777	0.055555	0	0.055555	0.027777	0	0	0	0.027
777	0	0	0	0	0	0	0	0	0	0
1980	1	1	3	0	1	12	12	11.3355	0	0	0	0	0.025	0.05	0.05	0.075	0.1	0.15	0.1
	0	0	0.075	0	0.025	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0.025	0	0.025	0.025	0.025	0.025	0.025	0	0	0	0.025
	0	0	0.05	0	0.025	0.025	0	0.025	0	0	0
1980	1	1	3	0	1	13	13	10.4853	0	0	0	0	0	0.027027	0	0.081081	0.108
108	0.108108	0.081081	0.081081	0.054054	0.027027	0.027027	0.027027	0	0	0	0	0
	0	0	0	0	0	0	0	0.027027	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.027027	0.027027	0.027027	0.027027	0	0.027027	0.027027	0.108
108	0.027027	0	0	0.027027	0	0.027027	0	0
1980	1	1	3	0	1	14	14	7.0846	0	0	0	0	0	0	0.04	0	0.08	0.04	0.2
	0.04	0.08	0.08	0.16	0.08	0.08	0.04	0.04	0	0	0	0	0	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
	0	0	0	0	0	0	0	0	0	0	0
1980	1	1	3	0	1	15	15	5.6677	0	0	0	0	0	0	0	0	0	0	0.2
	0	0.1	0.05	0.1	0.1	0.05	0.1	0.15	0	0.05	0	0.1	0	0	0	0	0	0	0
	0	0	0	0	0	0	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	3	0	1	16	16	8.785	0	0	0	0	0	0.032258	0.032258	0	0
	0	0	0.032258	0.032258	0.16129	0.064516	0.129032	0.064516	0.096774	0.096774	0.096774
	0.064516	0	0.032258	0.032258	0	0	0	0	0.032258	0	0	0	0	0	0
	0	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	3	0	1	17	17	7.368	0	0	0	0	0	0	0	0	0	0	0
	0.038461	0.038461	0	0	0.038461	0.076923	0.038461	0.038461	0.076923	0.115384	0
	0.038461	0.153846	0.038461	0.115384	0	0.115384	0	0.038461	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0.038461	0	0	0	0
	0	0	0	0	0	0	0
1980	1	1	3	0	1	18	18	0.5667	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
#


1981	1	1	3	0	1	6	6	0.8388	0	0	0	0.333333	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.666666	0	0	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	3	0	1	7	7	0.8388	0	0	0	0.333333	0.333333	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.333333	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	1	1	3	0	1	8	8	3.0756	0	0	0	0	0.181818	0.090909	0.181818	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0.090909	0.090909	0	0	0.090909	0	0
	0.181818	0	0	0	0	0	0.090909	0	0	0	0	0	0	0	0	0	0
1981	1	1	3	0	1	9	9	7.5493	0	0	0	0	0.074074	0.148148	0.148148	0.037
037	0.037037	0	0	0.037037	0	0.037037	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0.074074	0	0.074074	0.074074	0
	0	0.037037	0.037037	0.037037	0.074074	0	0.037037	0.037037	0	0	0	0	0
	0	0	0	0	0	0	0
1981	1	1	3	0	1	10	10	11.1842	0	0	0	0	0	0.05	0.15	0.175	0	0.075	0
	0	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	0.025	0.075	0.05	0.075	0.05	0.05	0.025	0.025	0.025	0	0.025	0	0.05
	0.05	0	0	0	0	0	0	0	0	0	0
1981	1	1	3	0	1	11	11	14.5394	0	0	0	0	0.01923	0	0.038461	0.038461	0.057
692	0.057692	0.057692	0.01923	0.01923	0	0.01923	0	0	0.038461	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0.038461	0	0	0.057692	0	0.038461
	0.038461	0.076923	0.01923	0.076923	0.01923	0.076923	0.153846	0.01923	0	0	0.01923	0	0	0
	0	0	0	0	0
1981	1	1	3	0	1	12	12	17.0559	0	0	0	0	0	0	0.016393	0.04918	0	0.016
393	0.04918	0.081967	0.032786	0.032786	0.04918	0.04918	0	0.016393	0.032786	0.016393	0	0.016393
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.032786	0.016
393	0	0	0.016393	0.016393	0.065573	0.081967	0.081967	0.081967	0.032786	0	0.016393
	0.016393	0.016393	0.016393	0	0.016393	0	0	0	0.032786
1981	1	1	3	0	1	13	13	11.7434	0	0	0	0	0	0	0	0.047619	0.023809
	0	0.023809	0.047619	0.095238	0.071428	0.166666	0.095238	0.023809	0.095238	0.023809
	0	0	0	0	0	0	0.047619	0	0	0	0.023809	0	0	0	0	0	0
```

0 0.023809 0 0 0 0 0 0 0 0.023809 0 0 0 0 0.071428 0
0.023809 0 0 0.023809 0 0.023809 0 0.023809
1981 1 1 3 0 1 14 14 8.3881 0 0 0 0 0 0 0 0 0 0 0.033
333 0 0.166666 0.1 0.066666 0.033333 0.2 0.066666 0.033333 0.033333 0.1 0 0 0.033
333 0.033333 0 0 0 0 0.033333 0 0 0 0 0 0 0 0 0 0 0
0 0.033333 0 0 0 0 0 0 0 0 0 0 0 0 0.033333 0 0
0 0
1981 1 1 3 0 1 15 15 4.194 0 0 0 0 0 0 0 0 0 0 0
0.066666 0 0.066666 0 0.066666 0.133333 0.133333 0.133333 0.133333 0.133333 0
0.066666 0 0 0 0.066666 0 0 0 0 0 0 0 0 0 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 3 0 1 16 16 2.5164 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.111111 0.333333 0.111111 0 0.111111 0.222222 0 0 0
0 0.111111 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
1981 1 1 3 0 1 17 17 2.796 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.1 0.1 0 0.1 0 0 0.1 0 0 0.6
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1981 1 1 3 0 1 18 18 0.2796 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
#

1982 1 1 3 0 1 7 7 0.2082 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1982 1 1 3 0 1 8 8 3.5397 0 0 0 0.058823 0.352941 0.17647 0 0.058823
0 0 0.058823 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0.117647 0.117647 0 0 0 0 0 0 0.058
823 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1982 1 1 3 0 1 9 9 8.9534 0 0 0 0 0.046511 0.139534 0.093023 0.116
279 0.023255 0 0.023255 0 0 0 0.023255 0 0 0.023255 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0.046511 0.139534 0.116279 0.023
255 0.023255 0.023255 0.046511 0 0 0.023255 0 0.023255 0 0.046511 0 0 0
0 0 0 0 0 0 0 0
1982 1 1 3 0 1 10 10 10.8273 0 0 0 0 0.01923 0.038461 0.115384 0.076923
0.076923 0.038461 0 0.057692 0.038461 0.01923 0 0.01923 0 0 0.01923 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.01923 0.01923 0 0.057
692 0.01923 0.057692 0.057692 0.038461 0.038461 0.01923 0.01923 0.01923 0.057692 0.038461 0.01923 0 0
0 0 0 0 0
1982 1 1 3 0 1 11 11 13.1178 0 0 0 0 0 0.015873 0.063492 0.111111
0.095238 0.047619 0.031746 0.031746 0.031746 0.063492 0 0.015873 0.015873 0.015873
0.015873 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.015873 0 0.031746 0.015873 0.031746 0.079365 0.063492 0.015873 0.015873 0.015873
0.015873 0.031746 0 0.015873 0 0.031746 0 0.015873 0.015873 0 0.015873 0.015
873 0 0
1982 1 1 3 0 1 12 12 14.1589 0 0 0 0 0 0 0.029411 0.044117 0.073
529 0.161764 0.029411 0.088235 0.044117 0.029411 0.088235 0.029411 0 0.014705 0.014705
0.029411 0 0.014705 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.014705 0 0.014705 0.014705 0.014705 0.014705 0.044117 0.029411
0.058823 0.058823 0.014705 0.014705 0 0.014705 0 0 0 0 0 0
1982 1 1 3 0 1 13 13 8.3287 0 0 0 0 0 0 0 0 0.05 0.1 0.075
0.05 0.1 0.05 0.05 0.125 0.1 0.075 0 0 0.05 0.05 0 0.025 0.025 0 0 0.025 0 0
0 0 0 0 0 0 0 0 0 0.025 0 0 0 0 0 0 0 0 0
0 0.025 0 0 0 0 0 0 0 0 0
1982 1 1 3 0 1 14 14 7.0794 0 0 0 0 0 0 0 0 0.058823 0
0.058823 0.058823 0.058823 0.088235 0.088235 0.058823 0.088235 0.147058 0.058823 0.029
411 0.029411 0 0.058823 0.058823 0 0.029411 0.029411 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1982 1 1 3 0 1 15 15 5.2054 0 0 0 0 0 0 0 0 0 0 0
0 0.04 0.04 0.08 0.08 0.08 0.12 0.04 0.16 0.12 0 0.04 0.04 0 0.08 0 0.04 0.04 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1982 1 1 3 0 1 16 16 2.4986 0 0 0 0 0 0 0 0 0 0.083333
0 0 0 0.083333 0 0.083333 0.083333 0 0.166666 0.166666 0.083333 0.083333

```
        0       0       0.083333        0       0       0       0       0.083333        0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0
1982    1       1       3       0       1       17      17      1.8739  0       0       0       0       0       0       0.111111        0       0       0
        0       0       0       0       0       0       0       0       0       0.222222        0       0       0.222222        0       0.111111        0.111
111     0       0.111111        0       0.111111        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
1982    1       1       3       0       1       18      18      0.2082  0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       1
        0       0       0       0       0       0       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       3       0       1       6       6       0.2461  0       0       0       0       0       0       0       0       0       0       0
        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       0.5     0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1983    1       1       3       0       1       7       7       0.3692  0       0       0       0       0       0       0       0.333333        0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0.666666        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       3       0       1       8       8       1.6     0       0       0       0       0.076923        0.076923        0       0.076923
        0.076923        0       0       0.076923        0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0.076923        0.307692        0       0       0.076923        0       0
        0       0       0.076923        0       0       0       0.076923        0       0       0       0       0       0       0       0       0       0
        0       0
1983    1       1       3       0       1       9       9       1.9692  0       0       0       0       0.0625  0.0625  0.0625  0.125   0.125   0.0625  0
        0       0       0       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   0.125   0       0       0       0       0       0       0       0.0625  0       0.062
5       0       0       0.125   0       0       0       0       0       0       0       0
1983    1       1       3       0       1       10      10      4.6769  0       0       0       0       0       0       0.052631        0.131578        0.052
631     0.026315        0.052631        0.026315        0.052631        0.052631        0.026315        0.052631        0       0.026315        0
        0       0.026315        0       0       0       0       0       0       0       0       0       0       0       0       0       0.026315        0
        0.026315        0.026315        0       0       0.052631        0.078947        0.105263        0       0       0       0       0       0       0.026
315     0.026315        0       0.026315        0       0       0.026315        0       0       0
1983    1       1       3       0       1       11      11      3.323   0       0       0       0       0       0       0.037037        0.037037        0.111
111     0.037037        0.074074        0       0.111111        0.037037        0       0.074074        0       0.074074        0.074074        0.037037
        0       0.037037        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.037037        0.074074        0.074074        0       0       0.037037        0       0       0       0       0
        0       0       0       0       0       0       0.037037
1983    1       1       3       0       1       12      12      6.4     0       0       0       0       0       0       0       0.038461        0.01923 0.057
692     0.057692        0.057692        0.01923 0.038461        0.057692        0.038461        0.153846        0.096153        0.076923        0.038461
        0.038461        0.038461        0.01923 0.01923 0.038461        0       0       0       0.01923 0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0.01923 0       0.01923 0       0       0.01923 0       0       0.01923 0       0       0
        0       0       0       0       0
1983    1       1       3       0       1       13      13      5.0461  0       0       0       0       0       0       0       0       0.02439 0.02439 0.024
39      0.02439 0.04878 0.07317 0.07317 0.02439 0.121951        0.04878 0.04878 0.09756 0.04878 0.07317 0.04878 0.04878 0       0       0       0       0.024
39      0.07317 0       0       0       0       0       0       0       0       0       0       0       0.02439 0       0       0.02439 0       0
        0       0       0       0       0       0       0       0       0       0       0       0
1983    1       1       3       0       1       14      14      3.0769  0       0       0       0       0       0       0       0       0       0.04    0.04
        0.08    0.08    0.04    0.12    0.08    0.12    0.08    0.12    0       0       0.08    0       0.04    0       0       0.04    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       0       0       0       0       0       0       0       0
1983    1       1       3       0       1       15      15      2.2153  0       0       0       0       0       0       0       0       0       0       0.055
555     0.055555        0       0.055555        0.055555        0       0.111111        0.222222        0.055555        0.055555        0.055555        0
        0.055555        0.055555        0       0.055555        0.055555        0       0       0.055555        0       0       0       0       0
        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       3       0       1       16      16      1.6     0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0.230769        0.153846        0       0       0.153846        0       0.153846        0       0.076923
        0.076923        0       0       0.076923        0.076923        0       0       0       0       0       0       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       3       0       1       17      17      1.2307  0       0       0       0       0       0       0       0       0       0       0
        0       0       0.1     0       0       0       0.2     0.1     0       0.1     0.1     0.1     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
1983    1       1       3       0       1       18      18      0.2461  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       0.5
        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
```

```
#


1984	1	1	3	0	1	6	6	0.8297	0	0	0	0	0.5	0.333333	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.166666	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	3	0	1	7	7	2.6276	0	0	0	0	0.105263	0.052631	0.052631	0.105
263	0.105263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0.157894	0	0.105263	0.052631	0.105263	0.052
631	0.052631	0.052631	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0
1984	1	1	3	0	1	8	8	4.4255	0	0	0	0	0.03125	0.03125	0.03125	0.09375	0.0625	0.1875	0.062
5	0	0.03125	0.03125	0	0	0.03125	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	0.09375	0	0.0625	0.0625	0	0.03125	0	0.03125	0
	0.03125	0	0	0	0	0	0	0	0	0	0
1984	1	1	3	0	1	9	9	7.8829	0	0	0	0	0	0.035087	0.070175	0.105263
	0.052631	0.017543	0.035087	0.035087	0.017543	0.017543	0.017543	0.017543	0	0.017543
	0	0.017543	0	0.017543	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.087719	0.052631	0	0.052631	0.017543	0.070175	0.035087	0	0.035087	0.017
543	0.052631	0.017543	0	0.017543	0.017543	0	0.035087	0	0	0.017543	0	0	0
1984	1	1	3	0	1	10	10	6.9148	0	0	0	0	0.02	0.02	0.04	0.04	0.08	0.02	0.12
	0.02	0	0	0.02	0	0	0.02	0.04	0.02	0	0	0	0.02	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.02	0.04	0.06	0	0.06	0.02	0.02	0.06	0	0.02	0.08	0.02
	0.04	0.02	0.02	0.02	0	0.02	0	0	0	0	0
1984	1	1	3	0	1	11	11	7.8829	0	0	0	0	0	0.035087	0.052631	0.035087
	0.035087	0.070175	0.070175	0.070175	0.035087	0.035087	0	0	0.087719	0.017543	0
	0	0	0	0	0.017543	0	0	0	0	0	0	0	0	0	0	0	0.017543
	0.017543	0.035087	0.017543	0.017543	0.035087	0	0.017543	0.017543	0.035087	0.052631
	0.035087	0.070175	0	0	0.017543	0	0.035087	0	0.017543	0	0	0	0	0
1984	1	1	3	0	1	12	12	12.5851	0	0	0	0	0	0	0.010989	0.032967	0.065
934	0.076923	0.021978	0.054945	0.043956	0.032967	0	0.054945	0.043956	0.087912	0.043956
	0.021978	0.021978	0.021978	0.032967	0	0	0.021978	0	0	0	0.021978	0	0
	0	0	0	0.010989	0.021978	0	0	0.010989	0	0	0.010989	0	0	0.021978
	0	0.021978	0.010989	0.010989	0.021978	0.032967	0.021978	0.021978	0	0.021978	0.010
989	0	0	0.032967
1984	1	1	3	0	1	13	13	8.4361	0	0	0	0	0	0	0	0.016393	0.065573
	0.016393	0.081967	0.016393	0.09836	0.065573	0.065573	0.04918	0.081967	0.081967	0.032786	0.081
967	0.032786	0	0.065573	0	0	0.016393	0	0	0	0.016393	0	0	0	0	0
	0	0	0	0	0	0	0.016393	0	0	0	0	0	0	0.016393	0	0	0
	0.016393	0.04918	0	0.016393	0	0	0	0
1984	1	1	3	0	1	14	14	4.4255	0	0	0	0	0	0	0	0.03125	0	0.09375	0.031
25	0.03125	0.03125	0.09375	0.0625	0.03125	0.0625	0.0625	0.0625	0.03125	0.125	0.0625	0.09375	0	0	0	0	0	0	0.031
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.03125	0	0	0.03125	0	0	0
1984	1	1	3	0	1	15	15	4.5638	0	0	0	0	0	0	0	0.060606	0	0
	0.060606	0.030303	0	0.030303	0.121212	0	0.060606	0.121212	0	0.060606	0.030303
	0.060606	0.030303	0.090909	0.060606	0.030303	0	0	0.030303	0.090909	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.030303	0	0	0
	0	0	0	0	0	0	0	0	0
1984	1	1	3	0	1	16	16	2.9042	0	0	0	0	0	0	0	0	0	0	0
	0	0.047619	0	0	0	0.047619	0.095238	0.142857	0	0.095238	0.095238	0.095238
	0	0.095238	0	0.142857	0	0.047619	0.095238	0	0	0	0	0	0	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	3	0	1	17	17	1.5212	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.090909	0	0	0	0	0	0	0	0.090909	0.272727	0	0.181818
	0	0	0.090909	0.272727	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#
#these are here just to evaluate overall fit to all conditional age data (by source) at once
#ALL YEARS COMBINED (composite)- USED TO VISUAL EVALUATE FIT ONLY!	0.001075	0.002
15	0.003225	0.004301	0.005376	0.006451	0.007526	0.008602	0.009677	0.010752	0.011827	0.012
903	0.013978	0.015053	0.016129	0.017204	0.018279	0.019354	0.02043	0.021505	0.02258	0.023655	0.024
731	0.025806	0.026881	0.027956	0.029032	0.030107	0.031182	0.032258	0.001075	0.00215	0.003225
	0.004301	0.005376	0.006451	0.007526	0.008602	0.009677	0.010752	0.011827	0.012903	0.013
978	0.015053	0.016129	0.017204	0.018279	0.019354	0.02043	0.021505	0.02258	0.023655	0.024731	0.025
806	0.026881	0.027956	0.029032	0.030107	0.031182	0.032258
1985	1	4	3	0	1	6	6	1.9361	0	0	0	0.214285	0.214285	0.142857	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.142857	0.142857	0.071428	0	0	0.071428	0	0	0
```

```
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
1985    1       4       3       0       1       7       7       4.5638  0       0       0       0.030303        0.151515        0.030303        0.030303
        0.090909        0.060606        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0.090909        0.030303        0.151515        0.060606        0.060606
        0.030303        0.060606        0.060606        0.030303        0.030303        0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0
1985    1       4       3       0       1       8       8       12.4468 0       0       0       0.011111        0.133333        0.088888        0.044444
        0.066666        0.033333        0.066666        0.033333        0.011111        0.022222        0.011111        0       0       0.011111        0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0.066666        0.088
888     0.022222        0.022222        0.033333        0.022222        0.044444        0.011111        0.033333        0.055555        0.011111        0.011
111     0       0.022222        0       0.022222        0       0       0       0       0       0       0       0       0       0
1985    1       4       3       0       1       9       9       23.7872 0       0       0       0       0.063953        0.104651        0.093023        0.093
023     0.040697        0.011627        0.017441        0.017441        0.005813        0.011627        0.011627        0.005813        0       0.011627
        0       0.005813        0       0.005813        0       0       0       0       0       0       0       0       0       0       0       0.005813
        0.017441        0.034883        0.052325        0.093023        0.046511        0.005813        0.023255        0.023255        0.029069        0.023
255     0.017441        0.011627        0.029069        0.023255        0.023255        0       0.005813        0.017441        0       0.011627        0
        0       0.005813        0       0       0
1985    1       4       3       0       1       10      10      29.5957 0       0       0       0       0.028037        0.051401        0.079439        0.098
13      0.051401        0.046728        0.042056        0.023364        0.023364        0.014018        0.009345        0.018691        0.004672        0.009
345     0.009345        0.009345        0       0.004672        0       0.004672        0       0       0       0       0       0       0       0       0
        0       0.004672        0.009345        0.009345        0.028037        0.03271 0.046728        0.018691        0.046728        0.028037        0.042
056     0.037383        0.009345        0.018691        0.023364        0.018691        0.03271 0.023364        0.018691        0.009345        0.004672
        0.004672        0       0.004672        0       0       0
1985    1       4       3       0       1       11      11      32.5    0       0       0       0       0.00851 0.021276        0.055319        0.059574
        0.063829        0.059574        0.059574        0.038297        0.038297        0.029787        0.00851 0.017021        0.029787        0.025531
        0.012765        0.004255        0       0.004255        0       0.004255        0       0       0       0       0       0       0       0       0
        0       0       0.017021        0.017021        0.00851 0.025531        0.017021        0.038297        0.034042        0.051063        0.021276
        0.046808        0.025531        0.029787        0.063829        0.004255        0.00851 0.004255        0.012765        0.00851 0.004255        0.008
51      0       0.004255        0.004255        0       0.004255
1985    1       4       3       0       1       12      12      43.1489 0       0       0       0       0.003205        0.00641 0.01923 0.044871        0.051
282     0.089743        0.044871        0.060897        0.032051        0.038461        0.038461        0.041666        0.044871        0.048076        0.035
256     0.022435        0.01282 0.01923 0.01282 0.003205        0.00641 0.00641 0       0       0.003205        0.00641 0       0       0       0       0
        0.003205        0.00641 0       0.009615        0.00641 0.00641 0.003205        0.01282 0.01282 0.01923 0.028846        0.025641        0.028846
        0.028846        0.016025        0.01282 0.025641        0.009615        0.016025        0.003205        0.009615        0.00641 0       0       0.016
025
1985    1       4       3       0       1       13      13      30.5638 0       0       0       0       0       0.004524        0       0.027149        0.054
298     0.045248        0.058823        0.040723        0.081447        0.058823        0.076923        0.063348        0.067873        0.063348        0.022
624     0.040723        0.027149        0.022624        0.027149        0.013574        0.004524        0.013574        0       0.004524        0.009049
        0.022624        0       0       0       0       0       0       0.004524        0       0.004524        0       0.004524        0.004524
        0       0.004524        0.013574        0.004524        0.004524        0.004524        0.004524        0.022624        0.018099        0.013574
        0.013574        0       0.013574        0       0.009049        0       0.004524
1985    1       4       3       0       1       14      14      20.1914 0       0       0       0       0       0       0.006849        0.006849        0.027
397     0.034246        0.068493        0.041095        0.082191        0.082191        0.09589 0.054794        0.109589        0.082191        0.061643
        0.020547        0.054794        0.027397        0.034246        0.027397        0.006849        0.006849        0.013698        0       0       0.013
698     0       0       0       0       0       0       0       0       0       0       0       0       0.006849        0       0       0       0       0.006
849     0       0       0.006849        0       0       0.006849        0       0.006849        0.006849        0       0       0
1985    1       4       3       0       1       15      15      15.351  0       0       0       0       0       0       0       0.018018        0       0
        0.063063        0.027027        0.027027        0.045045        0.081081        0.045045        0.081081        0.135135        0.063063        0.081
081     0.072072        0.018018        0.054054        0.045045        0.018018        0.036036        0.018018        0.009009        0.018018        0.036
036     0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0.009009
        0       0       0       0       0       0       0       0       0       0       0       0
1985    1       4       3       0       1       16      16      11.8936 0       0       0       0       0       0.011627        0.011627        0       0
        0.011627        0       0.011627        0.023255        0.069767        0.023255        0.058139        0.093023        0.116279        0.104651
        0.058139        0.093023        0.058139        0.058139        0.011627        0.046511        0.011627        0.046511        0       0.034883
        0.046511        0       0       0       0       0       0       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       3       0       1       17      17      9.1276  0       0       0       0       0       0.015151        0       0       0
        0       0.015151        0.015151        0.015151        0.015151        0.015151        0.030303        0.045454        0.030303        0.060606
        0.075757        0.030303        0.075757        0.136363        0.030303        0.10606 0.015151        0.060606        0.030303        0.166666
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0.015
151     0       0       0       0       0       0       0       0       0       0       0
1985    1       4       3       0       1       18      18      0.8297  0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.166666        0       0       0       0.166666        0       0.166666        0       0       0       0       0.166
666     0       0       0.333333        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
#
#Laidig composite - dive data - not used
#year   Seas    Flt/Svy Gender  Part    Ageerr  Lbin_lo Lbin_hi Nsamp   1       2       3       4       5       6       7       8       9       10      11
        12      13      14      15      16      17      18      19      20      21      22      23      24      25      26      27      28      29      30
        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
1995    1       4       3       0       1       1       1       0.3     1       0       0       0       0       0       0       0       0       0       0
```

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        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1995    1       4       3       0       1       2       2       0.6     1       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       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       3       0       1       3       3       0.2     0.5     0.5     0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       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       3       0       1       4       4       0.5     0       1       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1995    1       4       3       0       1       5       5       0.6     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
1995    1       4       3       0       1       6       6       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       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       3       0       1       7       7       0.5     0       0       0.285714        0.571428        0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0.142857        0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0
1995    1       4       3       0       1       8       8       1.1     0       0       0       0.333333        0.2     0.066666        0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0.066666        0.066666        0.133333        0.066666        0.066666        0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
1995    1       4       3       0       1       9       9       3.8     0       0       0       0.117647        0.215686        0.078431        0.117647
        0.058823        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0.019607        0.039215        0.058823        0.117647        0
        0.078431        0.058823        0.019607        0.019607        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0
1995    1       4       3       0       1       10      10      7.8     0       0       0       0.009708        0.116504        0.194174        0.213592
        0.165048        0.048543        0       0       0.009708        0       0       0       0       0       0       0.009708        0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0.009708        0.009
708     0.019417        0       0.019417        0.019417        0.029126        0.029126        0.019417        0.019417        0.029126        0.019417
        0       0       0       0.009708        0       0       0       0       0       0
1995    1       4       3       0       1       11      11      12.2    0       0       0       0       0.012345        0.074074        0.209876        0.228
395     0.19753 0.080246        0.061728        0.030864        0.018518        0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0.006172        0       0       0       0
        0       0       0       0       0.012345        0.006172        0       0.012345        0.006172        0       0.012345        0.006172        0.012
345     0       0       0       0       0.012345        0
1995    1       4       3       0       1       12      12      19.8    0       0       0       0       0       0.019083        0.045801        0.125954
        0.171755        0.122137        0.148854        0.141221        0.064885        0.061068        0.053435        0.0229  0.003816        0.007633
        0       0       0       0       0       0.003816        0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0.003816        0       0       0       0       0       0
        0       0       0       0       0       0.003816
1995    1       4       3       0       1       13      13      19.5    0       0       0       0       0       0       0.003875        0.023255        0.015
503     0.034883        0.085271        0.096899        0.104651        0.127906        0.077519        0.100775        0.089147        0.062015        0.050
387     0.034883        0.011627        0.023255        0.015503        0.015503        0.007751        0.007751        0       0.003875        0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0.003875
        0.003875        0       0       0       0       0       0       0       0       0       0       0       0
1995    1       4       3       0       1       14      14      11.6    0       0       0       0       0       0       0       0       0.006493        0.006
493     0       0.025974        0.045454        0.051948        0.032467        0.058441        0.071428        0.084415        0.077922        0.064935
        0.071428        0.051948        0.064935        0.058441        0.077922        0.032467        0.038961        0.025974        0.006493        0.038
961     0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0.006493        0       0       0       0       0       0       0       0
1995    1       4       3       0       1       15      15      4.3     0       0       0       0       0       0       0       0       0       0       0.017
543     0       0.017543        0       0.035087        0.017543        0.017543        0       0.105263        0.052631        0.070175        0.14035 0.052
631     0.070175        0.035087        0.087719        0.087719        0.017543        0.017543        0.157894        0       0       0       0       0
        0       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       3       0       1       16      16      0.8     0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0.1     0.2     0       0.1     0       0       0.2     0       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
#
#Laidig conditional age @ length - dive data - not used
```

#year	Seas	Flt/Svy	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	Nsamp	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	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								
1988	1	6	3	0	1	8	8	0.1	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0								
1988	1	6	3	0	1	9	9	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								
1988	1	6	3	0	1	10	10	0.9	0	0	0	0	0	0.214285		0.428571		0.071428	
	0.071428		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.071428		0.071428		0.071428		0	0	0	0	0	0	0	0	0	0	0	
1988	1	6	3	0	1	11	11	1.3	0	0	0	0	0	0.15	0.35	0.1	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	0.05	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.05	0.05	0	0	0	0	0	0	0								
1988	1	6	3	0	1	12	12	2.0	0	0	0	0	0	0	0.129032		0.290322		0.225
806	0.129032		0.032258		0.032258		0.096774		0.032258		0.032258		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	1	6	3	0	1	13	13	1.3	0	0	0	0	0	0	0	0.095238		0.047619	
	0	0.190476		0.190476		0.142857		0.095238		0	0.047619		0.047619		0.047619		0	0	0
	0	0.047619		0.047619		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0																
1988	1	6	3	0	1	14	14	1.1	0	0	0	0	0	0	0	0	0	0	0
	0.058823		0	0.17647	0	0	0.058823		0.117647		0.058823		0	0.058823		0	0	0.117647	
	0.117647		0	0.117647		0	0	0.117647		0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0																		
1988	1	6	3	0	1	15	15	0.1	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.5
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0								
1988	1	6	3	0	1	16	16	0.1	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0								
1989	1	6	3	0	1	8	8	0.2	0	0	0	0.333333		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.333333		0.333333		0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
1989	1	6	3	0	1	9	9	0.9	0	0	0	0	0.166666		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.083333		0	0.083333		0.166666		0.166666		0	0.25	0	0	0.083
333	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1989	1	6	3	0	1	10	10	0.5	0	0	0	0.142857		0.142857		0.142857		0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0.142857		0	0	0	0	0.142
857	0	0	0	0	0.142857		0	0	0	0.142857		0	0	0	0	0	0		
1989	1	6	3	0	1	11	11	2.1	0	0	0	0	0.034482		0.034482		0.241379		0.413
793	0.172413		0.034482		0.068965		0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1989	1	6	3	0	1	12	12	3.6	0	0	0	0	0	0.061224		0.061224		0.204081	
	0.183673		0.10204	0.122448		0.081632		0.040816		0.061224		0.020408		0.020408		0.020408		0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.020408																
1989	1	6	3	0	1	13	13	4.3	0	0	0	0	0	0	0.017241		0.034482		0
	0.068965		0.086206		0.206896		0.034482		0.120689		0.068965		0.103448		0.034482		0.017241		0.051
724	0.068965		0	0.034482		0.017241		0.017241		0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0.017241		0	0	0	0
	0	0	0	0	0	0	0	0											
1989	1	6	3	0	1	14	14	2.7	0	0	0	0	0	0	0	0	0	0	0
	0.027027		0.027027		0.054054		0.108108		0	0.027027		0.108108		0.027027		0.135135		0.081081	
	0.081081		0.054054		0.027027		0.054054		0.054054		0.027027		0.027027		0.027027		0.027027		0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 0 0.027027 0 0 0 0 0 0 0
1989 1 6 3 0 1 15 15 1.2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.0625 0 0.125 0.0625 0 0.1875 0.0625 0.125 0.0625 0.125 0.0625 0 0.0625 0.062
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
1989 1 6 3 0 1 16 16 0.4 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.333333 0 0 0 0 0.166666 0 0
0.333333 0.166666 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1990 1 6 3 0 1 7 7 0.3 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 0.2 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
1990 1 6 3 0 1 8 8 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 0.25 0.5 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
1990 1 6 3 0 1 9 9 0.3 0 0 0 0.25 0.25 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.25 0 0 0 0 0.25 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1990 1 6 3 0 1 10 10 0.3 0 0 0 0 0.4 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 0.2 0.2 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1990 1 6 3 0 1 11 11 1.0 0 0 0 0 0 0.066666 0.2 0.2 0.133333
0.133333 0.2 0 0.066666 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1990 1 6 3 0 1 12 12 3.3 0 0 0 0 0 0.020833 0 0.083333 0.125
0.041666 0.125 0.145833 0.083333 0.083333 0.208333 0.041666 0 0.041666 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
1990 1 6 3 0 1 13 13 4.8 0 0 0 0 0 0 0 0 0 0.014285
0.028571 0.057142 0.028571 0.128571 0.114285 0.157142 0.171428 0.071428 0.071428 0.042
857 0.014285 0.042857 0.014285 0.014285 0.028571 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1990 1 6 3 0 1 14 14 2.7 0 0 0 0 0 0 0 0 0 0 0
0 0.051282 0 0 0.102564 0.128205 0.025641 0.102564 0.025641 0.076923 0.128205
0.102564 0.051282 0.128205 0 0.025641 0.025641 0 0.025641 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1990 1 6 3 0 1 15 15 1.0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.071428 0 0 0 0 0 0.214285 0.142857 0.142857 0 0 0.071
428 0.214285 0.071428 0 0.071428 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 7 7 0.1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 8 8 0.3 0 0 0 0.25 0.25 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.25 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
1991 1 6 3 0 1 9 9 0.9 0 0 0 0.153846 0.153846 0.307692 0.076923
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.076923 0.076923 0 0 0 0.076923
0.076923 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 10 10 1.5 0 0 0 0 0.095238 0.190476 0.238095 0.285
714 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.047619 0.047619
0.047619 0 0 0 0.047619 0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 11 11 2.1 0 0 0 0 0 0.103448 0.310344 0.068965
0.241379 0.103448 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.034482 0.034482 0 0 0 0.068965 0 0 0 0.034482 0
0
1991 1 6 3 0 1 12 12 3.3 0 0 0 0 0 0.021739 0.065217 0.217
391 0.304347 0.217391 0.108695 0.043478 0.021739 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 13 13 2.0 0 0 0 0 0 0 0 0.035714 0.071428
0.142857 0.035714 0.071428 0.142857 0.25 0.035714 0.107142 0 0.071428 0 0 0.035
714 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
1991 1 6 3 0 1 14 14 0.7 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.3 0.1 0 0.2 0.2 0 0 0 0.1 0 0.1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1991 1 6 3 0 1 15 15 0.2 0 0 0 0 0 0 0 0 0 0 0.333
333 0 0 0 0 0 0 0 0.333333 0 0 0.333333 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
1992 1 6 3 0 1 8 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 0.5 0.5 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1992 1 6 3 0 1 9 9 0.4 0 0 0 0 0.2 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 0.2 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
1992 1 6 3 0 1 10 10 0.8 0 0 0 0 0.1 0.1 0.4 0.1 0 0 0
0 0 0 0 0 0 0 0.1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.1 0 0 0 0 0 0 0 0.1
0 0 0 0 0 0 0 0 0 0 0
1992 1 6 3 0 1 11 11 1.8 0 0 0 0 0 0.090909 0.136363 0.272727
0.136363 0.090909 0.045454 0.136363 0.045454 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.045454 0 0 0 0 0 0 0
0
1992 1 6 3 0 1 12 12 2.3 0 0 0 0 0 0 0.071428 0.107142 0.142
857 0 0.142857 0.285714 0.035714 0.071428 0.035714 0.071428 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.035714 0 0 0 0 0 0 0 0 0 0 0
0
1992 1 6 3 0 1 13 13 2.1 0 0 0 0 0 0 0 0.038461 0 0
0.153846 0.038461 0.115384 0.115384 0.115384 0.038461 0.115384 0.076923 0.038461 0.038
461 0 0.038461 0 0.038461 0 0.038461 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1992 1 6 3 0 1 14 14 1.2 0 0 0 0 0 0 0 0 0 0.066666
0 0 0.066666 0 0 0 0.066666 0.2 0.066666 0.133333 0.133333 0 0.066666
0.133333 0.066666 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
1992 1 6 3 0 1 15 15 0.3 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 0.25 0 0.25 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1993 1 6 3 0 1 8 8 0.2 0 0 0 0.666666 0 0.333333 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
1993 1 6 3 0 1 9 9 0.8 0 0 0 0 0.416666 0 0.25 0.083333 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.083333 0 0 0 0.083333 0 0 0.083333 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1993 1 6 3 0 1 10 10 1.4 0 0 0 0 0.136363 0.272727 0.090909 0.136
363 0.090909 0 0 0.045454 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.045454
0 0 0.045454 0.045454 0.045454 0 0.045454 0 0 0 0 0 0 0 0
0 0
1993 1 6 3 0 1 11 11 1.4 0 0 0 0 0 0 0.090909 0.318181 0.136
363 0.090909 0.045454 0.045454 0.045454 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.090909 0.045454 0 0.045454 0 0 0 0 0 0 0 0 0.045454
0 0
1993 1 6 3 0 1 12 12 1.5 0 0 0 0 0 0 0 0.086956 0.130434
0.043478 0.173913 0.217391 0.086956 0.173913 0 0.043478 0 0 0 0 0 0
0 0.043478 0 0 0 0 0 0 0 0 0 0 0 0 0 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       3       0       1       13      13      1.4     0       0       0       0       0       0       0       0       0       0       0.045
454     0.045454        0.136363        0.136363        0.090909        0.090909        0       0.181818        0.045454        0       0.045454        0
        0.045454        0       0       0.045454        0       0.045454        0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0.045454        0       0       0       0       0       0       0
        0       0       0       0
1993    1       6       3       0       1       14      14      1.3     0       0       0       0       0       0       0       0       0       0       0
        0       0       0.05    0       0       0.05    0.05    0.1     0       0.1     0       0.15    0       0.1     0.1     0.1     0.1     0       0.1
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1993    1       6       3       0       1       15      15      0.8     0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0.166666        0.083333        0       0.083333        0       0       0       0.166666
        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
1993    1       6       3       0       1       16      16      0.1     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       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       7       7       0.3     0       0       0.25    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       0.25    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
1994    1       6       3       0       1       8       8       0.1     0       0       0       0       0.5     0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.5     0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       9       9       0.5     0       0       0       0.125   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       0.25    0       0       0       0.25    0       0.125   0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       10      10      1.4     0       0       0       0       0.130434        0.217391        0.173913        0.260
869     0.086956        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0.043478        0       0       0       0       0.043
478     0       0.043478        0       0       0       0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       11      11      1.4     0       0       0       0       0.043478        0.043478        0.130434        0.217
391     0.260869        0.130434        0.130434        0.043478        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       12      12      1.9     0       0       0       0       0       0.033333        0.066666        0.066666
        0.166666        0.166666        0.2     0.166666        0.066666        0.033333        0.033333        0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0
1994    1       6       3       0       1       13      13      2.0     0       0       0       0       0       0       0       0       0       0       0.161
29      0.032258        0.32258 0.064516        0.064516        0.064516        0.129032        0.032258        0.096774        0.032258        0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       14      14      0.9     0       0       0       0       0       0       0       0       0.066666        0
        0       0.133333        0.2     0.066666        0.066666        0.133333        0.066666        0.133333        0.066666        0       0       0
        0       0.066666        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0
1994    1       6       3       0       1       15      15      0.4     0       0       0       0       0       0       0       0       0       0       0
        0       0.166666        0       0.166666        0.166666        0       0       0       0.166666        0.166666        0       0       0.166666
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
1994    1       6       3       0       1       16      16      0.1     0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       1       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
#
#marginal age comp data - CPFVs - females then males
#year   season  type    gender  part    errmat  Lbinlo  LbinHi  # samp  1       2       3       4       5       6       7       8       9       10      11
        12      13      14      15      16      17      18      19      20      plus    1       2       3       4       5       6       7       8       9
        10      11      12      13      14      15      16      17      18      19      20      plus
1980    1       7       3       0       1       -1      -1      97      0       0       0       2       16      19      12      14      12      17      20
        8       11      12      10      13      11      7       8       5       6       1       4       5       1       3       0       3       2       1
        0       0       0       3       9       8       7       4       2       6       6       3       3       2       6       2       2       2       2
        4       1       6       1       1       1       1       1       1       0       0
1981    1       7       3       0       1       -1      -1      86      0       0       0       2       6       7       15      15      5       7       8
        10      12      10      13      10      10      14      7       4       7       4       1       2       1       2       4       0       0       8
        0       0       0       3       0       4       2       7       9       4       5       5       8       6       11      7       11      14      5
```

```
        3       4       2       2       1       0       3       0       1       0       3
1982    1       7       3       0       1       -1      -1      77      0       0       0       4       14      21      19      22      20      21      11
        15      14      14      14      14      11      14      7       12      7       4       5       4       3       4       1       3       1       3
        0       0       0       0       7       11      8       5       4       4       5       10      8       5       6       4       7       5       7
        6       5       5       1       2       2       0       1       1       0       0
1983    1       7       3       0       1       -1      -1      30      0       0       0       0       2       2       4       13      10      8       10
        9       10      11      11      9       21      20      13      9       8       10      7       6       3       3       2       0       4       6
        0       0       0       0       2       5       2       3       5       0       0       2       5       8       2       2       1       2       2
        0       2       4       0       1       0       0       1       0       0       1
1984    1       7       3       0       1       -1      -1      64      0       0       0       0       7       9       12      22      23      23      24
        15      16      15      13      10      20      24      13      12      11      9       14      8       4       6       3       0       3       12
        0       0       0       0       0       6       3       10      9       8       9       6       10      6       5       8       4       15      4
        4       5       5       6       8       2       3       3       0       0       3
#
#
0 # Mean Size at Age Observations
0 # Number of Environmental Variables
0 # Environmental Observations
999 #
```

APPENDIX D - CONTROL FILE FOR 2007 BLUE ROCKFISH STOCK ASSESSMENT

```
# California stock, north of Point Conception
#
# SS2 Version 2.00g (July 2007)
# BASE catch stream
# M females = 0.10, M males = 0.12
# steepness = 0.58 based on Dorm recommendation
# RecFIN CPUE index split: post-2000 q as separate fishery
#
#
1 # Morphs - growth patterns - not gender
1 # Sub-Morphs
1 # Areas
1  1  1  1  1  1  1  1 # Areas per Type
1       # Recruitment Distribution Pattern
0       # Do not allow for Seasonal Recruitment Interaction
0       # Do not allow for Migration
0  0  0 # No movement patterns - must have a line of 3 numbers here
0       # Blocks
0.5     # Recruit Fraction Female
1000    # Sub-Morph Ratio Between/Within
-1      # Sub-Morph Distribution - set equal to -1 for normal approximation
#
# Natural Mortality & Maturity
1       # last age for constant young
2       # first age for constant old
2       # reference age for first size-at-age parameter
25      # reference age for second size-at-age parameter
0
1       # CV=f(A)
1       # maturity option - length logistic
3       # first mature age - (Laidig et al)
1       # MG parm as offset - direct assignment
1       # MG parm adjustment - log transform
-1
#
# mortality & growth_parms
# LO    HI      INIT    PRIOR   PR_type SD      PHASE   env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
0.001   0.4     0.1     0.006   0       0.8     -1      0 0 0 0 0.5 0 0 # female natural mortality young
0.0     0.2     0.1     0.1     0       0.8     -1      0 0 0 0 0.5 0 0 # female natural mortality old (offset)
10      25      17.9    17.9    0       0.8     -1      0 0 0 0 0.5 0 0 # female length at Amin
26      45      37.5    37.5    0       0.8     1       0 0 0 0 0.5 0 0 # female length at Amax
0.01    0.3     0.147   0.088   0       0.8     1       0 0 0 0 0.5 0 0 # female k, von Bertalanffy growth coef.
0.001   0.2     0.085   0.105   0       0.8     -2      0 0 0 0 0.5 0 0 # female CV young
0.001   0.2     0.095   0.105   0       0.8     -2      0 0 0 0 0.5 0 0 # female CV old (exp. offset)

-3      3       0.12    0.006   0       0.8     -1      0 0 0 0 0.5 0 0 # male natural mortality young
0.00    0.2     0.12    0.1     0       0.8     -1      0 0 0 0 0.5 0 0 # male natural mortality old (offset)
7       20      15.7    15.7    0       0.8     -1      0 0 0 0 0.5 0 0 # male length at Amin
21      40      31.2    31.2    0       0.8     1       0 0 0 0 0.5 0 0 # male length at Amax
0.01    0.4     0.295   0.295   0       0.8     1       0 0 0 0 0.5 0 0 # male k, von Bertalanffy growth coef.
0.07    0.23    0.085   0.111   0       0.8     -2      0 0 0 0 0.5 0 0 # male CV young
0.07    0.23    0.11    0.111   0       0.8     -2      0 0 0 0 0.5 0 0 # male CV old (exp. offset)
#
#_wt-len, maturity, and [eggs/kg]=a+b*weight
3.4e-5  3.4e-5  3.4e-5  3.4e-5  0       0.8     -1      0 0 0 0 0.5 0 0 # female - coef. to convert L in cm to Wt in kg (Lea et al 1999)
1       3       2.87    2.87    0       0.8     -1      0 0 0 0 0.5 0 0 # female - exp. in female L to W conversion     (Lea et al 1999)
22      32      26      26      0       0.8     -1      0 0 0 0 0.5 0 0 # maturity logistic inflection                  (Wyllie 1987)
-0.7    -0.5    -0.6    -0.6    0       0.8     -1      0 0 0 0 0.5 0 0 # maturity logistic slope (negative values)     (Wyllie 1987)
0       2       62585   62585   0       0.8     -1      0 0 0 0 0.5 0 0 # alpha (intercept) = 1
-1      1       211841  211841  0       0.8     -1      0 0 0 0 0.5 0 0 # beta (slope) = 0   --  these alpha and beta values causes fecundity to = SB
2.9e-5  2.9e-5  2.9e-5  2.9e-5  0       0.8     -1      0 0 0 0 0.5 0 0 # male - coef. to convert L in cm to Wt in kg   (Lea et al 1999)
1       3       2.89    2.89    0       0.8     -1      0 0 0 0 0.5 0 0 # male - exp. in female L to W conversion       (Lea et al 1999)
#
# recruitment apportionment
-4      4       0       0       -1      99      -3      0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4      4       0       0       -1      99      -3      0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4      4       4       0       -1      99      -3      0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
1       1       1       1       -1      99      -3      0 0 0 0 0.5 0 0 #_cohort_growth_deviation
#
```

```
0 # Environmental Custom Flag
0 # TimeBlock Custom Flag
#
#_Spawner-Recruitment
1       # SR Function (1=BH w flat-top beyond Bzero, 2=Ricker, 3=standard BH)
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
5       12      8.3     10      1       10      1       # virgin recruitment
0.2     1.0     0.58    0.58    1       0.181   -1      # steepness
0.1     1       0.5     1       1       1       -1      # sigma-r
-5      5       0       0       0       1       -3      # env-link
-5      5       0       0       0       1       -4      # offset for initial equilibrium
0       0.5     0       0       -1      99      -2      # reserve for future autocorrelation
#
0       #_SR_env_link
1       #_SR_env_target_1=devs;_2=R0;_3=steepness
1       #do_recr_dev:  0=none; 1=devvector; 2=simple deviations
#
#first_yr   last_yr   min_log_res  max_log_res  phase
1960    2006    -2      2       3       #_recr_devs
1492    #_first_yr_fullbias_adj_in_MPD
#
#_initial_F_parms for each fishery
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
0       0.1     0.00    0.01    0       1       -2
0       0.1     0.00    0.01    0       1       -2
0       0.8     0.00    0.1     0       1       -2
#
#_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
0 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 0 0  #this makes q analytical for cpfv survey; no difference in fit relative to freely estimating q
1 0 0 0 1 0
1 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 0 0  #POST2000 RECFIN
#
#_Q_parms(if_any)
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
-10     20      0       0       0       10      -3 # juv survey1 power
-10     20      0       0       0       10      -3 # juv survey1 power
#-50    50      -9      -7      0       10      2 # catchability for CPFV index
#
# Selectivity and Retention
#_size_selex_types
#_Pattern Discard Male Special
1 0 1 0 # 1-recreational
1 0 1 0 # 2-commercial hkl
1 0 1 0 # 3-commercial net
1 0 1 0 # 4-CPFV survey
0 0 0 0 # 5-juv survey
0 0 0 0 # 6-dive juv survey
5 0 0 1 # 7-ghost fishery
5 0 0 1 # 8-POST2000RECFIN
#
#_age_selex_types
#_Pattern Discard Male Special
10 0 0 0 # 1-recreational
10 0 0 0 # 2-commercial hkl
10 0 0 0 # 3-commercial net
10 0 0 0 # 4-CPFV survey
11 0 0 0 # 5-juv survey
10 0 0 0 # 6-dive juv survey
10 0 0 0 # 7-ghost fishery
10 0 0 0 # 8-POST2000RECFIN
#
#_selex_parms
# LO    HI      INIT    PRIOR   PR_type SD      PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#_size_sel: 1 - recfin
```

```
15      50      24.32   28      0       0.5     2       0 0 0 0 0.5 0 0 # 50%
1       15      6.75    6       0       0.5     2       0 0 0 0 0.5 0 0 # diff. in size b/t 50 & 95%
#
# size_sel: 1 - male offsets- 4 lines
1       60      24      20      0       10      -2      0       0       0       0       0.5     0       0       #       size@dogleg
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at minL
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at dogleg
-10     0       -0.33   2       0       10      -2      0       0       0       0       0.5     0       0       #       log(relmalesel)at maxL
#_size_sel: 2 - comm hkl
15      40      31.57   30      0       0.5     2       0 0 0 0 0.5 0 0
1       15      8.36    8       0       0.5     2       0 0 0 0 0.5 0 0
#
# size_sel: 2 - male offsets- 4 lines
1       60      24      20      0       10      -4      0       0       0       0       0.5     0       0       #       size@dogleg
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at minL
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at dogleg
-10     10      -0.33   2       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at maxL
#
#_size_sel: 3 - comm net
15      40      38.80   37      0       0.5     2       0 0 0 0 0.5 0 0
1       15      3.57    4       0       0.5     2       0 0 0 0 0.5 0 0
#
# size_sel: 3 - male offsets- 4 lines
1       60      24      20      0       10      -4      0       0       0       0       0.5     0       0       #       size@dogleg
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at minL
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at dogleg
-10     10      -0.33   2       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at maxL
#
#_size_sel: 4 - rec survey
15      40      22.27   37      0       0.5     2       0 0 0 0 0.5 0 0
1       15      3.749   4       0       0.5     2       0 0 0 0 0.5 0 0
#
# size_sel: 4 - male offsets- 4 lines
1       60      24      20      0       10      -4      0       0       0       0       0.5     0       0       #       size@dogleg
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at minL
-10     10      0       0       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel)at dogleg
-10     10      -0.33   2       0       10      -4      0       0       0       0       0.5     0       0       #       log(relmalesel) at maxL
#
#_length mirror CPFV for rec
-2      0       -1      1       0       0.5     2       0 0 0 0 0.5 0 0
-2      0       -1      31      0       0.5     2       0 0 0 0 0.5 0 0
#
#_length mirror POST2000 for rec
-2      0       -1      1       0       0.5     2       0 0 0 0 0.5 0 0
-2      0       -1      31      0       0.5     2       0 0 0 0 0.5 0 0
#  Age-based for juv survey (sel. age 0s only)
#_age_sel: 5 - juv survey 1
0 0 0 0 0 10 -3 0 0 0 0 0 0 0 #
0 0 0 0 0 10 -3 0 0 0 0 0 0 0 #
#
#_age_sel: 6 - juv survey 2 - Laidig, did not use
#0 0 0 0 0 10 -3 0 0 0 0 0 0 0 #
#0 0 0 0 0 10 -3 0 0 0 0 0 0 0 #
#
1       #_env/block/dev_adjust_method(1/2)
0       #_env setup
0       # block setup
-1      #_selparmdev-phase
#
#_Variance_adjustments_to_input_values
#_1 2 3 4 5 6 7
-0.025699 0 0 0.129625 0 0 0 0 #_add_to_survey_CV
0 0 0 0 0 0 0 0                #_add_to_discard_CV
0 0 0 0 0 0 0 0                #_add_to_bodywt_CV
1.7393 3.15333 1 3.19761 1 1 1 1 #_mult_by_lencomp_N
2.81663 1 1 1 1 1 1 1            #_mult_by_agecomp_N
1 1 1 1 1 1 1 1                  #_mult_by_size-at-age_N
#
30      #_DF_for_discard_like
30      #_DF_for_meanbodywt_like
#
1       #_maxlambdaphase
```

```
0       #_sd_offset
#
#_lambdas_(columns_for_phases)
1       # rec fishery - cpue index
0       # comm hkl fishery
0       # comm net fishery
1       # CPFV survey - cpue index
1       # coast juv survey - prerecruit index
0       # Miller Geibel survey
0       # ghost fisherY
1       # POST2000 - RecFIN cpue index
0       #_discard:_1
0       #_discard:_2
0       #_discard:_3
0       #_discard:_4
0       #_discard:_5
0       # discard 6
0       # ghost
0       # POST2000
0       #_meanbodyweight
1       #_lencomp:_1
1       #_lencomp:_2
1       #_lencomp:_3
1       #_lencomp:_4
0       #_lencomp:_5
0       # length6
0       # ghost
0       # POST2000 (comps left in 1)
1       #_agecomp:_1
0       #_agecomp:_2
0       #_agecomp:_3
0       #_agecomp:_4
0       # agecomp5
0       # age6
0       # age ghost
0       # POST2000
0       #_size-age:_1
0       #_size-age:_2
0       #_size-age:_3
0       #_size-age:_4
0       # size-age5
0       # sizeage6
0       # size age ghost
0       # POST2000
0       #_init_equ_catch
1       #_recruitments
0       #_parameter-priors
0       #_parameter-dev-vectors
1000    #_crashPenLambda
0.9     #_maximum allowed harvest rate
999
# ss2.output(dir="c:\\ss2\\susie\\",hessian=T,forecast=T,cor=T)
```

STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2009-2010 GROUNDFISH FISHERIES

The Council process for setting groundfish harvest levels and other specifications depends on periodic assessments of the status of groundfish stocks and a report from 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) the soundness of the scientific information relative to use in groundfish fishery management decision-making by the Council. The Council then approves the new assessments and relevant analyses for use in setting groundfish harvest levels and other specifications for the following biennial management period.

Two full assessments were recommended for a final "mop-up" STAR panel in the initial reviews by STAR panels and the SSC earlier this year. The southern black rockfish and blue rockfish assessments were subsequently reviewed at the "mop-up" STAR panel, which convened October 1-5 in Seattle, Washington. The executive summaries of these assessments and the associated STAR Panel reports are provided as Agenda Item D.3.a, Attachments 1-4. Additionally, draft rebuilding analyses for seven overfished rockfish species were reviewed at the "mop-up" STAR panel. Agenda Item D.3.a, Attachment 5 is a memorandum sent to authors of rebuilding analyses and SSC Groundfish Subcommittee members regarding the requested runs for rebuilding analyses that was sent prior to the "mop-up" STAR panel. Rebuilding analyses for the seven overfished rockfish species with the requested runs are provided as Agenda Item D.3.a, Attachments 6-12. **All the assessments in their entirety, STAR Panel reports, and rebuilding analyses under Council consideration at this meeting are included in the CD copy of meeting materials.**

The Council should consider the new full assessments, STAR Panel reports, and new rebuilding analyses, as well as the advice of the SSC, other advisory bodies, and the public in deciding whether or not to adopt the new stock assessments and rebuilding analyses for use in 2009-2010 groundfish management.

Council Action:

Approve stock assessments and rebuilding analyses recommended by the SSC.

Reference Materials:

1. Agenda Item D.3.a, Attachment 1: Executive Summary of "The Status of Black Rockfish off Oregon and California in 2007."
2. Agenda Item D.3.a, Attachment 2: Southern Black Rockfish STAR Panel Report.
3. Agenda Item D.3.a, Attachment 3: Executive Summary of "Assessment of Blue Rockfish (*Sebastes mystinus*) in California."
4. Agenda Item D.3.a, Attachment 4: Blue Rockfish STAR Panel Report.

5. Agenda Item D.3.a, Attachment 5: September 4, 2007 Memorandum Entitled, “Requested Rebuilding Analyses for Overfished Groundfish.”
6. Agenda Item D.3.a, Attachment 6: Bocaccio Rebuilding Analysis for 2007.
7. Agenda Item D.3.a, Attachment 7: Rebuilding Analysis for Canary Rockfish Based on the 2007 Stock Assessment.
8. Agenda Item D.3.a, Attachment 8: Cowcod Rebuilding Analysis.
9. Agenda Item D.3.a, Attachment 9: 2007 Darkblotched Rockfish Rebuilding Analysis.
10. Agenda Item D.3.a, Attachment 10: Rebuilding Update for Pacific Ocean Perch.
11. Agenda Item D.3.a, Attachment 11: Rebuilding Analysis for Widow Rockfish in 2007 – An Update.
12. Agenda Item D.3.a, Attachment 12: Updated Rebuilding Analysis for Yelloweye Rockfish Based on the Stock Assessment Update in 2007.
13. Agenda Item D.3.c, SSC GF Subcommittee Report: SSC Groundfish Subcommittee Report on Rebuilding Analyses for Overfished Rockfish.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Agency and Tribal Comments
c. Scientific and Statistical Committee Report — Bob Conrad
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. Council Action: Approve Remaining Stock Assessments and Rebuilding Analyses

PFMC
10/17/07

Agenda Item D.3.a
Attachment 1
November 2007

The Status of Black Rockfish off Oregon and California in 2007

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EXECUTIVE SUMMARY

Stock

This assessment applies to the black rockfish (*Sebastes melanops*) that reside in the waters south of Cape Falcon, Oregon and north of Point Piedros Blancos, California, corresponding to the Pacific Marine Fisheries Commission statistical areas 2C, 2B, 2A, 1C, and 1B. The assessment treats the black rockfish in this area as a unit stock. Wallace et al. (2007) separately assessed a northern stock, north of Cape Falcon to the US border with Canada, and determined that the spawning potential of that stock was above the management target (40% of the unexploited level). Black rockfish are also harvested from the waters off British Columbia and in the Gulf of Alaska, but there have not been any formal assessments of stock status for those areas.

Catches

Black rockfish are caught by a wide variety of gear types and can be an important component of nearshore commercial fisheries, either as incidental catch by the troll fishery for salmon or as directed catch by jig fisheries for groundfish. In recent years there have been almost no trawl-caught landings of black rockfish, but trawl landings in the past were fairly substantial. For the past several decades black rockfish have been an important target of recreational marine fisheries, especially during periods of reduced fishing opportunities for salmon or halibut. In recent years the recreational fishery has accounted for most of the black rockfish harvest.

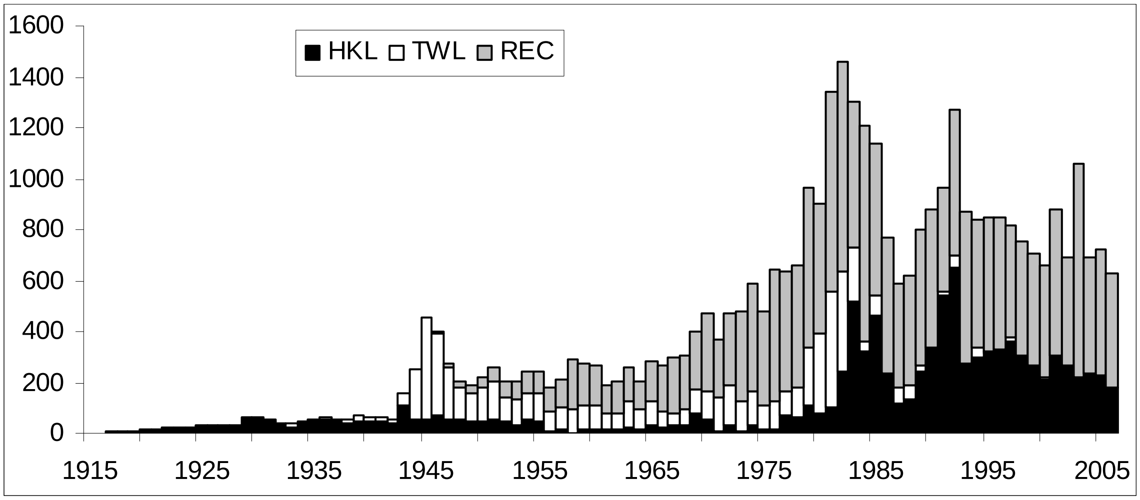
Detailed reports of commercial landings of black rockfish are generally unavailable prior to 1981, when the Pacific Fishery Information Network database began. The catch series prior to 1981 for this assessment were derived by applying assumed values for the percent black rockfish to reported landings of rockfish. The assessment assumes that total catch mortality is equal to the landed catch. Observer data, which are available only in recent years, indicate low levels of discarding of black rockfish.

Because of their nearshore distribution and low abundance compared to other rockfish species, black rockfish are unlikely to have ever comprised a large percentage of rockfish landings, but it seems quite certain that they have been more than a trivial component for many years. Black rockfish were one of only four rockfish species mentioned by scientific name in reports of rockfish landings in Oregon during the 1940s, and they were one of only six rockfish species mentioned by scientific name in reports of rockfish landings in California during the same period.

Recent landings of black rockfish (mt) in the southern assessment region.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Oregon												
non-trawl	128.8	191.2	217.8	206.4	196.6	159.8	192.5	163.5	150.7	160.7	138.9	112.2
trawl	2.0	0.2	1.7	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0
sport	350.8	376.8	343.6	339.6	282.5	308.2	329.3	270.2	341.2	330.8	309.6	259.8
California												
non-trawl	186.8	128.7	144.1	94.0	65.6	55.1	112.4	100.6	68.1	76.3	85.7	71.7
trawl	2.3	10.4	12.2	5.5	3.8	1.3	1.3	2.0	0.5	1.2	0.0	0.0
sport	176.5	143.2	94.9	108.7	154.7	131.0	240.4	152.7	500.4	117.3	183.3	183.5
Total	847.3	850.5	814.3	754.7	703.2	655.4	876.0	689.1	1060.9	686.5	717.7	627.2

Reconstruction of catches (MTs) of black rockfish in the southern assessment area.



Data and Assessment

The current assessment uses a similar approach and structure as the last assessment, which was completed in 2003. The assessment is structured into six fisheries: a set of trawl (TWL), commercial non-trawl (HKL), and recreational (REC) fisheries for Oregon and a similar set for California. The fisheries for each state are based on fish capture location rather than place of landings and therefore represent separate geographic areas. The model in this assessment, however, does not include any underlying spatial structure in the population dynamics. Like the previous assessment, abundance indices for tuning the assessment are based on recreational catch-per-unit-effort (CPUE) data with two independent indices available for each state. The standard research trawl surveys along the US West Coast do not operate in shallow enough water to catch appreciable numbers of black rockfish and therefore do not provide any fishery independent index of stock biomass for black rockfish. The current assessment has two additional abundance indices that were not available for the previous assessment: a black rockfish pre-recruit index for 2001-2006 and estimates from a tag-recapture study of exploitable black rockfish abundance off Newport, Oregon for 2003-2005. The current assessment uses the Stock Synthesis 2 software (version 2.00g), whereas the 2003 assessment used the Stock Synthesis 1 program.

Unresolved Problems and Major Uncertainties

The catch history for black rockfish is highly uncertain because this species was generally landed in mixed rockfish market categories, for which sampling to determine species composition was often very limited or non-existent. Trawl landings of rockfish accounted for the vast majority of commercial rockfish landings and received much more species composition sampling than non-trawl landings. However, trawl landings were essentially un-sampled prior to the 1970s. Even as recently as the 1980s, when species composition estimates were available for most of the trawl-caught rockfish, there were very low levels of species composition sampling of commercial non-trawl rockfish landings. Uncertainties in the estimated catch data were not directly incorporated into the uncertainty estimates for the assessment results. As a consequence, the estimated confidence limits for stock status estimates are too narrow. Sensitivity analyses using alternative assumed catch histories indicated that uncertainty in the catch series had relative little effect on the model's estimates of how depleted the stock is, but the level of catch had considerable influence on the model's estimates of the absolute size of the stock and its maximum sustainable yield (MSY).

The current assessment used the same sex- and age-specific formulation for natural mortality (M) that was used in the assessment for northern black rockfish, but there is little evidence to confirm that the assumed formulation is correct. The 2003 assessment for southern black rockfish used much smaller values for M that were more consistent with observed values for the maximum age of southern black rockfish. Sensitivity analyses that explored different combinations of values of M for young versus old females indicated that the values have a strong influence on estimates of depletion, MSY, and other measures of stock status. Because the natural mortality coefficients were included in the model as fixed parameters, uncertainties in the coefficients do not propagate into the model's estimated confidence limits, which are narrower than they should be.

The current assessment uses a fixed value (0.6) for the so-called steepness parameter, which controls the curvature in the relationship between spawning biomass (output of larvae) and the resulting recruitment, and which thus governs how rapidly the stock responds to fishery removals or other perturbations. Although the steepness value assumed for this assessment is consistent with values estimated for other rockfish stocks, steepness for this stock could not be directly estimated from the available data. Sensitivity analyses indicated that the value assumed for steepness has a strong influence on the model's estimates of depletion, MSY, and other measures of stock status. Because steepness was a fixed parameter, the model's estimated confidence limits are narrower than they should be.

The recreational fishery CPUE indices may not be reliable as abundance indices for numerous reasons, including long-term changes in fishing gear and fishing locations, and due to the increasing influence of restrictive management actions in recent years. The ODFW tagging study off Newport offers a promising alternative source of information about stock size and exploitation rate. Further, this source of information appears to be much less subject to bias than a CPUE index. However, it is not clear how to scale measures of localized abundance and exploitation to the much broader stock assessment area. The stock could be locally abundant off Newport, as evidenced by the estimates of abundance and exploitation rate from the Newport tagging study, but in a depressed condition off central California. The current assessment model estimated a catchability coefficient for the tagging study, which represents the fraction of the exploitable population that resides within the tagging study area. The estimated value for this coefficient was reasonably consistent with informal prior expectations, but those expectations were predicated on an assumed spatial distribution for the black rockfish population. The assumed proportions of black rockfish in Oregon versus California may be incorrect.

The assessment estimates of current stock status are largely driven by above-average recruitment throughout the 1990s, including two very strong year-classes. The available age- and length-composition data provide little coherent evidence to support the variations in year-class strength. The model's estimates of year-class strength appear to be driven by subtle shifts from year to year in the leading edges of the length-composition data from the California recreational fishery. This fishery catches more small fish than the surveys or other fisheries. Because the model has selection curves that do not vary from year-to-year, the model tends to interpret shifts in the frequency of small fish as a recruitment signal, but the shifts could instead reflect changing selection due to variation in fishing patterns.

Because no age-composition or length-at-age data were available for the California fisheries, the assessment made the strong but untested assumption that the sex-specific growth curves for black rockfish were the same throughout the assessment region. The substantial differences in the general shape and appearance of the length-composition data from the recreational fishery in California compared to Oregon, however, could be due to unequal growth curves in the two areas. The current assessment model accommodates the conflicting length composition data by means of very different selection curves for the two recreational fisheries, with peak selection in the California fishery occurring 6 cm smaller than peak selection in the Oregon fishery.

The final base model for the assessment was only partially "tuned" with respect to the model's fit to the mean length-at-age observations. That is, the level of "noise" in the mean length-at-age data that was input to the model was much less than the noise that the model internally ascribed to this data source. Further, the mean length-at-age data were very influential in determining the final set of model parameters and results. The mean length-at-age data, relative to many of the other data sources, were pulling the model towards a more productive stock. The tension between the mean length-at-age data and the other data sources could have been reduced with additional iterations of model tuning, which would have down-weighted the mean length-at-age data. However, doing so would have exaggerated some systematic but small discrepancies between the base model's estimates of mean length-at-age and the observations of mean length-at-age. The fully tuned model predicted that all fish older than about 10 yr were larger on average than what had been observed. This result seemed unreasonable. Because the assessment model is largely dominated by the length-composition data, and the model generates its predicted length-compositions by applying the growth curve to predictions of age-composition, it is crucial that the model have a reasonable growth curve. Tuning down the relative importance of the mean length-at-age data would have been appropriate if these data were considered to be unreliable, but in this instance the observations of mean length-at-age were based on length and age measurements from thousands of fish and should have been one of the more reliable data sources. The reason for the discrepancy between the mean length-at-age data and the other data sources remains unresolved, however.

Reference Points

For rockfish species managed by the Pacific Fishery Management Council (PFMC) the default target rate of fishing is F50%, which is the fishing rate that reduces the spawning potential ratio (SPR) to 50% of the level experienced in the absence of fishing. The Council's default harvest control rule for groundfish stocks specifies that a stock will be considered to be overfished if the stock's spawning output, often measured in terms of spawning biomass (SB), drops below 25% of the unexploited level, SB(0). In this assessment spawning output was measured in terms of millions of black rockfish larvae.

The base model from the current assessment estimated that the southern black rockfish stock can support a maximum sustainable yield (MSY) of about 1000 mt annually, but the accuracy of this estimate is highly dependent on the values assumed for the catch history, natural mortality, and steepness of the spawner-recruit relationship.

Management reference points for southern black rockfish.

	Point estimate	Uncertainty in estimates (approx. 95% confidence limits)	
Unfished Spawning Output (SB_0) (millions of larvae)	4578.5	3772.3	5384.7
Unfished Summary Age 2+ Biomass (B_0) (mt)	29099.6	na	na
Unfished Recruitment (R_0) at age 0 (1000s of fish)	7852.0	6459.2	9244.8
Reference points based on $SB_{40\%}$ and F50%			
Spawning Output at $SB_{40\%}$ (millions of larvae)	1831.4	1508.9	2153.9
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.5	none because steepness was fixed	
Exploitation rate resulting in $SB_{40\%}$	0.07227	na	na
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	1035.4	853.1	1217.7
Reference points based on estimated MSY values			
Spawning Output at MSY (SB_{MSY}) (mill. larvae)	1444.6	1189.7	1699.5
SPR_{MSY}	0.4296	0.4288	0.4304
Exploitation Rate corresponding to SPR_{MSY}	0.08864	na	na
MSY (mt)	1064.6	877.1	1251.9

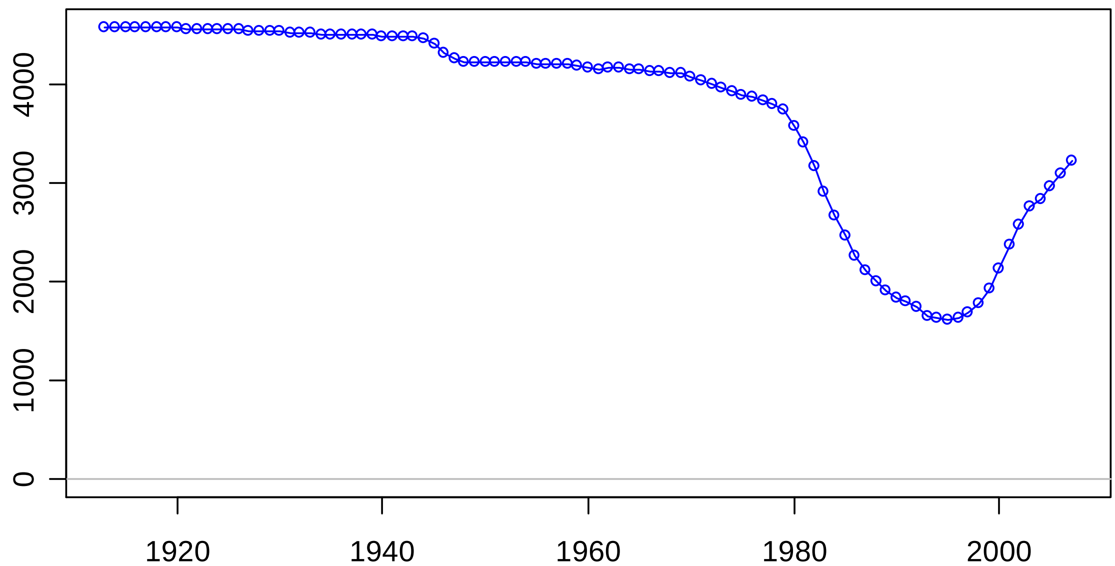
Stock Biomass

The base model estimated the unexploited spawning output to be about 4,600 million larvae and it estimated the spawning output at the start of 2007 to be about 3,200 million larvae, equivalent to 70% of the unexploited level. The model's estimates of spawning output and age 2+ biomass reached their lowest points in the mid 1990s and have been rising steadily since.

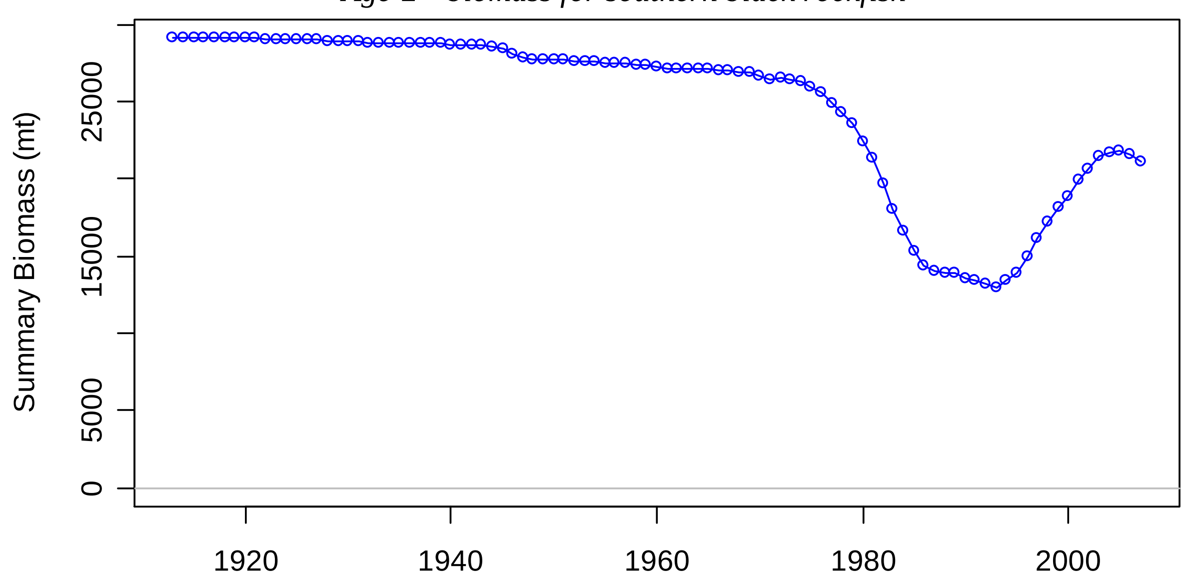
Recent trends in southern black rockfish spawning output, depletion, and biomass

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Spawning output (millions larvae)	1633	1684	1779	1924	2127	2375	2581	2760	2845	2970	3100	3227
% of Virgin	36%	37%	39%	42%	46%	52%	56%	60%	62%	65%	68%	70%
Age 2+ biomass (1000s mt)	14978	16105	17174	18133	18866	19946	20630	21475	21662	21775	21555	21109

Southern black rockfish spawning output (millions of larvae)



Age-2+ biomass for southern black rockfish



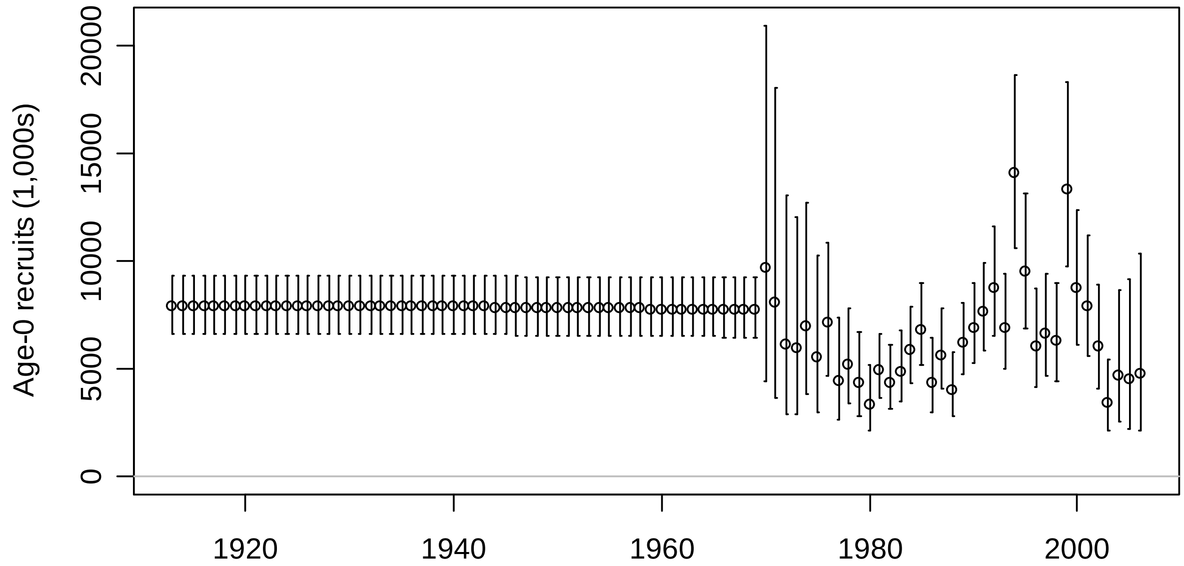
Recruitment

The above-average recruitment that occurred throughout the 1990s was the driver for the increases in spawning output and age-2+ biomass since the mid-1990s. The 1994 and 1999 year-classes were the strongest and second strongest estimated recruitment events in the series. Estimated recruitment for 2002 through 2006 was below average.

Recent trends in southern black rockfish recruitment

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Recruits (millions)	6007	6603	6270	13305	8678	7900	6013	3359	4681	4510	4700	7339

Age-0 recruitment for southern black rockfish
and approximate 95% confidence limits



Exploitation Status

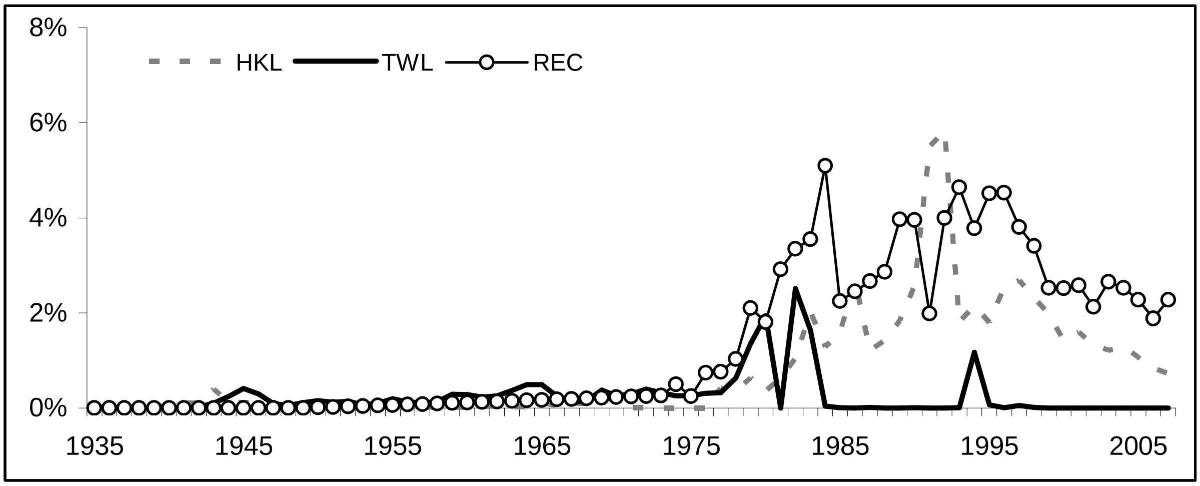
The harvest rates for black rockfish (catch over exploitable biomass) have generally been modest, with recent rates for individual fisheries generally being less than 3%. The peak estimated rate for any individual fishery was 6.6% by the California trawl fishery in 1981, when over 450 mt of black rockfish were landed in Eureka, CA (as reported in PacFIN). The recreational fisheries are now the dominant source of fishing mortality for black rockfish.

Recent trends in southern black rockfish harvest rate

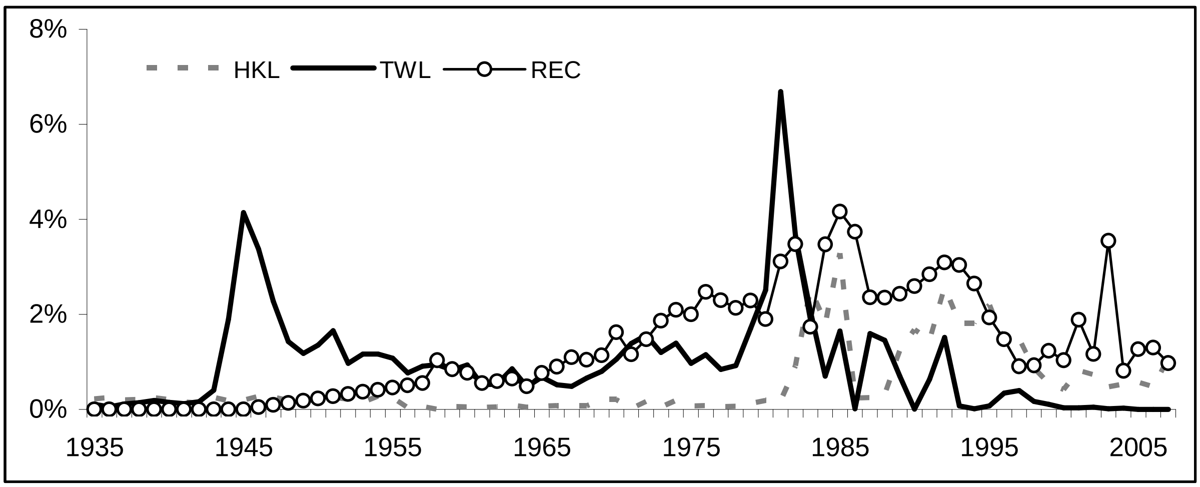
Fishery	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Oregon												
non-trawl	2.5%	2.7%	2.3%	2.0%	1.4%	1.6%	1.3%	1.2%	1.3%	1.1%	0.8%	0.7%
trawl	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sport	4.5%	3.8%	3.4%	2.5%	2.5%	2.6%	2.1%	2.7%	2.5%	2.3%	1.9%	2.3%
California												
non-trawl	1.4%	1.5%	0.9%	0.5%	0.4%	0.8%	0.7%	0.5%	0.5%	0.6%	0.5%	1.1%
trawl	0.3%	0.4%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sport	1.5%	0.9%	0.9%	1.2%	1.0%	1.9%	1.2%	3.5%	0.8%	1.3%	1.3%	1.0%
Total	5.6%	5.0%	4.3%	3.8%	3.4%	4.3%	3.3%	4.9%	3.2%	3.3%	2.9%	1.6%

Over most of the stock's history the fishing rate has been smaller than the F50% target fishing rate. The estimated spawning output has been above the target level (40% of unexploited) during all years except 1991 to 1998, and has never dropped below the overfished level (25% of unexploited).

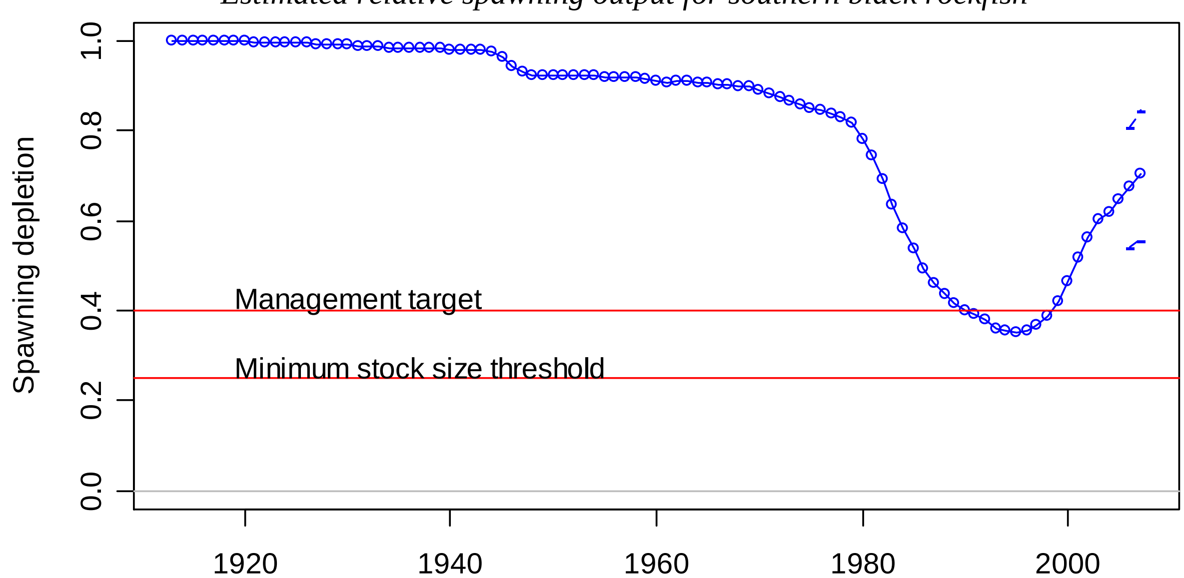
Harvest rates for southern black rockfish by Oregon fisheries



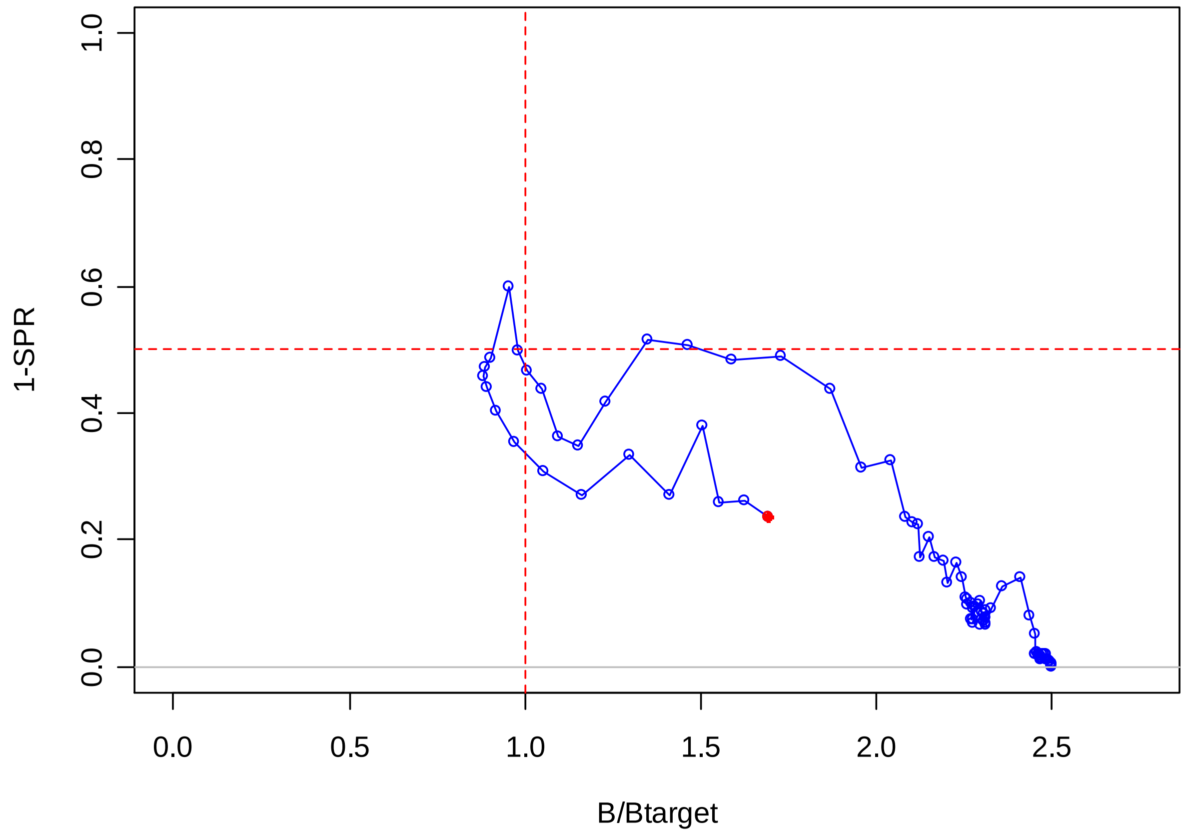
Harvest rates for southern black rockfish by California fisheries



Estimated relative spawning output for southern black rockfish



Evolution of exploitation rate and stock status for southern black rockfish



Management Performance

Prior to 2000 the Council managed black rockfish as part of the *Sebastes* complex and there were no separate ABC or OY values for black rockfish. For 2000 through 2003 the Council established ABC values for black rockfish caught north of Cape Mendocino, but left black rockfish south of Cape Mendocino as part of the "other rockfish" category, and without separate ABC or OY values. For 2004 the Council established a management boundary at the border between Oregon and Washington, and designated separate ABC and OY values for the two regions.

Management performance: black rockfish ABCs, OYs, and catches

	2000	2001	2002	2003	2004	2005	2006	2007
ABC = OY (mt)								
N of Cape Mendocino	1200	1115	1115	1115				
CA + OR					775	753	736	722
WA					540	540	540	540
Total	1200	1115	1115	1115	1315	1293	1276	1262
Catch (mt)								
S of Cape Falcon	655	876	689	1061	687	718	627	696
N of Cape Falcon	226	190	241	237	269	333	324	566
Total	882	1066	930	1298	956	1050	951	1262

Note: Catch values for 2007 were set at the Council's current OY values.

For all years with explicit ABC and OY values for black rockfish the estimated catches of black rockfish have been less than the ABC and OY values. In 2003 the estimated coast-wide catch exceeded the OY by 183 mt for the region north of Cape Mendocino, but 290 mt of this coast-wide catch was recreational harvest taken south of Cape Mendocino.

Forecasts

Projections of future catches through 2016 were made based on an F50% target rate of fishing mortality and the following assumptions:

- catches during 2007 and 2008 would be at the Optimum Yield (OY) levels specified by the Council (722 mt each year less an adjustment of 26 mt to account for catches from North of Cape Falcon);
- fishery selection curves estimated for 2006 and earlier years would continue unchanged into the future;
- 58% of each annual catch would be taken by Oregon fisheries, of which the Oregon recreational fishery would take 76% and the Oregon non-trawl fishery would take 26% (leaving Oregon trawl with no catch); and
- 42% of each annual catch would be taken by California fisheries, of which the California recreational fishery would take 55% and the California non-trawl fishery would take 45% (leaving California trawl with no catch).

Because the spawning output values for the projection period were always greater than the management target (40% of the unexploited level), the 40:10 harvest control rule adjustments did not apply, and the OY values were all equivalent to the Acceptable Biological Catch (ABC) values.

Forecasts of F50% Optimum Yields, spawning output, and depletion

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total catch (mt)	696	696	1454	1303	1203	1156	1146	1153	1163	1170
Spawning output (millions larvae)	3227	3293	3284	3077	2844	2616	2422	2277	2181	2122
% of Virgin	70.5%	71.9%	71.7%	67.2%	62.1%	57.1%	52.9%	49.7%	47.6%	46.3%

Decision Table

The decision table was developed with assistance from the STAR Panel. Although there are numerous dimensions of uncertainty regarding the results of this stock assessment, it was agreed that combining uncertainty in the formulation of natural mortality with uncertainty in the catch history could adequately capture the axis of uncertainty for the decision table. The three alternative states of nature were defined as follows.

- The least productive state of nature had a natural mortality coefficient (M) of 0.14^{-yr} for all males and for young females to age 10 yr, an M of 0.21^{-yr} for females 15 yr and older, and the catch history prior to 1981 for the trawl fisheries was based on low assumed values for the percentages of black rockfish in the landings of rockfish (0% in northern OR, 1.2% in southern OR, 3.6% in northern CA, and 0% in southern CA).

- The most productive state of nature had an M of 0.18 $^{-yr}$ for all males and for young females to age 10 yr, an M of 0.27 $^{-yr}$ for females 15 yr and older, and the catch history prior to 1981 for the trawl fisheries was based on high assumed values for the percentages of black rockfish in the landings of rockfish (0.4% in northern OR, 5.0% in southern OR, 14.0% in northern CA, and 0.2% in southern CA).
- The base-run model state of nature had a natural mortality coefficient (M) of 0.16 $^{-yr}$ for all males and for young females to age 10 yr, an M of 0.24 $^{-yr}$ for females 15 yr and older, and the catch history prior to 1981 for the trawl fisheries was based on the base-run assumed values for the percentage of black rockfish in the landings of rockfish (0.2% in northern OR, 2.5% in southern OR, 7.0% in northern CA, and 0.1% in southern CA).

The STAR and STAT agreed that the base-run model state of nature could be viewed as being twice as likely as the two alternative states of nature, and that the low-productivity and high-productivity states were equally likely.

Three alternative management actions were defined in terms of the stream of OY catches projected from each of the three alternative states of nature. The low productivity state of nature produced a stream of low catches, the high productivity state of nature produced a stream of high catches, and the base-model state of nature produced a stream of intermediate catches. The OY catch streams considered in the management actions of the decision table all have an abrupt increase in catch from 2009 to 2010 when the new stock assessment results first have an influence on the OY.

Southern black rockfish decision table.

Management Action		State of Nature					
		Low Productivity mal-M=0.14, fem-M=0.21, low trawl catch 25% probability		Medium Productivity mal-M=0.16, fem-M=0.24, medium trawl catch 50% probability		High Productivity mal-M=0.18, fem-M=0.27, high trawl catch 25% probability	
Year	Catch	Spawning output	Depletion	Spawning output	Depletion	Spawning output	Depletion
Low Catch Series: F50% OY stream from the Low Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	909	2195	53.9%	3284	71.7%	5710	92.7%
2010	831	2099	51.6%	3168	69.2%	5518	89.6%
2011	782	1981	48.6%	3015	65.9%	5258	85.4%
2012	765	1860	45.7%	2855	62.3%	4982	80.9%
2013	772	1756	43.1%	2714	59.3%	4737	76.9%
2014	789	1683	41.3%	2614	57.1%	4555	74.0%
2015	806	1641	40.3%	2556	55.8%	4446	72.2%
2016	819	1623	39.9%	2534	55.3%	4399	71.4%
Medium Catch Series: F50% OY stream from the Medium Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	1454	2195	53.9%	3284	71.7%	5710	92.7%
2010	1303	2007	49.3%	3077	67.2%	5428	88.1%
2011	1203	1804	44.3%	2844	62.1%	5092	82.7%
2012	1156	1612	39.6%	2616	57.1%	4753	77.2%
2013	1146	1450	35.6%	2422	52.9%	4458	72.4%
2014	1153	1329	32.6%	2277	49.7%	4237	68.8%
2015	1163	1242	30.5%	2181	47.6%	4094	66.5%
2016	1170	1180	29.0%	2122	46.3%	4017	65.2%
High Catch Series: F50% OY stream from the High Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	2660	2195	53.9%	3284	71.7%	5710	92.7%
2010	2333	1802	44.3%	2876	62.8%	5231	84.9%
2011	2112	1416	34.8%	2467	53.9%	4726	76.7%
2012	1994	1072	26.3%	2096	45.8%	4252	69.0%
2013	1945	796	19.5%	1791	39.1%	3854	62.6%
2014	1930	583	14.3%	1557	34.0%	3551	57.7%
2015	1925	415	10.2%	1380	30.2%	3339	54.2%
2016	1918	271	6.7%	1244	27.2%	3197	51.9%

Prioritized Research and Data Needs

- A comprehensive analysis of historic rockfish landings is needed to further refine the landings series for black rockfish and other rockfish species. The analysis should make consistent use of available species composition data and documented historical developments, such as the directed fisheries for Pacific ocean perch and widow rockfish.
- The ODFW tagging study off Newport should be continued and expanded to other areas. To provide better prior information on the spatial distribution of the black rockfish stock, further work should be conducted to map the extent of black rockfish habitat and the densities of black rockfish residing there.
- Age composition data should be developed for black rockfish caught commercially in California, and the data should be entered into the California commercial fishery database (CALCOM).
- If otoliths are available for black rockfish from the recreational fishery in California, they should be identified and read in a manner consistent with the processing of commercial fishery samples.
- A program should be established that routinely collects otoliths from black rockfish and other species harvested by the recreational fishery in California.
- Growth of black rockfish in California should be examined. The current assessment model assumes that black rockfish in California have the same growth curve as black rockfish in Oregon, but differences in growth could be an alternative explanation for the large differences in the length composition data between Oregon and California. Except for some published growth curves based on limited data, no length-at-age data are currently available for California.
- Additional age-reader comparisons should be conducted to resolve the apparent differences in mean length-at-age measurements between readers. Cross-validation experiments should be conducted with age-readers from Washington and California to confirm consistency in age-reading results.
- If otoliths are available from the older Oregon samples that were excluded from the current assessment, they should be re-read to extend the series of age composition data farther back in time.
- Length composition data, including gender, should be collected from the California fisheries to help better define the selection curves and the sex-specific natural mortality process. Currently all the length composition data from the California fisheries are combined-sex samples. Sex-specific length composition samples from the commercial fisheries in California would be particularly informative because these fisheries tend to catch larger black rockfish than the recreational fishery. The apparent lack of older females, which is evident in the age composition data from the Oregon recreational fishery, could be an artifact of the highly domed length-selection by the Oregon recreational fishery.

Rebuilding Projections

The southern stock of black rockfish is estimated to be well above the overfished level. No rebuilding is required.

Regional Management Concerns

Estimating how much of a stock's exploitable biomass should be assigned to separate management areas is an extremely challenging problem given the data currently available. This new assessment for the southern stock of black rockfish included considerable exploration of an area-based assessment model that split the assessment region into two latitudinal areas in Oregon and two areas in California. Each area had its own separate age-structured population and local fisheries, but the areas were linked by their pooled contribution to spawning biomass and the resulting recruits. With this spatial model one could have looked for regional differences in productivity and localized depletion. Unfortunately, despite considerable time and modeling effort, the STAT was unable to find a model configuration that produced stable and plausible results with the available sets of data. The fundamental problem seemed to be the lack of any reliable data to distribute recruiting fish to the different areas. The catch-per-unit-effort indices that are available for black rockfish on a regional basis may provide reliable measurements of trends in fish densities within each region, but they do not provide a good basis for gauging the distribution of fish between regions. If catch-per-angler-day in region A is double the catch-per-angler-day in region B, it is incorrect to assume that there are twice as many fish in region A, even if the relationship between catch rates and fish densities is an exactly consistent. The abundance of fish in the two areas depends not only on the relative fish densities, but also on the spatial extent of the fishing grounds in the two areas. If trawl survey estimates of swept-area biomass had been available for black rockfish, those data might have provided a consistent basis for the area-based model to apportion recruitment to the separate areas. With the data available for black rockfish, however, it did not appear feasible to go forward with the area-based model. Instead, the Oregon and California region was modeled as a single assessment area.

Summary Tables

Management reference points for southern black rockfish.

	Point estimate	Uncertainty in estimates (approx. 95% confidence limits)	
Unfished Spawning Output (SB_0) (millions larvae)	4578.5	3772.3	5384.7
Unfished Summary Age 2+ Biomass (B_0) (mt)	29099.6	na	na
Unfished Recruitment (R_0) at age 0 (1000s of fish)	7852.0	6459.2	9244.8
Reference points based on $SB_{40\%}$			
Spawning Output at $SB_{40\%}$ (millions of larvae)	1831.4	1508.9	2153.9
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.5	none because steepness was fixed	
Exploitation rate resulting in $SB_{40\%}$	0.07227	na	na
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	1035.4	853.1	1217.7
Reference points based on F50% proxy for MSY			
Spawning Output at SPR (SB_{SPR}) (mill. larvae)	1831.4	1508.9	2153.9
$SPR_{MSY\text{-}proxy}$	0.5		
Exploitation rate corresponding to $SPR_{MSY\text{-}proxy}$	0.07227	na	na
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	1035.4	853.1	1217.7
Reference points based on estimated MSY values			
Spawning Output at MSY (SB_{MSY}) (mill. larvae)	1444.6	1189.7	1699.5
SPR_{MSY}	0.4296	0.4288	0.4304
Exploitation Rate corresponding to SPR_{MSY}	0.08864	na	na
MSY (mt)	1064.6	877.1	1251.9

Note: The reference points based on SB40% are equivalent to the reference points base on the F50% proxy for F(MSY) because the steepness parameter was fixed at 0.6. When steepness is 0.6, fishing at F50% reduces spawning output to 40% of the unexploited level.

Recent trends in estimated exploitation and stock levels for the base model for southern black rockfish	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Landings (mt)										
Northern assessment region	337	226	226	190	241	237	269	333	324	566
Southern assessment region	755	703	655	876	689	1061	687	718	627	696
Coastwide	1092	929	882	1066	930	1298	956	1050	951	1262
Estimated Discards (mt)	0	0	0	0	0	0	0	0	0	0
Estimated Total Catch (mt)										
Northern assessment region	337	226	226	190	241	237	269	333	324	566
Southern assessment region	755	703	655	876	689	1061	687	718	627	696
Coastwide	1092	929	882	1066	930	1298	956	1050	951	1262
ABC = OY (mt)										
N of Cape Mendocino			1200	1115	1115	1115				
CA + OR							775	753	736	722
WA							540	540	540	540
Total			1200	1115	1115	1115	1315	1293	1276	1262
SPR	0.6468	0.6931	0.7302	0.6654	0.7292	0.6191	0.7413	0.7366	0.7649	0.7414
Exploitation Rate (total catch/summary biomass)	0.0439	0.0388	0.0347	0.0439	0.0334	0.0494	0.0317	0.0330	0.0291	0.0165
Summary Age 2+ Biomass (B) (mt)	21206	22210	23003	21576	22989	20519	23242	23134	23764	23232
Spawning Output (*SB*) (millions of larvae)	1779	1924	2127	2375	2581	2760	2845	2970	3100	3227
~95% Confidence interval	1218	1305	1435	1596	1714	1817	1839	1902	1966	2031
	2340	2542	2819	3155	3448	3702	3851	4039	4234	4422
Recruitment at age 0	6270	13305	8678	7900	6013	3359	4681	4510	4700	7339
~95% Confidence interval	3989	8989	5544	5057	3612	1701	1695	1149	780	-174
	8552	17621	11812	10744	8414	5018	7667	7871	8619	14853
Depletion (SB/SB0)	0.3885	0.4201	0.4645	0.5187	0.5637	0.6027	0.6214	0.6488	0.6771	0.7047
Uncertainty in Depletion estimate	na	na	na	na	na	na	na	na	na	na

INTRODUCTION

Black rockfish (*Sebastes melanops*) are an important component of the commercial and recreational fisheries in the nearshore waters off central and northern California, Oregon, and Washington and they range as far north as Amchitka and Kodiak islands in Alaska. Adults tend to occur in schools over rocky structure at depths less than 40 fathoms, and sometimes feed actively on or near the surface. They feed on a wide variety of prey including zooplankton, krill, mysids, sandlance, and juvenile rockfish (Love 1969), and are subject to predation by lingcod and marine mammals. Although tagging studies have documented some individuals moving long-distances (several hundreds of miles), the vast majority of recaptured individuals were found close to the areas of initial capture and tagging (Culver 1987, Ayres 1988, Starr and Green 2007).

Like all members of the genus *Sebastes* black rockfish have internal fertilization and bear live young approximately two months after insemination. Black rockfish are quite fecund, with a six-year-old female annually producing about 300,000 embryos and a 16-year-old producing about 950,000 embryos (Bobko and Berkeley 2004). Parturition of larvae occurs during winter (Wyllie-Echeverria 1987) and larvae and small juveniles are pelagic for several months to a year (Boehlert and Yoklavich 1983). Settlement occurs in estuaries, tide-pools, and in the nearshore at depths less than 20 m (Stein and Hassler 1989). Black rockfish begin recruiting to nearshore fisheries at 3-4 years of age, corresponding to a fork length of about 25-30 cm, and 50% of females attain maturity at about 6-8 years, corresponding to a fork length of about 38-42 cm. Adult female black rockfish grow 3-5 cm larger than males, with a few females attaining fork lengths greater than 55 cm.

Stock Structure

Recent assessments of black rockfish off Washington (Wallace et al. 1999, 2007) describe a study of coastal black rockfish genetic structure using 10 samples collected from northern California to southern British Columbia during 1995-97. Results of that study support the notion of separate genetic stocks north and south of Cape Falcon. However, a later study (Baker 1999) of black rockfish collected from eight sites along the northern Oregon coast concluded that black rockfish from north and south of Cape Falcon were genetically very similar. The previous assessment of black rockfish off Oregon and California (Ralston and Dick 2003) reviewed the evidence supporting genetic stock structure for black rockfish and other rockfish off the US West Coast. That assessment concluded that the Oregon and California populations of black rockfish are probably not genetically heterogeneous, and the assessment treated the black rockfish off California and Oregon as a unit stock.

Although it seems reasonable to draw a stock boundary line at the Columbia River, both because it is a state fishery management boundary and because the Columbia River plume is likely to be a natural barrier to the north-south exchange of black rockfish adults and larvae, the current assessment differs slightly from Ralston and Dick (2003) in placing the northern boundary at Cape Falcon rather than at the Columbia River. The boundary was changed to avoid overlap with the separate northern assessment (Wallace et al. 2007) and to simplify the process of assembling commercial landings data, which are largely available in terms of Pacific Marine Fisheries Commission (PMFC) statistical areas. The northern boundary of PMFC Area 2C is at Cape Falcon (Fig. 1). Given the spatial resolution of the available commercial fishery data, it is very problematic to estimate the catch of black rockfish taken north of Cape Falcon but south of the Columbia River.

The Fisheries for Black Rockfish

Black rockfish are harvested by a wide variety of fishing methods including trawling, trolling, and hook and line fishing with jigs and long-lines. Although black rockfish have never been a dominant component of any commercial fisheries, they are important as incidental catch in the troll fishery for salmon and the troll and jig fisheries for groundfish. With the decline of salmon fishing opportunities in late 1970s and early 1980s black rockfish became a vital target of marine recreational fisheries in Oregon and Washington, especially during periods of restricted or slack fishing for salmon, halibut, and tuna. Black rockfish are also an important component of the recreational fisheries in northern California but are of less significance south of Cape Mendocino due to their reduced prevalence compared to other species. Since 1990 recreational harvests of black rockfish have averaged about 300 tons annually off Oregon and about 200 tons annually off California. Commercial harvests during the same period averaged about 200 tons annually by non-trawl gear types in Oregon and about 120 tons by non-trawl gear types in California. Harvests by trawl on average during this period have been less than 10 tons annually for both states combined.

Management History and Performance

Prior to 2000 Pacific Fishery Management Council (PFMC) managed the fishery for black rockfish as part of the *Sebastes* complex, with no separate Acceptable Biological Catch (ABC) or Optimum Yield (OY) for black rockfish. In 2000 the Council established an ABC of 1,200 mt for black rockfish caught north of Cape Mendocino (in the Eureka, Columbia, and Vancouver INPFC statistical areas), but left black rockfish south of Cape Mendocino as part of the "other rockfish" category. For 2001 through 2003 the ABC for black rockfish caught north of Cape Mendocino was 1,115 mt annually, and black rockfish south of Cape Mendocino remained part of the "other rockfish" category and without a separate ABC or OY.

Regulation of the black rockfish fisheries prior to 2004 was accomplished primarily by trip limits for commercial fisheries and bag-limit restrictions for recreational fisheries, with different limits applying in different geographic regions (Table 1, from Ralston and Dick, 2003, with slight modification). Some important changes that occurred include the following.

- In 2000, black rockfish began to be managed as a minor nearshore species. Commercial trip-limits were significantly reduced, with specific restrictions applying to black rockfish. California instituted seasonal closures for commercial and recreational fisheries inside 20 fathoms, reduced the bag limit for rockfish from 15 to 10 fish, and limited recreational gear to one line with three hooks.
- In 2002, California adopted a Nearshore Fishery Management Plan and began more active management of nearshore fisheries including the use of seasonal, regional, and depth-specific closures. Oregon adopted an Interim Nearshore Fishery Management Plan in anticipation of increased pressure on nearshore stocks due to reduced fishing opportunities for groundfish in federal waters.
- In 2003, the Council established Rockfish Conservation Areas to control catches of overfished rockfish species, and large portions of the shelf were closed to fishing. In California the commercial and recreational fisheries for rockfish were closed early.
- In 2004, the sport fishery in Oregon closed in September due to early attainment of the state's limit for sport-caught black rockfish. This was the first time that the sport rockfish fishery in Oregon had not been open all year. In 2005 it closed early again.

In 2004 the coast wide ABC established for black rockfish was based on the projected yields derived from separate northern (Wallace et al. 1999) and southern (Ralston and Dick 2003) stock assessments. The northern assessment covered the Washington coast and the northernmost portion of Oregon, from Cape Falcon to the WA/OR border at the Columbia River. The southern assessment covered the entire Oregon coast and the California coastline north of Point Arena. To account for the spatial overlap of the two assessment areas, 12% of the projected yield from the northern assessment was transferred to the southern region when deriving the coast wide ABC and OY values of 1,315 mt for 2004. State-by-state Harvest Guidelines were established: 326 mt for California, 450 mt for Oregon, and 540 mt for Washington. A similar approach was taken in 2005 and 2006 and the OY for the area south of the Columbia River was apportioned to Harvest Guidelines for California and Oregon based on a 42:58 split.

Year		ABC	OY	Catch
2000	Black rockfish – N. of Cape Mendocino	1,200	na	
	Black rockfish – coast wide			881
2001	Black rockfish – N. of Cape Mendocino	1,115	na	
	Black rockfish – coast wide			1066
2002	Black rockfish – N. of Cape Mendocino	1,115	na	
	Black rockfish – coast wide			930
2003	Black rockfish – N. of Cape Mendocino	1,115	na	
	Black rockfish – coast wide			1298
2004	Black rockfish – OR and CA	775	775	687
2005	Black rockfish – OR and CA	753	753	717
2006	Black rockfish – OR and CA	736	736	627

In all years when there has been an OY specified for black rockfish the estimated catch has been less than the OY, except for 2003 when the estimated coast wide catch exceeded the ABC for north of Cape Mendocino. In 2003 the estimated coast-wide catch exceeded the OY by 183 mt for the region north of Cape Mendocino, but 290 mt of this coast-wide catch was recreational harvest taken south of Cape Mendocino.

The Historical Fishery

A significant issue in the most recent assessment of black rockfish, completed in 2003, was its treatment of catch history. Because of concerns about the effects of initial equilibrium assumptions on the level of depletion estimated by the preliminary base model, the 2003 Stock Assessment Review (STAR) panel worked with the Stock Assessment Team (STAT) to develop a catch history that avoided the need to assume historical catch and equilibrium conditions in the first year of the assessment. The assumed catch reconstruction began in 1946, ramping up from zero in 1945 and all prior years. In hindsight, this may not have been a good assumption, as indicated by the following text from Cleaver (1951) that describes catches of rockfish from 1941 to 1949 in Oregon.

> "The rockfish are caught by otter trawl and long-line gear. The principal species caught by the otter trawl are the black rockfish (*Sebastodes melanops*); green or yellow-tail rockfish (*S. flavidus*); red or orange rockfish (*S. pinniger*); and rosefish (*S. alutus*). …

The landings of rockfish (all species) rose rapidly during the war from 1,301,400 pounds in 1941 to a peak of over 17,000,000 in 1945. Subsequently the landings fell rapidly because of decreased demand and leveled off at about 4,000,000 per year in 1949."

Cleaver also states, in an introductory section on Bottom Fisheries, that the "otter trawl fishery accounts for at least 95 percent by weight of the bottom fish landings."

That black rockfish is one of only four species that Cleaver identifies as composing the large landings of rockfish in Oregon during the War years suggests that black rockfish were not a trivial fraction of the large catches taken during the 1940s. One might also suppose that the otter trawl fishery took a large portion of the landings of black rockfish. Cleaver's statements are certainly at odds with the catch reconstruction developed in the previous assessment.

It seems that black rockfish were also landed in appreciable quantities in California during the 1940s. Black rockfish was identified by scientific name as one of the "half-dozen of the larger and more abundant species [that] make up over half of the annual California commercial poundage landed …" (Anon. 1949).

A major task for the current assessment was developing a plausible reconstruction of historical landings of black rockfish and exploring the consequences of those landings.

ASSESSMENT DATA

Landings

The systems along the US West Coast for monitoring commercial fishery landings in the past did not keep track of the landings of individual rockfish species, largely because many rockfish species have similar market characteristics and therefore were landed as an unsorted mix of species. Black rockfish in particular, which are a nearshore species and much less abundant than many of the offshore rockfish species, were generally landed in mixed-species categories. As a consequence the historical records do not provide a detailed accounting of the landings of black rockfish. The basic approach taken in this assessment to develop the landings series was to apply values for the percentage of black rockfish to the reported landings of rockfish. Data on the percentages of black rockfish, however, are sparse, with the consequence that the landings reconstruction is very uncertain.

The landings data series (Table 2, Fig. 2) was assembled from five primary sources: the Pacific Fishery Information system (PacFIN) for 1981 to 2006; the Pacific Marine Fisheries Commission (PMFC) landings data series for 1956 to 1980; Fishery Statistics of the U.S. for 1927 to 1955; the Oregon Department of Fish and Wildlife's (ODFW) Ocean Recreational Boat Survey for 1979 to 2006 (provided by D. Bodenmiller, ODFW); and the Recreational Fishery Information system (RecFIN, http://www.recfin.org/). Data from California Department of Fish and Game (CDFG) Commercial Passenger Fishing Vessel (CPFV) logbooks for 1957 to 2006 (provided by D. Aseltine-Neilson, CDFG) were also used in an auxiliary manner to derive estimates of rockfish landings prior to 1980, the start of the RecFIN series.

The different landings data sources differ in their level of detail regarding location where the catches were taken and regarding the method of capture. It seemed impossible to resolve the catch locations for the entire data series to any scale finer than PMFC statistical area. Therefore, for this assessment the data were initially partitioned into four geographic areas, A to D, corresponding to PMFC areas 1B, 1C, 2A plus 2B, and 2C (Fig. 1). The spatial separations were maintained during data compilation because preliminary explorations of the data indicated important differences between areas in terms of the historical changes in rockfish landings and because of likely differences among areas in the percentages of black rockfish in the landings of generic rockfish. For input into the stock assessment model the landings data were aggregated into two sets corresponding to the states (OR=A+B, CA=C+D). Regarding capture methods, the data were partitioned into three "gear" groups: trawl (TWL), commercial non-trawl (referred to as HKL, hook and line, in the tables and figures of this document), and recreational (REC). The stock assessment model and data were thus partitioned into six fisheries.

The PacFIN Era – 1981 to 2006

The PacFIN system provides estimates of rockfish landings by species for those strata (year, quarter, port, area, gear type, and market category) that have species composition data available to apportion the landings to species. If no species composition data are available, the system reports the landings as the nominal species or as the mixed-species category, depending on how the landings were originally reported. The amount of unspecified rockfish that cannot be apportioned to species varies by year, area, and gear type. In many instances the landings of unspecified rockfish reported by PacFIN are quite substantial.

The landings data series for black rockfish landed in California and Oregon during 1981 to 2006 were assembled from two PacFIN data sets. The first PacFIN data set (Table 3) consisted of direct PacFIN estimates of black rockfish landings by PMFC area, which PacFIN derives from fish tickets, species composition estimates, and trawl-logbooks provided to PacFIN by ODFW and CDFG. Almost comparable data are available for fish landed at Washington ports, but the PacFIN system does not provide landings estimates by PMFC area for landings at Washington ports. The Washington Department of Fish and Wildlife (Farron Wallace) provided estimates of commercial fishery landings during the PacFIN era of black rockfish harvested off Oregon and California by vessels landing at ports in Washington (Table 4). These landings totaled only 3.5 mt for the period 1981 to 2006.

The other PacFIN data set (Table 5) was derived from landings of rockfish for which species composition sample estimates were unavailable, but which might feasibly contain some black rockfish. This derivation involved applying estimates of the percentages of black rockfish (%Black) to the landings of unspecified rockfish. Estimates of the percentages of black rockfish among the landings of unspecified rockfish were developed by area and gear-group from the first PacFIN data set, for which species composition sample estimates were available. In the PacFIN series prior to 1990 for Oregon there were almost no species composition data for the non-trawl gear types; in later years the species composition data for this gear type were limited. To develop annual estimates of %Black for Oregon, the data from the two Oregon areas (A+B) were pooled and an average estimate was developed for the early years by using all data available for the early years and also by "borrowing data" from the early 1990s (Fig. 3). The final values for black rockfish landings by year and area were the sum of the original PacFIN estimates, to which were added the nominal landings of black rockfish (listed as black rockfish on fish tickets but not verified by sampling) and the estimates of black rockfish in the unspecified rockfish landings. The landings of black rockfish estimated directly by PacFIN were about 25% greater than the amounts derived from the unspecified rockfish plus the nominal black rockfish.

The landings series during the PacFIN era are quite erratic, sometimes exhibiting large variations between years. While these changes could be a true reflection of changing fishing patterns, they may be no more than artifacts of low levels of species composition sampling. A recent study of the groundfish landings estimates for California (Pearson et al. 2007) evaluated the reliability of species composition sampling for various rockfish species. The study noted that black rockfish are easily readily misidentified as blue rockfish, that the hook and line fishery in California was not well sampled until the 1990's, and that many of the California landings estimates are based on "borrowed" data or by treating the black rockfish market category as "pure".

The PMFC Era – 1956 to 1980

The landings data series for black rockfish during 1956 to 1980 were derived primarily from the Pacific Marine Fisheries Commission (PMFC) data series on rockfish landings (all rockfish species) (Table 6). This data series shows considerable variation between areas in the level of landings and in the timing of peak landings. Because landings for the non-trawl gears were not reported in the PMFC series prior to 1971, values for these years were derived by applying the ratio of non-trawl to trawl landings of rockfish reported in the US Fishery Statistics series, which included landings by gear and area of landing. For some years at the end of the series the landings data were taken from state landings reports (documented in footnotes to Table 7).

The US Fishery Statistics Era – 1927 to 1955

The landings data series for black rockfish during 1927 to 1955 (Table 7) were derived from a compilation of rockfish landings data (all rockfish species) from the annual series of Fishery Statistics of the United States. This data source, unlike the PMFC data series, does not indicate catch locations, but it does tabulate the landings data to broad geographic regions where the landings occurred. The Oregon data are divided into a Columbia River versus coastal region, and the California data are sectioned into three relevant regions: a northern region; a San Francisco region, and a Monterey region. For this assessment, the rockfish landings at Oregon coastal ports were apportioned 50:50 to areas A and B, and 10% of the rockfish landings at Columbia River ports were apportioned to area A. The remaining 90% of landings at Columbia River ports was assumed to be taken north of the geographic range covered by this assessment. The landings reported for northern California ports were assigned to area C, and the landings reported for the San Francisco and Monterey regions were assigned to area D. The rockfish landings in the southern California region were assumed to not contain any black rockfish. This is consistent with contemporary landings data, which indicate almost no landings of black rockfish south of PMFC Area 1B.

The Fishery Statistics series provides total landings of rockfish and the trawl-caught landings of rockfish each year, as well as a more detailed breakdown by various gear-types for every fifth year. For this assessment trawl-caught rockfish landings were assigned to the TWL gear-type, and the difference between the total rockfish landings and the trawl-caught landings were assigned to the HKL gear-type.

The commercial fishery landings data series for black rockfish prior to 1927 were extended back to zero in 1915, based on linear interpolation.

Foreign Fishery Catches of Black Rockfish

Rogers (2003) developed catch reconstructions for removals by foreign trawlers operating off the US West Coast during the late 1960s to mid 1970s. Although this study reports that Japanese vessels operating in the Columbia and Eureka statistical areas (Oregon and northern California) caught substantial catches of black rockfish, with cumulative catches of more than 500 tons over

10 years, it seems very unlikely that foreign vessels could have operated sufficiently close to shore to catch appreciable quantities of black rockfish. This assessment does not include Rogers' estimates of black rockfish removals.

Assumed Percentages of Black Rockfish in Landings Prior to 1981 (PacFIN)

For the base-run model the rockfish landings were apportioned to black rockfish by applying assumed values for the %Black by area and gear-type that were derived from species composition data from the PacFIN era. For the non-trawl gear the percentages of black rockfish by area were simple ratio estimates of the PacFIN black rockfish landings during 1992-99 over the PacFIN estimates of "speciated" rockfish landings: 26% in area A; 28% in area B; 40% in area C; and 1.2% in area D. For non-trawl gear the estimates of %Black were reasonably stable during this period (Fig. 3). For the trawl gear the percentages of black rockfish by area were declining during the early PacFIN era and were essentially zero during later years in all areas except C (Fig. 3). The assumed values of %Black for trawl were 0.2% in area A, 2.5% in area B, 7% in area C, and 0.1% in area D.

Alternative Percentages of Black Rockfish in Commercial Landings Prior to 1981

There are few data available to suggest what would be reasonable values for the percentage of black rockfish in the rockfish catch prior to the PacFIN era. Although I could not find any information on the %Black by non-trawl gear, I was able to find three reports on the %Black by trawl.

Nitsos (1965) presented results of species-composition samplings from trawl catches of rockfish landed at major California ports from Eureka to Santa Barbara during 1962 and 1963. Black rockfish comprised 15.1% and 10.4% of the sampled landings at Eureka during 1962 and 1963, and they comprised 2.1% and 0.1% of the sampled landings at San Francisco during 1962 and 1963. No black rockfish were sampled at the other ports. Of the sampled rockfish landings at Eureka the percentage that was black rockfish is 12.3%. Of the rockfish landings at the other sampled ports (excluding Santa Barbara, which is south of the area covered by this assessment), black rockfish comprised 0.4%.

Niska (1976) summarized results of species composition samplings from trawl catches of rockfish landed in Oregon during 1963-71, which were landed as either nominal Pacific ocean perch (POP) or as "other rockfish". Few to no black rockfish were in any of the sampled landings of nominal POP, and very small percentages were present in the sampled landings of other rockfish. Black rockfish were 1.3% of the sampled other rockfish landings during 1963, 0.85% during 1964, 9.74% during 1965, 11.3% during 1966, 16.2% during 1967, 7.3% during 1968, 12.5% during 1969, 21.0% during 1970, and 10.9% during 1971. For those years with the larger reported percentages (1965-71), most of the apparent catches of black rockfish were taken from the area between Cape Elizabeth and Cape Lookout, and would probably have been from north of the current assessment region.

Douglas (1998) revised the analysis of Niska (1976) to apportion catches to PMFC areas and updated the analysis to include information through 1981 on species composition samplings from trawl catches of rockfish landed in Oregon. For the catch regions relevant to the current assessment (PMFC areas 2A, 2B, and 2C), essentially no black rockfish were in any of the sampled landings of nominal POP, and the percentages in the sampled landings of other rockfish were highly erratic, attaining values as high as 58% and 100% for two very lightly sampled strata. The overall ratios by PMFC area of black rockfish over the landings of other rockfish varied from 2.9% to 5.0%.

Oregon Sport Fishery Landings – 1950 to 2006

The Oregon Ocean Recreational Boat Survey (ORBS) provided estimates for 1973 to 2006 of the numbers of black rockfish harvested by recreational anglers fishing from boats in ocean waters off Oregon (Table 8). Estimates of catches from north of Cape Falcon, the northern boundary for the assessment region, were excluded from the tabulation. These were fish landed in Astoria and 28% of the fish landed at Garibaldi. Landings by other segments of the sport fishery (e.g. shore-based or in estuaries) were derived from an estimate of the average percentage of the black rockfish landed in Oregon by the ocean boat fishing modes (96.2%, based on RecFIN estimates of catch by mode). Landings in metric tons for 1980-2006 were derived using the annual estimated average weights of black rockfish landed in Oregon, obtained from RecFIN. For earlier years the tonnage was based on the average weight from 1980-84.

Over 40,000 black rockfish were harvested from each of areas A and B during 1973. To provide for a gradual building of the sport fisheries in these areas, the numbers of fish caught annually during 1950 to 1972 were filled in by linear interpolation, starting from assumed sport harvests of zero in 1949.

California Sport Fishery Landings – 1945 to 2006

Estimates of the numbers of black rockfish caught by sport fishers in California during 1980 to 2006 were obtained from RecFIN, with supplemental information provided by California Department of Fish and Game (CDFG, D. Wilson-Vandenberg) for 1993-96, when the catch of black rockfish by commercial passenger fishing vessels (CPFV) was not included in the RecFIN estimates (Table 9). The estimated black rockfish catches for 1990-92 were derived by linear interpolation from catches during 1989 and 1993. The Marine Recreational Fisheries Statistics Survey, which provides RecFIN with the basic sample data, was unfunded during 1990-92. Landings in metric tons for 1980-2006 were derived using the annual estimated average weights of black rockfish landed in California, obtained from RecFIN. For earlier years the tonnage was based on the average weight from 1980-84.

The CDFG Commercial Passenger Fishing Vessel (CPFV) logbooks for 1957 to 1982 provided the basis for estimating the annual landings of black rockfish during years prior to 1980. Landings for 1957-79 were the rockfish numbers reported in the CPFV logbooks times 0.329, which is the ratio (RecFIN black rockfish, 1980-82) over (CPFV logbook rockfish, 1980-82). The logbook series did not include reported landings of rockfish in the assessment area prior to 1957, but the rockfish landings reported for 1957 were substantial (almost 300,000 fish). To provide for a gradual building of the sport fishery in California, the numbers of black rockfish caught annually were derived by interpolation, starting from assumed sport harvests of zero in 1945.

There is little information with which to evaluate the reconstructed California recreational catch of black rockfish. Miller and Gotshall (1965) sampled the recreational marine fishery during 1958 to 1961 and estimated that the sport fishery during this period landed 64,167 black rockfish annually. In constrast, in the catch reconstruction based on the CPFV logbook data (Table 9) the average annual catch of black rockfish during this period was almost 140,000 fish.

Alternate Historical Landings Series

To evaluate the sensitivity of the assessment results to the catch history reconstructions, alternative values for the percentages of black rockfish were applied to the commercial rockfish landings series to generate high (Table 10) and low catch series (Table 11) by gear type and state. The following table shows the assumed values for %Black that were used with the commercial landings.

	A:OR-N	B:OR-S	C:CA-N	D:CA-Central
Non-trawl				
Low	19.5%	21%	30%	0.9%
Base	26.0%	28%	40%	1.2%
High	32.5%	35%	50%	1.5%
Trawl				
Low	0%	1.2%	3.6%	0%
Base	0.2%	2.5%	7.0%	0.1%
High	0.4%	5.0%	14.0%	0.2%

The percentage values shown above do not represent an exact analysis but instead are meant to reflect some general patterns that seem evident in the available %Black observations and to provide plausible ranges of values.

For each state's sport fishery the alternative landings were generated by multiplying the base-line landings times a fixed percentage: 75% to generate the low alternative landings and 125% to generate the high alternative.

Estimated Discards

Estimates from the Northwest Fisheries Science Center's (NWFSC) West Coast Groundfish Observer Program (provided by J. Hastie, NWFSC) of discards of black rockfish in the commercial fisheries indicated very low levels of discarding (less than 1% in 2004, and 1 to 1.5% in 2005). Estimates from the ORBS program of discards of black rockfish in the Oregon sport fishery, based on data collected by observers on charter boat trips, also indicated low levels of discarding, 2% to 3% in 2002 and 2003 but increasing in more recent years when bag limits were lower. This assessment assumes that there are negligible amounts of dead discards of black rockfish, and applies no adjustment to the landings data for discards or unreported landings. Given the large uncertainty in the %Black values used to generate most of the landings estimates, there seemed little purpose to adjusting for small amounts of discards.

Biological Parameters and Data

Maturity-at-length and Fecundity

This assessment uses the logistic formulation developed in the last assessment for the maturity versus length relationship. The assumed length at 50% maturity is 39.53 cm and the slope coefficient is 0.4103 cm^{-1}. Ralston and Dick (2003) derived this relationship by blending information from Wyllie-Echeverria (1987) on the maturity of black rockfish from northern California with information from Bobko and Berkeley (2003) for fish sampled in Oregon.

Similarly, this assessment, like Ralston and Dick (2003), assumes that weight-specific fecundity is linearly related to female body weight according to the following:

$$larvae / kg = 289{,}406 + 103{,}076 \cdot weight\ (kg)\ .$$

This relationship was derived from laboratory counts of fertilized eggs from several hundred female black rockfish collected in Oregon, as described in Bobko and Berkeley (2003).

Length-weight Relationship

This assessment used the length-weight relationship developed for the 2003 assessment, which was based on length and weight measurements from almost 4,000 individual black rockfish collected by ODFW staff:

$$weight = 0.00001677 \cdot length^{3.00}\ ,$$

where weight is measured in kg and length is fork length in cm. The 2003 assessment reported no statistically significant differences between males and females.

Length-at-age

Length and age data are available for large numbers of black rockfish caught by the sport fishery in Oregon; limited data are also available for fish caught commercially in Oregon. However, as noted in the STAR Panel report for the 2003 assessment, plots of mean length-at-age by year (e.g., Fig. 4) indicate changes that suggest inconsistent age reading. Alternatively, the apparent variations in mean length-at-age could indicate changes in growth.

To investigate this further, average length-at-age data were examined for individual age-readers, including an ANOVA to determine whether there were significant differences among readers in their determinations of length-at-age. All the data examined were from fish captured during 1996-2005. The database does not identify the age-readers prior to 1996. Plots of the data indicate substantial differences among some readers in their average length-at-age measurements (Fig. 5). The ANOVA and subsequent pair-wise comparisons among readers indicated a set of four readers whose measurements were mutually consistent and significantly different from the other four readers. These readers produced length-at-age estimates that were consistent from year to year (Fig. 6). For this assessment only age-readings from this set of standard age-readers were used for developing data series on age composition and mean length-at-age.

The length-at-age data from the set of standard age-readers were used to derive a set of von Bertalanffy growth curve parameters for possible use in the stock assessment model (Fig. 7). Fully separate curves were fitted for each sex, but when the data were fitted instead with a model in which the sexes had the same length at age-3 there was insignificant degradation in fit. The following parameter values were estimated:

Length-at-age-3:	30.00 cm	both sexes
Length-at-age-20:	45.86 cm	females
Growth coefficient, k:	0.2104 yr^{-1}	females
Length-at-age-20:	42.62 cm	males
Growth coefficient, k:	0.2428 yr^{-1}	males

This curve is provided for reference purposes only. In the stock assessment model the growth parameters were freely estimated, but with both sexes having the same length at age-3-yr.

No raw length-at-age data were available from the recent commercial or sport fisheries in California, but data from 186 black rockfish collected off central California between Monterey and Morro Bay during 1978-85, are presented in Lea et al. (1999). The average total length of the 63 age-4-yr fish was 29.6 cm, equivalent to a fork length of about 28.9 cm. The average total length of the four age-11-yr fish was 50.4 cm, equivalent to a fork length of about 49.4 cm. Compared to the length-at-age data from Oregon, the data from California imply that the fish there may not have growth that is comparable to that observed off Oregon. Based on the Oregon length-at-age data an age-4-yr black rockfish (without regard to gender) should have a fork-length of about 33 cm on average, and an age-11-yr fish should have a fork-length of about 42 cm.

Variability in Length-at-age

The length-at-age data from the set of standard age-readers were also used to derive estimates of the variation in length-at-age (Fig. 8). For both males and females the variation in length-at-age tends to decline more or less linearly with either age or length. The preliminary stock assessment model assumed that the coefficient of variation in length-at-age varies linearly with length, from 11% at age-3 to 7% at age-20 for females and to 5% at age-20 for males. During the October STAR meeting this assumption was re-evaluated and the growth model specification for the final base-run model was changed to have a constant 7% coefficient of variation.

Age-reading Error

To help inform this assessment, age-readers at the ODFW were asked to participate in a double-read experiment where both age readers were given the same set of 150 otoliths to read, all of which had previously been read by other readers. These double-reads were used to develop estimates of age-reading error standard deviations by age (Fig. 9), which were fitted by regression through the origin to develop a vector of age-reading error standard deviations for use in the stock assessment model.

Natural Mortality

The previous assessment of black rockfish used different rates of natural mortality on males versus females to account for the lack of older females in fishery samples. The assumed instantaneous rate of natural mortality (M) was 0.12 yr^{-1} and was constant with age for males. For females M was also 0.12 yr^{-1} but only up to age 10, after which there was a step change in M to 0.2 yr^{-1}. This assessment uses a slightly different formulation, which was developed during the May 2007 STAR Panel review. For fish less than 10 years the value of M is 0.16 yr^{-1} for males and females, and remains constant with age for males. For females between 10 and 15 years M increases linearly with age, and for females older than 15 years M is constant at 0.24 yr^{-1}.

The oldest black rockfish from age-readings by the standard set of Oregon age-readers were two 29-year-old males, and the oldest female black rockfish was 26 years old. These maximum age observations suggest that there should not be a large difference in mortality between females and males. The maximum ages are consistent with instantaneous total mortality rates of 0.14 to

0.16 yr^{-1}. However, a plot of the percent female versus age shows the same distinct decline with age in the percentage of females by age, starting from 50% at about age 10, which is a feature noted in the last assessment for southern black rockfish and in the assessment for northern black rockfish.

Size and Age Composition Data

Fish length measurements, primarily from the recreational fishery, are one of the major sources of data for this assessment. Length composition data from the commercial fisheries in Oregon and California were also included, as were some age composition data from the commercial and recreational fisheries in Oregon.

A large proportion of the length composition data were from the Marine Recreational Fishery Statistics Survey (MRFSS), which is a federally funded program operating since 1980 that collects information on the marine sport fisheries. The MRFSS program includes an intercept survey in which sport anglers are interviewed as they return from fishing trips, and where samplers can identify and measure the retained catches. The MRFSS sampling is intended to cover all forms of marine recreational fishing, including shore-based activities from beaches, jetties, and piers. In contrast the ORBS program that operates only in Oregon interviews and samples anglers operating from boats. The MRFSS length data, which are housed in the RecFIN system, generally do not indicate the sex of individual fish that were measured. Only the length and age data collected by the ORBS program are available by sex.

Processing of the RecFIN length data involved expanding the numbers of fish that were measured to account for fish that were observed and counted during the interviews but not measured. The expanded frequencies were then tabulating by Year, Mode, Wave (bi-monthly period), and State. In the version of the assessment that was reviewed by the late-May STAR panel, these first-stage expanded lengths compositions were further expanded by RecFIN estimates of the numbers of black rockfish landed by Year, Mode, Wave, and State. However, because very small samples from some strata had been expanded to represent very large estimated landings, the expansion process for some years resulted in extremely ragged length composition estimates. For this version of the assessment, strata with less than five fish lengths were excluded from the tabulations and no second-stage expansion was applied to the RecFIN length composition data.

For combining length (or age) data from ORBS and commercial fishery samples the individual sample data from a strata were expanded by the estimated numbers of fish in that strata to produce weighted average estimates of length (or age) composition.

Length and Age Sample Sizes

The level of commercial fishery sampling for black rockfish has been erratic, with almost no samples taken in Oregon until the early 1990s (Table 12). In California there was a shift from trawl to non-trawl samples, which in part reflects the growing importance of hook-and-line fishing in the nearshore and the development of a fishery for live fish. Sampling of the recreational fisheries in Oregon and California by the MRFSS program has been reasonably consistent except for the hiatus during 1990-92 when the program was not funded. The standard MRFSS sampling program stopped in 2003 in Oregon and in 2004 in California, at which time the states assumed larger roles in sampling their recreational fisheries. This resulted in some loss of continuity in the sampling processes.

In the length-composition sample size table for Oregon, the samples listed in the column "Rec-2" were limited to the port of Garibaldi until 1990, at which time ODFW began collecting samples of sport-caught black rockfish from most of the other ports. The average size of the fish sampled prior to 1990 is generally higher than the fish sampled after 1990, probably due to the very limited geographic coverage of the early sample data.

The age-composition data from the set of standard age-readers is limited to the years 1996 to 2005, with most of the age-readings coming from fish collected from the Oregon recreational fishery by the ORBS program (Table 13). Biological sampling by the ORBS program has tended to focus on the charter boat fleet, with the consequence that the age- and length-composition data collected by ORBS probably are not fully representative of fish landed by anglers aboard privately owned boats.

<u>Multinomial Sample Sizes</u>

Initial input values for the multinomial samples sizes determine the relative weights applied in fitting the annual composition data within the set of observations for each fishery. The initial input values in this assessment were based on the following equation developed by I.Stewart and S.Miller (NWFSC), and presented at the 2006 Stock Assessment Data and Modeling workshop.

Effective N = [(0.138*FPS + 1)*NS .... if FPS < 44

Effective N = 7.06 * NS .... if FPS >= 44

where FPS denotes the average number of fish measured per sample and NS denotes the number of samples.

Tuning of the assessment model involved multiplying the input sample sizes for each fishery by an adjustment factor to achieve a better balance between how well the model fit the set of composition data and how well it should have fit the data given the sample sizes underlying the data.

Length Compositions

The length data for the assessment model were tabulated into 2-cm length bins ranging from 20 cm to 60 cm, with accumulator bins at each end (Fig. 10). During the October STAR meeting the data were restructured to include a dummy length bin for fish less than 20 cm. For the data tabulation provided in this document (Table 14), the accumulator bins were extended to compress and simplify display of the data.

The length composition data indicate some general differences between the three fishery types, with the trawl fisheries producing the largest fish, the recreational fisheries producing the smallest fish, and the non-trawl fisheries producing fish of intermediate length. There is little evidence in any of the length-composition data of distinct modes or successions of modes from one year to the next that might represent strong year-classes.

The recreational fishery length-composition data from Oregon are generally quite symmetrically distributed, whereas the recreational fishery length-composition data from California are often quite asymmetric, with an extended shoulder having modest numbers of large fish. However, the data for the first few years of the California series are similar in general shape to the Oregon recreational length-composition data.

Sample length-composition data from the California sport fishery for 1999 and 2000 were excluded from the assessment model because they had very narrow distributions and were extremely different from adjacent years. Close examination of the raw data did not indicate any obvious reason for the odd appearance of these length-compositions.

Age Compositions

The fishery age-composition data for the assessment model consisted of otolith age-readings, mostly from the recreational fishery and only from Oregon (Fig. 11). The age-composition data for the assessment model were tabulated into 1-yr age bins from 1 to 25 years. For the data tabulation provided in this document (Table 15), the accumulator bins were extended to compress and simplify display of the data.

The age-composition data generally do not show much evidence of distinct year-classes that can be easily tracked from one year to the next, which suggests that that there is not much recruitment variability from year-to-year or that age-reading error is sufficient to mask the appearance of strong year-classes.

Mean Weights from Species Composition Sampling Programs

Length- or age-composition data are needed to inform the assessment model about the selection characteristics of the fisheries and surveys. There are very few such data available for the commercial fisheries. To supplement the sparse composition data series, annual average weights were developed from data on sample weights and numbers of black rockfish, information collected routinely as part of the species composition sampling programs in Oregon and California. The data indicate substantial differences in mean weight between the trawl and non-trawl fisheries, with the trawl fisheries landing fish that are about 0.5 kg heavier on average than the fish landed by the non-trawl fisheries (Fig. 12).

Abundance Indices

Age- and length-composition data by themselves do not provide sufficient information to reliably determine trends in stock abundance and biomass. Most assessments of US West Coast groundfish stocks rely on estimates of stock biomass from research trawl surveys to provide information on biomass trends.

Sport Fishery Catch-per-Unit-Effort

Black rockfish mostly occur in nearshore waters, and are rarely taken in the standard National Marine Fisheries Service (NMFS) bottom trawl surveys. The primary tuning indices available for this assessment are ones based on recreational catch-per-unit-effort. This assessment takes an approach similar to that used in the previous assessment for deriving standardized indices of abundance, and uses the same basic data: interview data from RecFIN (Type-3 records) in all areas on catch-per-angler-day; aggregated interview data from ORBS on catch-per-angler-day in Oregon; and data from observers aboard commercial passenger fishing vessels (CPFV) on catch-per-angler-hour off central California.

The RecFIN CPUE Indices

Because sport anglers target a wide variety of species, many fishing trips are very unlikely to ever encounter a black rockfish. The lack of any catch of black rockfish during these trips provides no information on the relative abundance of black rockfish, and these trips should not be included in a catch-rate analysis for black rockfish. To restrict the set of RecFIN data to trips that are likely to have encountered black rockfish, the multispecies analysis developed by Stephens and MacCall (2004) was used to select a subset of the RecFIN data for developing a CPUE index. The analysis applies a logistic regression to trip-level data on the presence or absence of the target species (black rockfish) based on presence or absence data for a suite of other species that occur with reasonable frequency in the catch and effort data set. The resulting logistic regression coefficients for each of the other species provide a measure of the likelihood of catching the target species, given that the other species were caught. Positive coefficients imply a greater likelihood of catching the target species. Separate analyses were done for the data from Oregon and California, and only data from ocean charter boats were used. Data from private boats were excluded because it seemed likely that private anglers would have less consistent fishing patterns than charter boat operators, and would therefore provide noisier information.

For the RecFIN data from Oregon, the logistic regression analysis to select likely black rockfish trips was based on data from 9,120 trips and a suite of 21 species (excluding black rockfish). The analysis generally produced large positive coefficients for shallow-water species that one would expect to co-occur with black rockfish (e.g., tiger rockfish and copper rockfish), and large negative coefficients for deepwater species that one would not expect to co-occur with black rockfish (e.g., Pacific halibut and Chinook salmon) (Table 16). Those trips having an estimated probability of producing a black rockfish that exceeded the cut-off value of 0.68 were selected for the CPUE analysis. This screening process resulted in 493 trips that were estimated to be false positives, where black rockfish were caught, but should not have been, given the other species caught during those trips. These probably represent trips that fished in multiple locations, and thus caught a mix of shallow- and deepwater species. The screening also resulted in the inclusion of 495 trips (false negatives) that should have caught black rockfish (given the other species), but did not. A total of 5,836 trips were selected for the CPUE analysis.

The analysis for the RecFIN data from California, which was based on 9,089 trips and 29 species, identified that black rockfish are likely to be caught in association with black and yellow rockfish and gopher rockfish, whereas they are unlikely to be caught on trips that land sablefish or chilipepper rockfish (Table 17). Trips were selected for the CPUE analysis if the estimated probability of producing a black rockfish exceeded a cut-off of 0.42, which resulted in the exclusion of 782 trips that were deemed to be false positives, and the inclusion of 779 trips that did not catch any black rockfish. A total of 2,110 trips were selected for the CPUE analysis.

For Oregon, the information collected from Lincoln County dominates the RecFIN catch and effort records selected for the CPUE analysis; the other coastal counties had much lower coverage (Table 18). One notable gap in coverage is the absence prior to 1997 of data from July/August, which generally are months of peak activity for the charter boat fleet in Oregon. Simple tabulations of the raw data indicate that most trips landed black rockfish (Table 19) and that the catch-per-angler-day was quite uniform across counties and seasons, with an overall average catch rate of nearly 6 fish per angler day (Table 20).

For California the RecFIN catch and effort records selected for the CPUE analysis are sparse, with very few data from the northernmost counties (Del Norte and Humboldt) and some gaps in coverage for all counties prior to 1990 (Table 21). Coverage during winter months is light in all years. Because the data are sparse, simple tabulations of the raw data produce quite variable estimates of the percentage of trips that catch black rockfish (Table 22), but it generally appears that trips in northern counties are more likely to catch black rockfish and that summer months are better than winter months. Tabulations of the catch per angler for trips that catch a black rockfish suggest that catch rates are higher in the two northern-most counties (Table 23).

Standardized CPUE indices for Oregon (Fig. 13) and California (Fig. 14) were developed from the selected subsets of the RecFIN catch and effort data using Generalized Linear Models (GLM), with a binomial model to estimate the probability of catching at least one black rockfish and a Gamma or a lognormal model to estimate the magnitude of the positive catches by one angler. In all cases, the structural models had three main effects for the factors Year, Wave (bimonthly period) and County, and there were no interaction terms. The annual index values were derived as the product of two components: predicted values for the probability of catching a black rockfish during a trip, and predicted values for the number of black rockfish caught by an angler given that at least one black rockfish was caught. The predicted values for the two components were based on the same specific levels for Wave and County in order to maintain scales that would be consistent with the observed catch-per-angler data.

The CPUE index for Oregon has a high amount of inter-annual variation, particularly in the early part of the series, but shows no long-term trend. The CPUE index for California has much greater inter-annual variation than the Oregon index, primarily due to some erratic predicted values in the log-normal component in a few early years when the data were few and scattered.

The ORBS CPUE Index

The ORBS data series for most years does not include full species composition information, and therefore was not amenable to a multispecies analysis to select a relevant subset of the data, as was done with the RecFIN data. However, the ORBS samplers classify whether each fishing trip was directed at "bottom fish" (as opposed to trips for salmon, halibut, or albacore tuna). For developing the CPUE index from the ORBS data the analysis was restricted to fishing trips that were identified as "bottom" trips and which were therefore thought to have a consistently high probability of catching black rockfish.

For much of the series the data are not available as records of individual fishing trips but instead are in an aggregated form (e.g., catch and effort by port and month). In this form there were essentially no records in the database where there was effort and no catch of black rockfish. There was also no basis for a formal model of the probability that a single trip catches a black rockfish. To develop a standardized CPUE index from the ORBS series, the CPUE observations (aggregated catch over aggregated effort) were fitted with a gamma model with main effects for Year, Month, Port, and Boat-type (private versus charter) and no interactions. Data from the ports of Astoria, Florence, Bandon, Port Orford, and Gold Beach were excluded from the analysis because of sparse data. The annual index values are the predicted numbers of fish per angler-day for charter boats operating from Newport during the month of July. The index varies between 2.9 and 5.5 fish per angler-day but shows no long-term trend (Fig. 15).

The CDFG CPFV Observer CPUE Index

During 1988 to 1998, observers from CDFG collected data on catch and effort while aboard Commercial Passenger Fishing Vessels (CPFV) operating off Central California. These data provide site-specific fishing rates, which the previous assessment used to develop a CPUE index.

The CPFV data series was restricted to observed catch rates at specific fishing locations where black rockfish were caught on at least five occasions during the study period. The index values, which were derived from a delta-gamma GLM with factors for Year, Month, and Location, are used without modification in the current assessment (Fig. 16).

Effects on CPUE of Changes in Bag-Limits

Use of catch-per-effort data as an index of fish abundance is based on numerous assumptions including consistency in the type of gear used and consistency in the spatial pattern of fishing. When fishery management adds constraints to fishing activities, it is likely that fishing patterns will change and distort the relationship between catch-per-effort and fish abundance. Bag-limits, in particular, will tend to constrain catch-rates (all else being equal), and a series of reductions in bag-limits over time will tend to impose a trend on catch-rates, even if stock abundance is increasing. There have been several important changes in bag-limits for black rockfish that might have bearing on the CPUE indices used in this assessment.

In Oregon in 1979, the first year of the CPUE series for California, there was a bag-limit of 15 rockfish, which became more restrictive in 1994 when a sub-limit of 10 black rockfish was added. From 2000 to 2002, there was a rockfish limit of 10 fish in effect, with a sub-limit of three canary rockfish during 2000, one canary rockfish during 2001, and one canary rockfish plus one yelloweye rockfish during 2002. Beginning in 2003 the 10-fish bag-limit applied to all marine fish species rather than just to rockfish. In July 2005 the marine fish bag-limit was reduced to 5 fish; for 2006 it was 6 marine fish.

In California in 1980, which is the first year of the CPUE series for California, there was a bag-limit of 15 rockfish in any combination. In 2000 the bag limit for rockfish was reduced to 10 fish.

To determine whether catch rates for black rockfish in the recreational fishery were being constrained by bag-limits, the RecFIN data on catch-per-angler were tabulated and plotted as frequency histograms (Fig. 17). The plots for both regions of Oregon and for the northern portion of California indicate truncation of the frequency histograms at 10 fish-per-angler, starting in the years when the 10-fish bag limits went into effect, which strongly suggests that the CPUE index would be influenced by the bag-limit changes.

When the late-May STAR Panel reviewed an earlier version of this assessment, it was agreed that the CPUE indices in Oregon should be broken into separate sections corresponding to changes in the bag-limits, with the breaks occurring between 1993 and 1994, and between 1999 and 2000. For California, a single break should be placed between 1999 and 2000. Further, broken series should be rejoined if the assessment model's fit to the series implied a reduction in the effective catch rate (catchability). An increase in the effective catch rate would imply that the reduced bag-limit was not constraining the fishing operations.

PIT-Tagging Study Estimates of Black Rockfish Abundance off Newport, Oregon

Beginning in 2002, ODFW has used Passive Integrated Transponder (PIT) tags to mark 2,500 to 3,000 black rockfish annually off Newport, Oregon. Marked fish are recovered from recreational fishery landings, with sampling focused on the charter vessel fleet. Approximately 80% of the annual landings are sampled for marked fish, resulting in the recovery of 976 marked fish to date. The multi-stage mark-recovery model described in Brownie et al. (1985) as Model 0 was used to estimate annual survival and recovery rates for the black rockfish population off Newport

(Table 24). Model 0 was selected because it was the only classic Brownie model that adequately fit the data. Model 0 allows direct (first-year) recovery rates to differ from recovery rates of previously marked cohorts, which appeared to be the case in the black rockfish mark-recovery data. Model 0 parameters were then used to calculate annual exploitation rates, which were then applied to the annual landings to estimate annual abundance.

The mark-recovery study only covers the black rockfish off Newport, Oregon, and this population is an unknown fraction (q) of the much larger stock of black rockfish residing in the waters off Oregon. To provide some idea of what fraction the Newport population represents of the larger Oregon stock south of Cape Falcon, recreational and commercial observer data were used to estimate the proportion of habitat occurring inside the mark-recovery study area in relation to the amount of habitat occurring in the larger areas used in the stock assessment (Table 25). Assuming that abundance is proportional to available habitat, which seems reasonable given observed catch-rates of black rockfish, these habitat proportions provide a reasonable range of estimates of q for the Newport population abundance estimates (from 9% to 21% with a best estimate of 16%). With regard to how much of the black rockfish stock resides in waters off Oregon versus California, the Council apportions optimum yields for Oregon plus California based on 58% to Oregon and 42% to California, implying that the Newport population comprises approximately 10% of the exploitable black rockfish in the assessment region.

Details for the tagging study are available in Buell et al. (2007), which is included as Appendix A to this assessment.

SWFSC Juvenile Rockfish Survey Index

Since 2001, the NMFS Southwest Fisheries Science Center, in conjunction with the Pacific Whiting Conservation Cooperative, has conducted a coast-wide, mid-water trawl survey of pre-recruit pelagic juvenile rockfish and Pacific hake. Using data for the juvenile black rockfish caught during the surveys, S. Ralston (SWFSC) developed three different indices of black rockfish recruitment strength for 2001-2006. Although the three indices differ in their underlying statistical models, they show similar patterns (Fig. 18). For this assessment, the index based on the ANOVA model was used, but the estimated coefficients of variation (CVs) for the index values were inflated by a factor of 10 when input to the stock assessment model because the CVs seemed extraordinarily low.

HISTORY OF MODELING APPROACHES

The first stock assessment of black rockfish off Oregon (Stewart 1993), which was limited in geographic scope to the northern portion of Oregon, was a Cohort Analysis based on age composition data collected from fish landed at Garibaldi. The first comprehensive analysis of the black rockfish stock off Oregon and California was by Ralston and Dick (2003), who developed a statistical catch-at-age model using Stock Synthesis. Their model configuration and approach were very similar to the current assessment, with a few notable exceptions that are described in more detail below. The stock of black rockfish off Washington has been assessed three times: by Wallace and Tagart (1994), Wallace et al. (1999), and Wallace et al. (2007). The assessments in 1994 and 2007 used the then-current versions of Stock Synthesis and the 1999 assessment used a purpose-built model (running under the AD Model Builder software) that directly incorporated tag-recapture data.

Response to 2003 STAR Panel Recommendations

The current assessment was partially successful at responding to the recommendations outlined in the 2003 STAR panel report.

Fishery independent surveys and biological data collection programs

The new assessment used data from two surveys that were not used by the 2003 assessment and that potentially provided indices for tuning the assessment. The juvenile rockfish survey is a fishery independent survey that provides information on recruitment strength of black rockfish. The ODFW tagging study, while not fishery-independent, provides a new data source that should be much less prone to the biases inherent in fishery catch-per-unit-effort data. There remains a general need for expanded data collection systems for nearshore rockfish species.

Pre-assessment meetings to evaluate data.

The STAT participated in the Recreational CPUE Statistics and Stock Assessment Data Workshops that were held during 2004 to exchange information about available data sources and suitable methods for analysis of these data. Also, the STAT was in repeated contact with personnel at ODFW, CDFG, PacFIN, and NMFS regarding the data sources during the data compilation phase of the assessment.

Consistent methods and data sources to estimate catch histories.

The assessment teams for southern and northern black rockfish shared catch history information to avoid overlap and double counting, but there was no coordination with other rockfish assessment teams to develop a comprehensive historical analysis of rockfish catches.

Investigate possible causes of changes in mean length at age

The STAT conducted analyses of the mean length-at-age data available from Oregon and concluded that the apparent changes in length-at-age were due to differences in age-reading over time because of changes in age-readers.

Evaluate the use of recreational fishery CPUE indices as an index of abundance.

The STAT did not conduct any analyses to confirm that the CPUE indices were valid indices of black rockfish abundance. Such an evaluation requires independent information on stock abundance with which to compare the CPUE indices, but no such data are available.

Investigate stock separation or a stock model with two spatial regions.

An assessment model for black rockfish that included four explicit spatial areas was developed for the late-May STAR Panel but this model did not produce stable results. The data available for black rockfish do not appear to be sufficient to support a finer spatial scale for the assessment.

Response to May 2007 STAR Panel Recommendations

An initial version of the new assessment for black rockfish was reviewed by a STAR Panel during May 2007, but the STAT was unable to develop an acceptable base-model during the

May STAR meeting. The STAR Panel made a number of suggestions concerning how the black rockfish assessment model should be revised. Many of these suggestions were incorporated into the assessment model that was subsequently reviewed during the October STAR.

Include the Oregon tagging study abundance estimates as an index with an informed prior probability distribution for the index's catchability coefficient.

The revised assessment model includes the Oregon tagging study abundance estimates. ODFW personnel developed estimates of the expected value for the catchability coefficient (Tag-Q) for this new index with respect to the portion of the stock residing off Oregon, but the STAT was unable to develop a formal prior probability distribution for the Tag-Q parameter because of the general lack of information on how black rockfish are spatially distributed between California and Oregon.

Fully capture the effect of uncertainty in the catch history.

The revised assessment includes an analysis that explores the sensitivity of the model results to alternative assumptions about the catch histories.

Include a descriptive analysis of CPUE and justify the use of CPUE as indices of abundance

The revised assessment document includes expanded descriptions of the catch and effort data sources and tabulations indicating the degree of sampling coverage.

Provide better GLM diagnostics.

The revised assessment document includes separate binomial and positive-catch indices. Residual plots for the indices were presented during the October STAR meeting.

Explore alternative stock hypotheses.

Subsequent to the May STAR meeting the STAT explored at length a two-area model configured with Oregon data only, but the STAT was unable to find model configurations that produced stable results.

Continue exploration of using multiple areas.

The STAT explored a series of area-based model configurations subsequent to the May STAR meeting. None of the configurations produced results that seemed stable or adequate to use as a base-model. No area-based model configurations were brought to the October STAR meeting.

Consultations with the GAP and with Fishers

Prior to developing a working stock assessment model, staff from ODFW organized a series of five public workshops that the STAT attended, and to which interested fishers were invited: in Oregon at Newport, North Bend, Port Orford, Pacific City, and Brookings; and in California at Eureka. Attendance at these workshops ranged from five (in Eureka) to more than 30 participants (in Brookings). Each workshop lasted from two to three hours, and every workshop produced lively and informative discussions between the audience and the STAT.

CURRENT MODELING APPROACH

The current assessment builds on the basic model structure and approach developed in Ralston and Dick (2003). The data are organized into three basic gear-types (HKL, TWL, and REC), the data from Oregon and California are kept separate, and the tuning indices are recreational angler CPUE series based on the same data sources (RecFIN for both states, ORBS for Oregon, and CPFV for California). In most cases the data series were re-developed for the current assessment, rather than simply updating the old series with information for later years. This was done initially because the original version of this assessment had four explicit spatial areas, each of which required its own sets of data. Also, re-developing all the data series meant greater assurance that the data were treated in a consistent manner across all years of the series.

The landings data series in the current assessment differ quite substantially from the series developed by Ralston and Dick for the previous assessment (Fig. 19). This is especially noticeable in the non-trawl fishery in California, the trawl fishery in Oregon, and the recreational fishery in Oregon. In small part, the differences arise because the current assessment starts reconstructing catch histories earlier than 1945, which was the starting year for the catch histories in the last assessment. For example, in the case of the non-trawl fishery in California, the current assessment assumes that black rockfish are a fairly large percentage of the non-trawl landings of rockfish, which began well before 1945. For the trawl fishery in Oregon the previous assessment mistakenly assumed that all the trawl landings of black rockfish in Oregon were taken from south of the Columbia River. However, most of the landings into Astoria, near the mouth of the Columbia River, are likely to have been taken from north of the Columbia River, and almost certainly from north of Cape Falcon, the northern boundary for the current assessment. Based on PacFIN data, landings into Astoria account for about one third of the black rockfish landings in Oregon. For the recreational fishery in Oregon, the current and previous assessments used the same estimates for the numbers of black rockfish landed, but the assessments differ considerably in the value assumed for the average weight of a black rockfish. The previous assessment derived its average weight value by applying a length-to-weight relationship to length-frequency data from fish sampled in Garibaldi, where the fish tend to be larger than the state-wide average. The current assessment used an average weight based on RecFIN, which has more broadly based sampling.

The new assessment took a slightly different approach in its use of the Stephens and MacCall procedures for developing the RecFIN CPUE indices. The current assessment used the technique to select a subset of data for the CPUE analysis, whereas the previous assessment used the probability values predicted by the method as weights in the GLM analyses of the full sets of RecFIN data.

The new assessment has a more complete CPUE series from the ORBS program, which in the previous assessment was missing data for 1987 to 1998, due to changed procedures for estimating rockfish species compositions. In connection with the 2006 assessment of yelloweye rockfish, a consistent and complete series of species composition proportions was developed, which also allowed black rockfish catches to be estimated for the years that were lacking estimates in the 2003 black rockfish assessment.

The new assessment uses the ODFW PIT tag estimates of black rockfish abundance off Newport as an abundance index. These data were unavailable for the previous assessment. The new assessment also uses the juvenile rockfish pre-recruit index, which was unavailable for the previous assessment.

New Approaches

The new assessment uses the Stock Synthesis 2 software (SS2, version 2.00g), which provided additional modeling features that were unavailable in the Stock Synthesis software used for the previous assessment.

Definitions of Fisheries and Surveys

Oregon and California each have a non-trawl, trawl, and recreational fishery, for a total of six fisheries. The model is structured as a single area with all fisheries (and surveys) simultaneously accessing the same population of fish. Oregon has a CPUE abundance index based on RecFIN data from Oregon that is associated for its selection curve with the Oregon recreational fishery. California has a similar RecFIN abundance index associated with the California recreational fishery. The two additional CPUE abundance indices, based on ORBS and the CPFV Observer data, are treated as independent surveys, each with its own separate length composition data. There are also age composition data and mean length-at-age data associated with the ORBS survey. Finally, there are two additional indices: one for the abundance estimates from the Newport tagging study, and one for the pre-recruit index.

Likelihood Components

The SS2 model for this assessment has 24 non-zero likelihood components: survey fit components for six indices (with some CPUE indices broken into two or three segments to account for changes in bag-limits), length composition components for six fisheries and two surveys; age composition components for one fishery (Oregon non-trawl) and one survey (ORBS), and one component each for length-at-age, mean body weight, recruitment, and the forecast recruitment.

Structural Assumptions

- The fisheries begin from an unfished state in 1915.
- The assessment model is configured for separate sexes.
- Growth differs between the sexes and is estimated within the model.
- Spawning output is measured as millions of larvae rather than as female spawning biomass.
- A Beverton and Holt curve was used to define the relationship between average recruitment and spawning output (larvae).
- Selection is by length, not by age, and does not differ by gender.
- Selection curves for all fisheries use the double-normal configuration, except for the two trawl fisheries, which are linked to a simple logistic curve.
- All six parameters for each of the double-normal selection curves are estimated.
- Breaks allowed in the CPUE indices for bag-limit changes are not accompanied by changes in selection.
- Deviations in recruitment begin in 1970 and extend through 2006.
- All active likelihood components have relative weights (lambda values) of 1.0 in the total likelihood.

Assumed Values and Constraints for Parameters

- Natural mortality is fixed for males at 0.16 and is constant with age.
- Natural mortality for females is 0.16 for females less than age-10-yr, ramps to 0.24 over the ages 10 to 15 yr, and then remains constant at 0.24.
- The CV for length-at-age is a function of length and is constant at 7%.
- Growth and maturity are assumed to be time-invariant.
- Steepness is fixed at 0.6.
- The input value for the log-scale standard deviation in recruitment (sigma-R) is 0.5.
- No estimated parameters are assigned prior probability distributions.

MODEL SELECTION AND EVALUATION

Developing the base model for southern black rockfish involved exploring a wide variety of model configurations, ranging from the suite of complex models with area-based fisheries that was examined during the May 2007 STAR meeting, to the much simpler single-area model that was brought to the October STAR meeting. During the process of model selection the STAT was guided by changes in goodness-of-fit and by subjective examination of the observed versus predicted values. The STAT also used the estimated catchability coefficient for the Newport tagging study (Tag-Q) as an informal diagnostic. It was the STAT's opinion that the tagging study's estimates of abundance and exploitation rate provided more reliable indications of stock size and status than any of the CPUE-based indices, although for a very limited geographic range. Constraints on the Tag-Q parameter were not formally included in the model fitting because the STAT was unable to develop a prior probability distribution for this parameter.

Changes to the Model during the October STAR Meeting

The October STAR Panel made a number of requests for additional information and model runs. The STAR Panel Report contains the full list of requests and the STAT responses. Described below are those that resulted in changes to the preliminary base model and thus lead to the final base-run model.

When developing a response to the request for a plot of age-readings versus average-age for the standard set of age-readers (Request D), the STAT found a mistake in its analysis of the coefficient that defines the vector of standard deviations of age-reading errors. Data from some non-standard age-readers had been mistakenly included in the original analysis. The analysis was redone using only data from the standard set of age-readers. This resulted in slight changes to the vector of standard deviations of age-reading errors that was input to the model.

The recreational CPUE time series for the Oregon ORBS survey was broken into segments between 2004 and 2005 to reflect the bag-limit reduction that occurred mid-year during 2005 (Request E).

Explorations of the sensitivity to alternative values for the parameters that define the variation in length-at-age (Request F) resulted in improved fit to the data and the decision to change the growth model configuration so that the coefficient of variation (CV) in length-at-age was constant at 7%. In the preliminary base model the CV was 11% at age-3-yr for females and males, but was 7% at age-20-yr for females and 5% at age-20-yr for males.

When exploring why the model provided poor fits to the pre-recruit times series (Request I), the STAT determined that the model was constrained by the absence of small fish in the

California recreational fishery. The large pre-recruit index value for 2004 should have appeared as a shoulder of small fish in the 2006 length composition data, but it did not. The STAT was concerned that the growth curve in the preliminary base model was predicting young fish that were unrealistically large because of the structure of the smallest length bin. The STAT modified the structure of the length bins to include a dummy length category representing 5-15 cm fish, and changed the growth model specification so that the model estimated length for age-1 rather than age-3 fish. These changes produced growth curves that appeared reasonable, but the changes did not lessen the poor model fit to the pre-recruit time series.

The STAR Panel was concerned that the mean length-at-age data were very influential in the likelihood profile over the virgin-recruitment parameter (R0). To remove any possible influence of a time-trend in the length-at-age data, the STAR panel suggested fitting only one year of mean length-at-age data (rather than three years) (Request K). For the final base model the mean length-at-age data from 2003 through 2005 were combined into a single composite set of mean length-at-age data that was assigned to the year 2004.

To explore candidates for a new base model (Request L) the STAT ran the model with the recruitment deviations starting in 1950. The plot of the estimated standard deviations of recruitment against year suggested that 1970 would be an appropriate starting year for the recruitment deviations. A series of one-step tuning runs for the input sigma-R parameter indicated that it would be appropriate to specify a sigma-R value of 0.5, which was approximately the output sigma-R value obtained from an input sigma-R of 1.0.

Input Variance Adjustments

The preliminary base-run model that was brought to the STAR meeting seemed to be fully "tuned". The effective sample sizes estimated by the model were almost equivalent on average to the multinomial samples sizes that were input to the model, the root mean square error (rmse) that the model estimated for each survey was almost equivalent to average standard error that was input for the survey, and the rmse that the model estimated for the recruitment deviations was almost equivalent to the sigma-R parameter that was input to the model. The change in the CV for length-at-age that occurred during the STAR meeting, however, resulted in changes to the model's estimates of variability in the data, particularly for the mean length-at-age data.

Prior to exploring dimensions of uncertainty for building the decision table, the STAT developed a tuned version of the working base model in which the variance adjustment for the mean length-at-age data was greatly reduced relative to the preliminary base model. A likelihood profile over R0 with this tuned model indicated that the revised model had considerably less tension between the likelihood component for mean length-at-age and the other components. However, the tuned model provided a very poor fit to the mean length-at-age data because those data had been so greatly down-weighted by the tuning process. Given that mean length-at-age data should provide a more reliable basis for estimating growth than the other sources of data that were input to the model, the STAT argued that an earlier partially tuned version of the model should be used as the final base model. The STAR Panel agreed.

The input variance adjustments for the final base-run model are in Table 26.

Likelihood Profiles

Likelihood profiles were conducted at all stages of model development and exploration to identify sources of tension among different data sources and model components. For the final base-run model the likelihood profile over the R0 parameter illustrates a fundamental conflict between the age-composition data and the mean length-at-age data (Fig. 20). The age composition data strongly favor lower values of R0, which corresponds to a more depleted stock and lower values for MSY, whereas the length-at-age data strongly favor higher values of R0. There is also considerable tension within a given type of likelihood component. For example, the Oregon recreational fishery length-composition data favor low values of R0, whereas the California recreational fishery length-composition data favor low values of R0. Most individual components tend to favor extreme rather than intermediate values of R0 (Table 27).

The likelihood profile over the spawner-recruit steepness parameter indicates that the available data provide very little information regarding the value of steepness. Most of the individual likelihood components are consistent with a wide range of steepness values (Table 28). The value of steepness assumed for the final base model (0.6) is essentially the same as the 0.58 value obtained from a meta-analysis of available steepness parameter estimates for West Coast rockfish (M.Dorn, Alaska Fisheries Science Center, personal communication).

Model Diagnostics

The final base model had a Hessian matrix that could be inverted and the maximum gradient component was 0.00015. To confirm that the final base-run model had fully converged, a series of 100 runs were conducted with randomized initial parameter values that were randomly "jittered" by 0.1. Many of the runs produced ridiculously high negative log-likelihood values and clearly had failed to converge to a sensible set of parameter values. Of the 69 runs that produced reasonable results, none had a lower negative log-likelihood than the base-run model, and 38 had converged to the same value negative log-likelihood as the base-run model. This supports the conclusion that the final base-run model had fully converged.

The base-run model's selection curves for the different fisheries and surveys generally seem plausible (Fig. 21), and were reasonably similar to the curves estimated by the previous assessment. The curves are all highly domed except for the selection curve for the two trawl fisheries, which were linked and forced to be asymptotic.

Plots of the observed versus predicted fits to the abundance indices generally indicate reasonable fits with essentially all predicted values lying within the confidence bands around the observed values (Fig. 22).

Plots of observed versus expected values for the length composition data often were not very good with strong indications of lack of fit (Fig. 23), particularly with the smaller size classes. Plots of observed versus expected values for the age composition data also showed trajectories with lack of fit (Fig. 24), with the model generally predicting smaller peaks than were apparent in the observed data. Plots of observed versus expected values for the mean length-at-age data indicated a tendency to over-estimate the size-at-age of older fish, particularly for males (Fig. 25).

Plots of the length-composition residuals (Fig. 26) and age-composition residuals (Fig. 27) showed evidence of systematic lack of fit to the data. Fixing this, however, would have required a much more complex model that allowed year-to-year variation in the selection curves to accommodate the year-to-year variations in the length- and age-composition data.

Base-Run Model Results

Parameter Values

The final base-run model had 92 estimated parameters, including five growth curve parameters, 38 selection curve parameters, and 37 annual recruitment deviation parameters (Table 29). Nine of the estimated selection curve parameters (for the initial or final selection) were at their lower bounds and could have been fixed at those values. Doing so had no effect on the values of the other estimated parameters or on the likelihood values.

Time-Trajectories of Population Estimates

The base-run model estimated that the unexploited stock had total biomass of over 29,300 mt, spawning output of about 4,600 million larvae, and annual recruitment of about 7.8 million age-0 fish (Table 30). The model estimated the spawning output at the start of 2007 to be about 3,200 million larvae, equivalent to 70% of the unexploited level. The model's estimates of spawning output (Fig. 28) and age 2+ biomass (Fig. 29) reached their lowest points in the mid-1990s and have been rising steadily since. The estimated increases in spawning output and biomass since the mid-1990s have been driven by above-average recruitment throughout the 1990s and very strong year-classes in 1994 and 1999 (Fig. 30). The greatest level of spawning depletion occurred in the mid-1990s when spawning output dropped to 35% of the unexploited level (Fig. 31). The fisheries exerted a fairly high and sustained total rate of exploitation on the stock during the 1980s and early 1990s, and the total exploitation rate reached its peak in 1992 and has declined more or less steadily ever since (Fig. 32).

Estimated Population Numbers-at-Age

The final base-run model estimates of the numbers of fish alive at the start of each year by sex are given in Table 31.

Uncertainty and Sensitivity Analyses

The final base-run model was fully converged and the Stock Synthesis program used the inverse of the Hessian matrix to produce approximate standard deviations for many of the estimated parameters and for the series of derived spawning outputs and recruitments (Table 32). The coefficients of variation (CV) for the estimates of spawning output (S) ranged from a low of 8.8% for S(0) to a high of 18.5% for S(2007). The estimates of annual recruitment were more variable, with the CVs ranging from a low of 8.9% for R(0) to a high of 51% for R(2007). These measures of variability based on the Hessian matrix reflect the model's lack of fit to the input data, but they do not include numerous other sources of uncertainty, such as the values for the steepness and natural mortality parameters, which are highly uncertain but were fixed in the model. Confidence limits derived from the standard deviations estimated from the model will be narrower than they should be for any stated confidence level.

Sensitivity Analyses

The first two sensitivity analyses described below (for catch history and natural mortality) were conducted with the preliminary base-run model and were not repeated with the final base-run model. Although the preliminary and final base models differ in the absolute scale of the results

(Fig. 33), the preliminary base model should provide a reasonable view of the general pattern of sensitivity to catch history or natural mortality.

Catch History

Catch histories are an important source of uncertainty in many stock assessments, and that seems to be especially so in this assessment where the scale of the catches is driven by assumed and largely unverified values for the percentages of black rockfish in landings of general rockfish. To evaluate whether uncertainty in the landings of black rockfish propagates into significant uncertainty in the assessment results, a sensitivity analysis was conducted with the preliminary base-run model using a series of eight runs with different levels for the three fishery classes (trawl, non-trawl, and recreational) (Table 33). The results generally indicated that the estimated levels of spawning depletion was quite insensitive to the levels of catch, with the greatest difference showing in the run with high levels for all three fishery classes versus the run with low levels for all three fishery classes. In contrast, the magnitude of the estimated MSY (calculated from F50%) was very sensitive to the catch history, varying by over 300 t in the run with high levels for the three fishery classes versus the run with low levels for the three fishery classes. Comparing the high versus low levels of recreational catch shows a change in MSY of almost 250 t.

Natural Mortality

At the September meeting of the PFMC's Scientific and Statistical Committee (SSC), the stock assessment for black rockfish off Washington was reviewed and the SSC agreed to accept a modified formulation for the natural mortality schedule for female black rockfish. In this formulation, M for females age-15-yr and older is 0.24^{-yr} rather than 0.20^{-yr}, as was agreed during the late-May STAR meeting. Although the preliminary base-run model for black rockfish off Oregon and Washington uses the formulation from the September SSC meeting, there remains considerable uncertainty in how best to model natural mortality for black rockfish. To explore this issue, an analysis was conducted that explored the sensitivity of the model's goodness-of-fit to alternative parameter values for M on young fish (males and females) and M on old fish (females only) (Table 34). The best overall fit occurred with a young-M value of 0.14^{-yr} and an old-Fem-M-offset of 0.5, corresponding to an old-Fem-M of 0.231^{-yr}. An even better fit might have been obtained with a higher value for the Old-M-offset. The difference in total log-likelihood between the best-fit value and the preliminary base-run model value was about 5.4 units.

Mean Length-at-Age Data

During the October STAR meeting the Panel expressed concern that the likelihood component for the mean length-at-age data appeared to have a great deal of influence on the base-run model's estimate of R0. To explore this the STAR Panel requested a sensitivity analysis with the final base model in which the prior weight (lambda) for the mean length-at-age likelihood component was reduced from 1.0 to 0.1. Results from this analysis indicated that reducing the prior weight on the mean length-at-age data resulted in improved fits to the age- and length-composition data, but degraded the fit to the indices (Table 35). For the model with reduced weight on the mean length-at-age data the stock was more depleted than in the base-run model and was less productive in terms of the maximum sustainable yield that it could support.

Comparison with Previous Assessments

The base-run model produced estimates of stock size and recruitment that differ substantially from the 2003 assessment (Fig. 34). The absolute scales of biomass and recruitment in the new assessment are much larger than in the 2003 assessment. The differing scales can largely be attributed to the higher rate of natural mortality in the new assessment. When the base-run model was re-done using the same natural mortality formulation and parameter values as in the 2003 assessment, the biomass and recruitment trajectories were much more similar (Fig. 34).

REBUILDING PARAMETERS AND REFERENCE POINTS

For rockfish species managed by the Pacific Fishery Management Council (PFMC) the default target rate of fishing is F50%, which is the fishing rate that reduces the spawning potential ratio (SPR) to 50% of the level experienced in the absence of fishing. The F50% fishing rate is considered to be a proxy for F(MSY), which is the rate of fishing mortality that produces the maximum sustainable yield (MSY). The Council's default harvest control rule for groundfish stocks specifies that a stock is overfished if the stock's spawning output, generally measured in terms of spawning biomass (SB), drops below 25% of the unexploited level, SB(0). In this assessment spawning output was measured in terms of millions of black rockfish larvae. The Council's target level for spawning output is 40% of the unexploited level, denoted SB40%. The SB40% level of spawning output is considered to be a proxy for SB(MSY), which is the level of spawning output that has surplus annual production equal to MSY.

In this assessment the steepness parameter was fixed at 0.6. When steepness is 0.6, fishing at F50% results in equilibrium spawning output that is 40% of the unexploited level, and F50% and SB40% are equivalent proxies for MSY conditions. The yield produced by fishing at F50%, which is the proxy value for MSY, was estimated to be 1,035 mt annually.

The MSY and SB(MSY) values were estimated within the SS2 software based on the Beverton and Holt stock-recruit relationship with an assumed steepness parameter of 0.6. The estimated MSY value, 1,064 mt annually, was very similar to the proxy MSY value. The estimated SB(MSY) was 31.6% of SB(0).

The mean generation time for the stock was estimated to be 13.5 years.

	Point estimate	Uncertainty in estimates (approx. 95% confidence limits)	
Unfished Spawning Output (SB_0) (millions of larvae)	4578.5	3772.3	5384.7
Unfished Recruitment (R_0) at age-0 (1000s of fish)	7852.0	6459.2	9244.8
Reference points based on $SB_{40\%}$ or F50%			
Spawning Output at $SB_{40\%}$ (millions of larvae)	1831.4	1508.9	2153.9
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.5	none because steepness was fixed	
Exploitation rate resulting in $SB_{40\%}$	0.07227	na	na
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	1035.4	853.1	1217.7
Reference points based on estimated MSY values			
Spawning Output at MSY (SB_{MSY}) (mill. larvae)	1444.6	1189.7	1699.5
SPR_{MSY}	0.4296	0.4288	0.4304
Exploitation Rate corresponding to SPR_{MSY}	0.08864	na	na
MSY (mt)	1064.6	877.1	1251.9

HARVEST PROJECTIONS AND DECISION TABLES

Catch Forecasts

Projections of future catches through 2016 (Table 36) were made based on an F50% target rate of fishing mortality and the following assumptions:

- catches during 2007 and 2008 would be at the Optimum Yield (OY) levels specified by the Council (722 mt each year less an adjustment of 26 mt to account for catches from North of Cape Falcon);
- fishery selection curves estimated for 2006 and earlier years would continue unchanged into the future;
- 58% of each annual catch would be taken by Oregon fisheries, of which the Oregon recreational fishery would take 76% and the Oregon non-trawl fishery would take 26% (leaving Oregon trawl with no catch); and
- 42% of each annual catch would be taken by California fisheries, of which the California recreational fishery would take 55% and the California non-trawl fishery would take 45% (leaving California trawl with no catch).

Because the projected spawning output values for the projection period were always greater than the management target (40% of the unexploited level), the 40:10 harvest control rule adjustments did not apply, and the OY values were all equivalent to the Acceptable Biological Catch (ABC) values.

Decision Table

The decision table (Table 37) was developed with assistance from the STAR Panel. Although there are numerous dimensions of uncertainty regarding the results of this stock assessment, it was agreed that combining uncertainty in the formulation of natural mortality with uncertainty in the historical catch series could adequately capture the axis of uncertainty for the decision table. The three alternative states of nature were defined as follows.

- The least productive state of nature had a natural mortality coefficient (M) of 0.14^{-yr} for males and young females to age-10-yr, an M of 0.21^{-yr} for females age-15-yr and older, and the catch history prior to 1981 for the trawl fisheries was based on low assumed values for the percentages of black rockfish in the landings of rockfish (0% in northern OR, 1.2% in southern OR, 3.6% in northern CA, and 0% in southern CA).
- The most productive state of nature had an M of 0.18^{-yr} for males and young females to age-10-yr, an M of 0.27^{-yr} for females age-15-yr and older, and the catch history prior to 1981 for the trawl fisheries was based on high assumed values for the percentages of black rockfish in the landings of rockfish (0.4% in northern OR, 5.0% in southern OR, 14.0% in northern CA, and 0.2% in southern CA).
- The base-run state of nature had a natural mortality coefficient (M) of 0.16^{-yr} for males and young females to age-10-yr, an M of 0.24^{-yr} for females age-15-yr and older, and the catch history prior to 1981 for the trawl fisheries was based on the base-run assumed values for the percentage of black rockfish in the landings of rockfish (0.2% in northern OR, 2.5% in southern OR, 7.0% in northern CA, and 0.1% in southern CA).

The STAR and STAT agreed that the base-run state of nature could be viewed as being twice as likely as the two alternative states of nature, and that the low-productivity and high-productivity states were equally likely.

Three alternative management actions were defined in terms of the stream of OY catches projected from each of the three alternative states of nature. The low productivity state of nature produced a stream of low catches, the high productivity state of nature produced a stream of high catches, and the base-model state of nature produced a stream of intermediate catches. The OY catch streams considered in the management actions of the decision table all have an abrupt increase in catch from 2009 to 2010 when the new stock assessment results first have an influence on the OY.

PRIORITIZED RESEARCH AND DATA NEEDS

- A comprehensive analysis of historic rockfish landings is needed to further refine the landings series for black rockfish and other rockfish species. The analysis should make consistent use of available species composition data and documented historical developments, such as the directed fisheries for Pacific ocean perch and widow rockfish.
- The ODFW tagging study off Newport should be continued and expanded to other areas. To provide better prior information on the spatial distribution of the black rockfish stock, further work should be conducted to map the extent of black rockfish habitat and the densities of black rockfish residing there.
- Age composition data should be developed for black rockfish caught commercially in California, and the data should be entered into the California commercial fishery database (CALCOM).
- If otoliths are available for black rockfish from the recreational fishery in California, they should be identified and read in a manner consistent with the processing of commercial fishery samples.
- A program should be established that routinely collects otoliths from black rockfish and other species harvested by the recreational fishery in California.
- Growth of black rockfish in California should be examined. The current assessment model assumes that black rockfish in California have the same growth curve as black rockfish in Oregon, but differences in growth could be an alternative explanation for the large differences in the length composition data between Oregon and California. Except for some published growth curves based on limited data, no length-at-age data are currently available for California.
- Additional age-reader comparisons should be conducted to resolve the apparent differences in mean length-at-age measurements between readers. Cross-validation experiments should be conducted with age-readers from Washington and California to confirm consistency in age-reading results.
- If otoliths are available from the older Oregon samples that were excluded from the current assessment, they should be re-read to extend the series of age composition data farther back in time.
- Length composition data, including gender, should be collected from the California fisheries to help better define the selection curves and the sex-specific natural mortality process.

Currently all the length composition data from the California fisheries are combined-sex samples. Sex-specific length composition samples from the commercial fisheries in California would be particularly informative because these fisheries tend to catch larger black rockfish than the recreational fishery. The apparent lack of older females, which is evident in the age composition data from the Oregon recreational fishery, could be an artifact of the highly domed length-selection by the Oregon recreational fishery.

ACKNOWLEDGMENTS

Numerous people contributed ideas and the data that made this assessment possible, but I am particularly grateful to staff from the ODFW Marine Resources Program, with whom I met regularly to discuss data and model issues. Bob Hannah and Don Bodenmiller were always available and willing to talk about black rockfish and the nearshore fishery. Their enthusiasm for the subject was infectious and inspiring. Gway Kirchner and Kelly Ames provided useful feedback and insights regarding unexpected model results. Troy Buell spent countless hours examining the tagging study data and doing additional analyses in support of the assessment. Josie Thompson, Mark Freeman, and Mark Karnowski provided able assistance in responding to requests for data.

I also acknowledge the help and data I received from the following individuals. Don Pearson (SWFSC) and Brenda Erwin (PSMFC) provided data on the commercial fisheries in California. Farron Wallace (WDFW) provided landings data from Washington and his Synthesis files from the northern black rockfish assessment were useful examples. Steve Ralston (SWFSC) provided data and supporting files from the 2003 assessment, and produced the pre-recruit survey index. Deb Wilson-Vandenberg and Debbie Aseltine-Neilson (CDFG) provided data from the recreational fishery in California and advice on use of those data. William Daspit (PSMFC) provided help with PacFIN data extractions. Ian Stewart (NWFSC) provided advice regarding Stock Synthesis and modeling issues. I am very grateful to Rick Methot for his willingness to develop and maintain the Stock Synthesis program.

I also thank the members of the two STAR Panel meetings that reviewed this assessment. Participating in the late-May STAR meeting were Owen Hamel (SSC Representative and Panel Chair), Patrick Cordue (CIE reviewer and rapporteur), Neil Klaer (CIE reviewer), Tom Helser (SSC reviewer), Kenyon Hensel (GAP Representative), and Kelly Ames (GMT Representative). Participating in the October STAR meeting were Martin Dorn (SSC Representative and Panel Chair), Patrick Cordue (CIE reviewer and rapporteur), Owen Hamel (SSC reviewer), Tom Helser (SSC reviewer), Andre Punt (SSC reviewer), Steve Ralston (SSC reviewer), Peter Leipzig (GAP Representative), and Kelly Ames (GMT Representative).

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Table 1. Summary of regulations for West Coast black rockfish off Oregon and California.

Date	Regulatory Action
01/83	40,000 lb trip limit *Sebastes* complex coastwide; recreational: California and Oregon 15 rockfish per angler.
01/84	30,000 lb trip limit for *Sebastes* complex north of Cape Blanco with a 1 trip per week restriction, no change south.
05/84	15,000 lb trip limit for *Sebastes* complex once per week north of Cape Blanco.
08/84	7,500 lb/trip per week or 15,000 lb/trip per 2 weeks for *Sebastes* complex north of Cape Blanco.
01/85	30,000 lb weekly trip limit for *Sebastes* complex north of Cape Blanco, no change south.
04/85	15,000 lbs per weekly trip or 30,000 lbs per biweekly trip north of Cape Blanco.
10/85	20,000 lbs per weekly trip or 40,000 lbs per biweekly trip north of Cape Blanco for *Sebastes* complex.
01/86	25,000 lbs per weekly trip or 50,000 lbs per biweekly trip for *Sebastes* complex north of Cape Blanco, no change south.
09/86	30,000 lbs per weekly trip or 60,000 lbs per biweekly trip north of Cape Blanco for *Sebastes* complex.
01/87	25,000 lbs per weekly trip or 50,000 lbs per biweekly trip north of Cape Blanco for *Sebastes* complex, no change south.
01/88	No change for *Sebastes* complex.
01/89	No change for *Sebastes* complex.
01/90	No change for *Sebastes* complex.
01/91	25,000 lbs per trip south of Cape Blanco for *Sebastes* complex, no change north.
01/92	50,000 lbs cumulative *Sebastes* complex per 2 weeks coastwide.
01/93	No change for *Sebastes* complex.
01/94	Limited entry: 80,000 lbs cumulative *Sebastes* complex per month. Coastwide open access: 10,000 lbs per trip not to exceed 40,000 lbs per month. Recreational: 10 black rockfish in 15 rockfish bag per angler for Oregon.
09/94	Limited entry south of Cape Mendocino raised to 100,000 lbs cumulative per month.
01/95	Limited entry: 35,000 lbs cumulative *Sebastes* complex north of Cape Lookout; 50,000 lbs cumulative per month between Cape Lookout; 100,000 lbs cumulative per month south of Cape Mendocino; open access fixed gear: 35,000 lbs cumulative north of Cape Lookout for fixed gear (except pot and hook and line); 40,000 lbs per cumulative month south of Cape Lookout; 10,000 lbs per trip for pot and hook and line coastwide.
01/96	Limited entry: 70,000 per 2 months north of Cape Lookout; 100,000 lbs per 2 month between Cape Lookout and Cape Mendocino; 200,000 lbs per 2 month period south of Cape Mendocino; open access fixed gear except hook and line and pot: 35,000 lbs per month north of Cape Lookout; 40,000 lbs per month south of Cape Lookout open access fixed hook and line and pot: 10,000 lbs/trip open access trawl: not to exceed 50% of limited entry.
01/97	Limited entry: 30,000 lbs per 2 month period north of Cape Mendocino; 150,000 lbs per 2 month period south of Cape Mendocino; open access trawl not to exceed 50% of this open access; fixed gear: 40,000 lbs per month coastwide with a 10,000 lb trip limit for hook and line and pot.
01/98	Limited entry: 40,000 lbs per 2 months north of Cape Mendocino; 150,000 lbs per 2 months south of Cape Mendocino open access, fixed gear: no change open access, trawl: no change.
07/98	Limited entry: south of Cape Mendocino reduced to 40,000 lbs per two months.
10/98	Limited entry: monthly trip limit reduced to 15,000 lbs open access: no landings north of Cape Blanco.
01/99	Limited entry managed by a complex 3 phase landing system, Open access: North of Cape Mendocino - 3,600 lbs/month; 2,000 lbs per month south of Cape Mendocino.
04/99	Open Access: North of Cape Mendocino - 12,000 lbs per month with no more than 3,500 lbs per month being blue and black rockfish.
05/99	Limited Entry: North of Cape Mendocino - 2 month cumulative limit of 30,000 lbs of *Sebastes* complex through Sep; South of Cape Mendocino - 2 month cumulative limit of 3,500 lbs of *Sebastes* complex.
08/99	Limited entry north of Cape Mendocino: 10,000 lbs cumulative bimonthly limit for all *Sebastes* other than canary and yellowtail rockfish.

Table 1. Summary of regulations (continued).

Date	Regulatory Action
01/00	Black rockfish managed as a minor nearshore species, Limited Entry Trawl: 200 lbs per month of minor nearshore species coastwide, Limited Entry Fixed Gear: 2,400 lbs coastwide limit for minor nearshore of which no more than 1,200 lbs may be species other than blue or black rockfish, Open Access: North - 1,000 lbs/2 months of minor nearshore rockfish of which no more than 500 lbs may be other than blue or black rockfish, South - 550 lbs/2 months with a 2 month closure (variable by location), Recreational: 2 month closures (variable by location) south of Cape Mendocino, bag limit 10 fish per day, Oregon bag limit of 10 fish per day.
05/00	Limited entry non-trawl limit: north of Cape Mendocino -cumulative bimonthly limit of nearshore rockfish increased to 3,000 lbs of which no more than 1,400 lbs may be other than blue or black rockfish; south of Cape Mendocino - 1,300 lbs per 2 months of minor nearshore rockfish, Open Access, Non trawl fishery: 1,500 lbs minor nearshore rockfish per two months of which no more than 700 lbs may be species other than blue or black rockfish.
07/00	Limited entry, fixed gear: North of Cape Mendocino - 5,000 lbs of minor nearshore rockfish per 2 month period with a maximum of 1,800 lbs of species other than blue or black rockfish; south of Cape Mendocino - 2,000 lbs of minor nearshore species per 2 month period, Open Access: North of Cape Mendocino - 3,000 lbs of minor nearshore rockfish with no more than 900 lbs of species other than blue or black rockfish; South of Cape Mendocino - 1,600 lbs per 2 month period of minor nearshore rockfish.
10/00	Limited entry, fixed gear: North of Cape Mendocino - 10,000 lbs cumulative bimonthly for minor nearshore rockfish with no more than 2,000 lbs of non blue or black rockfish; south of Cape Mendocino - 6,000 lbs of minor nearshore rockfish per two month trip; South of Pt Conception - 9,000 lbs /2 months for October and 3,000 lbs per two month period for November and December; Open Access: North - 6,000 lbs of minor nearshore rockfish per 2 months with no more than 2,000 lbs other than blue or black rockfish; South - 4,000 lbs of minor nearshore rockfish per 2 month period.
01/01	Limited entry trawl: 200 lbs/month of minor nearshore rockfish coastwide limited entry fixed gear: North - 10,000 lbs per 2 months of minor nearshore rockfish of which no more than 4,000 lbs may be other than blue or black rockfish; South (Monterey INPFC area) - 2,000 lbs per 2 months during Jan-Feb and July-Dec, closed Mar-April, closed outside of 20 fathoms May-June; open access: North - 3,000 lbs per 2 month period of which no more than 900 lbs may be other than blue or black rockfish; Monterey INPFC area - 1,800 lbs per 2 months during Jan-Feb and July-Dec, closed Mar-April, closed outside of 20 fathoms May-June; recreational: California - Closed March-April, In the Monterey INPFC area closed May-June except for inside the 20 fathom line.
05/01	Limited entry in north: 7,000 lbs per 2 month period through December of which no more than 4,000 lbs may be other than blue or black rockfish open access in north: 7,000 lbs per 2 month period through December of which no more than 900 lbs may be other than blue or black rockfish.
01/02	Limited entry trawl: North - minor nearshore rockfish closed Sep-Oct, otherwise 300 lbs/month; South 500 lbs per month minor nearshore rockfish Jan-April, 1,000 lbs/month May-June, then closed Limited entry fixed gear: North - 5,000 lbs/month of minor nearshore rockfish no more than 2,000 lbs of which may be other than blue or black rockfish through April, reducing to 7,000 lbs per 2 months by year end; South (Monterey INPFC area) - 1,600 lbs per 2 months Jan-Feb, closed Mar-Apr, then 1,600 lbs per 2 months inside of 20 fathoms May-Aug, then closed; Open access: North - 3,000 lbs per 2 months of minor nearshore rockfish through April (no more than 1,200 lbs of which may be other than blue or black rockfish), increasing to 7,000 lbs per 2 months by year end (no more than 3,000 lbs of which may be other than blue or black rockfish); South (Monterey INPFC area) - 1,200 lbs of minor nearshore rockfish Jan-Feb, closed Mar-April, 1,200 lbs inshore of 20 fathoms through September, then closed; recreational: California - North of Cape Mendocino open year round, Monterey INPFC are is closed March - April and Nov-Dec and outside of 20 fathoms it is closed May – Oct.
01/03	Limited Entry trawl: 300 lbs per month coastwide. Limited entry fixed gear: North - 3,000 lbs per 2 months of minor nearshore rockfish of which no more than 900 lbs may be other than blue or black rockfish; South - All fishing inside of 20 fathoms or outside of 150 fathoms, 200 lbs per 2 months minor nearshore rockfish Jan-Feb and Nov-Dec, closed Mar-April, 400 lbs per 2 months May - June and Sep-Oct, 500 lbs per 2 months July-Aug; Open Access: Same as limited entry; Recreational: California (Monterey INPFC) - inside of 20 fathoms, closed Jan-June; No change for Oregon or northern California.

Table 2. Landings of black rockfish in the base model.

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1915	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1916	0.2	0.0	0.0	2.7	0.1	0.0	2.9
1917	0.4	0.0	0.0	5.3	0.1	0.0	5.9
1918	0.6	0.0	0.0	8.0	0.2	0.0	8.8
1919	0.9	0.0	0.0	10.6	0.2	0.0	11.7
1920	1.1	0.0	0.0	13.3	0.3	0.0	14.7
1921	1.3	0.0	0.0	16.0	0.4	0.0	17.6
1922	1.5	0.0	0.0	18.6	0.4	0.0	20.5
1923	1.7	0.0	0.0	21.3	0.5	0.0	23.5
1924	1.9	0.0	0.0	23.9	0.6	0.0	26.4
1925	2.1	0.0	0.0	26.6	0.6	0.0	29.3
1926	2.3	0.0	0.0	29.3	0.7	0.0	32.3
1927	2.6	0.0	0.0	31.9	0.7	0.0	35.2
1928	2.7	0.0	0.0	30.8	0.9	0.0	34.4
1929	7.8	0.0	0.0	54.3	0.9	0.0	63.1
1930	11.6	0.0	0.0	47.7	3.1	0.0	62.5
1931	8.1	0.0	0.0	36.1	11.2	0.0	55.5
1932	2.2	0.0	0.0	29.9	9.6	0.0	41.7
1933	4.3	0.0	0.0	16.4	14.6	0.0	35.4
1934	2.6	0.0	0.0	34.1	8.8	0.0	45.5
1935	1.6	0.0	0.0	41.9	9.8	0.0	53.3
1936	7.9	0.0	0.0	47.9	4.7	0.0	60.5
1937	5.7	0.0	0.0	37.7	10.4	0.0	53.7
1938	2.7	0.0	0.0	39.7	12.6	0.0	55.0
1939	3.8	0.0	0.0	46.7	17.4	0.0	67.9
1940	10.9	0.3	0.0	39.0	13.7	0.0	64.0
1941	18.6	0.9	0.0	30.7	10.9	0.0	61.0
1942	18.4	2.2	0.0	23.6	14.6	0.0	58.7
1943	66.1	9.1	0.0	46.0	36.5	0.0	157.7
1944	23.2	21.7	0.0	34.2	170.1	0.0	249.2
1945	18.9	36.4	0.0	36.4	367.0	0.0	458.7
1946	19.6	26.0	0.0	49.9	293.4	8.1	396.9
1947	10.8	8.0	0.0	47.5	194.8	16.1	277.3
1948	19.9	4.7	0.0	34.1	121.0	24.2	204.0
1949	16.3	9.9	0.0	29.2	100.1	32.2	187.8
1950	10.3	13.1	1.7	40.5	114.6	40.3	220.4
1951	8.1	10.3	3.3	46.4	140.7	48.4	257.2
1952	7.7	12.0	5.0	39.0	81.5	56.4	201.7
1953	3.0	5.8	6.7	27.3	98.5	64.5	205.8
1954	4.3	8.7	8.3	49.4	98.3	72.6	241.6
1955	5.3	16.6	10.0	43.1	90.8	80.6	246.3
1956	2.2	10.8	11.7	5.7	64.6	88.7	183.6
1957	4.6	9.3	13.4	10.7	76.1	96.7	210.7
1958	1.4	11.2	15.0	0.4	79.0	179.7	286.8
1959	3.7	24.2	16.7	12.1	69.6	146.2	272.5
1960	2.5	23.4	18.4	9.3	77.7	133.2	264.6
1961	5.6	19.0	20.0	7.1	43.4	95.9	191.0

Table 2. Landings of black rockfish in the base model (continued).

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1962	6.0	21.2	21.7	9.1	44.6	101.9	204.6
1963	5.0	30.9	23.4	15.0	71.6	112.2	258.1
1964	5.5	40.7	25.0	8.1	40.0	83.3	202.7
1965	18.6	40.7	26.7	11.8	56.7	131.2	285.7
1966	6.0	20.4	28.4	13.9	42.7	154.0	265.5
1967	16.3	9.4	30.1	13.9	40.1	187.0	296.7
1968	16.4	12.5	31.7	13.0	54.4	177.3	305.3
1969	40.8	31.2	33.4	35.4	65.9	192.8	399.5
1970	18.6	20.9	35.1	35.7	85.9	274.4	470.6
1971	0.7	23.7	36.7	3.6	111.3	193.7	369.7
1972	0.8	31.6	38.4	28.3	124.9	246.9	470.9
1973	0.1	25.7	40.1	8.2	94.6	311.7	480.4
1974	0.0	19.9	75.6	32.1	108.9	353.2	589.6
1975	0.5	20.3	37.6	12.3	74.5	334.3	479.6
1976	0.2	23.7	113.1	14.1	88.5	403.1	642.6
1977	62.9	24.7	113.4	10.6	64.4	361.9	637.8
1978	55.2	47.9	148.4	11.1	69.1	327.4	659.0
1979	89.7	100.9	289.0	20.0	126.1	341.3	967.1
1980	46.6	138.5	236.0	27.9	179.5	270.2	898.7
1981	80.6	0.0	362.9	22.4	457.6	421.5	1345.0
1982	123.1	159.7	386.6	118.5	232.9	434.5	1455.3
1983	216.6	95.7	373.8	299.8	120.1	197.5	1303.5
1984	126.8	2.3	486.8	193.4	37.8	359.8	1206.9
1985	139.3	0.3	194.1	320.4	81.4	399.3	1134.8
1986	214.9	0.0	193.8	21.5	0.8	336.4	767.4
1987	92.5	0.4	202.5	21.4	67.3	207.3	591.4
1988	105.6	0.0	217.6	25.9	58.0	209.7	616.8
1989	137.2	0.0	308.6	106.6	26.6	219.8	798.8
1990	192.4	0.3	312.3	145.8	0.3	231.0	882.1
1991	413.2	0.0	156.3	125.0	21.9	246.0	962.5
1992	431.8	0.0	308.8	217.5	50.2	261.0	1269.3
1993	126.8	0.2	341.9	146.5	2.3	251.2	868.9
1994	149.9	35.9	280.8	147.9	0.3	228.1	842.9
1995	128.8	2.0	350.8	186.8	2.3	176.5	847.3
1996	191.2	0.2	376.8	128.7	10.4	143.2	850.5
1997	217.8	1.7	343.6	144.1	12.2	94.9	814.3
1998	206.4	0.4	339.6	94.0	5.5	108.7	754.7
1999	196.6	0.0	282.5	65.6	3.8	154.7	703.2
2000	159.8	0.0	308.2	55.1	1.3	131.0	655.4
2001	192.5	0.0	329.3	112.4	1.3	240.4	876.0
2002	163.5	0.0	270.2	100.6	2.0	152.7	689.1
2003	150.7	0.0	341.2	68.1	0.5	500.4	1060.9
2004	160.7	0.2	330.8	76.3	1.2	117.3	686.5
2005	138.9	0.2	309.6	85.7	0.0	183.3	717.7
2006	112.2	0.0	259.8	71.7	0.0	183.5	627.2
ALL	5319	1268	9483	4758	5208	11931	37967
Percent:	14.0%	3.3%	25.0%	12.5%	13.7%	31.4%	100%
	HKL =	26.5%	TWL =	17.1%	Rec =	56.4%	

Table 3. PacFIN reported landings "specified" as black rockfish.

Area =	A:OR-N		B:OR-S		C:CA-N		D:CA-Central		ALL
Type =	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1981		0.0		0.0	0.0	446.2	0.0	0.0	446.2
1982	0.0	0.0	0.0	104.2	54.7	166.6	20.9	0.0	346.4
1983		3.1		79.4	241.5	114.1	39.6	0.0	477.6
1984	0.0	2.1		0.1	155.8	36.7	19.6	0.0	214.2
1985	0.0	0.1	0.5	0.2	193.4	27.1	85.0	1.9	308.1
1986	93.3	0.0	4.7	0.0	1.5	0.7	0.1	0.0	100.3
1987	0.0	0.4	0.0	0.0	5.3	66.3	0.1	0.2	72.4
1988	0.0	0.0	0.0	0.0	0.9	56.4	0.2	0.0	57.5
1989	0.0	0.0	0.0	0.0	1.1	24.9	1.9	0.6	28.4
1990		0.0	0.5	0.3	31.1	0.0	1.5	0.0	33.4
1991		0.0	104.5	0.0	0.0	20.7	0.1	0.0	125.4
1992	169.7	0.0	132.5	0.0	189.3	49.7	10.6	0.0	551.8
1993	0.1	0.0	65.3	0.2	112.6	0.0	12.3	0.0	190.4
1994	0.3	0.0	48.6	31.2	99.7	0.0	27.9	0.0	207.7
1995	0.0	0.0	49.1	0.0	148.5	0.1	12.9	0.0	210.6
1996	0.0	0.0	70.5	0.0	74.5	0.7	16.0	0.0	161.8
1997	0.0	0.0	102.8	1.1	82.6	10.9	16.7	0.0	214.1
1998	31.0	0.0	63.7	0.0	52.7	1.8	11.7	0.0	160.9
1999	0.0	0.0	58.6	0.0	39.7	3.1	7.9	0.0	109.3
2000		0.0	58.2	0.0	35.9	0.3	4.9	0.0	99.3
2001	0.0	0.0	110.9	0.0	73.9	1.0	17.3	0.0	203.1
2002	8.6	0.0	78.2	0.0	83.4	0.0	5.3	0.0	175.5
2003	11.2	0.0	70.2	0.0	50.1	0.0	0.4	0.0	132.0
2004	0.0	0.0	72.0	0.0	60.8	1.0	2.7	0.0	136.4
2005	0.3	0.0	65.0	0.1	69.2	0.0	1.0	0.0	135.7
2006	18.1	0.0	59.6	0.0	57.1	0.0	2.5	0.0	137.4
	332.5	5.7	1215.4	216.8	1915.3	1028.3	319.2	2.7	5035.9
Percent:	6.6%	0.1%	24.1%	4.3%	38.0%	20.4%	6.3%	0.1%	100%

Table 4. Landings of black rockfish at Washington ports, 1981-2006. Data from WDFW.

Area =	A:OR-N		B:OR-S		C:CA-N		D:CA-Central		ALL
Gear =	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	ALL
Year									
1981		0.0	0.2	0.0		0.0		0.0	0.2
1982		0.0	0.1	0.0	0.0	0.0		0.0	0.1
1983		0.0	0.3	0.0	0.0	0.0		0.0	0.3
1984		0.0	0.0	0.0		0.0		0.0	0.0
1985		0.0	0.1	0.0		0.0		0.0	0.1
1986		0.0	0.0	0.0		0.0		0.0	0.0
1987		0.0	0.3	0.0	0.0	0.0		0.0	0.3
1988		0.0	0.0	0.0	0.0	0.0		0.0	0.0
1989		0.0	0.1	0.0		0.0		0.0	0.1
1990		0.0	0.0	0.0		0.0		0.0	0.0
1991		0.0	0.0	0.0		0.0		0.0	0.0
1992		0.0	0.0	0.0		0.0		0.0	0.0
1993		0.0	0.1	0.0		0.0		0.0	0.1
1994		0.0	1.3	0.0		0.0		0.0	1.3
1995		0.0	0.0	0.0		0.0		0.0	0.0
1996		0.0	0.0	0.0		0.0		0.0	0.0
1997		0.1	0.0	0.0		0.0		0.0	0.1
1998		0.2	0.0	0.0		0.0		0.0	0.2
1999		0.0	0.0	0.0		0.0		0.0	0.0
2000		0.0	0.8	0.0		0.0		0.0	0.8
2001		0.0	0.1	0.0		0.0		0.0	0.1
2002		0.0	0.0	0.0		0.0		0.0	0.0
2003		0.0	0.0	0.0		0.0		0.0	0.0
2004		0.0	0.0	0.0		0.0		0.0	0.0
2005		0.0	0.0	0.0		0.0		0.0	0.0
2006		0.0	0.0	0.0		0.0		0.0	0.0
	0.0	0.3	3.2	0.0	0.0	0.0	0.0	0.0	3.5

Table 5. Landings of black rockfish derived from "unspecified" rockfish plus nominal black rockfish, 1981-2006, from PacFIN data.

Area =	A:OR-N		B:OR-S		C:CA-N		D:CA-Central		ALL
Type =	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1981	38.5	0.0	41.9	0.0	18.4	9.4	3.9	2.0	114.0
1982	54.7	0.0	68.3	55.5	27.3	66.3	15.6	0.1	287.8
1983	125.9	0.3	90.5	13.0	5.6	5.5	13.1	0.5	254.3
1984	84.8	0.1	42.0	0.0	14.0	0.2	4.0	0.9	146.0
1985	74.3	0.0	64.4	0.0	32.1	52.4	9.9	0.0	233.2
1986	47.3	0.0	69.7	0.0	2.6	0.0	17.3	0.0	136.9
1987	19.7	0.0	72.5	0.0	8.3	0.7	7.7	0.0	108.9
1988	76.9	0.0	28.7	0.0	23.7	0.5	1.2	1.0	132.0
1989	84.2	0.0	52.9	0.0	97.7	1.2	6.0	0.0	242.0
1990	74.0	0.0	117.9	0.0	104.4	0.1	8.9	0.2	305.4
1991	154.1	0.0	154.7	0.0	115.0	1.0	9.9	0.2	434.8
1992	75.8	0.0	53.9	0.0	6.4	0.5	11.1	0.0	147.7
1993	54.2	0.0	7.1	0.0	10.6	1.8	11.0	0.5	85.2
1994	19.9	1.7	79.8	3.0	7.6	0.3	12.7	0.0	125.0
1995	56.9	0.6	22.9	1.4	16.8	2.0	8.6	0.2	109.3
1996	55.9	0.2	64.8	0.0	13.0	9.7	25.1	0.0	168.8
1997	57.1	0.0	57.9	0.5	18.6	1.2	26.3	0.1	161.6
1998	29.2	0.2	82.5	0.0	9.6	3.6	20.0	0.2	145.3
1999	55.7	0.0	82.3	0.0	11.7	0.4	6.3	0.3	156.8
2000	62.1	0.0	38.8	0.0	9.2	0.0	5.1	1.0	116.1
2001	50.8	0.0	30.7	0.0	3.7	0.0	17.5	0.2	103.0
2002	62.2	0.0	14.6	0.0	6.4	0.6	5.5	1.5	90.7
2003	62.5	0.0	6.8	0.0	14.3	0.1	3.3	0.4	87.3
2004	83.7	0.0	5.0	0.2	8.3	0.2	4.5	0.0	102.0
2005	60.0	0.0	13.6	0.0	11.9	0.0	3.6	0.0	89.2
2006	20.5	0.0	14.0	0.0	8.6	0.0	3.4	0.0	46.6
	1640.7	3.1	1377.9	73.8	605.8	157.8	261.4	9.2	4129.8

Table 6. Rockfish landings by area and gear type, 1956-1980, from Pacific Marine Fisheries Commission (PMFC) reports.

Area =	A:OR-N		B:OR-S		C:CA-N		D:CA-Central		ALL
Type =	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1956	6.0	1069.8	2.2	347.9	2.7	866.8	381.0	3923.2	6599.7
1957	10.8	774.1	6.3	309.4	13.8	1030.3	427.6	3968.1	6540.4
1958	3.3	861.6	2.0	379.7	0.0	1069.8	33.3	4132.9	6482.6
1959	6.0	848.9	7.5	900.4	7.3	937.8	762.7	3967.6	7438.2
1960	5.6	1390.5	3.9	826.5	10.9	1068.4	415.2	2923.2	6644.2
1961	15.4	1860.2	5.7	609.4	7.1	585.6	353.5	2417.2	5854.2
1962	15.1	1844.3	7.6	702.2	12.9	608.7	328.9	2024.9	5544.6
1963	11.5	2024.4	7.0	1075.9	28.5	991.6	294.9	2209.9	6643.8
1964	10.6	1993.6	9.7	1469.7	15.3	545.7	166.3	1827.1	6037.9
1965	51.2	4722.4	18.8	1249.7	21.7	782.0	261.6	1979.5	9086.9
1966	14.2	1433.8	8.3	700.8	20.8	577.0	463.2	2351.4	5569.6
1967	37.6	686.7	23.2	321.6	24.1	545.7	357.4	1873.8	3870.1
1968	17.7	294.8	42.0	477.2	24.6	752.5	268.2	1705.1	3582.0
1969	27.1	319.3	120.7	1222.4	82.4	919.9	204.7	1482.8	4379.4
1970	15.2	299.8	52.4	813.3	82.7	1198.9	215.8	2011.7	4689.7
1971	1.8	266.7	0.7	926.7	7.4	1562.6	56.8	1882.0	4704.7
1972	2.7	342.5	0.2	1237.1	59.9	1740.5	366.5	3085.8	6835.1
1973	0.3	441.3	0.1	992.9	14.1	1278.2	211.4	5152.9	8091.3
1974	0.0	252.7	0.0	773.8	69.9	1493.2	347.5	4386.3	7323.3
1975	1.4	314.3	0.5	788.8	*25.6*	*1028.8*	*169.4*	*2501.8*	4830.6
1976	0.1	747.5	0.5	886.8	*30.7*	*1233.2*	*149.1*	*2202.6*	5250.5
1977	84.0	381.0	146.5	956.2	*22.2*	*890.4*	*141.0*	*2082.0*	4703.3
1978	*108.7*	*1984.6*	*96.1*	*1755.4*	*23.9*	*961.5*	*124.1*	*1832.3*	6886.7
1979	*172.3*	*3989.0*	*160.5*	*3715.1*	*43.8*	*1758.3*	*207.7*	*3067.2*	13113.8
1980	*92.3*	*5792.2*	*80.9*	*5075.5*	*62.6*	*2514.3*	*237.8*	*3512.6*	17368.1

Notes: HKL landings for 1956-70 (grey-shaded above) were derived using the ratio of non-trawl to trawl reported in the US Fishery Statistics series for the corresponding years and areas.
Some of the PMFC landings statistics for Oregon during 1978-80 seemed unusal. Values in italics above for Oregon areas were derived from landings data in various "Pounds and Values" reports.
The PMFC landings statistics were incomplete for California during 1975-80. Values in italics above were derived from landings data in various Cal. Fishery Bulletins.

Table 7. Rockfish landings by area and gear type, 1927-1955, from the Fishery Statistics of the United States series.

Area =	Columbia River		Coastal Ports		A:OR-N		B:OR-S		C:CA-N		D:CA-Central		ALL
Type =	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	HKL	TWL	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1927	11.7	0.0	8.3	0.0	5.3	0.0	4.2	0.0	48.4	8.0	1046.4	178.3	1290.7
1928	25.8	0.0	7.6	0.0	6.4	0.0	3.8	0.0	39.6	9.1	1249.2	240.7	1548.8
1929	32.4	0.0	25.7	0.0	16.1	0.0	12.9	0.0	107.7	9.1	937.1	294.5	1377.4
1930	11.8	0.0	42.0	0.0	22.2	0.0	21.0	0.0	74.8	40.2	1482.8	265.2	1906.2
1931	12.2	0.0	28.9	0.0	15.7	0.0	14.5	0.0	47.9	158.8	1417.1	59.6	1713.5
1932	5.9	0.0	7.5	1.8	4.3	0.9	3.7	0.9	40.5	136.4	1139.6	100.7	1427.0
1933	5.4	0.0	15.6	1.1	8.3	0.5	7.8	0.5	14.1	206.5	898.9	143.7	1280.5
1934	15.8	0.0	8.2	0.0	5.7	0.0	4.1	0.0	58.1	123.5	902.0	150.0	1243.4
1935	16.8	0.1	4.5	0.7	3.9	0.4	2.2	0.4	71.2	138.1	1115.3	124.2	1455.6
1936	24.9	2.8	26.9	0.4	15.9	0.5	13.4	0.2	79.9	64.3	1328.1	190.4	1692.8
1937	47.2	5.9	16.4	0.3	12.9	0.7	8.2	0.1	60.6	145.7	1120.8	158.8	1507.8
1938	59.1	0.0	4.2	0.0	8.0	0.0	2.1	0.0	70.0	178.8	973.0	121.5	1353.4
1939	26.9	6.8	11.5	1.9	8.4	1.6	5.7	1.0	95.2	247.1	722.3	59.0	1140.3
1940	44.3	178.5	36.2	21.8	22.6	28.8	18.1	10.9	70.4	194.4	903.9	54.6	1303.6
1941	89.0	380.3	60.2	60.8	39.0	68.4	30.1	30.4	51.6	155.3	836.3	31.4	1242.6
1942	81.2	567.3	60.2	152.4	38.2	132.9	30.1	76.2	47.6	207.7	377.6	12.8	923.1
1943	285.4	2235.1	217.5	641.6	137.3	544.3	108.7	320.8	103.1	520.7	392.5	10.1	2137.6
1944	56.4	3489.7	80.5	1558.8	45.9	1128.4	40.2	779.4	79.0	2427.6	217.3	145.9	4863.6
1945	34.8	5217.0	66.7	2621.5	36.8	1832.4	33.3	1310.7	73.8	5241.8	574.2	44.0	9147.1
1946	57.3	2978.0	66.9	1879.1	39.2	1237.4	33.5	939.6	107.8	4190.9	565.2	43.1	7156.5
1947	18.2	2482.1	38.3	555.6	21.0	526.0	19.2	277.8	104.6	2779.0	475.5	310.5	4513.5
1948	20.0	1711.7	71.9	325.8	38.0	334.1	35.9	162.9	67.4	1725.3	591.9	279.3	3234.8
1949	22.4	1372.6	58.3	712.1	31.4	493.3	29.2	356.1	55.7	1426.2	575.8	271.7	3239.4
1950	18.5	1597.6	36.5	943.8	20.1	631.7	18.3	471.9	67.8	1630.5	1113.8	439.5	4393.6
1951	13.7	1736.6	28.5	739.1	15.6	543.2	14.3	369.6	85.1	1989.4	1030.2	1410.4	5457.9
1952	16.0	2977.8	27.0	844.4	15.1	720.0	13.5	422.2	59.8	1135.5	1254.5	2046.5	5667.2
1953	11.5	2247.8	9.9	397.5	6.1	423.6	5.0	198.8	24.5	1373.0	1461.8	2385.2	5877.9
1954	9.3	2961.0	14.9	600.2	8.4	596.2	7.4	300.1	72.4	1376.0	1701.8	2000.5	6062.8
1955	13.7	1909.3	18.1	1198.5	10.4	790.2	9.1	599.3	67.3	1278.9	1344.5	1251.2	5350.9

Notes: 10% of the reported landings at Columbia River ports were assigned to Area A (OR-North). 50% of the reported landings at coastal ports were assigned to Area A and 50% to Area B (OR-South). Landings reported for Northern California district were assigned to Area C (CA-North). Landings reported for the San Francisco and Monterey districts were assigned to Area D (CA-central).

Table 8. Sport fishery landings of black rockfish in Oregon (excluding North of Cape Falcon).

Area =	A:OR-N	B:OR-S	A	B		A	B	ALL
Type =	Ocean Boat		REC	REC		REC	REC	REC
Year	n fish	n fish	n fish	n fish	av wt (kg)	MTs	MTs	MTs
1949	0	0	0	0	0.948	0.0	0.0	0.0
1950	680	1014	707	1054	0.948	0.7	1.0	1.7
1951	1360	2028	1414	2108	0.948	1.3	2.0	3.3
1952	2040	3041	2121	3162	0.948	2.0	3.0	5.0
1953	2721	4055	2828	4216	0.948	2.7	4.0	6.7
1954	3401	5069	3536	5270	0.948	3.4	5.0	8.3
1955	4081	6083	4243	6324	0.948	4.0	6.0	10.0
1956	4761	7097	4950	7378	0.948	4.7	7.0	11.7
1957	5441	8110	5657	8432	0.948	5.4	8.0	13.4
1958	6121	9124	6364	9486	0.948	6.0	9.0	15.0
1959	6802	10138	7071	10540	0.948	6.7	10.0	16.7
1960	7482	11152	7778	11594	0.948	7.4	11.0	18.4
1961	8162	12166	8485	12648	0.948	8.0	12.0	20.0
1962	8842	13179	9193	13702	0.948	8.7	13.0	21.7
1963	9522	14193	9900	14756	0.948	9.4	14.0	23.4
1964	10202	15207	10607	15810	0.948	10.1	15.0	25.0
1965	10882	16221	11314	16864	0.948	10.7	16.0	26.7
1966	11563	17235	12021	17918	0.948	11.4	17.0	28.4
1967	12243	18248	12728	18972	0.948	12.1	18.0	30.1
1968	12923	19262	13435	20026	0.948	12.7	19.0	31.7
1969	13603	20276	14142	21080	0.948	13.4	20.0	33.4
1970	14283	21290	14849	22134	0.948	14.1	21.0	35.1
1971	14963	22303	15557	23188	0.948	14.7	22.0	36.7
1972	15643	23317	16264	24242	0.948	15.4	23.0	38.4
1973	16324	24331	16971	25296	0.948	16.1	24.0	40.1
1974	25915	50779	26943	52793	0.948	25.5	50.1	75.6
1975	15236	22955	15840	23865	0.948	15.0	22.6	37.6
1976	38033	76716	39541	79758	0.948	37.5	75.6	113.1
1977	40368	74637	41968	77596	0.948	39.8	73.6	113.4
1978	66042	84514	68660	87865	0.948	65.1	83.3	148.4
1979	118328	174913	123019	181848	0.948	116.6	172.4	289.0
1980	117007	94344	121646	98085	1.074	130.6	105.3	236.0
1981	200179	158485	208115	164768	0.973	202.6	160.4	362.9
1982	267831	191327	278450	198912	0.810	225.5	161.1	386.6
1983	263063	155851	273492	162030	0.858	234.7	139.1	373.8
1984	296506	160294	308262	166650	1.025	316.0	170.8	486.8
1985	108676	122404	112984	127257	0.808	91.3	102.8	194.1
1986	110821	88436	115215	91942	0.936	107.8	86.0	193.8
1987	102560	111113	106627	115518	0.912	97.2	105.3	202.5
1988	172603	64526	179446	67084	0.883	158.4	59.2	217.6
1989	224238	103393	233128	107493	0.906	211.2	97.4	308.6
1990	230892	89790	240046	93350	0.937	224.9	87.4	312.3

Table 8. Sport fishery landings of black rockfish in Oregon (continued).

Area =	A:OR-N	B:OR-S	A	B		A	B	ALL
Type =	Ocean Boat		REC	REC		REC	REC	REC
Year	n fish	n fish	n fish	n fish	av wt (kg)	MTs	MTs	MTs
1991	106052	54470	110256	56629	0.937	103.3	53.0	156.3
1992	208575	108446	216845	112745	0.937	203.1	105.6	308.8
1993	216807	118086	225402	122768	0.982	221.3	120.6	341.9
1994	152754	123849	158810	128759	0.977	155.1	125.7	280.8
1995	227867	138249	236901	143730	0.922	218.4	132.5	350.8
1996	284495	119053	295774	123773	0.898	265.6	111.2	376.8
1997	233850	132915	243121	138185	0.901	219.1	124.5	343.6
1998	253412	115104	263459	119668	0.887	233.6	106.1	339.6
1999	189125	118860	196623	123572	0.882	173.5	109.0	282.5
2000	196206	133621	203985	138919	0.899	183.3	124.8	308.2
2001	142953	131337	148621	136544	1.155	171.6	157.7	329.3
2002	138458	86560	143947	89992	1.155	166.2	103.9	270.2
2003	152900	134256	158961	139579	1.143	181.7	159.5	341.2
2004	154482	118509	160606	123207	1.166	187.2	143.6	330.8
2005	157867	110601	164126	114986	1.109	182.1	127.5	309.6
2006	132803	101235	138068	105249	1.068	147.4	112.4	259.8

Notes: ODFW estimates of rockfish landed by the ocean boat sport fishery begin in 1973. Landings for 1949-72 (grey-shaded above) were derived from a linear trend, zero in 1949. Landings by other segments of the sport fishery (e.g. shore-based or in estuaries) were derived from an estimate of the average percentage of the black rockfish landed in Oregon by the ocean boat fishing mode (96.2%), from RecFIN estimates of catch by mode. Average weight of a black rockfish for 1949-1979 was from the average weight observed during 1980-84.

Table 9. Sport fishery landings of black rockfish in California.

Area =	CA: N+Central			
Type =	CPFV-logs			
Year	n rock	n blck	av wt (kg)	MTs
1945		0		0.0
1946		8125		8.1
1947		16249		16.1
1948		24374		24.2
1949		32498		32.2
1950		40623		40.3
1951		48747		48.4
1952		56872		56.4
1953		64997		64.5
1954		73121		72.6
1955		81246		80.6
1956		89370		88.7
1957	296231	97495		96.7
1958	550353	181131		179.7
1959	447844	147393		146.2
1960	407924	134255		133.2
1961	293667	96651		95.9
1962	311989	102681		101.9
1963	343604	113086		112.2
1964	255148	83974		83.3
1965	401686	132202		131.2
1966	471643	155226		154.0
1967	572549	188436		187.0
1968	542978	178704		177.3
1969	590326	194287		192.8
1970	840170	276515		274.4
1971	593203	195234		193.7
1972	755944	248795		246.9
1973	954378	314103		311.7
1974	1081444	355922		353.2
1975	1023759	336937		334.3
1976	1234293	406228		403.1
1977	1108181	364722		361.9
1978	1002538	329953		327.4
1979	1045083	343955		341.3
1980	1033982	279829	0.966	270.2
1981	1175173	429089	0.982	421.5
1982	1147534	395828	1.098	434.5
1983		191272	1.032	197.5
1984		407423	0.883	359.8
1985		521117	0.766	399.3

Table 9. Sport fishery landings of black rockfish in California (continued).

Area =	CA: N+Central	Source =	RecFIN	
Year		n fish	av wt (kg)	MTs
1986		389800	0.863	336.4
1987		261235	0.794	207.3
1988		288920	0.726	209.7
1989		315858	0.696	219.8
1990		337836	0.684	231.0
1991		359814	0.684	246.0
1992		381792	0.684	261.0
1993		403770	0.622	251.2
1994		330100	0.691	228.1
1995		239336	0.737	176.5
1996		185730	0.771	143.2
1997		152601	0.622	94.9
1998		161313	0.674	108.7
1999		274359	0.564	154.7
2000		230214	0.569	131.0
2001		341512	0.704	240.4
2002		175119	0.872	152.7
2003		568824	0.880	500.4
2004		165100	0.710	117.3
2005		218818	0.838	183.3
2006		225833	0.813	183.5

Notes: RecFIN estimates of black rockfish landings began in 1980. Landings for 1957-79 (grey-shaded above) were derived from CPFV logbook reported rockfish times 0.329, which is the ratio (RecFIN black rockfish, 1980-82) over (CPFV logbook rockfish, 1980-82). Landings for 1990-92, when there was no MRFSS sampling, were derived by linear interpolation from adjacent years. Landings by commercial passenger fishing vessels (CPFV) during 1993-96, when CPFV catches were not included in the RecFIN estimates, were provided by CDFG. Average weight of a black rockfish for 1945-1979 was from the average weight observed during 1980-84.

Table 10. Low alternative landings history for black rockfish.

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1915	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1916	0.2	0.0	0.0	2.0	0.0	0.0	2.2
1917	0.3	0.0	0.0	4.0	0.0	0.0	4.4
1918	0.5	0.0	0.0	6.0	0.1	0.0	6.5
1919	0.6	0.0	0.0	8.0	0.1	0.0	8.7
1920	0.8	0.0	0.0	10.0	0.1	0.0	10.9
1921	1.0	0.0	0.0	12.0	0.1	0.0	13.1
1922	1.1	0.0	0.0	14.0	0.2	0.0	15.2
1923	1.3	0.0	0.0	16.0	0.2	0.0	17.4
1924	1.4	0.0	0.0	18.0	0.2	0.0	19.6
1925	1.6	0.0	0.0	19.9	0.2	0.0	21.8
1926	1.8	0.0	0.0	21.9	0.3	0.0	24.0
1927	1.9	0.0	0.0	23.9	0.3	0.0	26.1
1928	2.0	0.0	0.0	23.1	0.3	0.0	25.5
1929	5.8	0.0	0.0	40.8	0.3	0.0	46.9
1930	8.7	0.0	0.0	35.8	1.4	0.0	46.0
1931	6.1	0.0	0.0	27.1	5.7	0.0	38.9
1932	1.6	0.0	0.0	22.4	4.9	0.0	28.9
1933	3.3	0.0	0.0	12.3	7.4	0.0	23.0
1934	2.0	0.0	0.0	25.5	4.4	0.0	32.0
1935	1.2	0.0	0.0	31.4	5.0	0.0	37.6
1936	5.9	0.0	0.0	35.9	2.3	0.0	44.2
1937	4.2	0.0	0.0	28.3	5.2	0.0	37.7
1938	2.0	0.0	0.0	29.8	6.4	0.0	38.2
1939	2.8	0.0	0.0	35.0	8.9	0.0	46.8
1940	8.2	0.1	0.0	29.3	7.0	0.0	44.6
1941	13.9	0.4	0.0	23.0	5.6	0.0	42.9
1942	13.8	0.9	0.0	17.7	7.5	0.0	39.8
1943	49.6	3.8	0.0	34.5	18.7	0.0	106.7
1944	17.4	9.4	0.0	25.6	87.4	0.0	139.8
1945	14.2	15.7	0.0	27.3	188.7	0.0	245.9
1946	14.7	11.3	0.0	37.4	150.9	6.0	220.3
1947	8.1	3.3	0.0	35.6	100.0	12.1	159.2
1948	14.9	2.0	0.0	25.6	62.1	18.1	122.7
1949	12.2	4.3	0.0	21.9	51.3	24.2	114.0
1950	7.8	5.7	1.3	30.4	58.7	30.2	134.0
1951	6.0	4.4	2.5	34.8	71.6	36.3	155.7
1952	5.8	5.1	3.8	29.2	40.9	42.3	127.0
1953	2.2	2.4	5.0	20.5	49.4	48.4	127.9
1954	3.2	3.6	6.3	37.0	49.5	54.4	154.1
1955	3.9	7.2	7.5	32.3	46.0	60.5	157.4
1956	1.6	4.2	8.8	4.2	31.2	66.5	116.5
1957	3.4	3.7	10.0	8.0	37.1	72.6	134.8
1958	1.1	4.6	11.3	0.3	38.5	134.8	190.5
1959	2.8	10.8	12.5	9.1	33.8	109.7	178.6
1960	1.9	9.9	13.8	7.0	38.5	99.9	171.0
1961	4.2	7.3	15.0	5.3	21.1	71.9	124.9

Table 10. Low alternative landings history for black rockfish (continued).

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1962	4.5	8.4	16.3	6.8	21.9	76.4	134.4
1963	3.7	12.9	17.5	11.2	35.7	84.2	165.2
1964	4.1	17.6	18.8	6.1	19.6	62.5	128.8
1965	13.9	15.0	20.0	8.9	28.2	98.4	184.4
1966	4.5	8.4	21.3	10.4	20.8	115.5	180.9
1967	12.2	3.9	22.5	10.4	19.6	140.2	208.9
1968	12.3	5.7	23.8	9.8	27.1	133.0	211.6
1969	30.6	14.7	25.0	26.6	33.1	144.6	274.6
1970	14.0	9.8	26.3	26.7	43.2	205.8	325.7
1971	0.5	11.1	27.6	2.7	56.3	145.3	243.4
1972	0.6	14.8	28.8	21.3	62.7	185.1	313.3
1973	0.1	11.9	30.1	6.1	46.0	233.7	327.9
1974	0.0	9.3	56.7	24.1	53.8	264.9	408.7
1975	0.4	9.5	28.2	9.2	37.0	250.7	335.0
1976	0.1	10.6	84.8	10.5	44.4	302.3	452.8
1977	47.2	11.5	85.0	7.9	32.1	271.4	455.0
1978	41.4	21.1	111.3	8.3	34.6	245.5	462.2
1979	67.3	44.6	216.8	15.0	63.3	256.0	662.9
1980	35.0	60.9	177.0	20.9	90.5	202.6	586.9
1981	80.6	0.0	272.2	22.4	457.6	316.1	1148.8
1982	123.1	159.7	289.9	118.5	232.9	325.9	1250.0
1983	216.6	95.7	280.4	299.8	120.1	148.1	1160.7
1984	126.8	2.3	365.1	193.4	37.8	269.8	995.2
1985	139.3	0.3	145.6	320.4	81.4	299.4	986.4
1986	214.9	0.0	145.4	21.5	0.8	252.3	634.9
1987	92.5	0.4	151.9	21.4	67.3	155.5	489.0
1988	105.6	0.0	163.2	25.9	58.0	157.3	510.0
1989	137.2	0.0	231.5	106.6	26.6	164.8	666.7
1990	192.4	0.3	234.2	145.8	0.3	173.2	746.3
1991	413.2	0.0	117.3	125.0	21.9	184.5	861.9
1992	431.8	0.0	231.6	217.5	50.2	195.8	1126.9
1993	126.8	0.2	256.4	146.5	2.3	188.4	720.6
1994	149.9	35.9	210.6	147.9	0.3	171.0	715.7
1995	128.8	2.0	263.1	186.8	2.3	132.4	715.4
1996	191.2	0.2	282.6	128.7	10.4	107.4	720.5
1997	217.8	1.7	257.7	144.1	12.2	71.2	704.7
1998	206.4	0.4	254.7	94.0	5.5	81.5	642.6
1999	196.6	0.0	211.9	65.6	3.8	116.0	593.9
2000	159.8	0.0	231.1	55.1	1.3	98.3	545.6
2001	192.5	0.0	247.0	112.4	1.3	180.3	733.5
2002	163.5	0.0	202.6	100.6	2.0	114.5	583.4
2003	150.7	0.0	255.9	68.1	0.5	375.3	850.5
2004	160.7	0.2	248.1	76.3	1.2	88.0	574.5
2005	138.9	0.2	232.2	85.7	0.0	137.5	594.5
2006	112.2	0.0	194.9	71.7	0.0	137.6	516.4
ALL	5132	721	7113	4344	3218	8948	29475
Percent:	17.4%	2.4%	24.1%	14.7%	10.9%	30.4%	100%
	HKL =	32.1%	TWL =	13.4%	Rec =	54.5%	

Table 11. High alternative landings history for black rockfish.

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1915	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1916	0.3	0.0	0.0	3.3	0.1	0.0	3.7
1917	0.5	0.0	0.0	6.6	0.2	0.0	7.4
1918	0.8	0.0	0.0	10.0	0.4	0.0	11.1
1919	1.1	0.0	0.0	13.3	0.5	0.0	14.9
1920	1.3	0.0	0.0	16.6	0.6	0.0	18.6
1921	1.6	0.0	0.0	19.9	0.7	0.0	22.3
1922	1.9	0.0	0.0	23.3	0.9	0.0	26.0
1923	2.1	0.0	0.0	26.6	1.0	0.0	29.7
1924	2.4	0.0	0.0	29.9	1.1	0.0	33.4
1925	2.7	0.0	0.0	33.2	1.2	0.0	37.1
1926	2.9	0.0	0.0	36.6	1.4	0.0	40.9
1927	3.2	0.0	0.0	39.9	1.5	0.0	44.6
1928	3.4	0.0	0.0	38.5	1.8	0.0	43.7
1929	9.7	0.0	0.0	67.9	1.9	0.0	79.5
1930	14.6	0.0	0.0	59.7	6.2	0.0	80.4
1931	10.2	0.0	0.0	45.2	22.4	0.0	77.7
1932	2.7	0.0	0.0	37.3	19.3	0.0	59.4
1933	5.4	0.0	0.0	20.5	29.2	0.0	55.2
1934	3.3	0.0	0.0	42.6	17.6	0.0	63.4
1935	2.1	0.0	0.0	52.3	19.6	0.0	74.0
1936	9.9	0.0	0.0	59.9	9.4	0.0	79.2
1937	7.1	0.0	0.0	47.1	20.7	0.0	74.9
1938	3.3	0.0	0.0	49.6	25.3	0.0	78.2
1939	4.7	0.1	0.0	58.4	34.7	0.0	97.9
1940	13.7	0.7	0.0	48.8	27.3	0.0	90.4
1941	23.2	1.8	0.0	38.4	21.8	0.0	85.2
1942	23.0	4.3	0.0	29.4	29.1	0.0	85.9
1943	82.7	18.2	0.0	57.5	72.9	0.0	231.3
1944	29.0	43.5	0.0	42.7	340.2	0.0	455.4
1945	23.6	72.9	0.0	45.5	733.9	0.0	876.0
1946	24.4	51.9	0.0	62.4	586.8	10.1	735.6
1947	13.5	16.0	0.0	59.4	389.7	20.2	498.8
1948	24.9	9.5	0.0	42.6	242.1	30.2	349.3
1949	20.4	19.8	0.0	36.5	200.2	40.3	317.2
1950	12.9	26.1	2.1	50.6	229.2	50.4	371.3
1951	10.1	20.7	4.2	58.0	281.3	60.5	434.7
1952	9.6	24.0	6.3	48.7	163.1	70.5	322.2
1953	3.7	11.6	8.3	34.2	197.0	80.6	335.5
1954	5.3	17.4	10.4	61.7	196.6	90.7	382.2
1955	6.6	33.1	12.5	53.8	181.5	100.8	388.4
1956	2.7	21.7	14.6	7.1	129.2	110.8	286.1
1957	5.7	18.6	16.7	13.3	152.2	120.9	327.4
1958	1.8	22.4	18.8	0.5	158.0	224.7	426.2
1959	4.6	48.4	20.9	15.1	139.2	182.8	411.0
1960	3.2	46.9	23.0	11.7	155.4	166.5	406.7
1961	7.0	37.9	25.0	8.9	86.8	119.9	285.5

Table 11. High alternative landings history for black rockfish (continued).

Area =	Oregon			California			
Type =	HKL	TWL	REC	HKL	TWL	REC	ALL
Year	MTs	MTs	MTs	MTs	MTs	MTs	MTs
1962	7.6	42.5	27.1	11.4	89.3	127.4	305.2
1963	6.2	61.9	29.2	18.7	143.2	140.3	399.5
1964	6.8	81.5	31.3	10.2	80.0	104.2	314.0
1965	23.2	81.4	33.4	14.8	113.4	164.0	430.2
1966	7.5	40.8	35.5	17.4	85.5	192.5	379.2
1967	20.3	18.8	37.6	17.4	80.1	233.7	408.0
1968	20.4	25.0	39.7	16.3	108.8	221.6	431.8
1969	51.1	62.4	41.7	44.3	131.8	241.0	572.2
1970	23.3	41.9	43.8	44.6	171.9	343.0	668.4
1971	0.8	47.4	45.9	4.5	222.5	242.1	563.4
1972	1.0	63.2	48.0	35.4	249.8	308.6	706.0
1973	0.2	51.4	50.1	10.2	189.3	389.6	690.7
1974	0.0	39.7	94.5	40.1	217.8	441.4	833.6
1975	0.6	40.7	47.1	15.3	149.0	417.9	670.6
1976	0.2	47.3	141.4	17.6	177.1	503.8	887.4
1977	78.6	49.3	141.7	13.2	128.8	452.4	864.0
1978	69.0	95.7	185.5	13.8	138.3	409.2	911.5
1979	112.2	201.7	361.3	25.0	252.3	426.6	1379.1
1980	58.3	276.9	295.0	34.9	359.0	337.7	1361.8
1981	80.6	0.0	453.7	22.4	457.6	526.9	1541.1
1982	123.1	159.7	483.2	118.5	232.9	543.1	1660.6
1983	216.6	95.7	467.3	299.8	120.1	246.8	1446.3
1984	126.8	2.3	608.5	193.4	37.8	449.7	1418.5
1985	139.3	0.3	242.6	320.4	81.4	499.1	1283.1
1986	214.9	0.0	242.3	21.5	0.8	420.4	900.0
1987	92.5	0.4	253.2	21.4	67.3	259.1	693.9
1988	105.6	0.0	272.0	25.9	58.0	262.1	723.6
1989	137.2	0.0	385.8	106.6	26.6	274.7	930.9
1990	192.4	0.3	390.4	145.8	0.3	288.7	1017.9
1991	413.2	0.0	195.4	125.0	21.9	307.5	1063.0
1992	431.8	0.0	385.9	217.5	50.2	326.3	1411.8
1993	126.8	0.2	427.4	146.5	2.3	314.0	1017.2
1994	149.9	35.9	351.0	147.9	0.3	285.1	970.1
1995	128.8	2.0	438.5	186.8	2.3	220.6	979.1
1996	191.2	0.2	471.0	128.7	10.4	179.0	980.5
1997	217.8	1.7	429.4	144.1	12.2	118.6	923.9
1998	206.4	0.4	424.6	94.0	5.5	135.9	866.8
1999	196.6	0.0	353.1	65.6	3.8	193.3	812.4
2000	159.8	0.0	385.2	55.1	1.3	163.8	765.2
2001	192.5	0.0	411.6	112.4	1.3	300.5	1018.4
2002	163.5	0.0	337.7	100.6	2.0	190.9	794.8
2003	150.7	0.0	426.5	68.1	0.5	625.5	1271.3
2004	160.7	0.2	413.5	76.3	1.2	146.6	798.5
2005	138.9	0.2	387.0	85.7	0.0	229.1	840.9
2006	112.2	0.0	324.8	71.7	0.0	229.4	738.1
ALL	5506	2237	11854	5172	9217	14914	48900
Percent:	11.3%	4.6%	24.2%	10.6%	18.8%	30.5%	100%
	HKL =	21.8%	TWL =	23.4%	Rec =	54.7%	

Table 12. Black rockfish length composition sample sizes.

Oregon	Number of trips or interviews						Number of fish length measurements					
Year	HKL	TWL	REC	REC-2	REC-3	Total	HKL	TWL	REC	REC-2	REC-3	Total
1974		1				1		100				100
1978				7.4*		7				259		259
1979				3.6*		4				126		126
1980			121	1.4*		122			781	50		831
1981			70	2*		72			472	69		541
1982			151	5.3*		156			949	187		1136
1983			56	2.9*		59			298	101		399
1984			217	22.3*		239			1347	781		2128
1985			296	13.9*		310			1785	487		2272
1986			196	22.7*		219			1299	794		2093
1987			185	18*		203			865	629		1494
1988			276	14.3*		290			1364	502		1866
1989			143	22.8*		166			917	798		1715
1990				60*		60				2099		2099
1991				36.3*		36				1270		1270
1992	9			54.1*		63	216			1894		2110
1993			322	37.6*		360			1869	1315		3184
1994		1	451	90.9*		543		41	2175	3182		5398
1995	14		349	57.3*		420	404		2156	2004		4564
1996	6		326	46.9*		379	228		2171	1643		4042
1997	9	2	452	55		518	246	65	3054	1847		5212
1998	12		757	57		826	278		3905	1584		5767
1999	7		795	123		925	152		5083	3247		8482
2000	30		673	174		877	603		4229	4624		9456
2001	67	1	405	20	508	1001	1029	20	2249	440	5613	9351
2002	93		450	114	607	1264	1216		2235	3696	3682	10829
2003	123			116	680	919	1314			3416	3443	8173
2004	221			79	457	757	3510			3260	2572	9342
2005	100	1		146	668	915	2217	36		3082	3589	8924
2006	161				1126	1287	4695				7084	11779
All	852	6	6691	972	4046	12998.714	16108	262	39203	43386	25983	124942

Notes: REC = Data from RecFIN, collected by the Marine Recreational Fishery Statistics Survey.
REC-2 = Data collected by ODFW's Ocean Recreational Boat Survey (ORBS) program.
* Trip details unavailable. Estimate based on 35 fish per sample.
REC-3 = Extra data collected by ORBS.

Table 12. Black rockfish length composition sample sizes (continued).

California	Number of trips or interviews						Number of fish length measurements					
Year	HKL	TWL	REC	REC-2	REC-3	Total	HKL	TWL	REC	REC-2	REC-3	Total
1978		6				6		52				52
1980		16	108			124		132	478			610
1981		16	102			118		130	439			569
1982	3	25	126			154	55	313	558			926
1983	3	17	80			100	71	212	368			651
1984	2	10	152			164	57	176	590			823
1985	1	9	328			338	31	157	1318			1506
1986		3	254			257		27	1012			1039
1987		8	99	2		109		184	402	48		634
1988		3	90	20		113		63	313	888		1264
1989		8	97	20		125		80	364	948		1392
1990		1		7		8		5		261		266
1991		2		17		19		36		521		557
1992	49	3		24		76	948	65		384		1397
1993	143		386	31		560	2413		1253	711		4377
1994	134		227	35		396	2823		900	1024		4747
1995	82		196	21		299	2145		658	840		3643
1996	68	1	351	30		450	1953	25	1516	1088		4582
1997	46	3	121	49		219	967	82	1422	1798		4269
1998	20	1	178	33		232	300	6	769	450		1525
1999	172	1	371			544	4720	25	1426			6171
2000	36	1	272			309	571	25	901			1497
2001	50	4	244			298	952	47	983			1982
2002	33		338			371	601		1247			1848
2003	5	1	660			666	123	19	2345			2487
2004	14	1			1006	1021	257	9			3332	3598
2005	11				1578	1589	220				5259	5479
2006	31				1784	1815	641				5223	5864
All	903	140	4780	289	4368	10480	19848	1870	19262	8961	13814	63755

Notes: REC = Data from RecFIN, collected by the Marine Recreational Fishery Statistics Survey.
REC-2 = Data collected by CDFG's CPFV Observer Program.
REC-3 = Data collected by CDFG's California Recreational Fishery Survey (CRFS).

Table 13. Sample sizes for black rockfish age composition data (standard age-readers).

	Number of trips or interviews.			Number of fish with age-readings.		
Year	HKL	REC-2	Total	HKL	REC-2	Total
Oregon						
1996		17.8*	17.8		624	624
1997		13	13		457	457
1998		22	22		522	522
1999		61	61		1607	1607
2000		91	91		2320	2320
2002	22	103	125	316	3397	3713
2003	27	115	142	462	2230	2692
2004	19	79	98	385	2311	2696
2005	13	111	124	310	1446	1756
California	No ages available.					
All	81	604	693.8	1473	14914	16387

* Trip details unavailable. Estimate based on 35 fish per sample.

Table 14. Black rockfish fishery length composition data - sexed.

	Length in cm			Females													
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
OR-HKL																		
1992	0.0%	0.0%	0.0%	0.0%	0.3%	2.2%	2.4%	2.3%	6.8%	5.6%	7.3%	5.3%	3.0%	2.0%	3.8%	0.1%	0.0%	0.0%
1995	0.0%	0.0%	0.0%	0.0%	1.7%	2.8%	6.8%	4.8%	7.2%	8.1%	3.9%	7.0%	5.4%	1.6%	1.8%	0.3%	0.0%	0.0%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	3.4%	4.7%	8.5%	4.8%	4.7%	4.7%	1.1%	2.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.1%	0.0%	0.3%	0.6%	2.3%	2.5%	6.6%	7.6%	4.2%	4.8%	5.6%	1.5%	0.5%	0.4%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.0%	0.4%	0.4%	1.8%	3.3%	4.0%	5.2%	5.7%	3.2%	2.9%	2.1%	0.1%	0.4%	0.0%	1.0%	0.0%
1999	0.0%	1.4%	0.0%	0.0%	2.5%	6.7%	6.5%	7.5%	2.8%	5.9%	4.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.0%	0.0%	0.1%	0.4%	2.3%	1.9%	7.6%	9.5%	8.9%	5.7%	6.7%	2.3%	1.7%	0.3%	0.3%	0.7%	0.0%	0.0%
2001	0.0%	0.0%	0.0%	0.0%	0.6%	2.9%	4.9%	8.7%	10.7%	12.0%	8.9%	2.9%	2.9%	0.9%	0.0%	0.0%	0.0%	0.0%
2002*	0.0%	0.0%	0.0%	0.1%	0.9%	2.3%	4.4%	6.0%	9.7%	9.2%	8.9%	7.6%	3.2%	2.1%	0.8%	0.0%	0.0%	0.0%
2003*	0.2%	0.0%	0.2%	0.2%	1.4%	3.0%	5.0%	3.8%	7.4%	8.1%	8.6%	5.7%	2.4%	0.9%	0.2%	0.0%	0.0%	0.0%
2004*	0.0%	0.0%	0.0%	0.2%	1.8%	4.8%	6.9%	7.3%	5.3%	5.4%	6.9%	6.2%	3.8%	1.1%	0.4%	0.0%	0.0%	0.0%
2005*	0.0%	0.0%	0.0%	0.0%	1.1%	4.6%	7.9%	7.9%	5.9%	4.7%	5.0%	5.4%	2.3%	1.1%	0.2%	0.0%	0.0%	0.0%
2006	0.0%	0.0%	0.3%	0.2%	1.6%	3.3%	5.6%	7.6%	7.0%	5.5%	6.0%	6.2%	3.8%	1.2%	0.6%	0.2%	0.1%	0.0%
	* Sample age composition data used; length composition data not used.																	
OR-Rec-ORBS																		
1990	0.0%	0.0%	0.2%	0.8%	1.1%	2.1%	6.0%	9.1%	8.2%	7.9%	6.5%	4.8%	3.2%	1.8%	0.7%	0.2%	0.0%	0.0%
1991	0.0%	0.0%	0.0%	1.7%	3.8%	3.0%	4.0%	9.6%	11.8%	7.5%	9.1%	2.0%	1.8%	0.5%	0.0%	0.1%	0.0%	0.0%
1992	0.0%	0.1%	0.3%	0.9%	0.9%	1.8%	4.6%	6.9%	9.1%	9.6%	6.0%	4.5%	1.8%	1.4%	0.1%	0.0%	0.0%	0.0%
1993	0.2%	0.2%	0.7%	1.2%	2.0%	2.7%	4.5%	5.7%	6.9%	6.3%	6.2%	4.4%	2.9%	0.9%	0.2%	0.1%	0.0%	0.0%
1994	0.1%	0.1%	0.4%	0.9%	2.1%	4.7%	4.4%	6.0%	7.8%	7.8%	5.7%	4.0%	2.4%	1.5%	0.3%	0.1%	0.0%	0.0%
1995	0.1%	0.2%	0.3%	1.3%	2.9%	4.9%	6.0%	6.5%	8.1%	7.9%	4.8%	3.1%	1.8%	0.8%	0.2%	0.0%	0.1%	0.0%
1996	0.0%	0.2%	0.5%	1.3%	2.0%	4.3%	6.6%	8.1%	8.3%	6.3%	3.7%	3.1%	0.9%	0.4%	0.1%	0.0%	0.0%	0.0%
1997	0.0%	0.3%	0.2%	2.1%	3.8%	4.3%	7.4%	8.0%	8.3%	7.0%	4.7%	2.8%	1.8%	1.1%	0.3%	0.0%	0.1%	0.0%
1998	0.2%	0.6%	0.7%	1.5%	2.3%	5.4%	8.3%	9.4%	6.5%	4.5%	4.1%	2.5%	1.6%	0.6%	0.3%	0.1%	0.1%	0.0%
1999	0.2%	0.0%	0.2%	0.8%	2.8%	5.5%	7.8%	8.8%	9.6%	6.1%	4.1%	1.9%	1.3%	0.8%	0.2%	0.1%	0.0%	0.0%
2000	0.0%	0.2%	0.3%	0.4%	2.2%	4.2%	7.5%	10.7%	10.4%	6.3%	4.1%	1.7%	0.8%	0.3%	0.1%	0.0%	0.0%	0.0%
2001	0.0%	0.0%	0.2%	0.1%	0.1%	2.4%	6.8%	10.9%	9.1%	6.4%	6.3%	3.5%	1.9%	0.0%	0.2%	0.2%	0.0%	0.0%
2002	0.1%	0.2%	0.6%	1.2%	1.2%	2.5%	3.7%	5.7%	10.1%	11.6%	8.2%	4.3%	2.3%	0.6%	0.2%	0.0%	0.0%	0.0%
2003	0.0%	0.1%	0.2%	0.6%	1.8%	2.9%	4.1%	6.0%	8.2%	9.0%	7.8%	5.1%	2.6%	0.9%	0.3%	0.2%	0.1%	0.0%
2004	0.0%	0.1%	0.5%	0.8%	2.3%	3.3%	6.7%	6.6%	7.3%	8.0%	8.1%	4.3%	1.5%	0.8%	0.3%	0.0%	0.1%	0.0%
2005	0.1%	0.0%	0.0%	0.2%	1.2%	3.6%	7.7%	8.5%	8.1%	7.4%	6.5%	3.9%	1.3%	1.0%	0.1%	0.1%	0.1%	0.0%

Table 14. Black rockfish fishery length composition data – sexed (continued).

Year	Length in cm <=24	24	26	Males 28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
OR-HKL																		
1992	0.0%	0.0%	0.0%	0.0%	2.0%	0.1%	0.6%	2.7%	7.7%	9.2%	12.2%	12.5%	5.7%	5.0%	0.3%	1.2%	0.0%	0.0%
1995	0.0%	0.0%	0.0%	0.4%	1.1%	2.4%	4.7%	4.1%	8.5%	8.2%	10.9%	6.3%	1.3%	0.7%	0.1%	0.0%	0.0%	0.0%
1996	0.0%	0.0%	0.0%	0.0%	0.4%	2.0%	3.3%	7.1%	9.7%	18.6%	15.2%	7.7%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.2%	0.3%	0.9%	1.7%	3.5%	7.3%	3.7%	10.3%	14.0%	12.5%	6.1%	2.1%	0.1%	0.1%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.4%	1.0%	2.1%	4.8%	6.9%	11.7%	11.1%	15.9%	10.1%	4.9%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
1999	0.0%	0.0%	0.0%	1.4%	1.6%	6.1%	7.4%	13.6%	9.2%	12.7%	4.0%	1.4%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.0%	0.0%	0.1%	0.3%	0.5%	2.6%	8.4%	8.7%	10.4%	7.4%	5.6%	3.3%	3.6%	0.4%	0.4%	0.0%	0.0%	0.0%
2001	0.0%	0.0%	0.0%	0.0%	0.2%	0.7%	3.2%	5.6%	10.5%	11.7%	7.3%	3.3%	1.0%	0.7%	0.0%	0.0%	0.0%	0.1%
2002*	0.0%	0.0%	0.0%	0.0%	0.3%	1.3%	2.2%	5.2%	9.0%	12.3%	9.3%	3.7%	1.4%	0.1%	0.0%	0.0%	0.0%	0.0%
2003*	0.0%	0.0%	0.0%	0.7%	2.2%	2.4%	2.7%	7.0%	13.5%	11.6%	7.9%	3.0%	1.2%	0.9%	0.0%	0.0%	0.0%	0.0%
2004*	0.0%	0.0%	0.0%	0.1%	0.9%	3.1%	5.9%	6.9%	8.2%	11.0%	9.2%	3.0%	1.0%	0.4%	0.0%	0.0%	0.0%	0.0%
2005*	0.0%	0.0%	0.0%	0.2%	1.0%	4.5%	9.4%	6.8%	8.4%	12.5%	7.8%	2.6%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%
2006	0.0%	0.0%	0.0%	0.3%	0.6%	1.7%	4.9%	7.6%	9.2%	11.6%	8.5%	4.2%	1.3%	0.5%	0.1%	0.0%	0.0%	0.0%
	* Sample age composition data used; length composition data not used.																	
OR-Rec-ORBS																		
1990	0.0%	0.0%	0.8%	0.3%	1.7%	2.4%	6.2%	7.9%	7.7%	9.0%	5.7%	3.6%	1.0%	1.0%	0.1%	0.0%	0.0%	0.0%
1991	0.0%	0.0%	0.8%	0.0%	1.2%	5.8%	9.2%	8.6%	5.8%	7.5%	3.3%	2.1%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%
1992	0.0%	0.1%	0.1%	1.0%	1.9%	2.7%	5.4%	9.5%	10.4%	9.8%	7.0%	3.2%	0.7%	0.2%	0.0%	0.1%	0.0%	0.0%
1993	0.1%	0.2%	0.8%	1.9%	2.3%	3.2%	4.6%	7.6%	12.1%	10.2%	8.5%	2.1%	0.9%	0.2%	0.0%	0.0%	0.0%	0.0%
1994	0.0%	0.0%	0.4%	0.8%	1.8%	3.2%	5.0%	6.1%	9.1%	8.7%	8.3%	5.4%	2.4%	0.3%	0.1%	0.0%	0.0%	0.0%
1995	0.0%	0.0%	0.2%	1.1%	2.8%	4.7%	8.2%	9.3%	8.8%	6.6%	5.3%	2.4%	1.1%	0.2%	0.3%	0.1%	0.0%	0.0%
1996	0.3%	0.7%	0.8%	1.4%	2.6%	5.1%	9.3%	8.8%	10.3%	8.3%	5.5%	1.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.1%	0.2%	0.9%	1.8%	4.9%	7.6%	6.8%	8.9%	7.1%	4.0%	2.4%	2.3%	0.8%	0.2%	0.0%	0.0%	0.0%
1998	0.3%	0.4%	0.9%	0.9%	2.1%	5.3%	9.1%	9.0%	8.0%	7.5%	3.9%	2.0%	1.1%	0.7%	0.2%	0.0%	0.0%	0.0%
1999	0.1%	0.2%	0.1%	0.6%	2.6%	5.3%	7.8%	9.7%	8.3%	6.2%	4.7%	2.3%	1.1%	0.7%	0.2%	0.0%	0.0%	0.0%
2000	0.1%	0.2%	0.2%	0.9%	2.8%	4.7%	10.2%	11.6%	9.1%	6.0%	3.4%	1.2%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%
2001	0.0%	0.0%	0.2%	0.0%	1.6%	2.7%	10.4%	13.2%	7.6%	8.1%	5.0%	2.0%	1.1%	0.0%	0.2%	0.0%	0.0%	0.0%
2002	0.0%	0.3%	0.8%	1.4%	1.3%	2.5%	5.1%	10.6%	12.3%	8.3%	3.4%	1.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
2003	0.1%	0.1%	0.5%	0.6%	2.3%	4.0%	5.9%	8.3%	12.2%	9.0%	4.0%	2.0%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%
2004	0.1%	0.1%	0.3%	0.6%	1.6%	4.7%	7.9%	9.6%	11.3%	7.9%	3.3%	1.4%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%
2005	0.0%	0.0%	0.0%	0.3%	0.9%	3.1%	6.0%	9.4%	11.8%	10.2%	5.4%	2.2%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%

Table 14. Black rockfish fishery length composition data - unsexed.

	Length in cm			Both sexes														
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
OR-TWL																		
1974	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	5.0%	16.0%	16.0%	18.0%	14.0%	11.0%	10.0%	6.0%	1.0%
1994	0.0%	0.0%	0.0%	4.9%	0.0%	0.0%	12.2%	4.9%	17.1%	9.8%	22.0%	17.1%	9.8%	2.4%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.0%	0.0%	1.7%	1.7%	0.0%	0.0%	0.0%	1.3%	6.1%	18.4%	33.1%	26.6%	5.7%	5.3%	0.0%	0.0%	0.0%
2001	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	35.0%	10.0%	20.0%	0.0%	5.0%	15.0%	5.0%	0.0%	0.0%
2005	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	22.2%	19.5%	11.1%	22.2%	8.3%	5.6%	0.0%	8.3%	0.0%	0.0%
OR-REC																		
1980	0.3%	0.6%	1.9%	7.0%	5.8%	7.2%	9.8%	12.9%	10.4%	10.7%	9.3%	8.4%	6.3%	5.5%	2.6%	1.2%	0.1%	0.0%
1981	0.6%	0.1%	3.4%	2.6%	7.8%	11.5%	11.1%	10.1%	11.3%	12.5%	8.0%	7.9%	7.0%	4.1%	0.9%	0.6%	0.1%	0.3%
1982	0.1%	0.2%	0.7%	2.7%	5.1%	10.0%	10.9%	13.4%	13.0%	12.9%	12.8%	7.3%	6.3%	2.9%	1.2%	0.1%	0.4%	0.0%
1983	0.0%	0.2%	2.3%	1.9%	6.7%	7.3%	16.8%	15.2%	13.5%	11.3%	10.4%	7.2%	3.7%	1.9%	0.0%	0.0%	1.1%	0.6%
1984	0.3%	0.3%	1.3%	2.4%	3.0%	8.8%	12.9%	18.6%	13.6%	12.9%	11.7%	7.0%	4.0%	2.0%	1.0%	0.3%	0.1%	0.0%
1985	0.7%	2.9%	1.7%	4.3%	7.8%	7.2%	10.7%	16.6%	14.1%	14.8%	9.3%	5.0%	2.5%	1.6%	0.4%	0.2%	0.2%	0.1%
1986	0.0%	0.9%	1.0%	3.2%	6.2%	6.5%	11.5%	15.7%	16.6%	18.9%	10.5%	5.8%	1.6%	1.1%	0.4%	0.0%	0.1%	0.0%
1987	1.4%	2.7%	3.4%	6.0%	8.1%	7.5%	8.7%	13.3%	8.1%	14.3%	9.8%	8.3%	4.0%	3.2%	0.6%	0.4%	0.0%	0.2%
1988	2.7%	2.7%	3.2%	5.4%	7.6%	10.6%	13.3%	15.7%	12.7%	10.6%	6.7%	3.8%	2.8%	1.7%	0.5%	0.1%	0.0%	0.0%
1989	0.6%	0.8%	1.0%	3.0%	4.6%	10.8%	12.3%	15.4%	12.9%	14.4%	11.0%	6.3%	3.8%	1.5%	0.3%	0.7%	0.1%	0.4%
1993	0.2%	0.2%	1.1%	2.7%	4.4%	10.2%	10.4%	17.3%	17.2%	14.2%	10.0%	7.2%	3.2%	1.3%	0.2%	0.1%	0.1%	0.0%
1994	0.5%	0.6%	1.0%	2.3%	4.9%	8.6%	12.0%	15.9%	14.4%	16.0%	10.8%	6.6%	3.1%	1.6%	0.6%	0.8%	0.3%	0.0%
1995	0.0%	0.3%	0.8%	2.7%	4.7%	11.1%	14.8%	17.0%	16.7%	15.1%	8.9%	4.0%	2.3%	1.4%	0.2%	0.0%	0.0%	0.0%
1996	0.0%	0.1%	1.6%	2.5%	4.6%	11.1%	12.7%	15.1%	17.0%	15.3%	11.3%	5.2%	2.0%	0.9%	0.3%	0.0%	0.0%	0.2%
1997	0.2%	0.2%	1.1%	2.8%	5.1%	11.4%	17.4%	17.0%	14.8%	12.6%	9.2%	5.3%	1.8%	0.9%	0.2%	0.2%	0.0%	0.0%
1998	0.1%	0.3%	1.4%	3.2%	5.5%	9.1%	13.2%	17.0%	17.7%	12.9%	10.0%	5.3%	2.5%	1.5%	0.2%	0.0%	0.0%	0.0%
1999	0.0%	0.1%	0.9%	3.1%	7.1%	13.1%	17.3%	18.9%	15.3%	11.7%	7.5%	2.8%	1.6%	0.4%	0.2%	0.0%	0.0%	0.0%
2000	0.2%	0.2%	1.1%	2.2%	5.3%	10.8%	17.6%	19.5%	17.6%	12.2%	7.8%	3.8%	0.9%	0.3%	0.1%	0.1%	0.0%	0.2%
2001	0.1%	0.2%	0.9%	2.0%	3.1%	6.3%	14.4%	21.8%	20.9%	15.1%	8.2%	4.3%	1.3%	0.6%	0.6%	0.2%	0.0%	0.0%
2002	0.0%	0.1%	0.8%	1.4%	3.6%	4.6%	9.8%	16.7%	22.1%	18.5%	12.3%	6.0%	2.6%	0.9%	0.5%	0.1%	0.1%	0.1%
OR-ORBS																		
1978	0.0%	0.0%	3.1%	5.4%	7.0%	6.6%	11.2%	10.4%	14.3%	12.7%	5.4%	8.5%	7.0%	5.4%	2.7%	0.4%	0.0%	0.0%
1979	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	6.4%	11.9%	14.3%	22.2%	22.2%	8.7%	7.9%	2.4%	0.8%	0.8%	0.8%	0.0%

Table 14. Black rockfish fishery length composition data – unsexed (continued).

	Length in cm			Both sexes														
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
OR-ORBS (cont.)																		
1980	0.0%	0.0%	0.0%	0.0%	2.0%	2.0%	12.0%	10.0%	16.0%	16.0%	32.0%	2.0%	6.0%	2.0%	0.0%	0.0%	0.0%	0.0%
1981	0.0%	0.0%	0.0%	0.0%	1.5%	4.4%	7.3%	8.7%	13.0%	17.4%	24.6%	14.5%	5.8%	2.9%	0.0%	0.0%	0.0%	0.0%
1982	0.0%	0.0%	0.0%	0.5%	0.0%	3.2%	5.3%	11.8%	8.6%	17.1%	18.2%	13.9%	8.6%	5.9%	4.8%	2.1%	0.0%	0.0%
1983	0.0%	0.0%	0.0%	1.0%	2.0%	9.9%	13.9%	18.8%	23.8%	16.8%	6.9%	3.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%
1984	0.0%	0.1%	0.0%	0.5%	1.4%	5.3%	11.4%	14.9%	16.9%	15.6%	11.8%	10.8%	4.7%	4.0%	1.5%	0.8%	0.4%	0.0%
1985	0.0%	0.0%	0.2%	0.2%	0.2%	3.3%	5.8%	15.2%	21.4%	14.6%	16.0%	10.7%	7.6%	3.9%	0.8%	0.2%	0.0%	0.0%
1986	0.0%	0.0%	0.3%	0.3%	1.8%	1.5%	5.0%	11.2%	17.4%	17.8%	12.9%	11.7%	9.8%	5.3%	3.2%	1.0%	0.8%	0.3%
1987	0.0%	0.3%	0.5%	0.8%	1.4%	1.7%	5.4%	10.3%	15.3%	18.8%	16.4%	12.3%	8.4%	5.2%	2.4%	0.6%	0.2%	0.0%
1988	0.0%	0.0%	0.0%	0.0%	0.6%	2.2%	4.2%	5.2%	9.0%	13.9%	18.3%	16.3%	14.0%	10.4%	3.6%	2.0%	0.4%	0.0%
1989	0.0%	0.0%	0.0%	0.0%	0.4%	1.1%	3.6%	8.0%	11.0%	13.2%	18.7%	17.5%	11.0%	7.8%	4.6%	2.1%	0.9%	0.0%
OR-ORBS-2																		
2001	0.2%	0.2%	0.6%	1.1%	2.8%	4.6%	8.6%	19.4%	22.4%	18.4%	10.5%	6.2%	3.1%	1.0%	0.6%	0.1%	0.1%	0.0%
2002	0.0%	0.9%	0.9%	1.5%	3.0%	4.0%	6.3%	13.2%	22.2%	20.0%	13.2%	8.2%	3.1%	2.0%	0.8%	0.4%	0.2%	0.2%
2003	0.0%	0.5%	0.2%	1.7%	3.6%	6.5%	8.0%	12.5%	15.6%	17.3%	14.7%	9.6%	4.7%	2.5%	1.2%	0.7%	0.6%	0.2%
2004	0.0%	0.0%	0.4%	0.9%	2.5%	5.7%	12.5%	13.1%	16.0%	17.1%	13.1%	9.9%	4.5%	2.8%	1.1%	0.2%	0.1%	0.0%
2005	0.0%	0.0%	0.2%	0.4%	2.1%	4.0%	11.6%	13.5%	19.8%	19.4%	13.5%	7.7%	4.8%	1.5%	0.7%	0.8%	0.0%	0.1%
2006	0.0%	0.0%	0.1%	0.7%	1.7%	5.9%	11.3%	15.6%	17.5%	18.2%	13.7%	7.9%	4.0%	1.4%	0.9%	0.6%	0.3%	0.2%
CA-HKL																		
1982	0.0%	0.0%	0.0%	1.8%	1.8%	3.6%	3.6%	14.5%	3.6%	14.5%	12.7%	18.2%	10.9%	7.3%	3.6%	1.8%	0.0%	1.8%
1983	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	4.2%	1.4%	9.9%	16.9%	26.8%	14.1%	12.7%	9.9%	2.8%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.5%	1.8%	7.0%	29.8%	22.8%	17.5%	8.8%	1.8%	0.0%	0.0%	0.0%
1985	0.0%	0.0%	0.0%	3.2%	3.2%	0.0%	6.5%	9.7%	9.7%	16.1%	19.4%	19.4%	6.5%	6.5%	0.0%	0.0%	0.0%	0.0%
1992	0.4%	1.6%	3.5%	2.8%	5.9%	6.6%	7.8%	10.0%	15.1%	16.9%	10.5%	8.8%	5.5%	3.7%	0.5%	0.1%	0.2%	0.0%
1993	0.2%	1.3%	3.5%	5.1%	6.3%	8.9%	10.2%	15.1%	16.2%	13.7%	9.5%	5.5%	2.2%	1.5%	0.3%	0.2%	0.0%	0.1%
1994	0.7%	1.0%	2.7%	5.2%	7.7%	10.9%	11.2%	12.6%	12.2%	12.7%	9.5%	6.8%	3.5%	1.7%	1.1%	0.2%	0.2%	0.0%
1995	0.1%	0.2%	1.4%	4.7%	9.7%	12.0%	13.3%	12.6%	14.5%	12.3%	8.3%	5.5%	3.5%	0.7%	0.6%	0.1%	0.3%	0.0%
1996	0.7%	0.7%	1.1%	3.6%	8.4%	11.5%	13.5%	13.5%	13.5%	12.0%	10.0%	6.2%	3.5%	1.0%	0.5%	0.3%	0.0%	0.0%
1997	0.1%	0.8%	1.4%	3.6%	7.1%	12.8%	18.0%	15.1%	12.8%	10.8%	7.9%	5.5%	2.3%	1.6%	0.2%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.3%	3.0%	7.0%	12.0%	13.0%	14.7%	14.3%	15.7%	11.0%	4.3%	2.3%	2.0%	0.3%	0.0%	0.0%	0.0%

Table 14. Black rockfish fishery length composition data – unsexed (continued).

	Length in cm			Both sexes														
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
CA-HKL (cont.)																		
1999	0.0%	0.2%	0.3%	1.3%	4.5%	10.3%	18.6%	18.6%	17.0%	12.8%	8.0%	4.1%	2.3%	1.4%	0.5%	0.1%	0.0%	0.0%
1999	0.0%	0.2%	0.3%	1.3%	4.5%	10.3%	18.6%	18.6%	17.0%	12.8%	8.0%	4.1%	2.3%	1.4%	0.5%	0.1%	0.0%	0.0%
2000	0.0%	0.0%	0.9%	2.3%	4.2%	11.7%	14.4%	17.7%	16.6%	14.4%	9.1%	4.9%	2.5%	0.7%	0.4%	0.4%	0.0%	0.0%
2001	0.0%	0.0%	0.3%	0.8%	2.7%	7.4%	12.0%	20.4%	20.3%	16.8%	9.9%	4.5%	2.9%	1.3%	0.6%	0.1%	0.0%	0.0%
2002	0.0%	0.0%	1.0%	2.0%	3.2%	7.3%	10.0%	17.1%	16.0%	13.8%	12.0%	8.0%	5.5%	2.7%	0.7%	0.8%	0.0%	0.0%
2003	0.0%	1.6%	2.4%	8.1%	6.5%	5.7%	6.5%	11.4%	12.2%	18.7%	13.0%	5.7%	4.9%	1.6%	0.0%	1.6%	0.0%	0.0%
2004	0.0%	0.4%	1.9%	3.1%	14.0%	11.7%	14.8%	10.9%	10.5%	10.1%	6.6%	8.6%	4.7%	1.6%	0.4%	0.8%	0.0%	0.0%
2005	0.0%	0.5%	4.1%	2.7%	9.1%	13.6%	19.1%	17.3%	10.5%	9.1%	6.8%	3.6%	1.8%	1.4%	0.5%	0.0%	0.0%	0.0%
2006	0.0%	0.0%	1.2%	3.3%	6.7%	13.4%	15.0%	15.4%	14.0%	10.6%	9.2%	5.5%	3.6%	1.4%	0.2%	0.2%	0.3%	0.0%
CA-TWL																		
1978	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	9.6%	15.4%	15.4%	15.4%	7.7%	11.5%	3.8%	5.8%	1.9%	7.7%
1980	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	1.5%	5.3%	8.3%	13.6%	16.7%	22.0%	12.1%	3.8%	7.6%	5.3%	3.0%
1981	0.0%	0.0%	0.0%	0.0%	1.5%	2.3%	2.3%	4.6%	6.2%	6.9%	12.3%	12.3%	16.2%	16.9%	8.5%	3.1%	4.6%	2.3%
1982	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	3.8%	5.1%	11.8%	10.5%	22.4%	13.4%	11.5%	11.8%	5.1%	3.2%	1.0%
1983	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	2.8%	8.0%	16.5%	17.5%	17.9%	14.6%	9.0%	7.1%	3.8%	2.4%
1984	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.7%	0.0%	0.0%	7.4%	25.0%	19.3%	19.9%	11.9%	6.8%	4.0%	1.7%	1.7%
1985	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	4.5%	10.8%	24.8%	22.9%	16.6%	9.6%	5.1%	5.1%	0.0%
1986	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	18.5%	22.2%	22.2%	11.1%	14.8%	7.4%	0.0%	0.0%
1987	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	3.8%	6.5%	15.2%	21.2%	25.0%	12.5%	6.5%	4.3%	2.7%
1988	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	4.8%	9.5%	14.3%	17.5%	15.9%	22.2%	11.1%	3.2%
1989	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	5.0%	8.8%	5.0%	15.0%	26.3%	17.5%	11.3%	7.5%	2.5%
1990*	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	20.0%	60.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1991	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	5.6%	13.9%	8.3%	22.2%	30.6%	8.3%	5.6%	0.0%	0.0%	0.0%
1992	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.2%	4.6%	24.6%	20.0%	18.5%	16.9%	3.1%	1.5%	0.0%	1.5%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.0%	4.0%	16.0%	20.0%	20.0%	12.0%	0.0%	8.0%	8.0%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	7.3%	8.5%	9.8%	9.8%	15.9%	17.1%	15.9%	6.1%	3.7%	4.9%	0.0%
1998*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	50.0%	16.7%	0.0%	16.7%	0.0%	0.0%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%	4.0%	12.0%	16.0%	24.0%	8.0%	16.0%	8.0%	0.0%	8.0%
2000	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%	8.0%	20.0%	28.0%	24.0%	12.0%	4.0%	0.0%	0.0%
2001	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%	4.3%	6.4%	8.5%	12.8%	17.0%	21.3%	4.3%	12.8%	2.1%	4.3%

Table 14. Black rockfish fishery length composition data – unsexed (continued).

	Length in cm			Both sexes														
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
CA-TWL (cont.)																		
2003	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.0%	21.1%	15.8%	21.1%	5.3%	15.8%	5.3%	10.5%	0.0%
2004*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	0.0%	33.3%	0.0%	33.3%	0.0%	0.0%	11.1%
	* Very small sample; excluded from model.																	
CA-REC																		
1980	0.1%	1.0%	1.3%	4.3%	6.7%	9.0%	10.2%	8.9%	10.8%	8.8%	10.5%	11.6%	5.8%	6.6%	2.4%	1.8%	0.0%	0.1%
1981	0.4%	0.6%	0.9%	2.0%	2.2%	6.7%	10.6%	13.2%	7.8%	11.1%	13.0%	10.3%	11.5%	5.9%	2.2%	1.3%	0.0%	0.3%
1982	0.2%	0.3%	0.4%	3.3%	6.8%	10.4%	9.3%	7.3%	10.2%	11.5%	9.8%	8.6%	9.5%	6.6%	3.2%	1.7%	0.4%	0.4%
1983	0.5%	0.0%	0.6%	2.3%	6.2%	8.8%	7.9%	9.0%	11.8%	11.1%	10.7%	9.1%	11.6%	8.4%	0.8%	0.6%	0.2%	0.4%
1984	1.4%	1.4%	4.6%	4.1%	7.8%	7.0%	8.0%	6.7%	11.2%	10.1%	12.9%	11.2%	5.7%	3.8%	1.4%	1.3%	0.9%	0.4%
1985	1.1%	1.9%	4.5%	9.5%	12.3%	11.5%	8.5%	8.1%	9.0%	7.6%	8.1%	6.0%	4.7%	4.7%	1.5%	0.9%	0.2%	0.0%
1986	0.4%	1.4%	2.4%	4.2%	8.3%	11.0%	10.6%	11.0%	10.3%	11.1%	9.7%	5.8%	7.1%	3.2%	2.2%	0.6%	0.5%	0.3%
1987	2.3%	3.8%	6.6%	8.0%	12.6%	11.2%	13.5%	11.3%	7.3%	3.4%	2.2%	5.9%	5.5%	3.9%	1.1%	0.7%	0.2%	0.4%
1988	2.7%	3.2%	6.1%	8.6%	12.8%	9.2%	16.0%	9.4%	9.1%	5.4%	3.1%	3.8%	5.1%	2.8%	1.5%	0.9%	0.0%	0.3%
1989	2.5%	4.3%	8.6%	12.3%	13.3%	15.4%	16.7%	8.6%	5.1%	3.9%	1.8%	3.4%	2.1%	1.8%	0.0%	0.0%	0.0%	0.2%
1993	2.2%	4.2%	7.1%	10.0%	14.6%	11.8%	9.3%	8.4%	7.4%	7.7%	6.7%	4.9%	3.1%	1.1%	1.0%	0.0%	0.0%	0.4%
1994	1.1%	2.3%	3.8%	11.1%	14.5%	15.4%	13.6%	9.9%	7.2%	7.4%	5.6%	4.1%	3.0%	0.8%	0.4%	0.1%	0.0%	0.1%
1995	1.8%	3.4%	5.5%	13.3%	19.8%	10.8%	8.8%	10.5%	7.8%	5.0%	4.5%	2.9%	2.3%	0.9%	0.9%	0.9%	0.3%	0.5%
1996	1.6%	1.0%	4.1%	8.4%	13.0%	13.1%	11.9%	7.9%	10.0%	9.3%	7.5%	6.0%	3.7%	1.6%	0.4%	0.1%	0.3%	0.1%
1997	4.1%	9.1%	12.9%	16.9%	17.4%	12.5%	8.4%	7.0%	3.3%	3.2%	2.0%	2.1%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%
1998	1.3%	2.8%	10.9%	17.3%	17.4%	11.7%	5.0%	7.3%	6.3%	9.8%	3.2%	2.0%	1.7%	0.5%	0.8%	1.8%	0.1%	0.0%
1999*	1.6%	3.5%	7.6%	15.9%	28.5%	22.8%	12.5%	4.5%	1.2%	0.9%	0.6%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
2000*	0.9%	3.1%	6.6%	18.7%	31.4%	22.1%	11.4%	2.0%	0.8%	0.7%	0.7%	0.5%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%
2001	1.9%	1.8%	5.5%	9.7%	16.6%	20.4%	17.2%	8.3%	7.9%	4.3%	3.0%	0.1%	1.2%	2.0%	0.2%	0.0%	0.1%	0.1%
2002	3.4%	5.8%	10.3%	9.1%	13.6%	17.0%	19.1%	9.6%	4.5%	2.2%	2.2%	1.2%	0.9%	0.7%	0.3%	0.2%	0.0%	0.1%
2003	1.4%	3.3%	10.6%	16.4%	20.3%	12.0%	7.0%	4.4%	4.9%	5.4%	4.8%	3.7%	3.1%	1.5%	0.8%	0.3%	0.0%	0.2%
2004	3.6%	4.9%	6.5%	13.0%	17.7%	17.2%	12.2%	6.1%	3.5%	4.5%	1.7%	3.3%	2.0%	1.7%	1.1%	0.3%	0.2%	0.3%
2005	0.8%	1.8%	3.6%	7.1%	12.3%	12.0%	10.8%	9.6%	8.7%	11.1%	8.6%	5.9%	3.5%	2.4%	0.7%	0.6%	0.2%	0.2%
2006	0.4%	1.2%	3.2%	6.9%	11.7%	13.4%	11.5%	8.2%	9.5%	8.6%	8.6%	6.8%	4.6%	3.0%	1.2%	0.7%	0.3%	0.2%
	* Extremely narrow distribution; excluded from model.																	

Table 14. Black rockfish fishery length composition data – unsexed (continued).

	Length in cm			Both sexes														
Year	<=24	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56+
CA-CPFV																		
1987*	2.1%	6.3%	10.4%	14.6%	10.4%	18.8%	16.7%	16.7%	2.1%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1988	1.4%	4.8%	12.2%	6.6%	6.5%	9.7%	13.1%	8.3%	6.4%	3.0%	3.6%	5.7%	5.9%	6.6%	3.4%	1.6%	0.7%	0.5%
1989	0.5%	1.5%	2.6%	6.6%	13.7%	18.5%	15.4%	10.1%	4.3%	4.4%	5.0%	4.2%	5.7%	3.6%	1.8%	1.3%	0.7%	0.0%
1990	1.1%	6.1%	8.4%	8.4%	22.2%	27.6%	17.2%	5.7%	1.9%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1991	3.8%	3.8%	14.2%	19.6%	18.2%	17.9%	12.9%	6.7%	1.9%	0.0%	0.4%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%
1992	0.5%	1.0%	5.5%	13.0%	12.0%	21.1%	13.8%	10.4%	5.7%	4.4%	3.6%	2.6%	3.6%	1.6%	0.8%	0.3%	0.0%	0.0%
1993	0.6%	3.7%	9.1%	12.8%	15.0%	11.8%	9.3%	5.2%	4.5%	5.9%	7.3%	5.2%	4.2%	3.0%	1.3%	0.7%	0.4%	0.0%
1994	2.7%	4.7%	10.4%	15.7%	22.0%	18.6%	9.5%	6.4%	1.9%	1.4%	1.9%	1.8%	1.4%	1.4%	0.3%	0.1%	0.1%	0.0%
1995	1.7%	9.5%	21.2%	26.5%	24.6%	12.4%	2.5%	1.0%	0.1%	0.1%	0.0%	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
1996	1.7%	3.1%	10.0%	18.8%	22.2%	17.4%	11.2%	5.4%	2.6%	1.8%	1.7%	1.5%	1.0%	1.1%	0.1%	0.0%	0.4%	0.0%
1997	2.4%	6.0%	15.3%	19.3%	22.2%	14.8%	10.1%	5.5%	1.8%	1.0%	0.4%	0.6%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%
1998	1.1%	4.7%	10.9%	23.3%	23.1%	14.2%	6.4%	2.2%	1.1%	2.2%	1.8%	4.2%	2.7%	1.3%	0.4%	0.2%	0.0%	0.0%

* Very small sample; excluded from model.

Table 15. Black rockfish fishery age composition data – sexed.

	Age in years.			Females														
Year	<4	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20+
OR-HKL																		
2002	0.0%	0.8%	3.4%	12.1%	5.4%	15.2%	6.1%	3.3%	3.0%	3.0%	0.7%	1.4%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
2003	0.1%	1.4%	4.5%	7.8%	4.9%	9.0%	7.8%	4.2%	2.9%	1.9%	0.3%	0.2%	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%
2004	0.0%	1.6%	9.1%	8.0%	6.4%	5.6%	3.1%	5.4%	5.1%	1.3%	0.9%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
2005	0.0%	0.0%	13.0%	12.7%	6.0%	3.1%	7.3%	0.4%	2.0%	0.2%	0.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OR-REC																		
1996	5.8%	9.4%	10.0%	8.9%	4.8%	2.3%	1.1%	0.9%	0.8%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	1.4%	6.9%	13.0%	10.8%	7.4%	4.7%	3.7%	1.9%	1.4%	0.4%	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
1998	3.2%	14.3%	13.7%	9.4%	6.6%	4.9%	0.9%	1.3%	0.2%	0.0%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1999	0.4%	7.7%	11.6%	11.3%	7.4%	5.9%	2.4%	2.5%	0.8%	0.4%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.8%	4.0%	13.4%	12.1%	7.9%	5.2%	2.8%	1.9%	0.9%	0.6%	0.3%	0.3%	0.2%	0.0%	0.2%	0.1%	0.0%	0.0%
2002	1.1%	1.6%	4.3%	8.7%	10.8%	9.8%	5.3%	3.4%	2.9%	1.7%	1.3%	0.4%	0.4%	0.4%	0.3%	0.2%	0.0%	0.3%
2003	0.2%	2.5%	6.5%	7.3%	10.1%	9.3%	5.3%	3.5%	2.3%	1.0%	0.9%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
2004	0.2%	3.0%	9.3%	8.3%	6.8%	6.9%	6.7%	3.8%	2.7%	1.6%	0.8%	0.4%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%
2005	0.0%	0.4%	7.9%	15.8%	6.2%	3.7%	6.9%	2.3%	2.1%	0.5%	1.4%	0.6%	0.3%	0.1%	0.3%	0.0%	0.0%	0.0%

Table 15. Black rockfish fishery age composition data – sexed (continued).

	Age in years.		Males															
Year	<4	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20+
OR-HKL																		
2002	0.0%	0.4%	4.2%	6.1%	6.6%	9.2%	6.7%	2.2%	3.7%	1.5%	1.5%	1.6%	0.8%	0.0%	0.0%	0.0%	0.1%	0.5%
2003	0.0%	0.7%	2.1%	5.6%	5.3%	8.6%	12.4%	5.5%	3.3%	6.0%	1.9%	1.3%	1.1%	0.3%	0.1%	0.4%	0.0%	0.1%
2004	0.0%	1.2%	5.9%	3.8%	4.8%	3.2%	9.9%	8.5%	4.5%	5.2%	0.9%	1.7%	0.4%	0.2%	0.1%	0.3%	0.8%	0.8%
2005	0.4%	2.7%	12.0%	10.2%	5.1%	4.1%	5.1%	5.2%	2.7%	2.8%	1.9%	1.1%	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%
OR-REC																		
1996	3.1%	7.7%	11.9%	11.4%	4.6%	3.4%	3.4%	2.2%	2.1%	1.1%	0.9%	1.3%	0.5%	0.0%	0.3%	0.4%	0.2%	0.6%
1997	1.4%	1.8%	6.8%	11.6%	9.0%	6.6%	1.4%	1.8%	3.1%	0.3%	0.3%	1.7%	0.9%	0.1%	0.2%	0.1%	0.0%	0.8%
1998	3.0%	4.6%	10.3%	11.4%	5.5%	3.8%	3.3%	1.5%	0.8%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999	0.7%	4.8%	10.3%	7.1%	7.9%	6.5%	3.9%	1.7%	1.9%	1.2%	0.9%	0.7%	0.1%	0.1%	0.2%	0.1%	0.2%	0.5%
2000	0.6%	4.7%	13.5%	11.5%	5.5%	3.8%	2.6%	2.0%	1.5%	1.1%	0.3%	0.5%	0.3%	0.6%	0.2%	0.2%	0.1%	0.2%
2002	1.3%	2.0%	5.5%	7.3%	9.4%	6.7%	4.1%	2.6%	2.4%	1.3%	0.9%	0.6%	0.8%	0.5%	0.7%	0.3%	0.2%	0.6%
2003	0.2%	2.1%	7.1%	8.5%	8.9%	7.1%	4.8%	3.9%	2.5%	2.5%	1.0%	0.8%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%
2004	0.0%	2.3%	10.3%	7.8%	6.6%	5.3%	5.9%	4.0%	1.8%	1.9%	1.1%	0.8%	0.5%	0.3%	0.1%	0.1%	0.1%	0.2%
2005	0.1%	0.7%	6.4%	11.0%	7.5%	5.5%	3.7%	3.9%	2.7%	3.5%	1.3%	1.9%	1.2%	0.4%	0.1%	0.7%	0.3%	0.7%

Table 16. Selecting black rockfish trips from RecFIN catch and effort data – Oregon.

Logistic regression coefficients for species co-caught with black rockfish, ocean charter/party boat trips only (N trips = 9120).

Species	Coeff	N trips	Trips w Blck
tiger rockfish	4.375	125	104
copper rockfish	2.898	523	495
dungeness crab	2.132	439	350
kelp greenling	1.481	1504	1408
vermilion rockfish	1.474	476	433
blue rockfish	1.374	3699	3277
cabezon	1.349	1479	1380
China rockfish	1.052	935	857
quillback rockfish	0.878	762	668
lingcod	0.568	3652	2970
bocaccio	-0.114	94	7
canary rockfish	-0.504	2041	1400
yellowtail rockfish	-0.633	1997	1329
rosethorn rockfish	-0.857	191	19
greenstriped rockfish	-0.873	175	5
yelloweye rockfish	-1.779	814	368
widow rockfish	-1.919	290	74
coho salmon	-2.346	1038	120
albacore	-2.521	153	3
chinook salmon	-2.585	1258	157
Pacific halibut	-3.448	661	41

Cut-off probability for selection = 0.68

Table 17. Selecting black rockfish trips from RecFIN catch and effort data – California.

Logistic regression coefficients for species co-caught with black rockfish, ocean charter/party boat trips only (N trips = 9089).

Species	Coeff	N trips	Trips w Blck
black and yellow rockfish	1.344	129	107
gopher rockfish	0.926	1492	932
cabezon	0.784	326	226
kelp greenling	0.709	363	230
vermilion rockfish	0.451	1410	650
China rockfish	0.401	930	513
lingcod	0.224	1776	642
blue rockfish	0.064	3370	1333
brown rockfish	-0.083	1134	478
yelloweye rockfish	-0.129	374	33
quillback rockfish	-0.178	183	49
olive rockfish	-0.192	798	234
copper rockfish	-0.216	812	184
canary rockfish	-0.337	1786	238
starry rockfish	-0.621	539	26
Pacific sanddab	-0.736	272	23
yellowtail rockfish	-0.764	2980	415
speckled rockfish	-0.791	203	6
chub (Pacific) mackerel	-0.810	119	10
widow rockfish	-0.820	737	41
greenstriped rockfish	-1.121	479	5
rosy rockfish	-1.179	835	52
flag rockfish	-1.291	161	2
bocaccio rockfish	-1.395	1028	27
greenspotted rockfish	-1.747	928	11
chinook salmon	-3.356	1877	39
rockfish genus	-3.650	436	7
chilipepper rockfish	-3.993	714	2
sablefish	-4.163	83	0

Cut-off probability for selection = 0.42

Table 18. Summary of RecFIN catch-per-angler data used for the CPUE analysis – Oregon.

Number of trips interviewed.

Year	Tillamook	Lincoln	Coos	Curry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980	6	63	5	1	25	17			27	6	75
1981		47	2		7	13			23	6	49
1982	3	58	1		13	14	13		14	8	62
1983	7	52		1	1	31	22			6	60
1984	14	65	27	7	9	14	60		28	5	116
1985	13	90	33	7	21	9	46		53	14	143
1986	8	50	54	1	1	19	66		24	3	113
1987	8	118	16	2	24	21	37		38	24	144
1988	4	170	7	20	48	60	22		44	28	202
1989		212	10	2	25	63	30		103	8	229
1990											
1991											
1992											
1993	12	238	66	23	28	70	142		69	31	340
1994	16	234	53	57		81	120		159		360
1995	16	153	48	62		68	143		62	6	279
1996	7	205	48	21	29	66	95		78	13	281
1997	38	322	85	54	19	76	88	222	63	31	499
1998	30	220	63	65	2	43	117	126	86	4	378
1999	54	315	64	65	18	62	131	133	149	5	498
2000	24	229	12	48	27	77	80	56	54	19	313
2001	26	98	54	28	22	37	66	40	20	21	206
2002	18	152	48	43	15	83	51	58	46	8	261
2003		49		6	14	41					55
Total	490	3785	888	658	348	1222	1777	1081	1162	246	5836

Table 19. Summary of RecFIN catch-per-angler data – Oregon (continued).

Percentage of trips catching black rockfish.

Year	Tillamook	Lincoln	Coos	Curry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980	33.3%	79.4%	20.0%	100.0%	56.0%	52.9%			96.3%	83.3%	72.0%
1981		93.6%	100.0%		85.7%	100.0%			91.3%	100.0%	93.9%
1982	100.0%	91.4%	0.0%		100.0%	92.9%	76.9%		92.9%	87.5%	90.3%
1983	85.7%	82.7%		100.0%	100.0%	87.1%	72.7%			100.0%	83.3%
1984	100.0%	80.0%	81.5%	100.0%	88.9%	71.4%	96.7%		64.3%	80.0%	84.5%
1985	100.0%	85.6%	93.9%	85.7%	57.1%	100.0%	93.5%		92.5%	100.0%	88.8%
1986	100.0%	96.0%	100.0%	100.0%	100.0%	100.0%	100.0%		91.7%	100.0%	98.2%
1987	100.0%	65.3%	75.0%	100.0%	83.3%	66.7%	59.5%		76.3%	58.3%	68.8%
1988	100.0%	77.1%	14.3%	90.0%	70.8%	78.3%	95.5%		79.5%	60.7%	76.2%
1989		85.4%	100.0%	50.0%	72.0%	98.4%	96.7%		82.5%	37.5%	86.0%
1990											
1991											
1992											
1993	100.0%	87.4%	74.2%	95.7%	67.9%	88.6%	83.8%		92.8%	90.3%	85.9%
1994	100.0%	90.2%	83.0%	96.5%		92.6%	92.5%		88.1%		90.6%
1995	100.0%	93.5%	83.3%	100.0%		95.6%	94.4%		90.3%	83.3%	93.5%
1996	85.7%	89.8%	77.1%	100.0%	93.1%	90.9%	87.4%		89.7%	61.5%	88.3%
1997	94.7%	95.7%	98.8%	94.4%	100.0%	98.7%	93.2%	96.4%	93.7%	96.8%	96.0%
1998	93.3%	95.5%	90.5%	100.0%	100.0%	100.0%	97.4%	94.4%	90.7%	100.0%	95.2%
1999	92.6%	92.1%	79.7%	93.8%	77.8%	98.4%	96.2%	91.0%	83.9%	100.0%	90.8%
2000	95.8%	93.0%	66.7%	100.0%	100.0%	96.1%	86.3%	91.1%	98.1%	94.7%	93.3%
2001	100.0%	96.9%	98.1%	100.0%	95.5%	97.3%	100.0%	97.5%	100.0%	95.2%	98.1%
2002	88.9%	94.7%	100.0%	95.3%	100.0%	95.2%	94.1%	93.1%	97.8%	100.0%	95.4%
2003		100.0%		100.0%	100.0%	100.0%					100.0%
Total	94.5%	90.8%	89.4%	97.6%	81.9%	93.8%	93.5%	95.3%	87.3%	83.3%	91.6%

Table 20. Summary of RecFIN catch-per-angler data – Oregon (continued).

Catch per angler-day for trips catching black rockfish.

Year	Tillamook	Lincoln	Coos	Curry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980	9.71	5.10	2.50		6.89	7.13			3.59	5.35	5.23
1981		7.36	3.50		6.54	8.11			7.17	5.83	7.18
1982	7.50	6.71			8.52	8.53	3.76		7.08	2.73	6.73
1983	9.33	3.74		5.00	3.50	4.71	4.82			1.33	4.50
1984	8.81	3.07	6.24	8.63	1.91	2.03	6.25		4.05	1.22	4.64
1985	9.83	4.55	4.12	5.60	2.40	4.16	6.88		4.14	5.51	5.06
1986	5.82	4.18	7.41	4.00	13.00	2.52	7.14		3.16	7.83	5.65
1987	9.88	3.61	4.02	6.10	4.21	4.62	4.54		3.03	4.53	4.10
1988	13.50	4.02	0.50	2.67	4.68	3.13	3.79		4.45	4.17	4.00
1989		6.54	8.33	8.50	5.07	7.89	8.47		5.25	1.29	6.63
1990											
1991											
1992											
1993	9.31	5.21	5.35	6.77	7.41	6.56	4.82		6.94	1.90	5.46
1994	7.07	4.33	5.41	6.62		5.72	4.59		4.76		4.94
1995	7.64	5.41	5.75	7.98		8.09	6.40		3.74	2.28	6.24
1996	10.11	5.46	7.58	5.28	3.90	6.49	6.35		5.96	2.85	5.87
1997	7.25	4.92	6.67	6.65	5.20	6.63	6.85	5.40	4.22	4.80	5.63
1998	5.96	6.16	6.77	7.08	8.25	6.90	6.64	6.68	5.38	6.75	6.41
1999	5.68	5.23	7.25	5.24	5.05	7.52	5.80	5.18	4.46	10.30	5.56
2000	6.99	5.59	4.38	5.67	5.35	6.66	5.42	4.71	6.28	4.38	5.68
2001	6.66	4.42	6.37	6.81	4.83	6.47	6.60	5.47	4.53	2.92	5.57
2002	7.09	5.94	7.94	4.20	4.71	7.65	6.57	4.06	5.51	5.11	5.97
2003		6.19		5.10	5.48	6.34					6.08
Total	6.81	5.35	6.45	6.26	5.12	6.43	6.14	5.59	5.00	4.05	5.75

Table 21. Summary of RecFIN catch-per-angler data used for the CPUE analysis – California.

Number of trips interviewed.

Year	Del Norte	Humboldt	Mendocino	Sonoma	San Mateo	Santa Cruz	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980				2	4		1	1	2		2		6
1981	1		3						1	2	1		4
1982		1	3						1	1		2	4
1983			2		1	5			2	5	1		8
1984			1	3	1	4			3		6		9
1985	2		3	4	23	3	2	4	4	12	9	4	35
1986			5	1	9	14			13	10	4	2	29
1987				6	9				2		9	4	15
1988		1		1	23	1	1	1	4	9	11		26
1989		1	5			15				18	3		21
1990													
1991													
1992													
1993													
1994													
1995	3	4	9	3	1					19		1	20
1996	8	8	18	26	14	38	1		17	42	50	2	112
1997				14	3	6			2	11	6	4	23
1998		3	1	4	18	6				10	12	10	32
1999		3	12	10	28	25	7	4	10	38	18	1	78
2000				11	30	14			30	14	2	9	55
2001		8	2	8	128	32	1		65	72	34	6	178
2002			6	39	71	56	1		9	114	48		172
2003	8	20	38	92	132	89	6		2	197	112	62	379
2004	6	11	28	72	87	133	53		6	130	148		337
2005	1	26	13	21	82	90			1	86	105	41	233
2006	12	61		35	129	97			14	154	136	30	334
Total	41	147	149	352	793	628	73	10	188	944	717	178	2110

Table 22. Summary of RecFIN catch-per-angler data – California (continued).

Percentage of trips catching black rockfish.

Year	Del Norte	Humboldt	Mendocino	Sonoma	San Mateo	Santa Cruz	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980				50.0%	25.0%		0.0%	0.0%	50.0%		50.0%		33.3%
1981	100.0%		33.3%						0.0%	100.0%	0.0%		50.0%
1982		100.0%	33.3%						100.0%	0.0%		50.0%	50.0%
1983			0.0%		0.0%	0.0%			0.0%	0.0%	0.0%		0.0%
1984			0.0%	100.0%	0.0%	25.0%			100.0%		16.7%		44.4%
1985	50.0%		0.0%	25.0%	91.3%	0.0%	0.0%	25.0%	50.0%	100.0%	44.4%	100.0%	65.7%
1986			20.0%	0.0%	11.1%	64.3%			30.8%	70.0%	0.0%	0.0%	37.9%
1987				16.7%	44.4%				50.0%		33.3%	25.0%	33.3%
1988		100.0%		0.0%	52.2%	100.0%	100.0%	0.0%	0.0%	77.8%	54.5%		53.8%
1989		0.0%	40.0%			0.0%				0.0%	66.7%		9.5%
1990													
1991													
1992													
1993													
1994													
1995	100.0%	75.0%	100.0%	33.3%	0.0%					84.2%		0.0%	80.0%
1996	100.0%	87.5%	44.4%	69.2%	21.4%	63.2%	0.0%		58.8%	54.8%	68.0%	50.0%	60.7%
1997				100.0%	100.0%	100.0%			100.0%	100.0%	100.0%	100.0%	100.0%
1998		66.7%	100.0%	100.0%	27.8%	50.0%				60.0%	58.3%	20.0%	46.9%
1999		66.7%	50.0%	0.0%	57.1%	96.0%	0.0%	50.0%	40.0%	71.1%	83.3%	0.0%	61.5%
2000				90.9%	93.3%	71.4%			90.0%	85.7%	0.0%	100.0%	87.3%
2001		100.0%	0.0%	62.5%	78.1%	40.6%	0.0%		70.8%	77.8%	55.9%	83.3%	70.8%
2002			16.7%	64.1%	93.0%	89.3%	0.0%		66.7%	81.6%	89.6%		82.6%
2003	100.0%	75.0%	55.3%	77.2%	53.8%	55.1%	100.0%		100.0%	72.6%	48.2%	48.4%	62.0%
2004	66.7%	100.0%	32.1%	58.3%	81.6%	57.9%	28.3%		100.0%	66.9%	71.6%		63.5%
2005	100.0%	88.5%	46.2%	19.0%	56.1%	41.1%			100.0%	60.5%	38.1%	58.5%	50.2%
2006	91.7%	93.4%		57.1%	49.6%	59.8%			92.9%	73.4%	56.6%	23.3%	62.9%
Total	90.2%	88.4%	44.3%	62.5%	64.6%	57.6%	30.1%	30.0%	68.6%	70.7%	58.3%	49.4%	62.9%

Table 23. Summary of RecFIN catch-per-angler data – California (continued).

Catch per angler-day for trips catching black rockfish.

Year	Del Norte	Humboldt	Mendocino	Sonoma	San Mateo	Santa Cruz	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec	Total
1980				1.00	2.50				2.50		1.00		1.75
1981	4.33		1.00							2.67			2.67
1982		1.00	4.00						1.00			4.00	2.50
1983													
1984				12.67		0.50			12.67		0.50		9.63
1985	1.00			1.50	5.13			1.50	1.50	6.42	4.50	2.71	4.80
1986			7.00		2.00	1.67			2.00	2.29			2.18
1987				2.00	5.25				2.00		6.00	3.00	4.60
1988		12.50			3.25	1.00	1.00			3.57	4.42		3.75
1989			3.50								3.50		3.50
1990													
1991													
1992													
1993													
1994													
1995	10.00	1.33	3.72	2.00						4.34			4.34
1996	13.88	5.24	1.25	2.81	0.61	2.31			11.40	2.87	2.46	2.00	3.90
1997				6.78	4.70	1.77			1.23	8.13	3.35	1.93	5.20
1998		8.00	2.00	3.17	1.60	0.59				5.00	1.11	1.34	2.70
1999		4.50	1.75		4.34	4.47		7.00	2.00	3.91	4.58		4.09
2000				6.00	2.64	5.55			3.73	5.63		2.33	3.94
2001		3.73		3.60	4.17	1.37			4.36	3.59	3.89	1.35	3.83
2002			1.00	3.59	3.73	3.26			2.11	3.51	3.73		3.52
2003	8.00	2.35	3.52	3.37	2.77	1.70	3.83		1.92	3.02	3.00	2.42	2.95
2004	4.22	6.52	2.67	4.36	3.87	1.94	1.90		8.21	3.51	3.18		3.36
2005	8.00	8.06	2.33	2.00	2.62	2.22			8.00	4.73	2.76	2.24	3.57
2006	6.45	6.71		2.70	1.98	2.29			8.10	4.11	2.33	2.57	3.65
Total	8.27	6.03	2.85	3.89	3.36	2.42	2.39	5.17	5.11	3.79	3.05	2.30	3.56

Table 24. PIT tagging study estimates of black rockfish abundance off Newport, OR.

		Recovery Year				
Tag Year	N Tagged	1	2	3	4	5
2002	2312	51	51	41	27	16
2003	2461		41	51	54	52
2004	2527			59	73	60
2005	2622				55	58
2006	2574					89
	12496	51	92	151	209	275
Est. fishery landings		63,251	72,178	58,895	66,721	63,586
Landings scanned		50,994	49,982	44,412	56,264	55,117
Sampling rate		80.6%	69.2%	75.4%	84.3%	86.7%
Year-1 recovery rate		2.21%	1.67%	2.33%	2.10%	3.46%
Observed recovery rate			3.83%	3.23%	2.64%	
Exploitation rate			5.53%	4.28%	3.13%	
Revised est. abundance			1,305,793	1,375,807	2,130,612	
CV (Ni)			19.36%	15.72%	17.65%	

Table 25. Estimates of relative black rockfish habitat area off Oregon.

Spatial Cell	Major Port	Habitat area (km^2) From all observer data	From similar number of locations per spatial cell	Linear km of coastline
A	Garibaldi	9.25	5.44	40.13
B	Pacific City	5.38	5.04	40.13
C	Depoe Bay	18.91	8.16	40.13
D	Newport	22.77	8.87	40.13
E	Reedsport	0.43	0.43	110.89
F	Charleston	20.16	8.92	40.20
G	Port Orford	15.12	9.41	44.15
H	Gold Beach	6.09	6.09	40.03
I	Brookings	15.25	7.14	35.21
Cape Falcon to OR/CA border	All	113.36	59.50	431.00
PMFC Area 2C	Garibaldi to Newport	56.31	27.50	163.07
PIT tag area total	Newport	23.41	9.36	38.47
PIT tag area as percent of OR assessment area.		21%	16%	9%

Table 26. Final base-run model input variance adjustments from iterative model tuning.

		- - - - - - Effective N multipliers - - - - - -		
Likelihood Component	Index extra CV	Length comp	Age comp	Len-at-age
Oregon HKL fishery		0.9098	1.5815	
Oregon TWL fishery		5.5968		
Oregon REC fishery		0.7116		
California HKL fishery		1.6377		
California TWL fishery		3.3032		
California REC fishery		0.3747		
Oregon REC survey 1	0.1661			
Oregon REC survey 2				
Oregon ORBS survey 1	0.1991	0.7873	0.528	0.6998
Oregon ORBS survey 2	0.0598			
Oregon ORBS survey 3				
Oregon tag abundance	0.0473			
California REC survey 1	0.2461			
California REC survey 2	0.1041			
California CPFV survey	0.0900	0.9891		
Pre-recruit survey	0.3680			

Table 27. Final base-run model profile over unexploited recruitment (R0).

Values marked in bold and highlighted indicate the minimum negative log-likelihood value for the given row.

Component		ln(R0) = / R0 =	8.6 / 5432	8.7 / 6003	8.8 / 6634	8.9 / 7332	9.0 / 8103	9.1 / 8955	9.2 / 9897
	Lambda	Min Like	- - - - - Change in neg. ln(Like) from Minimum Value - - - - -						
Total		1406.7	12.7	6.2	2.1	0.3	**0.0**	0.9	2.5
Indices		-74.4	5.4	2.8	1.0	0.2	**0.0**	0.2	0.7
OREC-1	1	-18.3	2.7	1.6	0.7	0.2	**0.0**	0.1	0.3
OREC-2	1	-8.9	1.3	0.8	0.5	0.2	0.1	0.0	**0.0**
ORBS-1	1	-16.7	2.2	1.4	0.8	0.4	0.1	0.0	**0.0**
ORBS-2	1	-9.2	1.6	1.0	0.6	0.3	0.2	0.1	**0.0**
ORBS-3	1	-5.2	**0.0**	0.1	0.2	0.3	0.3	0.3	0.3
TAGS	1	-3.3	0.3	0.2	0.1	0.1	0.0	0.0	**0.0**
CREC-1	1	-3.8	**0.0**	0.1	0.3	0.6	0.9	1.2	1.4
CREC-2	1	-9.2	**0.0**	0.5	1.0	1.3	1.6	1.8	1.9
CPFV	1	-3.8	0.2	0.1	0.0	**0.0**	0.0	0.0	0.0
JUV	1	0.8	0.3	0.2	0.1	0.1	0.1	0.0	**0.0**
MnWt	1	-83.0	0.1	0.1	0.1	0.1	0.1	0.0	**0.0**
Length		1377.3	6.0	4.7	3.4	2.1	1.1	0.4	**0.0**
OHKL	1	73.5	3.0	2.6	2.1	1.5	1.0	0.5	**0.0**
OTWL	1	64.4	1.6	1.2	0.8	0.5	0.3	0.1	**0.0**
OREC	1	267.5	**0.0**	1.2	2.5	3.5	4.4	5.1	5.8
CHKL	1	173.1	1.0	1.0	0.9	0.7	0.4	0.2	**0.0**
CTWL	1	138.3	**0.0**	0.2	0.8	1.4	2.1	2.6	3.0
CREC	1	252.1	3.5	2.6	1.6	0.9	0.3	0.1	**0.0**
ORBS	1	244.3	0.3	0.1	0.1	**0.0**	0.0	0.0	0.1
CPFV	1	155.3	5.5	4.6	3.5	2.5	1.5	0.7	**0.0**
Age		163.0	**0.0**	1.9	4.3	7.0	9.7	12.4	15.0
OHKL	1	48.6	**0.0**	0.3	0.6	1.1	1.6	2.1	2.6
ORBS	1	114.4	**0.0**	1.7	3.7	5.9	8.2	10.4	12.4
Len-at-Age	1	31.4	11.9	10.0	7.8	5.5	3.4	1.6	**0.0**
Recruits	1	-15.5	4.0	1.3	0.2	**0.0**	0.3	0.8	1.4
ForecastRecr	1	-6.9	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0
Spawning-0			3195	3522	3883	4282	4722	5209	5748
Spawning-2006			1434	1789	2250	2801	3434	4147	4940
Depletion			44.9%	50.8%	57.9%	65.4%	72.7%	79.6%	85.9%
MSY			719	794	876	967	1068	1180	1303
Tag-Q			27.6%	22.5%	18.1%	14.7%	12.1%	10.1%	8.5%

Table 28. Final base-run model profile over spawner-recruit steepness (H).

Values marked in bold and highlighted indicate the minimum negative log-likelihood value for the given table.

Component	Lambda	H =	0.40	0.50	0.55	0.60	0.65	0.70	0.80
	Lambda	Min Like	- - - - - Change in neg. ln(Like) from Minimum Value - - - - -						
Total		1406.3	2.4	0.8	0.5	0.3	0.2	0.1	**0.0**
Indices		-74.4	0.3	0.0	**0.0**	0.0	0.0	0.1	0.1
OREC-1	1	-18.3	0.2	0.0	0.0	0.0	**0.0**	0.0	0.0
OREC-2	1	-8.9	0.4	0.2	0.1	0.1	0.1	0.0	**0.0**
ORBS-1	1	-16.6	0.2	0.1	0.0	0.0	0.0	0.0	**0.0**
ORBS-2	1	-9.1	0.5	0.2	0.2	0.1	0.1	0.0	**0.0**
ORBS-3	1	-5.0	**0.0**	0.1	0.1	0.1	0.1	0.1	0.1
TAGS	1	-3.3	0.1	0.1	0.0	0.0	0.0	0.0	**0.0**
CREC-1	1	-3.4	**0.0**	0.2	0.3	0.4	0.4	0.5	0.6
CREC-2	1	-8.2	**0.0**	0.3	0.5	0.5	0.6	0.7	0.7
CPFV	1	-3.8	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0
JUV	1	0.7	0.2	0.1	0.1	0.1	0.1	0.0	**0.0**
MnWt	1	-82.9	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Length		1377.0	**0.0**	1.1	1.5	1.8	2.0	2.1	2.4
OHKL	1	74.4	**0.0**	0.2	0.2	0.3	0.3	0.3	0.3
OTWL	1	64.3	**0.0**	0.2	0.3	0.4	0.5	0.5	0.6
OREC	1	269.4	**0.0**	1.3	1.8	2.2	2.5	2.8	3.3
CHKL	1	172.7	**0.0**	0.6	0.7	0.9	1.0	1.1	1.2
CTWL	1	139.2	3.4	1.9	1.4	1.0	0.7	0.4	**0.0**
CREC	1	252.3	**0.0**	0.1	0.2	0.2	0.2	0.2	0.2
ORBS	1	244.1	**0.0**	0.1	0.2	0.2	0.2	0.2	0.2
CPFV	1	157.0	0.1	0.2	0.1	0.1	0.1	0.1	**0.0**
Age		171.5	2.4	0.9	0.6	0.4	0.2	0.1	**0.0**
OHKL	1	50.0	0.6	0.2	0.1	0.1	0.1	0.0	**0.0**
ORBS	1	121.6	1.8	0.7	0.4	0.3	0.2	0.1	**0.0**
Len-at-Age	1	33.9	**0.0**	1.1	1.4	1.5	1.6	1.7	1.8
Recruits	1	-16.3	4.0	2.0	1.4	1.0	0.6	0.4	**0.0**
ForecastRecr	1	-6.9	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0

	0.40	0.50	0.55	0.60	0.65	0.70	0.80
Spawning-0	5094	4757	4655	4579	4518	4470	4396
Spawning-2006	2700	3004	3125	3227	3312	3384	3499
Depletion	53.0%	63.2%	67.1%	70.5%	73.3%	75.7%	79.6%
MSY	578	898	978	1035	1078	1111	1158
Tag-Q	15.2%	13.7%	13.2%	12.8%	12.5%	12.3%	11.9%

Table 29. Final base-run model parameter values.

Parameter	Value	Est?
Natural Mortality		
Male and female to age-10	0.16	No
Female age 15+	0.24	No
Growth for females		
Length at age-1	11.522	Yes
Length at age-20	51.016	Yes
von Bertalanffy K	0.17074	Yes
CV of length, all ages	0.07	No
Growth for males		
Length at age-1, exp. offset from fem	0	No
Length at age-20, exp. offset from fem	-0.12832	Yes
von Bertalanffy K, exp. offset from fem	0.25892	Yes
CV of length, all ages	0.07	No
Recruitment		
Ln(virgin recruitment, R0)	8.9685	Yes
Steepness	0.6	No
Recruitment variability, Sigma-R	0.5	No
Catchability coefficients		
Ln(OR tagging study, Tag-Q)	-2.0537	Yes

Table 29. Final base-run model parameter values (continued).

Selection Curves

Parameter	Value	Est?	Bound?	Value	Est?	Bound?
Double normal selection curves						
Oregon HKL fishery				California HKL fishery		
Length at peak	40.454	Yes		38.547	Yes	
Width of top	-3.6261	Yes		-6	Yes	Low
Ln(ascending width)	3.6337	Yes		3.9335	Yes	
Ln(descending width)	3.2559	Yes		4.1424	Yes	
Initial selection as logistic	-6	Yes	Low	-6	Yes	Low
Final selection as logistic	-1.8071	Yes		-1.7015	Yes	
Oregon REC fishery				California REC fishery		
Length at peak	38.469	Yes		32.437	Yes	
Width of top	-6	Yes	Low	-5.9908	Yes	Low
Ln(ascending width)	3.8369	Yes		3.6169	Yes	
Ln(descending width)	3.4028	Yes		-1.0171	Yes	
Initial selection as logistic	-6	Yes	Low	-5.6639	Yes	
Final selection as logistic	-1.5458	Yes		0.5058	Yes	
Oregon ORBS survey				California CPFV survey		
Length at peak	39.936	Yes		30.618	Yes	
Width of top	-6	Yes	Low	-6	Yes	Low
Ln(ascending width)	3.7489	Yes		3.0868	Yes	
Ln(descending width)	2.9344	Yes		2.3073	Yes	
Initial selection as logistic	-6	Yes	Low	-5.8454	Yes	
Final selection as logistic	-0.7477	Yes		-0.9587	Yes	
Logistic curves						
Oregon and California TWL fisheries						
Length for 50% selection	45.594	Yes				
Width for 95% selection	7.9284	Yes				

Table 29. Final base-run model parameter values (continued).

Recruitment Deviations

Year	Value	Year	Value
1970	0.34653	1990	0.21164
1971	0.17462	1991	0.32010
1972	-0.10649	1992	0.46725
1973	-0.13996	1993	0.24488
1974	0.02668	1994	0.97211
1975	-0.20653	1995	0.57847
1976	0.05747	1996	0.12007
1977	-0.41779	1997	0.20362
1978	-0.26723	1998	0.13304
1979	-0.43430	1999	0.85944
1980	-0.70754	2000	0.40075
1981	-0.29607	2001	0.27490
1982	-0.39544	2002	-0.02050
1983	-0.26560	2003	-0.61986
1984	-0.06498	2004	-0.29549
1985	0.10825	2005	-0.34315
1986	-0.31381	2006	-0.31180
1987	-0.03292		
1988	-0.35632		
1989	0.09599		

Table 30. Final base-run model time-trajectories of population estimates.

Year	Total Biomass (mt)	Age 2+ Biomass (mt)	Spawning Output (mil. larvae)	Depletion	Age-0 Recruits (1000s)	Spawning Potential Ratio	Total Catch (mt)	Total Exploit. Rate
1915	29344	29100	4578.5	100.0%	7852	100.0%	0.0	0.0%
1916	29344	29100	4578.5	100.0%	7852	99.9%	2.9	0.0%
1917	29341	29097	4578.0	100.0%	7852	99.8%	5.9	0.0%
1918	29336	29091	4577.1	100.0%	7852	99.7%	8.8	0.0%
1919	29328	29083	4575.7	99.9%	7851	99.6%	11.7	0.0%
1920	29317	29073	4573.8	99.9%	7851	99.5%	14.7	0.1%
1921	29305	29061	4571.6	99.8%	7850	99.4%	17.6	0.1%
1922	29291	29047	4568.9	99.8%	7849	99.3%	20.5	0.1%
1923	29276	29032	4565.9	99.7%	7848	99.2%	23.5	0.1%
1924	29259	29015	4562.7	99.7%	7847	99.1%	26.4	0.1%
1925	29241	28997	4559.2	99.6%	7846	99.0%	29.3	0.1%
1926	29222	28978	4555.4	99.5%	7845	98.9%	32.3	0.1%
1927	29202	28958	4551.5	99.4%	7844	98.8%	35.2	0.1%
1928	29181	28937	4547.5	99.3%	7843	98.8%	34.4	0.1%
1929	29163	28919	4543.8	99.2%	7842	97.9%	63.1	0.2%
1930	29119	28875	4536.0	99.1%	7840	97.9%	62.5	0.2%
1931	29079	28835	4528.4	98.9%	7838	98.1%	55.5	0.2%
1932	29052	28808	4521.5	98.8%	7836	98.6%	41.7	0.1%
1933	29041	28797	4517.8	98.7%	7834	98.8%	35.4	0.1%
1934	29039	28795	4515.5	98.6%	7834	98.5%	45.5	0.2%
1935	29027	28784	4513.2	98.6%	7833	98.2%	53.3	0.2%
1936	29009	28766	4510.0	98.5%	7832	98.0%	60.5	0.2%
1937	28985	28742	4506.4	98.4%	7831	98.2%	53.7	0.2%
1938	28971	28727	4503.4	98.4%	7830	98.1%	55.0	0.2%
1939	28957	28713	4500.3	98.3%	7829	97.7%	67.9	0.2%
1940	28932	28688	4495.0	98.2%	7828	97.9%	64.0	0.2%
1941	28913	28670	4491.0	98.1%	7827	98.0%	61.1	0.2%
1942	28899	28656	4488.1	98.0%	7826	98.0%	58.6	0.2%
1943	28890	28646	4485.3	98.0%	7825	94.9%	157.7	0.5%
1944	28789	28546	4464.6	97.5%	7819	92.0%	249.2	0.9%
1945	28627	28384	4416.7	96.5%	7804	86.0%	458.7	1.6%
1946	28309	28067	4321.9	94.4%	7775	87.4%	396.9	1.4%
1947	28085	27843	4257.6	93.0%	7755	90.7%	277.3	1.0%
1948	27991	27750	4232.4	92.4%	7746	93.0%	204.0	0.7%
1949	27971	27730	4230.9	92.4%	7746	93.5%	187.8	0.7%

Table 30. Final base-run model time-trajectories of population estimates (continued).

Year	Total Biomass (mt)	Age 2+ Biomass (mt)	Spawning Output (mil. larvae)	Depletion	Age-0 Recruits (1000s)	Spawning Potential Ratio	Total Catch (mt)	Total Exploit. Rate
1950	27963	27722	4234.9	92.5%	7747	92.4%	220.5	0.8%
1951	27922	27681	4232.5	92.4%	7746	91.2%	257.2	0.9%
1952	27848	27607	4221.9	92.2%	7743	92.9%	201.6	0.7%
1953	27825	27584	4225.2	92.3%	7744	92.7%	205.8	0.7%
1954	27798	27557	4224.8	92.3%	7744	91.6%	241.6	0.9%
1955	27735	27494	4217.2	92.1%	7741	91.4%	246.3	0.9%
1956	27671	27430	4207.6	91.9%	7738	93.4%	183.7	0.7%
1957	27669	27428	4210.1	92.0%	7739	92.4%	210.7	0.8%
1958	27640	27399	4206.7	91.9%	7738	89.7%	286.8	1.0%
1959	27539	27298	4190.6	91.5%	7733	90.3%	272.5	1.0%
1960	27457	27217	4176.1	91.2%	7728	90.5%	264.6	1.0%
1961	27391	27151	4162.4	90.9%	7723	93.0%	191.0	0.7%
1962	27400	27159	4164.7	91.0%	7724	92.6%	204.6	0.7%
1963	27395	27155	4164.7	91.0%	7724	90.8%	258.1	0.9%
1964	27343	27103	4153.1	90.7%	7720	92.7%	202.7	0.7%
1965	27349	27109	4153.6	90.7%	7720	89.8%	285.7	1.0%
1966	27276	27036	4140.2	90.4%	7716	90.4%	265.5	1.0%
1967	27225	26985	4134.2	90.3%	7714	89.3%	296.7	1.1%
1968	27143	26903	4124.1	90.1%	7710	89.0%	305.3	1.1%
1969	27059	26820	4110.1	89.8%	7706	86.0%	399.5	1.5%
1970	26926	26654	4078.4	89.1%	9603	83.5%	470.6	1.7%
1971	26707	26434	4035.9	88.1%	8071	86.7%	369.7	1.4%
1972	26699	26481	4008.1	87.5%	6085	83.4%	470.9	1.8%
1973	26621	26435	3966.3	86.6%	5873	82.9%	480.4	1.8%
1974	26479	26279	3932.0	85.9%	6927	79.6%	589.6	2.2%
1975	26085	25894	3888.3	84.9%	5474	82.7%	479.6	1.8%
1976	25760	25562	3876.8	84.7%	7124	77.5%	642.6	2.5%
1977	25087	24910	3847.2	84.0%	4423	77.3%	637.8	2.5%
1978	24466	24316	3808.9	83.2%	5132	76.3%	659.0	2.7%
1979	23668	23521	3737.9	81.6%	4326	67.3%	967.0	4.1%
1980	22540	22424	3584.4	78.3%	3264	68.5%	898.7	4.0%
1981	21446	21317	3419.6	74.7%	4878	56.1%	1344.9	6.3%
1982	19831	19689	3168.1	69.2%	4344	50.9%	1455.3	7.3%
1983	18183	18040	2904.9	63.4%	4848	51.5%	1303.5	7.2%
1984	16739	16572	2676.5	58.5%	5806	49.2%	1206.9	7.2%

Table 30. Final base-run model time-trajectories of population estimates (continued).

Year	Total Biomass (mt)	Age 2+ Biomass (mt)	Spawning Output (mil. larvae)	Depletion	Age-0 Recruits (1000s)	Spawning Potential Ratio	Total Catch (mt)	Total Exploit. Rate
1985	15526	15329	2469.2	53.9%	6759	48.5%	1134.8	7.3%
1986	14537	14368	2253.9	49.2%	4320	58.2%	767.4	5.3%
1987	14181	14025	2108.9	46.1%	5610	65.1%	591.4	4.2%
1988	14038	13890	2000.2	43.7%	3994	63.7%	616.8	4.4%
1989	14037	13876	1916.1	41.9%	6193	56.3%	798.8	5.7%
1990	13804	13600	1843.6	40.3%	6865	53.2%	882.1	6.4%
1991	13610	13385	1793.6	39.2%	7582	50.1%	962.5	7.1%
1992	13474	13220	1744.1	38.1%	8700	40.0%	1269.3	9.4%
1993	13206	12966	1652.9	36.1%	6836	51.3%	868.9	6.6%
1994	13709	13375	1627.9	35.6%	14068	52.7%	842.9	6.1%
1995	14234	13873	1614.2	35.3%	9461	54.1%	847.3	6.0%
1996	15215	14978	1632.7	35.7%	6007	55.9%	850.5	5.6%
1997	16302	16105	1684.3	36.8%	6603	59.5%	814.3	5.0%
1998	17373	17174	1778.8	38.8%	6270	64.7%	754.7	4.3%
1999	18447	18133	1923.6	42.0%	13305	69.3%	703.2	3.8%
2000	19202	18866	2126.8	46.5%	8678	73.0%	655.4	3.4%
2001	20203	19946	2375.1	51.9%	7900	66.5%	876.0	4.3%
2002	20844	20630	2580.9	56.4%	6013	72.9%	689.1	3.3%
2003	21618	21475	2759.6	60.3%	3359	61.9%	1060.9	4.9%
2004	21788	21662	2844.9	62.1%	4681	74.1%	686.5	3.2%
2005	21918	21775	2970.5	64.9%	4510	73.7%	717.7	3.3%
2006	21699	21555	3100.3	67.7%	4700	76.5%	627.2	2.9%
2007	21300	21109	3226.5	70.5%	7339	74.1%	na	na

Table 31. Final base-run model estimates of numbers-at-age by sex.

Females (1000s)

Age	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
0	3926	3926	3926	3926	3926	3925	3925	3925	3924	3924	3923	3923	3922	3922	3921	3920	3919
1	3346	3346	3346	3345	3345	3345	3345	3345	3344	3344	3344	3343	3343	3342	3342	3341	3340
2	2851	2851	2851	2851	2851	2851	2851	2850	2850	2850	2850	2849	2849	2848	2848	2848	2847
3	2429	2429	2429	2429	2429	2429	2429	2429	2429	2429	2428	2428	2428	2428	2427	2427	2427
4	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2069	2069	2069	2069	2068	2068	2068
5	1764	1764	1764	1764	1764	1764	1764	1764	1763	1763	1763	1763	1763	1762	1762	1761	1761
6	1503	1503	1503	1503	1503	1502	1502	1502	1502	1502	1501	1501	1501	1500	1500	1499	1498
7	1281	1281	1281	1281	1280	1280	1280	1279	1279	1278	1278	1278	1277	1277	1277	1275	1274
8	1092	1092	1091	1091	1091	1090	1090	1089	1089	1088	1088	1088	1087	1086	1086	1084	1083
9	930	930	930	930	929	929	928	928	927	927	926	926	925	925	924	923	921
10	793	793	793	792	792	792	791	791	790	789	789	788	788	787	787	785	784
11	675	675	675	675	675	675	674	674	673	673	672	671	671	670	670	669	667
12	566	566	566	566	566	566	565	565	564	564	563	563	562	562	561	560	559
13	467	467	467	467	467	467	467	466	466	465	465	465	464	464	463	462	461
14	380	380	380	380	379	379	379	379	379	378	378	377	377	377	376	375	375
15	303	303	303	303	303	303	303	303	303	302	302	302	301	301	301	300	300
16	239	239	239	239	239	239	238	238	238	238	238	237	237	237	237	236	236
17	188	188	188	188	188	188	188	187	187	187	187	187	187	186	186	186	185
18	148	148	148	148	148	148	148	147	147	147	147	147	147	147	146	146	146
19	116	116	116	116	116	116	116	116	116	116	116	116	116	115	115	115	115
20	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	90
21	72	72	72	72	72	72	72	72	72	72	72	72	72	71	71	71	71
22	57	57	57	57	57	57	57	56	56	56	56	56	56	56	56	56	56
23	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
24	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
25	28	28	28	28	28	28	28	27	27	27	27	27	27	27	27	27	27
26	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	21
27	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
28	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
29	11	11	11	11	11	11	11	11	11	11	11	11	11	10	10	10	10
30	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
31	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6
32	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
33	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
34	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
35	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
37	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Females (1000s)

Age	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
0	3918	3917	3917	3917	3916	3916	3915	3915	3914	3913	3913	3912	3909	3902	3888	3877	3873
1	3339	3339	3338	3338	3337	3337	3337	3336	3336	3335	3335	3334	3334	3331	3325	3313	3304
2	2846	2846	2845	2844	2844	2844	2844	2843	2843	2843	2842	2842	2841	2841	2839	2834	2823
3	2426	2426	2425	2424	2424	2424	2423	2423	2423	2423	2422	2422	2421	2421	2421	2419	2414
4	2068	2067	2067	2066	2066	2065	2065	2065	2065	2064	2064	2064	2063	2063	2063	2062	2060
5	1761	1761	1761	1760	1759	1759	1759	1759	1758	1758	1758	1758	1757	1757	1757	1755	1754
6	1498	1499	1500	1499	1498	1497	1497	1497	1496	1496	1496	1496	1494	1494	1494	1492	1491
7	1274	1275	1276	1276	1275	1273	1273	1273	1272	1272	1272	1273	1269	1268	1267	1266	1266
8	1083	1084	1085	1085	1085	1083	1082	1082	1082	1081	1081	1081	1078	1076	1072	1071	1072
9	921	921	922	923	923	922	921	920	919	919	919	919	915	911	905	903	905
10	783	783	784	784	785	784	783	783	782	781	781	781	777	772	763	760	761
11	666	666	666	667	667	667	667	666	665	664	664	664	661	655	644	638	639
12	558	558	558	558	558	558	558	558	557	556	556	555	553	547	535	528	527
13	461	460	460	459	459	459	459	459	459	458	458	457	455	450	438	431	429
14	374	374	373	373	372	372	372	372	372	372	371	371	369	364	354	347	344
15	299	298	298	298	297	297	297	297	297	297	297	296	295	290	281	275	272
16	235	235	234	234	234	233	233	233	233	233	233	233	231	228	220	215	212
17	185	185	184	184	184	184	183	183	183	183	183	183	182	179	173	168	166
18	146	145	145	145	145	144	144	144	144	144	144	143	143	140	136	132	130
19	115	114	114	114	114	114	113	113	113	113	113	113	112	110	106	103	101
20	90	90	90	90	89	89	89	89	89	89	89	88	88	87	83	81	80
21	71	71	71	71	70	70	70	70	70	70	70	69	69	68	65	64	62
22	56	56	56	56	55	55	55	55	55	55	55	55	54	53	51	50	49
23	44	44	44	44	44	44	43	43	43	43	43	43	43	42	40	39	38
24	35	35	34	34	34	34	34	34	34	34	34	34	34	33	32	31	30
25	27	27	27	27	27	27	27	27	27	27	27	27	26	26	25	24	24
26	21	21	21	21	21	21	21	21	21	21	21	21	21	20	20	19	19
27	17	17	17	17	17	17	17	17	17	17	16	16	16	16	15	15	15
28	13	13	13	13	13	13	13	13	13	13	13	13	13	13	12	12	11
29	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9
30	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7
31	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
32	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4
33	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
34	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
35	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
37	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Females (1000s)

Age	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
0	3873	3874	3873	3872	3872	3872	3871	3869	3870	3869	3866	3864	3862	3862	3862	3860	3860
1	3301	3300	3301	3301	3299	3300	3299	3298	3297	3297	3297	3295	3293	3291	3291	3291	3289
2	2815	2812	2812	2813	2812	2811	2812	2812	2811	2809	2810	2809	2807	2806	2804	2804	2804
3	2405	2399	2396	2396	2397	2396	2395	2396	2395	2395	2393	2394	2393	2392	2390	2389	2389
4	2056	2048	2042	2040	2039	2039	2039	2037	2038	2037	2033	2033	2034	2035	2034	2032	2032
5	1753	1749	1741	1735	1732	1732	1731	1729	1729	1728	1721	1720	1721	1725	1725	1723	1724
6	1491	1489	1484	1477	1472	1470	1467	1466	1466	1464	1458	1454	1454	1458	1460	1460	1460
7	1266	1265	1263	1258	1252	1248	1244	1242	1242	1242	1237	1232	1230	1232	1234	1235	1236
8	1073	1073	1072	1068	1065	1060	1055	1052	1052	1052	1049	1045	1042	1041	1042	1043	1046
9	907	909	908	905	904	902	896	892	891	890	888	885	882	881	881	880	883
10	765	767	767	766	765	764	761	756	754	753	751	749	747	746	745	743	744
11	643	646	647	646	647	646	644	641	639	637	634	632	631	631	630	628	627
12	530	534	536	536	537	537	536	534	533	531	528	525	524	524	524	522	522
13	430	433	435	436	438	438	438	437	437	436	432	430	428	428	429	427	427
14	344	346	347	348	350	351	351	351	351	351	349	346	344	344	345	344	343
15	271	272	273	273	275	277	277	277	278	278	276	275	273	273	273	272	272
16	211	211	211	211	212	214	215	215	216	216	215	214	213	213	212	211	211
17	165	164	164	163	164	165	166	167	167	168	167	167	166	166	166	165	164
18	128	128	127	126	127	127	128	129	130	130	130	130	129	129	129	128	128
19	100	100	99	98	98	98	99	99	100	101	101	101	100	101	101	100	100
20	79	78	77	77	76	76	76	77	77	78	78	78	78	78	78	78	78
21	62	61	60	60	60	59	59	59	60	60	60	60	60	61	61	61	61
22	48	48	47	47	46	46	46	46	46	46	46	47	47	47	47	47	47
23	38	38	37	37	36	36	36	36	36	36	36	36	36	36	37	37	37
24	30	29	29	29	28	28	28	28	28	28	28	28	28	28	28	28	28
25	23	23	23	22	22	22	22	22	22	22	21	21	21	22	22	22	22
26	18	18	18	18	17	17	17	17	17	17	17	17	17	17	17	17	17
27	14	14	14	14	14	14	13	13	13	13	13	13	13	13	13	13	13
28	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10
29	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8
30	7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	6
31	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
32	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
33	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
34	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2
35	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
36	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Females (1000s)

Age	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	3858	3857	3855	3853	4801	4035	3043	2937	3463	2737	3562	2211	2566	2163	1632	2439	2172
1	3289	3288	3287	3285	3283	4092	3439	2593	2502	2951	2332	3035	1884	2186	1843	1391	2078
2	2803	2803	2801	2801	2799	2797	3486	2930	2209	2132	2515	1987	2586	1606	1863	1570	1185
3	2389	2388	2388	2386	2386	2384	2383	2970	2495	1881	1816	2141	1692	2202	1367	1586	1337
4	2030	2029	2027	2027	2025	2021	2023	2020	2514	2110	1592	1534	1810	1431	1860	1156	1335
5	1720	1717	1713	1712	1710	1701	1705	1702	1695	2103	1768	1327	1280	1511	1189	1552	952
6	1457	1452	1446	1444	1439	1432	1433	1431	1424	1412	1757	1467	1101	1062	1242	983	1259
7	1233	1230	1223	1219	1213	1206	1206	1202	1198	1187	1181	1459	1217	912	868	1021	791
8	1044	1041	1036	1031	1023	1016	1015	1012	1007	999	994	981	1209	1007	743	711	816
9	882	880	877	873	864	856	854	850	847	839	836	825	813	1000	818	606	565
10	744	744	741	738	731	723	719	714	711	704	701	693	683	672	812	666	481
11	626	627	626	624	618	611	606	600	596	591	588	581	574	565	546	660	526
12	519	519	519	518	514	508	503	497	493	487	485	480	474	467	451	435	512
13	425	424	423	423	420	415	411	406	401	396	394	389	385	379	367	354	332
14	342	341	340	339	337	334	331	326	322	317	315	311	307	303	294	283	265
15	271	270	269	268	266	264	262	258	255	251	248	244	241	238	231	223	208
16	211	210	210	209	207	205	203	201	198	195	193	189	187	184	179	172	161
17	164	164	163	163	161	159	158	156	154	151	150	147	145	143	138	133	124
18	127	127	127	127	125	124	122	121	119	118	116	114	113	111	107	103	96
19	99	99	99	99	98	96	95	94	93	91	90	89	87	86	83	79	74
20	77	77	77	77	76	75	74	73	72	71	70	69	68	67	64	62	57
21	60	60	60	60	59	58	58	57	56	55	54	54	53	52	50	48	44
22	47	47	47	46	46	45	45	44	44	43	42	42	41	40	39	37	34
23	37	36	36	36	36	35	35	34	34	33	33	32	32	31	30	29	27
24	28	28	28	28	28	27	27	27	26	26	26	25	25	24	23	22	21
25	22	22	22	22	22	21	21	21	21	20	20	20	19	19	18	17	16
26	17	17	17	17	17	17	16	16	16	16	15	15	15	15	14	13	13
27	13	13	13	13	13	13	13	13	12	12	12	12	12	11	11	10	10
28	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	8	8
29	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	6	6
30	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5
31	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4
32	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3
33	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2
34	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
35	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
36	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
40	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Females (1000s)

Age	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0	2424	2903	3380	2160	2805	1997	3097	3433	3791	4350	3418	7034	4731	3003	3302	3135	6653
1	1851	2065	2474	2880	1841	2390	1702	2639	2925	3230	3707	2912	5994	4031	2559	2813	2672
2	1771	1577	1759	2107	2453	1568	2036	1450	2248	2492	2751	3158	2481	5106	3434	2180	2397
3	1008	1507	1342	1497	1793	2089	1335	1734	1234	1913	2120	2342	2688	2112	4348	2925	1857
4	1123	851	1265	1123	1257	1513	1763	1125	1459	1039	1607	1782	1971	2267	1785	3682	2478
5	1093	927	692	1025	920	1042	1253	1450	923	1198	844	1311	1461	1622	1875	1485	3074
6	763	876	730	545	823	751	849	1006	1156	736	934	668	1046	1167	1304	1520	1214
7	997	599	678	567	434	666	606	670	786	901	555	725	523	818	918	1035	1221
8	621	774	460	524	449	349	535	475	519	605	667	428	564	406	637	721	824
9	639	481	596	356	414	362	280	420	368	399	446	516	332	438	316	501	575
10	442	496	373	462	283	334	291	221	328	284	296	348	403	260	344	250	401
11	375	344	388	291	369	229	270	231	174	255	214	233	274	318	206	274	202
12	404	289	267	299	230	295	182	212	181	134	191	167	182	214	250	163	219
13	386	308	222	204	234	181	232	142	165	138	100	147	129	141	167	196	129
14	246	290	234	167	157	182	141	178	109	125	102	77	112	99	109	129	153
15	193	183	218	174	128	120	139	107	135	82	91	77	58	85	75	83	100
16	150	141	135	160	131	96	91	104	80	100	59	68	57	43	64	57	63
17	115	110	105	99	120	99	73	68	78	59	73	44	51	43	33	49	43
18	89	85	82	77	75	91	74	55	51	58	43	55	33	38	33	25	37
19	69	65	63	60	58	57	69	56	41	38	42	32	41	25	29	25	19
20	53	51	49	47	45	44	43	52	42	31	28	32	24	31	19	22	19
21	41	39	38	36	35	34	33	32	39	32	22	21	24	18	23	14	17
22	32	30	29	28	27	27	26	25	24	29	23	17	16	18	14	18	11
23	25	23	23	22	21	21	20	20	19	18	21	17	13	12	14	11	14
24	19	18	17	17	16	16	16	15	15	14	13	16	13	10	9	10	8
25	15	14	14	13	13	12	12	12	11	11	10	10	12	10	7	7	8
26	12	11	11	10	10	10	9	9	9	9	8	8	8	9	8	6	5
27	9	9	8	8	8	7	7	7	7	7	6	6	6	6	7	6	4
28	7	7	6	6	6	6	6	5	5	5	5	5	5	4	4	5	4
29	5	5	5	5	5	4	4	4	4	4	4	4	4	3	3	3	4
30	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3
31	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
32	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
33	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
34	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
36	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
38	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Females (1000s)

Age	2000	2001	2002	2003	2004	2005	2006	2007
0	4339	3950	3007	1680	2341	2255	2350	3670
1	5669	3697	3366	2562	1431	1995	1921	2002
2	2276	4830	3150	2868	2182	1219	1699	1637
3	2041	1939	4113	2683	2441	1859	1039	1447
4	1573	1731	1638	3485	2255	2071	1575	880
5	2071	1318	1438	1371	2859	1892	1732	1319
6	2526	1710	1076	1187	1106	2365	1561	1435
7	985	2063	1380	879	950	905	1934	1284
8	985	801	1658	1123	702	774	738	1587
9	665	801	644	1350	899	572	631	606
10	466	543	647	526	1084	735	469	520
11	327	382	441	531	425	891	604	387
12	162	265	307	357	423	345	723	493
13	174	130	210	245	282	340	276	582
14	101	138	102	166	191	223	269	219
15	119	79	106	79	127	149	174	210
16	76	91	60	82	60	98	115	134
17	48	59	70	46	62	46	75	88
18	33	37	45	53	35	48	36	58
19	29	26	29	35	41	27	37	28
20	15	22	20	22	26	31	21	28
21	15	11	17	15	17	20	24	16
22	13	11	9	13	11	13	16	19
23	8	10	9	7	10	9	10	12
24	10	7	8	7	5	8	7	8
25	6	8	5	6	5	4	6	5
26	6	5	6	4	4	4	3	5
27	4	5	4	5	3	3	3	2
28	3	3	4	3	4	2	3	2
29	3	3	2	3	2	3	2	2
30	3	3	2	2	2	2	2	1
31	2	2	2	2	1	2	1	2
32	2	2	2	2	1	1	1	1
33	1	1	1	1	1	1	1	1
34	1	1	1	1	1	1	1	1
35	1	1	1	1	1	1	1	1
36	1	1	1	1	1	1	1	1
37	0	0	0	0	0	0	0	1
38	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0
40	1	1	1	1	1	1	1	1

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
0	3926	3926	3926	3926	3926	3925	3925	3925	3924	3924	3923	3923	3922	3922	3921	3920	3919
1	3346	3346	3346	3345	3345	3345	3345	3345	3344	3344	3344	3343	3343	3342	3342	3341	3340
2	2851	2851	2851	2851	2851	2851	2851	2850	2850	2850	2850	2849	2849	2848	2848	2848	2847
3	2429	2429	2429	2429	2429	2429	2429	2429	2429	2429	2428	2428	2428	2428	2427	2427	2427
4	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2069	2069	2069	2069	2068	2068	2068
5	1764	1764	1764	1764	1764	1764	1764	1764	1763	1763	1763	1763	1763	1762	1762	1761	1761
6	1503	1503	1503	1503	1503	1503	1502	1502	1502	1502	1501	1501	1501	1500	1500	1499	1498
7	1281	1281	1281	1281	1280	1280	1280	1279	1279	1279	1278	1278	1278	1277	1277	1275	1274
8	1092	1092	1091	1091	1091	1090	1090	1090	1089	1089	1088	1088	1087	1087	1087	1085	1084
9	930	930	930	930	929	929	929	928	928	927	927	926	926	925	925	923	922
10	793	793	793	792	792	792	791	791	790	789	789	788	788	787	787	785	784
11	675	675	675	675	675	674	674	674	673	672	672	671	671	670	670	668	667
12	576	576	576	575	575	575	574	574	573	573	572	572	571	571	570	569	568
13	490	490	490	490	490	490	489	489	489	488	488	487	486	486	485	484	483
14	418	418	418	418	418	417	417	417	416	416	415	415	414	414	413	413	412
15	356	356	356	356	356	356	355	355	355	354	354	354	353	353	352	351	351
16	303	303	303	303	303	303	303	303	302	302	302	301	301	300	300	299	299
17	259	259	259	259	258	258	258	258	258	257	257	257	256	256	256	255	254
18	220	220	220	220	220	220	220	220	220	219	219	219	218	218	218	217	217
19	188	188	188	188	188	188	187	187	187	187	187	186	186	186	186	185	185
20	160	160	160	160	160	160	160	160	159	159	159	159	159	158	158	158	157
21	136	136	136	136	136	136	136	136	136	136	136	135	135	135	135	134	134
22	116	116	116	116	116	116	116	116	116	116	116	115	115	115	115	115	114
23	99	99	99	99	99	99	99	99	99	99	98	98	98	98	98	98	97
24	84	84	84	84	84	84	84	84	84	84	84	84	84	84	83	83	83
25	72	72	72	72	72	72	72	72	72	72	72	71	71	71	71	71	71
26	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	60	60
27	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	51
28	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
29	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	37	37
30	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
31	28	28	28	28	28	28	27	27	27	27	27	27	27	27	27	27	27
32	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
33	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
34	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
35	15	15	15	15	15	15	14	14	14	14	14	14	14	14	14	14	14
36	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
37	11	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10
38	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
39	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
40	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	43

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
0	3918	3917	3917	3917	3916	3916	3915	3915	3914	3913	3913	3912	3909	3902	3888	3877	3873
1	3339	3339	3338	3338	3337	3337	3337	3336	3336	3335	3335	3334	3334	3331	3325	3313	3304
2	2846	2846	2845	2844	2844	2844	2844	2843	2843	2843	2842	2842	2841	2841	2839	2834	2823
3	2426	2426	2425	2424	2424	2424	2423	2423	2423	2423	2422	2422	2421	2421	2421	2419	2414
4	2067	2067	2067	2066	2065	2065	2065	2065	2065	2064	2064	2064	2063	2063	2063	2062	2060
5	1761	1761	1761	1760	1760	1759	1759	1759	1758	1758	1758	1758	1757	1757	1757	1756	1755
6	1499	1499	1500	1499	1498	1497	1497	1497	1497	1496	1496	1497	1495	1495	1494	1493	1492
7	1275	1275	1277	1276	1275	1274	1273	1273	1273	1273	1273	1273	1270	1270	1269	1268	1267
8	1084	1084	1086	1086	1085	1084	1083	1083	1082	1082	1082	1082	1079	1078	1076	1075	1075
9	921	922	923	923	923	922	921	921	920	920	920	920	917	915	911	910	910
10	784	784	784	785	785	784	784	783	782	782	782	782	779	776	772	769	770
11	667	666	667	667	667	667	667	666	666	665	665	664	662	659	653	650	650
12	567	567	567	567	567	567	567	567	566	566	565	565	562	559	553	549	548
13	483	482	482	482	482	482	482	482	482	481	481	480	478	475	469	464	463
14	411	411	411	410	410	410	410	410	410	409	409	408	406	403	397	393	391
15	350	350	349	349	349	348	348	348	348	348	348	347	346	343	337	333	331
16	298	298	297	297	297	296	296	296	296	296	296	296	294	291	286	282	280
17	254	253	253	253	253	252	252	252	252	251	251	251	250	248	243	239	237
18	216	216	216	215	215	215	214	214	214	214	214	214	213	211	206	203	201
19	184	184	184	183	183	183	183	182	182	182	182	182	181	179	175	173	171
20	157	157	156	156	156	156	155	155	155	155	155	154	154	152	149	147	145
21	134	134	133	133	133	133	132	132	132	132	131	131	131	129	127	125	123
22	114	114	114	113	113	113	113	113	112	112	112	112	111	110	108	106	105
23	97	97	97	97	96	96	96	96	96	95	95	95	95	94	92	90	89
24	83	83	83	82	82	82	82	82	81	81	81	81	80	80	78	76	76
25	71	70	70	70	70	70	70	70	69	69	69	69	68	68	66	65	64
26	60	60	60	60	60	60	59	59	59	59	59	59	58	58	56	55	55
27	51	51	51	51	51	51	51	50	50	50	50	50	50	49	48	47	46
28	44	44	44	43	43	43	43	43	43	43	43	43	42	42	41	40	39
29	37	37	37	37	37	37	37	37	37	36	36	36	36	36	35	34	34
30	32	32	32	32	31	31	31	31	31	31	31	31	31	30	30	29	29
31	27	27	27	27	27	27	27	27	27	26	26	26	26	26	25	25	24
32	23	23	23	23	23	23	23	23	23	23	22	22	22	22	21	21	21
33	20	20	20	20	19	19	19	19	19	19	19	19	19	19	18	18	18
34	17	17	17	17	17	17	17	16	16	16	16	16	16	16	16	15	15
35	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13	13	13
36	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	11
37	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9
38	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8
39	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
40	43	43	43	43	43	43	43	43	43	42	42	42	42	41	40	40	39

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
0	3873	3874	3873	3872	3872	3872	3871	3869	3870	3869	3866	3864	3862	3862	3862	3860	3860
1	3301	3300	3301	3301	3299	3300	3299	3298	3297	3297	3297	3295	3293	3291	3291	3291	3289
2	2815	2812	2812	2813	2812	2811	2812	2812	2811	2809	2810	2809	2807	2806	2804	2804	2804
3	2405	2399	2396	2396	2397	2396	2395	2395	2395	2395	2393	2394	2393	2392	2390	2389	2389
4	2056	2048	2042	2040	2039	2039	2039	2037	2037	2037	2033	2033	2034	2035	2034	2032	2032
5	1753	1749	1741	1735	1733	1732	1731	1730	1729	1728	1722	1720	1721	1725	1726	1723	1724
6	1491	1489	1485	1477	1472	1470	1467	1466	1466	1465	1458	1454	1454	1458	1460	1460	1460
7	1267	1266	1263	1259	1252	1248	1245	1242	1243	1242	1236	1232	1230	1232	1234	1235	1237
8	1075	1075	1073	1070	1067	1062	1057	1053	1053	1053	1049	1045	1042	1042	1043	1044	1046
9	911	912	911	908	906	904	898	894	893	892	889	886	883	882	881	881	884
10	771	772	772	770	769	768	764	759	757	755	753	751	749	748	746	745	746
11	651	653	653	652	651	651	649	645	643	640	638	635	634	634	632	630	630
12	550	551	552	551	551	551	550	548	546	544	540	538	536	536	536	534	533
13	464	465	466	466	466	466	465	464	463	462	458	456	454	454	453	452	451
14	391	392	393	393	394	394	393	392	392	392	389	386	384	384	383	382	382
15	330	331	331	331	332	333	332	332	332	332	330	328	326	325	324	323	323
16	279	279	279	279	280	280	280	280	281	280	279	278	277	275	275	273	273
17	236	236	236	235	236	236	236	236	237	237	236	235	234	234	233	231	231
18	200	200	199	198	199	199	199	199	200	200	200	199	198	198	198	196	195
19	170	169	168	168	168	168	168	168	168	169	169	168	168	168	167	166	166
20	144	143	143	142	142	141	141	141	142	142	142	142	142	142	142	141	141
21	122	122	121	120	120	120	119	119	119	120	120	120	120	120	120	119	119
22	104	103	103	102	101	101	101	100	101	101	101	101	101	101	101	101	101
23	88	88	87	86	86	86	85	85	85	85	85	85	85	85	85	85	85
24	75	75	74	73	73	73	72	72	72	72	72	71	72	72	72	72	72
25	64	63	63	62	62	62	61	61	61	61	60	60	60	60	61	61	61
26	54	54	53	53	53	52	52	52	51	51	51	51	51	51	51	51	51
27	46	46	45	45	45	44	44	44	44	43	43	43	43	43	43	43	43
28	39	39	39	38	38	38	37	37	37	37	36	36	36	36	36	36	36
29	33	33	33	32	32	32	32	32	31	31	31	31	31	31	31	30	31
30	28	28	28	28	27	27	27	27	27	26	26	26	26	26	26	26	26
31	24	24	24	23	23	23	23	23	23	22	22	22	22	22	22	22	22
32	21	20	20	20	20	20	19	19	19	19	19	19	19	19	18	18	18
33	17	17	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16
34	15	15	15	14	14	14	14	14	14	14	14	14	13	13	13	13	13
35	13	13	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11
36	11	11	11	10	10	10	10	10	10	10	10	10	10	10	10	9	9
37	9	9	9	9	9	9	9	9	9	8	8	8	8	8	8	8	8
38	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7
39	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6
40	39	38	38	37	37	37	36	36	36	35	35	34	34	34	33	33	33

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	3858	3857	3855	3853	4801	4035	3043	2937	3463	2737	3562	2211	2566	2163	1632	2439	2172
1	3289	3288	3287	3285	3283	4092	3439	2593	2502	2951	2332	3035	1884	2186	1843	1391	2078
2	2803	2803	2801	2800	2799	2797	3486	2930	2209	2132	2515	1987	2586	1606	1863	1570	1185
3	2389	2388	2388	2386	2385	2384	2383	2969	2495	1881	1816	2141	1692	2202	1367	1586	1337
4	2030	2029	2026	2027	2025	2021	2023	2019	2513	2110	1591	1533	1809	1430	1859	1156	1334
5	1720	1717	1713	1712	1710	1702	1705	1702	1695	2103	1769	1328	1280	1511	1190	1553	953
6	1457	1452	1446	1444	1440	1432	1433	1431	1424	1412	1758	1468	1102	1063	1244	985	1262
7	1233	1230	1223	1219	1213	1206	1206	1202	1198	1187	1181	1459	1217	913	870	1025	795
8	1044	1041	1036	1031	1024	1017	1016	1012	1007	999	994	981	1209	1008	745	715	823
9	883	881	877	873	865	858	856	852	848	840	836	825	813	1001	821	611	572
10	746	745	743	739	733	725	722	717	714	707	703	694	684	672	814	671	487
11	629	629	628	625	620	613	609	604	601	594	591	583	575	565	546	664	534
12	531	531	530	529	524	519	515	510	506	500	497	491	483	475	459	446	528
13	449	448	447	446	443	439	436	431	426	421	418	412	406	399	386	374	353
14	380	379	377	376	374	370	368	364	360	355	352	347	342	336	324	314	296
15	322	320	319	317	315	312	311	308	304	300	296	292	287	282	273	264	249
16	272	271	270	268	266	263	262	260	257	253	250	246	242	237	229	222	209
17	230	229	228	227	225	222	221	219	217	214	211	208	204	200	193	186	175
18	194	194	193	192	190	188	186	184	183	180	178	175	172	168	162	157	147
19	164	164	163	162	161	159	157	155	154	152	150	148	145	142	137	132	124
20	139	139	138	137	136	134	133	131	130	128	127	125	123	120	115	111	104
21	118	117	117	116	115	114	113	111	110	108	107	105	103	101	97	94	88
22	100	100	99	98	97	96	95	94	93	91	90	89	87	85	82	79	74
23	85	84	84	83	82	81	80	79	78	77	76	75	73	72	69	67	62
24	72	71	71	71	70	69	68	67	66	65	64	63	62	61	58	56	53
25	61	60	60	60	59	58	58	57	56	55	54	53	52	51	49	47	44
26	51	51	51	51	50	49	49	48	47	47	46	45	44	43	41	40	37
27	43	43	43	43	42	42	41	41	40	39	39	38	37	36	35	34	32
28	36	36	36	36	36	35	35	34	34	33	33	32	32	31	30	28	27
29	31	31	31	30	30	30	30	29	29	28	28	27	27	26	25	24	22
30	26	26	26	26	26	25	25	25	24	24	24	23	23	22	21	20	19
31	22	22	22	22	22	21	21	21	21	20	20	19	19	19	18	17	16
32	18	18	18	18	18	18	18	18	17	17	17	17	16	16	15	15	14
33	15	15	15	15	15	15	15	15	15	14	14	14	14	13	13	12	11
34	13	13	13	13	13	13	13	13	12	12	12	12	12	11	11	10	10
35	11	11	11	11	11	11	11	11	10	10	10	10	10	10	9	9	8
36	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	7	7
37	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7	6	6
38	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	5	5
39	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	4
40	33	32	32	32	31	31	30	30	29	29	28	28	27	27	26	25	23

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0	2424	2903	3380	2160	2805	1997	3097	3433	3791	4350	3418	7034	4731	3003	3302	3135	6653
1	1851	2065	2474	2880	1841	2390	1702	2639	2925	3230	3707	2912	5994	4031	2559	2813	2672
2	1770	1577	1759	2107	2453	1568	2036	1450	2248	2492	2751	3157	2481	5106	3434	2180	2397
3	1008	1507	1341	1496	1793	2088	1335	1733	1234	1913	2120	2341	2687	2112	4347	2924	1857
4	1122	851	1264	1122	1256	1512	1762	1124	1459	1038	1605	1780	1970	2265	1784	3681	2478
5	1094	928	693	1026	921	1043	1254	1452	924	1200	845	1313	1463	1624	1877	1487	3076
6	766	882	735	549	827	754	852	1011	1164	742	943	673	1053	1175	1313	1530	1220
7	1004	606	687	574	438	671	610	676	796	915	566	737	531	829	931	1050	1236
8	628	785	468	532	455	354	540	480	527	617	685	438	575	413	650	736	840
9	647	488	603	361	421	367	284	424	372	405	457	528	340	446	322	511	587
10	448	501	375	465	286	339	294	223	328	286	299	353	410	264	347	253	406
11	381	347	386	289	368	230	272	231	173	252	211	231	274	319	206	273	201
12	417	295	268	299	229	297	185	214	180	133	186	163	180	214	249	162	218
13	412	324	229	208	237	185	239	146	167	138	99	145	128	141	167	197	130
14	276	320	252	177	165	191	149	188	114	129	103	77	113	100	111	132	158
15	231	215	249	195	141	133	154	118	148	88	96	81	60	89	79	88	106
16	194	180	167	194	156	114	108	122	93	115	66	75	63	47	70	63	71
17	163	151	141	130	155	126	92	85	96	72	86	52	59	50	37	56	50
18	137	127	118	110	104	125	102	73	67	75	54	68	41	47	39	30	45
19	115	107	99	92	88	84	101	81	58	52	56	43	53	32	37	31	24
20	96	90	84	78	74	71	68	80	64	45	39	44	33	42	26	30	25
21	81	75	70	65	62	60	57	54	64	50	34	31	35	27	33	20	24
22	68	63	59	55	52	50	48	46	43	50	38	27	25	28	21	27	17
23	58	53	50	46	44	42	41	39	36	33	37	30	21	19	22	17	22
24	49	45	42	39	37	36	34	32	30	28	25	30	23	17	15	18	14
25	41	38	35	33	31	30	29	27	26	24	21	20	23	19	13	12	14
26	35	32	30	28	26	25	24	23	22	20	18	17	16	19	15	11	10
27	29	27	25	23	22	21	20	19	18	17	15	14	13	13	15	12	9
28	25	23	21	20	19	18	17	16	15	14	13	12	11	11	10	12	10
29	21	19	18	17	16	15	15	14	13	12	11	10	9	9	8	8	10
30	17	16	15	14	13	13	12	12	11	10	9	9	8	8	7	7	6
31	15	14	13	12	11	11	10	10	9	9	8	7	7	6	6	6	5
32	13	12	11	10	9	9	9	8	8	7	6	6	6	5	5	5	5
33	11	10	9	8	8	8	7	7	7	6	5	5	5	4	4	4	4
34	9	8	8	7	7	6	6	6	6	5	5	4	4	4	4	3	3
35	8	7	7	6	6	5	5	5	5	4	4	4	3	3	3	3	3
36	6	6	5	5	5	5	4	4	4	4	3	3	3	3	3	2	2
37	5	5	5	4	4	4	4	4	3	3	3	3	2	2	2	2	2
38	5	4	4	4	3	3	3	3	3	3	2	2	2	2	2	2	2
39	4	4	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1
40	21	20	18	17	16	15	15	14	13	12	11	10	9	9	8	8	8

Table 31. Final base-run model estimates of numbers-at-age by sex (continued).

Males (1000s)

Age	2000	2001	2002	2003	2004	2005	2006	2007
0	4339	3950	3007	1680	2341	2255	2350	3670
1	5669	3697	3366	2562	1431	1995	1921	2002
2	2276	4830	3150	2868	2182	1219	1699	1637
3	2041	1939	4112	2683	2440	1859	1038	1447
4	1573	1730	1638	3484	2253	2070	1574	880
5	2072	1318	1439	1372	2863	1892	1733	1320
6	2537	1716	1080	1191	1110	2374	1566	1438
7	995	2080	1391	886	956	911	1948	1291
8	1001	811	1676	1134	709	781	744	1601
9	678	814	652	1364	906	577	636	611
10	473	551	654	530	1090	738	470	522
11	328	385	443	532	424	888	602	386
12	163	267	310	361	427	346	725	495
13	176	133	216	253	290	349	283	597
14	105	144	107	176	203	237	286	233
15	128	86	117	88	142	167	195	235
16	86	105	70	96	71	116	137	161
17	57	71	85	57	77	58	96	113
18	41	47	58	70	46	63	48	79
19	37	34	38	47	56	38	52	39
20	20	30	27	31	38	46	31	43
21	21	16	25	22	25	31	38	26
22	20	17	13	20	18	21	26	32
23	13	16	14	11	16	15	17	21
24	18	11	13	11	9	13	12	14
25	11	14	9	11	9	7	11	10
26	12	9	12	7	9	8	6	9
27	8	10	7	10	6	7	6	5
28	7	7	8	6	8	5	6	5
29	8	6	5	6	5	6	4	5
30	8	6	5	5	5	4	5	3
31	5	6	5	4	4	4	3	4
32	4	4	5	4	3	3	4	3
33	4	4	4	4	3	3	2	3
34	3	3	3	3	3	3	2	2
35	3	3	3	2	2	3	2	2
36	2	2	2	2	2	2	2	2
37	2	2	2	2	2	2	2	2
38	2	2	2	1	1	1	1	1
39	1	1	1	1	1	1	1	1
40	7	7	7	7	6	6	6	6

Table 32. Base-run model estimated standard deviations and coefficients of variation for spawning output and recruitment.

	Spawning Output		Recruitment	
Year	Std Dev	CV	Std Dev	CV
1915	403.1	8.80%	696.4	8.87%
1920	403.1	8.81%	696.4	8.87%
1925	403.1	8.84%	696.4	8.88%
1930	403.1	8.89%	696.4	8.88%
1935	403.1	8.93%	696.4	8.89%
1940	403.1	8.97%	696.4	8.90%
1941	403.1	8.98%	696.4	8.90%
1942	403.1	8.98%	696.4	8.90%
1943	403.1	8.99%	696.4	8.90%
1944	403.2	9.03%	696.5	8.91%
1945	403.2	9.13%	696.6	8.93%
1946	403.4	9.33%	696.8	8.96%
1947	403.4	9.47%	697.0	8.99%
1948	403.3	9.53%	697.1	9.00%
1949	403.2	9.53%	697.1	9.00%
1950	403.2	9.52%	697.1	9.00%
1951	403.2	9.53%	697.1	9.00%
1952	403.2	9.55%	697.1	9.00%
1953	403.2	9.54%	697.1	9.00%
1954	403.2	9.54%	697.1	9.00%
1955	403.3	9.56%	697.2	9.01%
1956	403.3	9.59%	697.2	9.01%
1957	403.3	9.58%	697.2	9.01%
1958	403.3	9.59%	697.2	9.01%
1959	403.4	9.63%	697.3	9.02%
1960	403.4	9.66%	697.4	9.02%
1961	403.5	9.69%	697.5	9.03%
1962	403.5	9.69%	697.5	9.03%
1963	403.5	9.69%	697.5	9.03%
1964	403.5	9.72%	697.5	9.03%
1965	403.5	9.71%	697.5	9.03%
1966	403.5	9.75%	697.6	9.04%
1967	403.6	9.76%	697.6	9.04%
1968	403.6	9.79%	697.7	9.05%
1969	403.7	9.82%	697.8	9.06%

	Spawning Output		Recruitment	
Year	Std Dev	CV	Std Dev	CV
1970	403.7	9.90%	3963.9	41.28%
1971	403.8	10.01%	3456.5	42.83%
1972	403.8	10.08%	2462.6	40.47%
1973	403.9	10.18%	2227.0	37.92%
1974	403.3	10.26%	2191.0	31.63%
1975	400.6	10.30%	1781.3	32.54%
1976	394.2	10.17%	1541.0	21.63%
1977	385.8	10.03%	1178.4	26.64%
1978	377.2	9.90%	1110.3	21.64%
1979	367.1	9.82%	960.8	22.21%
1980	354.4	9.89%	763.6	23.39%
1981	340.1	9.94%	764.3	15.67%
1982	324.4	10.24%	737.3	16.97%
1983	308.4	10.62%	827.9	17.08%
1984	292.8	10.94%	914.9	15.76%
1985	277.4	11.24%	967.8	14.32%
1986	262.7	11.65%	875.4	20.26%
1987	249.1	11.81%	937.8	16.72%
1988	237.5	11.88%	743.6	18.62%
1989	228.3	11.92%	833.9	13.46%
1990	222.1	12.05%	925.3	13.48%
1991	219.3	12.22%	1041.3	13.73%
1992	219.4	12.58%	1272.9	14.63%
1993	221.9	13.43%	1108.9	16.22%
1994	226.0	13.89%	2031.3	14.44%
1995	232.6	14.41%	1577.2	16.67%
1996	243.0	14.88%	1150.1	19.15%
1997	258.7	15.36%	1194.4	18.09%
1998	280.6	15.78%	1140.7	18.19%
1999	309.3	16.08%	2157.9	16.22%
2000	346.1	16.28%	1567.0	18.06%
2001	389.8	16.41%	1421.6	17.99%
2002	433.4	16.79%	1200.5	19.96%
2003	471.3	17.08%	829.2	24.69%
2004	503.0	17.68%	1493.1	31.90%
2005	534.2	17.98%	1680.6	37.27%
2006	567.0	18.29%	1959.8	41.70%
2007	598.0	18.53%	3756.5	51.18%

Table 33. Sensitivity of the preliminary base-run model to assumed catch histories.

	Treatment =	Base	H-HKL	L-HKL	H-TWL	L-TWL	H-REC	L-REC	H-All	L-All
	Fishery	- - - - - Level assumed for catch history (High, Medium, Low) - - - - -								
	HKL =	M	**H**	**L**	M	M	M	M	**H**	**L**
	TWL =	M	M	M	**H**	**L**	M	M	**H**	**L**
Component	REC =	M	M	M	M	M	**H**	**L**	**H**	**L**
	Lambda									
Total		1444.2	1444.5	1443.9	1448.7	1442.2	1443.9	1444.6	1448.0	1441.9
Indices		-72.1	-72.1	-72.2	-71.6	-72.4	-72.2	-72.0	-71.7	-72.3
OREC-1	1	-18.0	-18.1	-18.0	-18.1	-18.0	-18.0	-18.0	-18.1	-17.9
OREC-2	1	-8.6	-8.6	-8.6	-8.7	-8.5	-8.6	-8.6	-8.7	-8.5
ORBS-1	1	-16.4	-16.4	-16.4	-16.4	-16.5	-16.4	-16.5	-16.3	-16.5
ORBS-2	1	-10.7	-10.6	-10.7	-10.5	-10.8	-10.7	-10.6	-10.5	-10.8
TAGS	1	-4.9	-4.9	-4.9	-4.8	-4.9	-4.9	-4.8	-4.8	-4.9
CREC-1	1	-3.3	-3.3	-3.3	-3.1	-3.4	-3.3	-3.3	-3.1	-3.4
CREC-2	1	-7.6	-7.5	-7.6	-7.3	-7.7	-7.6	-7.5	-7.4	-7.7
CPFV	1	-3.8	-3.8	-3.8	-3.8	-3.8	-3.8	-3.8	-3.8	-3.7
JUV	1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
MnWt	1	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8
Length		1385.4	1385.6	1385.3	1388.3	1384.1	1385.4	1385.5	1387.9	1383.7
OHKL	1	76.1	76.1	76.1	75.9	76.1	76.1	76.0	76.0	76.0
OTWL	1	63.5	63.5	63.5	64.4	63.0	63.3	63.7	64.2	63.1
OREC	1	273.6	273.7	273.6	276.3	272.4	273.3	274.1	275.6	272.5
CHKL	1	175.4	175.5	175.3	175.9	175.1	175.4	175.4	175.9	175.0
CTWL	1	134.0	134.0	134.1	132.1	135.2	134.2	133.9	132.4	135.3
CREC	1	267.6	267.7	267.5	268.2	267.3	268.0	267.1	268.5	266.7
ORBS	1	242.7	242.8	242.7	243.3	242.5	242.7	242.8	243.2	242.4
CPFV	1	152.5	152.5	152.5	152.3	152.5	152.4	152.6	152.3	152.6
Age		163.0	163.0	163.0	163.0	163.1	163.0	163.0	163.0	163.2
OHKL	1	49.4	49.4	49.4	49.4	49.5	49.4	49.4	49.4	49.4
ORBS	1	113.6	113.6	113.6	113.7	113.7	113.6	113.6	113.6	113.7
Len-at-Age	1	76.2	76.2	76.2	76.6	75.9	76.1	76.4	76.4	76.1
Recruits	1	-15.6	-15.5	-15.6	-14.9	-15.8	-15.6	-15.6	-15.0	-15.9
ForecastRecr	1	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9
Spawning-0		3724	3748	3701	3970	3614	4281	3169	4546	3034
Spawning-2006		2318	2343	2295	2574	2211	2637	2002	2909	1870
Depletion		62.3%	62.5%	62.0%	64.8%	61.2%	61.6%	63.2%	64.0%	61.6%
MSY		847	853	842	900	823	972	723	1029	694
Tag-Q		22.0%	21.8%	22.2%	20.0%	23.0%	19.3%	25.5%	17.7%	27.2%

Table 34. Sensitivity of the preliminary base-run model to the assumed natural mortality formulation.

Values marked in bold and highlighted indicate the minimum negative log-likelihood value for the given table.

	Old-M-offset			Old-M-offset			Old-M-offset		
	Total			Indices			MnWt		
Yng-M	0.3	0.4	0.5	0.3	0.4	0.5	0.3	0.4	0.5
0.12	1444.5	1444.5	1439.6	-69.0	-69.0	-69.5	**-83.1**	**-83.1**	-83.1
0.14	1440.1	1439.1	**1438.8**	-71.3	-71.3	-71.4	-82.9	-82.9	-82.9
0.16	1444.2	1444.2	1444.7	**-72.2**	-72.2	-72.1	-82.8	-82.8	-82.8
0.18	1451.6	1452.1	1453.0	-72.1	-72.0	-71.9	-82.7	-82.7	-82.7

	Length			Age			Len-at-Age		
Yng-M	0.3	0.4	0.5	0.3	0.4	0.5	0.3	0.4	0.5
0.12	1378.2	1378.2	**1376.2**	172.5	172.5	168.6	**68.6**	**68.6**	71.4
0.14	1380.8	1380.1	1379.9	166.6	165.2	164.1	72.6	73.9	75.1
0.16	1385.9	1385.4	1385.4	164.0	163.0	162.3	74.9	76.2	77.4
0.18	1391.3	1391.0	1391.1	163.2	162.5	**161.9**	76.2	77.4	78.6

	Recruits			Virgin SB		
Yng-M	0.3	0.4	0.5	0.3	0.4	0.5
0.12	-12.7	-12.7	-14.0	3586.3	3586.3	3324.6
0.14	-15.7	-15.9	**-16.0**	3579.9	3476.0	3379.2
0.16	-15.7	-15.6	-15.5	3795.8	3728.0	3664.1
0.18	-14.3	-14.1	-14.0	4418.2	4413.6	4408.9

	Depletion			MSY			Tag-Q		
Yng-M	0.3	0.4	0.5	0.3	0.4	0.5	0.3	0.4	0.5
0.12	28.2%	28.2%	32.3%	576.0	576.0	607.5	50.6%	50.6%	47.2%
0.14	40.6%	43.6%	46.6%	668.5	690.2	711.3	35.3%	33.7%	32.3%
0.16	58.2%	62.0%	65.7%	813.0	845.4	877.0	23.2%	22.1%	21.1%
0.18	79.8%	84.1%	88.1%	1074.8	1131.9	1188.3	14.5%	13.7%	13.0%

Old-M = Yng-M * exp(Old-M-offset)

	Old-M-offset =	0.3	0.4	0.5
	exp(Old-M-offset) =	1.35	1.49	1.65
Yng-M	0.12	0.162	0.179	0.198
	0.14	0.189	0.209	0.231
	0.16	0.216	**0.239**	0.264
	0.18	0.243	0.269	0.297

Note: The base-run model has Yng-M equal to 0.16 and Old-M-offset equal to 0.4055.

Table 35. Sensitivity of the final base-run model to the mean length-at-age data.

	Base-Run Model		Reduced Len-at-age	
Component	Lambda	Neg. log-Like	Lambda	Neg. log-Like
Total		1406.6		1346.1
Indices		-74.4		-72.3
OREC-1	1	-18.3	1	-17.6
OREC-2	1	-8.8	1	-8.4
ORBS-1	1	-16.5	1	-15.7
ORBS-2	1	-9.0	1	-8.8
ORBS-3	1	-4.9	1	-4.8
TAGS	1	-3.3	1	-3.3
CREC-1	1	-3.0	1	-3.4
CREC-2	1	-7.6	1	-7.5
CPFV	1	-3.8	1	-3.7
JUV	1	0.8	1	1.1
MnWt	1	-82.9	1	-82.2
Length		1378.7		1366.1
OHKL	1	74.6	1	72.8
OTWL	1	64.7	1	63.3
OREC	1	271.6	1	265.7
CHKL	1	173.6	1	176.0
CTWL	1	140.2	1	142.2
CREC	1	252.5	1	254.0
ORBS	1	244.3	1	233.8
CPFV	1	157.1	1	158.3
Age		171.9		142.8
OHKL	1	50.0	1	48.6
ORBS	1	121.9	1	94.2
Length-at-Age	1	35.4	0.1	14.5
Recruits	1	-15.3	1	-15.9
Forecast Recr	1	-6.9	1	-6.9
Spawning-0		4578.5		3774.0
Depletion		70.5%		53.3%
MSY		1035.4		839.7
Tag-Q		12.8%		20.6%

Table 36. Final base-run model forecasts of optimum yield, spawning output, and recruitment.

	- - - - - Oregon Catch (mt) - - - - -			- - - - California Catch (mt) - - - -		
Year	HKL	TWL	REC	HKL	TWL	REC
2007	96.9	0	306.8	160.8	0	131.6
2008	96.9	0	306.8	160.8	0	131.6
2009	201.1	0	615.2	361.8	0	275.6
2010	178.0	0	544.7	323.0	0	257.5
2011	159.7	0	498.1	296.1	0	249.6
2012	148.5	0	478.3	282.8	0	246.7
2013	144.1	0	477.7	279.5	0	244.6
2014	144.0	0	485.2	281.0	0	242.6
2015	145.5	0	493.2	283.6	0	240.6
2016	147.1	0	498.3	285.5	0	238.6
2017	148.1	0	499.9	286.1	0	236.5
2018	148.3	0	498.5	285.4	0	234.4
2019	147.7	0	495.0	283.7	0	232.3
2020	146.6	0	490.4	281.3	0	230.2
2021	145.2	0	485.5	278.7	0	228.3

Year	OY Catch (mt)	Spawning Output	Recruits	Depletion	Exploitation
2007	696	3227	7339	70.5%	3.30%
2008	696	3293	7372	71.9%	3.41%
2009	1454	3284	7368	71.7%	7.33%
2010	1303	3077	7262	67.2%	7.01%
2011	1203	2844	7127	62.1%	6.78%
2012	1156	2616	6980	57.1%	6.73%
2013	1146	2422	6838	52.9%	6.80%
2014	1153	2277	6720	49.7%	6.94%
2015	1163	2181	6636	47.6%	7.08%
2016	1170	2122	6582	46.3%	7.19%
2017	1171	2088	6550	45.6%	7.26%
2018	1167	2070	6533	45.2%	7.29%
2019	1159	2060	6523	45.0%	7.30%
2020	1149	2050	6514	44.8%	7.30%
2021	1138	2040	6503	44.6%	7.29%

Table 37. Decision table for southern black rockfish.

Management Action		State of Nature					
		Low Productivity mal-M=0.14, fem-M=0.21, low trawl catch 25% probability		Medium Productivity mal-M=0.16, fem-M=0.24, medium trawl catch 50% probability		High Productivity mal-M=0.18, fem-M=0.27, high trawl catch 25% probability	
Year	Catch	Spawning output	Depletion	Spawning output	Depletion	Spawning output	Depletion
Low Catch Series: F50% OY stream from the Low Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	909	2195	53.9%	3284	71.7%	5710	92.7%
2010	831	2099	51.6%	3168	69.2%	5518	89.6%
2011	782	1981	48.6%	3015	65.9%	5258	85.4%
2012	765	1860	45.7%	2855	62.3%	4982	80.9%
2013	772	1756	43.1%	2714	59.3%	4737	76.9%
2014	789	1683	41.3%	2614	57.1%	4555	74.0%
2015	806	1641	40.3%	2556	55.8%	4446	72.2%
2016	819	1623	39.9%	2534	55.3%	4399	71.4%
Medium Catch Series: F50% OY stream from the Medium Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	1454	2195	53.9%	3284	71.7%	5710	92.7%
2010	1303	2007	49.3%	3077	67.2%	5428	88.1%
2011	1203	1804	44.3%	2844	62.1%	5092	82.7%
2012	1156	1612	39.6%	2616	57.1%	4753	77.2%
2013	1146	1450	35.6%	2422	52.9%	4458	72.4%
2014	1153	1329	32.6%	2277	49.7%	4237	68.8%
2015	1163	1242	30.5%	2181	47.6%	4094	66.5%
2016	1170	1180	29.0%	2122	46.3%	4017	65.2%
High Catch Series: F50% OY stream from the High Productivity State							
2007	696	2160	53.0%	3227	70.5%	5660	91.9%
2008	696	2203	54.1%	3293	71.9%	5748	93.3%
2009	2660	2195	53.9%	3284	71.7%	5710	92.7%
2010	2333	1802	44.3%	2876	62.8%	5231	84.9%
2011	2112	1416	34.8%	2467	53.9%	4726	76.7%
2012	1994	1072	26.3%	2096	45.8%	4252	69.0%
2013	1945	796	19.5%	1791	39.1%	3854	62.6%
2014	1930	583	14.3%	1557	34.0%	3551	57.7%
2015	1925	415	10.2%	1380	30.2%	3339	54.2%
2016	1918	271	6.7%	1244	27.2%	3197	51.9%

Figure 1. The stock assessment areas.

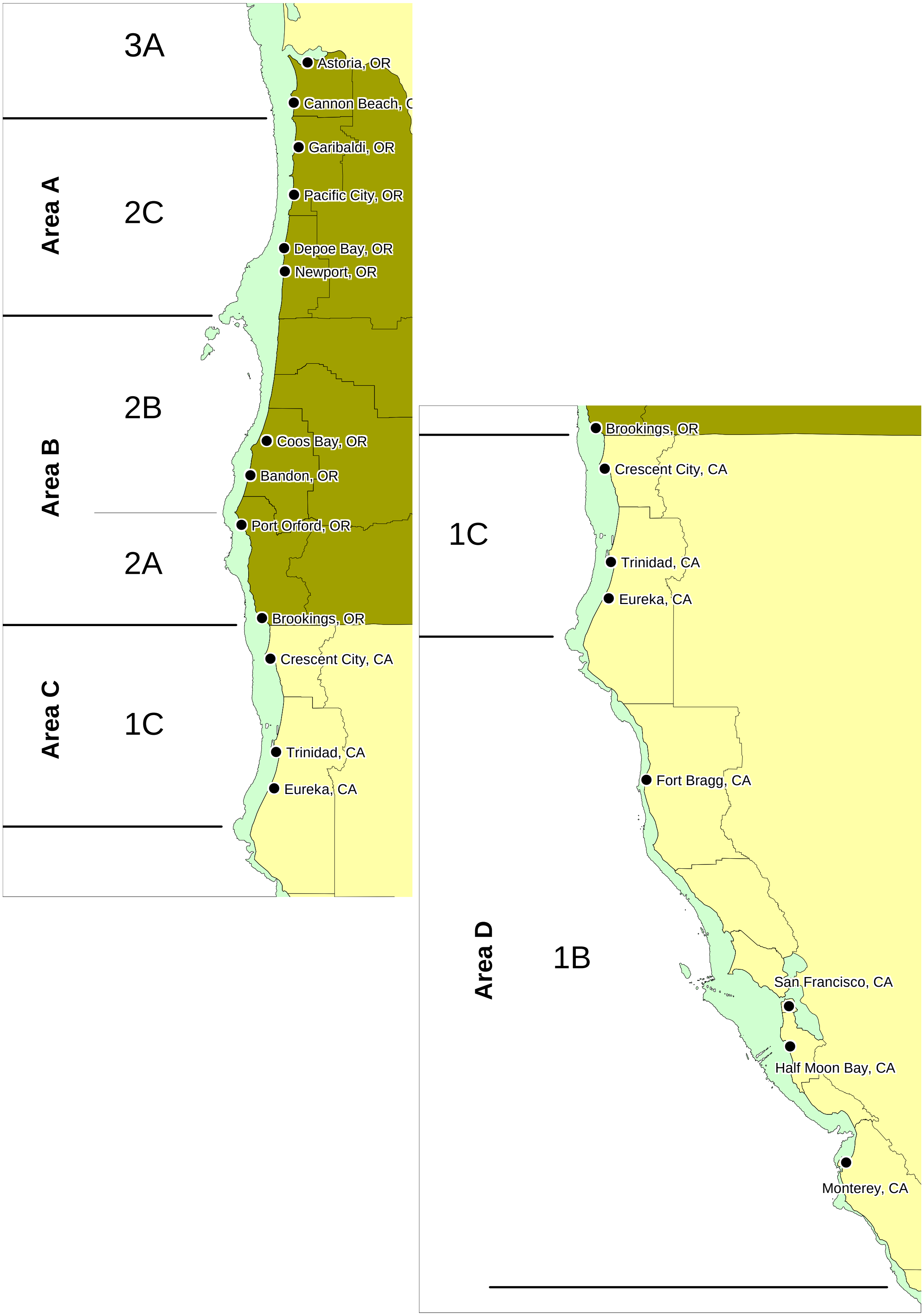
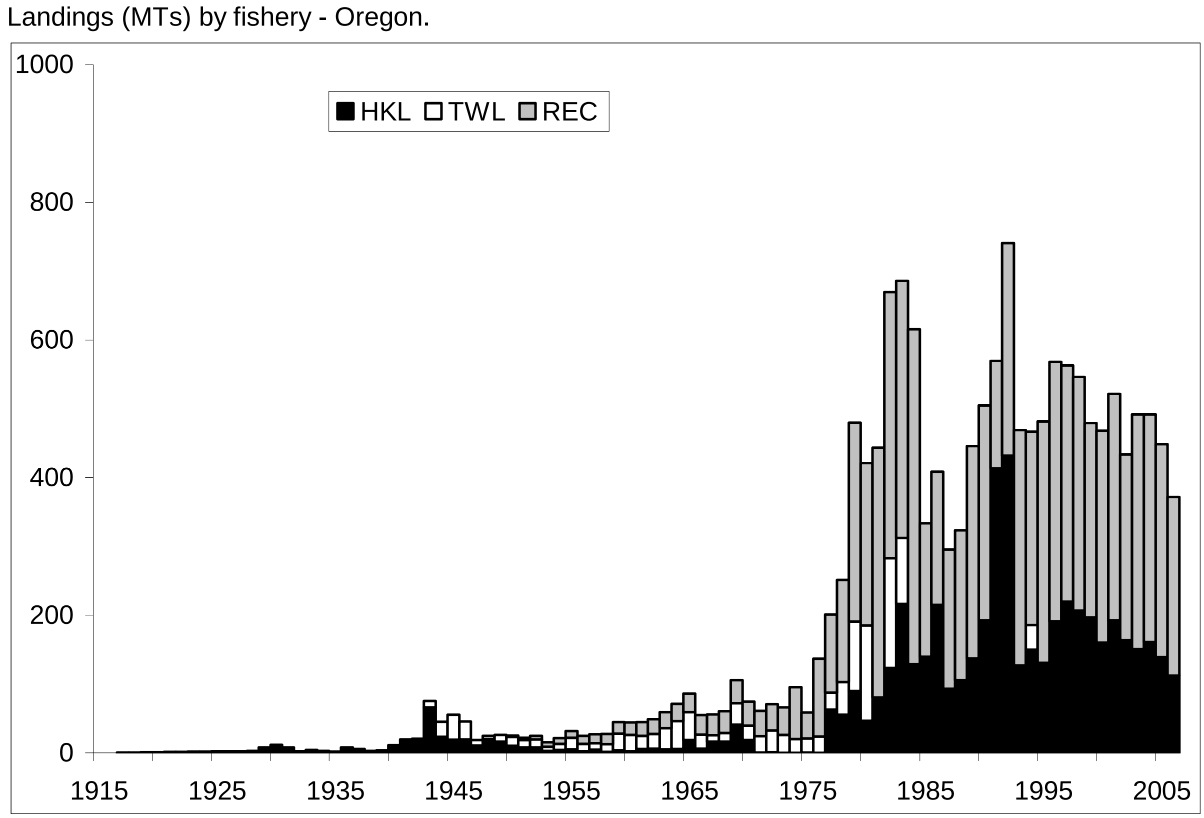


Figure 2. Base landings history for black rockfish off Oregon and California.



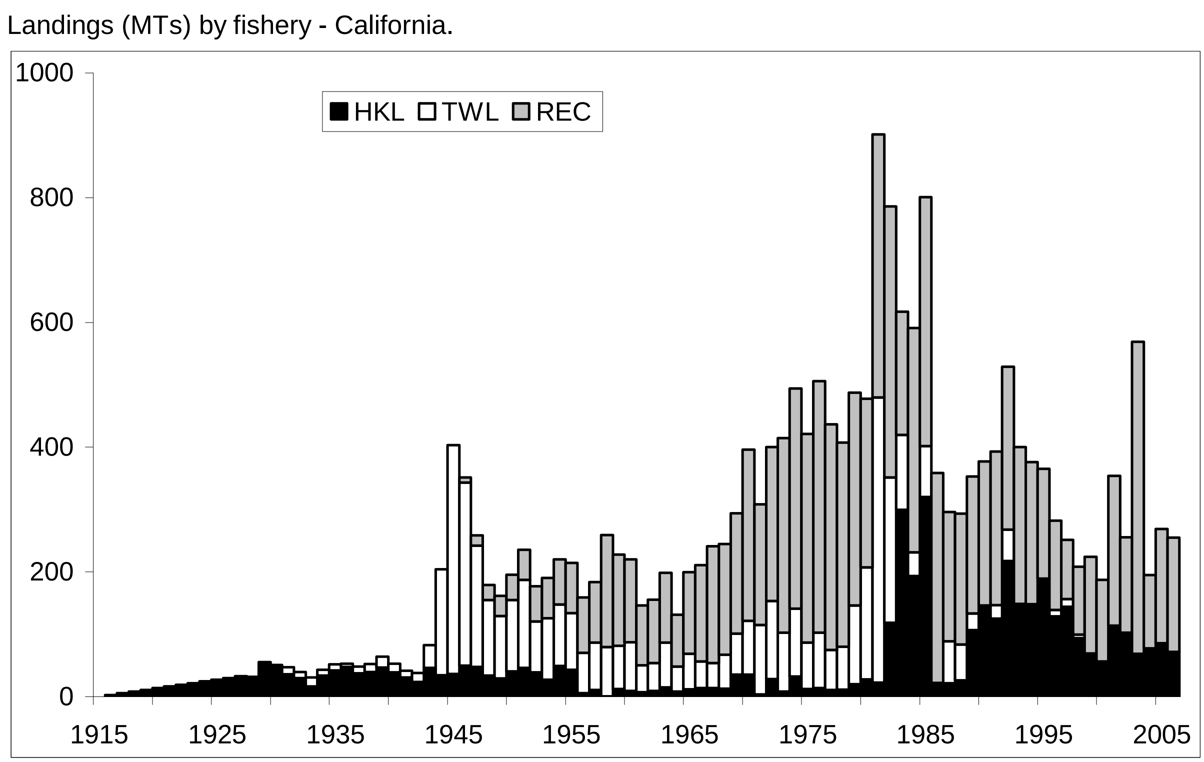
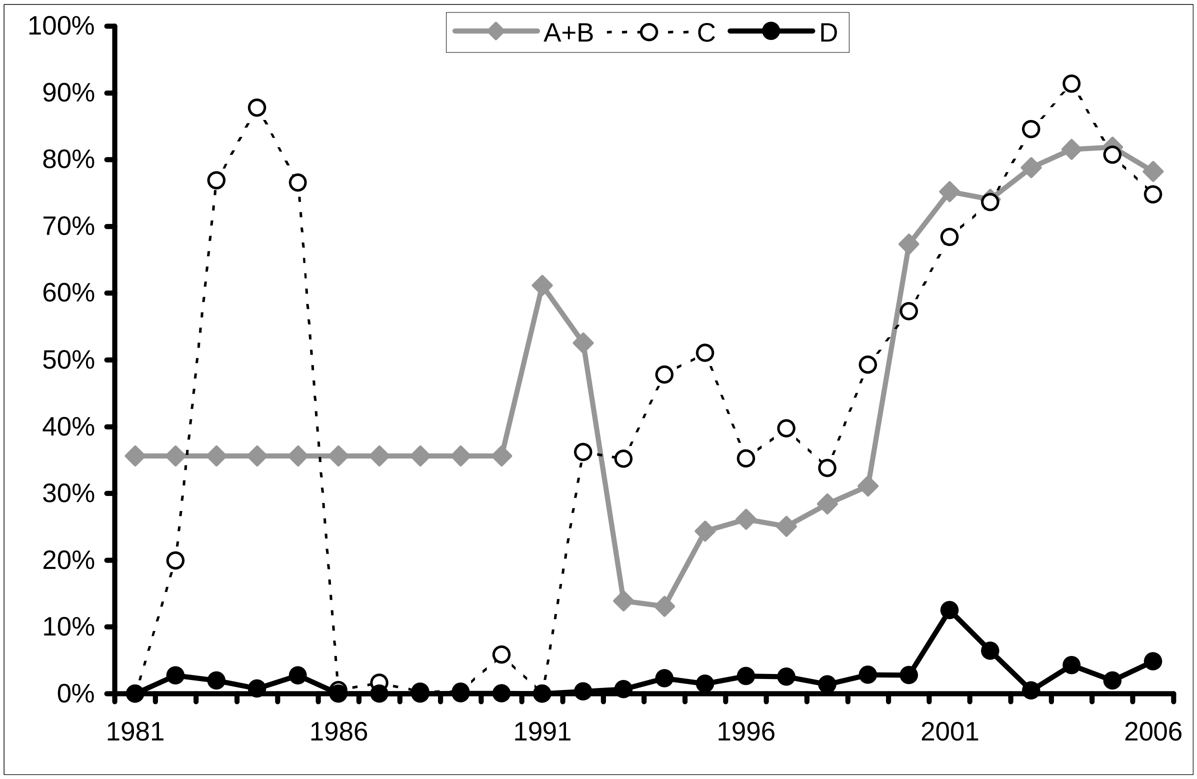


Figure 3. Percent black rockfish from "speciated" PacFIN landings data, by year and area.

Gear = HKL



Gear = TWL

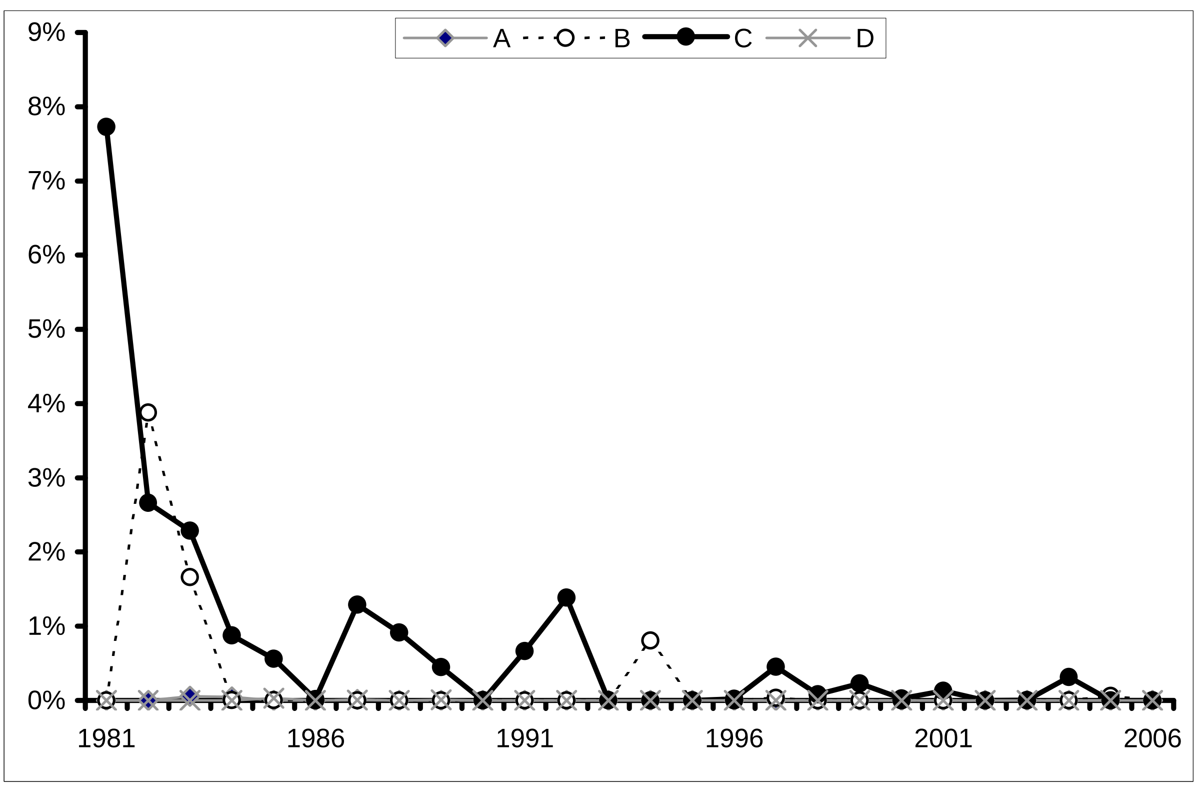
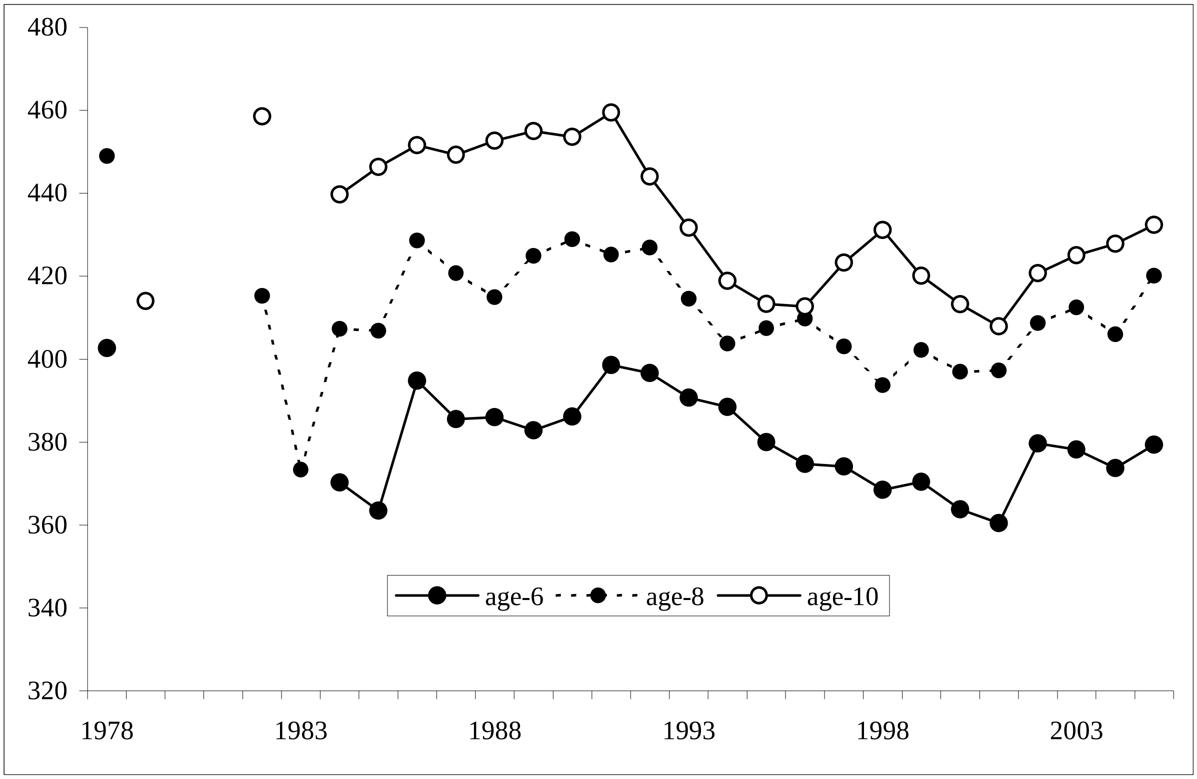


Figure 4. Black rockfish average lengths-at-age (mm), from the complete ODFW database.

Females



Males

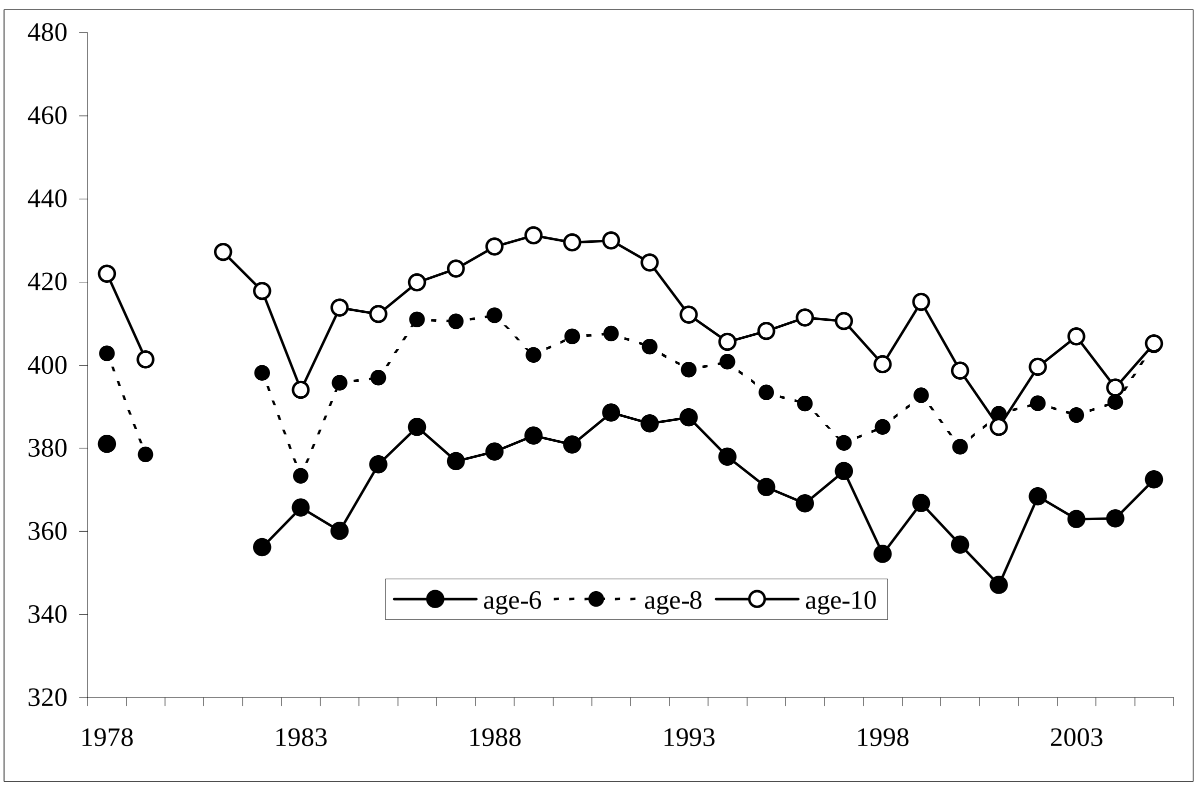
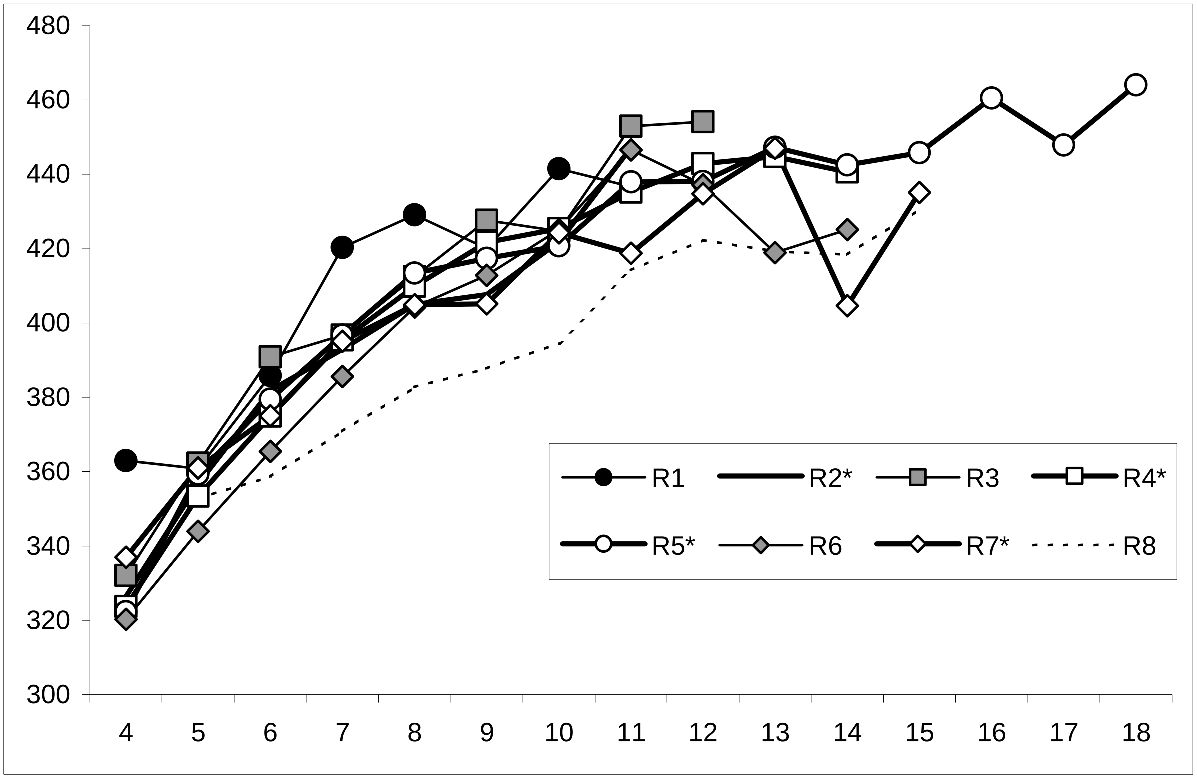


Figure 5. Age-reader comparisons.
Readers marked with asterisks were selected for the set of standard readers.

Females



Males

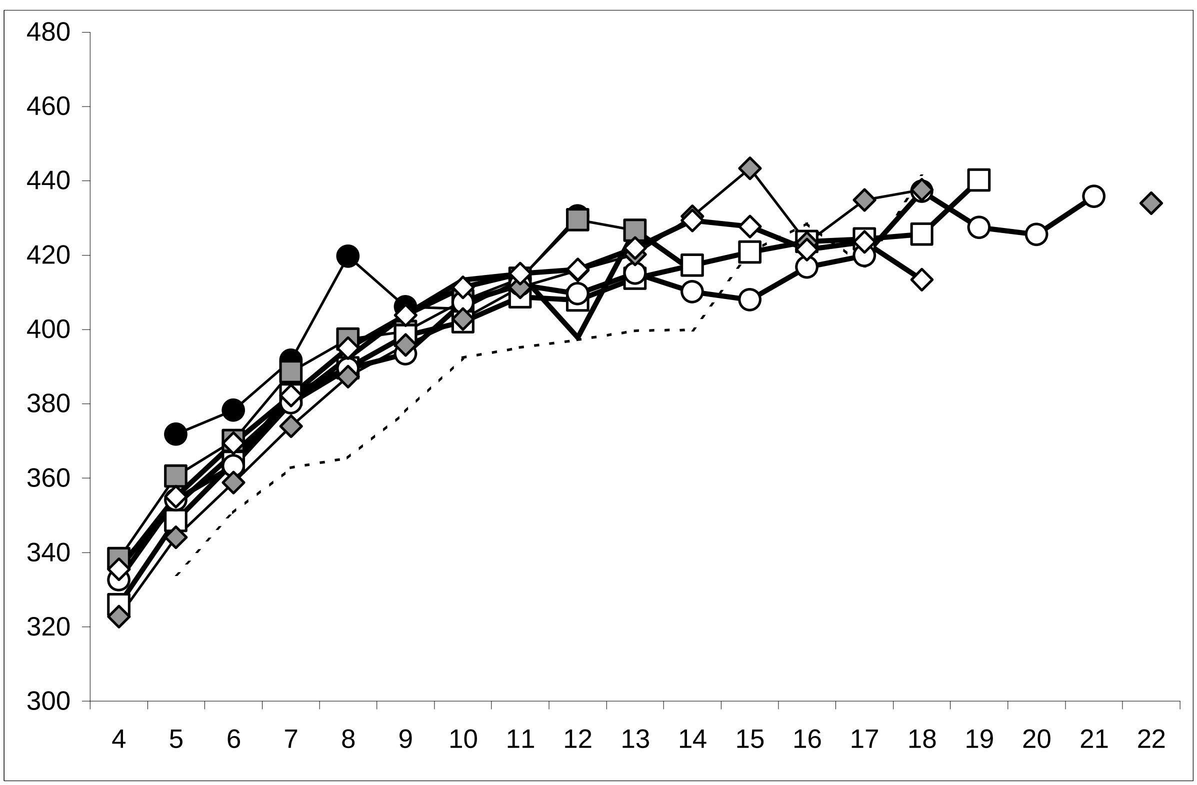
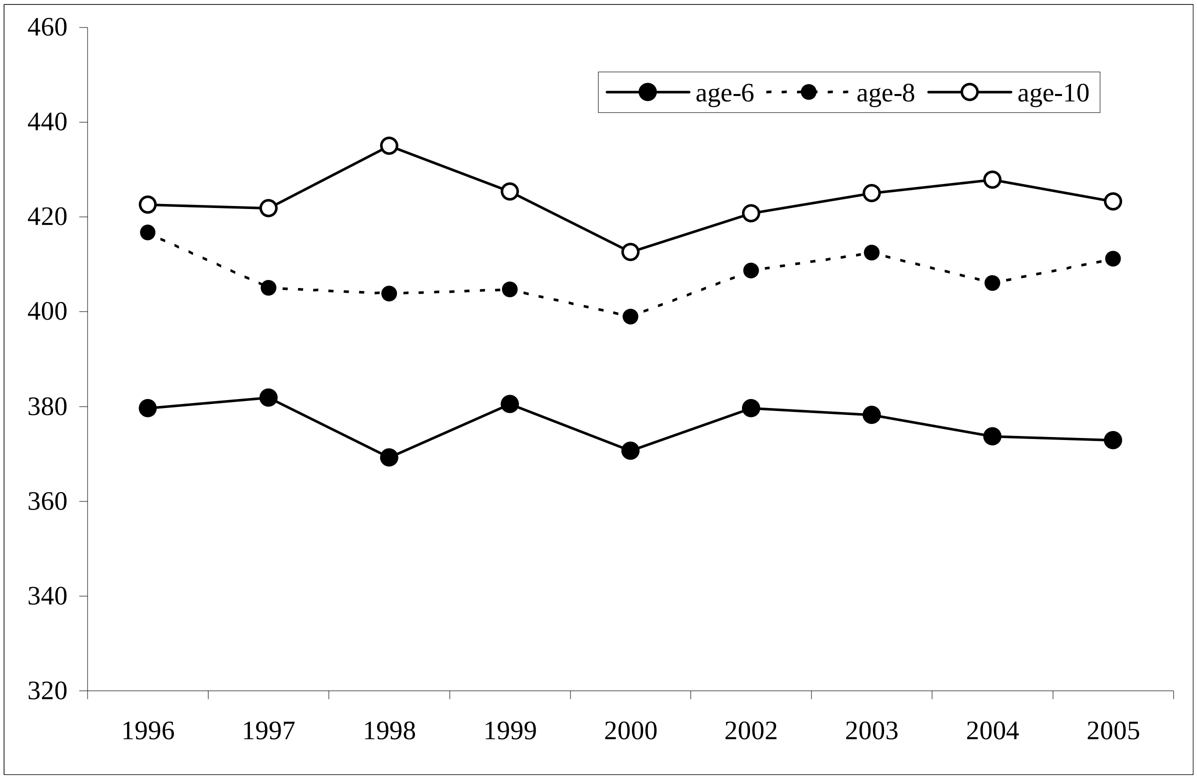


Figure 6. Black rockfish average lengths-at-age (mm) by the set of standard readers.

Females



Males

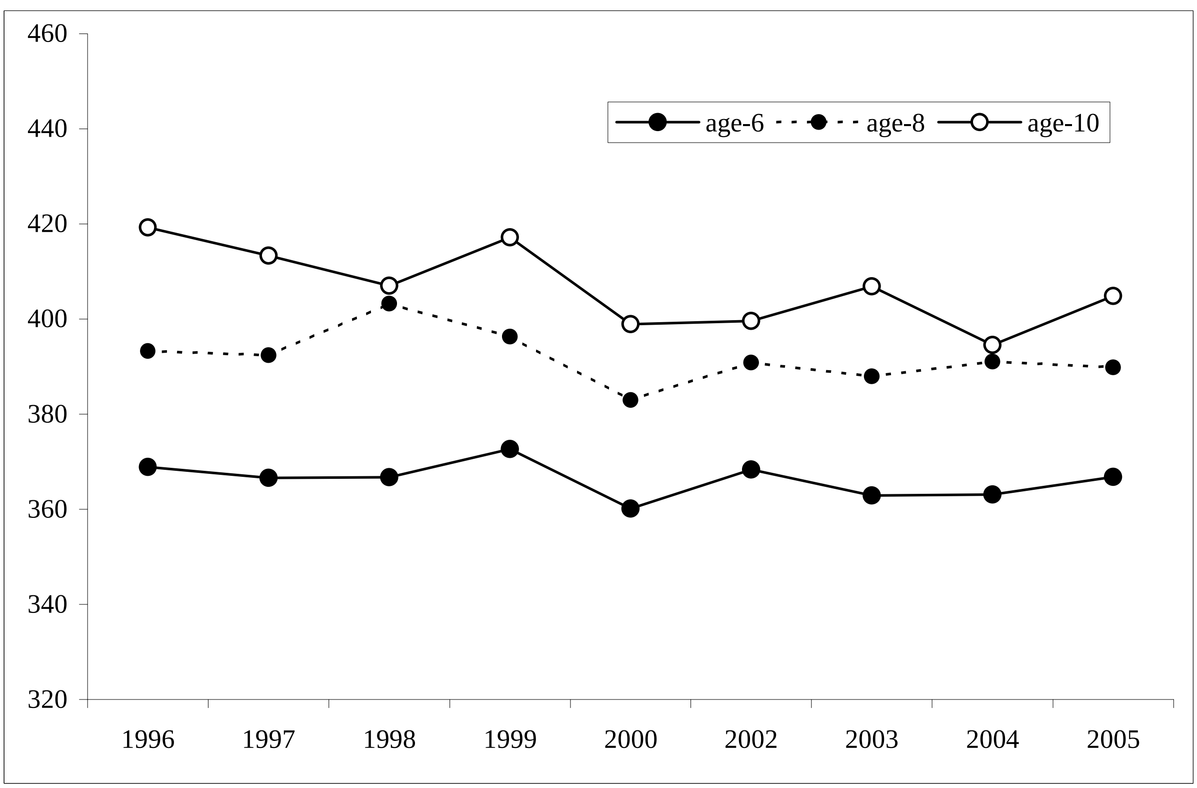
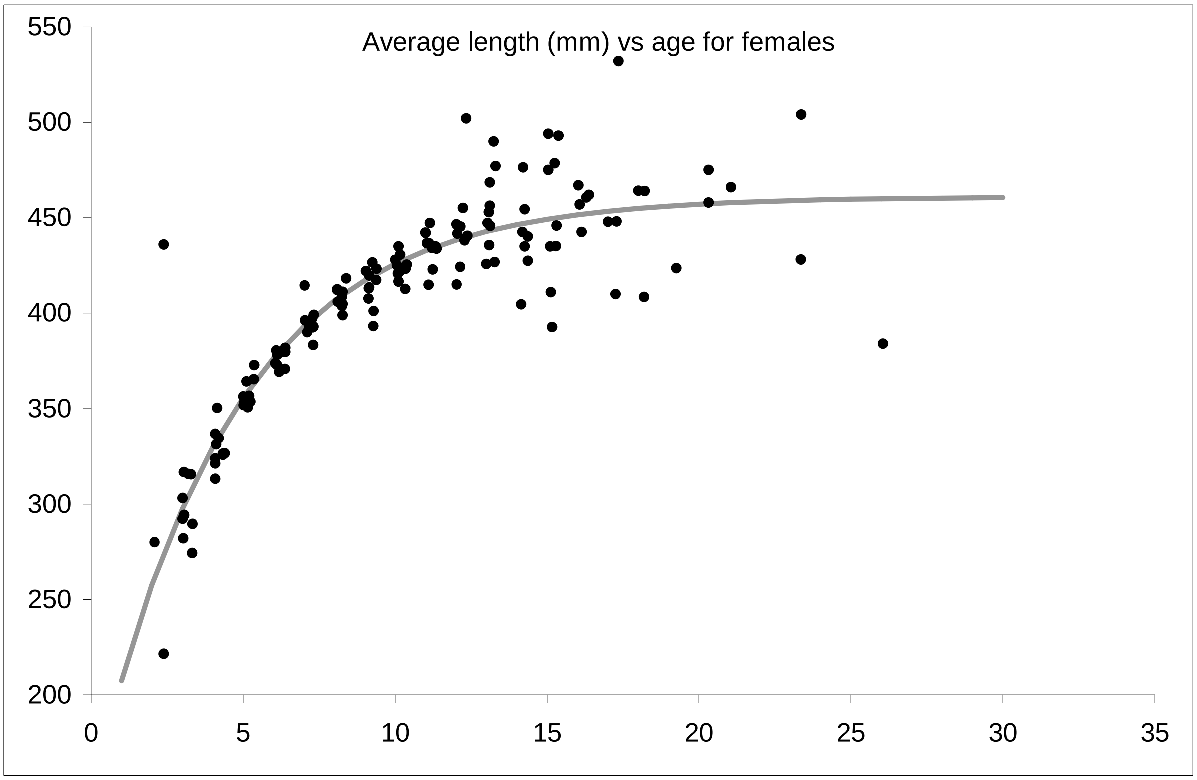


Figure 7. Black rockfish growth curves based on age-reads by the standard set of readers.



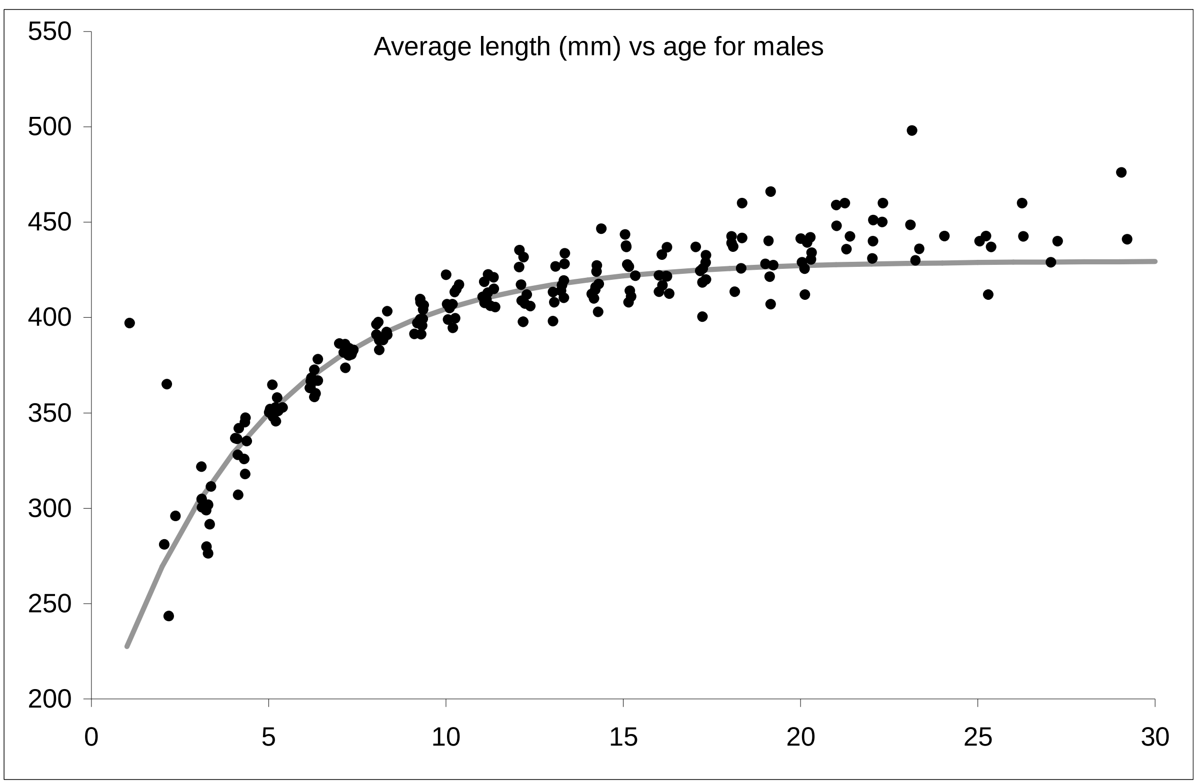


Figure 8. Variability in length-at-age for age-reads by the standard set of readers.

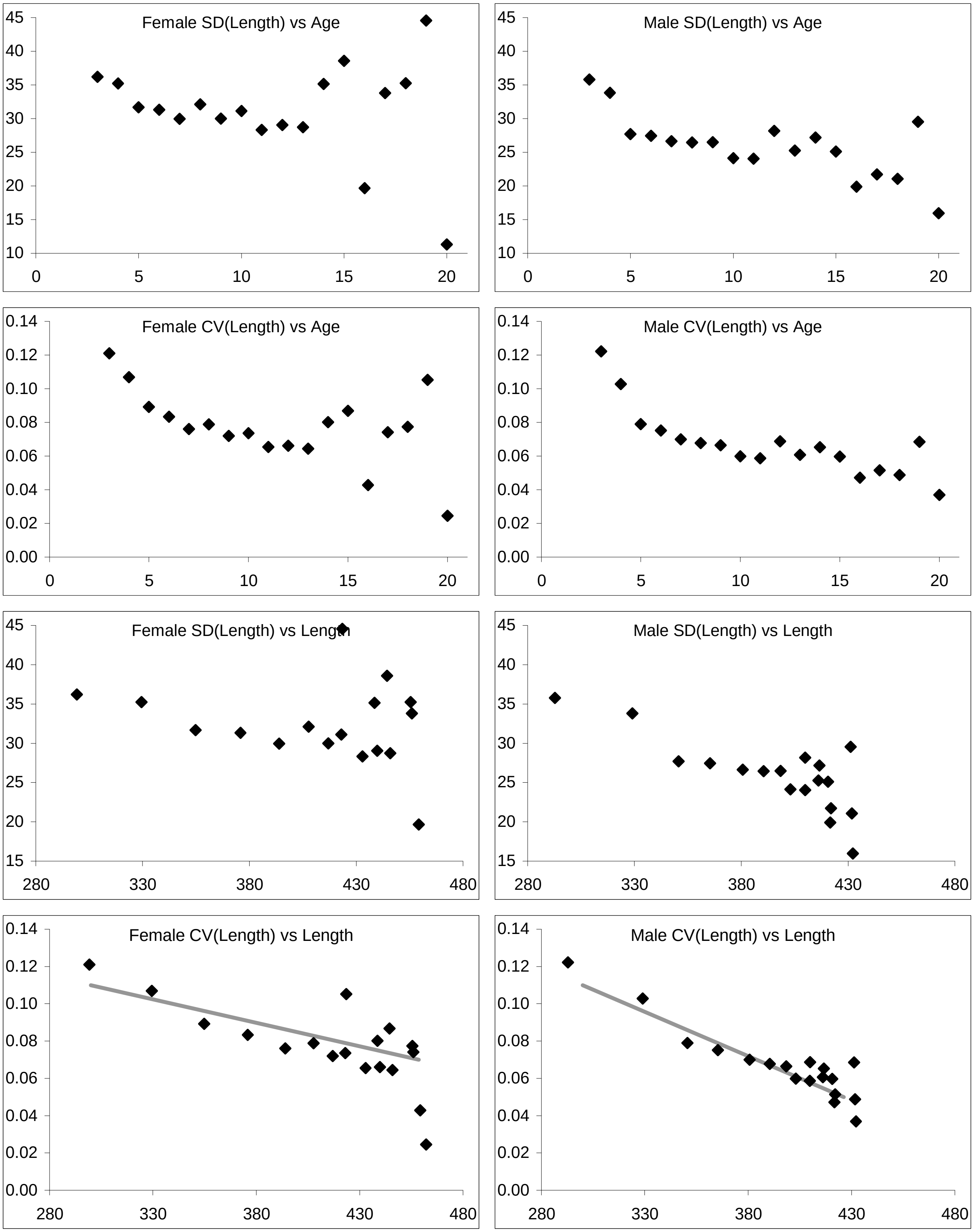


Figure 9. Age-reading variability among the standard set of readers.

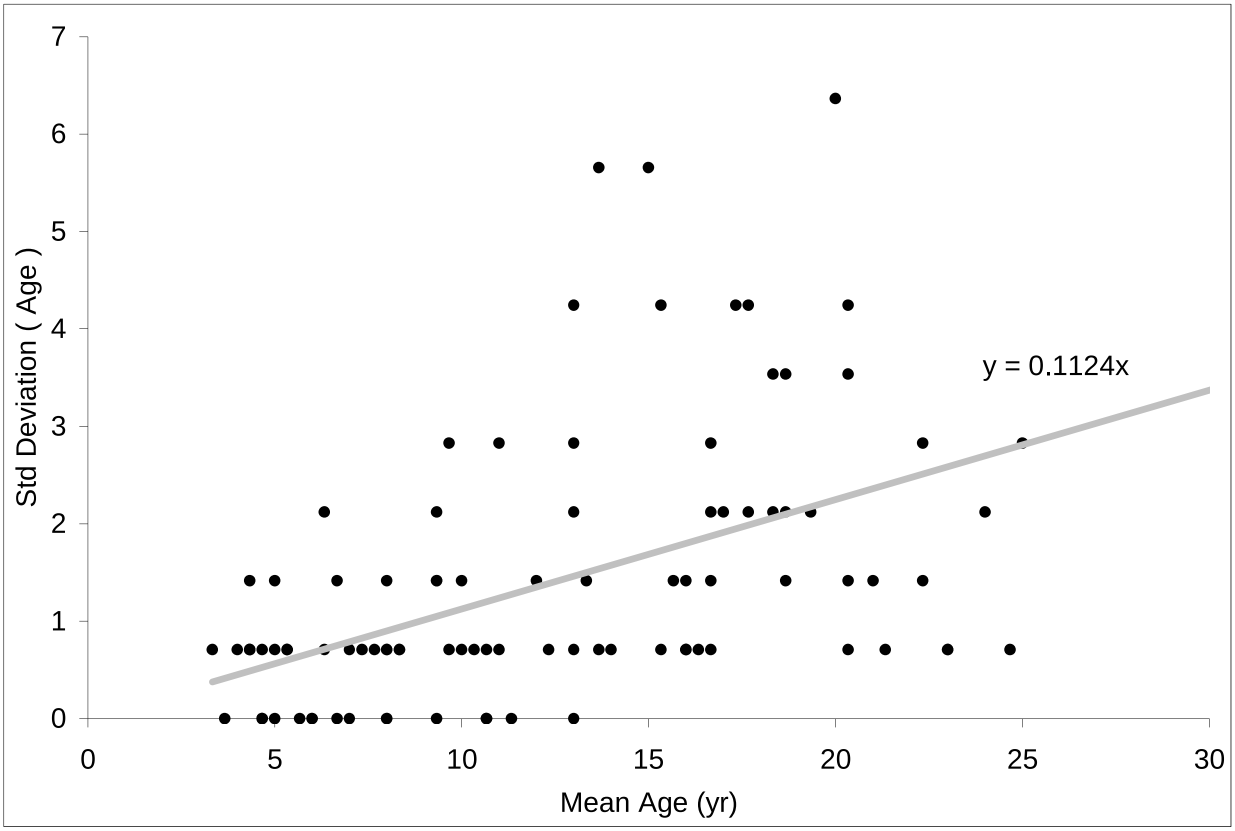
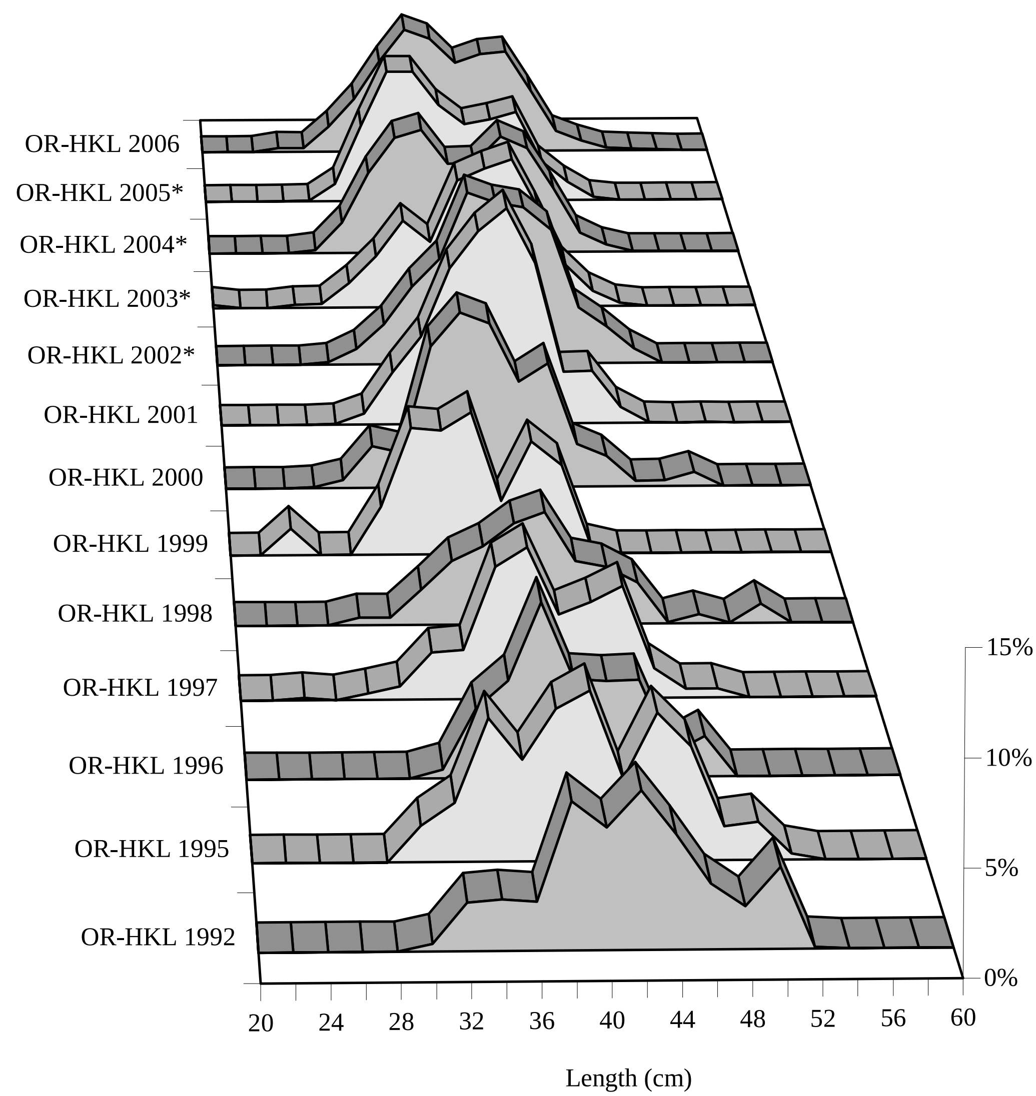


Figure 10. Black rockfish length composition data.

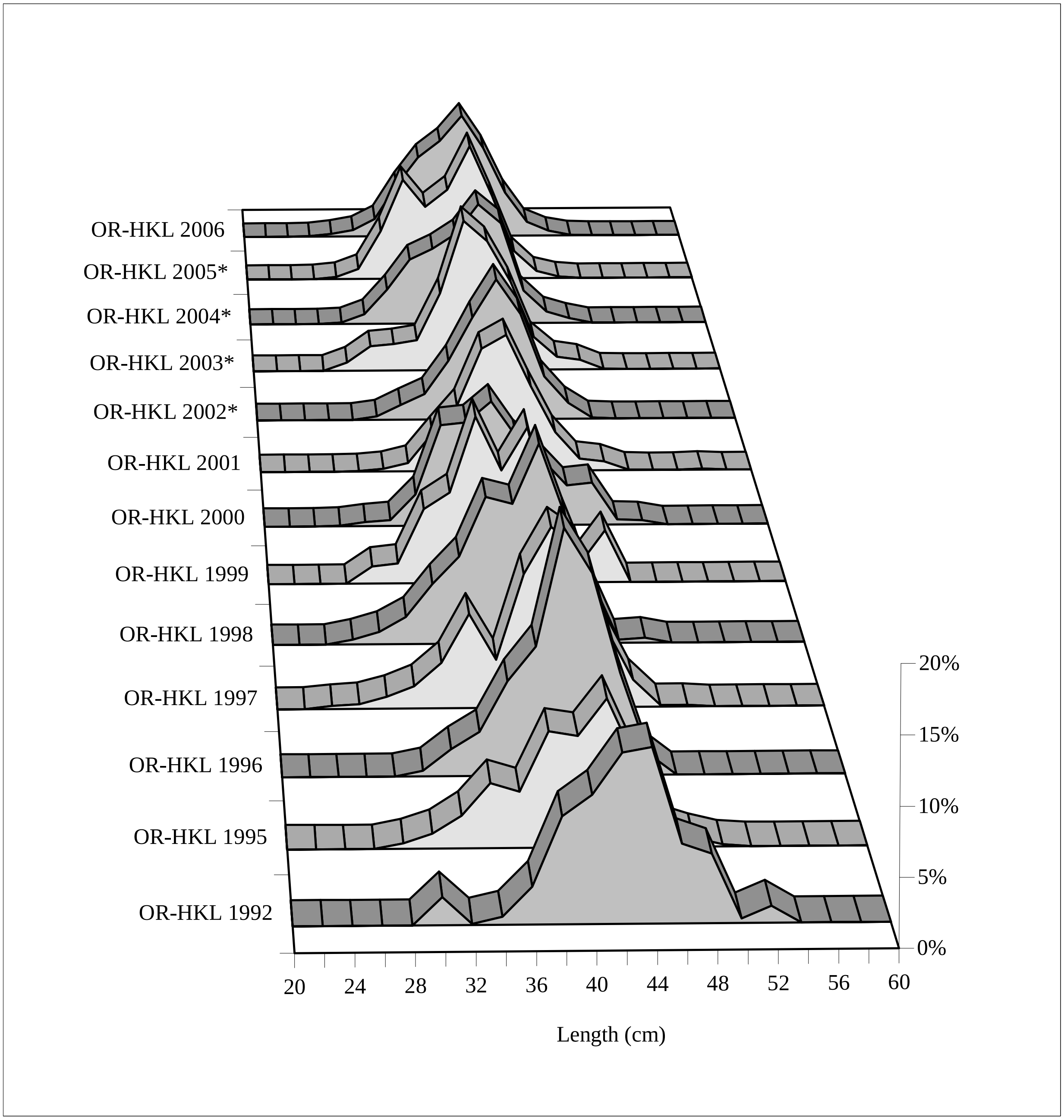
Oregon HKL length compositions - females.



* Length data not included in model because age-composition data used instead.

Figure 10. Black rockfish length composition data (continued).

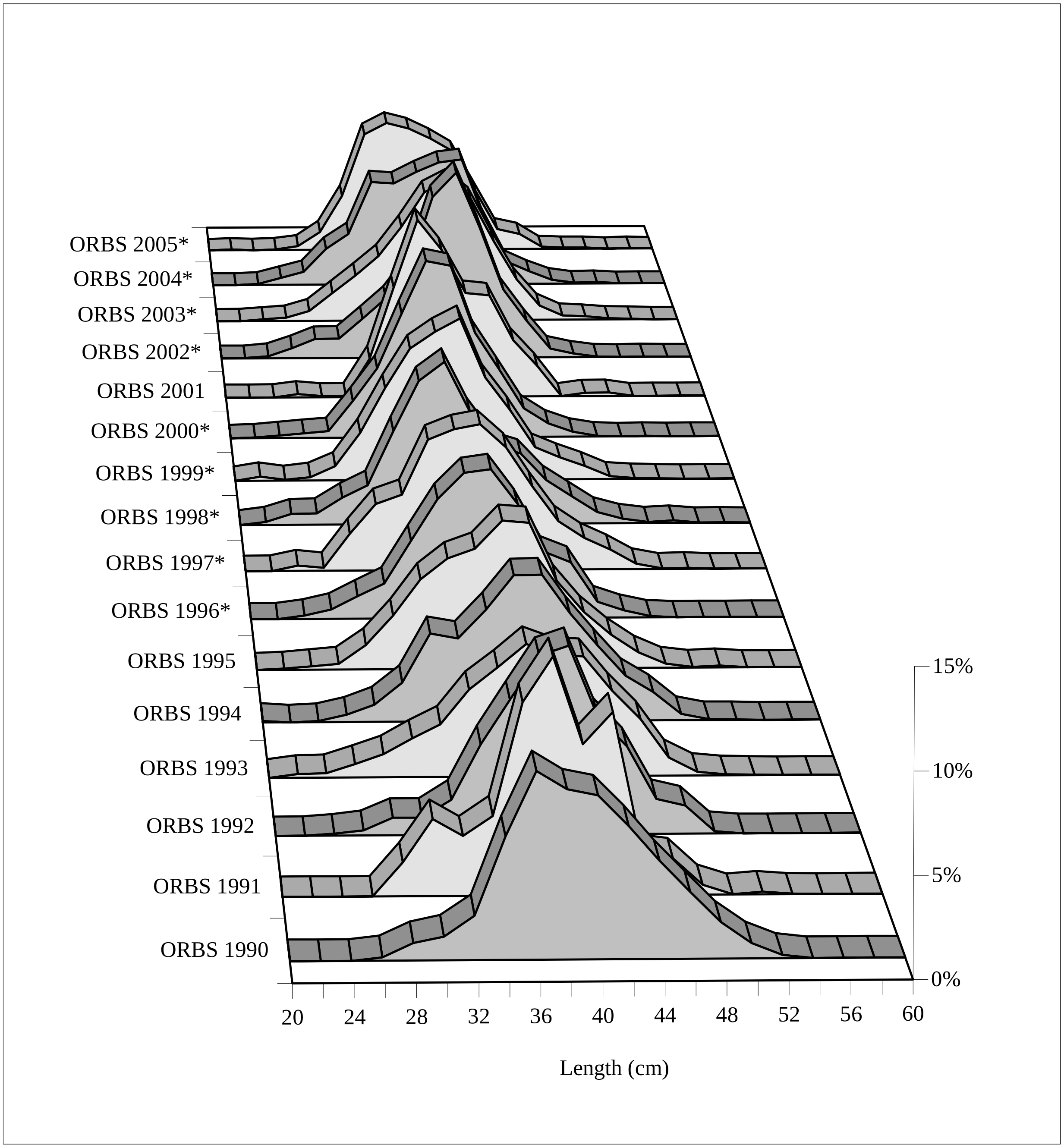
Oregon HKL length compositions - males.



* Length data not included in model because age-composition data used instead.

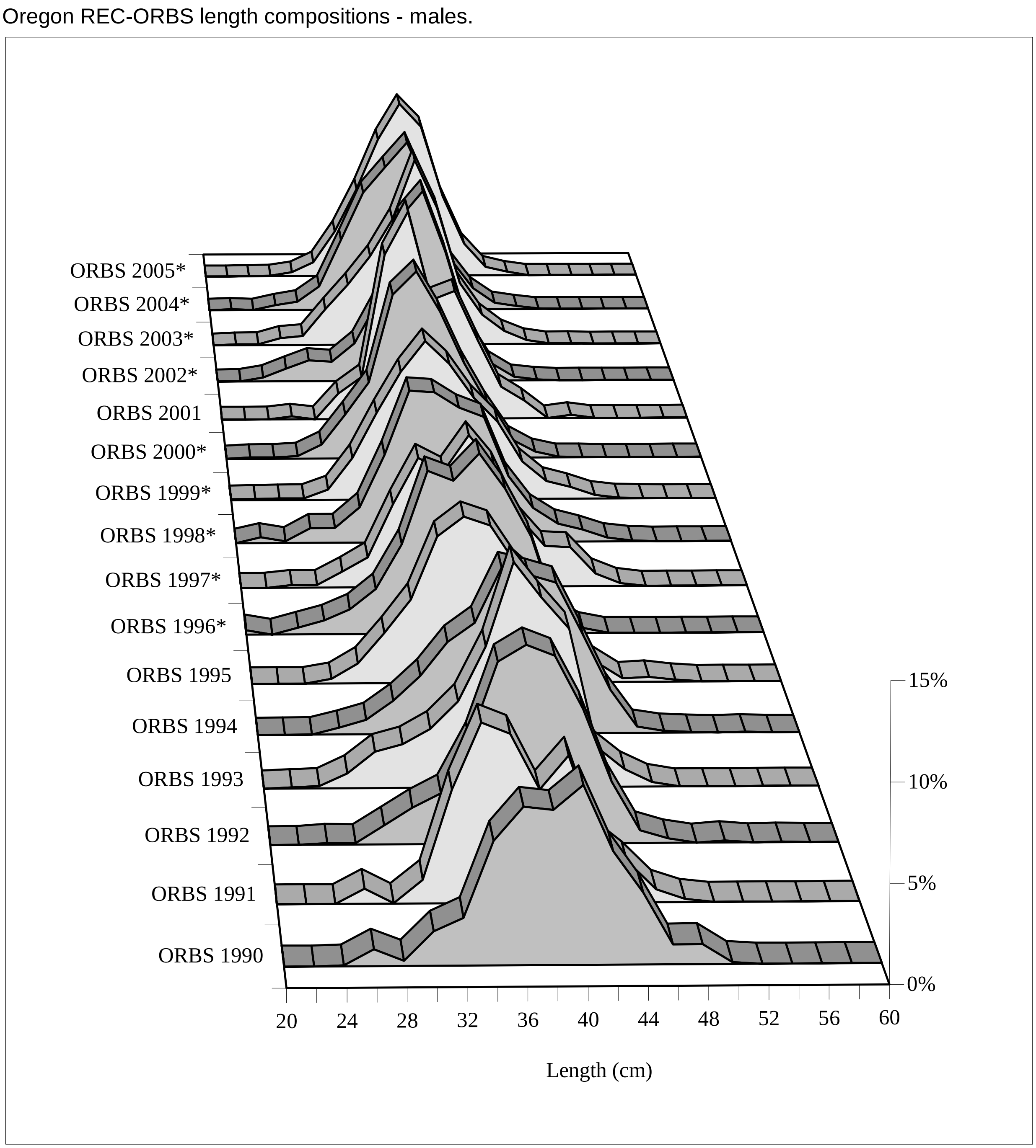
Figure 10. Black rockfish length composition data (continued).

Oregon REC-ORBS length compositions - females.



* Length data not included in model because age-composition data used instead.

Figure 10. Black rockfish length composition data (continued).



* Length data not included in model because age-composition data used instead.

Figure 10. Black rockfish length composition data (continued).

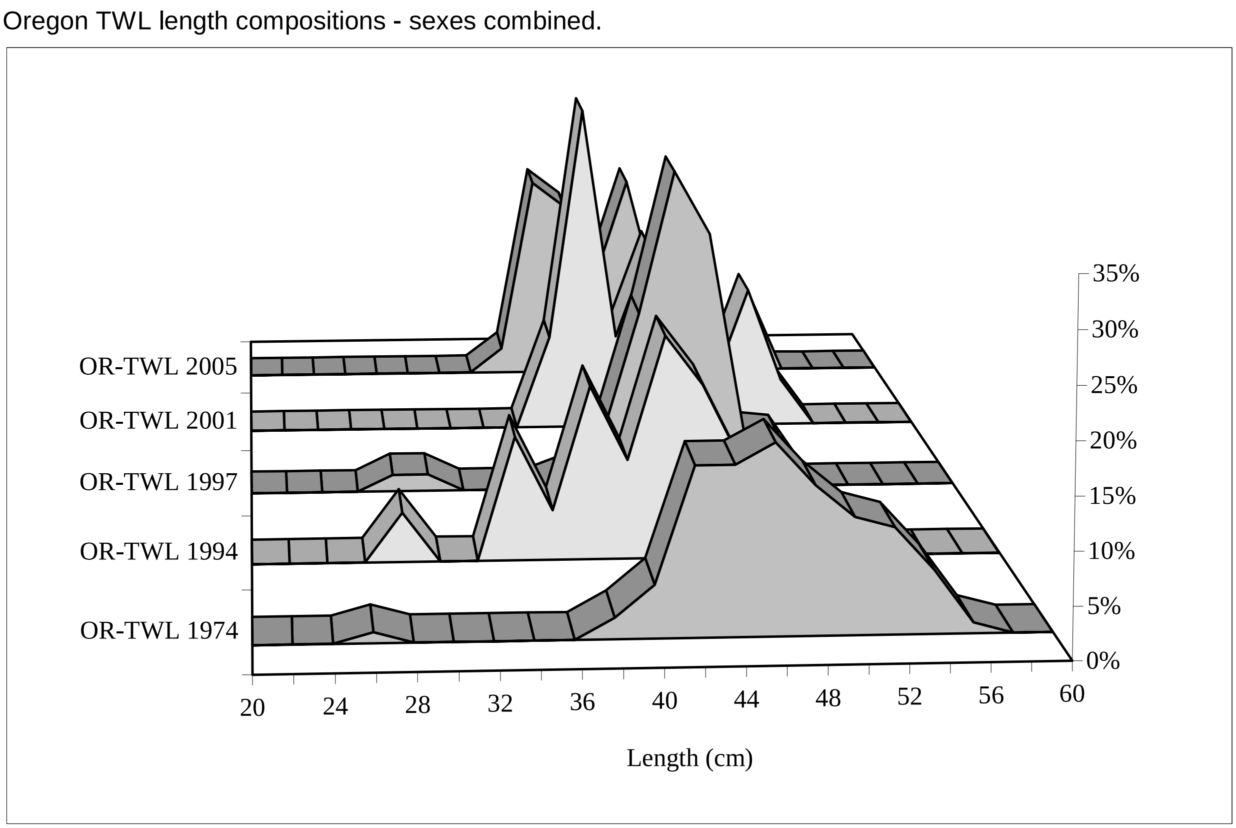


Figure 10. Black rockfish length composition data (continued).

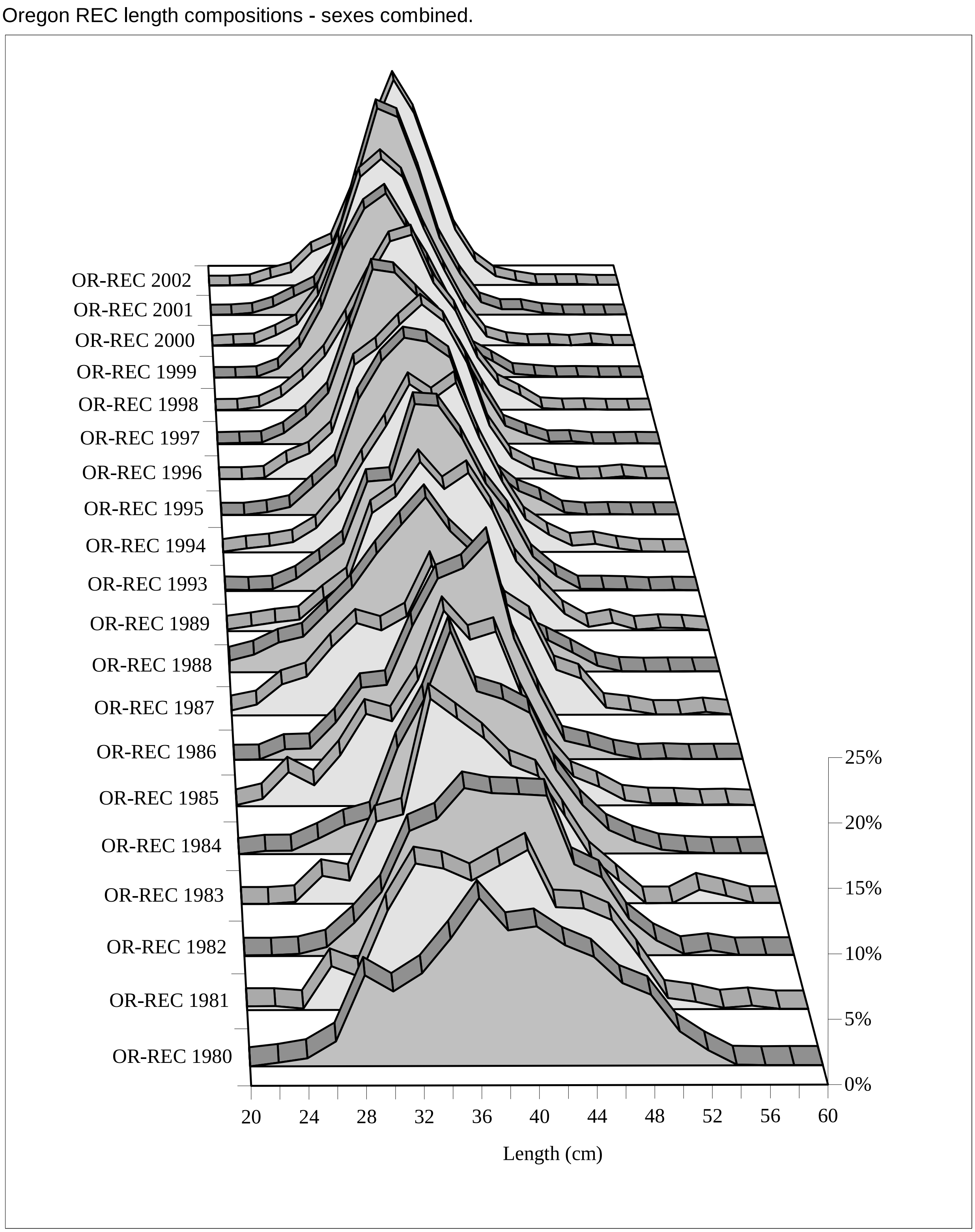


Figure 10. Black rockfish length composition data (continued).

Oregon REC-ORBS length compositions - sexes combined.

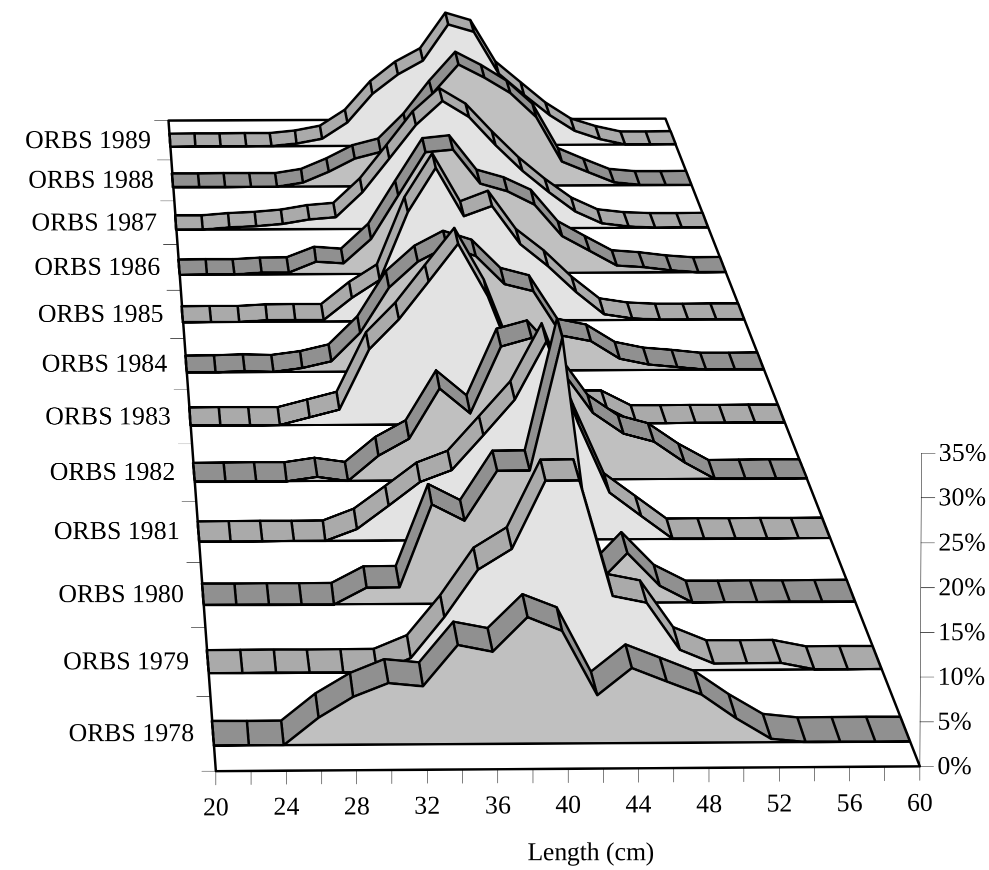


Figure 10. Black rockfish length composition data (continued).

Oregon REC-ORBS-2 length compositions - sexes combined.

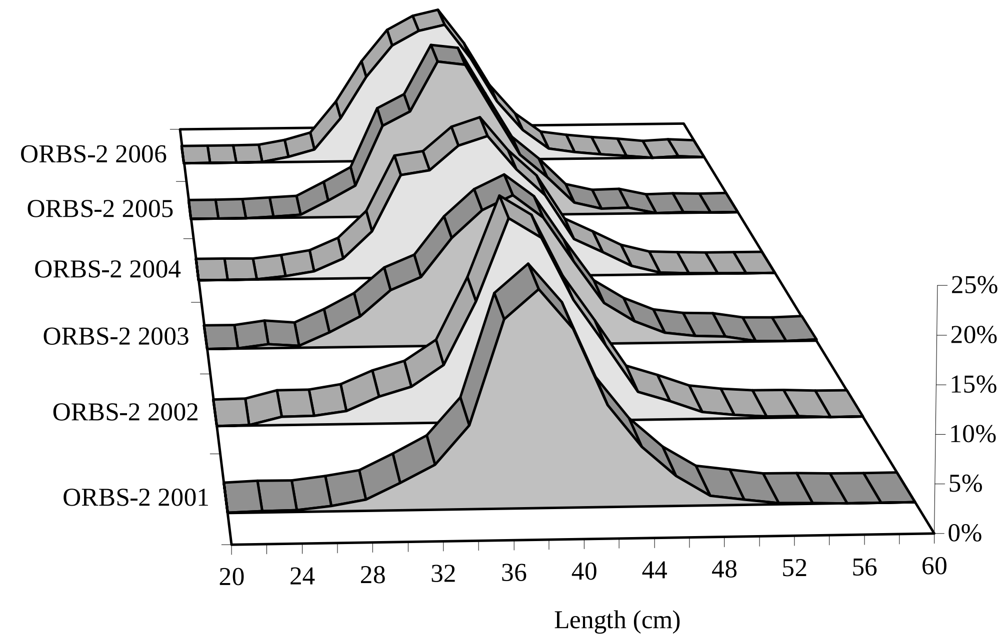


Figure 10. Black rockfish length composition data (continued).

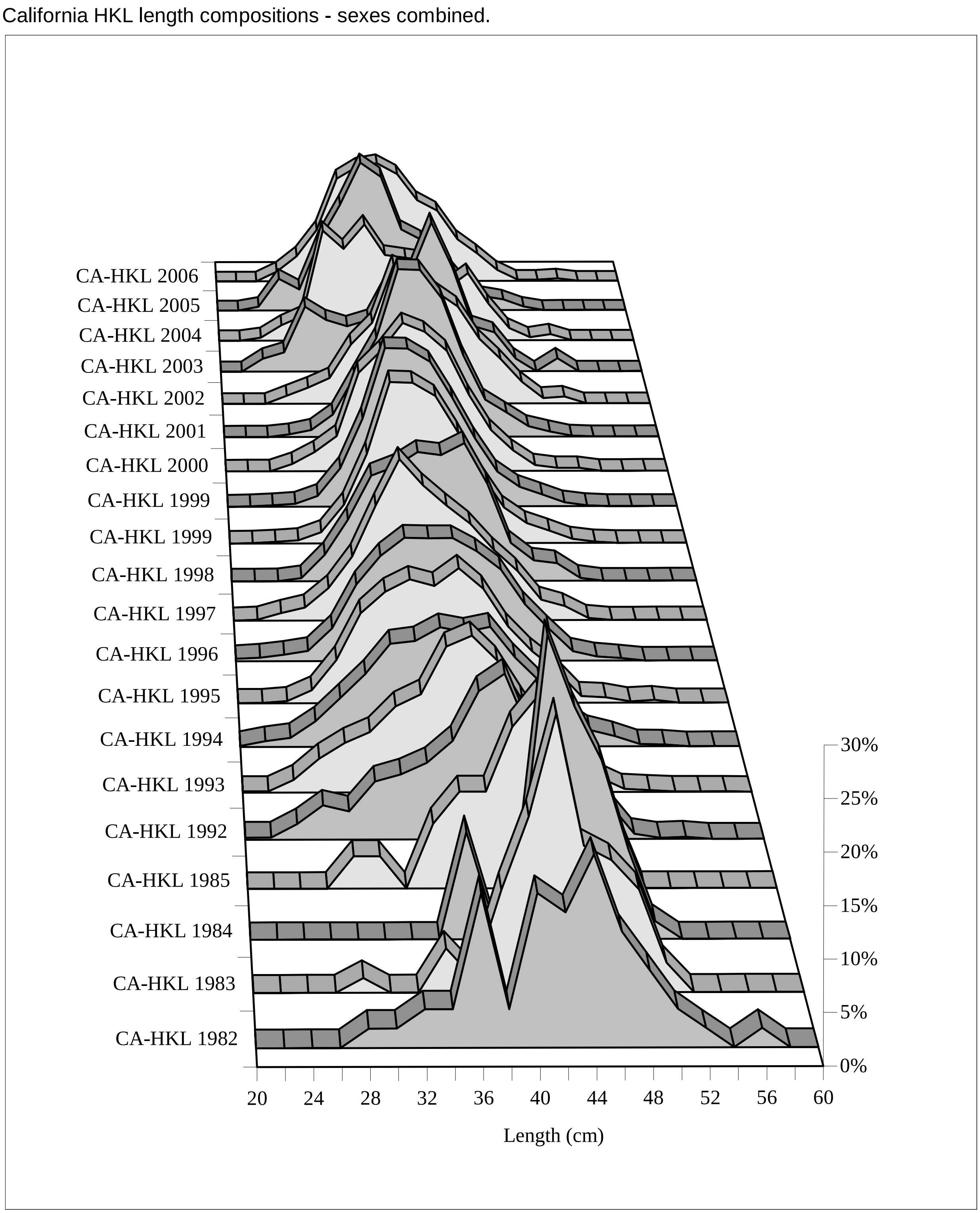
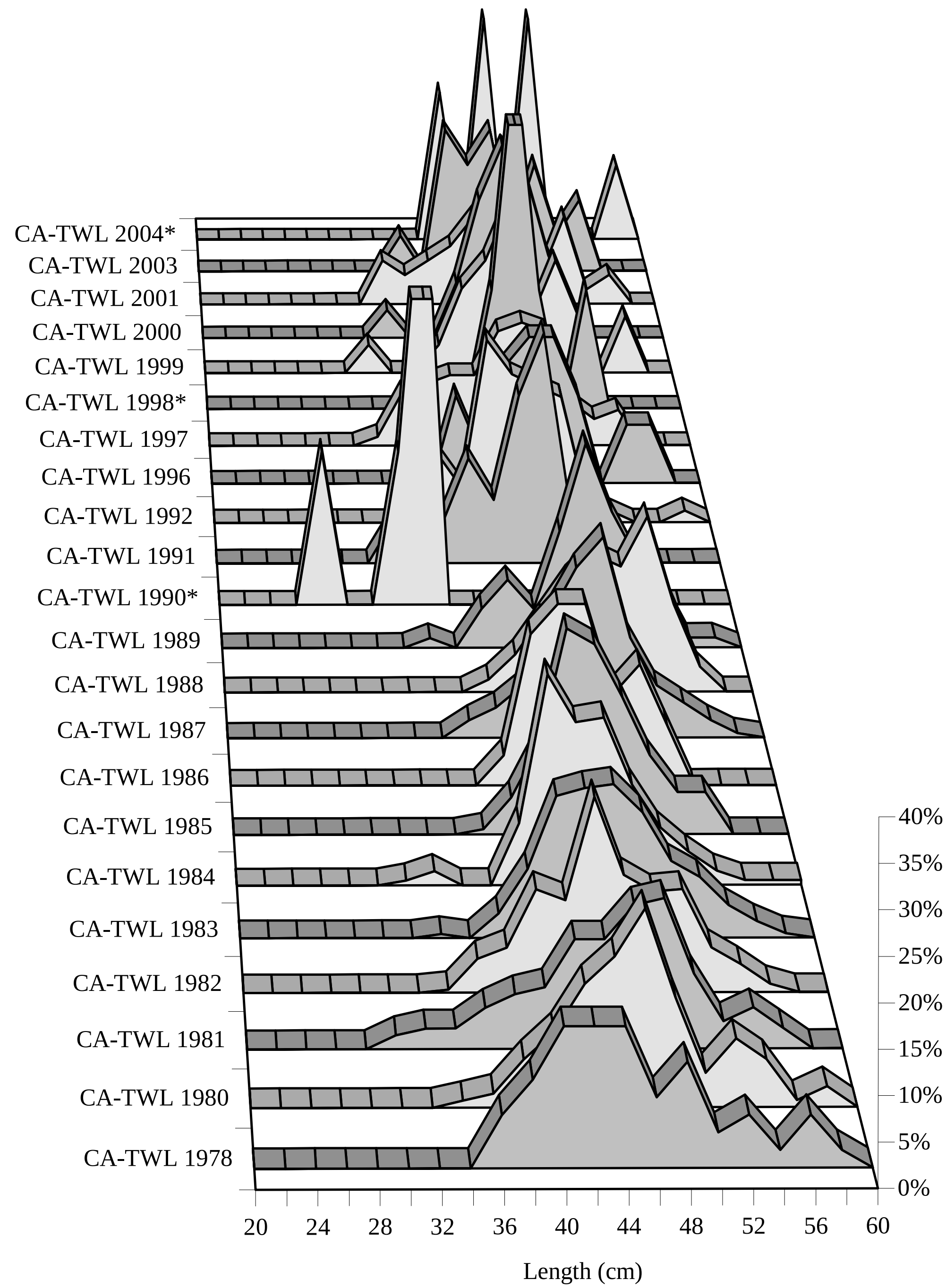


Figure 10. Black rockfish length composition data (continued).

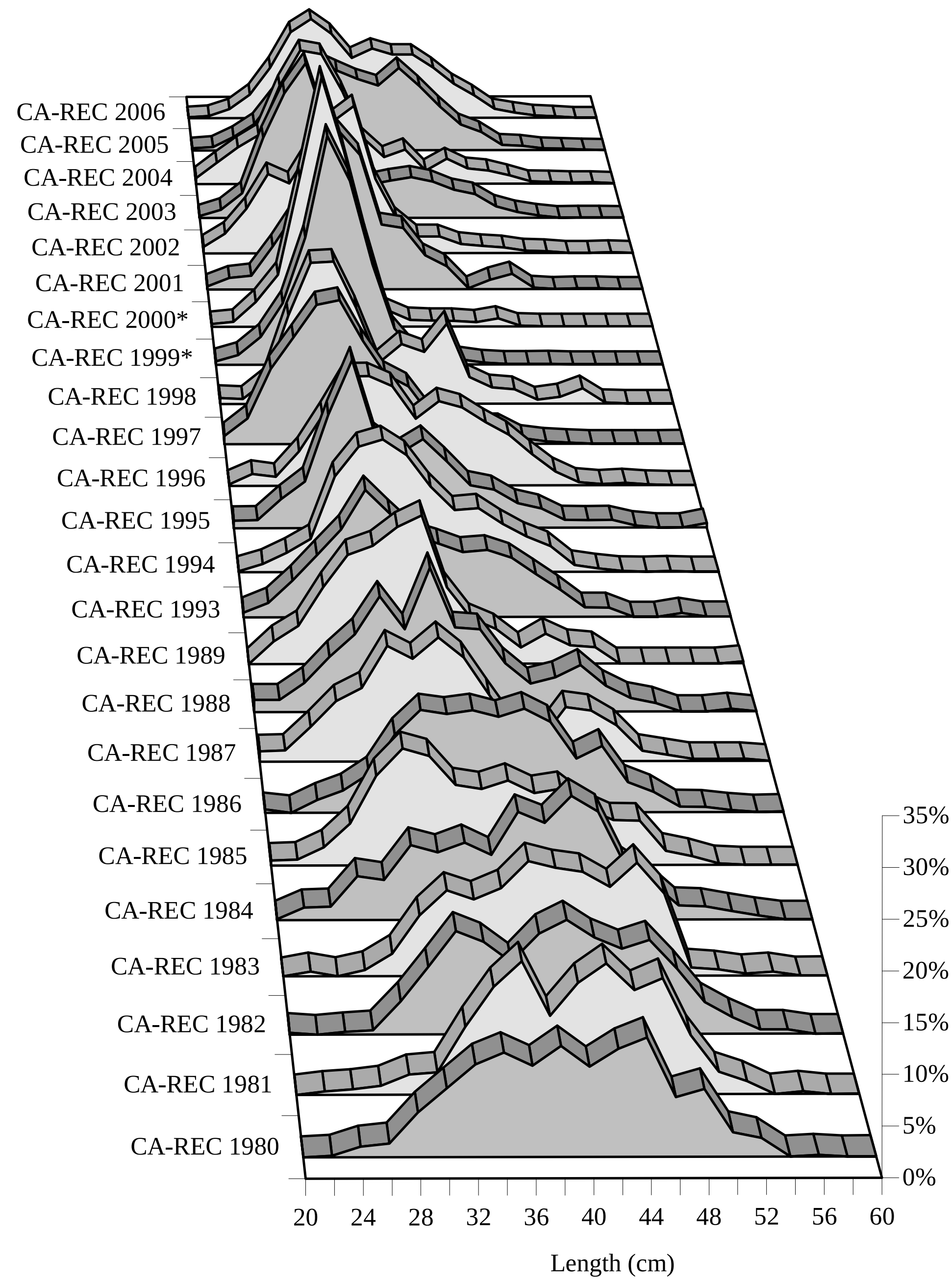
California TWL length compositions - sexes combined.



* Data not included in model because too small sample size.

Figure 10. Black rockfish length composition data (continued).

California REC length compositions - sexes combined.



* Data not included in model because extremely narrow distribution.

Figure 10. Black rockfish length composition data (continued).

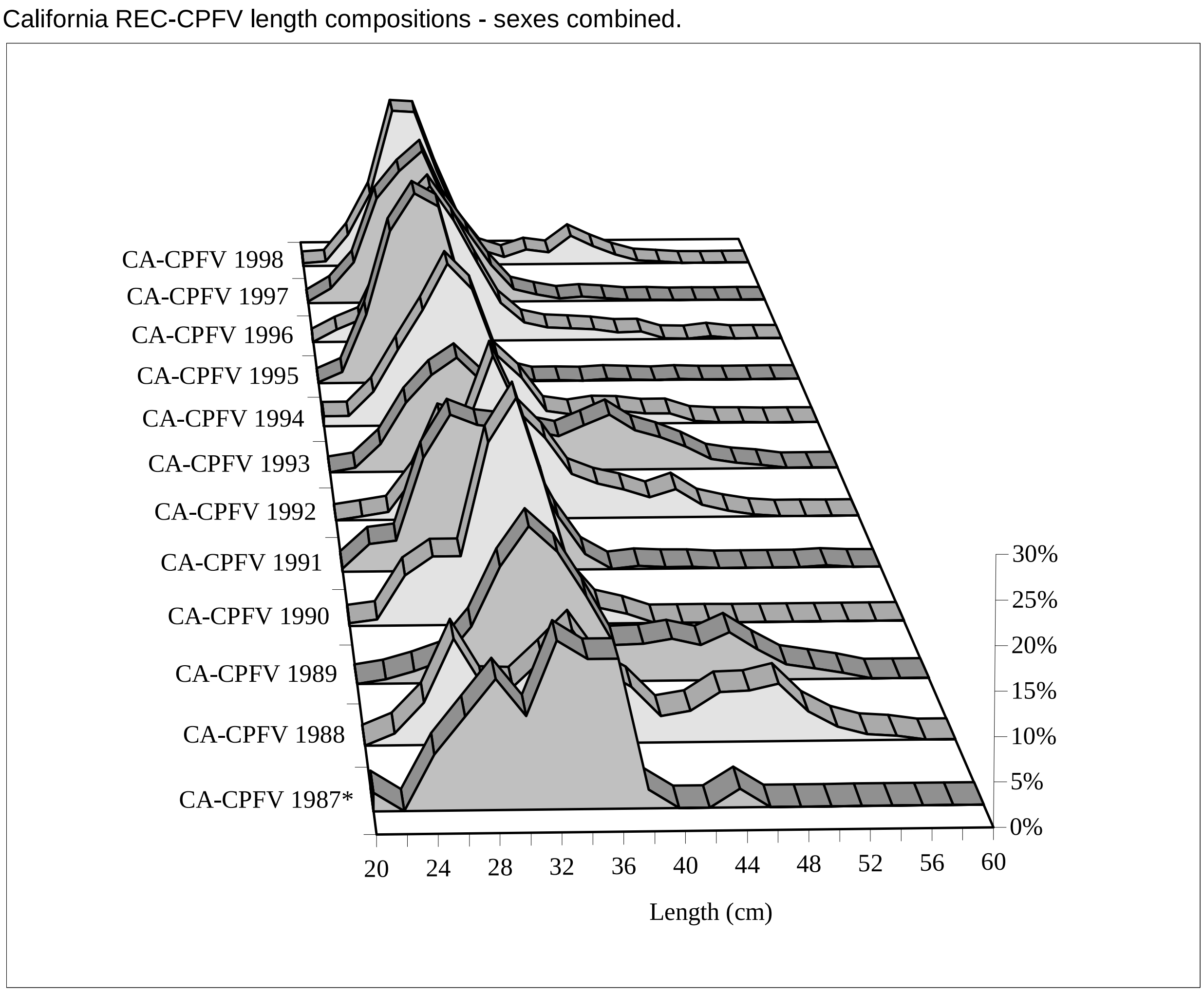


Figure 11. Black rockfish age composition data.

Oregon HKL age compositions - females.

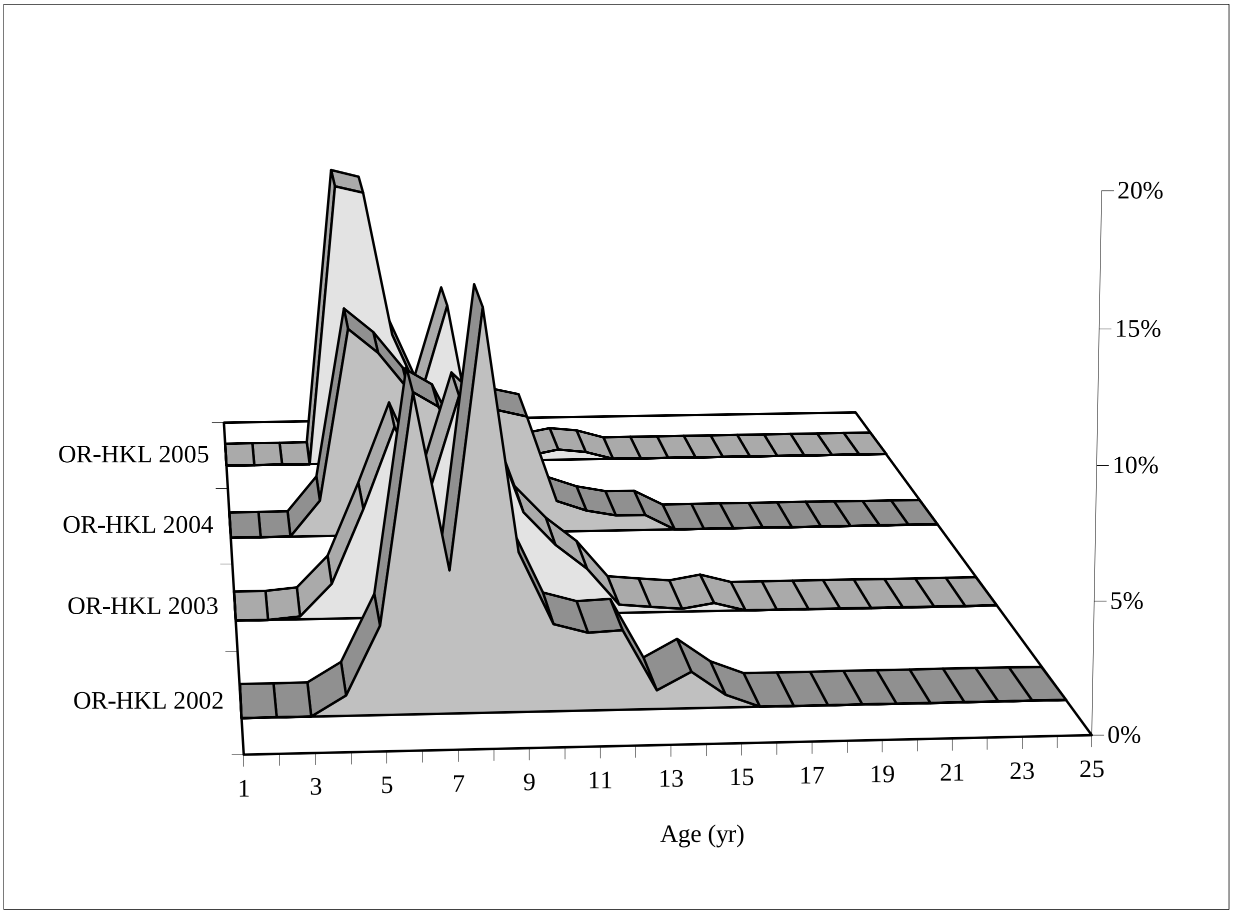


Figure 11. Black rockfish age composition data (continued).

Oregon HKL age compositions - males.

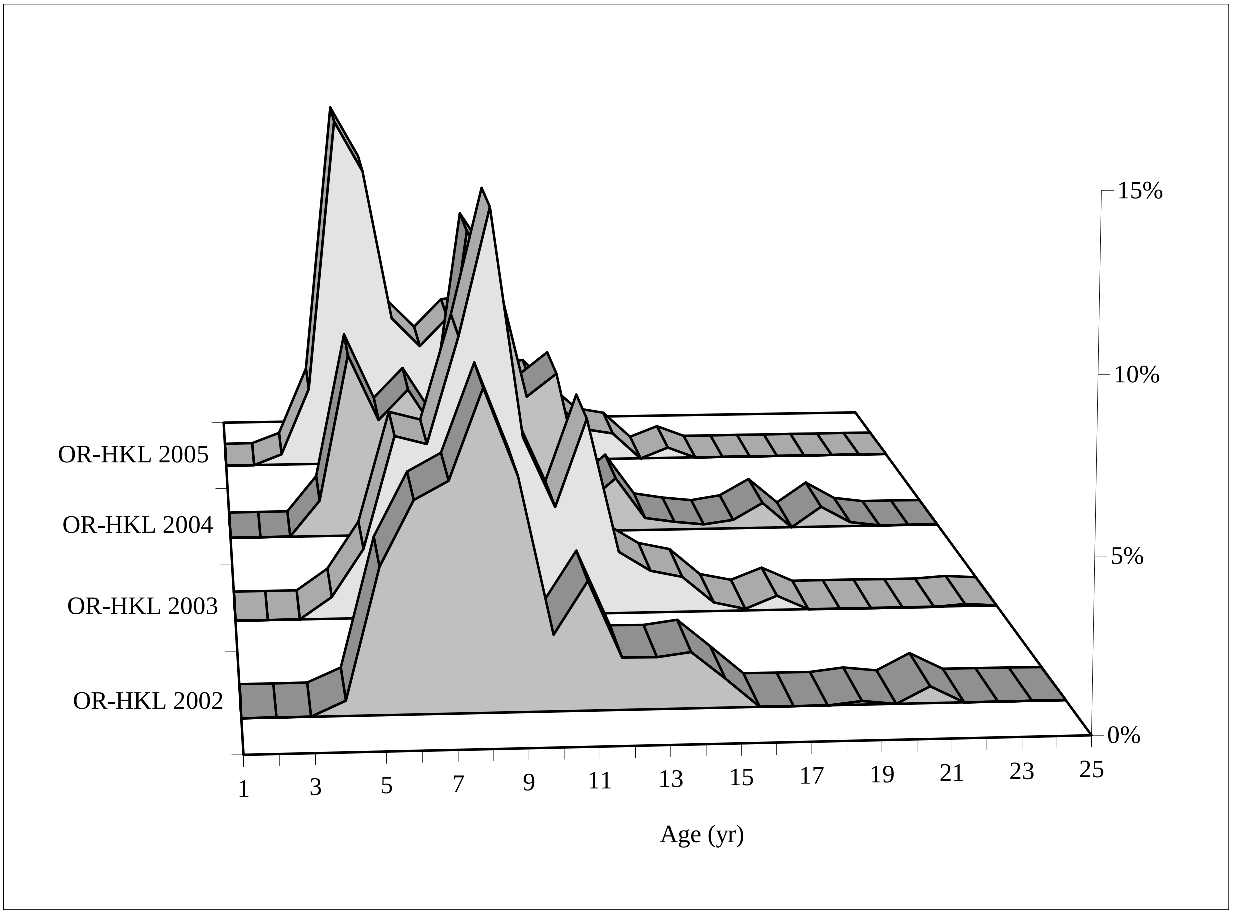


Figure 11. Black rockfish age composition data (continued).

Oregon REC-ORBS length compositions - females.

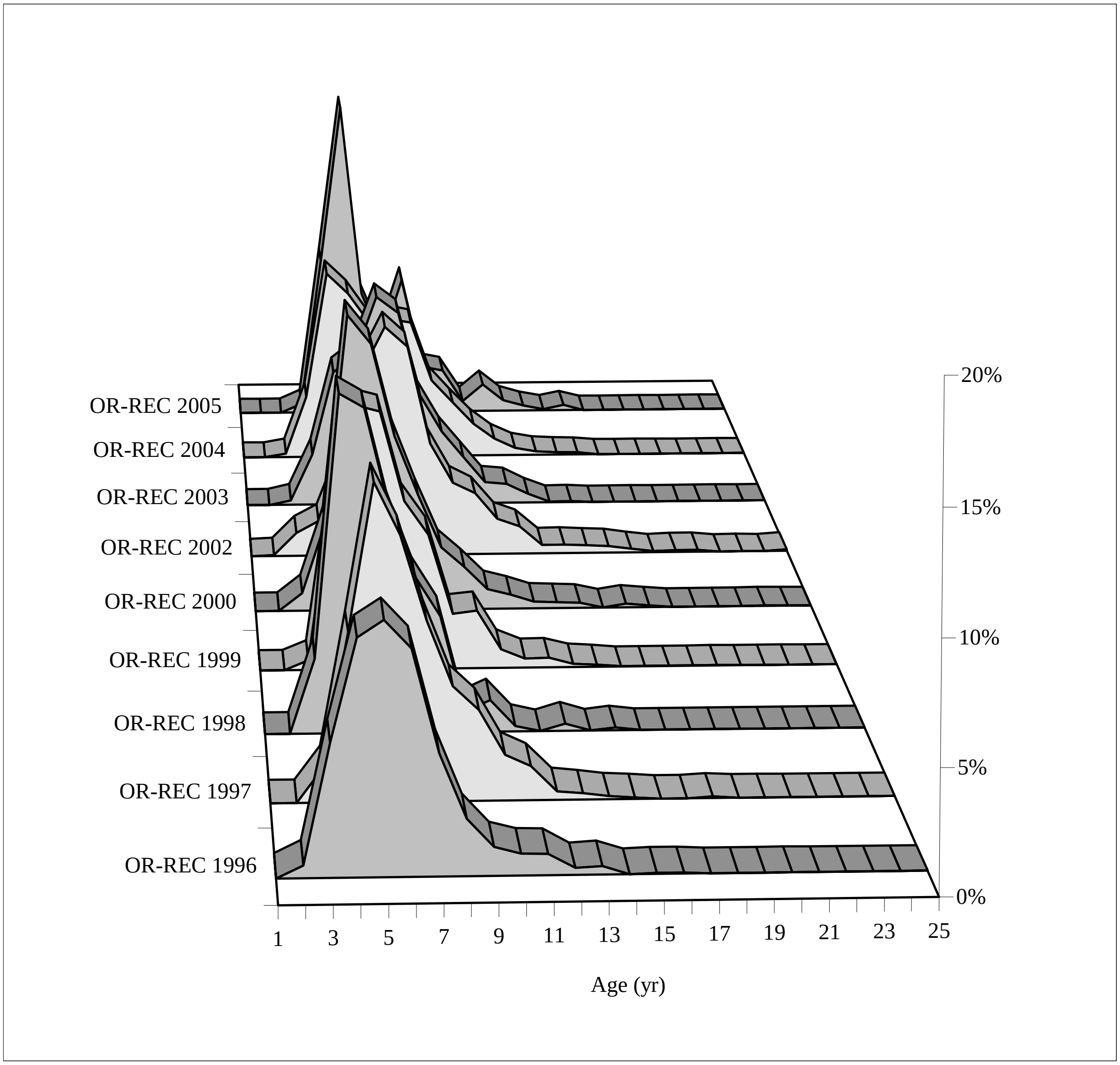


Figure 11. Black rockfish age composition data (continued).

Oregon REC-ORBS length compositions - males.

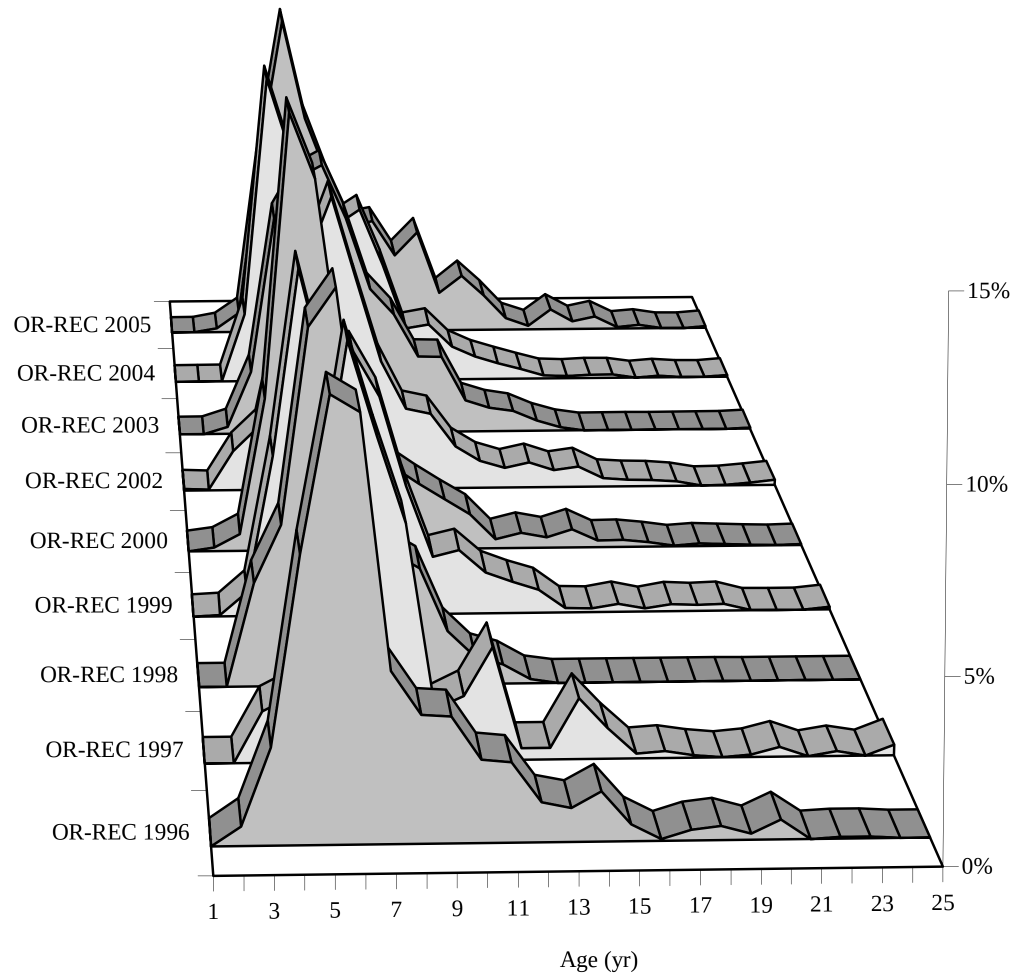
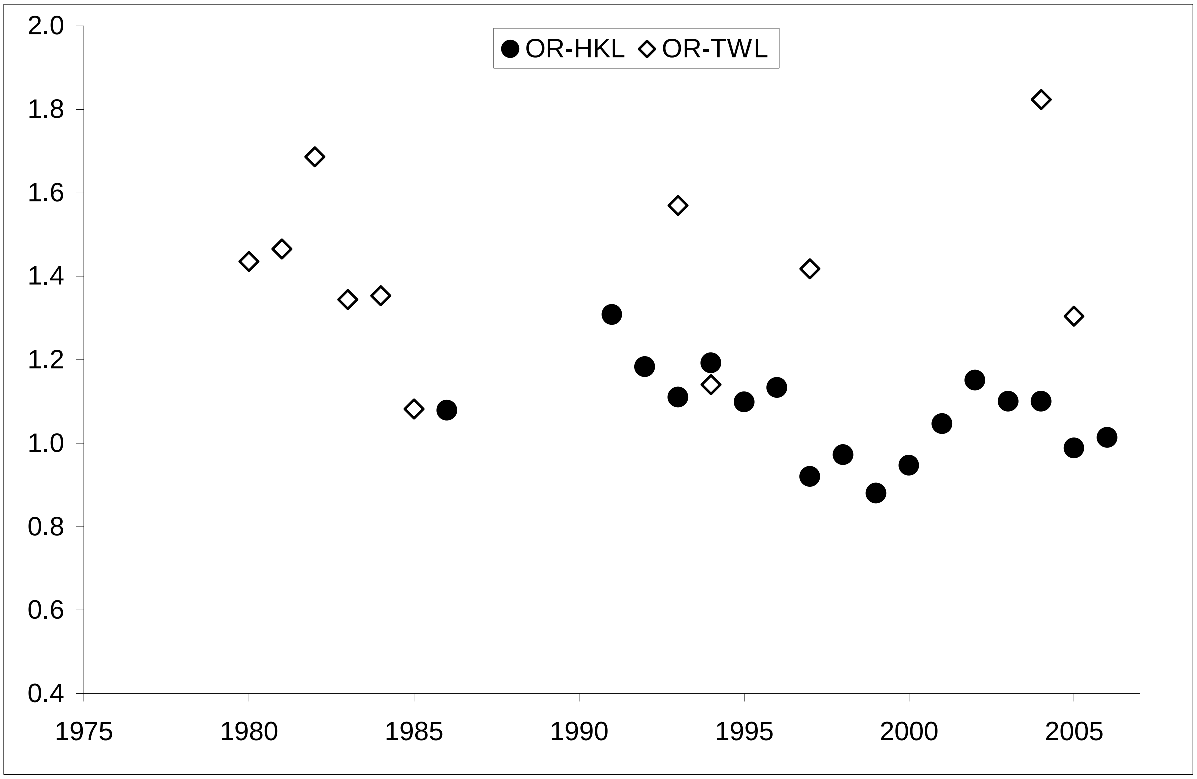


Figure 12. Black rockfish mean weights from species composition samples.

Oregon Commercial Fisheries - Average Fish Weight (kg)



California Commercial Fisheries - Average Fish Weight (kg)

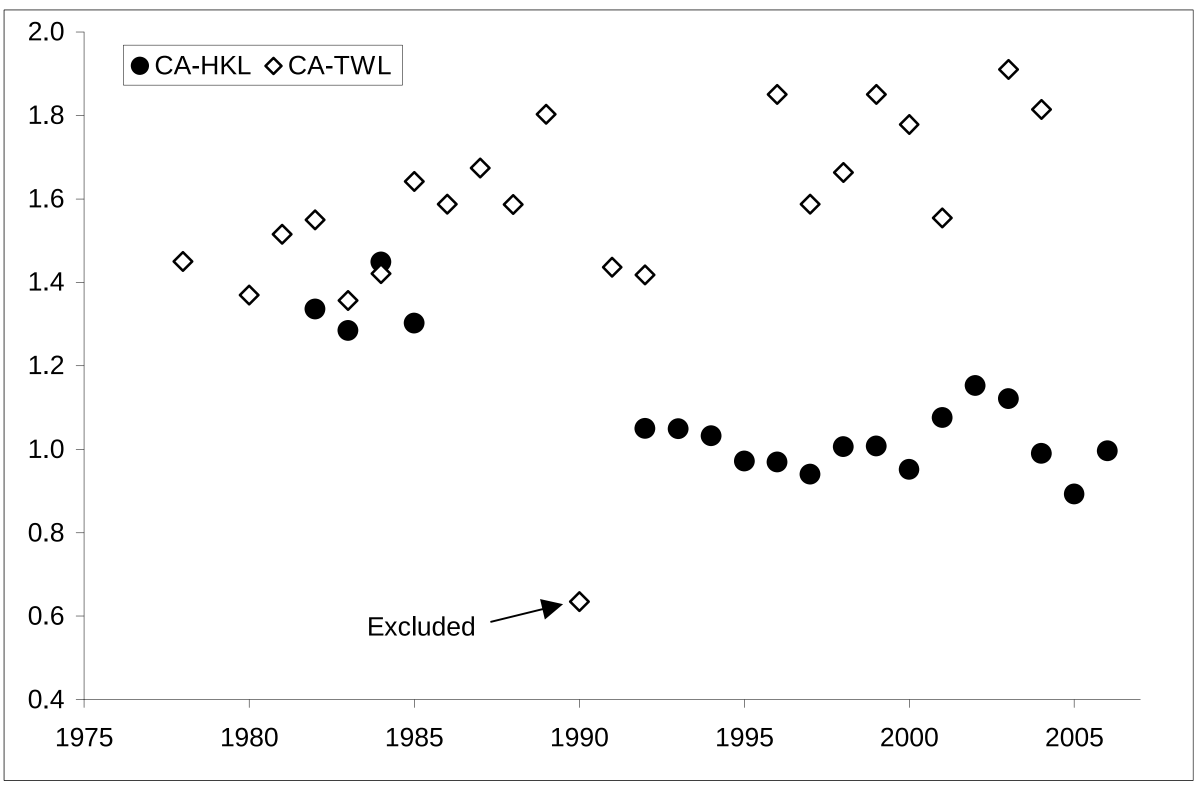
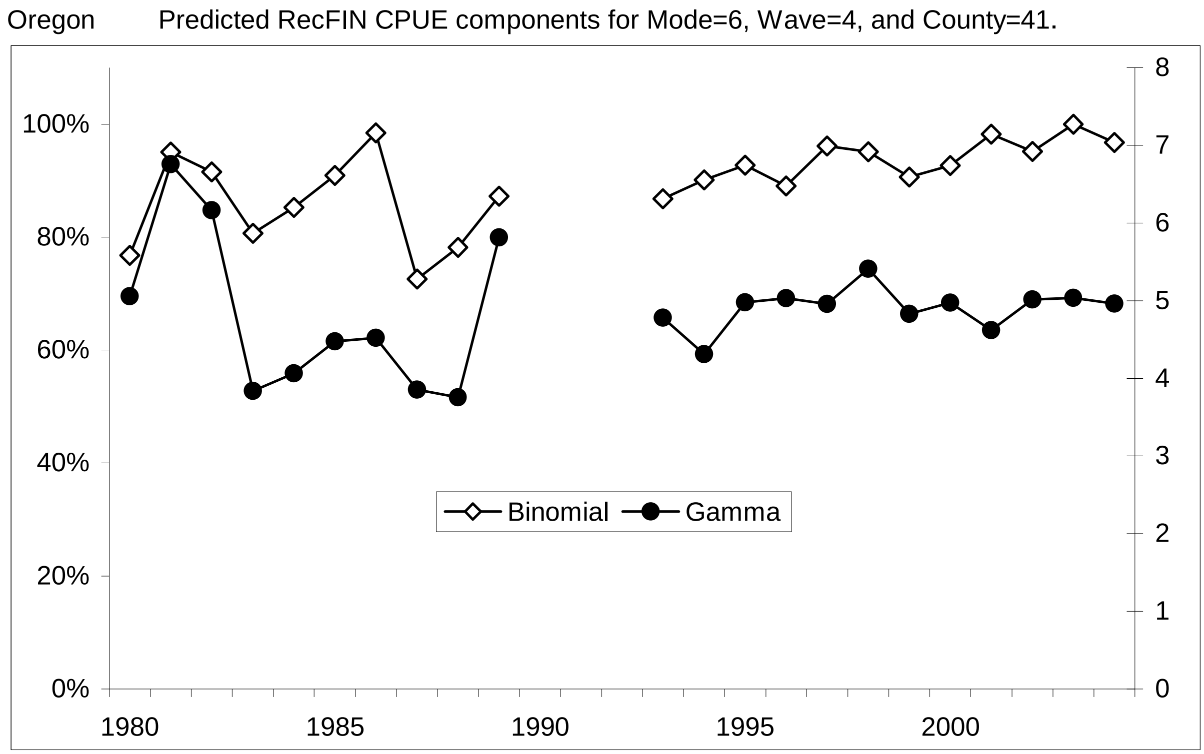


Figure 13. RecFIN CPUE abundance indices.



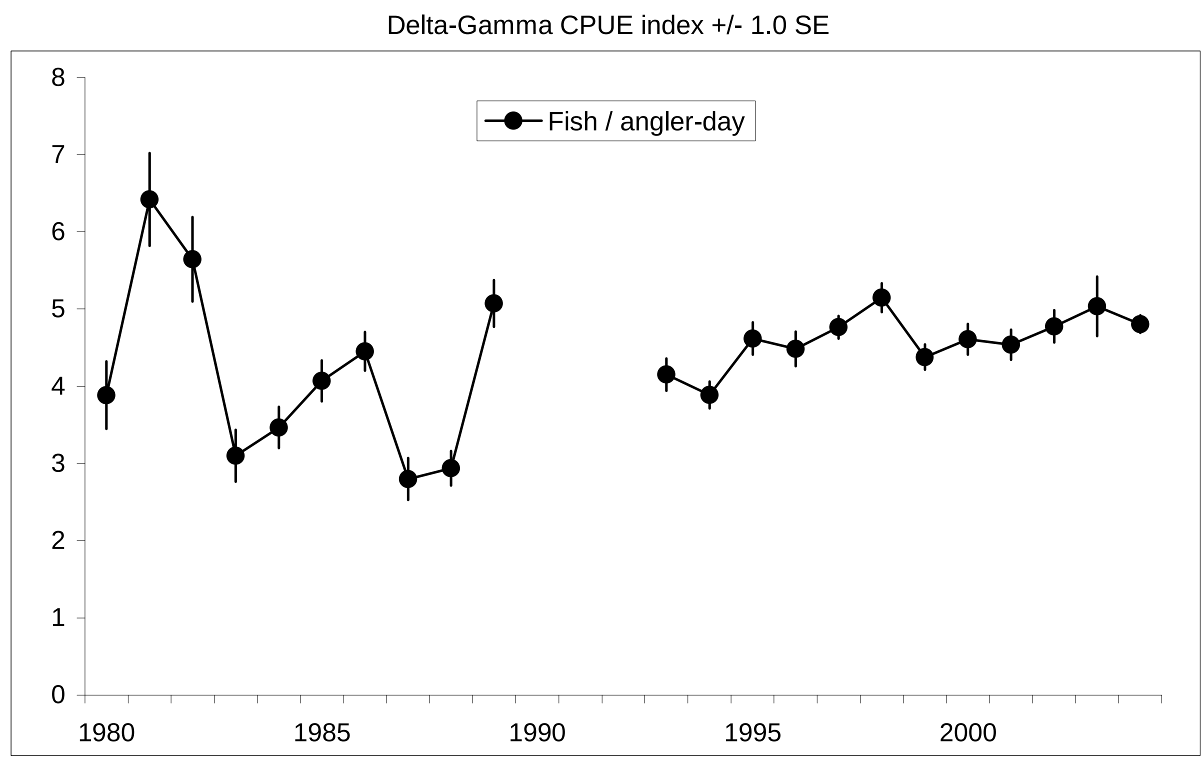
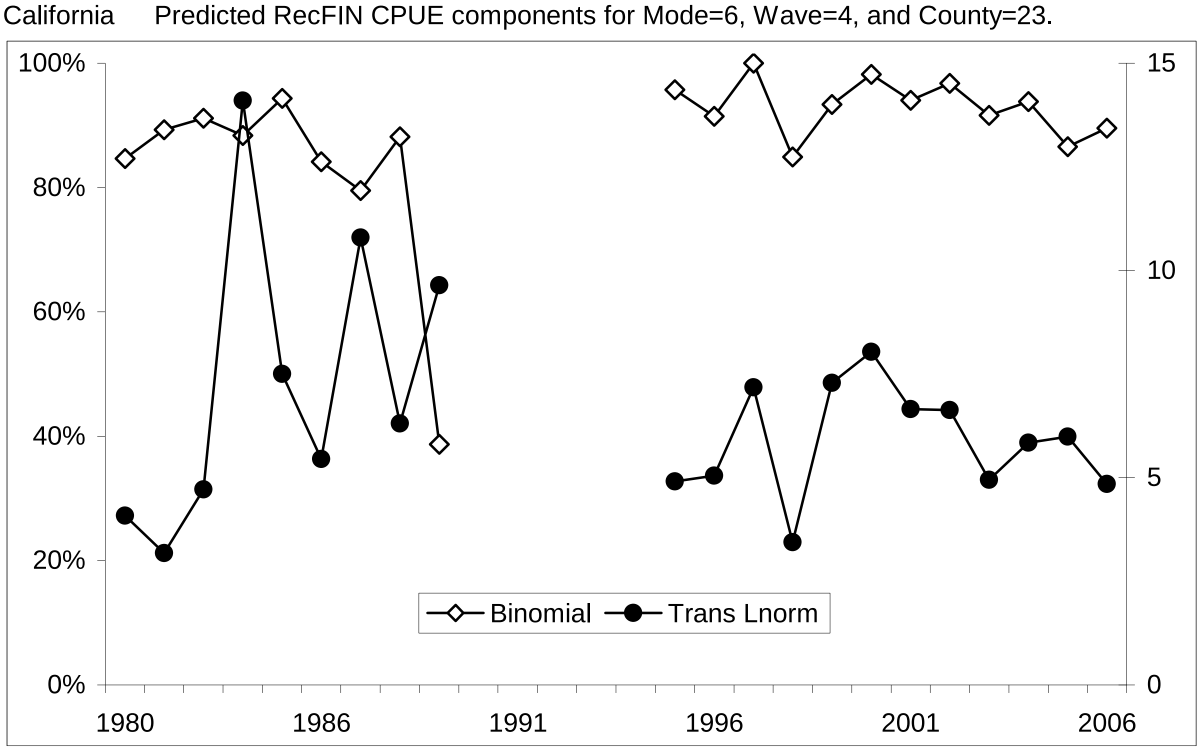


Figure 14. RecFIN CPUE abundance indices (continued).



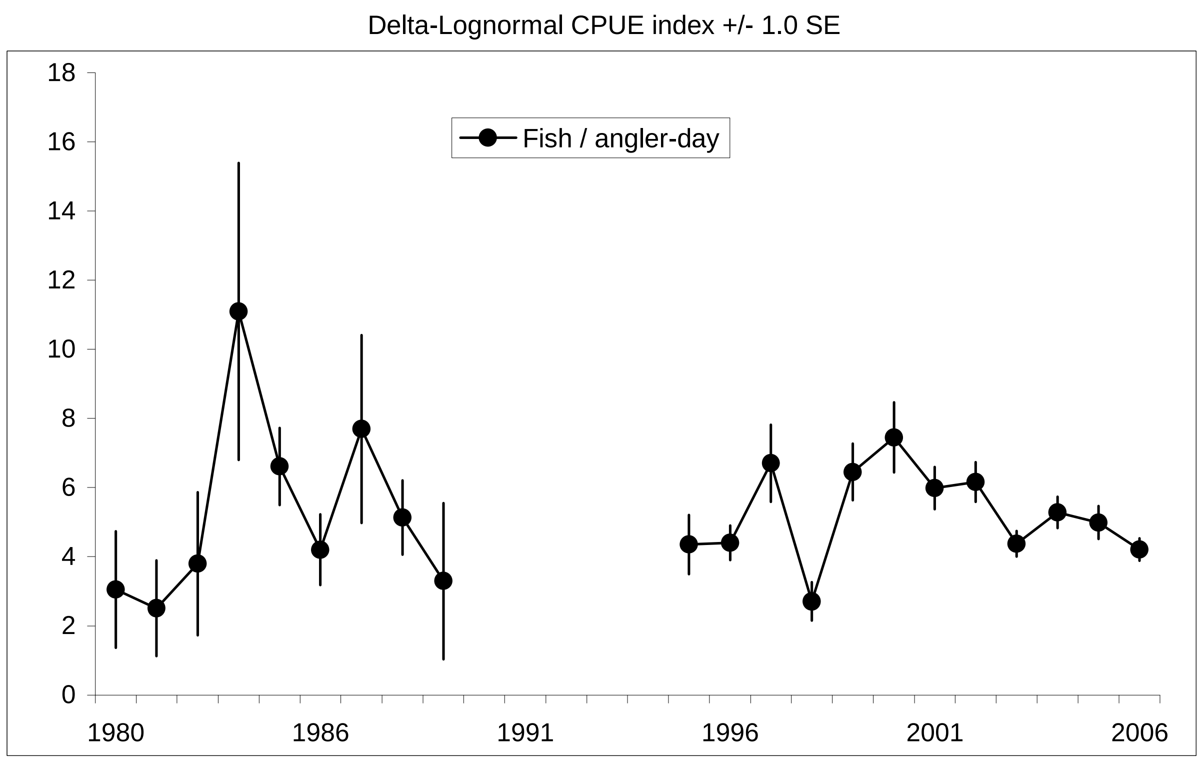


Figure 15. CPUE abundance index from the Oregon Ocean Recreation Boat Survey.

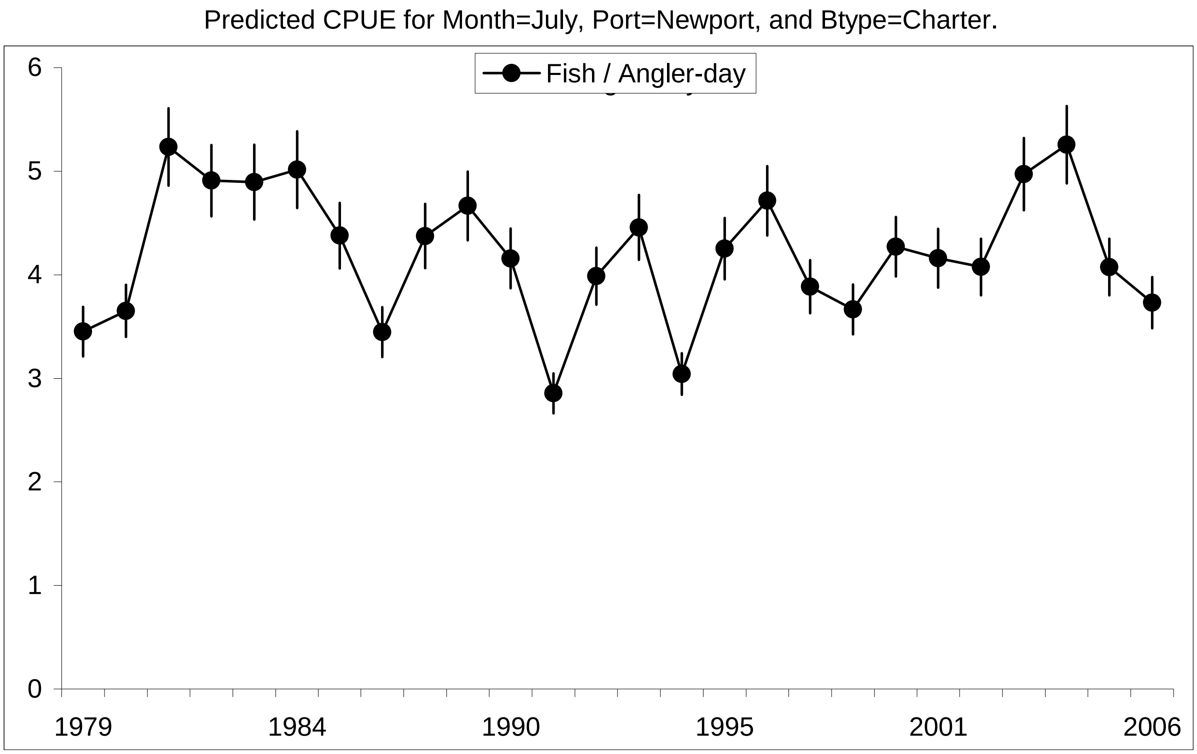


Figure 16. CPUE abundance index from the California CPFV Observer database.

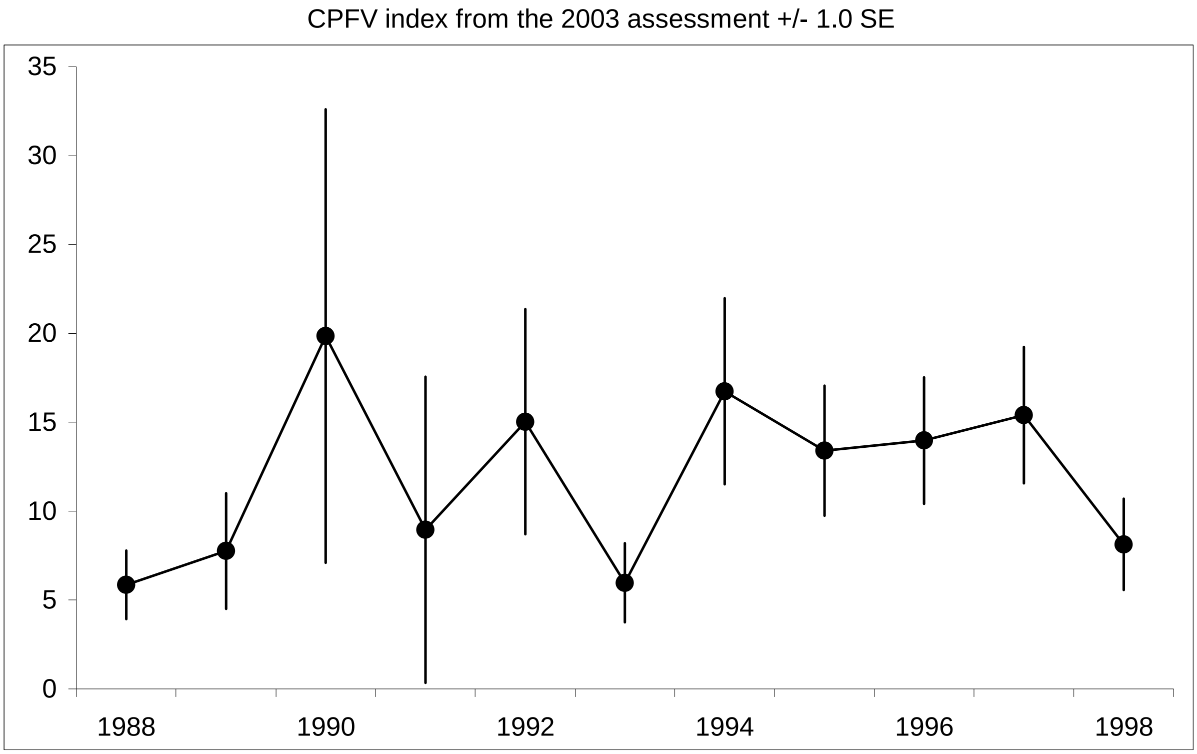
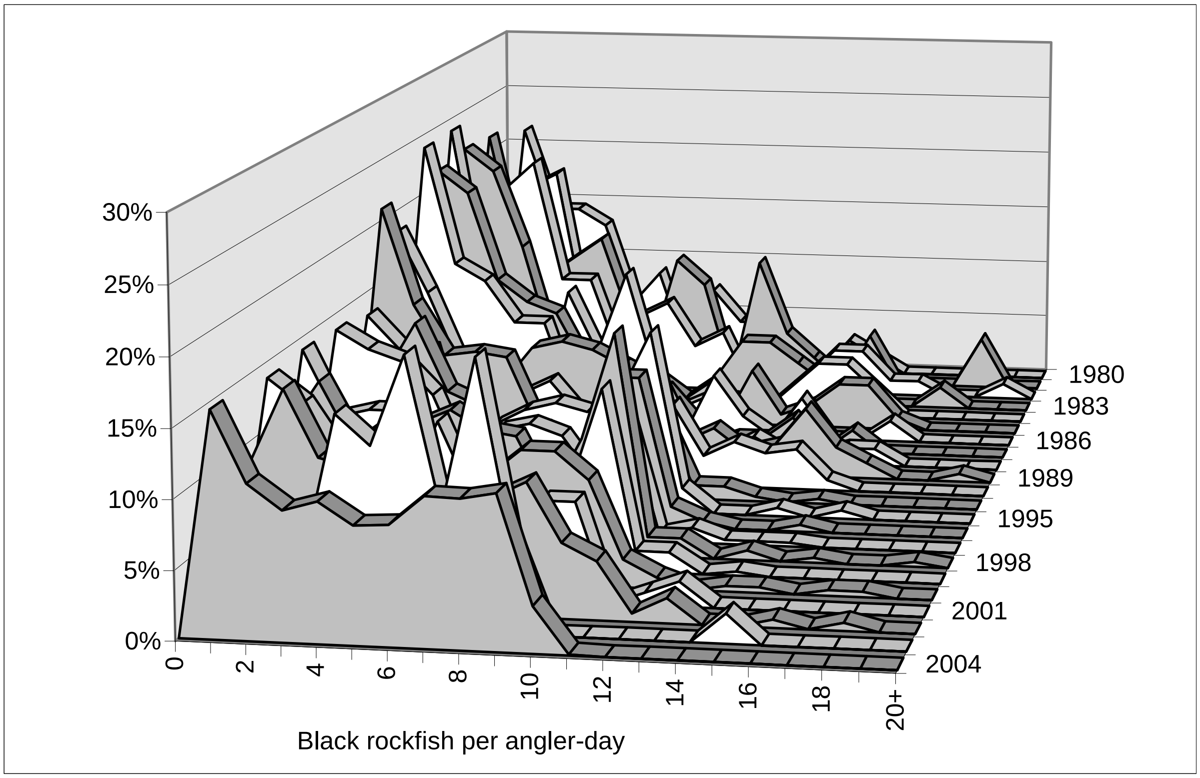


Figure 17. Frequency of black rockfish catch-per-angler from RecFIN.

Area A - Northern Oregon



Area B - Southern Oregon.

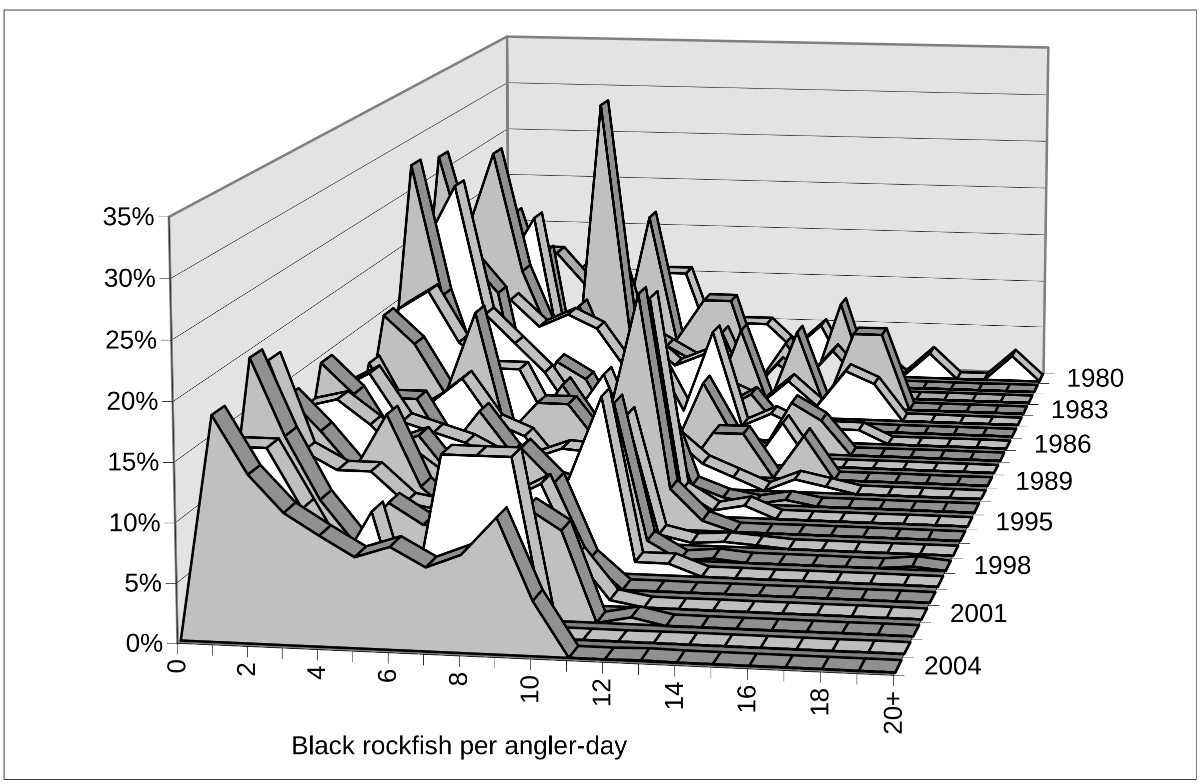
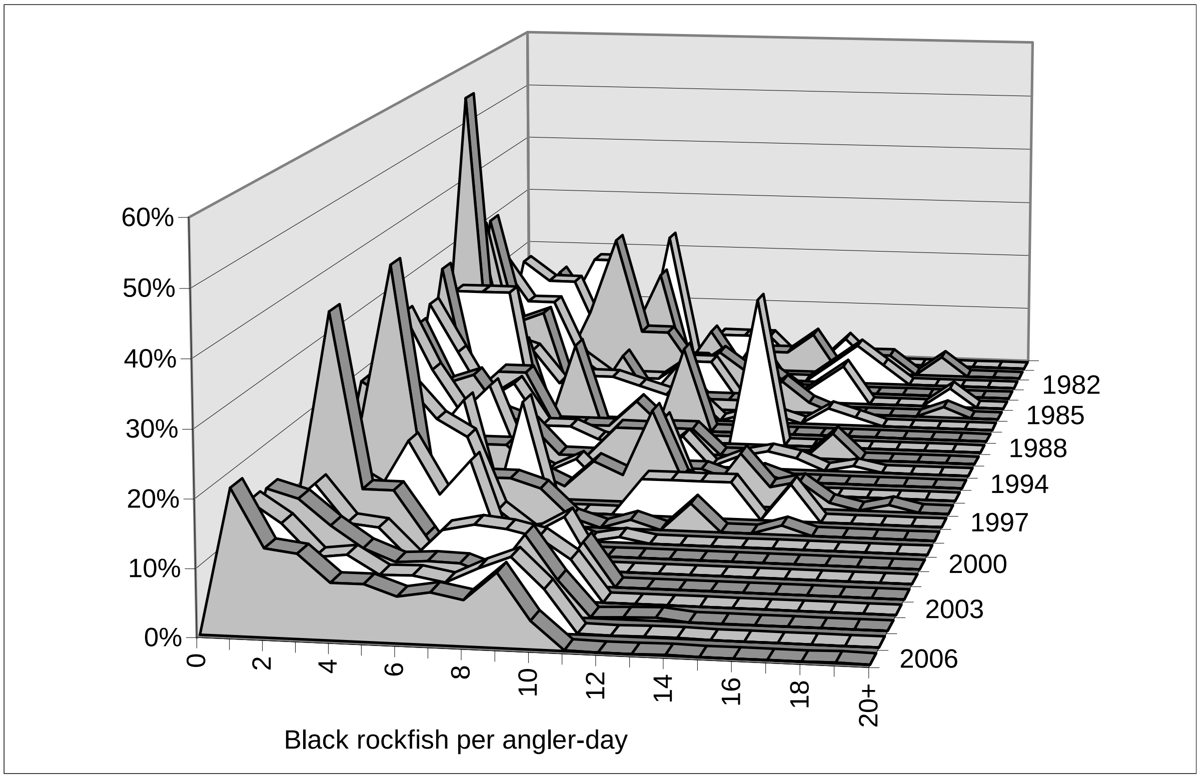


Figure 17. Frequency of black rockfish catch-per-angler from RecFIN (continued).

Area C - Northern California.



Area D - Central California.

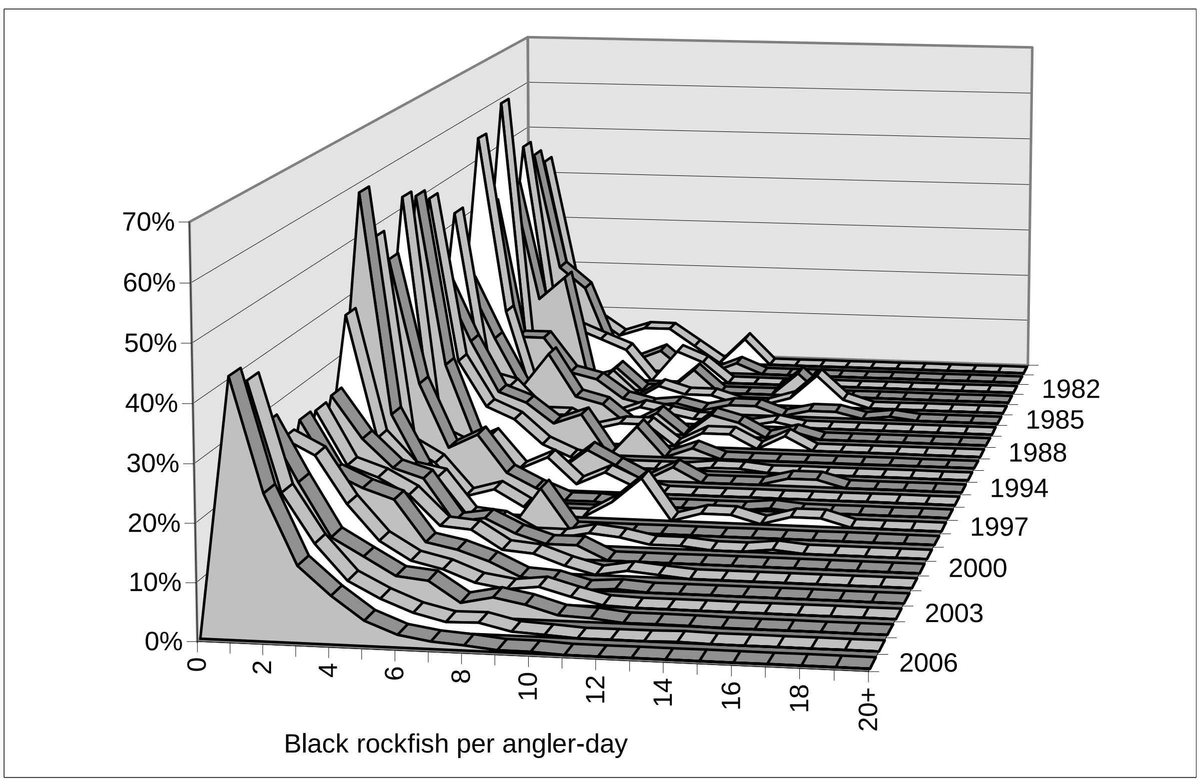


Figure 18. SWFSC juvenile rockfish survey index of black rockfish recruitment.

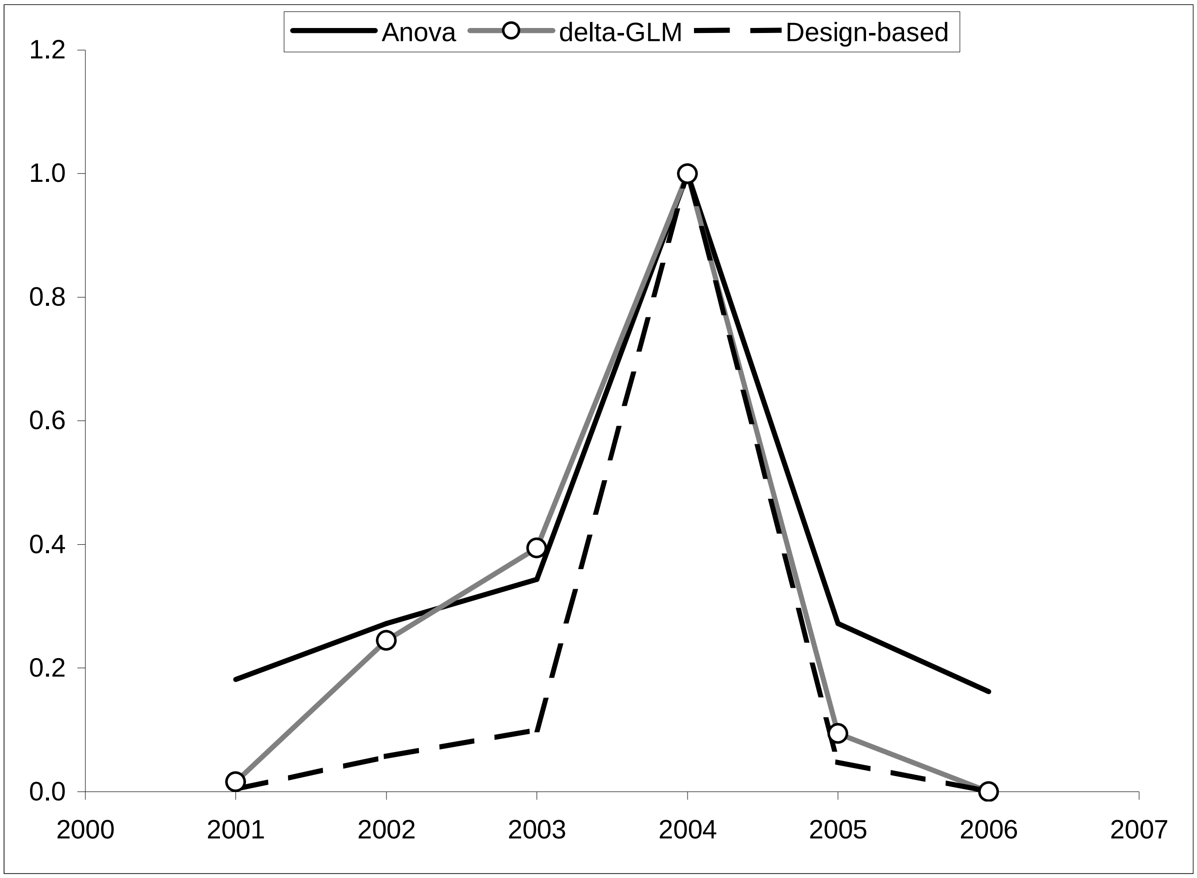


Figure 19. Cumulative landings for the current assessment versus the 2003 assessment.

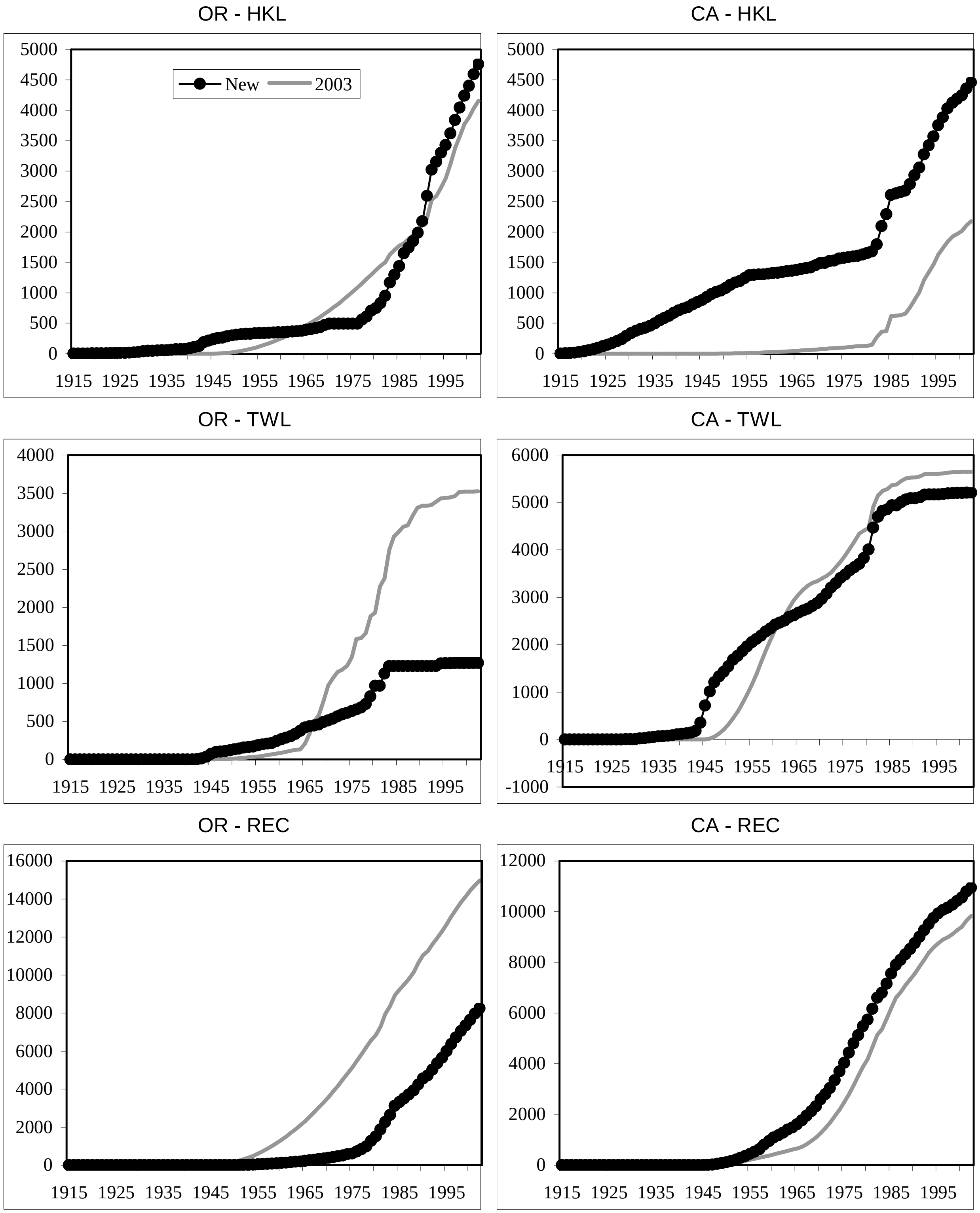


Figure 20. Final base-run model likelihood profile over virgin recruitment (R0).

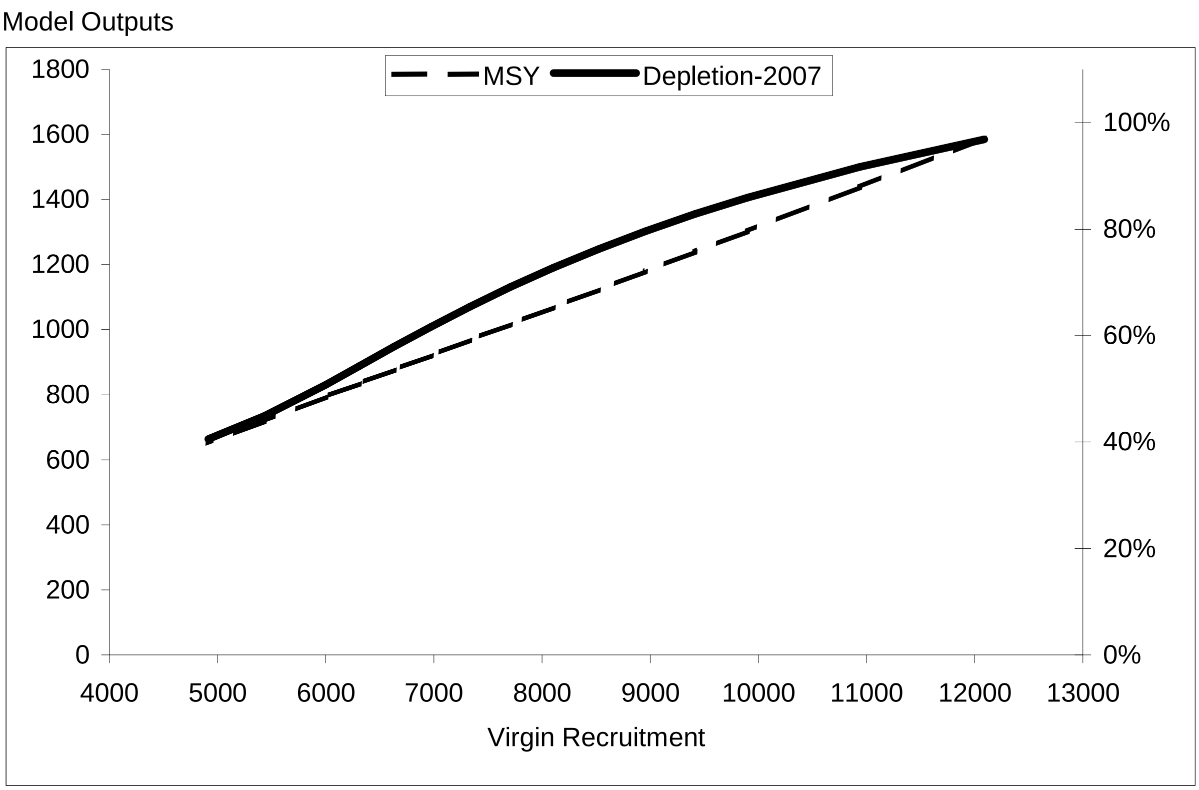
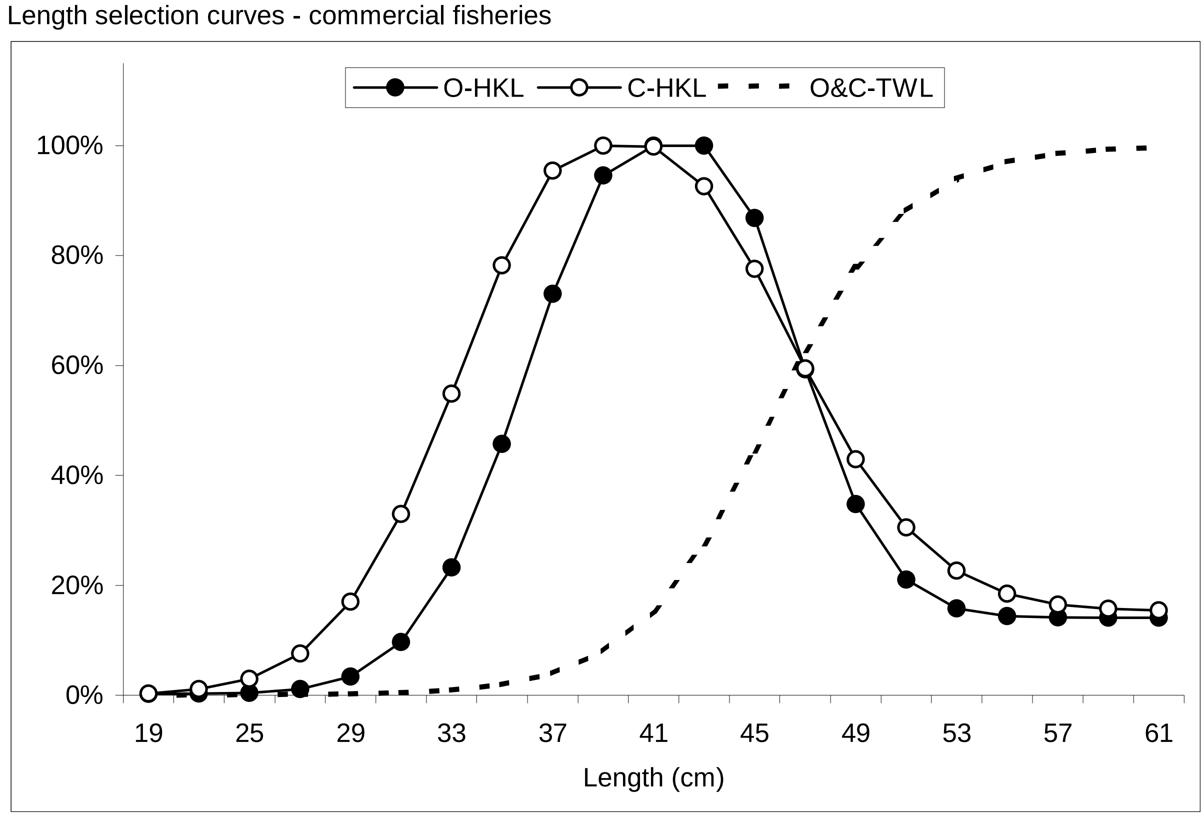


Figure 21. Estimated selection curves for the final base-run model.



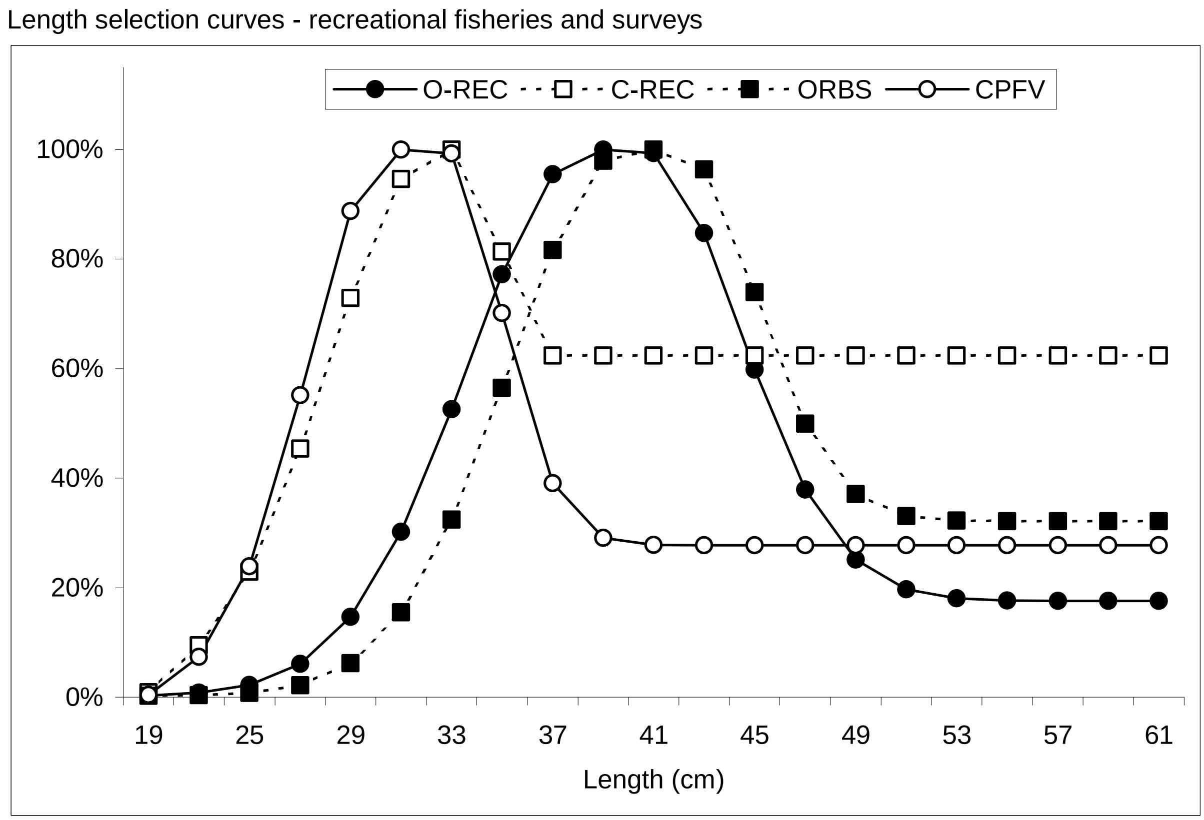
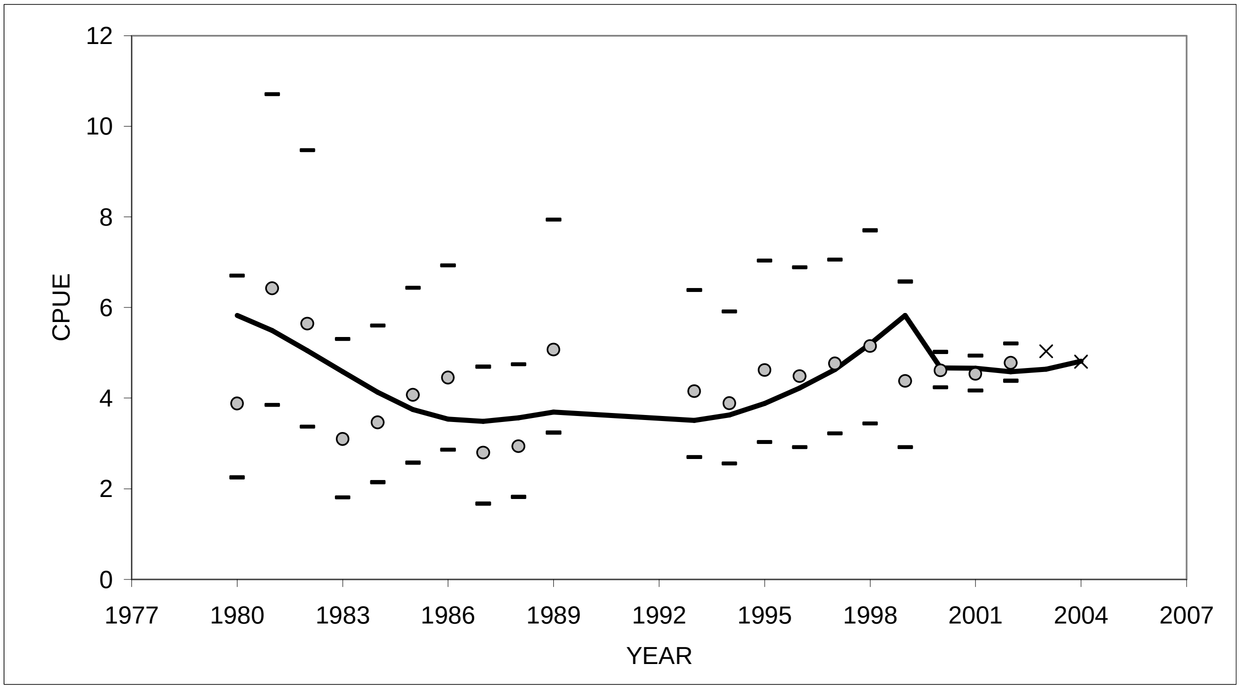


Figure 22. Final base-run model fit to indices.

Oregon RecFIN CPUE – break in series between 1999 and 2000.



Oregon ORBS – breaks in series between 1999 and 2000, and between 2004 and 2005.

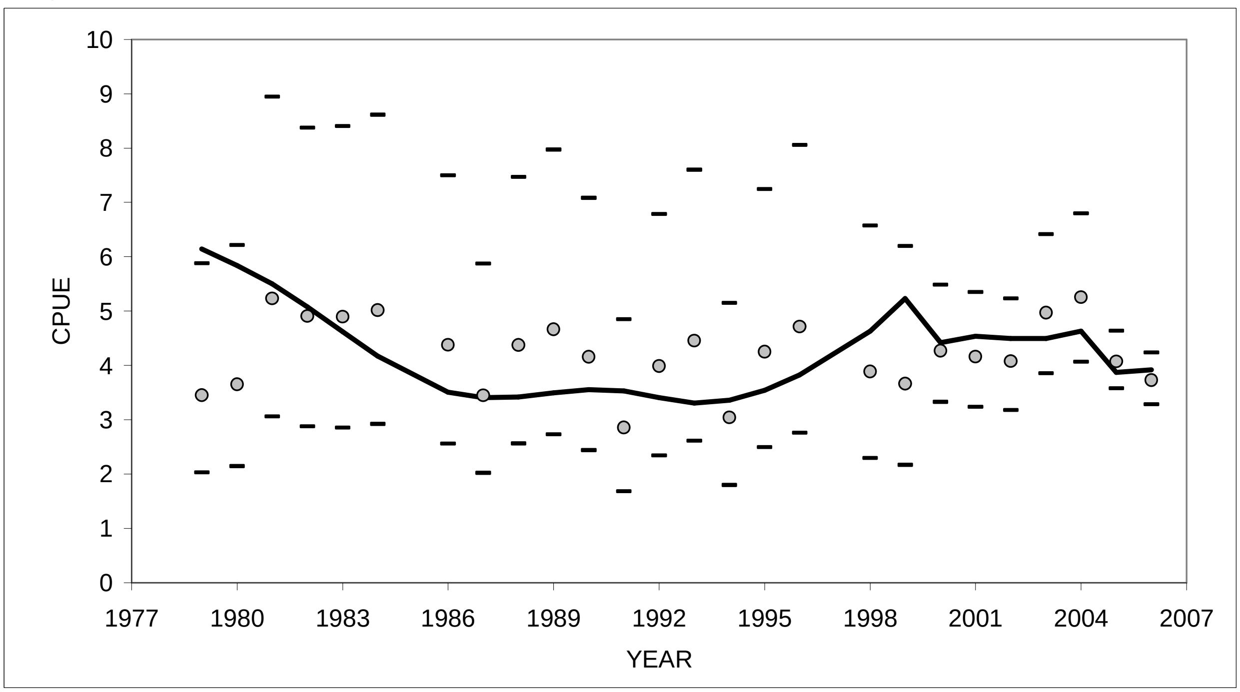
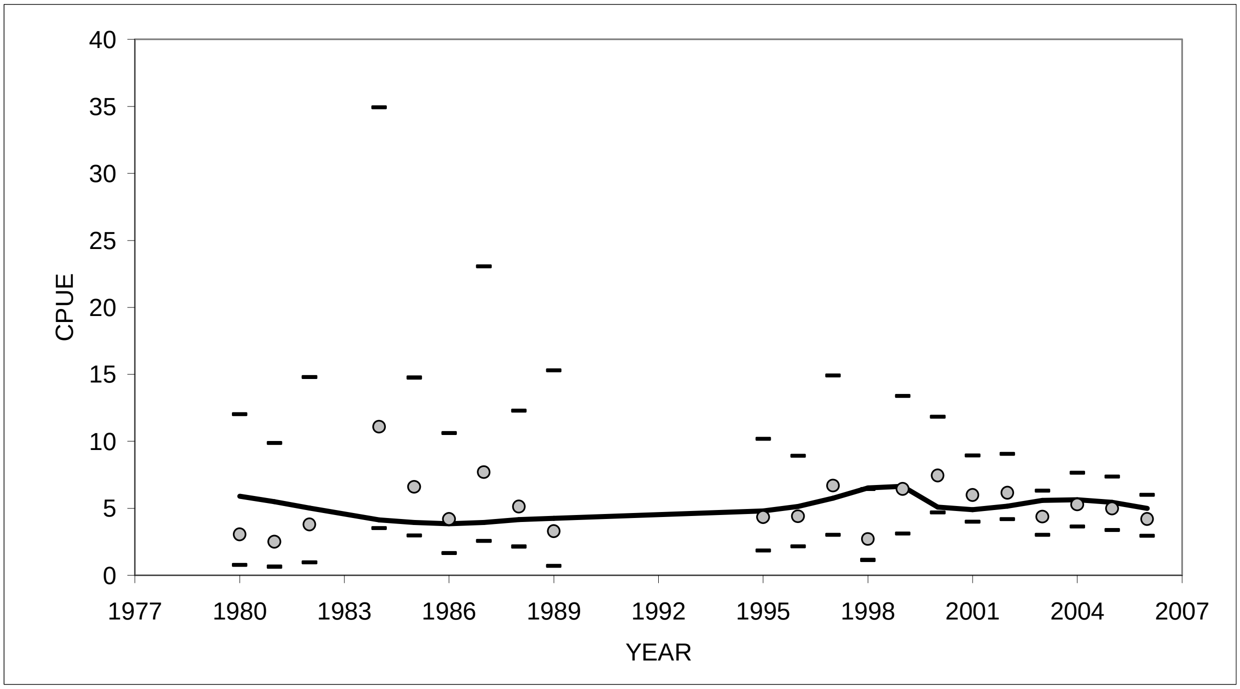


Figure 22. Final base-run model fit to indices (continued).

California RecFIN CPUE – break in series between 1999 and 2000.



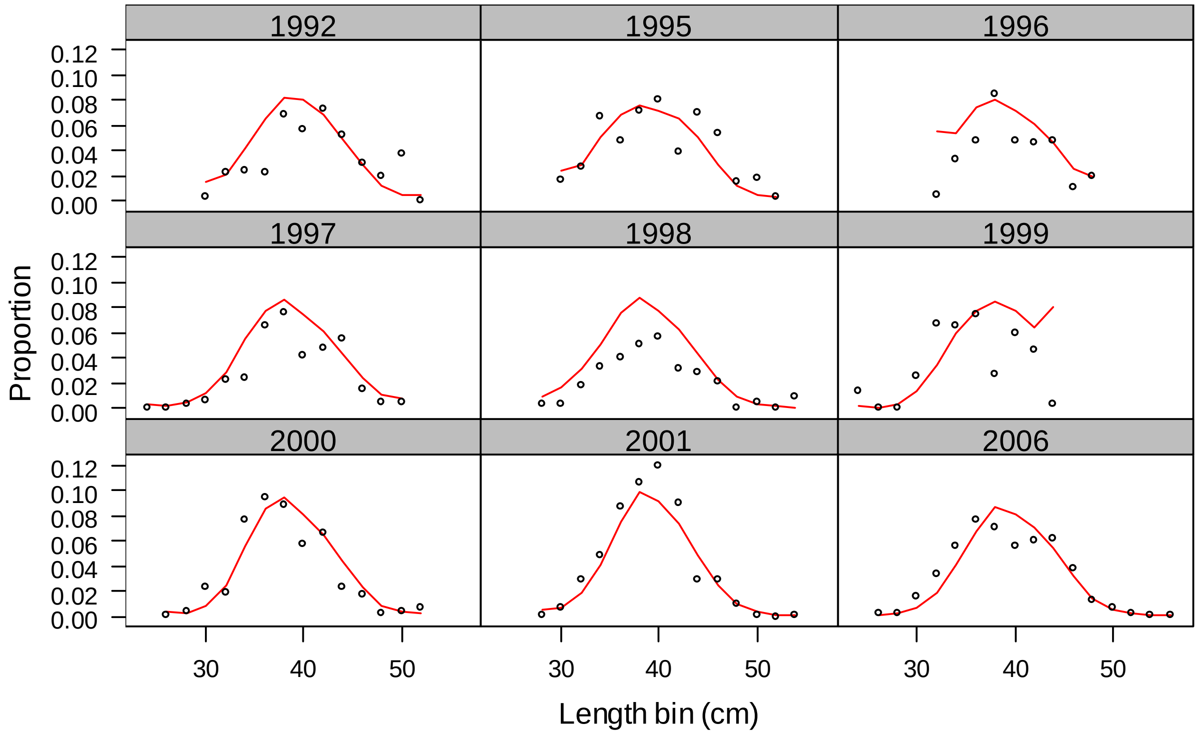
California CPFV CPUE – continuous series.

Figure 22. Final base-run model fit to indices (continued).

Oregon Tagging Study Abundance

SWFSC Pre-recruit Index

Figure 23. Final base-run model fit to length composition data from the Oregon HKL fishery, females (top panel) and males (bottom panel).



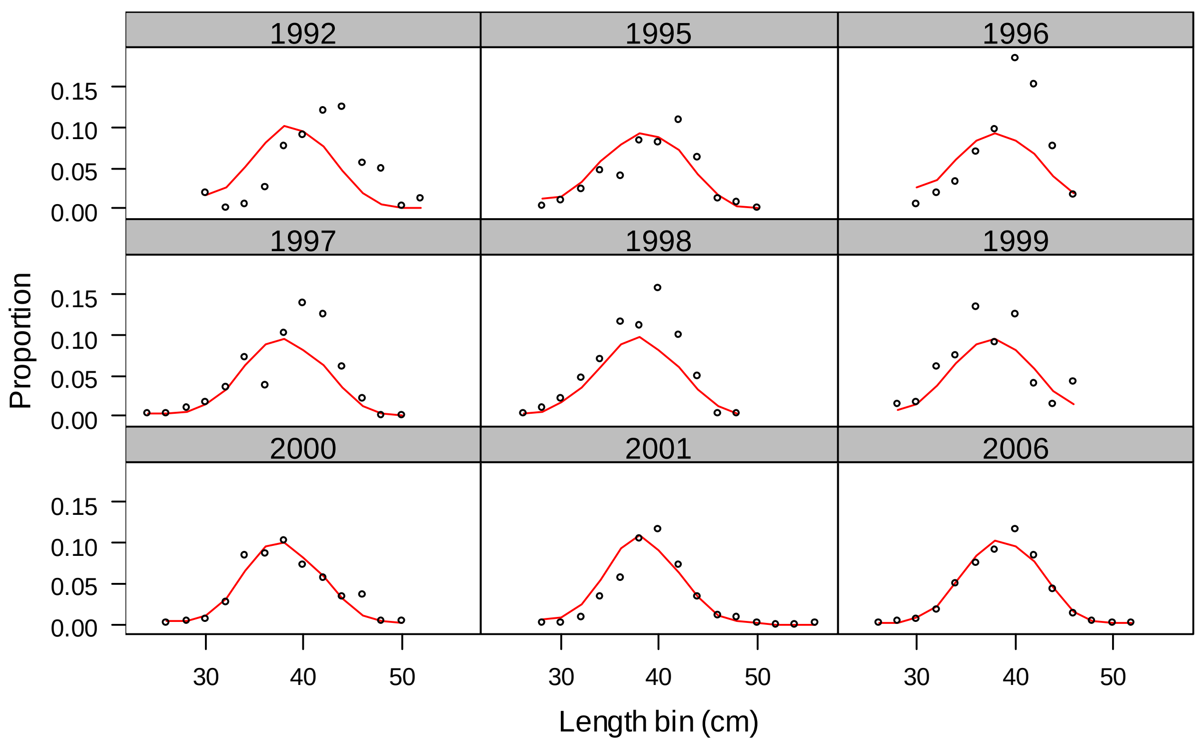
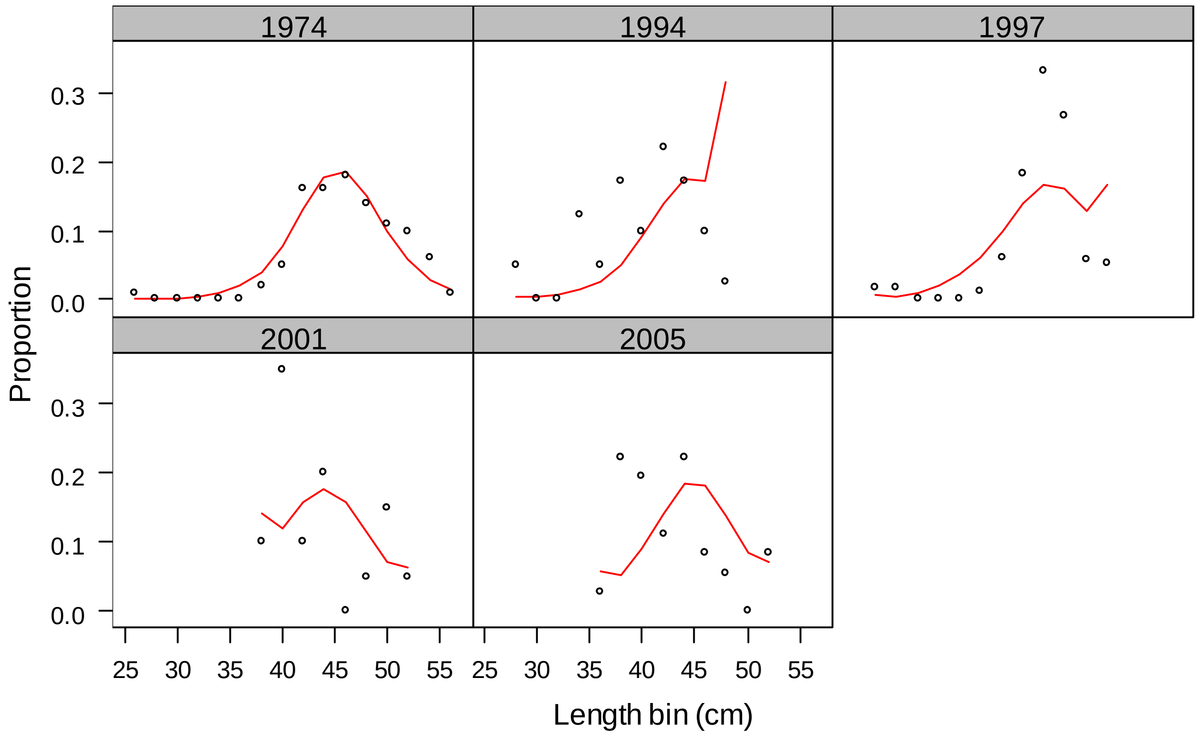


Figure 23. Final base-run model fit to length composition data (sexes combined) from the Oregon TWL (top panel) and REC (bottom panel) fisheries.



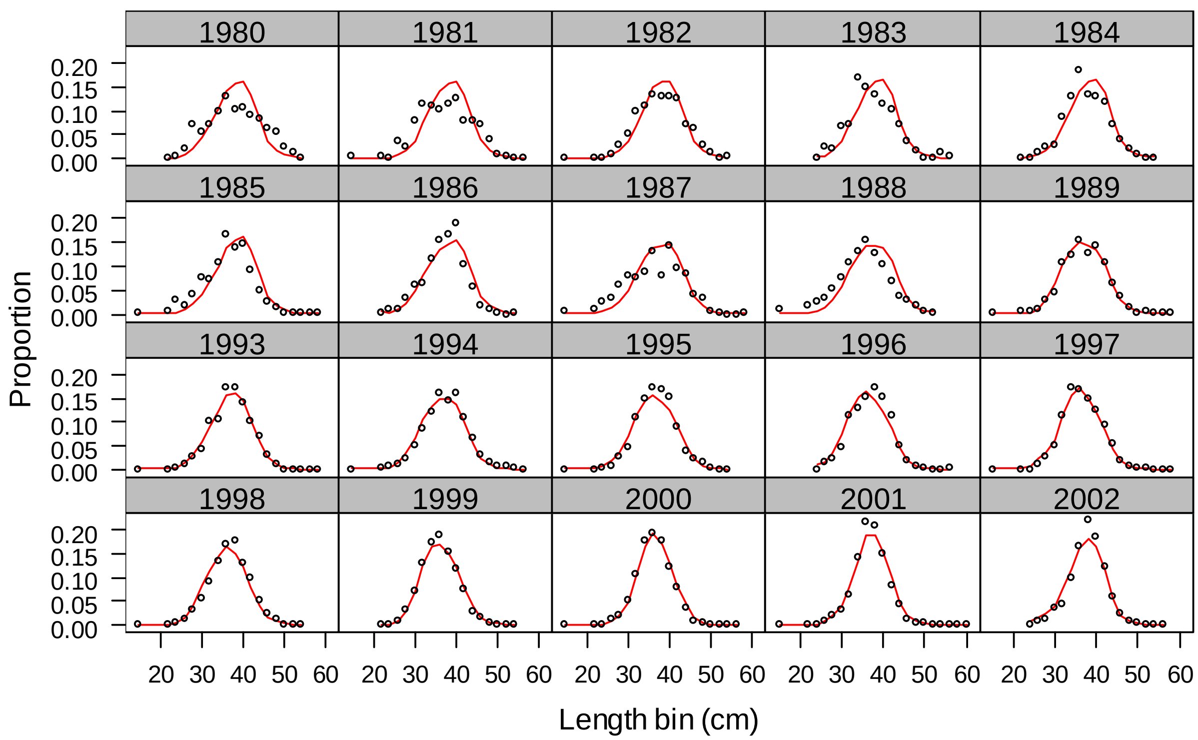
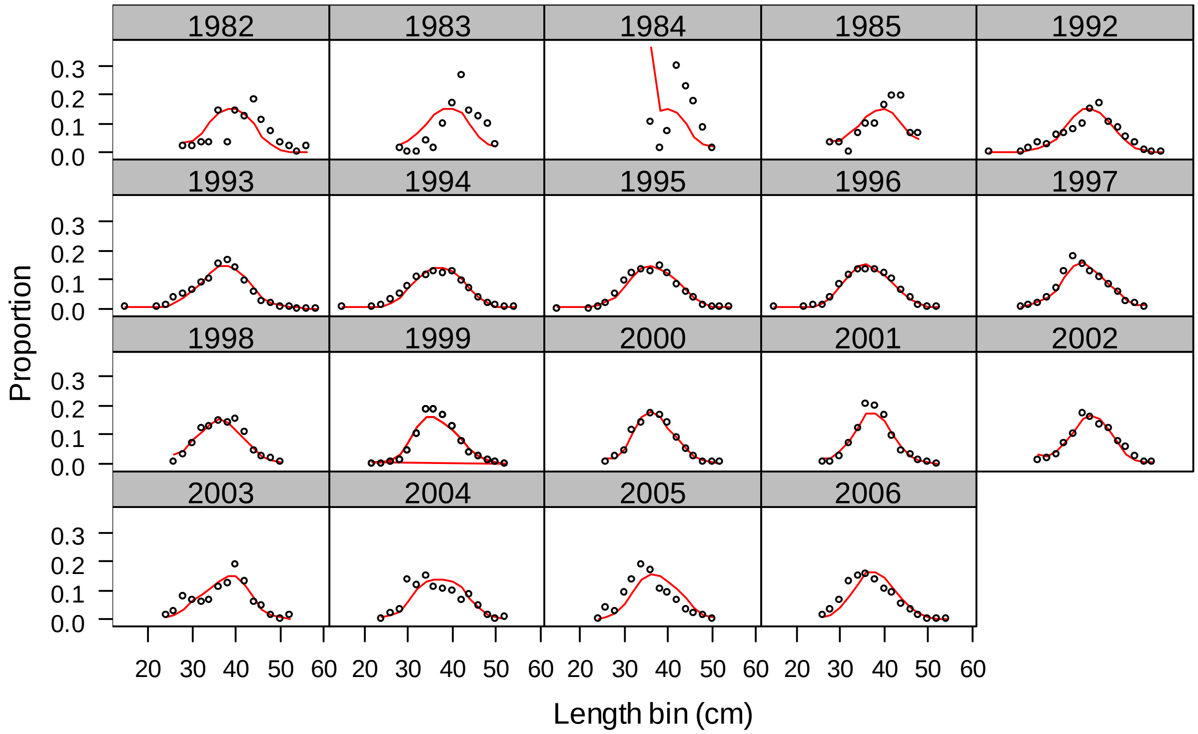


Figure 23. Final base-run model fit to length composition data (sexes combined) from the California HKL (top panel) and TWL (bottom panel) fisheries.



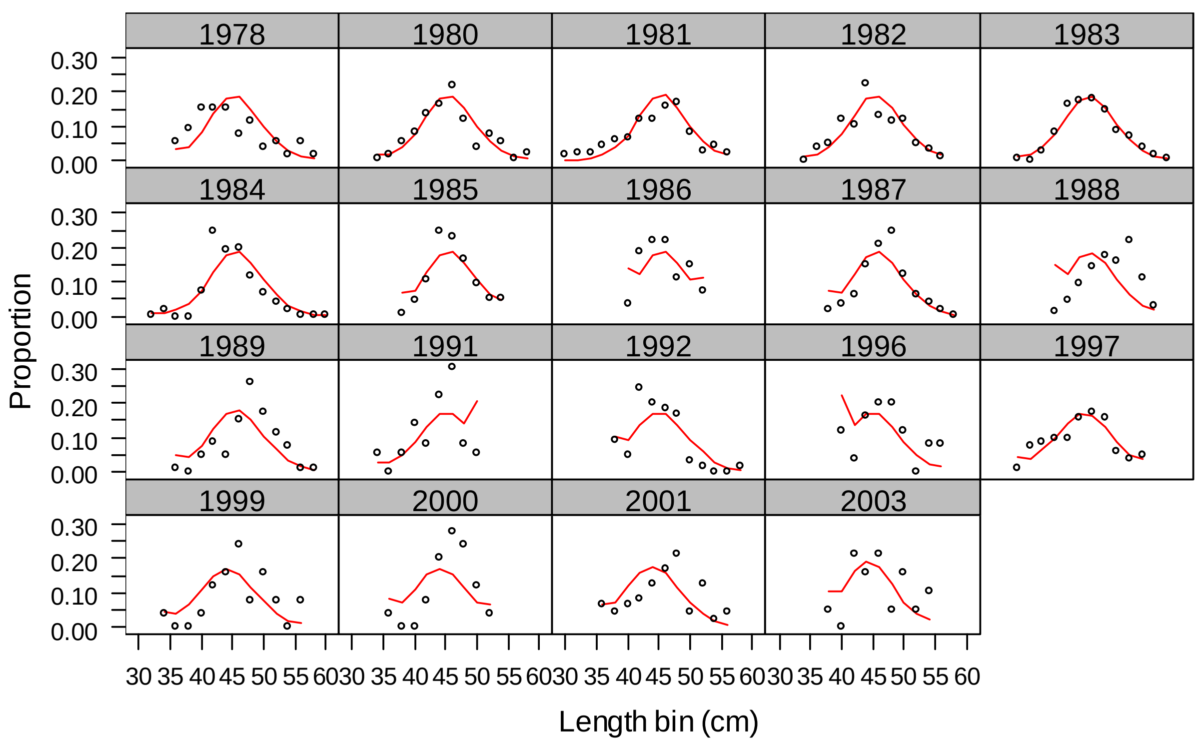


Figure 23. Final base-run model fit to length composition data (sexes combined) from the California REC fishery.

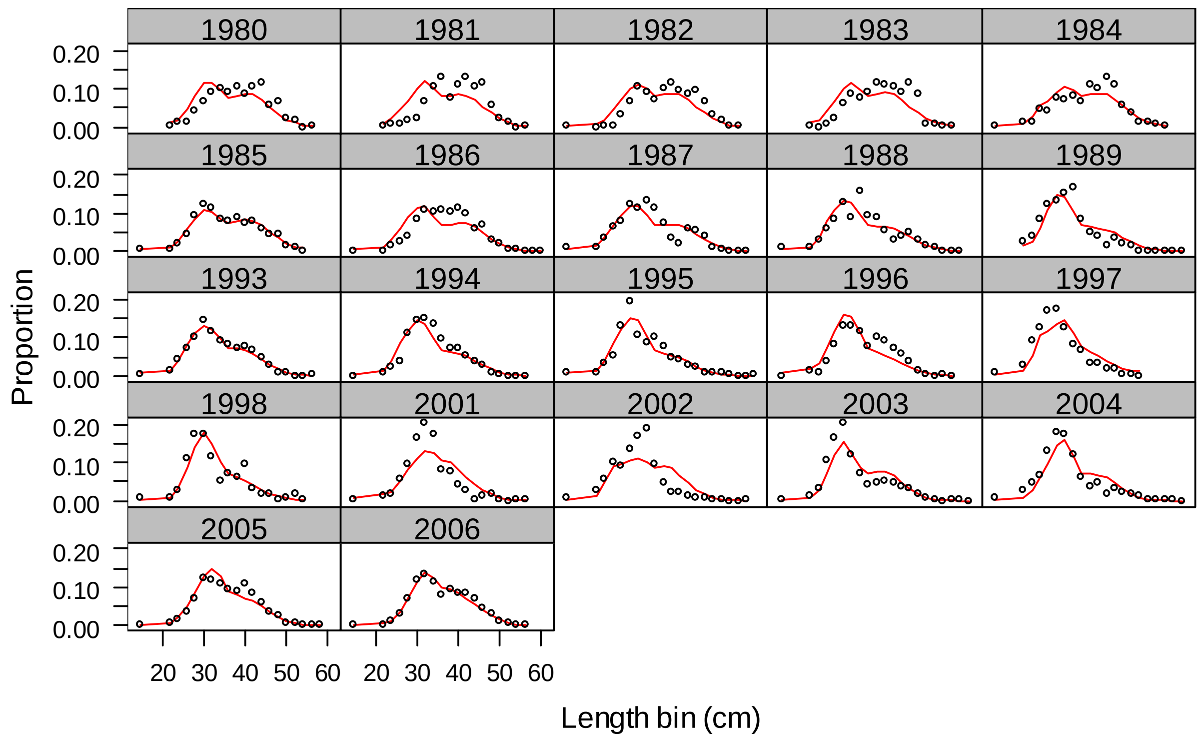


Figure 23. Final base-run model fit to length composition data (sexes combined) from the Oregon ORBS survey.

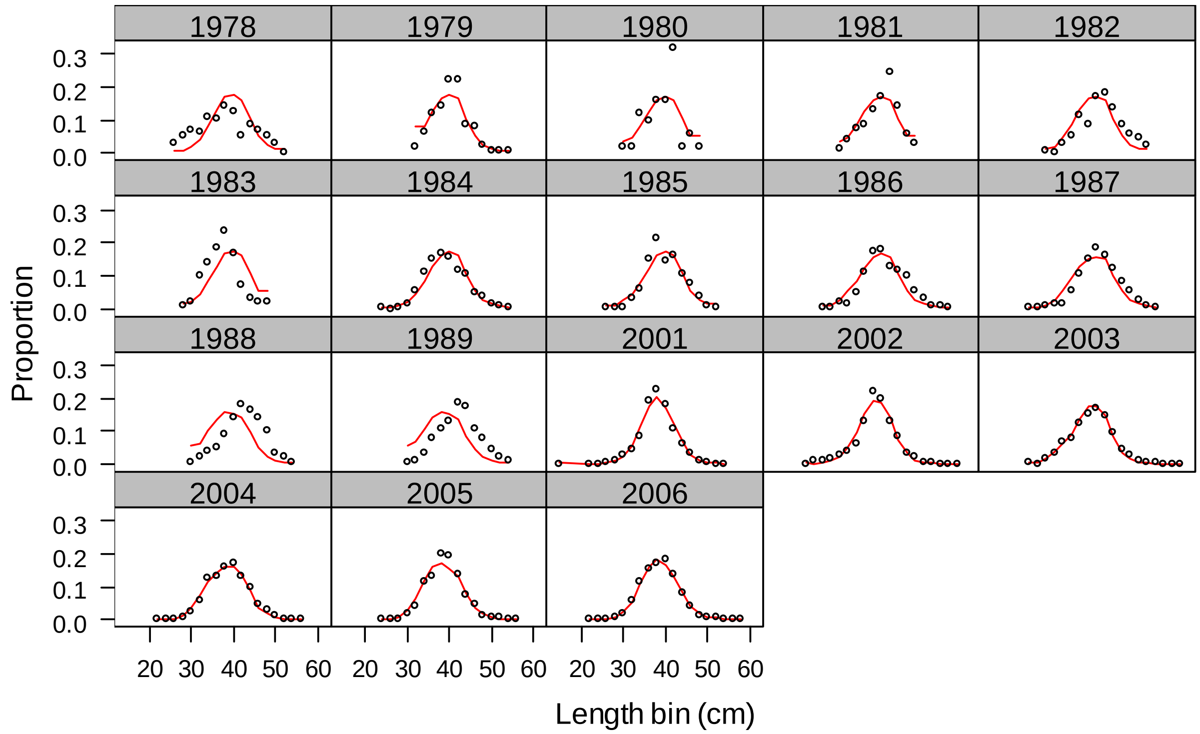


Figure 23. Final base-run model fit to length composition data from the Oregon ORBS survey, females (top panel) and males (lower panel).

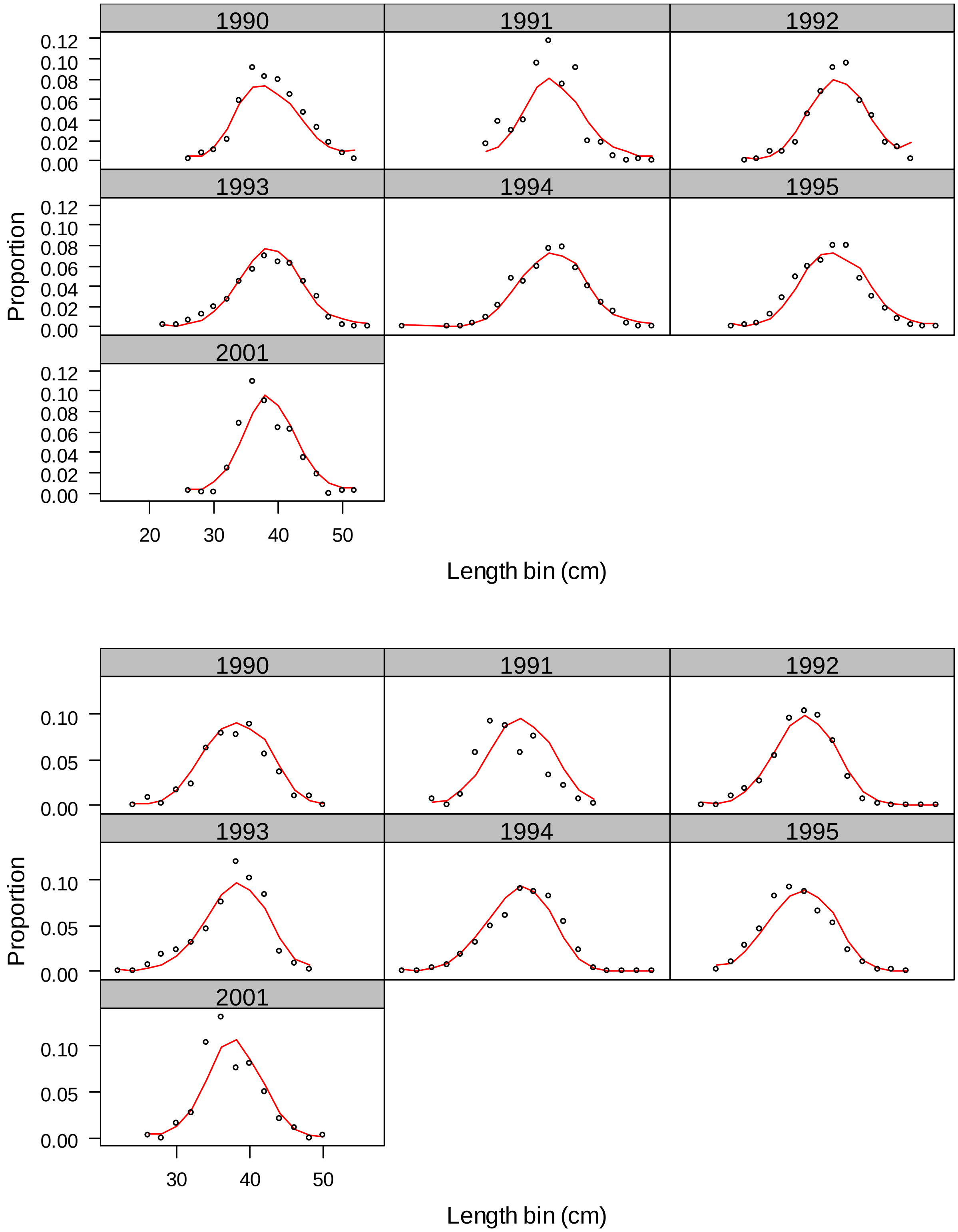


Figure 23. Final base-run model fit to length composition data (sexes combined) from the California CPFV survey.

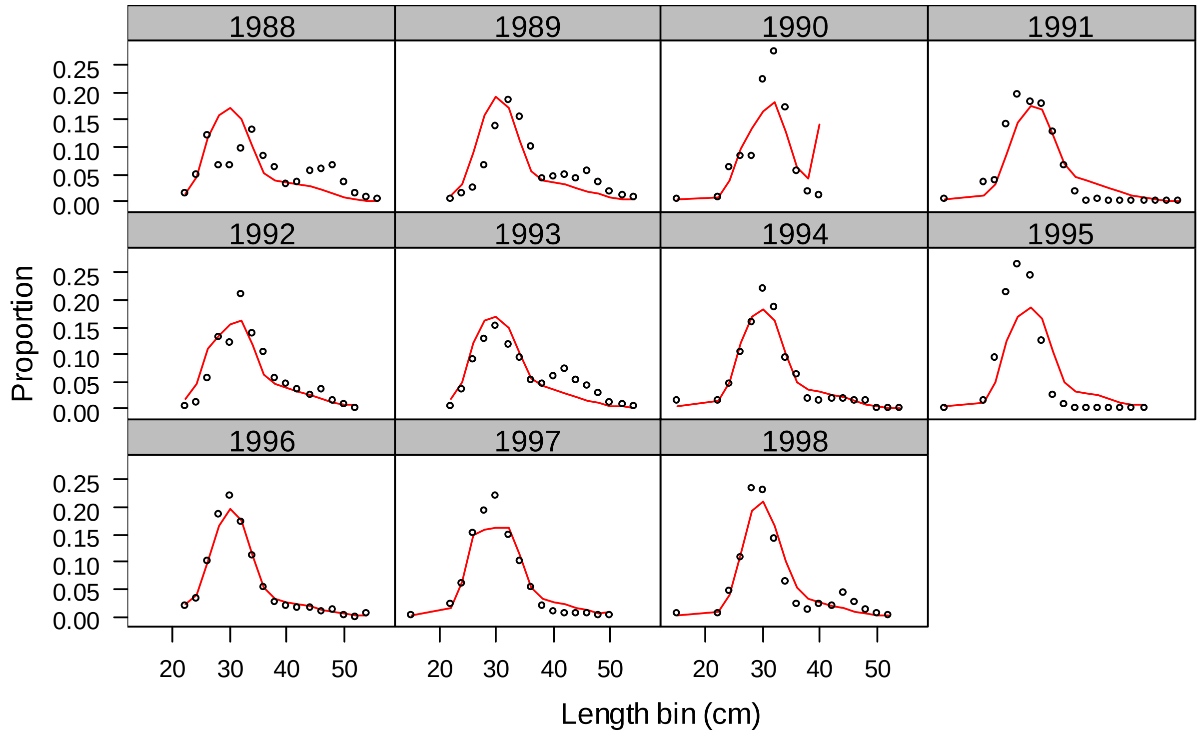
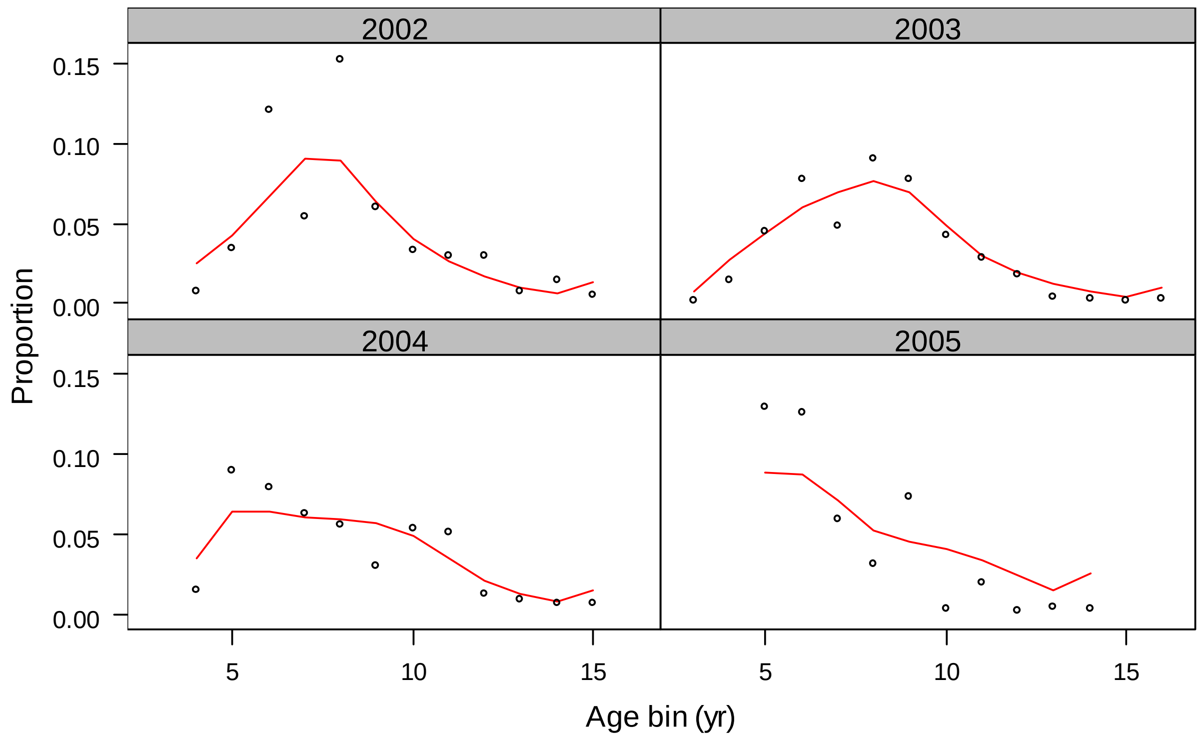


Figure 24. Final base-run model fit to age composition data from the Oregon HKL fishery, females (top panel) and males (bottom panel).



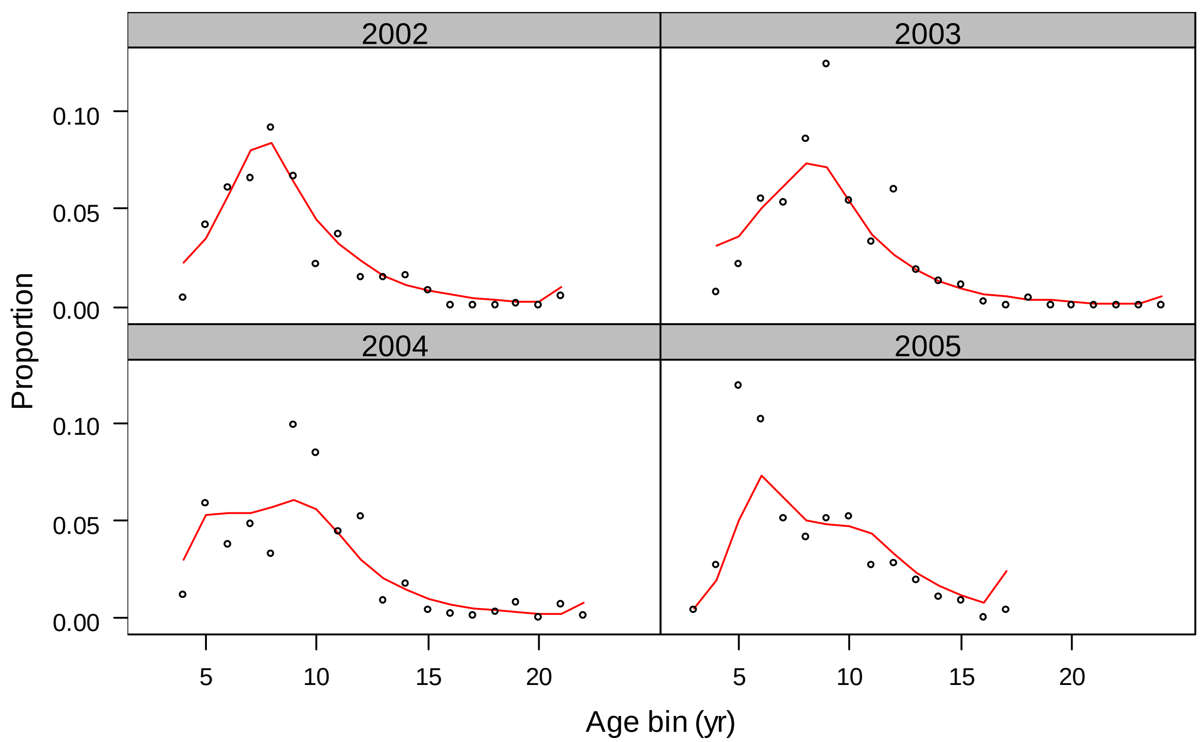
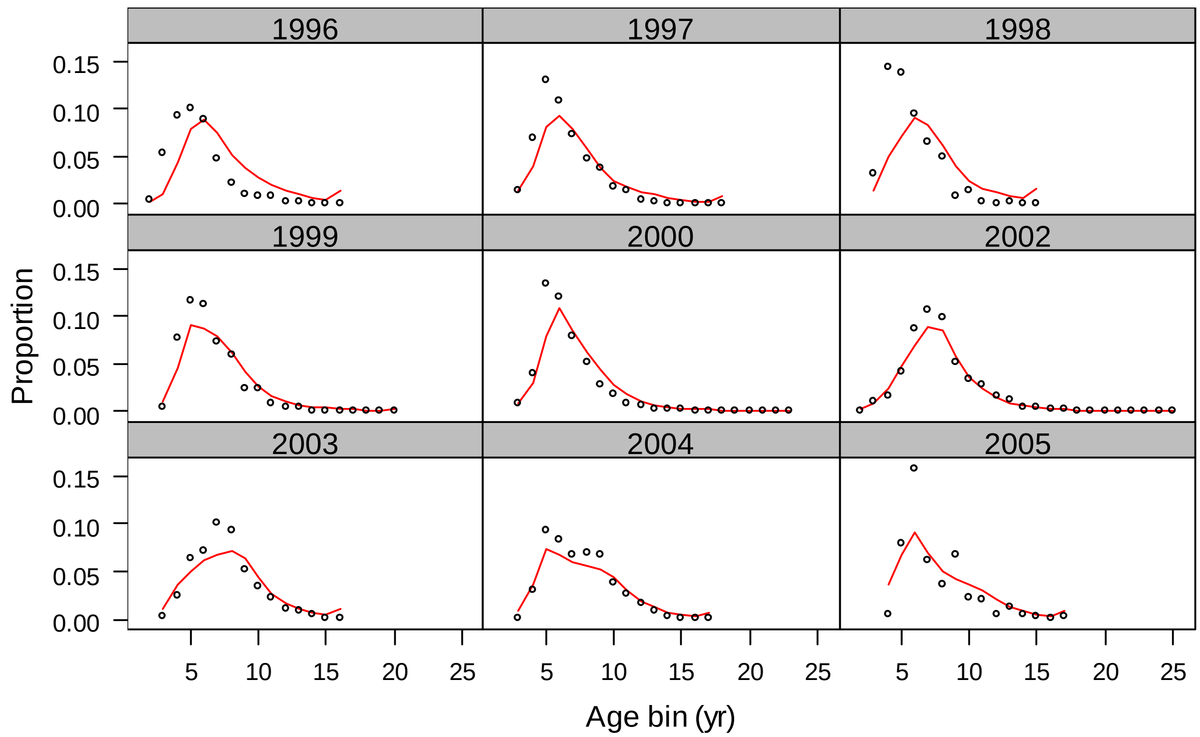


Figure 24. Final base-run model fit to age composition data from the Oregon ORBS survey, females (top panel) and males (bottom panel).



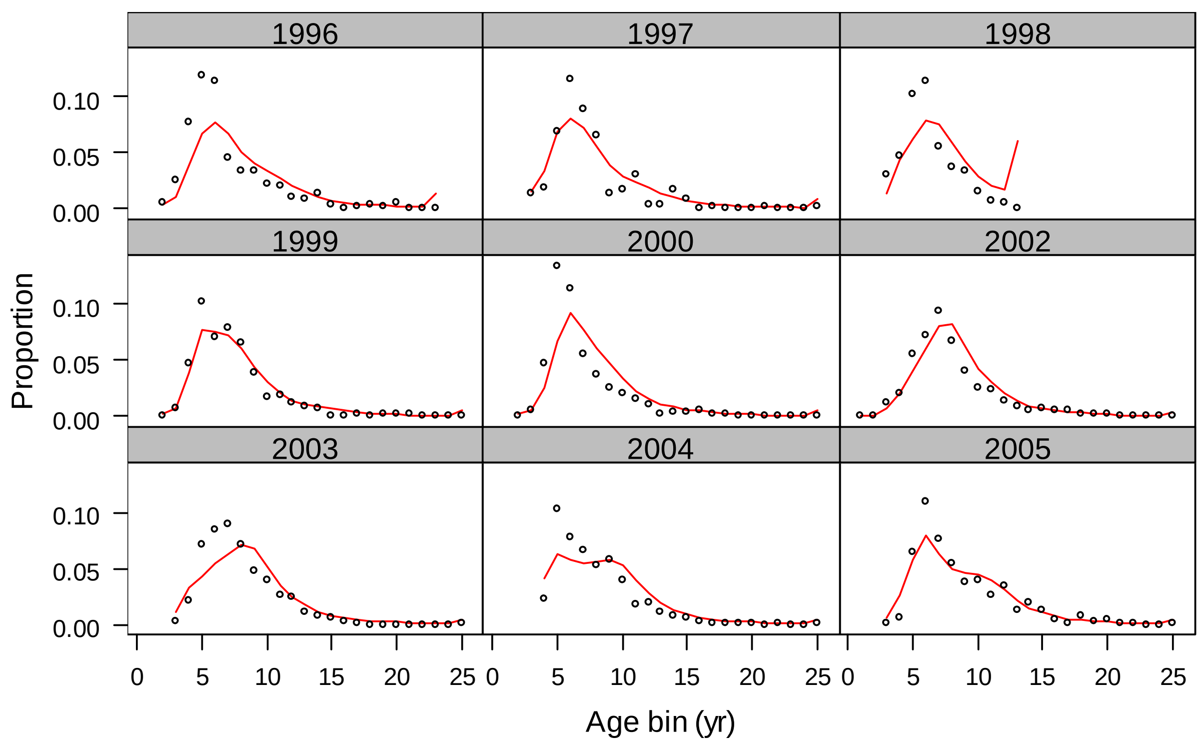
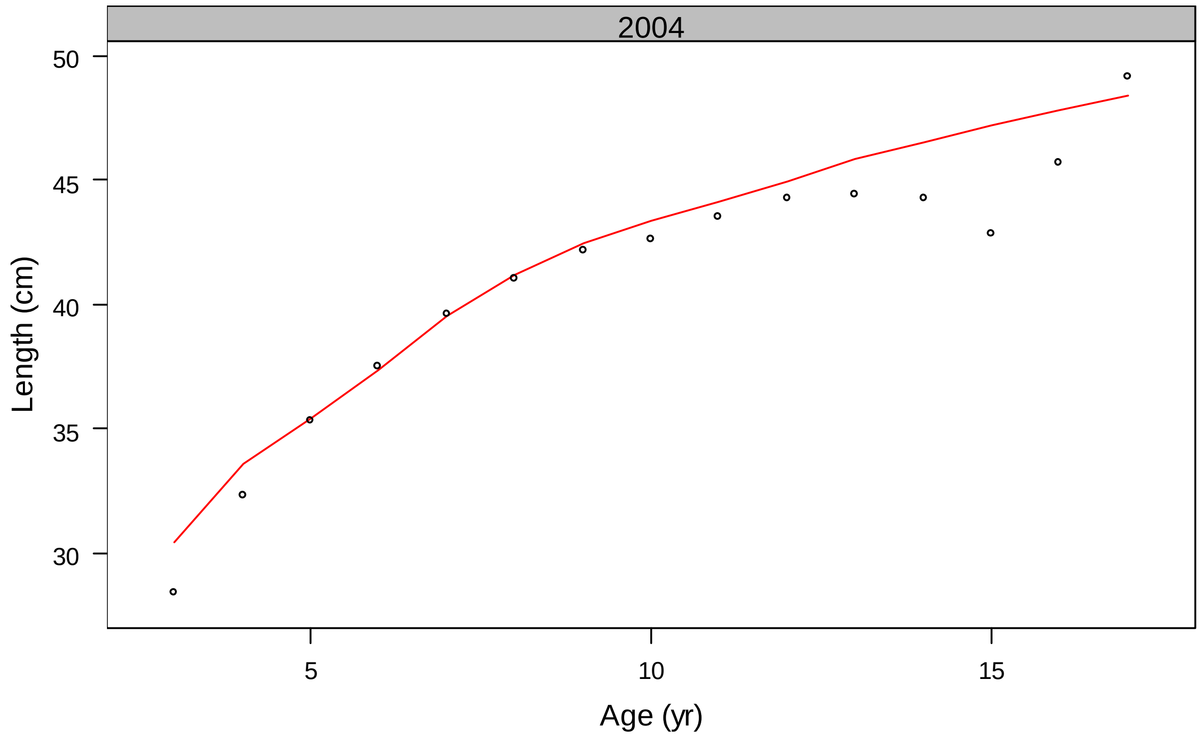


Figure 25. Final base-run model fit to mean length-at-age data from the Oregon ORBS survey, females (top panel) and males (bottom panel). In the final base-run model the length-at-age data from 2003 to 2005 were combined and assigned to 2004.



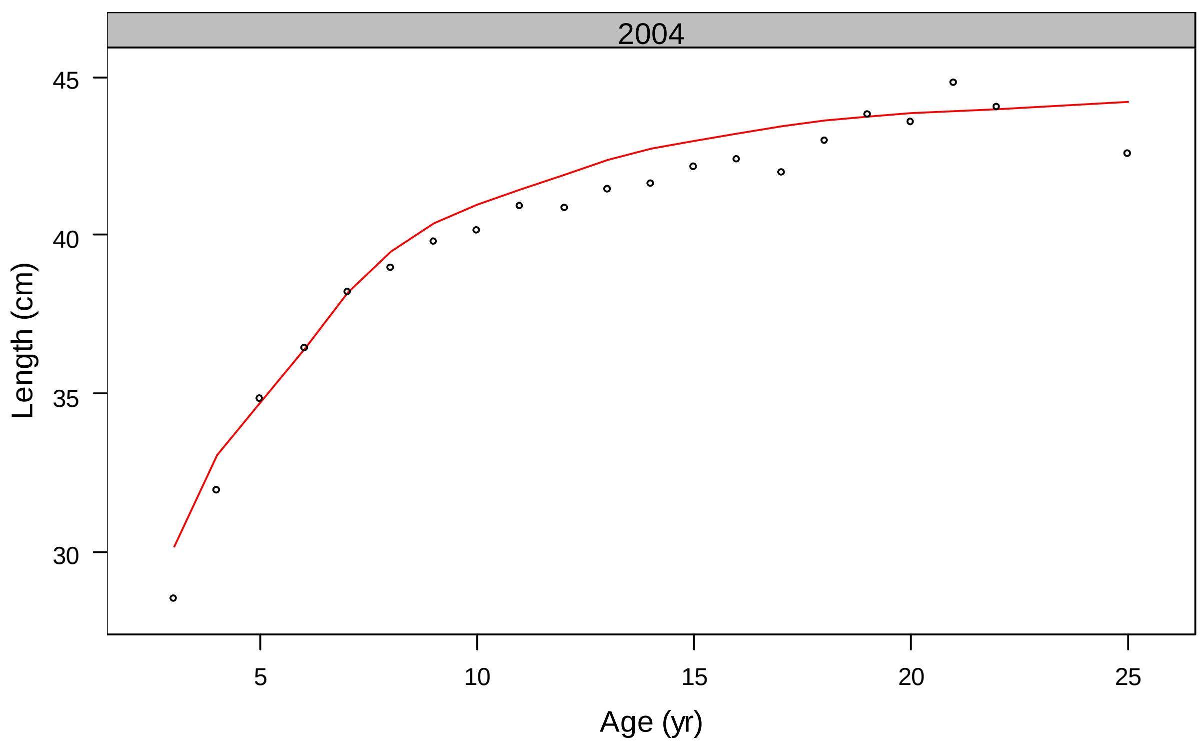


Figure 26. Residuals from the final base-run model fit to .the Oregon HKL fishery length composition data, females (top panel) and males (bottom panel).

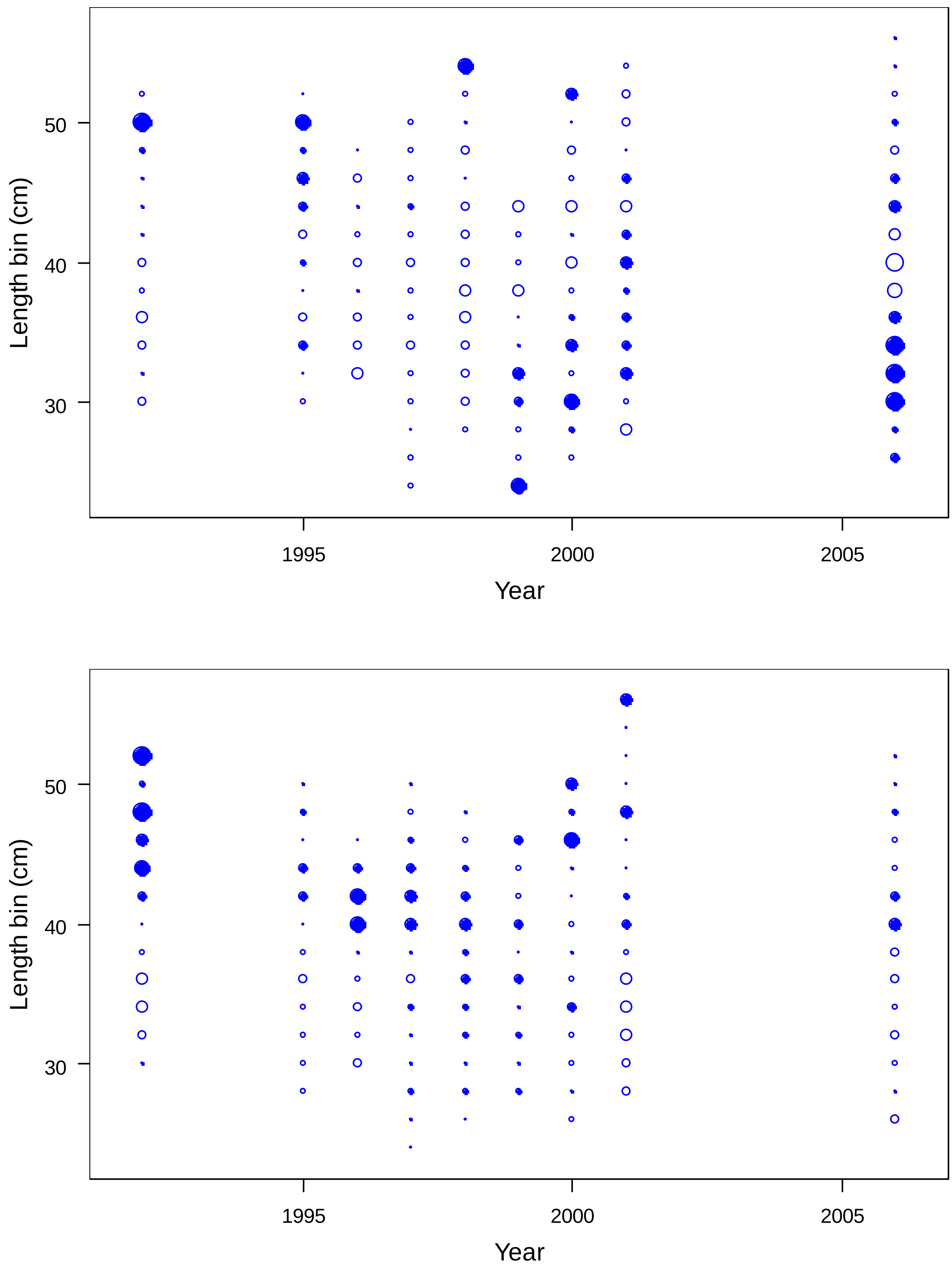
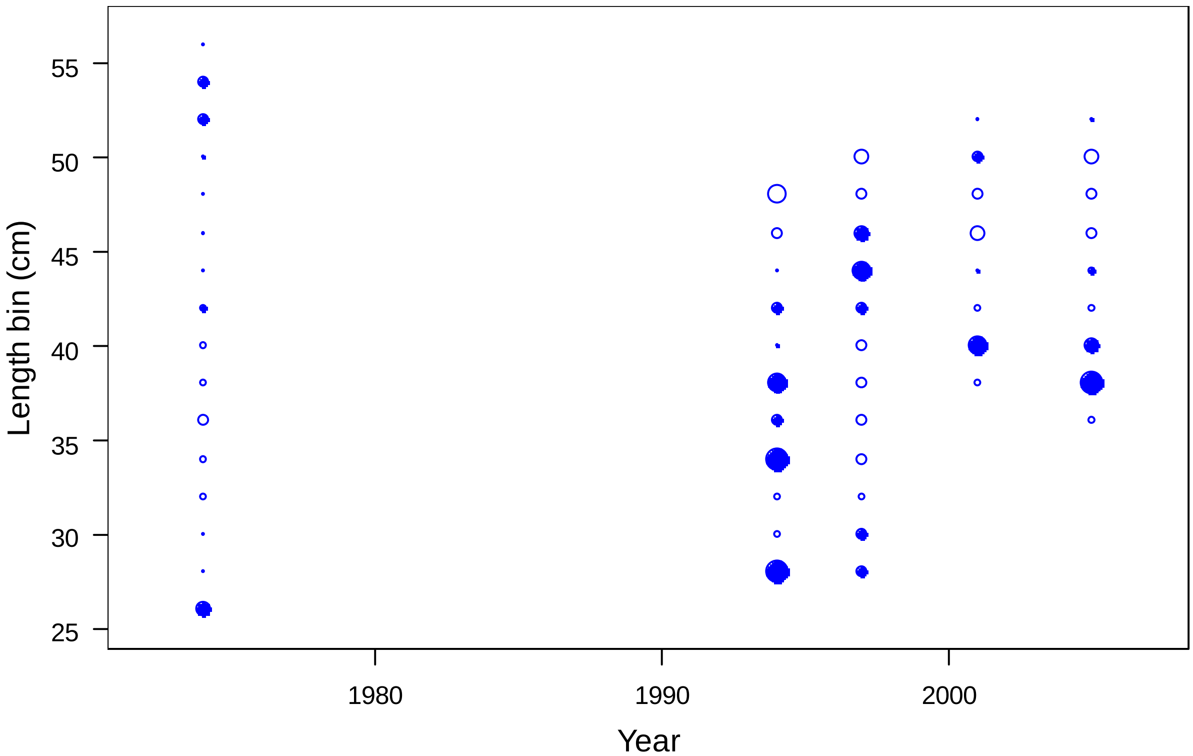


Figure 26. Residuals from the final base-run model fit to Oregon TWL (top panel) and REC (bottom panel) fisheries length composition data, sexes combined.



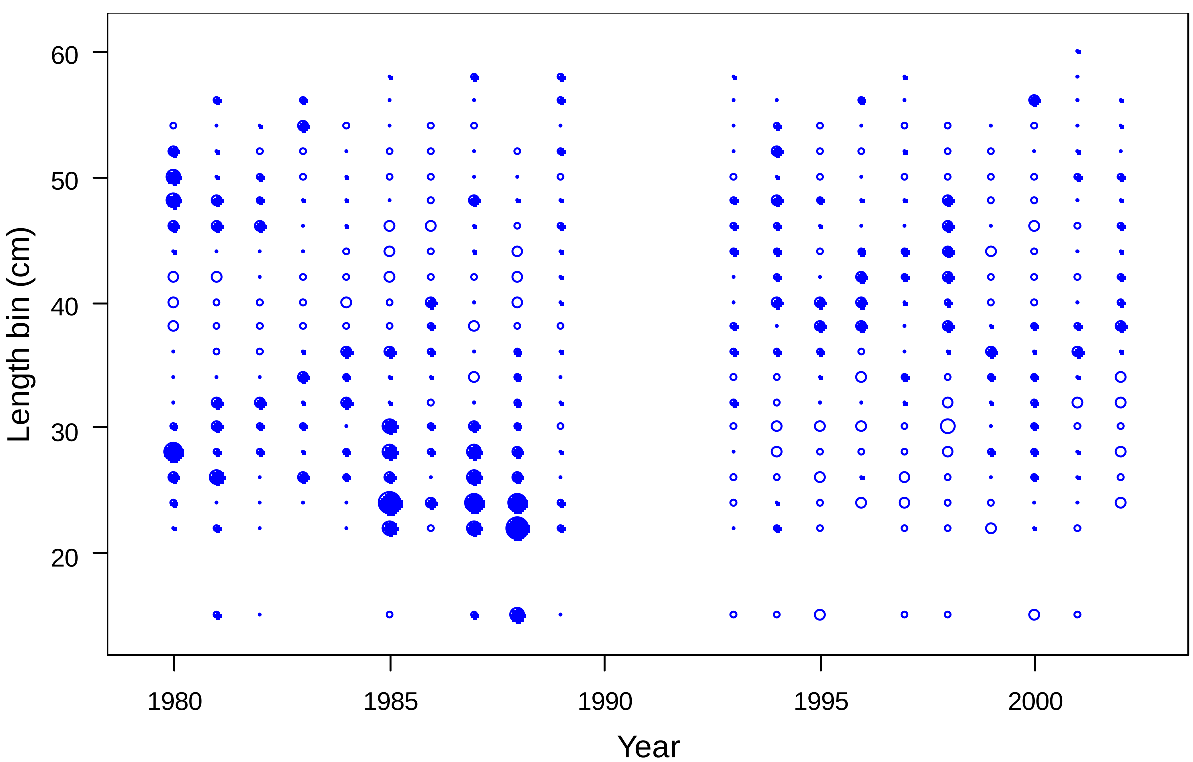


Figure 26. Residuals from the final base-run model fit to the California HKL (top panel) and TWL (bottom panel) fisheries length composition data, sexes combined.

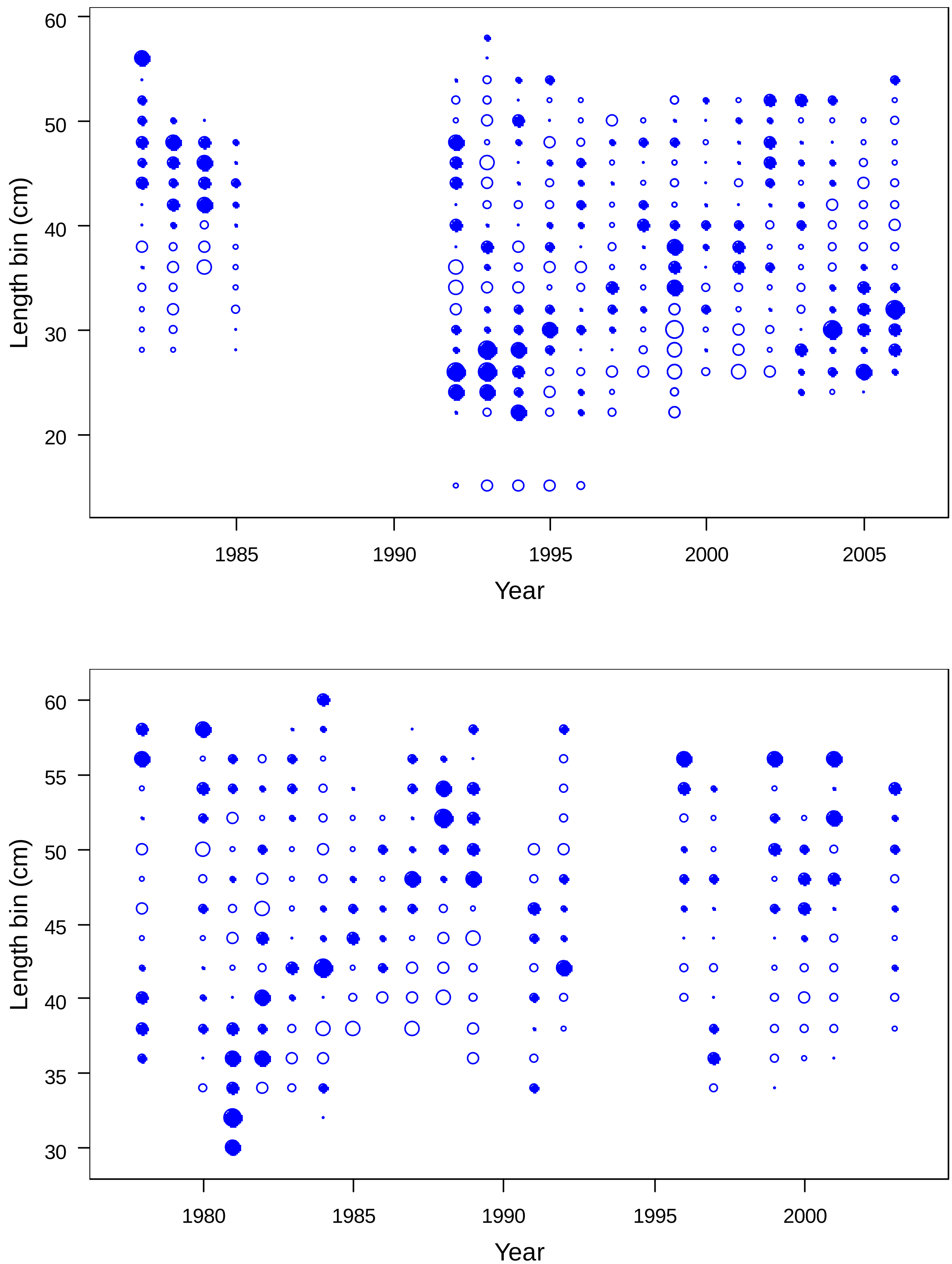


Figure 26. Residuals from the final base-run model fit to the California REC fishery length composition data, sexes combined.

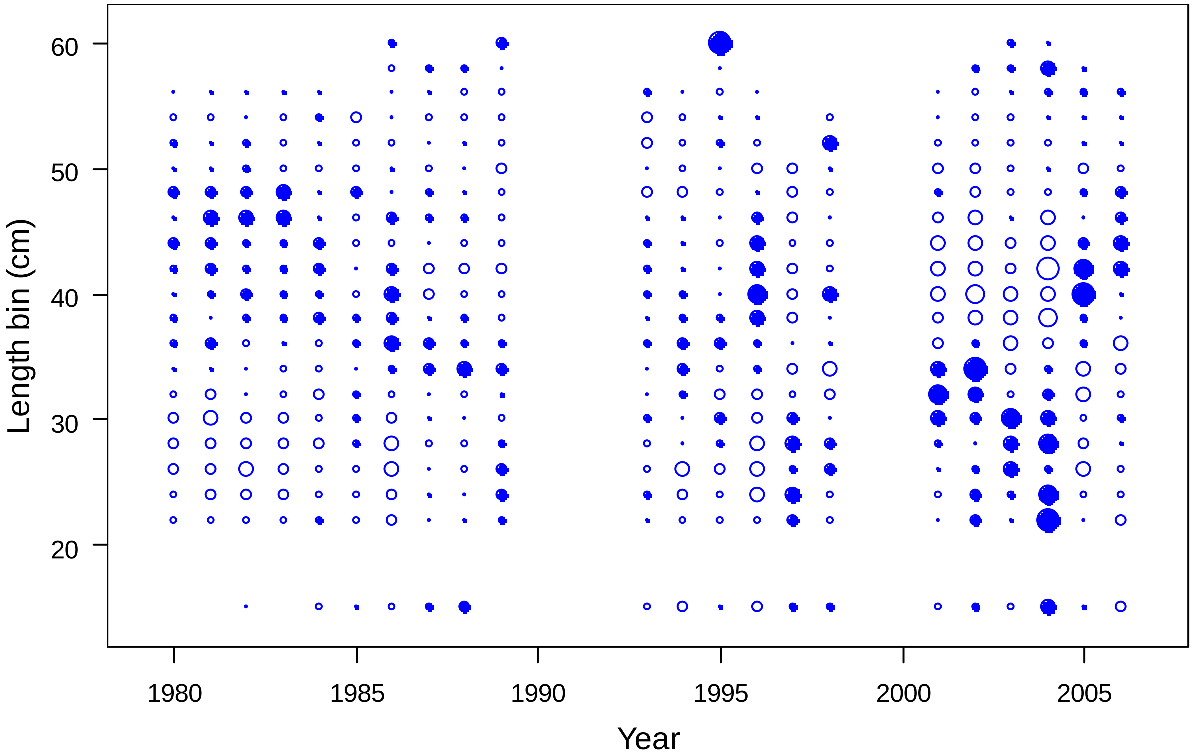


Figure 26. Residuals from the final base-run model fit to the Oregon ORBS survey length composition data, sexes combined.

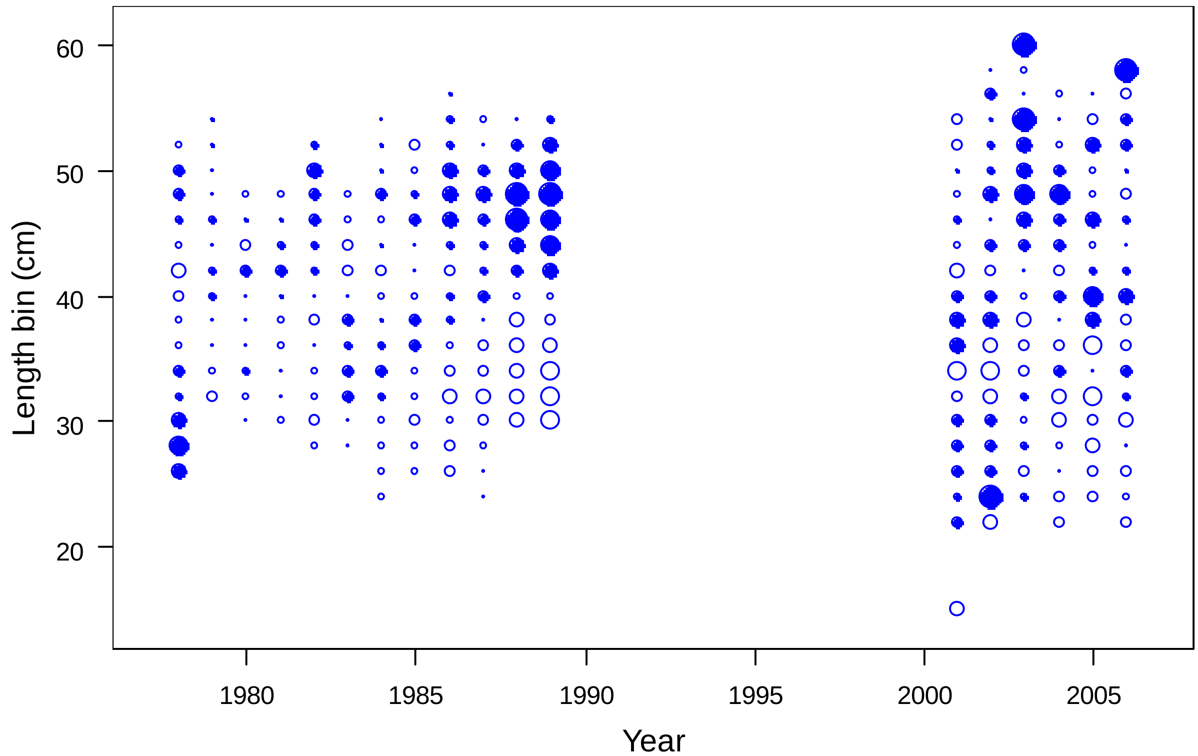


Figure 26. Residuals from the final base-run model fit to the Oregon ORBS survey length composition data, females (top panel) and males (lower panel).

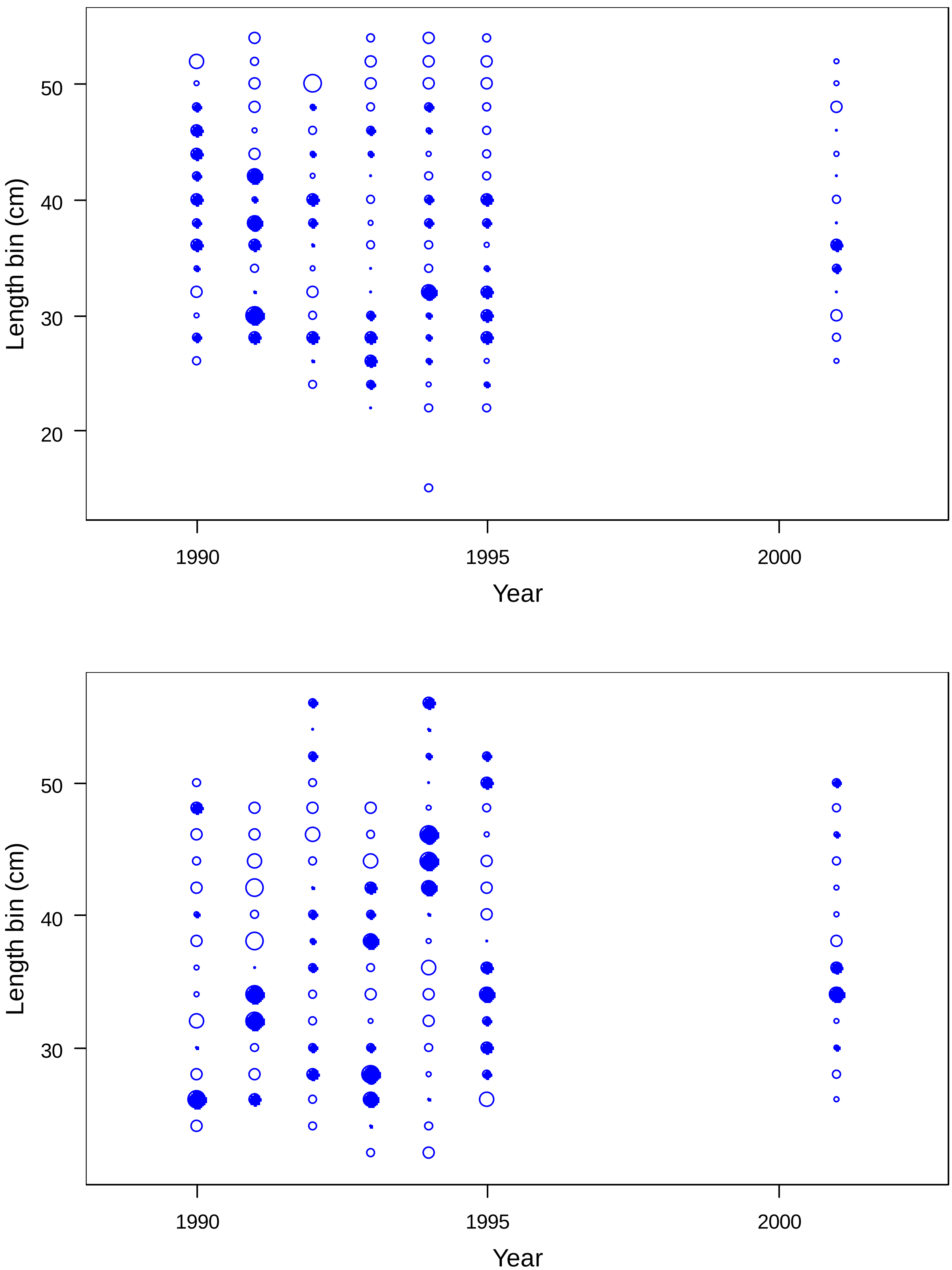


Figure 26. Residuals from the final base-run model fit to .the California CPFV survey length composition data, sexes combined

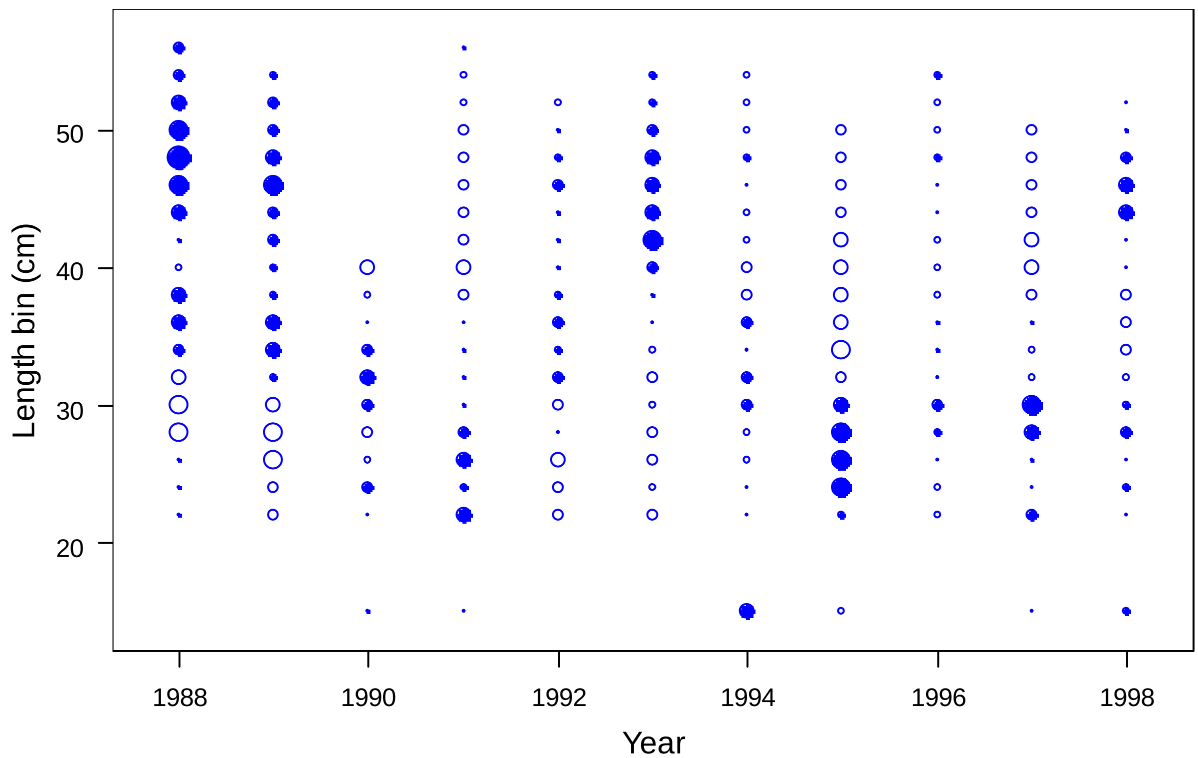


Figure 27. Residuals from the final base-run model fit to the Oregon HKL fishery age composition data, females (top panel) and males (bottom panel).

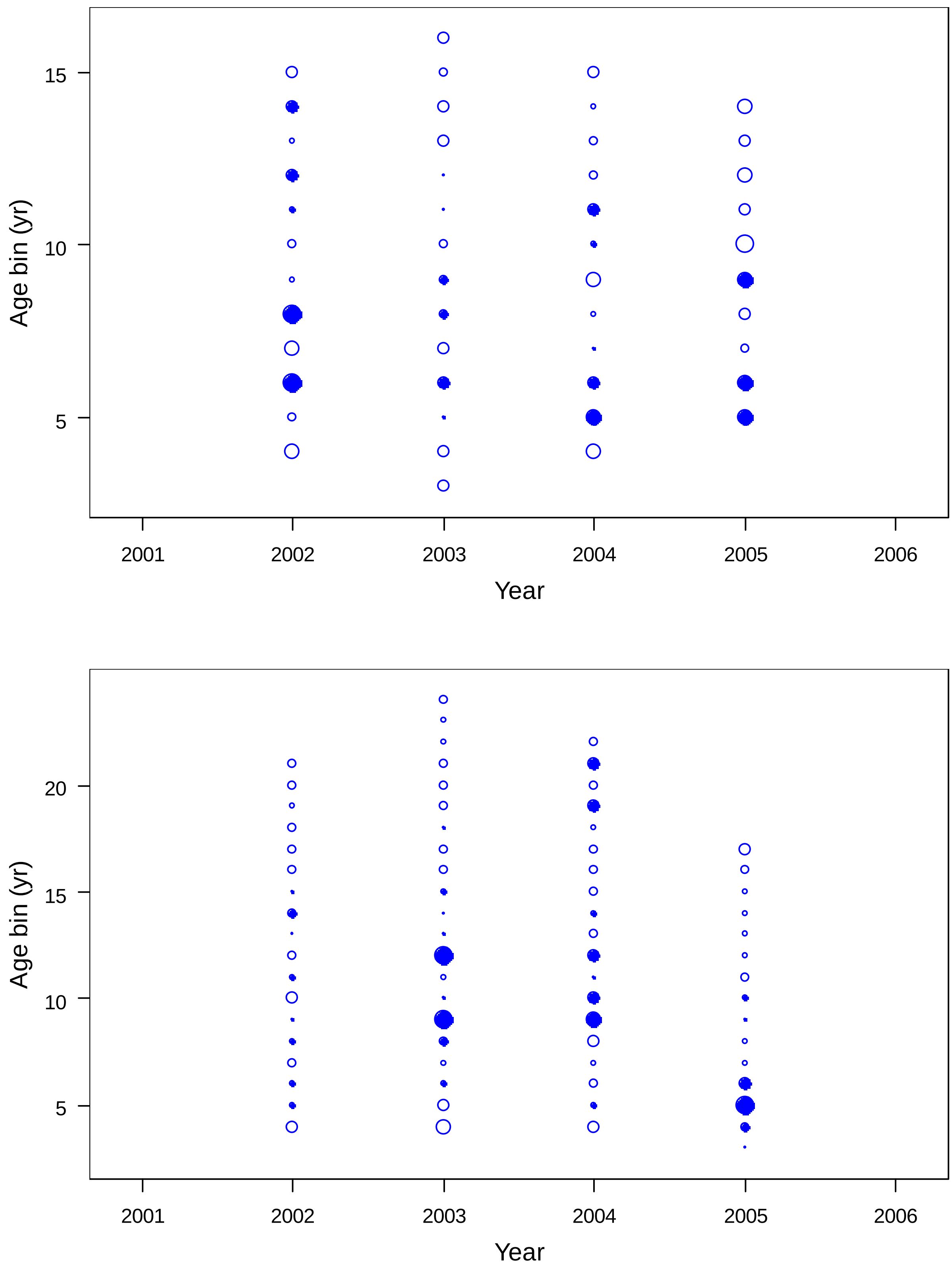
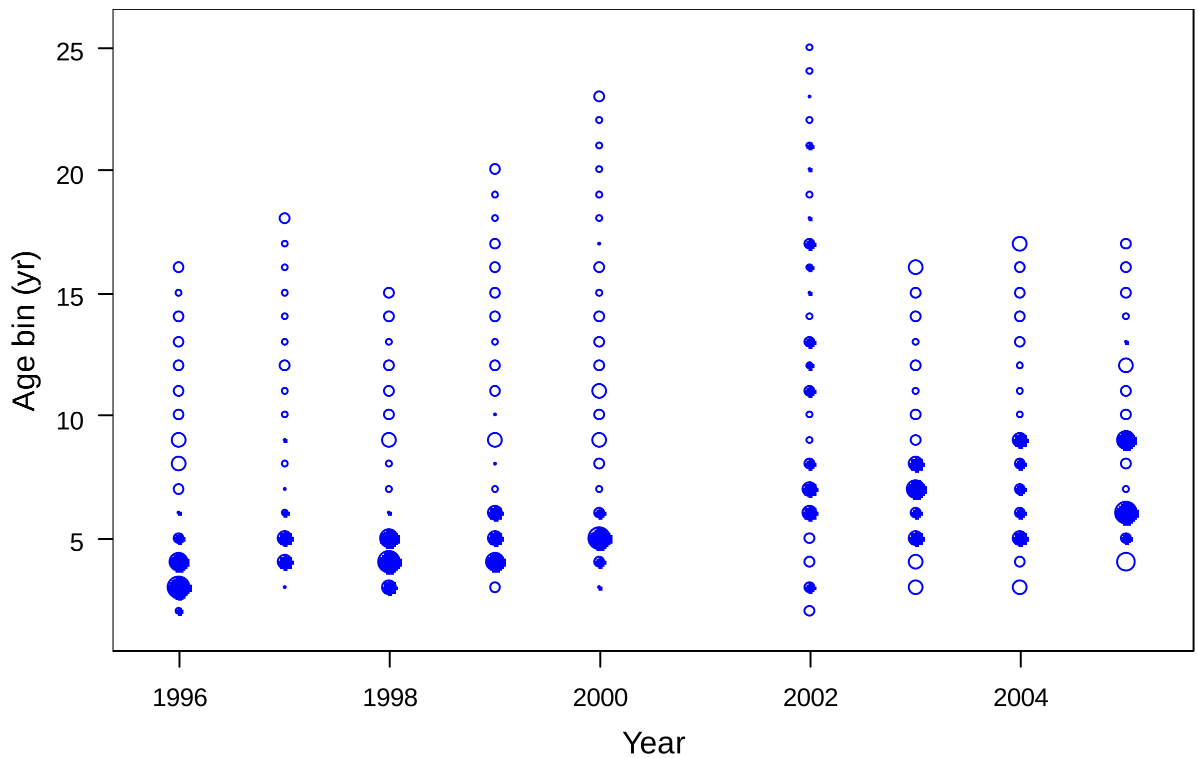


Figure 27. Residuals from the final base-run model fit to the Oregon ORBS survey age composition data, females (top panel) and males (bottom panel).



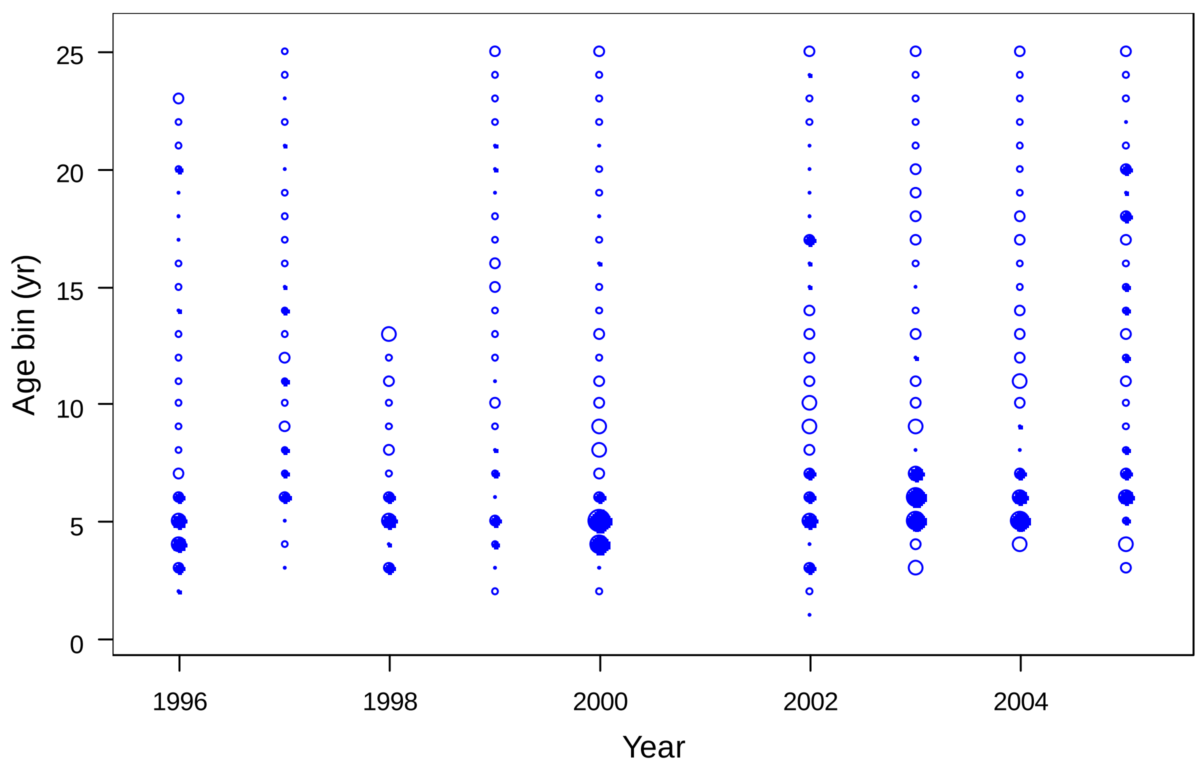


Figure 28. Final base-run model estimates of spawning output (millions of larvae).

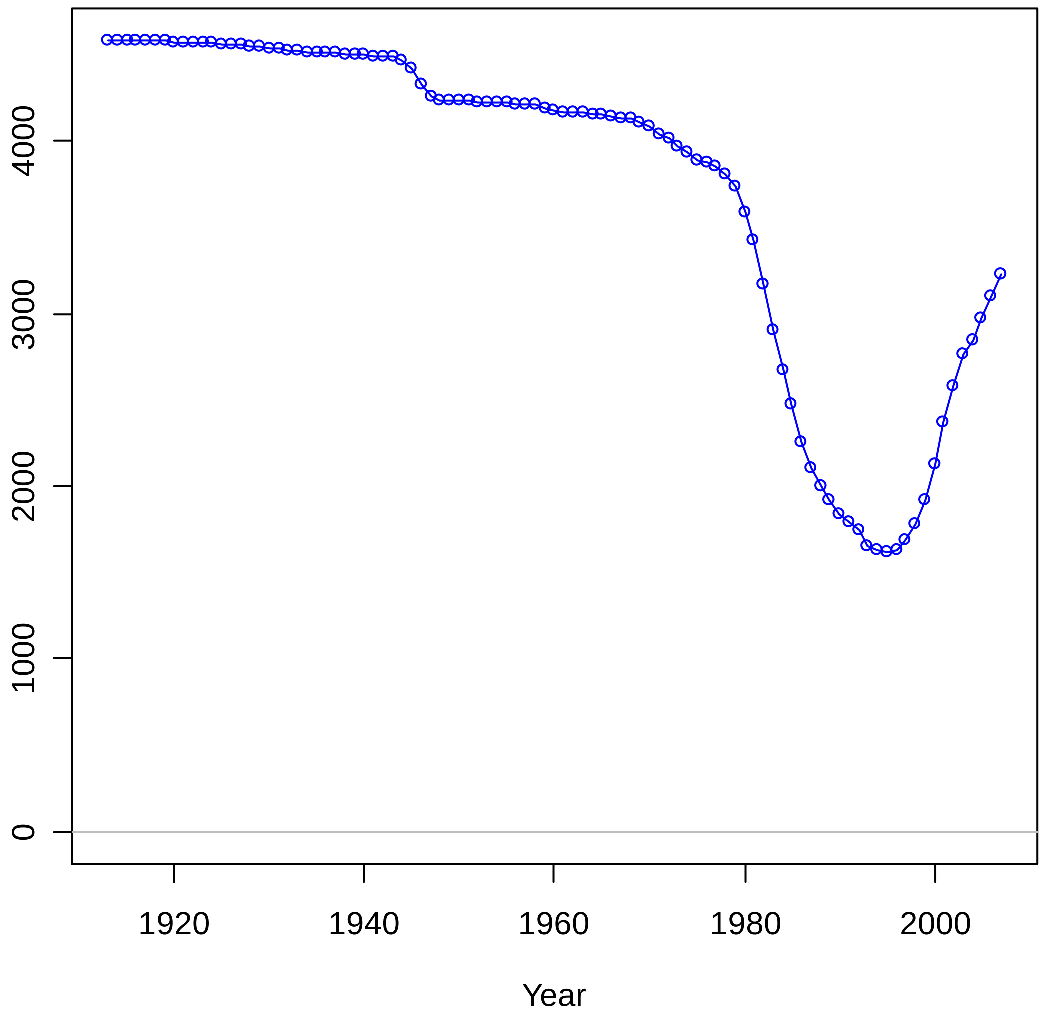


Figure 29. Final base-run model estimates of age-2+ biomass (mt).

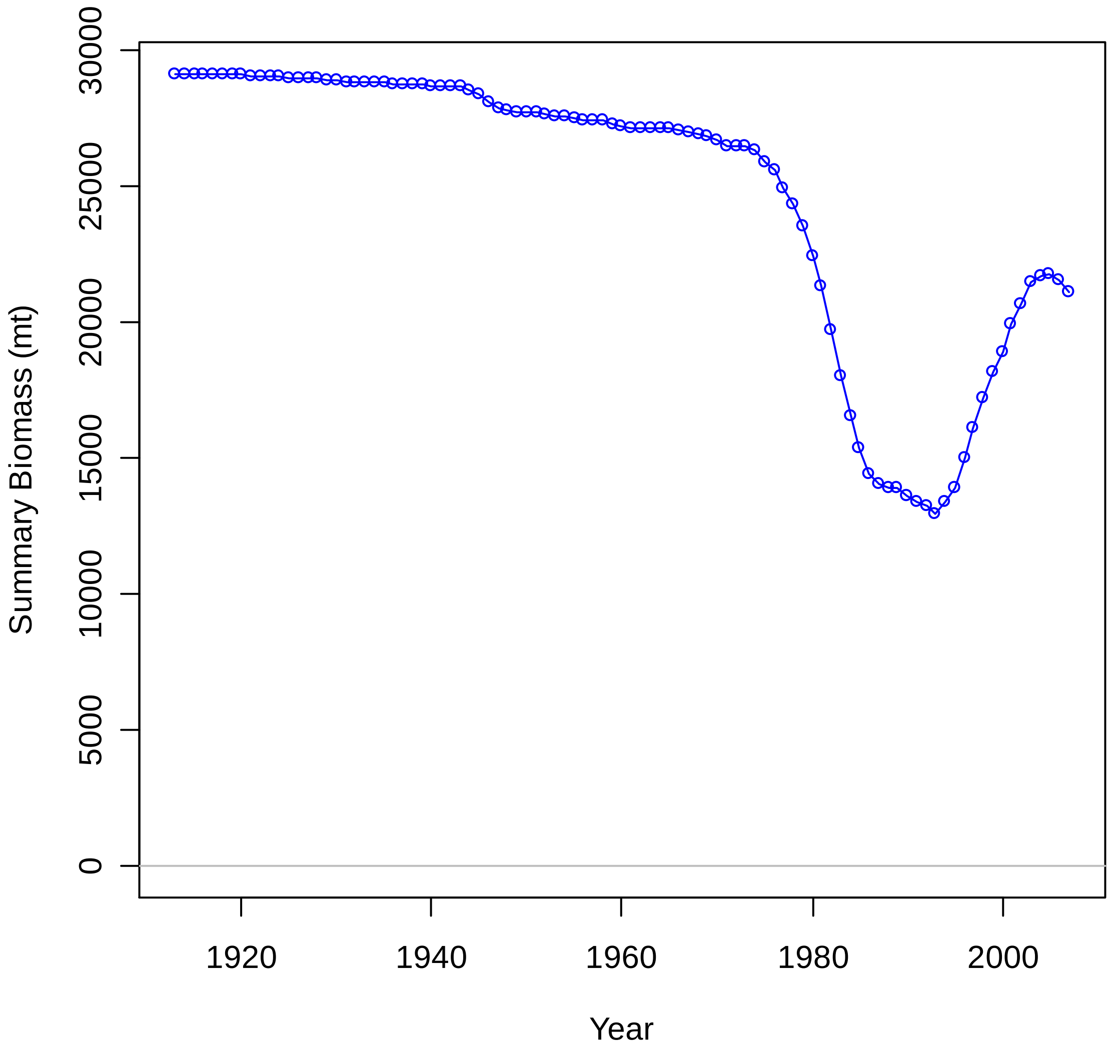


Figure 30. Final base-run model estimates of age-0 recruitment.

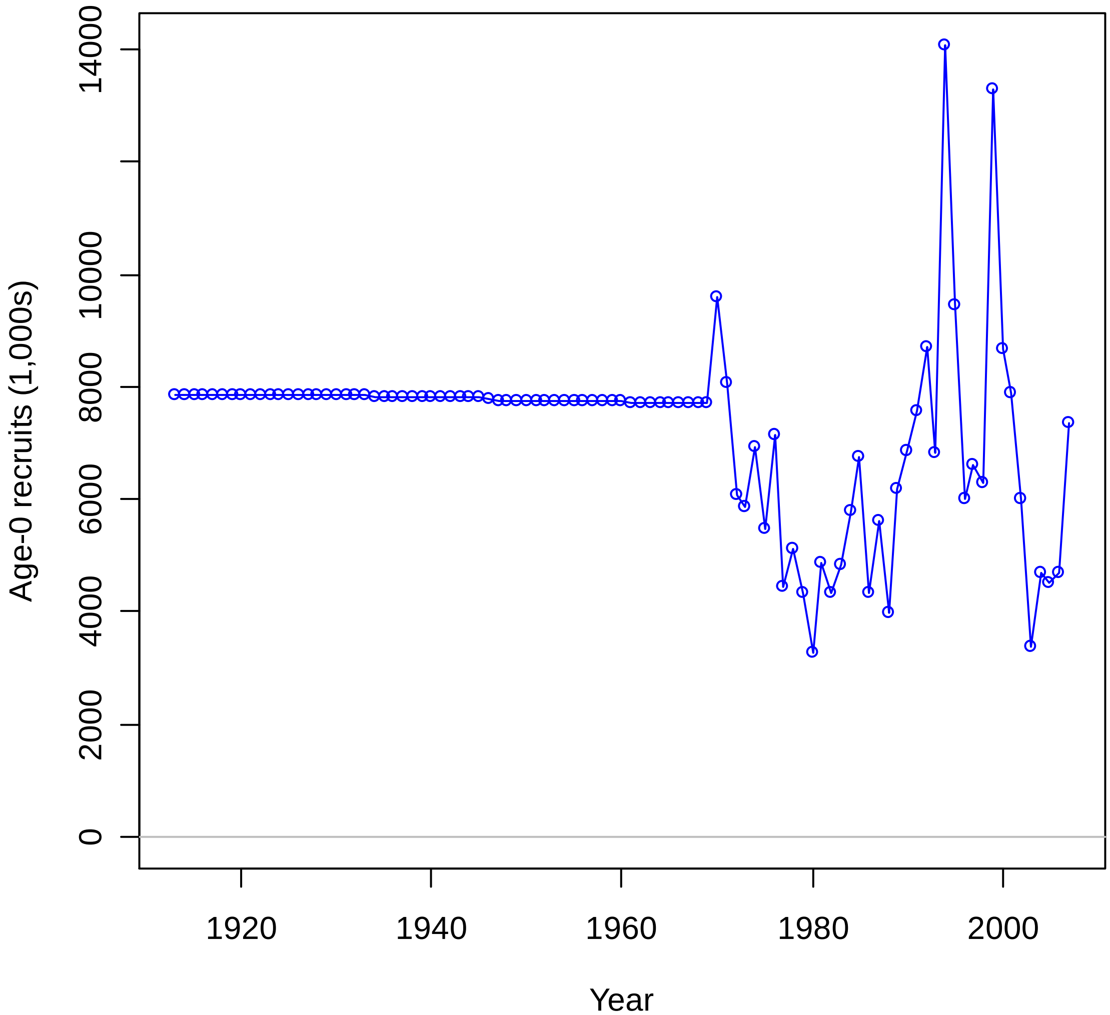


Figure 31. Final base-run model estimates of depletion (spawning output over unexploited).

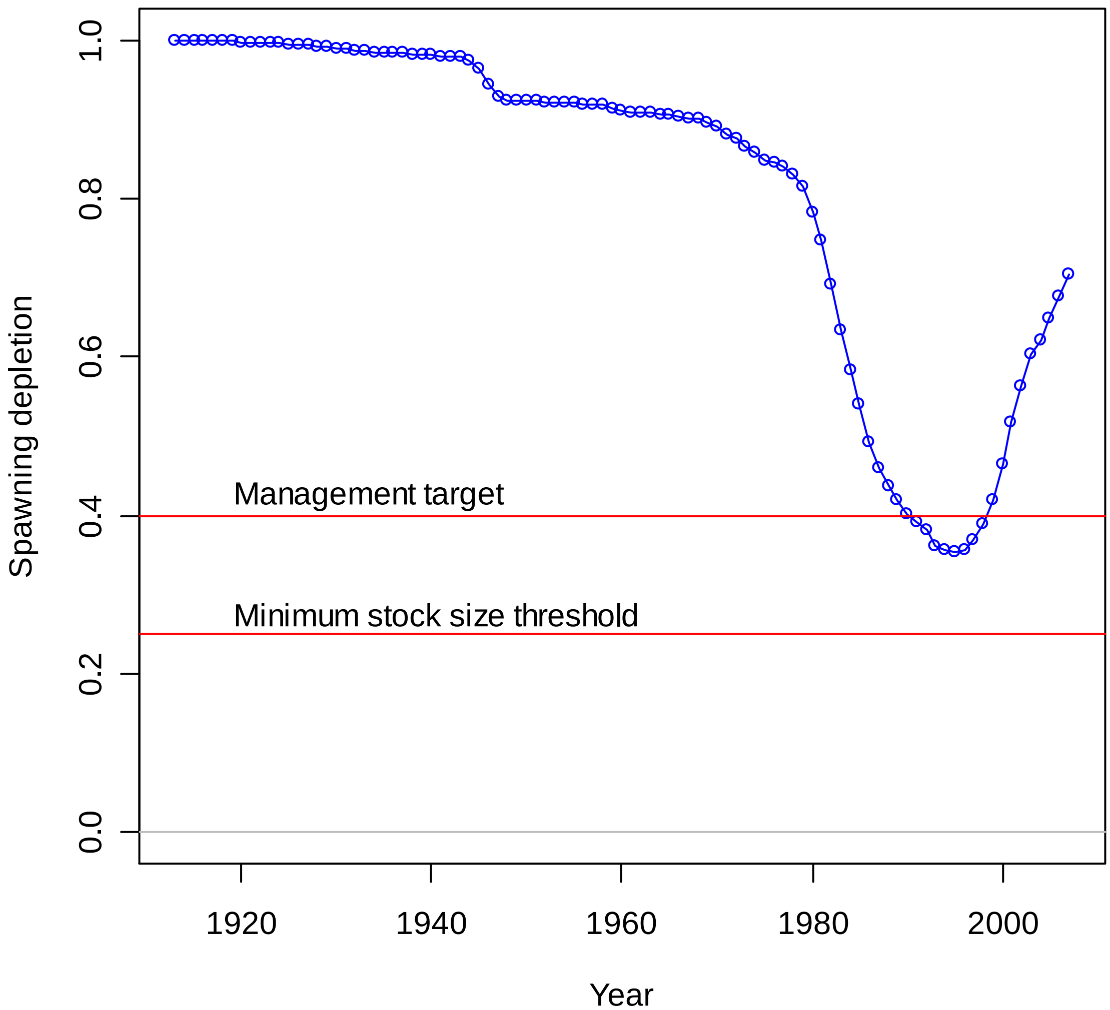


Figure 32. Final base-run model estimates of the total exploitation rate.

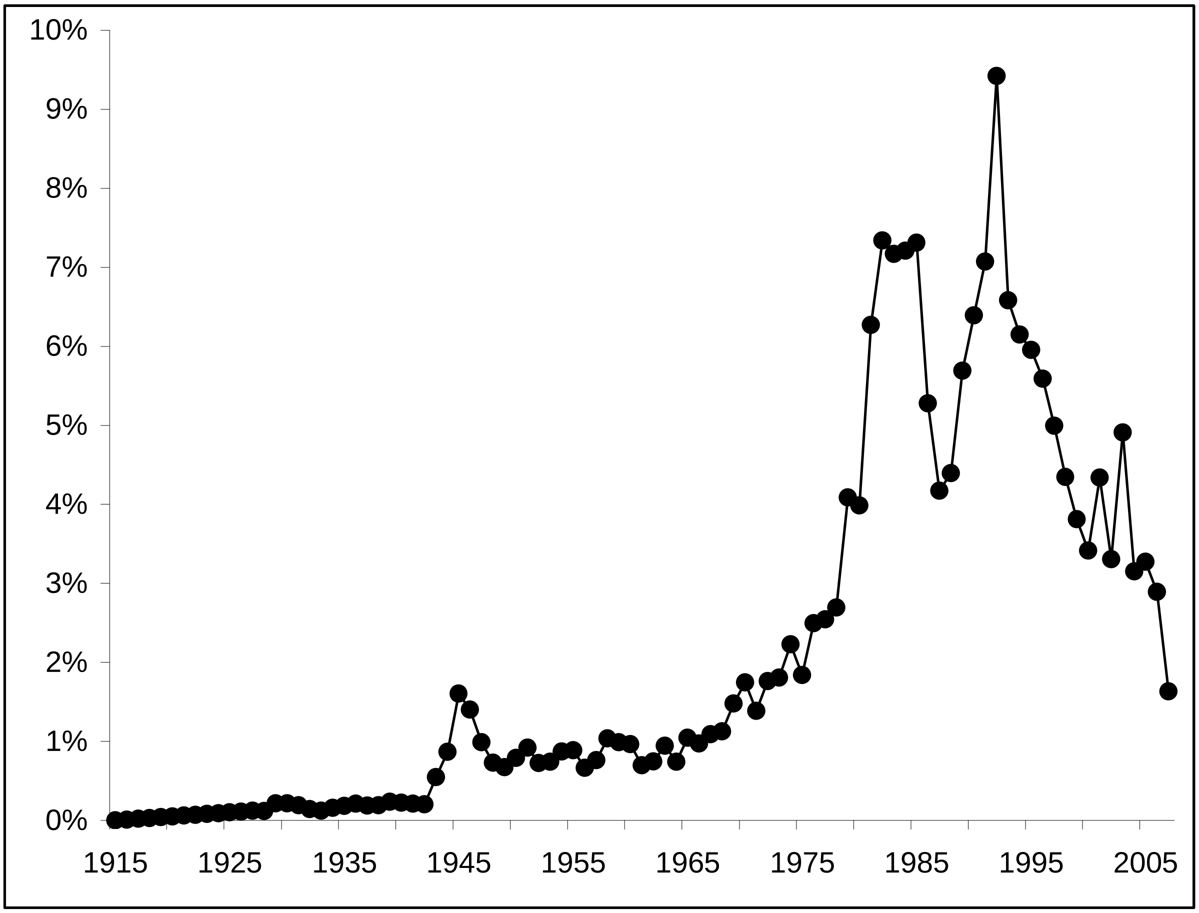
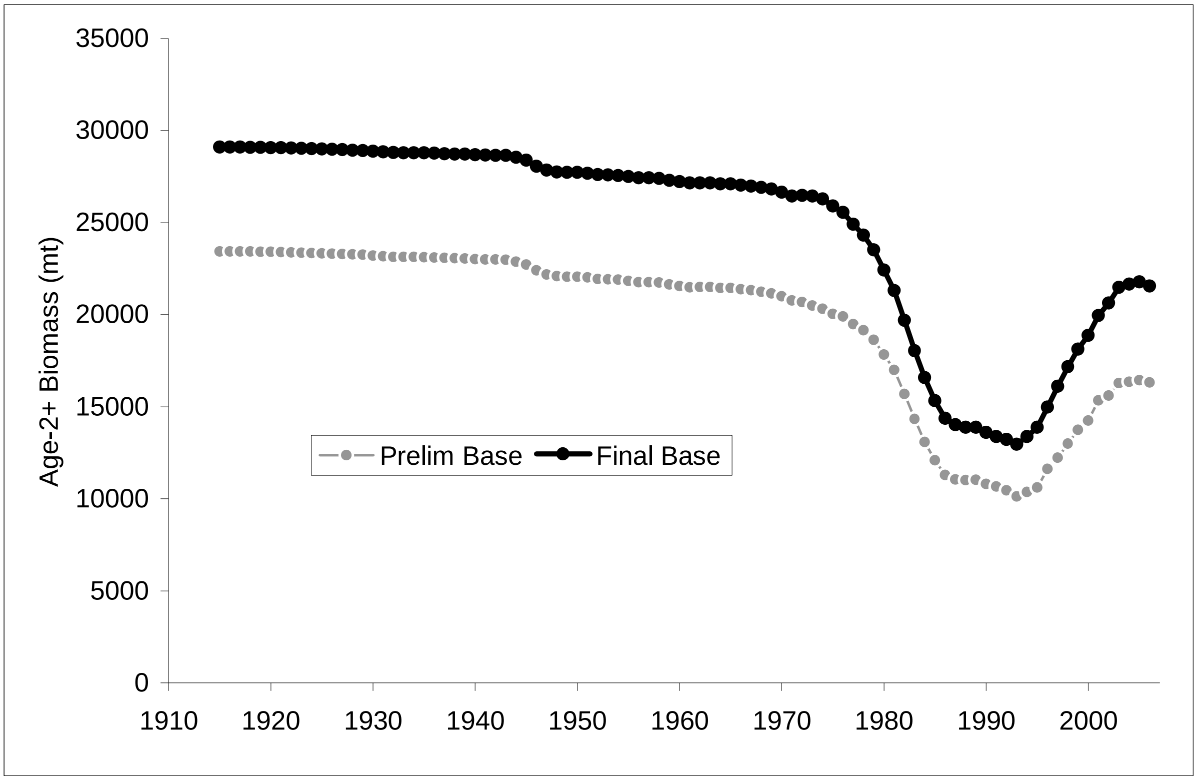


Figure 33. Comparison of the final base-run model with the preliminary base model.



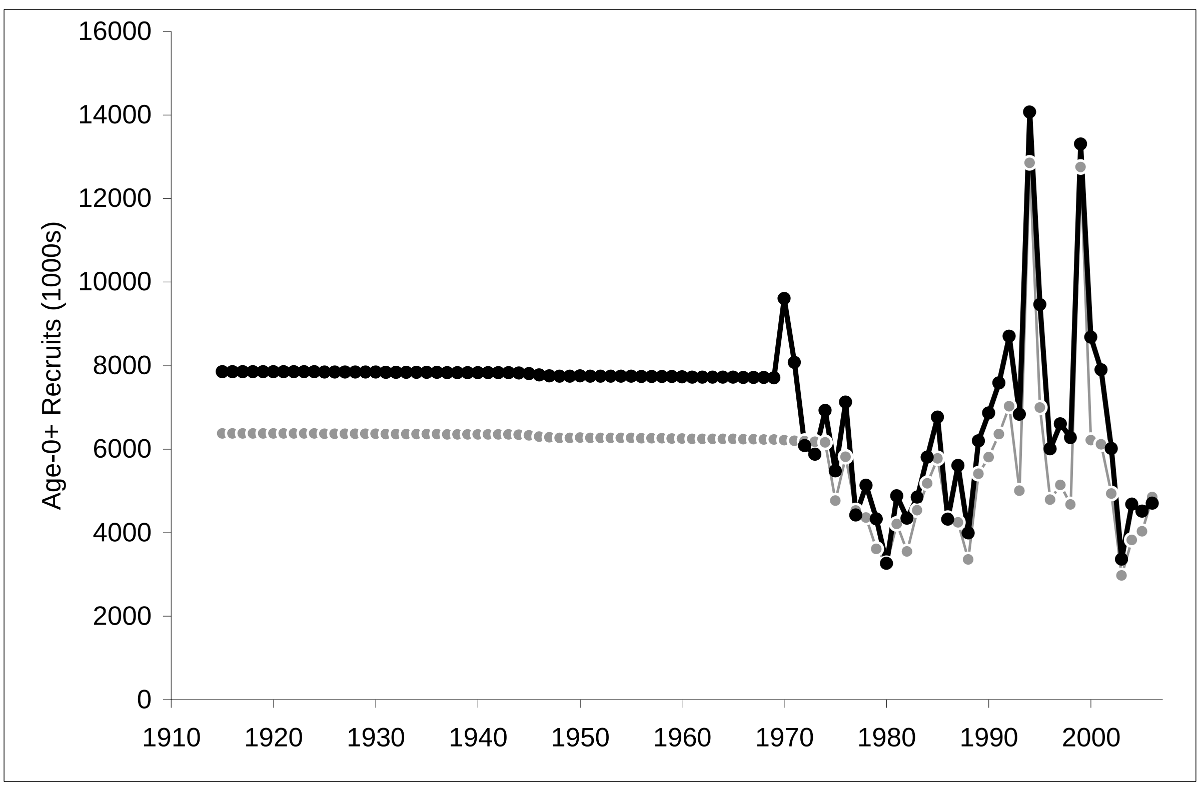
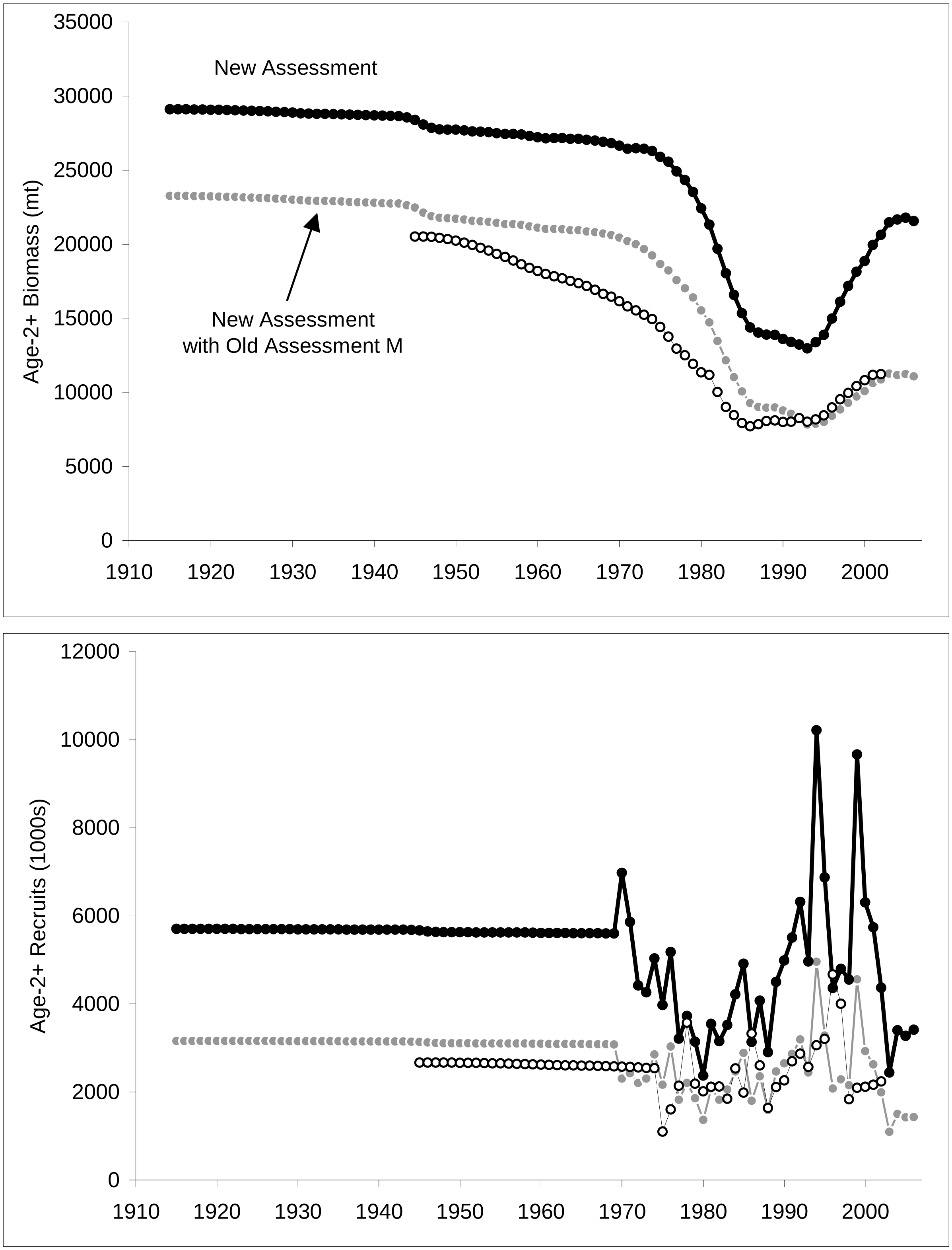


Figure 34. Comparison of the final base-run model with the 2003 assessment.



Appendix A.

Estimation of black rockfish (*Sebastes melanops*) population parameters from recreational fisheries mark-recovery data off Newport, Oregon

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October 11, 2007

Introduction
Assessments of the status of black rockfish (*Sebastes melanops*) populations have historically relied on trends in recreational catch-per-unit-effort (CPUE) as a relative index of abundance (Ralston and Dick 2003, Wallace et al. 1999). However, these data are not robust to changes in fishing effort distribution, the species targeted, or daily bag limits. In Oregon, daily bag limits governing the recreational take of black rockfish have been reduced from 15 fish in 1993 to 6 fish in 2006. These types of regulatory changes can dramatically reduce the utility of CPUE data as an abundance index for recent years.

Black rockfish is one of the primary target species in Oregon's recreational groundfish fishery. In 2004 and 2005, attainment of the federal harvest limit for black rockfish caused managers to close all recreational groundfish angling (except Pacific sanddab fishing) shoreward of the 40 fathom isobath (Oregon Department of Fish and Wildlife 2004 and 2005). These closures were highly controversial among resource users, and highlight the need for additional data sources to inform both stock assessments and management decisions for this important species.

In 2002, the Oregon Department of Fish and Wildlife (ODFW) initiated a mark-recovery experiment for black rockfish with the express intent of providing future stock assessments with an independent time series of estimates of exploitation rate, survival rate, and population abundance off Newport, Oregon. The Washington Department of Fish and Wildlife has conducted a similar black rockfish mark-recovery study off Westport, Washington since 1998 (Wallace et al. 1999), results of which have been used to inform assessments of black rockfish populations in Washington waters.

Field methods
Passive Integrated Transponder (PIT) tags were used to mark 2,500 to 3,000 fish per year since 2002 off Newport, OR. Specifically, we used Destron-Fearing ISO FDX-B 134.2-kHz PIT tags with dimensions of 12 x 1.2 mm. Each PIT tag is encoded with a unique number, allowing identification of individual marked fish. These marks are not visible to anglers, eliminating problems associated with non-reporting of visible marks by anglers. PIT tags were injected 1 cm deep into the hypaxial musculature just anterior of the origin of the pelvic fin. This tag location was chosen because it allows fish to be checked for PIT tags after they have been filleted, and a tag retention study found 100% retention after 49 weeks in fish tagged in this manner (Parker et. al 2003).

Fish were captured by hook and line anglers using barbless hooks aboard chartered recreational fishing vessels between statistical weeks 11 and 26 (March through June) in each year. Upon capture, fish were scanned for a pre-existing PIT tag, assessed for signs of barotrauma (injuries related to pressure changes), measured, injected with a PIT tag, re-scanned, and released. Fish with significant signs of barotrauma, such as an everted esophagus or bulging eyes, were lowered to a depth of 10-15 meters in a weighted cage prior to release. Recent studies indicate that returning black rockfish to depth quickly is the best way to mitigate barotruama related mortality (Hannah and Matteson 2007). Fish bleeding from the gills or suffering major flesh wounds from hooks or predators were not marked. Fish that were unable to remain submerged after being released at depth were recovered when possible and removed from the marked fish population. Anglers included ODFW staff, volunteers, and vessel crew. Injection of PIT tags and data recording tasks were performed by ODFW staff.

Distribution of marked fish was divided among four areas off the central Oregon coast between Yaquina Head and Alsea Bay to reflect the estimated distribution of the black rockfish population, based on the distributions of recreational fishing effort and rockfish habitat (Figure 1). Latitude and longitude were recorded every 60 seconds during marking operations by a data logging Global Positioning System (GPS). The capture location of each fish could then be plotted by matching the time of marking to the nearest time that a GPS position was recorded (Figure 1).

Marked fish were recovered by ODFW staff at dockside landing sites in Newport, OR. In 2002 and 2003, sampling for marked fish occurred from March through October. Approximately 95% of Oregon's estimated annual black rockfish landings occur during this period (Recreational Fisheries Information Network (RecFIN)). Beginning in July 2004, sampling occurred throughout the entire year. Samplers were trained to use Allflex® portable scanners to search for marked fish, and to tally the number of fish scanned. Several blind tag seeding experiments demonstrated a tag detection rate of 96.5% ± 7%. Whenever possible, interviews with the captain or crew were conducted to determine the area where most of the fishing took place. Recovery effort focused on charter boats, which are historically responsible for over 75% of recreational black rockfish landings in Newport (RecFIN). Samplers typically met charter boats at landing sites and scanned fish prior to or just after they were filleted. Fish landed by private vessels were also checked for marks by ODFW's Ocean Recreational Boat Survey (ORBS) samplers. Carcasses of marked fish were examined to determine size, sex, maturity, tag movement, and general fish condition to compare with data collected at the time of marking.

Depoe Bay, the nearest port to the north (23 Kilometers), was also sampled for marked fish in order to address model assumptions about movement and migration. The nearest port to the south, Florence, OR, is 64 kilometers south and has relatively low black rockfish landings. Therefore no fish were scanned at Florence. However, vessels from Newport occasionally fish well south of the study area at Cape Perpetua, and these fish were also checked for marks.

Analysis methods

This experiment was designed to utilize the multi-stage mark-recovery model described by Brownie et al. (1985a) to generate a time series of annual estimates of recovery ($\hat{f}_i$) and survival ($\hat{S}_i$) rates where *i*=year. With the additional inputs of an independent estimate of annual total catch ($\hat{C}_i$) and an annual census of fish sampled for marks (cs_i), the recovery rate parameter can be used to calculate annual estimates of exploitation rate ($\hat{u}_i$) and their variances as given in the following equations (Jagielo, 1994):

$$\hat{u}_i = \frac{\hat{f}_i \hat{C}_i}{cs_i}$$

with variance

$$\mathrm{var}(\hat{u}_i) = \frac{\mathrm{var}(\hat{C}_i)\,\hat{f}_i^{\,2} + \mathrm{var}(\hat{f}_i)\hat{C}_i^{\,2}}{cs_i^{\,2}}$$

The annual population abundance (N_i) can then be estimated by dividing the annual estimated catch by the estimated exploitation rate:

$$\hat{N}_i = \frac{\hat{C}_i}{\hat{u}_i}$$

The Brownie model depends on several inherent assumptions about the population being modeled. ODFW has conducted extensive support studies and analyses of ancillary data generated during marking in an attempt to validate these assumptions for black rockfish populations off Newport. Table 1 summarizes the assumptions, our attempts to address each assumption, and the results of these support studies.

Based on ODFW laboratory studies (Parker et al. 2006) a capture and release mortality rate of 3.3% was applied to the number of marks released in each year. A one year recovery period was defined as statistical week 26 (approximately the fourth week of June) in year *i* through statistical week 25 in year *i*+1. Fish recovered prior to week 26 in the same year they were marked were removed from the analysis. This definition was adopted to approximate the simultaneous release of all marks within a year, which is impossible to accomplish in practice. The time period under consideration for this analysis is from week 26 in 2002 through week 25 in 2007.

Analysis of recovery rates by length bin showed that fish from 29-32 cm had lower first-year recovery rates than larger fish in every year except 2002. This observation is supported by data collected by charter boat observers which indicate 29-32 cm black rockfish are frequently discarded (Figure 2). Observer data also indicate that the average size of discarded black rockfish is increasing as bag limits decrease, presumably a result of anglers “high grading” their catches. As small marked fish fully recruit to the fishery in later years, they give the appearance of increasing recoveries over time. For this reason, fish 29-32 cm in length at time of marking were excluded from our analysis. This is a conservative measure from a management perspective since exclusion of 29-32 cm fish leads to higher estimates of exploitation rate and lower estimates of survival rate. The computer program ESTIMATE (Brownie et al. 1985b) was used to generate estimates of recovery and survival rates, and to assess model fit. ESTIMATE assesses the goodness of fit (GOF) for four predefined models (Table 2) using the Chi-square tests described in Brownie et al. (1985a), and provides tests between models.

Estimation of *q* for the Newport fishery

While exploitation and survival rates are important information for fishery managers, at this time Stock Synthesis II does not allow for the direct input of these parameters to help inform stock assessments. Estimates of abundance can be directly incorporated into the assessment model as a survey, but abundance estimates from the black rockfish PIT tag program only pertain to the population from Yaquina Head to Alsea Bay. This is a much smaller area than the Pacific States Marine Fisheries Commission's (PSMFC) management areas 2C and 2A/2B or the broader area from Cape Falcon to the Oregon/California border, which are the spatial units under consideration for assessment models. In order to allow the mark-recovery abundance estimates to be directly incorporated into assessment models, it was necessary to calculate the fraction (q) that the black rockfish population off Newport represents with respect to the entire area 2C population and the broader population from Cape Falcon to the OR/CA border. To estimate q, we used onboard observer data from charter and commercial vessels targeting nearshore rockfish to estimate the proportion of black rockfish habitat occurring within the mark-recovery study area with respect to each of the larger areas. Based on the assumption that abundance is a function of available habitat, this habitat estimate allows the estimation of a q for the Newport population survey.

The available data consisted of latitude and longitude coordinates for the start and stop points of "drifts" in the recreational fishery and "sets" in the commercial fishery, catch counts by species, and much ancillary data. Because the data described only spatial points with no inherent geographical area, it was necessary to assign some amount of area to each black rockfish catch location. We examined the average distance between the drift start and stop locations ($\bar{x}$ =190 m) in the recreational observer data to estimate the average habitat area represented by a single catch location. Based on this result, we represented each start location as a circular area with a radius of 190 meters, then merged all overlapping circles and calculated the total area of black rockfish habitat using ESRI's ArcView® software. Although this approach incorporates spatial area that is likely not black rockfish habitat, and cannot yield absolute estimates of habitat area, we felt it was useful for estimating the relative proportion of black rockfish habitat among major harvest areas.

One potentially serious bias in the above analysis results from the uneven spatial distribution of observer effort for both the commercial and recreational data. In both of these programs, observer effort is approximately proportional to fishing effort by port. This could lead to a situation where the habitat in some areas has been well defined by observer data, but habitat in areas with less effort is poorly defined, leaving spaces where habitat exists but no fishing has been observed. Since the area off of Newport has the greatest number of observed black rockfish locations (figure 3), this method is likely to overestimate the relative proportion of habitat occurring inside the PIT tag study area. Therefore, we viewed this estimate as representing the maximum proportion of total black rockfish habitat occurring inside the PIT tag study area.

In order to remove any bias associated with spatial differences in observer effort, we equalized observer effort by randomly selecting 119 locations from each of 8 port sub-areas and including all 17 locations from sub-area E (Figure 3). The number of locations randomly selected reflects the fewest locations in any sub-area except sub-area E. Port sub-areas were approximately equal in size (40 km North-South by 25 km East-West) except area E which stretched from just north of Cape Perpetua to Coos Bay and contained only 17 black rockfish locations. Again, this method is not useful for estimating absolute habitat area, only the relative proportions of black rockfish habitat between areas.

Finally, we calculated the linear kilometers of coastline for the PIT tag study area, PSMFC area 2C, and Cape Falcon to the OR/CA border. We then calculated the same black rockfish habitat proportions described above assuming habitat area was directly proportional to linear kilometers of coastline. Visual examination of maps of fishing locations clearly shows that black rockfish habitat in the PIT tag study area off Newport is less patchy than across much of the rest of the state. We therefore felt that calculating the proportions of black rockfish habitat in each area using linear miles of coastline would give a reasonable minimum for the proportion of habitat area occurring inside the PIT tag study area.

Results

From March 2002 through June 2006, a total of 14,372 black rockfish were successfully marked with PIT tags and released (an additional 3,056 marked in 2007 were not included this analysis). Through June 2007, 976 marked black rockfish were recovered from recreational fishery landings at Newport, and 2 were recovered at Depoe Bay. During this period, 272,677 black rockfish were checked for marks at Newport, and 85,282 were checked at Depoe Bay. A total of 93 marked fish were removed from the analysis because they were recovered prior to the beginning of the first recovery period for their marked fish cohort. The censure of fish less than 32 cm resulted in the removal of an additional 1,354 marked fish from the analysis. The final numbers of marked and recovered fish by year and recovery period that were used as model inputs are given in Table 3.

Based on port-specific weekly estimates of landings generated by the Recreational Fisheries Information Network (RecFIN), 79% of black rockfish landed at Newport and 34% of those landed at Depoe Bay were checked for marks during the period under consideration. Sampling rates were similar for each recovery period (Table 4).

Comparisons of annual length distributions of marked fish with annual length distributions of fish landed in the Newport fishery (from separate creel surveys) show that in 2003, 2004, and 2006 marked fish were somewhat smaller than those landed in the fishery (Figure 4). Examination of recovery rate anomalies (difference from the mean) for fish in 6 different barotrauma categories showed a statistically significant relationship between level of barotruama and probability of recovery ($p=0.02$, Kruskal-Wallis test), with lower recovery rates for fish having the fewest signs of barotrauma (Figure 5). This effect is the opposite of what would be expected if visible signs of barotrauma led to increased tagging mortality. It is probable that in this case the level of barotrauma is correlated with some other effect on recovery rate such as location or depth and is not the direct cause of differences in recovery rate.

Comparison of the geographic distribution of marked fish showed that fish were marked at most reefs each year, although the number of fish marked at any specific reef was variable from year to year. Interviews with boat operators and deckhands indicated that the majority of fish are recovered in the same area that they were initially marked (Table 5). Additionally, 26 of 33 fish that were recaptured during marking operations were within 1 km of the initial point of capture.

Goodness of fit statistics generated using ESTIMATE indicate that model 0, in which first year recovery rates are assumed to be independent of other years, is the only model which adequately describes the data considered (Table 6). Model 0 has a large number of parameters, some of which are not separately estimable. For a five year dataset, *f* is not estimable for period 5, and *S* is not estimable for periods 4 or 5. While *f'* is estimable for all periods, it is based on minimal information and should be treated with caution. Model 0 estimates of f_i ranged from 2.6% to 3.8% and estimates of S_i ranged from 57% to 106% (Table 7). Using estimates of f_i from model 0, estimates of u_i ranged from 3.1% to 5.5% and estimates of N_i ranged from 1.3 to 2.1 million fish from 2003 to 2006 (Table 8). Measures of the variance of the estimated catch are not currently available, therefore the CVs given for *u* and *N* in table 8 assume that catch is known without error. Because catch is treated as a constant in this case, the CVs for the estimate of *N* are approximately equivalent to the CVs for the corresponding estimate of *u*. Figure 6 shows the effect of increasing CV($\hat{C}$) on CV($\hat{u}$).

In our estimation of *q* for the Newport population survey, we found that the amount of black rockfish habitat inside the PIT tag study area as a proportion of that inside either larger area was greatest when calculated using all available observer data, least when calculated using linear km of coastline, and somewhere between these values when observer effort was equalized (Table 9). We feel that the estimate obtained using equalized observer effort is the most accurate, and that the estimates using the other two methods may be viewed as reasonable upper and lower bounds for this estimate. It is important to note that this analysis only attempts to account for habitat that is fished, and ignores habitat which may be too shallow to safely fish from vessels. Also noteworthy is the apparent lack of black rockfish habitat between Cape Perpetua and Coos Head. While this could be an artifact of a long coastline with few good ocean access points for vessels, reports from various operators of fishing vessels indicate this area is largely devoid of fishable rocky reef habitat.

Discussion

Selecting a model that adequately describes the data in the most parsimonious manner possible is an important step in the analysis of mark-recovery data. Since all models except model 0 were rejected by the Chi-square GOF tests, it may seem logical to conclude that model 0 is the proper model to use. However, model 0 is confounded with another model where both first year survival and first year recovery rates are independent of previously marked cohorts, in which case only the products of survival and recovery rates are estimable (Brownie et al. 1985a). This situation may arise from marking-induced mortality or from a failure of newly marked fish to thoroughly mix with previously marked fish.

Proper use of model 0 is limited to situations in which it can reasonably be assumed that first year recovery rates are different from recovery rates for previously marked cohorts, while survival rates are equal for all cohorts within a year. A priori information from support studies indicates marking-induced mortality is probably quite low (Table 1), and the widespread distribution of release sites for marked fish in all years should minimize non-mixing problems. On the other hand, it is plausible that the marking process affects the catchability of the fish for some period after marking, leading to lower recovery rates for newly marked fish. Based on this assumption, we selected model 0 as the best available model for the analysis of these data. In practice, the use of model 0 gives higher estimates of exploitation rates and lower estimates of survival rates, and is therefore conservative from a fishery management perspective.

Annual exploitation rates calculated using the results of model 0 are quite low considering the large annual black rockfish catch for the Newport recreational fishery ($\bar{x}$ =66,162 fish). However, the estimates are reasonably precise (CV<20%) and we feel it is unlikely that actual annual exploitation rates regularly exceed 6% for black rockfish populations off Newport. Annual survival rates as estimated by Model 0 are highly variable with wide confidence intervals. This could be a reflection of a true difference in cohort survival due to between-cohort differences in the spatial or size distribution of marked fish. Brownie et al. (1985a) suggest that a study duration of five years is minimal to generate reasonable estimates of survival and recovery rates. We expect both model fit and the precision of parameter estimates to improve as the duration of the study is extended and field methods are fine-tuned based on experience and the ongoing analysis of data. Development of a customized model including factors such as emigration and immigration, length-based fishery selectivity, or non-mixing may be desirable but is not currently funded.

Acknowledgements
We would like to thank all of the charter vessel booking agencies, fish cleaners, captains and deckhands of Newport and Depoe Bay, OR for their willing cooperation in the mark recovery portion of this project, and especially the owners, captains and deckhands of those charter vessels hired to conduct marking operations; the *Umatilla II, Surfrider, Misty, Blitz,* and *Miss Raven.* We would also like to thank all the anglers, both paid and volunteer, who assisted with the capture, marking, and release of fish. This project was funded by the U.S. Fish and Wildlife Service through Sport Fish Restoration grant number F-186-R, and by the Oregon Department of Fish and Wildlife.

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Table 1. Evaluation of model assumptions

Model Assumption	Evaluation method	Results
The marked population is representative of the population under study	1. Compare marked fish length distributions to fishery length distributions 2. Acoustic telemetry study to assess spatial mixing of marked and unmarked fish (Parker et al. 2007)	1. Smaller fish may have been disproportionately marked in 2003, 2004, and 2006 2. Small home range (55 ha), 43% re-located to nearby reefs or moved outside telemetry study area. Indicates moderate levels of mixing.
There is no tag loss	Tag retention study (Parker and Rankin, 2003)	100% retention for 49 weeks
Survival rates are not affected by the marking itself	1. Tag retention study 2. Barotrauma induced mortality study (Parker et al. 2006) 3. Visual observations of black rockfish released at depth after hook and line capture (Hannah and Matteson, 2007) 4. Comparison of recovery rates by severity of barotrauma signs	1. No mortality from tag injection 2. 3.3% mortality for simulated capture and release from 30.5 meters water depth 3. Black rockfish showed little behavioral impairment when released at depth 4. Fish with severe barotrauma signs are recovered at higher rates than fish with little or no barotruama

Table 2. Predefined Brownie models assessed for goodness of fit using program ESTIMATE. *S*=survival rate, *f*=recovery rate, *f'*=1st year recovery rate. (t) indicates time dependent variable, (.) indicates constant.

Model	Description	Parameterization
Model 0	Time dependent survival and recovery rates, 1st year recovery rate independent of recovery rate for previously marked cohorts	*S*(t), *f*(t), *f'*(t)
Model 1	Time dependent survival and recovery rates	*S*(t), *f*(t)
Model 2	Constant survival rate, time dependent recovery rate	*S*(.), *f*(t)
Model 3	Constant survival and recovery rate	*S*(.), *f*(.)

Table 3. The number of marked and recovered black rockfish by release year and recovery period for fish ≥ 32 cm at the time of marking, representing final model inputs.

		Recovery Period				
Release year	Number marked	1	2	3	4	5
2002	2312	51	51	41	27	16
2003	2461		41	51	54	52
2004	2527			59	73	60
2005	2622				55	58
2006	2574					89

Table 4. Percent of total landings of black rockfish (from RecFin) checked for marks by recovery period and port

	Recovery period				
Port	1	2	3	4	5
Newport	81%	69%	75%	84%	87%
Depoe Bay	38%	32%	24%	35%	40%

Table 5. Area of release and reported area of recovery of marked fish

Reported recovery area	Release area 1	2	3	4
1	17	4	5	
2	1	56	46	3
3	4	18	159	47
4	1	2	19	89
Depoe Bay			2	
Unknown	5	78	298	124

Table 6. Results of Goodness of Fit tests generated by ESTIMATE

Null Hypothesis	p-value	Result
Data fit Model 0 (time dependent S and f, first-year recoveries independent)	0.0509	Accept H_0: Model 0 adequately fits data
Data fit Model 1 (time dependent S and f)	0.0012	Reject H_0: Model 1 does not adequately fit data
Data fit Model 2 (constant S, time dependent f)	0.0002	Reject H_0: Model 2 does not adequately fit data
Data fit Model 3 (constant S and f)	<0.0001	Reject H_0: Model 3 does not adequately fit data

Table 7. Parameter estimates (%), standard errors (SE), and 95% confidence intervals (CI) for model 0.

	Recovery period				
	1	2	3	4	5
Recovery rate f_i	-------------	3.83	3.23	2.64	-------------
SE f_i	-------------	0.74	0.51	0.47	-------------
Lower 95% CI f_i	-------------	2.38	2.23	1.73	-------------
Upper 95% CI f_i	-------------	5.28	4.22	3.55	-------------
First year recovery rate f'_i	2.21	1.67	2.34	2.10	3.46
SE f'_i	0.31	0.26	0.30	0.28	0.36
Lower 95% CI f'_i	1.61	1.60	1.75	1.55	2.75
Upper 95% CI f'_i	2.81	2.17	2.92	2.65	4.16
Survival rate S_i	56.6	74.4	106.2	-------------	-------------
SE S_i	7.5	9.3	17.9	-------------	-------------
Lower 95% CI S_i	42.0	56.2	71.2	-------------	-------------
Upper 95% CI S_i	71.3	92.7	141.2	-------------	-------------

Table 8. Estimates of annual exploitation rate and abundance with corresponding coefficients of variation (CVs).

	Recovery period				
	1	2	3	4	5
Exploitation rate (*u*)	------------	0.0553	0.0428	0.0313	------------
CV(*u*)	------------	0.1938	0.1572	0.1765	------------
Abundance (N)	------------	1,305,793	1,375,807	2,130,612	------------
CV(N)	------------	0.1938	0.1572	0.1765	------------

Table 9. Proportion of black rockfish habitat occurring inside PIT tag study area

Analysis	Proportion of Area 2C habitat occurring inside PIT tag study area	Proportion of Falcon to OR/CA border habitat occurring inside PIT tag study area
Using all available observer data	42%	21%
Random re-sampling of 119 locations per port sub-area	34%	16%
Linear kilometers of coastline	24%	9%

Figure 1. Tagging area boundaries and release locations of individual tagged fish, 2002-2006

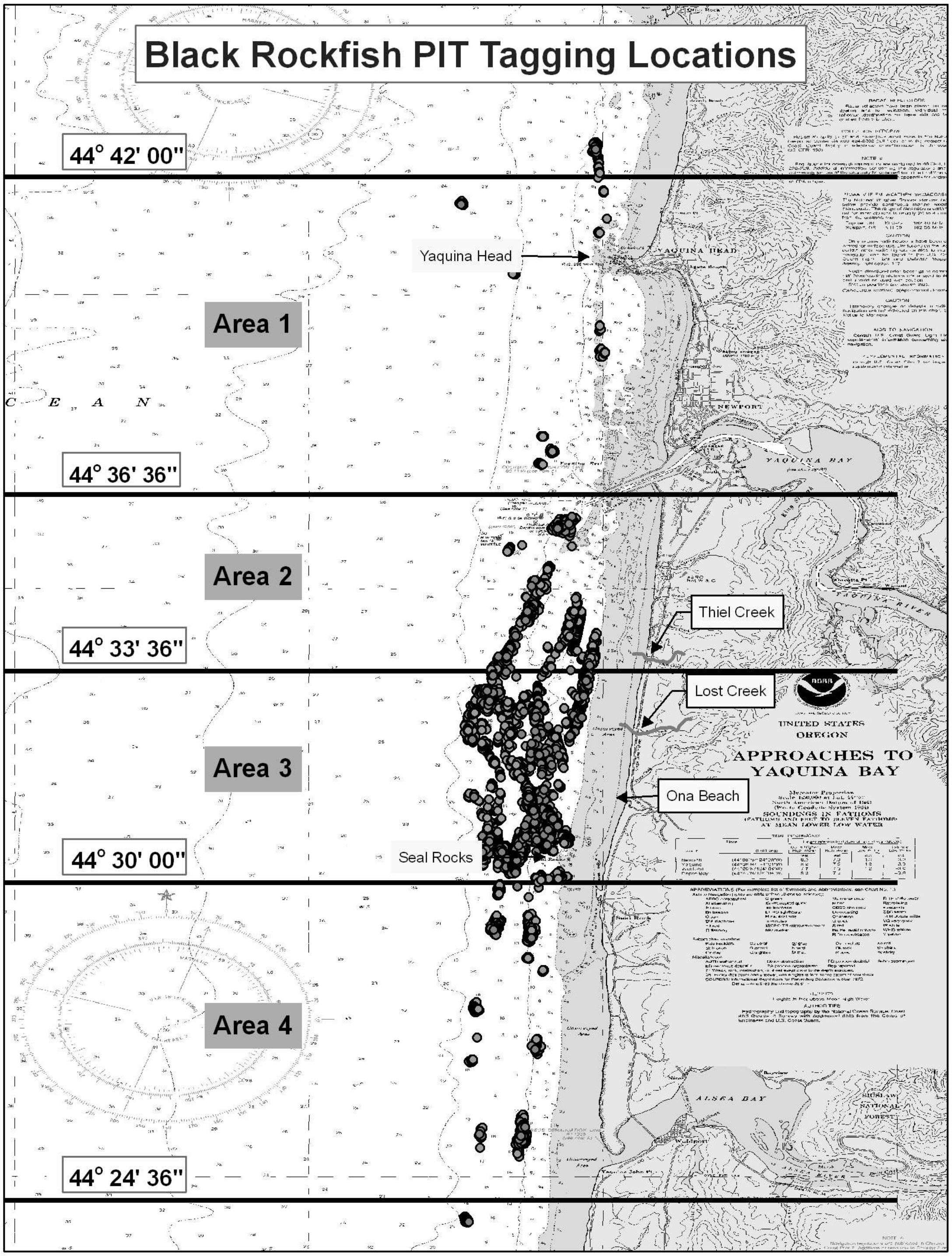


Figure 2. Length distribution of size-based black rockfish discards (excludes limit driven discards) from 54 observed Newport charter boat trips, 2003-2005

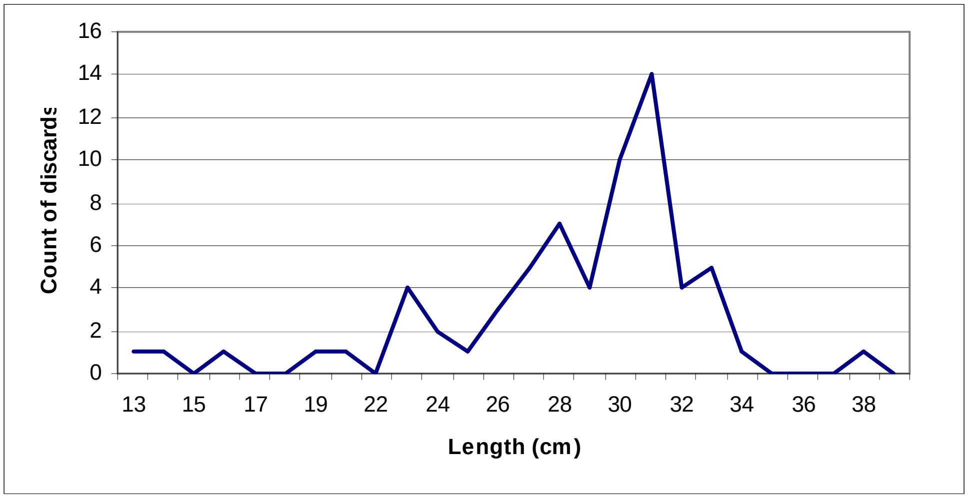


Figure 3. Port sub-areas used in random re-sampling and the number of black rockfish locations recorded in each.

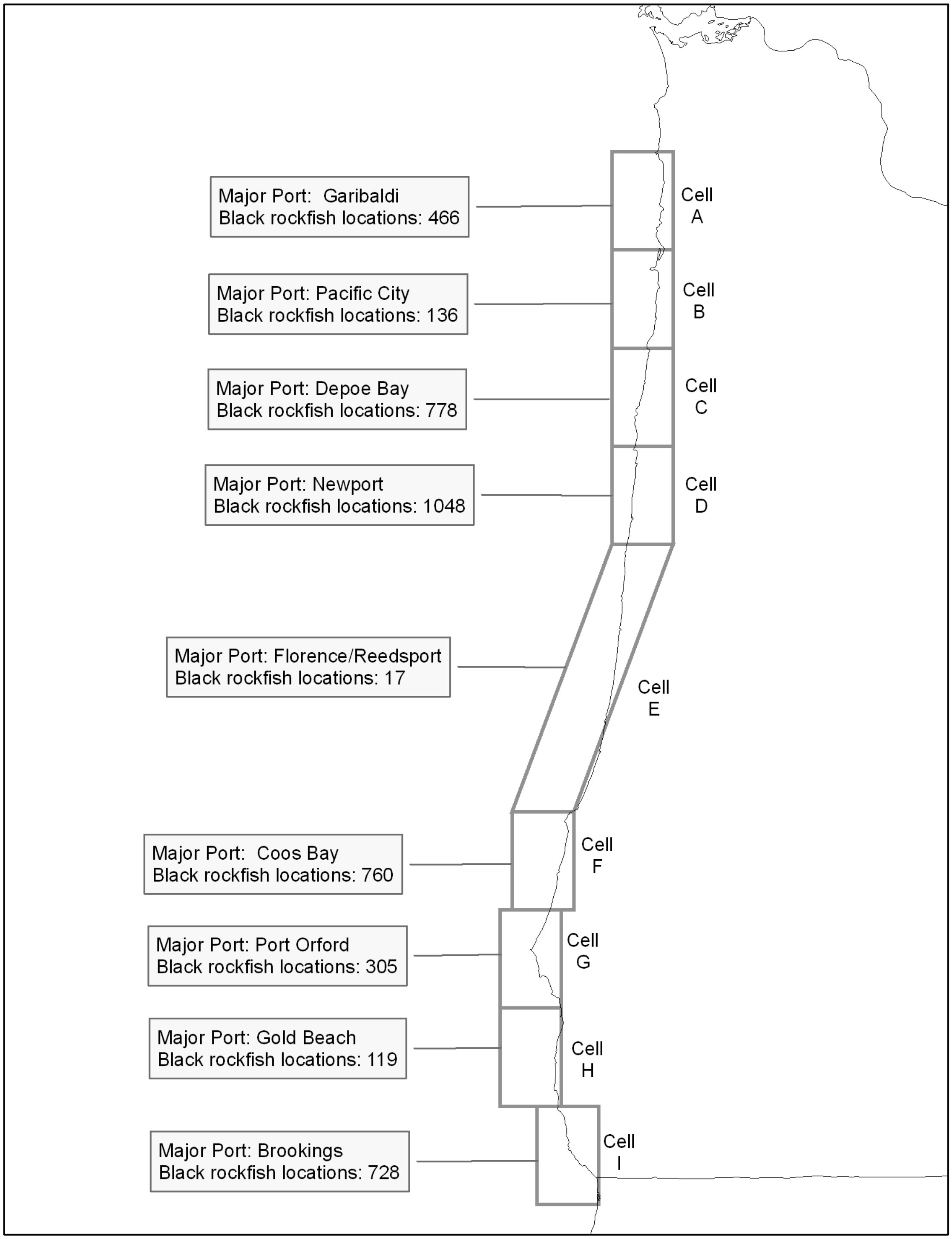
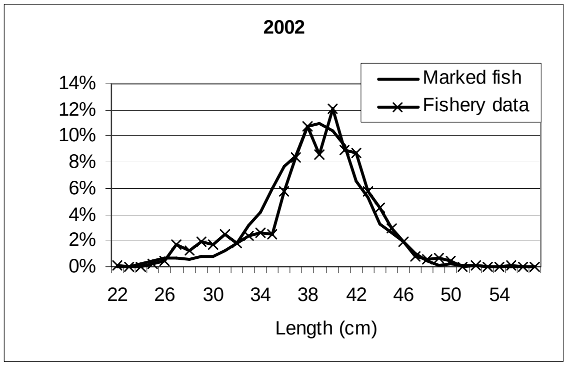
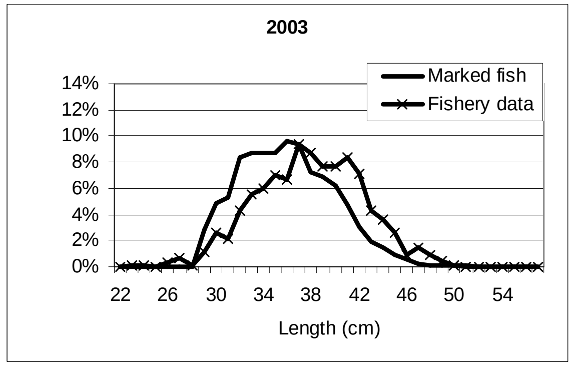
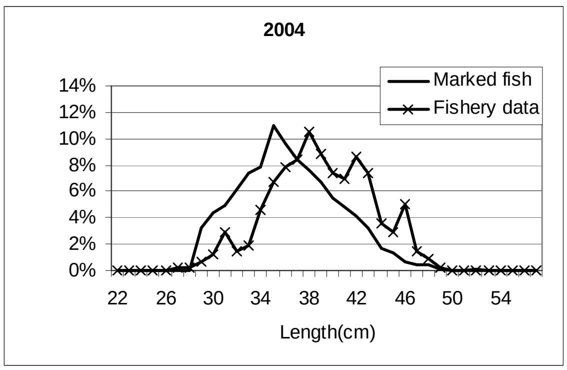
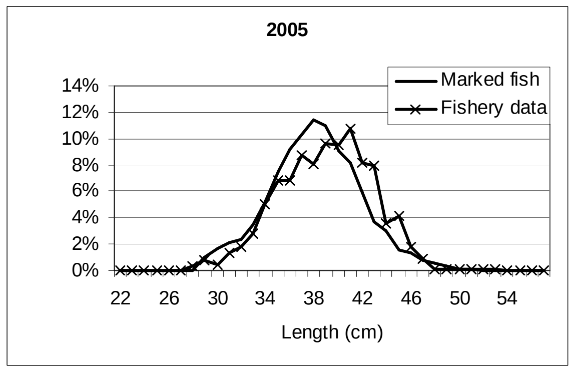


Figure 4. Comparison of the length distributions of marked fish and length distributions of fish sampled from fishery landings at Newport in each year









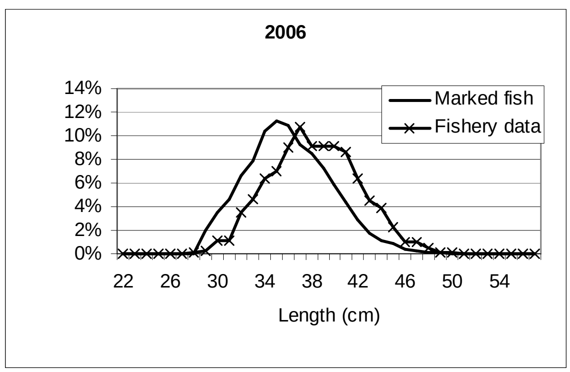


Figure 5. Recovery rate anomalies (difference from mean recovery rate) by year for 6 commonly observed classes of barotruama. 0000=no signs of barotrauma; 1000= body tight from expanded gas; 1010=body tight, branchiostegal membrane bulging or with visible gas bubbles (membrane signs); 1100=body tight, esophagus everted; 1110=body tight, membrane signs, esophagus everted; 1111=body tight, membrane signs, esophagus everted, eyes exopthalmic or with visible gas bubbles. Kruskal-Wallis test showed significant difference between barotruama categories (p=0.02).

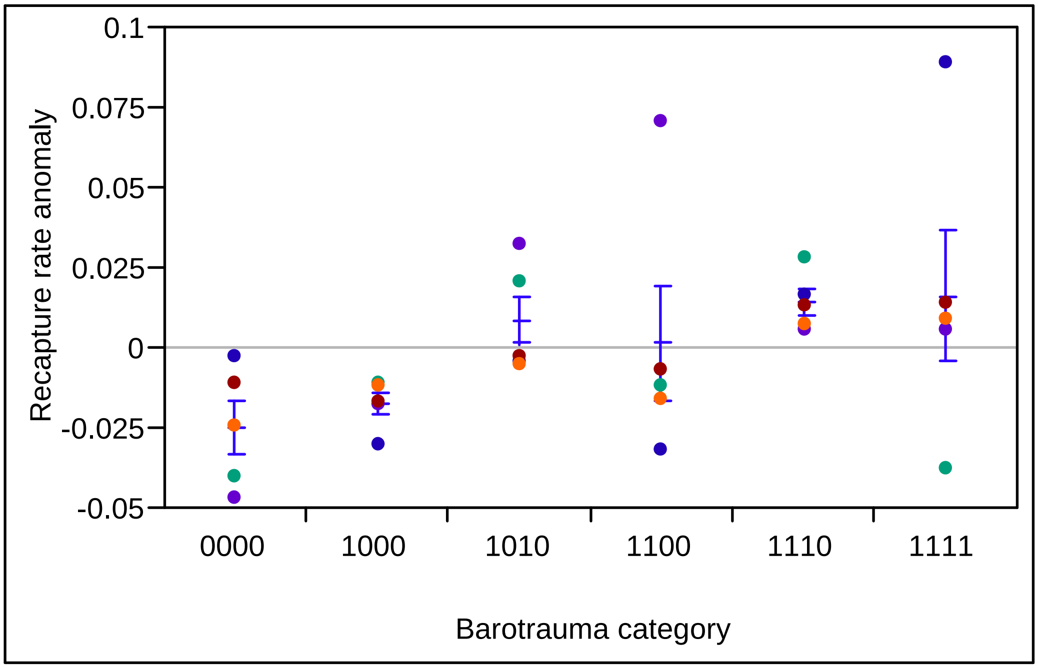
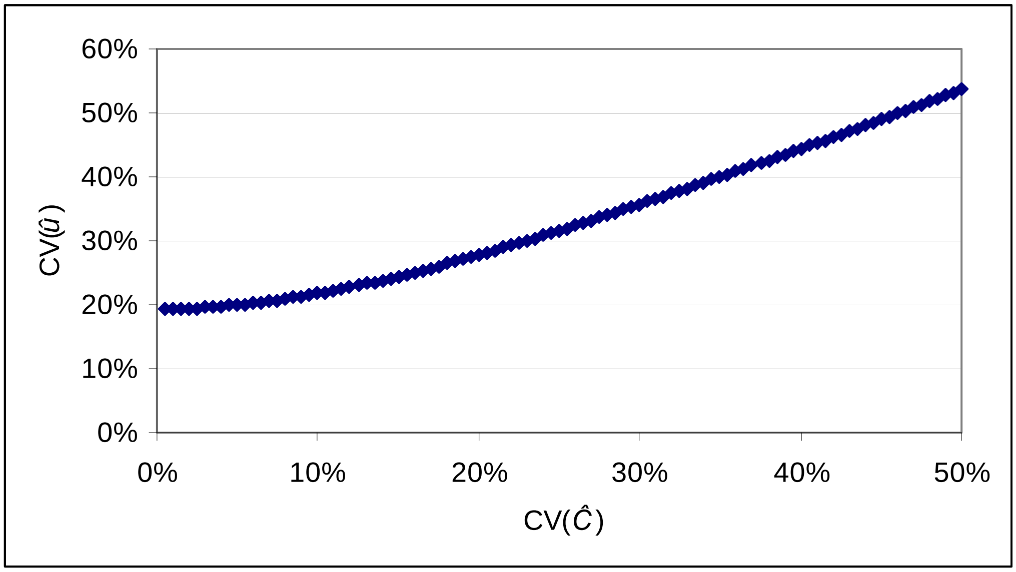


Figure 6. Effect of increasing CV of catch estimate ($\hat{C}$) on CV of exploitation rate estimate ($\hat{u}$) for recovery period 2.



Appendix B. Stock Synthesis control file.

```
## Black_Rockfish_Assessment_for_Oregon_&_California,_1-area_model
## SS2_Version_2.00        Final_Base-run_Model
1  #_Morphs
1  #_Sub-Morphs
1  #_Areas
#_Type_1 2  3  4  5  6  7  8  9  10 11 12 13 14 15 16
#_OHKL   OTWL  OREC  CHKL  CTWL  CREC  OCE1a OCE1c OCE2a OCE2c OCE2d TAGS
   CCE1a CCE1b CCE2  JUV
1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
#_Recruitment_Distribution_Pattern
1
0  #_Allow_Seasonal_Recruitment_Interaction
0  #_Allow_Migration
#_movement_among_the_areas,0=no_movement
0  1  1  #_area_1_to_1

1  #_N_block_patterns
2  #_N_Blocks_for_each_Design
1915  1999  2000  2006  #_Bag-limit_changes_in_2000

0.5   #_Recruit_Fraction_Female
1  #_Sub-Morph_Ratio_Between/Within
#_Sub-Morph_Distribution
1
#_Natural_Mortality_&_Maturity
10 #_natM_amin
15 #_natM_amax
1  #_Growth_Age_for_L1
20 #_Growth_Age_for_L2
0  #_SD_add_to_LAA
0  #_CV_Growth_Pattern:_0=CV=f(L@A)
1  #_maturity_option:_1=f(Length)
4  #_First_Mature_Age
3  #_parameter_offset_approach:_3_=_expo_offset_from_values@Amin
2  #_env/block/dev_adjust_method       2=use_logistic_to_maintain_base_bounds
-4 #_MGparm_Dev_Phase

#_Maturity_&_Growth_Parameters
#_LO  HI INIT  PRIOR PR_type  SD_Prior PHASE env-var  use_dev  dev_minyr
   dev_maxyr   STD_4_Dev_Vec  Block Block_Fxn
#_Female_length-at-age
0.05  0.18  0.16  0.16  -1 0.8   -9 0  0  0  0  0.5   0  0  #_M1_natM_young
-3 3  0.40547  0.539 -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_natM_old
10 35 15.000   22.6722  -1 10 4  0  0  0  0  0.5   0  0
   #_M1_Lmin_Body_length_at_Amin
40 55 49.5345  49.5345  -1 10 4  0  0  0  0  0.5   0  0
   #_M1_Lmax_Body_length_at_Amax
0.05  0.3   0.197714 0.197714 -1 0.8   4  0  0  0  0  0.5   0  0  #_M1_VBK
0.05  0.25  0.07  0.11  -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_CV-young
-3 3  0  -0.451985   -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_CV-
old_as_expo_offset_rel_yng_female
#_Male_growth
-3 3  0  0  -1 0.8   -3 0  0  0  0  0.5   0  0
   #_M1_natM_young_as_expo_offset_rel_fem
-3 3  0  0  -1 0.8   -3 0  0  0  0  0.5   0  0
   #_M1_natM_old_as_expo_offset_rel_yng_male
-3 3  0  0  -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_Lmin_Body_length_at_Amin
```

```
-3 3  -0.0936  -0.0936  -1 0.8   4  0  0  0  0  0.5   0  0
   #_M1_Lmax_Body_length_at_Amax
-3 3  0.11122  0.11122  -1 0.8   4  0  0  0  0  0.5   0  0
   #_M1_VBK_as_expo_offset_rel_fem
-3 3  0  0  -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_CV-
young_as_expo_offset_rel_fem
-3 3  0  -0.788457   -1 0.8   -3 0  0  0  0  0.5   0  0  #_M1_CV-
old_as_expo_offset_rel_yng_male
#_Female_weight-length,_maturity,_and_fecundity
-3 3  1.68E-05 1.68E-05 -1 0.8   -3 0  0  0  0  0.5   0  0  #_Female_wt-
len_alpha
-3 3  3  3  -1 0.8   -3 0  0  0  0  0.5   0  0  #_Female_wt-len_exponent
-3 3  39.53 39.53 -1 0.8   -3 0  0  0  0  0.5   0  0
   #_Female_maturity_logistic_inflection
-3 3  -0.4103  -0.4103  -1 0.8   -3 0  0  0  0  0.5   0  0
   #_Female_maturity_logistic_slope
-3 3  0.28941  1  -1 0.8   -3 0  0  0  0  0.5   0  0
   #_Female_eggs/gm_intercept
-3 3  0.10311  0  -1 0.8   -3 0  0  0  0  0.5   0  0  #_Female_eggs/gm_slope
#_Male_weight-length
-3 3  1.68E-05 1.68E-05 -1 0.8   -3 0  0  0  0  0.5   0  0  #_Male_wt-
len_alpha
-3 3  3  3  -1 0.8   -3 0  0  0  0  0.5   0  0  #_Male_wt-len_exponent

0  0  0  0  -1 0  -4 0  0  0  0  0  0  0
   #_recr_distribution_by_growth_pattern
0  0  0  0  -1 0  -4 0  0  0  0  0  0  0
   #_recr_distribution_dummy_parm_for_one_area
0  0  0  0  -1 0  -4 0  0  0  0  0  0  0
   #_recr_distribution_dummy_parm_for_one_season
0  0  0  0  -1 0  -4 0  0  0  0  0  0  0  #_cohort_growth_deviation

0  #_Environmental_Custom_Flag
0  #_TimeBlock_Custom_Flag

3  #_Recruitment_Function:_3_=_Std_B&H
#_Recruitment_Parms
#_LO  HI INIT  PRIOR PR_type  SD PHASE
6  12 9  9  -1 10 1  #_log(R0)
0.2   1  0.6   0.6   -1 0.2   -9 #_steepness
0  2  0.5   0.8   -1 0.8   -3 #_sigma-r
-5 5  0.1   0  -1 1  -3 #_env-link_recruitment
-5 5  0  0  -1 1  -4 #_log(R1)_offset_for_initial_equil_recr
0  0  0  0  -1 0  -99   #_reserved_for_future_autocorr_parm

1  #_SR_env_link
1  #_SR_env_target
1  #_do_Rec_dev
1970  #_begin_year
2006  #_end_year
-5 #_min_Dev
5  #_max_Dev
2  #_phase
0  #_first_yr_fullbias_adj_in_MPD

#_Initial_Fishing_Mortality_Parameters
0  1  0  0.01  -1 99 -1
0  1  0  0.01  -1 99 -1
0  1  0  0.01  -1 99 -1
0  1  0  0.01  -1 99 -1
```

```
0  1  0  0.01  -1 99 -1
0  1  0  0.01  -1 99 -1

#_Catchability_Specification        Q_type:_0=no_parm-med-
unbiased;_2=parm_for_ln(Q)
#_do_powr   do_env   do_xtra_sd  Q_type   0=N,1=B  err_type    Type
0  0  0  0  1  0  #_01  OHKL
0  0  0  0  1  0  #_02  OTWL
0  0  0  0  1  0  #_03  OREC
0  0  0  0  1  0  #_04  CHKL
0  0  0  0  1  0  #_05  CTWL
0  0  0  0  1  0  #_06  CREC
0  0  0  0  0  0  #_07  OCE1a
0  0  0  0  0  0  #_08  OCE1c
0  0  0  0  0  0  #_09  OCE2a
0  0  0  0  0  0  #_10  OCE2c
0  0  0  0  0  0  #_11  OCE2d
0  0  0  2  0  0  #_12  TAGS
0  0  0  0  0  0  #_13  CCE1a
0  0  0  0  0  0  #_14  CCE1b
0  0  0  0  0  0  #_15  CCE2
0  0  0  0  0  0  #_16  JUV

#_Catchability_Parameters
#_LO  HI INIT  PRIOR PR_type  SD PHASE       Segment
-3 -0.05 -1.374   -2.3434  0  0.2   1  #_11_TAGS

#_Selectivity_Specification
#_length_selection
24 0  0  0  #  OHKL  #_24=double_normal
1  0  0  0  #  OTWL  #_1=simple_logistic
24 0  0  0  #  OREC
24 0  0  0  #  CHKL
5  0  0  2  #  CTWL  #_mirror_OTWL
24 0  0  0  #  CREC
5  0  0  3  #  OCE1a #_mirror_OREC
5  0  0  3  #  OCE1c #_mirror_OREC
24 0  0  0  #  OCE2a
5  0  0  9  #  OCE2c #_mirror_OCE2a
5  0  0  9  #  OCE2d #_mirror_OCE2a
5  0  0  9  #  TAGS  #_mirror_OCE2a
5  0  0  6  #  CCE1a #_mirror_CREC
5  0  0  6  #  CCE1b #_mirror_CREC
24 0  0  0  #  CCE2
32 0  0  0  #  JUV   #_32=rec_before_dens_dep
#_age_selection
10 0  0  0  #  OHKL  #_10=Age_sel=1_for_all_but_0s
10 0  0  0  #  OTWL
10 0  0  0  #  OREC
10 0  0  0  #  CHKL
10 0  0  0  #  CTWL
10 0  0  0  #  CREC
10 0  0  0  #  OCE1a
10 0  0  0  #  OCE1c
10 0  0  0  #  OCE2a
10 0  0  0  #  OCE2c
10 0  0  0  #  OCE2d
10 0  0  0  #  TAGS
10 0  0  0  #  CCE1a
10 0  0  0  #  CCE1b
```

```
10 0  0  0  #  CCE2
10 0  0  0  #  JUV

#
#_LO  HI INIT  PRIOR PR_type  SD_Prior PHASE env-var  use_dev  dev_minyr
   dev_maxyr   STD_4_Dev_Vec  Block Block_Fxn
#_Selectivity_Parms
#_size_sel:_1     OHKL
11.11 58 40.268   39.1294  -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -4.17109 -4.53129 -1 0.05  3  0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  3.59611  3.41656  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  3.48402  3.69353  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
-6 9  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0  #_Sel_at_1st_bin_(logistic)
-6 9  -1.94773 -1.45578 -1 0.05  4  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#
#_size_sel:_2     OTWL
20 50 45.824   50 -1 0.05  3  0  0  0  0  0.5   0  0  #_Simple_logistic
0  15 8.22837  9.71724  -1 0.05  3  0  0  0  0  0.5   0  0
#
#_size_sel:_3     OREC
11.11 58 38.2881  37.7831  -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  3.7789   3.74197  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  3.32151  2.96266  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
-6 9  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0  #_Sel_at_1st_bin_(logistic)
-6 9  -1.46583 -0.999446   -1 0.05  4  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#
#_size_sel:_4     CHKL
11.11 58 38.2544  37.5029  -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  3.85971  3.76884  -1 0.05  4  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  4.17183  3.37891  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
-6 9  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0  #_Sel_at_1st_bin_(logistic)
-6 9  -1.66545 -0.466063   -1 0.05  3  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#
#_size_sel:_5     CTWL
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_6     CREC
11.11 58 32.0296  31.3018  -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -5.99941 -6 -1 0.05  -9 0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  3.35799  3.18476  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  0.239708 1.83867  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
```

```
-6 9  -4.85633 -4.91165 -1 0.05  3  0  0  0  0  0.5   0  0
   #_Sel_at_1st_bin_(logistic)
-6 9  0.499791 -0.0259862  -1 0.05  3  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#
#_size_sel:_7     OCE1a
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_8     OCE1c
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_9     OCE2a
11.11 58 39.8003  39.2744  -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  3.71955  3.72437  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  2.95891  2.26633  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
-6 9  -6 -6 -1 0.05  -9 0  0  0  0  0.5   0  0  #_Sel_at_1st_bin_(logistic)
-6 9  -0.654804   -0.20489 -1 0.05  4  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#
#_size_sel:_10    OCE2c
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_11    OCE2d
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_12    TAGS
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_13    CCE1a
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_14    CCE1b
20 60 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0  #_mirror
0.01  30 -1 -1 -1 99 -9 0  0  0  0  0.5   0  0
#
#_size_sel:_15    CCE2
11.11 58 30.3749  29.46 -1 0.05  3  0  0  0  0  0.5   0  0  #_Peak_(in_cm)
-6 4  -5.99999 -3.85288 -1 0.05  3  0  0  0  0  0.5   0  0
   #_top_(_logistic_between_Peak_and_MaxLen_)
-2 9  2.85207  2.6764   -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_ascending_width_)
-2 9  2.45206  2.69477  -1 0.05  3  0  0  0  0  0.5   0  0
   #_ln(_decending_width_)
-6 9  -5.59217 -5.96791 -1 0.05  3  0  0  0  0  0.5   0  0
   #_Sel_at_1st_bin_(logistic)
-6 9  -0.997155   -1.75581 -1 0.05  3  0  0  0  0  0.5   0  0
   #_Sel_at_last_bin_(logistic)
#_end_Selection_parameters
   1
```

```
0  #_Environmental_Custom_Flag

0  #_TimeBlock_Custom_Flag

1
#_Variance_Adjustment_Factors
#_HKL TWL   REC   HKL   TWL   REC   CPUE_1   CPUE_1   CPUE_2   CPUE_2
   CPUE_2   TAGS  CPUE_1   CPUE_1   CPUE_2   JUV
0  0  0  0  0  0  0.1661   0.0000   0.1991   0.0598   0.0000   0.0473
   0.2461   0.1041   0.0900   0.3680   #_add_to_survey_CV
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  #_add_to_discard_SD
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  #_add_to_av_body_wt_SD
0.9098   5.5968   0.7116   1.6377   3.3032   0.3747   1.0000   1.0000
   0.7873   1.0000   1.0000   1.0000   1.0000   1.0000   0.9891   1.0000
   #_multiply_len_comp_input_N
1.5815   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000
   0.5280   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000
   #_multiply_age_comp_input_N
1  1  1  1  1  1  1  1  0.6998   1  1  1  1  1  1  1  #_multiply_len-at-
age_input_N

#_Degrees_of_Freedom_for_Discard_&_Mean_Body_Weight
30
30
#_Lambdas
1  #_Max_Lambda_Phase
1  #_SD_offset:_1=include_log(s)_terms_in_Like
#_CPUE_Lambdas:_1_for_each_Fishery/Survey
1  1  1  1  1  1  #_Fisheries
1  1  1  1  1  1  1  1  1  1  #_Surveys
#_Discard_Lambdas:_1_for_each_Fishery/Survey
1  1  1  1  1  1  #_Fisheries
1  1  1  1  1  1  1  1  1  1  #_Surveys
#_Mean_Body_Weight:_1_only
1
#_Length_Compositions:_1_for_each_Fishery/Survey
1  1  1  1  1  1  #_Fisheries
1  1  1  1  1  1  1  1  1  1  #_Surveys
#_Age_Compositions:_1_for_each_Fishery/Survey
1  1  1  1  1  1  #_Fisheries
1  1  1  1  1  1  1  1  1  1  #_Surveys
#_Mean_Size_at_Age:_1_for_each_Fishery/Survey
1  1  1  1  1  1  #_Fisheries
1  1  1  1  1  1  1  1  1  1  #_Surveys
#_Initial_Equilibrium
1
#_Recruitment_Deviations
1
#_Prior_Lambda
0
#_Deviation_Time_Series
1
#_Crash_Penalty
100
0.9   #_Max_Allowable_Harvest_Rate
999
```

Appendix C. Stock Synthesis data file.

```
## Black_Rockfish_Assessment_for_Oregon_&_California,_1-area_model
## SS2_Version_2.00        Final_Base-run_Model
1915  #_start_year
2006  #_end_year
1  #_seasons_per_year
12 #_vector_of_months_within_each_season
1  #_spawning_season
6  #_N_fishing_fleets
10 #_N_surveys
HKL%TWL%REC%HKL%TWL%REC%CPUE1%CPUE1%CPUE2%CPUE2%CPUE2%TAGS%CPUE1%CPUE1%CPUE2%
JUV
#_vector_of_fishery/survey_timing_for_catch_&_CPUE
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
2  #_N_genders_FEM=1
40 #_accumulator_age
#_init_equilibrium_catch
0  0  0  0  0  0
#_ret_catch
#_OHKL   OTWL  OREC  CHKL  CTWL  CREC  #
0.00  0.00  0.00  0.00  0.00  0.00  #  1915  0.00
0.21  0.00  0.00  2.66  0.06  0.00  #  1916  2.93
0.43  0.00  0.00  5.32  0.12  0.00  #  1917  5.87
0.64  0.00  0.00  7.98  0.18  0.00  #  1918  8.80
0.85  0.00  0.00  10.64 0.25  0.00  #  1919  11.74
1.07  0.00  0.00  13.30 0.31  0.00  #  1920  14.67
1.28  0.00  0.00  15.96 0.37  0.00  #  1921  17.61
1.49  0.00  0.00  18.62 0.43  0.00  #  1922  20.54
1.70  0.00  0.00  21.28 0.49  0.00  #  1923  23.47
1.92  0.00  0.00  23.94 0.55  0.00  #  1924  26.41
2.13  0.00  0.00  26.60 0.61  0.00  #  1925  29.34
2.34  0.00  0.00  29.26 0.68  0.00  #  1926  32.28
2.56  0.00  0.00  31.92 0.74  0.00  #  1927  35.21
2.73  0.00  0.00  30.81 0.88  0.00  #  1928  34.42
7.79  0.00  0.00  54.34 0.93  0.00  #  1929  63.06
11.65 0.00  0.00  47.73 3.08  0.00  #  1930  62.46
8.13  0.00  0.00  36.15 11.18 0.00  #  1931  55.46
2.17  0.02  0.00  29.86 9.65  0.00  #  1932  41.70
4.34  0.01  0.00  16.43 14.60 0.00  #  1933  35.39
2.61  0.00  0.00  34.07 8.79  0.00  #  1934  45.47
1.65  0.01  0.00  41.85 9.79  0.00  #  1935  53.30
7.91  0.01  0.00  47.91 4.69  0.00  #  1936  60.51
5.66  0.00  0.00  37.67 10.35 0.00  #  1937  53.69
2.68  0.00  0.00  39.67 12.63 0.00  #  1938  54.98
3.80  0.03  0.00  46.73 17.36 0.00  #  1939  67.92
10.94 0.33  0.00  39.02 13.66 0.00  #  1940  63.95
18.57 0.90  0.00  30.68 10.90 0.00  #  1941  61.05
18.37 2.17  0.00  23.55 14.55 0.00  #  1942  58.65
66.13 9.11  0.00  45.97 36.46 0.00  #  1943  157.67
23.19 21.74 0.00  34.20 170.08   0.00  #  1944  249.21
18.91 36.43 0.00  36.43 366.97   0.00  #  1945  458.74
19.56 25.96 0.00  49.91 293.40   8.06  #  1946  396.89
10.82 8.00  0.00  47.53 194.84   16.12 #  1947  277.31
19.93 4.74  0.00  34.08 121.05   24.18 #  1948  203.98
16.33 9.89  0.00  29.21 100.10   32.25 #  1949  187.78
10.34 13.06 1.67  40.49 114.58   40.31 #  1950  220.45
8.06  10.33 3.34  46.42 140.67   48.37 #  1951  257.18
```

```
7.71  11.99 5.01  38.97 81.53 56.43 #  1952  201.65
2.98  5.82  6.68  27.34 98.49 64.49 #  1953  205.80
4.26  8.69  8.35  49.40 98.32 72.55 #  1954  241.57
5.26  16.56 10.02 43.06 90.77 80.61 #  1955  246.28
2.18  10.84 11.69 5.66  64.60 88.68 #  1956  183.65
4.57  9.28  13.36 10.66 76.09 96.74 #  1957  210.70
1.41  11.21 15.03 0.40  79.02 179.72   #  1958  286.79
3.67  24.21 16.70 12.08 69.61 146.25   #  1959  272.51
2.55  23.44 18.37 9.35  77.71 133.21   #  1960  264.63
5.59  18.96 20.04 7.09  43.41 95.90 #  1961  190.98
6.05  21.24 21.71 9.10  44.64 101.88   #  1962  204.62
4.97  30.95 23.38 14.96 71.62 112.21   #  1963  258.07
5.48  40.73 25.05 8.12  40.02 83.32 #  1964  202.72
18.58 40.69 26.72 11.83 56.72 131.18   #  1965  285.71
6.02  20.39 28.38 13.90 42.74 154.02   #  1966  265.45
16.26 9.41  30.05 13.93 40.07 186.97   #  1967  296.70
16.35 12.52 31.72 13.04 54.38 177.32   #  1968  305.34
40.84 31.20 33.39 35.41 65.88 192.78   #  1969  399.50
18.61 20.93 35.06 35.66 85.93 274.37   #  1970  470.56
0.66  23.70 36.73 3.63  111.27   193.72   #  1971  369.71
0.77  31.61 38.40 28.35 124.92   246.86   #  1972  470.91
0.12  25.71 40.07 8.16  94.63 311.66   #  1973  480.35
0.00  19.85 75.60 32.11 108.91   353.16   #  1974  589.63
0.48  20.35 37.64 12.27 74.52 334.32   #  1975  479.58
0.16  23.66 113.11   14.06 88.53 403.07   #  1976  642.59
62.87 24.67 113.36   10.55 64.41 361.89   #  1977  637.75
55.18 47.85 148.40   11.06 69.14 327.39   #  1978  659.02
89.72 100.86   289.04   19.99 126.15   341.28   #  1979  967.05
46.63 138.47   235.99   27.88 179.51   270.19   #  1980  898.68
80.55 0.00  362.93   22.35 457.61   421.50   #  1981  1344.95
123.09   159.73   386.57   118.48   232.94   434.51   #  1982  1455.32
216.60   95.70 373.81   299.82   120.08   197.48   #  1983  1303.49
126.77   2.27  486.83   193.41   37.80 359.79   #  1984  1206.87
139.33   0.29  194.11   320.38   81.41 399.25   #  1985  1134.78
214.93   0.00  193.84   21.55 0.75  336.35   #  1986  767.41
92.46 0.45  202.53   21.42 67.26 207.32   #  1987  591.43
105.63   0.00  217.56   25.93 57.95 209.69   #  1988  616.77
137.20   0.00  308.64   106.60   26.63 219.76   #  1989  798.83
192.41   0.27  312.32   145.81   0.33  230.96   #  1990  882.10
413.24   0.04  156.33   124.96   21.90 245.99   #  1991  962.46
431.83   0.00  308.75   217.49   50.24 261.02   #  1992  1269.32
126.77   0.18  341.90   146.52   2.29  251.23   #  1993  868.89
149.88   35.88 280.81   147.93   0.32  228.06   #  1994  842.88
128.84   2.02  350.83   186.82   2.28  176.47   #  1995  847.25
191.24   0.22  376.80   128.69   10.39 143.18   #  1996  850.53
217.81   1.72  343.56   144.12   12.19 94.88 #  1997  814.28
206.44   0.40  339.64   93.99 5.50  108.73   #  1998  754.70
196.59   0.03  282.48   65.63 3.79  154.66   #  1999  703.16
159.83   0.02  308.17   55.06 1.32  131.02   #  2000  655.41
192.49   0.01  329.32   112.41   1.30  240.44   #  2001  875.96
163.54   0.03  270.16   100.63   2.03  152.73   #  2002  689.12
150.68   0.00  341.24   68.07 0.51  500.38   #  2003  1060.89
160.68   0.16  330.82   76.32 1.23  117.29   #  2004  686.51
138.93   0.17  309.60   85.73 0.00  183.28   #  2005  717.71
112.21   0.01  259.81   71.68 0.00  183.52   #  2006  627.23
#_end_catch                      37966.9

89 #_Surveys
#_OR_RecFIN_CPUE
1980  1  7  3.883 0.1066   #  0.4370
```

```
1981  1  7  6.421 0.0896   #  0.6020
1982  1  7  5.645 0.0927   #  0.5481
1983  1  7  3.097 0.1029   #  0.3356
1984  1  7  3.464 0.0743   #  0.2671
1985  1  7  4.069 0.0633   #  0.2658
1986  1  7  4.452 0.0548   #  0.2510
1987  1  7  2.797 0.0924   #  0.2707
1988  1  7  2.936 0.0738   #  0.2247
1989  1  7  5.070 0.0581   #  0.3032
1993  1  7  4.150 0.0492   #  0.2091
1994  1  7  3.886 0.0436   #  0.1731
1995  1  7  4.617 0.0445   #  0.2101
1996  1  7  4.482 0.0487   #  0.2239
1997  1  7  4.764 0.0303   #  0.1467
1998  1  7  5.145 0.0356   #  0.1866
1999  1  7  4.377 0.0369   #  0.1646
#_OR_RecFIN_CPUE
2000  1  8  4.609 0.0422   #  0.1984
2001  1  8  4.536 0.0420   #  0.1948
2002  1  8  4.774 0.0430   #  0.2096
2003  1  8  -5.036   0.0737   #  0.3850
2004  1  8  -4.803   0.0236   #  0.1145
#_ORBS_CPUE
1979  1  9  3.452 0.0669   #  0.2389
1980  1  9  3.651 0.0667   #  0.2520
1981  1  9  5.233 0.0690   #  0.3737
1982  1  9  4.909 0.0678   #  0.3442
1983  1  9  4.894 0.0712   #  0.3612
1984  1  9  5.015 0.0714   #  0.3714
1986  1  9  4.378 0.0698   #  0.3166
1987  1  9  3.446 0.0676   #  0.2410
1988  1  9  4.374 0.0684   #  0.3097
1989  1  9  4.665 0.0687   #  0.3316
1990  1  9  4.157 0.0673   #  0.2895
1991  1  9  2.856 0.0655   #  0.1934
1992  1  9  3.987 0.0667   #  0.2749
1993  1  9  4.456 0.0680   #  0.3136
1994  1  9  3.042 0.0639   #  0.2006
1995  1  9  4.252 0.0674   #  0.2966
1996  1  9  4.714 0.0688   #  0.3358
1998  1  9  3.886 0.0638   #  0.2562
1999  1  9  3.664 0.0637   #  0.2409
#_ORBS_CPUE
2000  1  10 4.270 0.0651   #  0.2872
2001  1  10 4.160 0.0659   #  0.2834
2002  1  10 4.076 0.0649   #  0.2735
2003  1  10 4.971 0.0677   #  0.3481
2004  1  10 5.256 0.0686   #  0.3733
#_ORBS_CPUE
2005  1  11 4.074 0.0649   #  0.2733
2006  1  11 3.730 0.0639   #  0.2461
#_TAGS_off_Newport_1000s_fish
#  2003  1  12 2311.7   0.1349   #  0.1444
#  2004  1  12 2048.1   0.1098   #  0.1161
#  2005  1  12 1568.3   0.1032   #  0.1087
#  2006  1  12 2230.4   0.1337   #  0.1430
2004  1  12 1305.8   0.1770   #  0.1936
2005  1  12 1375.8   0.1460   #  0.1572
2006  1  12 2130.6   0.1625   #  0.1765
#_CA_RecFIN_CPUE
```

```
1980  1  13 3.051 0.4396   #  1.6844
1981  1  13 2.509 0.4392   #  1.3834
1982  1  13 3.794 0.4348   #  2.0662
1984  1  13 11.093   0.3272   #  4.2940
1985  1  13 6.607 0.1557   #  1.1133
1986  1  13 4.198 0.2177   #  1.0212
1987  1  13 7.692 0.3025   #  2.7173
1988  1  13 5.129 0.1907   #  1.0774
1989  1  13 3.296 0.5212   #  2.2544
1995  1  13 4.349 0.1793   #  0.8543
1996  1  13 4.400 0.1072   #  0.4979
1997  1  13 6.700 0.1537   #  1.1131
1998  1  13 2.707 0.1861   #  0.5538
1999  1  13 6.446 0.1197   #  0.8197
#_RecFIN_CPUE
2000  1  14 7.446 0.1279   #  1.0158
2001  1  14 5.982 0.0969   #  0.6088
2002  1  14 6.158 0.0890   #  0.5732
2003  1  14 4.369 0.0806   #  0.3669
2004  1  14 5.278 0.0820   #  0.4508
2005  1  14 4.985 0.0913   #  0.4764
2006  1  14 4.202 0.0740   #  0.3227
#_CA_CPFV      from_2003_assessment
1988  1  15 5.850 0.2851   #  0.3299
1989  1  15 7.760 0.3498   #  0.4188
1990  1  15 19.850   0.4964   #  0.6428
1991  1  15 8.960 0.6734   #  0.9609
1992  1  15 15.030   0.3515   #  0.4212
1993  1  15 5.970 0.3162   #  0.3719
1994  1  15 16.740   0.2719   #  0.3124
1995  1  15 13.400   0.2415   #  0.2731
1996  1  15 13.970   0.2270   #  0.2548
1997  1  15 15.400   0.2226   #  0.2494
1998  1  15 8.130 0.2747   #  0.3161
#_SWFSC_juv_rockfish_survey_ANOVA_index
2001  1  16 0.4244   0.3487   #  0.0355
2002  1  16 0.6357   0.2734   #  0.0277
2003  1  16 0.8027   0.2633   #  0.0267
2004  1  16 2.3344   0.3059   #  0.0311
2005  1  16 0.6350   0.2765   #  0.0280
2006  1  16 0.3785   0.2480   #  0.0251
#_end_Surveys

2  #_Discards_Type
0  #_Discards
68 #_Mean_Body_Wt
#_Year   Season   Type  Partition   Wgt
#_OR_HKL_av_wt
1986  1  1  2  1.0787   0.0974
1991  1  1  2  1.3082   0.0974
1992  1  1  2  1.1834   0.0974
1993  1  1  2  1.1104   0.0974
1994  1  1  2  1.1925   0.0974
1995  1  1  2  1.0991   0.0974
1996  1  1  2  1.1331   0.0974
1997  1  1  2  0.9203   0.0974
1998  1  1  2  0.9721   0.0974
1999  1  1  2  0.8804   0.0974
2000  1  1  2  0.9471   0.0974
2001  1  1  2  1.0464   0.0974
```

```
2002  1  1  2  1.1508   0.0974
2003  1  1  2  1.1000   0.0974
2004  1  1  2  1.1004   0.0974
2005  1  1  2  0.9879   0.0974
2006  1  1  2  1.0133   0.0974
#_OR_TWL_av_wt
1980  1  2  2  1.4356   0.354
1981  1  2  2  1.4651   0.354
1982  1  2  2  1.6860   0.354
1983  1  2  2  1.3445   0.354
1984  1  2  2  1.3535   0.354
1985  1  2  2  1.0818   0.354
1993  1  2  2  1.5694   0.354
1994  1  2  2  1.1403   0.354
1997  1  2  2  1.4175   0.354
2004  1  2  2  1.8235   0.354
2005  1  2  2  1.3041   0.354
#_CA_HKL_av_wt
1982  1  4  2  1.336 0.135
1983  1  4  2  1.284 0.135
1984  1  4  2  1.448 0.135
1985  1  4  2  1.302 0.135
1992  1  4  2  1.050 0.135
1993  1  4  2  1.049 0.135
1994  1  4  2  1.032 0.135
1995  1  4  2  0.971 0.135
1996  1  4  2  0.969 0.135
1997  1  4  2  0.940 0.135
1998  1  4  2  1.006 0.135
1999  1  4  2  1.007 0.135
2000  1  4  2  0.952 0.135
2001  1  4  2  1.076 0.135
2002  1  4  2  1.153 0.135
2003  1  4  2  1.121 0.135
2004  1  4  2  0.990 0.135
2005  1  4  2  0.893 0.135
2006  1  4  2  0.996 0.135
#_CA_TWL_av_wt
1978  1  5  2  1.450 0.2195
1980  1  5  2  1.370 0.2195
1981  1  5  2  1.515 0.2195
1982  1  5  2  1.549 0.2195
1983  1  5  2  1.356 0.2195
1984  1  5  2  1.421 0.2195
1985  1  5  2  1.642 0.2195
1986  1  5  2  1.588 0.2195
1987  1  5  2  1.674 0.2195
1988  1  5  2  1.587 0.2195
1989  1  5  2  1.803 0.2195
# 1990   1  5  2  0.635 0.2195
1991  1  5  2  1.437 0.2195
1992  1  5  2  1.417 0.2195
1996  1  5  2  1.851 0.2195
1997  1  5  2  1.588 0.2195
1998  1  5  2  1.663 0.2195
1999  1  5  2  1.851 0.2195
2000  1  5  2  1.778 0.2195
2001  1  5  2  1.554 0.2195
2003  1  5  2  1.910 0.2195
2004  1  5  2  1.814 0.2195
```

```
#_end_Mean_Body_Wt

#_Composition_Conditioners
0.0001
0.0001
22 #_Number_of_Length_Bins
5  15 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60

150   #_Length_Composition_Observations
#_OR_Commercial_HKL
1992  1  1  3  0  38.8  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00334  0.02228  0.02359  0.02253  0.06833  0.05617  0.07311  0.05288
   0.03013  0.01961  0.03759  0.00077  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.01988  0.00077
   0.00560  0.02679  0.07662  0.09186  0.12153  0.12521  0.05670  0.04950
   0.00325  0.01198  0.00000  0.00000  0.00000  0.00000  #  1.00002
1995  1  1  3  0  69.8  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.01723  0.02793  0.06793  0.04817  0.07203  0.08057  0.03881  0.06982
   0.05390  0.01601  0.01803  0.00280  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00388  0.01075  0.02394
   0.04740  0.04103  0.08497  0.08163  0.10885  0.06304  0.01317  0.00659
   0.00148  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99996
1996  1  1  3  0  37.5  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00423  0.03378  0.04736  0.08518  0.04782  0.04676  0.04734
   0.01122  0.01961  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00423  0.02017
   0.03312  0.07103  0.09712  0.18612  0.15198  0.07696  0.01594  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99998
1997  1  1  3  0  42.9  0.00000  0.00000  0.00000  0.00115  0.00000  0.00305
   0.00649  0.02336  0.02460  0.06610  0.07574  0.04200  0.04816  0.05602
   0.01488  0.00450  0.00446  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00229  0.00344  0.00909  0.01723  0.03502
   0.07289  0.03727  0.10316  0.13952  0.12484  0.06143  0.02091  0.00115
   0.00115  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99991
1998  1  1  3  0  50.4  0.00000  0.00000  0.00000  0.00000  0.00000  0.00385
   0.00385  0.01803  0.03283  0.04022  0.05179  0.05740  0.03238  0.02914
   0.02096  0.00055  0.00448  0.00000  0.00963  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00385  0.00998  0.02146  0.04767
   0.06927  0.11665  0.11110  0.15866  0.10053  0.04938  0.00240  0.00390
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99998
1999  1  1  3  0  28.0  0.00000  0.00000  0.00000  0.01406  0.00000  0.00000
   0.02531  0.06681  0.06538  0.07475  0.02799  0.05929  0.04670  0.00371
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.01406  0.01640  0.06063
   0.07417  0.13602  0.09185  0.12671  0.04001  0.01390  0.04217  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99992
2000  1  1  3  0  113.2 0.00000  0.00000  0.00000  0.00000  0.00063  0.00440
   0.02254  0.01886  0.07638  0.09469  0.08862  0.05707  0.06686  0.02301
   0.01656  0.00292  0.00318  0.00743  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00063  0.00343  0.00509  0.02640
   0.08441  0.08659  0.10386  0.07380  0.05575  0.03338  0.03550  0.00435
   0.00372  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00008
2001  1  1  3  0  209.0 0.00000  0.00000  0.00000  0.00000  0.00000  0.00045
   0.00604  0.02883  0.04877  0.08657  0.10686  0.11977  0.08927  0.02860
   0.02927  0.00898  0.00045  0.00000  0.00045  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00046  0.00236  0.00723
   0.03248  0.05627  0.10514  0.11684  0.07283  0.03307  0.01020  0.00748
   0.00044  0.00000  0.00000  0.00091  0.00000  0.00000  #  1.00001
2002  1  1  3  0  -260.8   0.00000  0.00000  0.00000  0.00000  0.00000
   0.00133  0.00894  0.02270  0.04397  0.05983  0.09745  0.09179  0.08903
```

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   0.07618  0.03186  0.02101  0.00827  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00316
   0.01284  0.02243  0.05153  0.08975  0.12290  0.09282  0.03730  0.01396
   0.00087  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99992
2003  1  1  3  0  -304.3   0.00000  0.00170  0.00000  0.00000  0.00170
   0.00206  0.01409  0.02973  0.05034  0.03790  0.07370  0.08065  0.08590
   0.05698  0.02411  0.00893  0.00172  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00733  0.02200
   0.02379  0.02704  0.06961  0.13456  0.11630  0.07949  0.02965  0.01169
   0.00868  0.00038  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00004
2004  1  1  3  0  -705.4   0.00000  0.00000  0.00000  0.00000  0.00000
   0.00185  0.01800  0.04759  0.06873  0.07344  0.05295  0.05353  0.06901
   0.06208  0.03817  0.01141  0.00412  0.00023  0.00023  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00110  0.00872
   0.03147  0.05916  0.06902  0.08247  0.10987  0.09246  0.02986  0.01036
   0.00422  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00004
2005  1  1  3  0  -405.9   0.00000  0.00000  0.00000  0.00000  0.00000
   0.00035  0.01056  0.04614  0.07897  0.07876  0.05852  0.04669  0.04965
   0.05380  0.02343  0.01097  0.00180  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00033  0.00218  0.00965
   0.04532  0.09376  0.06801  0.08408  0.12525  0.07805  0.02575  0.00659
   0.00142  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00003
2006  1  1  3  0  808.9 0.00000  0.00000  0.00000  0.00000  0.00253  0.00226
   0.01563  0.03284  0.05620  0.07610  0.07043  0.05511  0.06048  0.06194
   0.03757  0.01219  0.00618  0.00162  0.00098  0.00046  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00038  0.00258  0.00627  0.01675
   0.04930  0.07619  0.09212  0.11618  0.08494  0.04188  0.01333  0.00451
   0.00064  0.00014  0.00000  0.00000  0.00000  0.00000  #  0.99772
#
#_OR_Commercial_TWL
1974  1  2  0  0  7.1   0.00000  0.00000  0.00000  0.00000  0.01000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.02000  0.05000  0.16000  0.16000
   0.18000  0.14000  0.11000  0.10000  0.06000  0.01000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  2  0  0  6.7   0.00000  0.00000  0.00000  0.00000  0.00000  0.04878
   0.00000  0.00000  0.12195  0.04878  0.17073  0.09756  0.21951  0.17073
   0.09756  0.02439  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00001
1997  1  2  0  0  11.0  0.00000  0.00000  0.00000  0.00000  0.00000  0.01722
   0.01722  0.00000  0.00000  0.00000  0.01336  0.06118  0.18354  0.33087
   0.26583  0.05730  0.05344  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99997
2001  1  2  0  0  3.8   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.10005  0.34992  0.10005  0.19959
   0.00000  0.04977  0.14982  0.04977  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99896
2005  1  2  0  0  6.0   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.02779  0.22233  0.19454  0.11117  0.22233
   0.08338  0.05558  0.00000  0.08338  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00050
```

```
#
#_OR_RecFIN
1980  1  3  0  0  228.8 0.00000  0.00000  0.00277  0.00617  0.01910  0.07004
   0.05758  0.07158  0.09814  0.12940  0.10446  0.10735  0.09289  0.08385
   0.06345  0.05467  0.02619  0.01177  0.00058  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1981  1  3  0  0  135.1 0.00000  0.00294  0.00294  0.00107  0.03440  0.02594
   0.07770  0.11488  0.11104  0.10134  0.11344  0.12547  0.08044  0.07948
   0.07009  0.04076  0.00881  0.00570  0.00089  0.00267  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1982  1  3  0  0  282.0 0.00000  0.00058  0.00063  0.00155  0.00699  0.02653
   0.05138  0.09989  0.10938  0.13448  0.13027  0.12940  0.12825  0.07307
   0.06254  0.02885  0.01170  0.00097  0.00354  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1983  1  3  0  0  97.1  0.00000  0.00000  0.00000  0.00168  0.02290  0.01886
   0.06724  0.07330  0.16766  0.15152  0.13509  0.11315  0.10429  0.07156
   0.03738  0.01852  0.00000  0.00000  0.01094  0.00589  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1984  1  3  0  0  402.9 0.00000  0.00000  0.00259  0.00279  0.01253  0.02360
   0.03014  0.08844  0.12882  0.18594  0.13558  0.12887  0.11733  0.06969
   0.04041  0.01970  0.00977  0.00286  0.00093  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1985  1  3  0  0  542.3 0.00000  0.00102  0.00600  0.02879  0.01743  0.04297
   0.07813  0.07193  0.10698  0.16581  0.14105  0.14777  0.09331  0.04984
   0.02459  0.01584  0.00411  0.00174  0.00159  0.00042  0.00072  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1986  1  3  0  0  375.3 0.00000  0.00000  0.00034  0.00929  0.00988  0.03216
   0.06220  0.06488  0.11536  0.15664  0.16571  0.18939  0.10484  0.05780
   0.01618  0.01067  0.00406  0.00000  0.00058  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1987  1  3  0  0  304.4 0.00000  0.00458  0.00929  0.02725  0.03415  0.05976
   0.08123  0.07492  0.08696  0.13259  0.08128  0.14286  0.09766  0.08350
   0.03985  0.03203  0.00628  0.00376  0.00000  0.00000  0.00205  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1988  1  3  0  0  464.2 0.00000  0.01064  0.01601  0.02674  0.03208  0.05387
   0.07577  0.10631  0.13256  0.15706  0.12674  0.10577  0.06696  0.03820
   0.02820  0.01734  0.00521  0.00053  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1989  1  3  0  0  269.5 0.00000  0.00152  0.00455  0.00803  0.01046  0.02952
   0.04616  0.10760  0.12274  0.15432  0.12929  0.14410  0.10991  0.06327
   0.03836  0.01530  0.00304  0.00698  0.00061  0.00243  0.00182  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
```

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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1993  1  3  0  0  579.9 0.00000  0.00141  0.00094  0.00191  0.01144  0.02720
   0.04434  0.10156  0.10356  0.17350  0.17203  0.14158  0.09979  0.07177
   0.03157  0.01327  0.00157  0.00132  0.00094  0.00000  0.00031  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  3  0  0  751.2 0.00000  0.00062  0.00389  0.00608  0.00972  0.02288
   0.04906  0.08583  0.11953  0.15913  0.14435  0.16026  0.10826  0.06625
   0.03119  0.01611  0.00586  0.00751  0.00320  0.00026  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1995  1  3  0  0  646.5 0.00000  0.00023  0.00026  0.00283  0.00755  0.02738
   0.04732  0.11106  0.14786  0.17037  0.16654  0.15114  0.08902  0.03970
   0.02269  0.01386  0.00193  0.00000  0.00023  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1996  1  3  0  0  625.6 0.00000  0.00000  0.00000  0.00132  0.01580  0.02497
   0.04551  0.11137  0.12748  0.15060  0.17028  0.15323  0.11340  0.05187
   0.02002  0.00894  0.00303  0.00000  0.00021  0.00196  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1997  1  3  0  0  873.5 0.00000  0.00057  0.00112  0.00157  0.01069  0.02782
   0.05066  0.11359  0.17352  0.17016  0.14780  0.12583  0.09247  0.05334
   0.01769  0.00902  0.00179  0.00218  0.00000  0.00000  0.00019  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  3  0  0  1295.9   0.00000  0.00036  0.00051  0.00343  0.01378
   0.03196  0.05480  0.09139  0.13245  0.17028  0.17687  0.12861  0.10006
   0.05333  0.02541  0.01459  0.00159  0.00017  0.00041  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  3  0  0  1496.5   0.00000  0.00000  0.00012  0.00082  0.00913
   0.03122  0.07128  0.13086  0.17282  0.18861  0.15258  0.11710  0.07509
   0.02807  0.01634  0.00356  0.00162  0.00029  0.00049  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2000  1  3  0  0  1256.6   0.00000  0.00019  0.00136  0.00230  0.01125
   0.02237  0.05289  0.10804  0.17568  0.19486  0.17571  0.12231  0.07826
   0.03796  0.00946  0.00314  0.00096  0.00135  0.00000  0.00192  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2001  1  3  0  0  715.4 0.00000  0.00048  0.00048  0.00240  0.00914  0.01983
   0.03060  0.06294  0.14362  0.21845  0.20908  0.15112  0.08157  0.04326
   0.01329  0.00583  0.00572  0.00166  0.00029  0.00000  0.00000  0.00024
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2002  1  3  0  0  758.4 0.00000  0.00000  0.00000  0.00107  0.00826  0.01420
   0.03579  0.04554  0.09808  0.16682  0.22051  0.18479  0.12287  0.05972
   0.02559  0.00937  0.00480  0.00096  0.00086  0.00077  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_OR_ORBS-1,_Garibaldi_only
1978  1  9  0  0  43.1  0.00000  0.00000  0.00000  0.00000  0.03090  0.05400
   0.06950  0.06560  0.11190  0.10430  0.14290  0.12740  0.05400  0.08490
   0.06950  0.05400  0.02710  0.00390  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99990
1979  1  9  0  0  21.0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.01590  0.06350  0.11900  0.14290  0.22220  0.22220  0.08730
   0.07940  0.02380  0.00790  0.00790  0.00790  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99990
1980  1  9  0  0  8.3   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.02000  0.02000  0.12000  0.10000  0.16000  0.16000  0.32000  0.02000
   0.06000  0.02000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1981  1  9  0  0  11.5  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.01450  0.04350  0.07250  0.08700  0.13040  0.17390  0.24640  0.14490
   0.05800  0.02900  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00010
1982  1  9  0  0  31.1  0.00000  0.00000  0.00000  0.00000  0.00000  0.00530
   0.00000  0.03210  0.05340  0.11760  0.08550  0.17110  0.18190  0.13900
   0.08560  0.05880  0.04810  0.02140  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99980
1983  1  9  0  0  16.8  0.00000  0.00000  0.00000  0.00000  0.00000  0.00990
   0.01980  0.09900  0.13860  0.18810  0.23760  0.16830  0.06930  0.02970
   0.01980  0.01980  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99990
1984  1  9  0  0  130.1 0.00000  0.00000  0.00000  0.00130  0.00000  0.00510
   0.01410  0.05250  0.11390  0.14850  0.16900  0.15620  0.11780  0.10760
   0.04740  0.03970  0.01540  0.00760  0.00390  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1985  1  9  0  0  81.1  0.00000  0.00000  0.00000  0.00000  0.00210  0.00210
   0.00210  0.03290  0.05750  0.15200  0.21360  0.14580  0.16020  0.10680
   0.07590  0.03900  0.00830  0.00210  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00040
1986  1  9  0  0  132.3 0.00000  0.00000  0.00000  0.00000  0.00260  0.00250
   0.01770  0.01510  0.05040  0.11210  0.17380  0.17760  0.12850  0.11710
   0.09820  0.05290  0.03150  0.01010  0.00760  0.00260  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00030
1987  1  9  0  0  104.8 0.00000  0.00000  0.00000  0.00320  0.00480  0.00800
   0.01430  0.01740  0.05400  0.10330  0.15260  0.18760  0.16380  0.12250
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   0.08420  0.05240  0.02390  0.00640  0.00160  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1988  1  9  0  0  83.6  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00600  0.02190  0.04180  0.05180  0.08960  0.13940  0.18320  0.16330
   0.13950  0.10360  0.03590  0.01990  0.00400  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  0.99990
1989  1  9  0  0  132.9 0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00380  0.01130  0.03630  0.08020  0.11030  0.13160  0.18670  0.17540
   0.11030  0.07770  0.04630  0.02130  0.00880  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#_OR_ORBS-1,_state-wide
1990  1  9  3  0  349.6 0.00000  0.00000  0.00000  0.00000  0.00158  0.00845
   0.01147  0.02145  0.05969  0.09125  0.08232  0.07930  0.06453  0.04752
   0.03233  0.01766  0.00743  0.00161  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00047  0.00836  0.00255  0.01713  0.02383
   0.06195  0.07894  0.07730  0.08956  0.05655  0.03587  0.00993  0.01001
   0.00098  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1991  1  9  3  0  211.5 0.00000  0.00000  0.00000  0.00000  0.00001  0.01673
   0.03811  0.02972  0.03957  0.09579  0.11833  0.07486  0.09078  0.02000
   0.01805  0.00482  0.00009  0.00128  0.00025  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00772  0.00026  0.01208  0.05809
   0.09222  0.08638  0.05785  0.07507  0.03264  0.02119  0.00651  0.00156
   0.00001  0.00003  0.00000  0.00000  0.00000  0.00000  #  1.00001
1992  1  9  3  0  315.5 0.00000  0.00000  0.00000  0.00099  0.00265  0.00891
   0.00892  0.01802  0.04588  0.06855  0.09084  0.09577  0.05963  0.04455
   0.01785  0.01433  0.00121  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00093  0.00083  0.00994  0.01917  0.02675
   0.05415  0.09516  0.10388  0.09821  0.07029  0.03233  0.00656  0.00229
   0.00000  0.00109  0.00000  0.00033  0.00000  0.00000  #  1.00000
1993  1  9  3  0  219.0 0.00000  0.00000  0.00203  0.00239  0.00701  0.01205
   0.02017  0.02736  0.04540  0.05677  0.06900  0.06337  0.06234  0.04447
   0.02948  0.00935  0.00194  0.00065  0.00028  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00067  0.00118  0.00802  0.01941  0.02332  0.03158
   0.04621  0.07552  0.12063  0.10168  0.08473  0.02121  0.00940  0.00239
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  9  3  0  530.0 0.00000  0.00090  0.00000  0.00066  0.00384  0.00929
   0.02079  0.04691  0.04426  0.05956  0.07760  0.07795  0.05746  0.04007
   0.02392  0.01512  0.00330  0.00051  0.00033  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00014  0.00019  0.00370  0.00794  0.01845  0.03197
   0.05036  0.06093  0.09093  0.08704  0.08269  0.05398  0.02384  0.00344
   0.00111  0.00039  0.00005  0.00039  0.00000  0.00000  #  1.00000
1995  1  9  3  0  333.8 0.00000  0.00000  0.00058  0.00169  0.00294  0.01307
   0.02918  0.04877  0.06006  0.06522  0.08060  0.07935  0.04768  0.03050
   0.01819  0.00844  0.00206  0.00027  0.00095  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00245  0.01108  0.02816  0.04692
   0.08200  0.09294  0.08800  0.06591  0.05277  0.02366  0.01113  0.00188
   0.00256  0.00098  0.00000  0.00000  0.00000  0.00000  #  1.00000
1996  1  9  3  0  -273.7   0.00000  0.00000  0.00000  0.00198  0.00519
   0.01261  0.01962  0.04322  0.06642  0.08097  0.08293  0.06345  0.03681
   0.03094  0.00868  0.00379  0.00069  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00257  0.00000  0.00395  0.00794  0.01414  0.02598
   0.05145  0.09342  0.08775  0.10327  0.08278  0.05547  0.01092  0.00288
   0.00017  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
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1997  1  9  3  0  -309.9   0.00000  0.00000  0.00000  0.00312  0.00163
   0.02095  0.03793  0.04320  0.07428  0.08007  0.08292  0.06964  0.04744
   0.02761  0.01785  0.01110  0.00317  0.00032  0.00060  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00148  0.00151  0.00926  0.01759
   0.04868  0.07567  0.06800  0.08883  0.07084  0.04028  0.02379  0.02302
   0.00753  0.00169  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  9  3  0  -275.6   0.00000  0.00000  0.00174  0.00632  0.00664
   0.01550  0.02278  0.05415  0.08329  0.09418  0.06518  0.04516  0.04069
   0.02521  0.01579  0.00648  0.00261  0.00064  0.00147  0.00021  0.00021
   0.00000  0.00000  0.00000  0.00341  0.00084  0.00872  0.00885  0.02127
   0.05260  0.09071  0.08978  0.08049  0.07479  0.03940  0.02017  0.01084
   0.00708  0.00230  0.00050  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  9  3  0  -571.1   0.00000  0.00000  0.00238  0.00043  0.00196
   0.00836  0.02810  0.05455  0.07806  0.08799  0.09568  0.06073  0.04129
   0.01903  0.01297  0.00781  0.00161  0.00052  0.00025  0.00000  0.00000
   0.00000  0.00000  0.00056  0.00066  0.00100  0.00104  0.00627  0.02555
   0.05303  0.07799  0.09668  0.08278  0.06200  0.04706  0.02296  0.01083
   0.00712  0.00219  0.00043  0.00018  0.00000  0.00000  0.00000  #  1.00000
2000  1  9  3  0  -812.1   0.00000  0.00000  0.00044  0.00164  0.00286
   0.00412  0.02240  0.04191  0.07527  0.10685  0.10394  0.06344  0.04084
   0.01745  0.00813  0.00309  0.00050  0.00000  0.00023  0.00000  0.00000
   0.00000  0.00000  0.00018  0.00091  0.00091  0.00181  0.00879  0.02754
   0.04738  0.10214  0.11644  0.09133  0.05958  0.03361  0.01164  0.00378
   0.00052  0.00032  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2001  1  9  3  0  80.7  0.00000  0.00000  0.00000  0.00000  0.00200  0.00068
   0.00076  0.02367  0.06769  0.10920  0.09090  0.06402  0.06259  0.03472
   0.01887  0.00000  0.00200  0.00200  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00179  0.00000  0.01626  0.02672
   0.10435  0.13178  0.07556  0.08125  0.04970  0.02030  0.01122  0.00000
   0.00200  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2002  1  9  3  0  -624.0   0.00000  0.00030  0.00025  0.00153  0.00640
   0.01221  0.01245  0.02472  0.03749  0.05655  0.10127  0.11649  0.08219
   0.04272  0.02290  0.00557  0.00225  0.00030  0.00000  0.00020  0.00000
   0.00000  0.00000  0.00000  0.00019  0.00265  0.00830  0.01363  0.01264
   0.02462  0.05139  0.10574  0.12307  0.08338  0.03432  0.01124  0.00240
   0.00065  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2003  1  9  3  0  -587.4   0.00000  0.00000  0.00000  0.00102  0.00210
   0.00623  0.01775  0.02909  0.04137  0.06011  0.08225  0.08962  0.07821
   0.05070  0.02611  0.00913  0.00263  0.00200  0.00071  0.00035  0.00000
   0.00000  0.00000  0.00000  0.00061  0.00062  0.00470  0.00595  0.02345
   0.03994  0.05856  0.08280  0.12188  0.09026  0.04049  0.01954  0.00854
   0.00255  0.00035  0.00039  0.00000  0.00000  0.00000  0.00000  #  1.00000
2004  1  9  3  0  -528.9   0.00000  0.00000  0.00000  0.00069  0.00452
   0.00835  0.02343  0.03306  0.06711  0.06618  0.07349  0.07965  0.08148
   0.04292  0.01452  0.00796  0.00252  0.00048  0.00082  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00061  0.00000  0.00318  0.00557  0.01578
   0.04689  0.07893  0.09588  0.11254  0.07942  0.03342  0.01431  0.00417
   0.00195  0.00018  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2005  1  9  3  0  -571.3   0.00000  0.00000  0.00057  0.00000  0.00046
   0.00243  0.01184  0.03584  0.07689  0.08455  0.08078  0.07382  0.06518
   0.03928  0.01337  0.01003  0.00134  0.00082  0.00076  0.00000  0.00045
   0.00000  0.00000  0.00000  0.00000  0.00024  0.00045  0.00272  0.00947
   0.03065  0.05964  0.09361  0.11789  0.10243  0.05447  0.02189  0.00578
   0.00230  0.00005  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_OR_ORBS-2
2001  1  9  0  0  1282.6   0.00000  0.00024  0.00142  0.00169  0.00557
   0.01140  0.02813  0.04647  0.08604  0.19438  0.22438  0.18394  0.10499
   0.06176  0.03116  0.01031  0.00587  0.00139  0.00087  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2002  1  9  0  0  1115.1   0.00000  0.00000  0.00046  0.00907  0.00940
   0.01457  0.02959  0.03980  0.06281  0.13206  0.22187  0.20015  0.13223
   0.08231  0.03082  0.02008  0.00779  0.00381  0.00160  0.00147  0.00012
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2003  1  9  0  0  1155.1   0.00000  0.00000  0.00006  0.00458  0.00203
   0.01721  0.03565  0.06525  0.07991  0.12452  0.15604  0.17281  0.14686
   0.09570  0.04700  0.02546  0.01160  0.00715  0.00613  0.00052  0.00000
   0.00151  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2004  1  9  0  0  811.9 0.00000  0.00006  0.00006  0.00018  0.00394  0.00929
   0.02457  0.05704  0.12536  0.13075  0.15999  0.17144  0.13067  0.09863
   0.04499  0.02813  0.01114  0.00226  0.00114  0.00038  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2005  1  9  0  0  1163.3   0.00000  0.00000  0.00000  0.00020  0.00160
   0.00357  0.02112  0.04001  0.11639  0.13466  0.19798  0.19369  0.13520
   0.07728  0.04849  0.01468  0.00676  0.00764  0.00000  0.00072  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2006  1  9  0  0  2103.6   0.00000  0.00000  0.00019  0.00017  0.00054
   0.00698  0.01687  0.05864  0.11339  0.15552  0.17491  0.18250  0.13692
   0.07889  0.03992  0.01432  0.00943  0.00571  0.00320  0.00014  0.00176
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_CA_Commercial_HKL
1982  1  4  0  0  10.6  0.00000  0.00000  0.00000  0.00000  0.00000  0.01818
   0.01818  0.03636  0.03636  0.14545  0.03636  0.14545  0.12727  0.18182
   0.10909  0.07273  0.03636  0.01818  0.00000  0.01818  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1983  1  4  0  0  12.8  0.00000  0.00000  0.00000  0.00000  0.00000  0.01408
   0.00000  0.00000  0.04225  0.01408  0.09859  0.16901  0.26761  0.14085
   0.12676  0.09859  0.02817  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1984  1  4  0  0  9.9   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.10526  0.01754  0.07018  0.29825  0.22807
   0.17544  0.08772  0.01754  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1985  1  4  0  0  5.3   0.00000  0.00000  0.00000  0.00000  0.00000  0.03226
   0.03226  0.00000  0.06452  0.09677  0.09677  0.16129  0.19355  0.19355
   0.06452  0.06452  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1992  1  4  0  0  179.8 0.00000  0.00211  0.00211  0.01582  0.03481  0.02848
   0.05907  0.06646  0.07806  0.10021  0.15084  0.16878  0.10549  0.08755
```

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   0.05485  0.03692  0.00527  0.00105  0.00211  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1993  1  4  0  0  476.0 0.00000  0.00124  0.00124  0.01285  0.03523  0.05139
   0.06258  0.08910  0.10195  0.15126  0.16245  0.13676  0.09532  0.05512
   0.02238  0.01533  0.00290  0.00166  0.00041  0.00041  0.00041  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  4  0  0  523.6 0.00000  0.00106  0.00638  0.00956  0.02728  0.05172
   0.07722  0.10910  0.11229  0.12646  0.12150  0.12682  0.09458  0.06837
   0.03471  0.01736  0.01098  0.00248  0.00213  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1995  1  4  0  0  378.0 0.00000  0.00047  0.00047  0.00233  0.01399  0.04662
   0.09697  0.12028  0.13333  0.12634  0.14545  0.12308  0.08252  0.05548
   0.03497  0.00746  0.00606  0.00140  0.00280  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1996  1  4  0  0  337.5 0.00000  0.00256  0.00410  0.00717  0.01126  0.03584
   0.08397  0.11521  0.13518  0.13466  0.13466  0.12033  0.10036  0.06196
   0.03533  0.01024  0.00461  0.00256  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1997  1  4  0  0  179.4 0.00000  0.00000  0.00103  0.00827  0.01448  0.03619
   0.07135  0.12823  0.17994  0.15098  0.12823  0.10755  0.07859  0.05481
   0.02275  0.01551  0.00207  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  4  0  0  61.4  0.00000  0.00000  0.00000  0.00000  0.00333  0.03000
   0.07000  0.12000  0.13000  0.14667  0.14333  0.15667  0.11000  0.04333
   0.02333  0.02000  0.00333  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  4  0  0  411.7 0.00000  0.00000  0.00042  0.00169  0.00339  0.01271
   0.04492  0.10339  0.18644  0.18559  0.16992  0.12754  0.08008  0.04110
   0.02288  0.01398  0.00466  0.00127  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  4  0  0  411.7 0.00000  0.00000  0.00042  0.00169  0.00339  0.01271
   0.04492  0.10339  0.18644  0.18559  0.16992  0.12754  0.08008  0.04110
   0.02288  0.01398  0.00466  0.00127  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2000  1  4  0  0  114.8 0.00000  0.00000  0.00000  0.00000  0.00876  0.02277
   0.04203  0.11734  0.14361  0.17688  0.16637  0.14361  0.09107  0.04904
   0.02452  0.00701  0.00350  0.00350  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2001  1  4  0  0  181.4 0.00000  0.00000  0.00000  0.00000  0.00315  0.00840
   0.02731  0.07353  0.11975  0.20378  0.20273  0.16807  0.09874  0.04517
```

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   0.02941  0.01261  0.00630  0.00105  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2002  1  4  0  0  115.9 0.00000  0.00000  0.00000  0.00000  0.00998  0.01997
   0.03161  0.07321  0.09983  0.17138  0.15973  0.13810  0.11980  0.07987
   0.05491  0.02662  0.00666  0.00832  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2003  1  4  0  0  22.0  0.00000  0.00000  0.00000  0.01626  0.02439  0.08130
   0.06504  0.05691  0.06504  0.11382  0.12195  0.18699  0.13008  0.05691
   0.04878  0.01626  0.00000  0.01626  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2004  1  4  0  0  49.5  0.00000  0.00000  0.00000  0.00389  0.01946  0.03113
   0.14008  0.11673  0.14786  0.10895  0.10506  0.10117  0.06615  0.08560
   0.04669  0.01556  0.00389  0.00778  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2005  1  4  0  0  41.4  0.00000  0.00000  0.00000  0.00455  0.04091  0.02727
   0.09091  0.13636  0.19091  0.17273  0.10455  0.09091  0.06818  0.03636
   0.01818  0.01364  0.00455  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2006  1  4  0  0  119.5 0.00000  0.00000  0.00000  0.00000  0.01248  0.03276
   0.06708  0.13417  0.14977  0.15445  0.14041  0.10608  0.09204  0.05460
   0.03588  0.01404  0.00156  0.00156  0.00312  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_CA_Commercial_TWL
1978  1  5  0  0  13.2  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.05769  0.09615  0.15385  0.15385  0.15385
   0.07692  0.11538  0.03846  0.05769  0.01923  0.05769  0.01923  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1980  1  5  0  0  34.2  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00758  0.01515  0.05303  0.08333  0.13636  0.16667
   0.21970  0.12121  0.03788  0.07576  0.05303  0.00758  0.02273  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1981  1  5  0  0  33.9  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.01538  0.02308  0.02308  0.04615  0.06154  0.06923  0.12308  0.12308
   0.16154  0.16923  0.08462  0.03077  0.04615  0.02308  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1982  1  5  0  0  68.2  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00319  0.03834  0.05112  0.11821  0.10543  0.22364
   0.13419  0.11502  0.11821  0.05112  0.03195  0.00958  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
```

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1983  1  5  0  0  46.3  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00472  0.00000  0.02830  0.08019  0.16509  0.17453
   0.17925  0.14623  0.08962  0.07075  0.03774  0.01887  0.00472  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1984  1  5  0  0  34.3  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00568  0.01705  0.00000  0.00000  0.07386  0.25000  0.19318
   0.19886  0.11932  0.06818  0.03977  0.01705  0.00568  0.00568  0.00568
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1985  1  5  0  0  30.7  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00637  0.04459  0.10828  0.24841
   0.22930  0.16561  0.09554  0.05096  0.05096  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1986  1  5  0  0  6.7   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.03704  0.18519  0.22222
   0.22222  0.11111  0.14815  0.07407  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1987  1  5  0  0  33.4  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.02174  0.03804  0.06522  0.15217
   0.21196  0.25000  0.12500  0.06522  0.04348  0.02174  0.00543  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1988  1  5  0  0  11.7  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.01587  0.04762  0.09524
   0.14286  0.17460  0.15873  0.22222  0.11111  0.03175  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1989  1  5  0  0  19.0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.01250  0.00000  0.05000  0.08750  0.05000
   0.15000  0.26250  0.17500  0.11250  0.07500  0.01250  0.01250  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1990  1  5  0  0  -1.7  0.00000  0.00000  0.00000  0.00000  0.00000  0.20000
   0.00000  0.00000  0.20000  0.60000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1991  1  5  0  0  7.0   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.05556  0.00000  0.05556  0.13889  0.08333  0.22222
   0.30556  0.08333  0.05556  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1992  1  5  0  0  12.0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.09231  0.04615  0.24615  0.20000
   0.18462  0.16923  0.03077  0.01538  0.00000  0.00000  0.01538  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
```

```
1996  1  5  0  0  4.5   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.12000  0.04000  0.16000
   0.20000  0.20000  0.12000  0.00000  0.08000  0.08000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1997  1  5  0  0  14.3  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.01220  0.07317  0.08537  0.09756  0.09756  0.15854
   0.17073  0.15854  0.06098  0.03659  0.04878  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  5  0  0  -1.8  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.16667
   0.50000  0.16667  0.00000  0.16667  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  5  0  0  4.5   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.04000  0.00000  0.00000  0.04000  0.12000  0.16000
   0.24000  0.08000  0.16000  0.08000  0.00000  0.08000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2000  1  5  0  0  4.5   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.04000  0.00000  0.00000  0.08000  0.20000
   0.28000  0.24000  0.12000  0.04000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2001  1  5  0  0  10.5  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.06383  0.04255  0.06383  0.08511  0.12766
   0.17021  0.21277  0.04255  0.12766  0.02128  0.04255  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2003  1  5  0  0  3.6   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.05263  0.00000  0.21053  0.15789
   0.21053  0.05263  0.15789  0.05263  0.10526  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2004  1  5  0  0  -2.2  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.22222  0.00000
   0.33333  0.00000  0.33333  0.00000  0.00000  0.00000  0.11111  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_CA_RecFIN
1980  1  6  0  0  174.0 0.00000  0.00000  0.00148  0.01035  0.01314  0.04345
   0.06695  0.09012  0.10181  0.08877  0.10779  0.08764  0.10511  0.11601
   0.05805  0.06606  0.02379  0.01803  0.00000  0.00148  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1981  1  6  0  0  162.6 0.00000  0.00000  0.00371  0.00551  0.00878  0.01992
   0.02239  0.06729  0.10645  0.13199  0.07787  0.11072  0.12985  0.10341
   0.11511  0.05862  0.02228  0.01317  0.00000  0.00293  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
```

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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1982  1  6  0  0  203.0 0.00000  0.00221  0.00000  0.00277  0.00443  0.03333
   0.06798  0.10407  0.09322  0.07296  0.10153  0.11526  0.09754  0.08603
   0.09500  0.06566  0.03233  0.01683  0.00443  0.00443  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1983  1  6  0  0  130.8 0.00000  0.00000  0.00504  0.00000  0.00630  0.02288
   0.06215  0.08776  0.07852  0.09007  0.11778  0.11064  0.10666  0.09091
   0.11589  0.08440  0.00840  0.00630  0.00210  0.00420  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1984  1  6  0  0  233.4 0.00000  0.00099  0.01300  0.01369  0.04554  0.04148
   0.07769  0.07035  0.08037  0.06737  0.11222  0.10081  0.12860  0.11242
   0.05676  0.03850  0.01449  0.01330  0.00853  0.00387  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1985  1  6  0  0  509.9 0.00000  0.00528  0.00611  0.01901  0.04452  0.09470
   0.12338  0.11550  0.08480  0.08052  0.08955  0.07621  0.08081  0.05963
   0.04740  0.04685  0.01506  0.00917  0.00150  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1986  1  6  0  0  393.7 0.00000  0.00355  0.00000  0.01364  0.02380  0.04163
   0.08339  0.11010  0.10605  0.10982  0.10257  0.11145  0.09724  0.05775
   0.07103  0.03232  0.02181  0.00575  0.00526  0.00213  0.00000  0.00071
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1987  1  6  0  0  154.5 0.00000  0.01124  0.01214  0.03777  0.06597  0.08014
   0.12600  0.11206  0.13532  0.11309  0.07259  0.03373  0.02226  0.05887
   0.05528  0.03880  0.01124  0.00675  0.00225  0.00225  0.00225  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1988  1  6  0  0  133.2 0.00000  0.01340  0.01340  0.03215  0.06109  0.08628
   0.12781  0.09164  0.15970  0.09352  0.09137  0.05386  0.03108  0.03805
   0.05145  0.02840  0.01474  0.00938  0.00000  0.00000  0.00268  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1989  1  6  0  0  147.2 0.00000  0.00000  0.02546  0.04261  0.08614  0.12278
   0.13288  0.15369  0.16728  0.08613  0.05085  0.03910  0.01791  0.03386
   0.02075  0.01835  0.00000  0.00000  0.00000  0.00000  0.00000  0.00218
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1993  1  6  0  0  558.9 0.00000  0.00557  0.01670  0.04202  0.07123  0.10012
   0.14554  0.11818  0.09251  0.08399  0.07429  0.07677  0.06746  0.04926
   0.03089  0.01066  0.01049  0.00000  0.00000  0.00434  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  6  0  0  351.2 0.00000  0.00108  0.00954  0.02255  0.03839  0.11103
   0.14522  0.15358  0.13567  0.09871  0.07160  0.07374  0.05577  0.04069
   0.02964  0.00774  0.00361  0.00072  0.00000  0.00072  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1995  1  6  0  0  286.8 0.00000  0.00872  0.00939  0.03421  0.05500  0.13313
   0.19761  0.10800  0.08787  0.10451  0.07848  0.05044  0.04508  0.02898
   0.02281  0.00939  0.00894  0.00939  0.00268  0.00000  0.00000  0.00537
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1996  1  6  0  0  560.2 0.00000  0.00176  0.01383  0.01020  0.04087  0.08351
   0.13027  0.13062  0.11857  0.07947  0.10029  0.09277  0.07527  0.06042
   0.03718  0.01635  0.00352  0.00147  0.00281  0.00082  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1997  1  6  0  0  317.2 0.00000  0.00994  0.03118  0.09106  0.12884  0.16876
   0.17420  0.12505  0.08438  0.06974  0.03301  0.03236  0.02025  0.02066
   0.00652  0.00280  0.00124  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  6  0  0  284.1 0.00000  0.00691  0.00576  0.02764  0.10862  0.17301
   0.17443  0.11741  0.04995  0.07337  0.06333  0.09823  0.03224  0.01958
   0.01727  0.00461  0.00806  0.01842  0.00115  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  6  0  0  -567.8   0.00000  0.00414  0.01202  0.03475  0.07621
   0.15859  0.28462  0.22850  0.12478  0.04486  0.01239  0.00881  0.00616
   0.00219  0.00066  0.00066  0.00066  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2000  1  6  0  0  -396.3   0.00000  0.00339  0.00598  0.03090  0.06558
   0.18727  0.31424  0.22112  0.11412  0.01993  0.00787  0.00698  0.00688
   0.00498  0.00977  0.00100  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2001  1  6  0  0  379.7 0.00000  0.00431  0.01465  0.01776  0.05502  0.09667
   0.16577  0.20361  0.17196  0.08277  0.07868  0.04333  0.02961  0.00086
   0.01181  0.01975  0.00172  0.00000  0.00086  0.00086  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2002  1  6  0  0  510.1 0.00000  0.00870  0.02545  0.05762  0.10278  0.09050
   0.13554  0.16991  0.19107  0.09626  0.04474  0.02167  0.02167  0.01180
   0.00915  0.00722  0.00303  0.00217  0.00000  0.00000  0.00072  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2003  1  6  0  0  983.6 0.00000  0.00279  0.01097  0.03272  0.10591  0.16376
   0.20318  0.12008  0.06997  0.04381  0.04911  0.05352  0.04777  0.03683
   0.03125  0.01531  0.00766  0.00310  0.00038  0.00075  0.00075  0.00038
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2004  1  6  0  0  1465.8   0.00000  0.00804  0.02817  0.04856  0.06509
   0.13024  0.17719  0.17243  0.12244  0.06070  0.03545  0.04532  0.01733
   0.03301  0.02016  0.01732  0.01084  0.00274  0.00214  0.00120  0.00140
   0.00020  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
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   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2005  1  6  0  0  2303.7   0.00000  0.00275  0.00489  0.01819  0.03569
   0.07135  0.12322  0.12031  0.10753  0.09586  0.08716  0.11103  0.08620
   0.05902  0.03488  0.02430  0.00721  0.00601  0.00244  0.00158  0.00039
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
2006  1  6  0  0  2504.8   0.00000  0.00108  0.00262  0.01189  0.03198
   0.06882  0.11669  0.13440  0.11468  0.08197  0.09468  0.08635  0.08609
   0.06823  0.04628  0.03046  0.01187  0.00690  0.00314  0.00178  0.00000
   0.00010  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#
#_CA_CPFV
1987  1  15 0  0  -8.6  0.00000  0.02083  0.00000  0.06250  0.10417  0.14583
   0.10417  0.18750  0.16667  0.16667  0.02083  0.00000  0.00000  0.02083
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1988  1  15 0  0  141.2 0.00000  0.00000  0.01351  0.04842  0.12162  0.06644
   0.06532  0.09685  0.13063  0.08333  0.06419  0.03041  0.03604  0.05743
   0.05856  0.06644  0.03378  0.01577  0.00676  0.00450  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1989  1  15 0  0  141.2 0.00000  0.00000  0.00527  0.01477  0.02637  0.06646
   0.13713  0.18460  0.15401  0.10127  0.04325  0.04430  0.04958  0.04219
   0.05696  0.03586  0.01793  0.01266  0.00738  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1990  1  15 0  0  43.0  0.00000  0.00383  0.00766  0.06130  0.08429  0.08429
   0.22222  0.27586  0.17241  0.05747  0.01916  0.01149  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1991  1  15 0  0  88.9  0.00000  0.00384  0.03455  0.03839  0.14203  0.19578
   0.18234  0.17850  0.12860  0.06718  0.01919  0.00000  0.00384  0.00192
   0.00192  0.00000  0.00000  0.00000  0.00000  0.00192  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1992  1  15 0  0  77.0  0.00000  0.00000  0.00521  0.01042  0.05469  0.13021
   0.11979  0.21094  0.13802  0.10417  0.05729  0.04427  0.03646  0.02604
   0.03646  0.01563  0.00781  0.00260  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1993  1  15 0  0  129.1 0.00000  0.00000  0.00563  0.03657  0.09142  0.12799
   0.15049  0.11814  0.09283  0.05204  0.04501  0.05907  0.07314  0.05204
   0.04219  0.02954  0.01266  0.00703  0.00422  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1994  1  15 0  0  176.3 0.00000  0.01369  0.01369  0.04692  0.10362  0.15738
   0.21994  0.18573  0.09482  0.06354  0.01857  0.01369  0.01857  0.01760
```

```
   0.01369  0.01369  0.00293  0.00098  0.00098  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1995  1  15 0  0  136.9 0.00000  0.00119  0.01549  0.09535  0.21216  0.26460
   0.24553  0.12396  0.02503  0.00954  0.00119  0.00119  0.00000  0.00238
   0.00119  0.00000  0.00119  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1996  1  15 0  0  180.1 0.00000  0.00000  0.01746  0.03125  0.10018  0.18750
   0.22243  0.17371  0.11213  0.05423  0.02574  0.01838  0.01654  0.01471
   0.01011  0.01103  0.00092  0.00000  0.00368  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1997  1  15 0  0  297.1 0.00000  0.00222  0.02169  0.05951  0.15295  0.19299
   0.22247  0.14794  0.10122  0.05451  0.01835  0.01001  0.00389  0.00612
   0.00389  0.00111  0.00111  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1998  1  15 0  0  95.1  0.00000  0.00444  0.00667  0.04667  0.10889  0.23333
   0.23111  0.14222  0.06444  0.02222  0.01111  0.02222  0.01778  0.04222
   0.02667  0.01333  0.00444  0.00222  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
#_end_length_comps

25 #_Number_of_Age_Bins
1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

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
0.056 0.169 0.281 0.393 0.506 0.618 0.731 0.843 0.955 1.068 1.180 1.293 1.405
   1.517 1.630 1.742 1.855 1.967 2.079 2.192 2.304 2.417 2.529 2.641 2.754
   2.866 2.979 3.091 3.203 3.316 3.428 3.541 3.653 3.765 3.878 3.990 4.103
   4.215 4.327 4.440 4.552

13 #_Age_Composition_Observations
#_OR_Commercial_HKL
2002  1  1  3  0  1  0  0  65.6  0.00000  0.00000  0.00000  0.00779  0.03396
   0.12116  0.05423  0.15233  0.06056  0.03320  0.02957  0.03025  0.00713
   0.01398  0.00490  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00431
   0.04213  0.06078  0.06602  0.09186  0.06687  0.02186  0.03689  0.01500
   0.01489  0.01612  0.00825  0.00000  0.00000  0.00000  0.00102  0.00000
   0.00490  0.00000  0.00000  0.00000  0.00000  #  0.99997
2003  1  1  3  0  1  0  0  90.8  0.00000  0.00000  0.00132  0.01441  0.04476
   0.07800  0.04873  0.09007  0.07764  0.04213  0.02866  0.01852  0.00348
   0.00231  0.00111  0.00330  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00681
   0.02134  0.05564  0.05300  0.08564  0.12446  0.05464  0.03306  0.05993
   0.01892  0.01291  0.01086  0.00267  0.00061  0.00443  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00061  0.00000  #  0.99998
```

```
2004  1  1  3  0  1  0  0  72.1  0.00000  0.00000  0.00000  0.01556  0.09058
   0.07995  0.06373  0.05603  0.03062  0.05403  0.05100  0.01337  0.00896
   0.00657  0.00657  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.01175
   0.05923  0.03789  0.04777  0.03244  0.09914  0.08452  0.04473  0.05228
   0.00915  0.01731  0.00401  0.00247  0.00139  0.00284  0.00825  0.00000
   0.00657  0.00123  0.00000  0.00000  0.00000  #  0.99992
2005  1  1  3  0  1  0  0  55.8  0.00000  0.00000  0.00000  0.00000  0.12991
   0.12670  0.06015  0.03109  0.07340  0.00357  0.01994  0.00237  0.00490
   0.00359  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00360  0.02658
   0.11967  0.10232  0.05088  0.04103  0.05083  0.05181  0.02687  0.02847
   0.01919  0.01065  0.00895  0.00000  0.00370  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00017
#
#_OR_ORBS-1
1996  1  9  3  0  1  0  0  103.9 0.00000  0.00500  0.05284  0.09372  0.10048
   0.08923  0.04836  0.02266  0.01132  0.00872  0.00842  0.00272  0.00333
   0.00000  0.00046  0.00046  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00530  0.02611  0.07717
   0.11905  0.11428  0.04602  0.03431  0.03381  0.02224  0.02142  0.01068
   0.00905  0.01337  0.00452  0.00046  0.00288  0.00379  0.00167  0.00524
   0.00000  0.00046  0.00046  0.00000  0.00000  #  1.00000
1997  1  9  3  0  1  0  0  76.1  0.00000  0.00000  0.01400  0.06933  0.12993
   0.10843  0.07373  0.04694  0.03711  0.01872  0.01395  0.00360  0.00261
   0.00130  0.00062  0.00000  0.00000  0.00068  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.01427  0.01820
   0.06842  0.11599  0.08982  0.06572  0.01425  0.01793  0.03132  0.00317
   0.00317  0.01681  0.00852  0.00130  0.00192  0.00068  0.00000  0.00068
   0.00267  0.00000  0.00130  0.00000  0.00291  #  1.00000
1998  1  9  3  0  1  0  0  94.0  0.00000  0.00000  0.03170  0.14336  0.13730
   0.09407  0.06606  0.04923  0.00875  0.01347  0.00233  0.00000  0.00306
   0.00000  0.00116  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.02980  0.04646
   0.10290  0.11408  0.05486  0.03809  0.03350  0.01536  0.00774  0.00555
   0.00116  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  #  1.00000
1999  1  9  3  0  1  0  0  282.8 0.00000  0.00000  0.00414  0.07658  0.11572
   0.11296  0.07387  0.05895  0.02404  0.02519  0.00809  0.00387  0.00416
   0.00146  0.00091  0.00000  0.00000  0.00000  0.00000  0.00011  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00036  0.00711  0.04774
   0.10318  0.07125  0.07903  0.06520  0.03851  0.01720  0.01903  0.01223
   0.00936  0.00685  0.00132  0.00112  0.00244  0.00093  0.00219  0.00187
   0.00209  0.00008  0.00000  0.00000  0.00084  #  1.00000
2000  1  9  3  0  1  0  0  411.2 0.00000  0.00000  0.00804  0.03951  0.13430
   0.12114  0.07936  0.05238  0.02839  0.01921  0.00906  0.00634  0.00305
   0.00259  0.00223  0.00000  0.00165  0.00074  0.00000  0.00000  0.00000
   0.00000  0.00022  0.00000  0.00000  0.00000  0.00104  0.00521  0.04700
   0.13492  0.11458  0.05548  0.03814  0.02562  0.02022  0.01528  0.01060
   0.00268  0.00469  0.00326  0.00560  0.00201  0.00213  0.00137  0.00022
   0.00077  0.00052  0.00022  0.00000  0.00022  #  1.00000
2002  1  9  3  0  1  0  0  571.8 0.00000  0.00055  0.01079  0.01629  0.04254
   0.08731  0.10767  0.09830  0.05252  0.03393  0.02876  0.01668  0.01296
   0.00404  0.00410  0.00367  0.00323  0.00172  0.00049  0.00088  0.00091
   0.00000  0.00013  0.00000  0.00068  0.00053  0.00030  0.01255  0.02001
   0.05537  0.07317  0.09369  0.06691  0.04097  0.02567  0.02398  0.01346
   0.00863  0.00630  0.00796  0.00541  0.00652  0.00261  0.00209  0.00188
   0.00137  0.00000  0.00016  0.00077  0.00154  #  1.00000
2003  1  9  3  0  1  0  0  422.7 0.00000  0.00000  0.00220  0.02453  0.06460
   0.07254  0.10105  0.09323  0.05298  0.03514  0.02266  0.01022  0.00937
```

```
   0.00421  0.00038  0.00052  0.00000  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00242  0.02059
   0.07131  0.08470  0.08887  0.07131  0.04771  0.03925  0.02521  0.02502
   0.01043  0.00793  0.00669  0.00340  0.00116  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00038  #  1.00000
2004  1  9  3  0  1  0  0  397.9 0.00000  0.00000  0.00180  0.03034  0.09255
   0.08250  0.06786  0.06941  0.06739  0.03823  0.02678  0.01606  0.00839
   0.00365  0.00180  0.00125  0.00107  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.02304
   0.10331  0.07844  0.06552  0.05334  0.05854  0.03964  0.01763  0.01893
   0.01126  0.00778  0.00536  0.00322  0.00101  0.00074  0.00107  0.00107
   0.00000  0.00051  0.00000  0.00000  0.00051  #  1.00000
2005  1  9  3  0  1  0  0  310.5 0.00000  0.00000  0.00000  0.00446  0.07884
   0.15817  0.06175  0.03688  0.06851  0.02329  0.02123  0.00524  0.01376
   0.00556  0.00259  0.00056  0.00275  0.00000  0.00000  0.00000  0.00000
   0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00134  0.00670
   0.06436  0.10960  0.07541  0.05483  0.03731  0.03885  0.02674  0.03484
   0.01327  0.01926  0.01220  0.00402  0.00132  0.00696  0.00271  0.00438
   0.00056  0.00121  0.00000  0.00000  0.00056  #  1.00000
#_end_age_comps

1  #_mean_length-at-age_(cm)              SampSiz Scalar =  0.75
#_Year   Season   Type  Gender   Partition   Age-Err  Nsamp
#_Composite_of_all_3_years
2004  1  9  3  0  1  1  10.00 20.00 28.39 32.31 35.32 37.47 39.61 41.00 42.15
   42.59 43.52 44.28 44.45 44.28 42.83 45.72 49.13 46.00 46.00 46.00 46.00
   46.00 46.00 46.00 46.00 46.00 46.00 28.50 31.91 34.82 36.41 38.22 38.94
   39.82 40.16 40.89 40.88 41.43 41.64 42.17 42.39 42.01 42.99 43.82 43.58
   44.80 44.05 43.00 43.00 42.60
                     0.00  0.00  6.00  91.50 347.25   437.25   376.50
   337.50   277.50   150.00   102.75   57.75 43.50 18.75 4.50  4.50  2.25
   0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  6.00  80.25
   360.75   382.50   318.75   262.50   217.50   168.75   104.25   99.00 51.75
   48.00 37.50 17.25 8.25  6.00  4.50  3.75  0.75  1.50  0.00  0.00  1.50
#_end_mean_length-at-age

1  #_Number_of_Environmental_Variables
0  #_Environmental_Observations
999
```

Southern Black Rockfish STAR Panel Report

National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, Washington 98115

October 1-5, 2007

Reviewers

Martin Dorn, Alaska Fisheries Science Center, Panel Chair
Stephen Ralston, Southwest Fisheries Science Center
Andre Punt, University of Washington
Thomas Helser, Northwest Fisheries Science Center
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Tom Jagielo, Washington Department of Fish and Wildlife
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Peter Leipzig, Groundfish Advisory Subpanel (GAP) Representative
Kelly Ames, Groundfish Management Team (GMT) Representative

Stock Assessment Team

David Sampson, Oregon State University

Overview

The southern black rockfish assessment was initially reviewed by a STAR panel in May, 2007. The draft assessment model was an innovative attempt to develop a more spatially-explicit approach to assessing black rockfish. Unfortunately model behavior was unstable and it was not possible to resolve the difficulties during the STAR panel meeting.

For this STAR panel review, the STAT retrenched and proposed a preliminary base model similar in structure to the previous assessment, which assumed a unit stock in the waters off Oregon and California. The STAT reconstructed all input datasets and developed a time series of historical catch estimates extending to back to 1915. The assessment also used two new indices of abundance: tagging estimates of black rockfish abundance off Newport, Oregon, and the juvenile rockfish pre-recruit index. However, both of these indices begin after 2000 and are not yet informative about trends in stock status. During the initial presentation of the assessment, the STAR panel learned that the tag abundance estimates had been revised and that STAT's preliminary base model now included those revised estimates. This change had a minor impact on assessment results.

A primary focus of the review was how length at age was modeled in the assessment. The Panel was concerned about the lack of fit to pre-recruit index when there was no apparent additional information to inform the model about recent recruitment patterns. SS2 uses linear extrapolation to extend the growth curve below the Amin growth parameter, which was set at age 3 in the preliminary base model. The Panel surmised that this could produce an unrealistic growth curve for the younger fish that was interfering with the fit to the pre-recruit index. To address this problem, Amin was lowered to age 1 and an additional size bin was added to the lower end of size composition data. Alternative parameterizations of the CVs of length-at-age were also evaluated, and a new value was adopted (0.07 for all ages) based on improved model fits. The modified treatment of growth did somewhat improve the fit to pre-recruit index, but substantial lack of fit remained. The STAR panel ultimately concluded that the lack of fit could be explained by 1) the low level of recruitment variability, 2) the low emphasis given to pre-recruit index during iterative re-weighting of input variances, 3) an inconsistency between the index and size composition data, particular the California RecFIN data, which did not show the presence of a mode (or a shoulder) of small fish consistent with high pre-recruit index values.

The Panel also attempted to understand the tradeoff between the fits to various data sets used in the assessment. Most of the length data fit best at high estimated stock size, while age data fit best at low stock size. Length-at-age data, which ordinarily should not be informative about stock size, was also influential, and fit best at high stock size. Attempts were made to reduce the influence of the length-at-age data by combining all the data in a single year, and by iterative re-weighting. While this reduced the influence of the length-at-age data, the fit to these data showed a pronounced bias for the older fish. The STAT and the STAR panel agreed a good fit to length-at-age data was important to preserve, and so the final model did not use iterative re-weighting for the length-at-age data. The final model is an attempt to balance opposing datasets that imply differing views of stock status, which increases the overall uncertainty of assessment results.

Finally, the STAR Panel recommended a number of relatively minor changes to "tidy up" the model. These changes included a revised ageing error matrix based on double reads from the set of consistent age readers, the addition of a catchability break in 2005 in the Oregon CPUE index to model the most recent change in the bag limit, and the use of a new value for the recruitment variability parameter (σ_R) based on a single iteration (i.e., it was not iterated to convergence). Further, the start year for estimating recruitment deviations was changed from 1975 to 1970. None of these changes had a substantial impact on assessment results.

Analyses requested by the STAR Panel

Round 1 requests

New runs are all variations on the existing base model with the revised tag estimates. For each new run present any significant changes to fits or estimates.

A: Present diagnostics for the GLM analyses (e.g., residuals vs predicted values, qq-plots, or other diagnostics that illustrate whether the assumptions of the models are satisfied).

Reason: To evaluate whether the GLM model assumptions are satisfied or not.

Response: Diagnostic plots were presented for the positive-catch sub-models for Oregon and California. The Oregon model used a gamma distribution and the standardized residuals were not symmetrically distributed and not centered on zero. The California model used a normal distribution and the residuals were reasonably symmetric but showed some departures from the assumption of normality.

Discussion/conclusion: The Panel had difficulty interpreting the diagnostics presented for the gamma model. It was concluded that alternative diagnostics were needed to draw valid conclusions about whether the assumptions were met or not. It was suggested that a general recommendation be made that a standard set of easily interpretable diagnostics be routinely calculated (and presented) for all GLM analyses. This will require that appropriate diagnostics are identified for each type of GLM analysis (e.g., gamma, binomial, or lognormal) and that suitable tools are made available to STATs.

B: Present a year-by-year comparison of the length frequencies for aged and un-aged fish (with sample sizes). Scaled length frequencies should be used in both cases if feasible.

Reason: To evaluate whether the aged fish were selected at random or not.

Response: Comparisons were presented for the ORBS dataset using un-scaled length frequencies. The aged and un-aged fish had very similar length frequencies in most years.

Discussion/conclusion: It was not clear how best to obtain scaled length frequencies for this comparison. However, there is no evidence that the aged fish are unrepresentative of the fish that were sampled for length.

C: Tabulate selectivity parameters indicating which were freely estimated, which were fixed and why.

Reason: To clarify exactly what was done.

Response: A table was presented showing the required detail and also whether parameters were estimated at a bound or not. All parameters of the mainly double normal selectivities had been estimated freely. Some double normal parameters were on the upper bounds (8/36), but half of these were for the selection in the lowest length bin (i.e., no selection of fish in the smallest bin).

Discussion/conclusion: There was discussion about why the parameters on bounds had not caused problems for inversion of the Hessian. There were mixed views on whether it should cause problems or not. It was suggested that the parameters on the bounds should be fixed at those values, but it was agreed that if this is done, it should not be until a final base model has been chosen.

D: For the set of otoliths that were read by three of the standard readers, plot each individual reading vs average age.

Reason: To evaluate how much spread in age readings there is amongst the three readers.

Response: It was reported that some of the duplicate readings used to calculate the ageing-error matrix had been from non-standard readers (these should have been eliminated). Duplicate readings were actually only available for two standard readers. These results were presented on the plot as requested. They showed general agreement but also some otoliths which had been assigned very different ages by the two readers (e.g., 5 years vs 10 years).

Discussion/conclusion: A minor revision to the ageing-error matrix was noted. The between-reader variability was not considered to be unusual.

E: New run: separate time series (q) for the 2005 and 2006 points in the Oregon recreational CPUE time series.

Reason: To disconnect the 2005 and 2006 indices from the time series because of much more restrictive bag-limit regulations in 2005 and 2006. The points were retained with a different q rather than being deleted so that future updated assessments would be able to include the 2005 and 2006 indices as well as future indices.

Response: As expected this minor change was of no consequence.

F: Explore sensitivity to CVs of length-at-age (or report previous results).

Reason: To check for potential sensitivity to CVs of length-at-age.

Response: Three parameters (cv-young, cv-old-female, cv-old-male) were varied to produce an array of alternative runs. The best fit was obtained when all parameters were equal to 0.07 (which gave an improvement of 30 likelihood units over the provisional base model). The assessment results were not sensitive to the parameters.

Discussion/conclusion: The STAT recommended moving to a model with the CVs of length-at-age fixed at 0.07. There were no objections.

G: New run: block selectivity in the same way as CPUE qs.

Reason: The CPUE time series were split because of regulation changes which could have impacted on selectivity as well as catchability.

Response: This change was made cumulative with the split in the Oregon CPUE recreational time series. Four parameters were estimated for each block's selectivity. There was an improvement of 50 likelihood units for 12 parameters. There was not much difference in the estimated selectivities in Oregon, but there were some differences in California.

Discussion/conclusion: There was a general feeling from meeting participants that the changed selection patterns were contrary to what would have been expected given regulation changes and changes in fishing patterns. Blocking made little difference to the assessment results and it was agreed not to use it in any base models.

H: Evaluate using mirrored selectivities for data sets sampling the same recreational fisheries (e.g., are the splits justified in terms of a decrease in likelihood units?)

Reason: To determine if the splits are justified in terms of an improved fit.

Response: The mirrored run had a much poorer fit to the data overall (a drop of 200 likelihood units) with the main degradation in the recreational length frequencies as expected.

Discussion/conclusion: It was concluded that the splits were justified.

I: Explore why the pre-recruit time series is so poorly fitted (e.g., try a range of larger values for σ_R).

Reason: It was not clear why the pre-recruit time series could not be fitted exactly (as it had been in the blue rockfish assessment).

Response: The STAT described a process where he had cumulatively made changes to try to obtain a good fit to the pre-recruit time series. At the end of the process the 2005 and 2006 length frequencies were removed from the likelihood, the pre-recruit indices had been converted to an "arithmetic scale" (incorrectly as they were already in arithmetic space) and a larger $\sigma_R = 0.75$ was used. After all of these changes, the fit was improved but was still missing the 2004 index.

Discussion/conclusion: It was suggested that there was an interplay with the relatively large CV of length-at-age on young ages so that the pre-recruit series was competing with length frequencies. This was confirmed and a suggestion was made to specify zero selection at age 1 (and perhaps 2). There was also a suggestion to use option 33 (post density dependent) rather than 32 (pre-density dependent) for fitting the pre-recruit time series. It was concluded that the current growth curve had unrealistic sizes at ages 0, 1, and 2 years (being too large). This was all to do with SS2 using the lower edge of the lowest growth bin in the growth curve. Various suggestions were made on how to make the growth curve more realistic (without too much effort). The proposal to specify zero selection at young ages was warned against as there were no age data from California (perhaps young fish were being caught).

J:	Explore what is driving the estimates of the two strong year classes.

Reason: There is little visual evidence of strong cohorts in the data.

Response: This was explored at various times during the meeting by the STAT but was accorded lower priority than other requests. Some results were presented where the strong recruitment estimates had been constrained by bounds. This showed degradation in the fit to some length frequencies.

Round 2 requests

K:	Construct a new candidate base model and profile across R_0.

Make the following changes to the preliminary base model:

- Ensure that the growth curve has realistic mean length-at-age for 1 and 2 year old fish.
- Use the new ageing-error slope
- CVs of length at age = 0.07

Reason: A new candidate base model was needed to progress the assessment. The important change was to incorporate realistic mean length-at-age for the young fish. There was concern that inappropriate sizes for the young fish could distort the assessment results (through poor recruitment estimates). See discussion for Request I.

Response: An extra length bin was inserted with zero observations for each length frequency (thus reducing the lowest length in the length bins). Also, the Amin parameter from reduced from 3 years to 1 year. The pre-recruit series was still not fitted.

Discussion/conclusion: It was agreed that the new growth curve was realistic at young ages. There was further discussion about options 32 and 33 and it was agreed to try option 33 (see Request M). It was concluded that the length frequencies must be competing with the pre-recruit time series (even given the new growth curve).

Round 3 requests

L:	Explore candidates for a new base model.

Use the model with cumulative changes from request K and request E:

- Choose a start year for estimating recruitment deviations by considering the standard deviations of recruitment deviations.
- Do runs with three alternative starting values of σ_R: 1.0, 0.8, and 0.5, and compare with output values.

Reason: To finalize σ_R and the start year for estimating recruitment deviations in the base model.

Response: The plot of the standard deviation of recruitment deviations suggested that 1970 was an appropriate start year (although 1975 wasn't too bad). All output values of σ_R were lower than the input values (1.0 gave 0.47; 0.5 gave 0.37).

Discussion/conclusion: It was agreed to start estimating recruitment deviations from 1970. In the spirit of letting the "data speak" (somewhat), σ_R was fixed at 0.5 (being the approximate output from an input of 1.0).

Round 4 requests

M: Explore candidates for a new base model.

Use the model with changes from request L:

- Use option 33 for fitting the pre-recruit time series.
- Fit only one year of the mean length-at-age data (choose the year with the largest sample).

Reason: To finalize the option for fitting the pre-recruit time series (pre- or post- density dependent effects) and the mean length-at-age data. There was a concern that the three years of mean length-at-age data perhaps showed a trend which the model was attempting to fit (and hence giving the data undue influence on R_0).

Response: Use of option 33 gave a slightly worse fit to the pre-recruit time series and no effect on results otherwise. Data from 2004 were slightly more numerous so it was chosen as the single year for mean length-at-age data. The new run had somewhat lower estimates of depletion and MSY and had an improved fit to the length and age data. There was little reduction in the mean length-at-age likelihood component (despite there being only one year of data). This was because there was a poor fit to the 2004 mean length-at-age.

Discussion/conclusion: Option 32 was agreed upon for base models. There was concern about the poor fit to the mean length-at-age data and it was agreed to explore other options for using the data (see Request N).

Round 5 requests

N: Refine base model.

Use the model with changes from request L. Explore options for the use of the mean length-at-age data with the objective of removing the strong contrast in the likelihood component with respect to R_0.

Reason: Continued concern that, in reality, mean length-at-age data are not informative about abundance.

Response: Two options were tried: 2003 only, and all years combined and input in 2004 ("composite" run). Tuning was done to three iterations which resulted in down-weighting of the mean length-at-age data. Profiles over R_0 were shown and the mean length-at-age data showed a much reduced contrast compared to earlier runs.

Discussion/conclusion: It was noted by the STAT that the reduced contrast from the mean length-at-age data was partly due to the tuning process and subsequent down-weighting. The same tensions were present between the data sets as in earlier runs. The composite mean length-at-age run was preferred by the STAT and the Panel agreed (it had “more data”).

O: Explore dimensions of uncertainty.

With the base model from Request N do high and low runs with respect to M and catch history, first individually and then in combination. The low and high vectors for M are respectively, (0.12, 0.18) and (0.19, 0.28) – the same values used for northern black rockfish.

Reason: The estimates of depletion and MSY were likely to be most sensitive to these dimensions of uncertainty.

Response: The requested runs were presented, with the catch histories only including low and high elements for trawl. The low and high runs for M showed strong contrast in MSY and depletion. When combined with catch the contrast increased somewhat.

Discussion/conclusion: There was some discomfort with the results, with the low and high combinations being considered too extreme to represent the “ideal” of 25% “probability” each (with 50% probability on the base model). The CV on the MSY estimate for the base model was requested and found to be approximately 10%. It was noted that this greatly under-estimated the “true” uncertainty (model uncertainty being the key element). It was suggested that further investigation of uncertainty was warranted.

Round 6 requests

P: Explore dimensions of uncertainty.

With the base model from Request N do high and low runs with respect to M and catch history in combination. Use a low and high M for young fish of 0.14 and 0.18 respectively (with the base model offset for old females). Also include the low and high trawl-catch histories.

Reason: An attempt to find less extreme runs meeting the ideal of 25% probability each for the low and high runs.

Response: Before completing the request the STAT requested that the choice of base model be revisited. His concern was that the fit to the mean length-at-age data was very poor; so much so that the estimated growth in the model was inconsistent with the "reality" being represented by the mean length-at-age data (which he considered was much more reliable for estimating growth than the other data in the model). He proposed returning to an earlier model than that from Request N, where the mean length-at-age data were somewhat better fitted (because they had not been down-weighted due to tuning).

Discussion/conclusion: There was general agreement that there was a problem. There was an inconsistency between the mean length-at-age data and other data sets in the model. In particular, the conflict was with the Oregon age frequency from which the mean length-at-age data were derived. Balancing the STAT's concern that inappropriate growth was being estimated in the model was the concern that if too much weight was given to the mean length-at-age data then it would have an undue influence on abundance estimates. It was agreed that an earlier run would be used but that a sensitivity would be done to the weight on the mean length-at-age data (i.e., lambda = 0.1).

Response: The low and high runs from the new base model provided a less extreme range for depletion and MSY than those from Request O. The sensitivity run with lambda = 0.1 on the mean length-at-age data gave results very similar to the low run.

Discussion/conclusion: The Panel and the STAT agreed that the low and high runs conformed to the 25% probability guidelines. They also agreed that some cautionary words should be used to note the sensitivity of results to the weight placed on data which were primarily meant to inform growth.

Final base model description

The final base model was a modification of the preliminary base model. On the whole, the changes were relatively minor and include:

- The growth model in SS2 was re-specified by lowering Amin to age 1 and an additional size bin was added to the lower end of size composition data.
- The CV of length at age was set to a constant value of 0.07 for all ages.
- Length-at-age data was entered for a single year to reduce its impact on the estimate of stock size.
- The Oregon ORBS CPUE index was split with a new catchability period in 2005 to account for the most recent change in the bag limit.
- The ageing error matrix was revised based on double reads from the set of consistent age readers.
- A new value for the recruitment variability parameter (σ_R) was adopted based on a single iteration from a starting value of 1.0 (i.e., it was not iterated to convergence).
- The start year for estimating recruitment deviations was changed from 1975 to 1970.

Comments on the technical merits and/or deficiencies of the assessment

Technical Merits

- The assessment generally achieved a good balance between model complexity and data availability.
- Inclusion of tagging estimates of abundance is a positive step.
- SS2 was used effectively to model population dynamics, growth, and size-specific fishery impacts. SS2 brings the advantages of a standard and well tested package.
- Age data were carefully evaluated for consistency before they were added to the model. Questionable data were excluded.
- Substantial improvements were made to the historical catch estimates. In particular, the parallel development of low, medium and high estimates was an important advance.

Technical Deficiencies

- More appropriate ways of using both age and length data are available, i.e., conditional age-at-length compositions.

Areas of disagreement regarding STAR Panel recommendations

There were no important areas of disagreement between members of the STAR Panel or between the STAR Panel and the STAT.

Unresolved problems and major uncertainties

- There was a substantial change in estimated stock size between this assessment and the previous assessment. This in itself raises concerns about the temporal stability of assessment results.
- The assessment area is based on management boundaries and not on population structure.
- Historical catches of black rockfish are highly uncertain.
- Various datasets used in the assessment do not provide a consistent indication of stock status. Estimates of current status are a result of balance between conflicting datasets.
- Natural mortality is fixed to same values used in the northern black rockfish assessment. In reality, natural mortality is highly uncertain and cannot be reliably estimated.
- The assumed value of stock-recruit steepness was based on Dorn's meta-analysis of steepness and represents average for all West Coast rockfish. The assessment itself provides little indication of the appropriate value of steepness for black rockfish. Consequently, how the stock will respond to the Council's harvest policy for rockfish is not well known.
- The assessment only considers black rockfish status at the stock level. Are there local areas that have been fished more intensely and thus become more depleted than the stock as a whole? This question is not addressed in the assessment.

Issues of concern raised by GMT and GAP representatives during the meeting

There were no issues of concern raised by GMT and GAP representatives during the meeting.

Recommendations for future research and data collection

- Additional work is needed to develop a quantitative prior for tagging catchability. Tagging catchability should be based on analysis of potential black rockfish habitat and the relative abundance of black rockfish throughout the geographic range of the assessment (see Appendix IV to the 2005 cowcod assessment). Continuation and/or expansion of tagging programs should consider the scope of project the relative to the area being assessed. If the area covered by the project is small relative to assessed area, the potential to provide useful information for stock assessment is limited. Development of priors for tag catchability should consider uncertainty as well as point estimates.
- Development of a fishery independent time series using fixed sites and volunteer fishers properly supervised using standard protocols. The CPFV dataset consisting of reef-specific CPUE data has been repeatedly identified as most valuable index for monitoring stock trends of nearshore species.
- The STAT excluded a large amount of ageing data because of inconsistencies that made it unsuitable for use in the assessment model. This raises concerns about age reading protocols. Age reader comparisons, both between readers within the

same agency and between readers from different agencies, should be a routine part of age reading procedures.

- This assessment was limited by inadequate biological sampling of California component of the recreational and commercial fishery for black rockfish. Recreational fishery length data could not be expanded to landings because strata with large landings were not sufficiently sampled. Age data were unavailable for California, which made it impossible to compare geographic differences in growth. There have been positive steps towards sustainable management of nearshore species off California at the policy level, but the lack of investment in long-term sampling programs for biological data may make it difficult to achieve policy objectives.
- For stocks whose primary assessment index is derived from recreational fishery CPUE, greater consideration should be given to the potential impact of management changes on the ability to assess the stock. Management tools such as bag limit and season closures may have different impacts on CPUE trend data. Each management change, e.g., a bag limit change, potentially reduces the value of fishery-dependent data.

Executive Summary

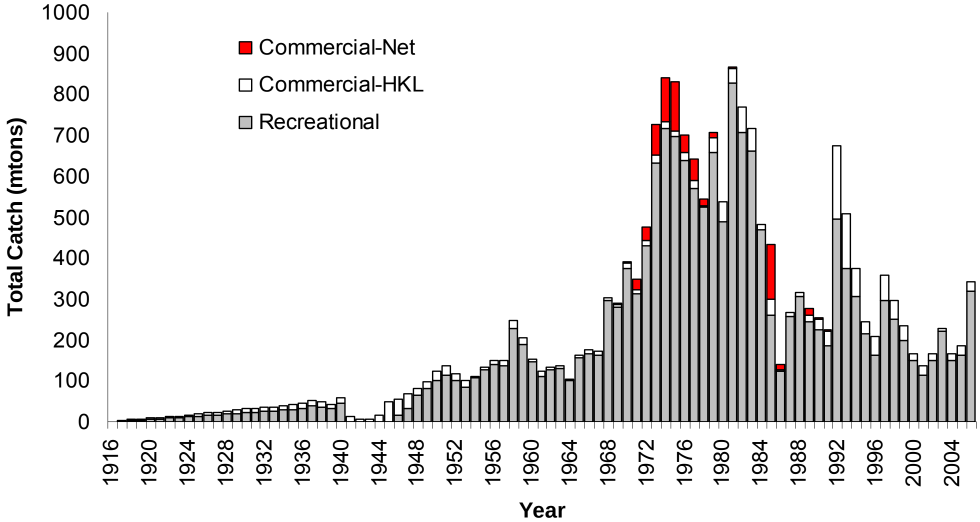
Stock

This is the first assessment of blue rockfish (*Sebastes mystinus*) on the West coast of the US. This assessment determines the status of the California stock from the Oregon border to Point Conception where blue rockfish are most commonly found, using data through 2006. This assessment treats these fish as a single stock. Blue rockfish are also harvested in Oregon and Washington, but black rockfish are more sought after in those waters. In southern California waters, the disappearance of that stock is believed to be related to environmental conditions, such as the lack of kelp in the warmer waters since the 1990s.

The variability in growth over time and between areas along the coast of California were evident while assessing this stock, but sufficient data did not allow the complex modeling needed to appropriately assess blue rockfish. Genetic evidence has also suggested two species of blue rockfish in California, so this status report is in effect an assessment of a blue rockfish “complex” instead of a single species.

Catches

Blue rockfish are the primary recreational (CPFV/private) caught species in California and is also important in the commercial fishery (mainly hook and line) even though landings from the commercial fishery are minor compared to the recreational catch. Due to the lack of historical reporting of the blue rockfish catch, estimates back to 1916 rely primarily on a proportion of total rockfish prior to 1969 in the commercial fishery (non-trawl) and prior to 1980 in the recreational fishery. Trawl landings in the commercial fishery were removed from total rockfish catches since we found no reporting of blue rockfish landed in this gear. The catch history of blue rockfish is highly uncertain, especially in the earlier years.



Recent landings (mt) of blue rockfish in California, north of Point Conception.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Recreational	296.1	249.4	198.6	150.7	115.6	148.8	219.9	149.9	162.9	319.6
Commercial-HKL	63.7	47.7	35.7	15.6	19.7	18.5	9.2	14.8	21.7	21.9
Commercial-Net	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	359.7	297.1	234.4	166.3	135.3	167.4	229.1	164.6	184.6	341.4

Data and Assessment

This first assessment for blue rockfish used the Stock Synthesis 2 (version 2.00g) integrated length-age structured model. The model includes estimated historical catches dating back to 1916 for each fishery (recreational, commercial hook and line and setnet), length-frequency data from each fishery and conditional age at length-frequency data from the early 1980s from the recreational CPFV fishery. Two recreational CPFV CPUE indices (RecFIN and CDFG onboard observer program) were used as abundance indices, with the RecFIN CPUE index being split into two time periods (1980-1999 and 2000-2006) to allow for potential changes in catchability due to the bag limit change (from 15 to 10) in the year 2000. Lastly, a coast-wide pre-recruit mid-water trawl survey (NWFSC/SWFSC/PWCC) provided a source of recruitment strength information in recent years.

In this assessment, variation in growth over time and space were evident, however the lack of data did not allow the appropriate modeling needed to accurately assess this stock. Recent genetic studies have also shown there are two species of blue rockfish, which adds additional uncertainty to the outcome. Most of the catch was represented by females (~70%), which suggests either males have a higher natural mortality (M) or they are less selected in the fisheries. Even though there are various states of nature needed to capture the uncertainty in this assessment, the proposed states of nature were based on varying M for females and male with different steams of catch histories. Probabilities were not assigned to the states of nature, however the STAT strongly believes that the low and BASE catch stream scenarios, producing the BASE and high bracket, are more likely given the lower –log likelihoods associated with each model run.

Unresolved problems and major uncertainties

Recent genetic studies suggest that blue rockfish is two closely-related species that intermix in the area covered by the assessment. Knowing the differences (if any) in behavior, spatial distributions, and life histories between the two species may help explain some of the uncertainties in this assessment.

The variability in growth over time and space is another essential element that was not properly modeled in this assessment. The model estimated the growth curve, which appeared to be an “average” of the 1980s growth curve and the 2000s growth curve explored. There was not enough recent data to support the use of time-varying growth for a base model, even though there was an attempt to do so.

Natural mortality is highly uncertain and cannot be reliably estimated. The scarcity of males in the landings could be either due to higher male natural mortality or lower fishery selectivity for the males.

Historical catches of blue rockfish are highly uncertain and are based on, in some cases, one point in time. Taking a proportion of total rockfish to reconstruct the historical catches is very worrisome. Attention needs to be given to historical catch reconstruction in Oregon as well, so this area can be included in the next assessment of blue rockfish. A common problem in California and Oregon is the mixing of similar species (ie. black rockfish) in the commercial fishery, which is difficult to tease apart.

This assessment had limited information on trying to measure stock abundance. The results of this assessment depend on the assumption of constant proportionality between the recreational CPFV CPUE indices and stock abundance.

Reference points

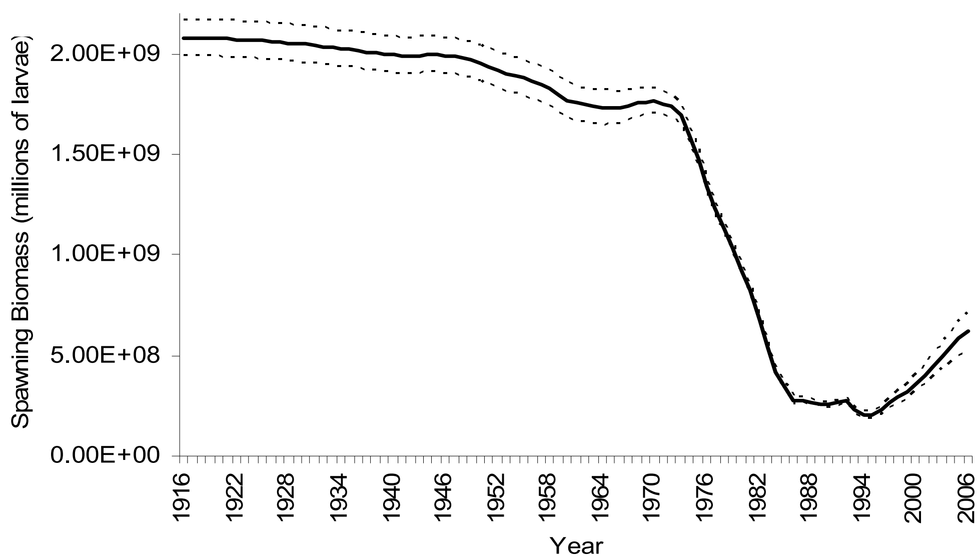
This assessment uses the default target rate of F50% used for rockfishes on the West Coast of the US. Under PFMC Groundfish management policy, if the stock’s current spawning biomass falls below 25% of the unexploited biomass, the stock is considered overfished. Under the state’s guidelines, the stock is considered overfished at 30% of the unexploited biomass. Unfished spawning biomass was estimated to be 2077 millions of larvae in the base model, with the target stock size at 831 millions of larvae. The base model estimated that the stock could support an MSY of 275 mtons.

	Point Estimate	Uncertainty in estimates
Unfished Spawning Stock Biomass (SB_0) (millions of larvae)	2077	1986-2167
Unfished Summary Age 1+ Biomass (B_0) (mt)	13223	
Unfished Recruitment (R_0) at age 0 (1000s)	3220	3081-3359
Reference points based on SPR proxy for MSY		
Spawning Stock Biomass at SPR (SB_{SPR})(mt)	831	
$SPR_{MSY\text{-}proxy}$	0.5	
Exploitation rate corresponding to $SPR_{MSY\text{-}proxy}$	0.0403	
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	275	

Stock biomass

Blue rockfish were not a highly sought species early on, but an increase in catches in the 1970s resulted in a continuous decline in spawning biomass through the early 1990s. Spawning biomass reached a minimum (10% of unexploited) in 1994 and 1995; however, there has been a constant increase since then. The base model estimated spawning output and relative depletion level in 2007 at 622 (millions of larvae) and 29.7%, respectively.

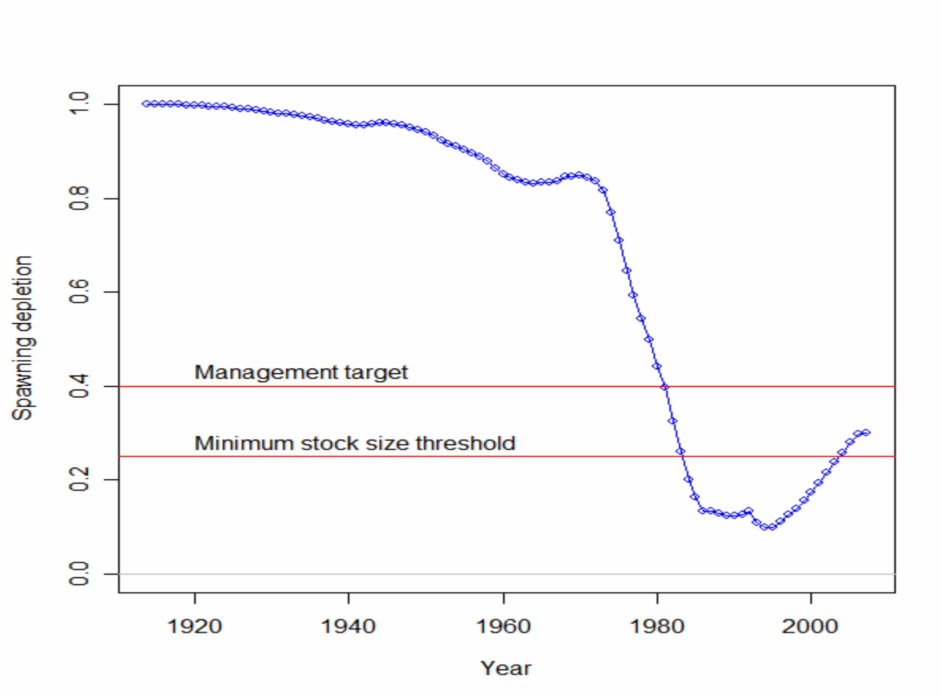
Time series of spawning biomass (~95% CI's) as estimated in the base case model



Recent trend in estimated blue rockfish spawning biomass (millions of larvae) and depletion

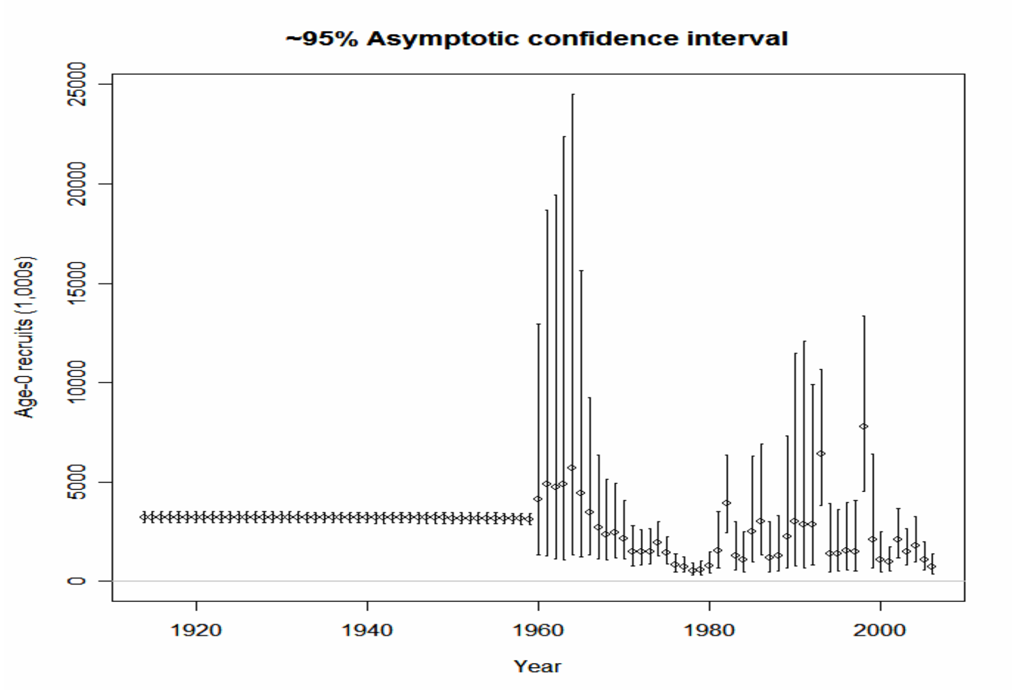
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Spawning Output	289	323	359	401	447	495	537	583	618	622
~95% CI	*259-318*	*286-359*	*317-402*	*352-450*	*391-503*	*431-559*	*464-610*	*501-665*	*528-708*	
Depletion	13.9%	15.5%	17.3%	19.3%	21.5%	23.8%	25.9%	28.1%	29.7%	29.9%

Time series of depletion level as estimated in the base case model.



Recruitment

Recruitment is variable and highly uncertain for blue rockfish. There is little information other than the pre-recruit index in the recent years to inform the assessment model about recruitments. Recruitment was high in the 1960s, with strong year classes appearing in 1993 and 1998. Considering the use of conditional age at length data in this assessment, estimated recruitment could potentially be off by a year in capturing the famous 1999 year class seen in most other groundfish stocks. The late 1970s showed all time low recruitment with the year 2006 being in the lowest 3 that recruitment was estimated.

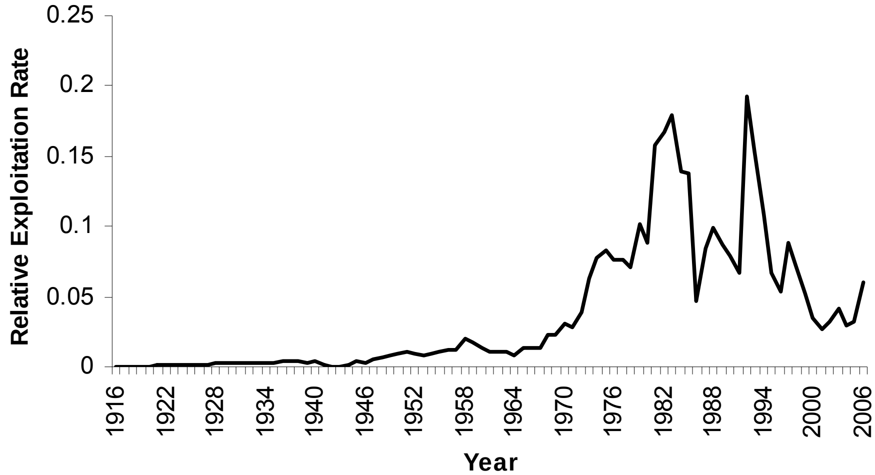


Recent trend in estimated blue rockfish recruitment (1000s)										
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Recruitment	7792	2074	1080	960	2094	1484	1806	1071	735	2261
~95% CI	*5609-9975*	*773-3374*	*592-1567*	*667-1252*	*1490-2698*	*1026-1941*	*1244-2368*	*725-1416*	*496-974*	

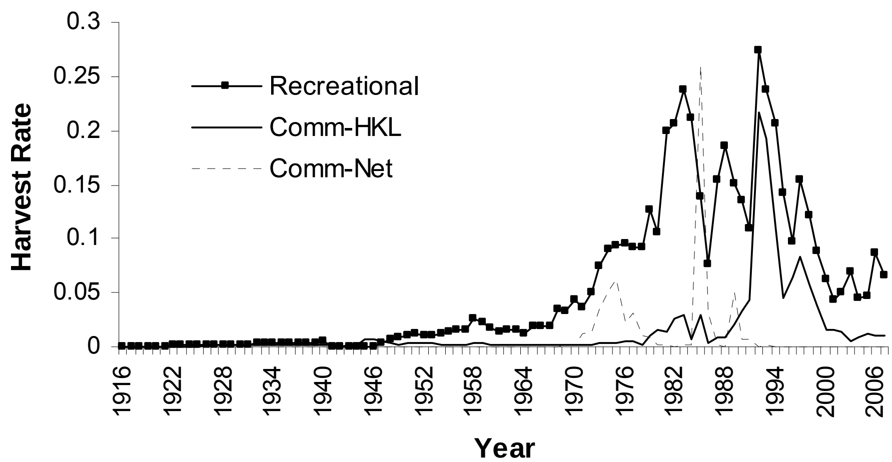
Exploitation status

Blue rockfish harvest was minor in the earlier years, but in the 1970s, recreational harvesting of blue rockfish began to increase with peaks in the early 1980s and early 1990s. The abundance of blue rockfish was at the management target ($SB_{40\%}$) in 1980 and the overfished threshold in 1982. Excess fishing of the stock has occurred since the 1970s; however, there has been an increase in abundance in recent years.

Time series of estimated relative exploitation rate for the base model.

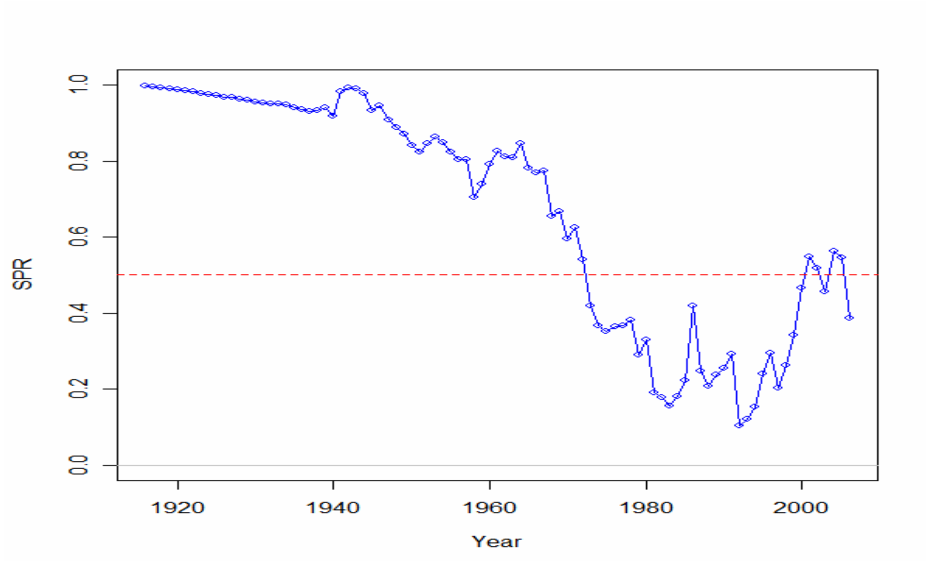


Time series of harvest rates by fishery for the base model.

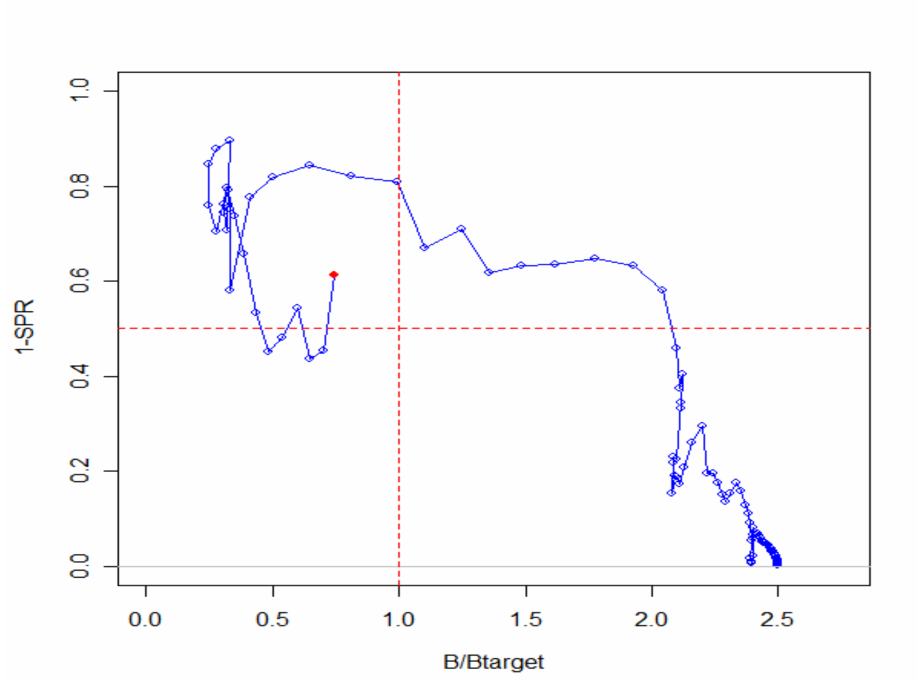


Recent trends in blue rockfish exploitation and harvest rates										
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Exploitation	8.8%	7.2%	5.2%	3.4%	2.7%	3.2%	4.2%	3.0%	3.3%	6.0%
(fraction of summary biomass)										
Harvest										
(fraction of available biomass)										
Recreational	15.5%	12.1%	8.9%	6.2%	4.3%	5.1%	6.9%	4.5%	4.6%	8.7%
Comm-HKL	8.3%	5.8%	3.9%	1.5%	1.6%	1.3%	0.6%	0.9%	1.2%	1.1%
Comm-Net	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

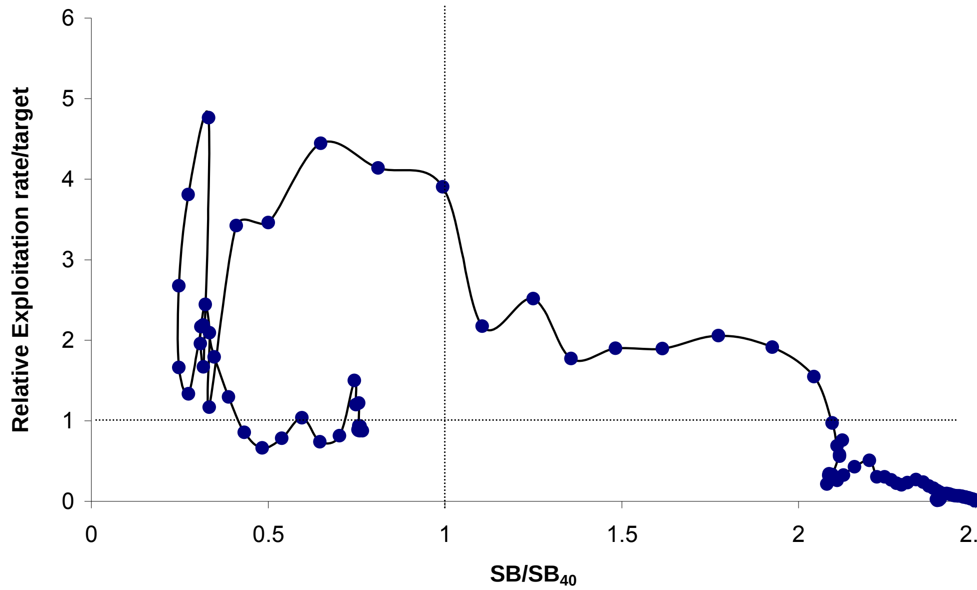
Time series of estimated spawning potential ratio (SPR) for the base case model.



Estimated spawning potential ratio relative to the proxy target of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base case model.



Estimated fishing intensity vs. relative spawning biomass for the base case model.



Management performance

This is the first assessment of blue rockfish and in the past they have been managed under a “complex.” Prior to 2000, this species was managed within the *Sebastes* complex, and since then has been managed under the minor nearshore rockfish complex, north and south of Cape Mendocino (40 10' N. lat.). Blue rockfish have not been considered a “point of concern” in management; hence no ABCs or OYs have been set particularly for this species.

Forecasts

Future catch projections through 2016 were made based on an F50% fishing rate with 40:10 adjustment. The average catches from each fishery for the years 2005 and 2006 (263 mtons) were applied to the beginning projection years of 2007 and 2008. The forecasts predict a slight increase in abundance but not enough to support increase harvesting of blue rockfish in the future. However, the state of nature corresponding to higher natural mortality (M females = 0.13, M males = 0.15) remains above 40% and allows about 370 mtons to be taken in 2009.

Base model projections for blue rockfish ABC, OY, spawning biomass and depletion										
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
ABC (mtons)	*227*	*226*	223	221	219	217	215	215	216	218
OY (mtons)	*263*	*263*	199	198	196	193	192	192	193	195
Spawning Biomass (millions of larvae)	622	628	628	632	631	628	627	628	631	637
Depletion	29.9%	30.3%	30.3%	30.4%	30.4%	30.2%	30.2%	30.2%	30.4%	30.7%

According to the base model, blue rockfish may be experiencing overfishing (current F exceeds proxy F_{MSY}), and the total catch should be reduced. However overfishing is not occurring under the upper bracket scenario.

Decision tables

Even though there are many uncertainties in this assessment, the STAR panel and STAT agreed that the decision table could capture some level of uncertainty through alternate scenarios of historical catches and natural mortality (for males and females separately) of blue rockfish. The scenario that suggested a lower level of abundance was with the high catch stream (double BASE) and lower natural mortality (M female=0.07, M male=0.09). The upper level of abundance can be bracketed by the low catch stream (1/2 of BASE) and higher natural mortality (M female=0.13, M male=0.15). Even though the STAR and STAT agreed with not assigning probabilities to the states of nature, the –log likelihood values from the model runs for the BASE (1340) and high natural mortality (1338) scenarios suggest they are more likely than the scenario with lower natural mortality (1361).

Since blue rockfish are managed by the State of California under the minor nearshore rockfish complex, a second decision table with the 60:20 adjustment applied is also provided. The state, being more conservative, considers a stock to be overfished at (or below) 30% of unfished spawning biomass. However, overfishing may be occurring under both the state and federal policies.

Decision table (40:10 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

40:10			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	42	14.0%	407	30.3%	628	50.0%	827
	2010	49	14.7%	429	31.6%	656	51.6%	855
Low	2011	54	15.4%	447	32.7%	679	52.8%	875
	2012	59	15.9%	464	33.7%	700	53.8%	891
from high	2013	64	16.5%	480	34.6%	720	54.7%	906
catch stream	2014	69	17.1%	497	35.6%	740	55.6%	921
	2015	75	17.7%	515	36.7%	762	56.6%	938
	2016	80	18.3%	533	37.8%	785	57.7%	955
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	199	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	198	13.9%	404	**30.4%**	**632**	50.2%	831
Medium	2011	196	13.7%	398	**30.4%**	**631**	50.0%	828
	2012	193	13.4%	390	**30.2%**	**628**	49.7%	823
from BASE	2013	192	13.2%	384	**30.2%**	**627**	49.4%	818
catch stream	2014	192	13.0%	379	**30.2%**	**628**	49.3%	816
	2015	193	12.9%	376	**30.4%**	**631**	49.4%	817
	2016	195	12.9%	375	**30.7%**	**637**	49.6%	820
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	376	14.0%	407	30.3%	628	50.0%	827
	2010	363	12.9%	376	29.1%	604	48.6%	804
High	2011	348	11.8%	343	27.8%	577	46.9%	776
	2012	335	10.7%	311	26.5%	550	45.2%	748
from low	2013	325	9.7%	282	25.4%	527	43.7%	724
catch stream	2014	317	8.8%	257	24.5%	509	42.6%	705
	2015	311	8.1%	235	23.8%	495	41.8%	691
	2016	308	7.4%	217	23.4%	485	41.2%	682

Decision table (60:20 adjustment applied) of 10-year projections for alternate states of nature (columns) and management options (rows). Spawning output is in millions of larvae.

60:20			State of nature					
			LOWER bracket (M = 0.07 f, 0.09 m)		Base case (M = 0.1 f, 0.12 m)		HIGHER bracket (M = 0.13 f, 0.15 m)	
Management decision	Year	Catch (mt)	Depletion	Spawning output	Depletion	Spawning output	Depletion	Spawning output
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	0	14.0%	407	30.3%	628	50.0%	827
	2010	0	15.0%	435	31.9%	663	52.0%	861
Low	2011	0	15.9%	461	33.4%	694	53.7%	889
	2012	0	16.8%	487	34.8%	723	55.2%	913
from high	2013	0	17.7%	514	36.2%	753	56.6%	937
catch stream	2014	0	18.6%	542	37.7%	784	58.1%	962
	2015	0	19.7%	572	39.3%	816	59.7%	988
	2016	8	20.7%	604	41.0%	851	61.3%	1015
	2007	263	14.4%	418	**29.9%**	**622**	49.3%	817
	2008	263	14.3%	415	**30.3%**	**628**	49.9%	826
	2009	113	14.0%	407	**30.3%**	**628**	50.0%	827
	2010	121	14.3%	417	**31.1%**	**645**	51.0%	844
Medium	2011	125	14.6%	424	**31.6%**	**657**	51.5%	853
	2012	128	14.7%	428	**32.0%**	**665**	51.8%	858
from BASE	2013	132	14.9%	433	**32.5%**	**674**	52.1%	863
catch stream	2014	136	15.1%	438	**32.9%**	**684**	52.5%	869
	2015	142	15.3%	445	**33.5%**	**696**	53.0%	877
	2016	148	15.5%	452	**34.1%**	**708**	53.5%	885
	2007	263	14.4%	418	29.9%	622	49.3%	817
	2008	263	14.3%	415	30.3%	628	49.9%	826
	2009	339	14.0%	407	30.3%	628	50.0%	827
	2010	323	13.1%	382	29.4%	610	48.9%	810
High	2011	307	12.2%	355	28.4%	589	47.6%	788
	2012	291	11.3%	330	27.4%	569	46.3%	766
from low	2013	279	10.6%	308	26.6%	552	45.2%	748
catch stream	2014	270	9.9%	289	26.0%	541	44.4%	735
	2015	266	9.4%	274	25.7%	533	43.9%	727
	2016	263	9.0%	262	25.5%	530	43.7%	723

Research and data needs

- As with many rockfish, reconstruction of the historical landings is difficult and very time consuming. A standard method should be applied, and historical documentation should be provided to highlight major fishery events to allow more certainty in these estimates.
- Continued genetic studies to confirm that blue rockfish is two species. Some major research that is needed related to this topic include: aging to determine differences in growth and longevity, fecundity, maturation schedules and their spatial distributions.
- More biological sampling, especially age composition information, of the recreational and commercial fisheries to be able to determine changes in life history parameters over time and space.
- Research to help understand the lack of males in the catches. Is this a selectivity issue or a substantial difference in natural mortality between males and females?
- Development of a fishery independent survey to capture changes in stock abundance. Many assessments have used a recreational CPFV CPUE index to determine this, which is not as reliable considering management changes (ie. bag limits, closures) that continue to occur.
- Sex-specific length and age information from the recreational fishery. Attempts have been made to gather sex-specific information from sampling the commercial fishery, and even though samples are small, it is informative.
- Environmental factors that affect survival of juvenile blue rockfish needs to be explored further. The lack of kelp habitat caused by increasing ocean temperatures (warmer waters) in Southern California since the 1990s led the STAT to believe that the disappearance of blue rockfish in this area was not due to fishing.

Regional Management Concerns

Blue rockfish are going to be a challenge for management considering the STAT's lack in confidence of the results of this assessment. Even though efforts were made to try and accommodate the changes in growth over time and space, sufficient data were not available to accomplish this. Not including Oregon or southern California add additional challenges for management, for this assessment did not comply with management boundaries. Lastly, the unknowns related to whether blue rockfish is two species causes concern not knowing the overlap of their spatial distributions or the degree of intermixing.

The STAT advices that this assessment for management purposes should be used with caution. Because of the numerous violations of model assumptions, the STAT does not consider the management quantities estimated in this assessment to be sufficiently reliable for quantitative fisheries management. Given the numerous levels of uncertainty, and the lack of information to assess blue rockfish appropriately throughout their range, this may be better used as a tool for guidance in monitoring blue rockfish until a more reliable assessment becomes available.

Summary Table	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Landings (mt)	297	234	166	135	167	229	165	185	341	341
Estimated Discards (included in total catch)	0	0	0	0	0	0	0	0	0	0
Estimated Total Catch (mt)	297	234	166	135	167	229	165	185	341	341
ABC (mt)										
OY (mt)										
SPR	0.22	0.25	0.36	0.48	0.56	0.53	0.45	0.58	0.56	0.41
Exploitation Rate (total catch/summary biomass)	0.07	0.05	0.03	0.03	0.03	0.04	0.03	0.03	0.06	0.06
Summary Age 1+ Biomass (B) (mt)	4114	4488	4825	5084	5298	5474	5541	5636	5649	5447
Spawning Stock Biomass (*SB*) (millions of larvae)	289	323	359	401	447	495	537	583	618	622
Uncertainty in SB estimate	259-318	286-359	317-402	352-450	391-503	431-559	464-610	501-665	528-708	
Recruitment at age 0 (1000s)	7792	2074	1080	960	2094	1484	1806	1071	735	2261
Uncertainty in Recruitment estimate	5609-9975	773-3374	592-1567	667-1252	1490-2698	1026-1941	1244-2368	725-1416	496-974	
Depletion (SB/SB0)	13.9%	15.5%	17.3%	19.3%	21.5%	23.8%	25.9%	28.1%	29.7%	29.9%
Uncertainty in Depletion estimate	na	na	na	na	na	na	na	na	na	na

Blue Rockfish STAR Panel Report

National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, Washington 98115

October 1-5, 2007

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Overview

Blue rockfish assessment was initially reviewed by a STAR panel in May 2007. The draft assessment included information on blue rockfish life history and growth, time series of recreational fisheries CPUE, and fishery age and size composition. The draft assessment also presented results of model runs using ASPIC, an assessment program based on a biomass production model. A SS2 model had been attempted, but the STAT had not been able to get the model to run satisfactorily. The STAR panel did not consider that the assessment was adequate and recommended that a new assessment be provided for review a later meeting. At the June Council meeting, the SSC supported the effort to explore simpler approaches such ASPIC, but also encouraged the STAT not to rule out other models that may be able to utilize more of the available data, such as a simplified SS2 or delay-difference model. The SSC stated that it was willing to review any model that the STAT put forward as being the best choice to assess the stock.

The STAT was able to resolve the implementation problems with SS2, and the preliminary base model presented for review at this meeting was in SS2. During the initial presentation of the assessment, the STAT identified a new base model different than the model in the draft document. This model included conditional age-at-length data, and growth was estimated for both males and females, with the exception of the L1 growth parameter.

The STAT also reported on preliminary results of a genetic study, motivated by discussions at pre-assessment data workshop, that suggested that blue rockfish may actually be two species. The Panel considered whether the assessment could proceed given this discovery. The Panel concluded that the assessment would be robust if the two putative species had similar life history characteristics such as growth and longevity; if recruitment patterns were similar; and if they were intermixed such that they would have experienced similar patterns of historical exploitation. While limited life history information suggests similarity between the two species, no information is available on the other concerns. The Panel was willing to let the assessment proceed, but cautions that the two-species question adds additional uncertainty to the assessment that should be considered when making management decisions.

For this assessment the STAT followed a recommendation of the previous STAR panel to construct a catch history for blue rockfish as far back as feasible. The STAR was able to extend the catch time series back to 1916 for both recreational and commercial fisheries. Earlier estimates (i.e., pre-RecFIN and pre-CalCOM) were based on published time series of total rockfish catch and a percentage of blue rockfish gleaned from sporadic species composition samples. The uncertainty of early catch estimates is high. Comments during the pre-assessment workshop on the unreliability of historical catches were accommodated through sensitivity analyses with high and low catch histories rather than changes to the base catch history, which is a more defensible approach than the previous draft.

The Panel put considerable effort into understanding and attempting to improve the fit to the age data. While fits to length data and the recreational CPUE indices appeared reasonable, the fit to the age composition was extremely poor, suggesting a problem in model specification. The Panel recommended several changes to improve the fit. First, the Panel recommended extending estimation of recruitment deviations further back (to 1960). Second, the Panel recommended using a higher mortality for males (0.12) than females (0.10). Finally, the CVs for length at age were modified, based on model fits, so that there would be less tension between the age and the length data. These changes improved the fit to the age data to an acceptable level.

The Panel also attempted to improve the treatment of growth in the model. This effort was hampered by the complexity of the apparent patterns and by a lack of age data. A strong latitudinal cline in length at age was observed in early age samples. A temporal decline in length at age has also been documented. Male and female growth curves of blue rockfish are very different. No recent age samples have been collected that are representative of the blue rockfish population, or even of landings. A model with two growth periods was evaluated during the meeting but eventually rejected because there was insufficient age data in the last 20 years to support the more complex model.

The Panel also recommended a number of other relatively minor changes to improve treatment of various aspects of the model. The initial CVs for the pre-recruit index set at 0.35 rather than using the much smaller CVs that came from the ANOVA. The ANOVA model accounted for both a year-latitude interaction, as well as depth, vessel, and period effects. The preliminary base model achieved a nearly perfect fit the pre-recruit indices because of the low initial variances and a tuning process that increased the weight on the indices. This result did not seem reasonable given the additional variability must exist in the relationship between the index and recruitment strength. The recruitment variability parameter σ_R was set to 0.5 rather than iterated to convergence. Panel did not consider the available data of sufficient quality or quantity to rely on an iterated estimate. The RecFIN CPUE index was split with a new catchability period starting 2000 to account for the change in the bag limit. Finally, an error in specification of spawning biomass corrected. The preliminary base model had intended to use spawning output (which increases as a function of body weight), but was actually using female spawning biomass.

The Panel agreed that the final base model was best that could be produced with the available data and time for analysis and review. Given that this is a data-limited assessment, relatively strong assumptions were needed to obtain a well-behaved model. The major uncertainties, of which there are many, are listed in a section below. On the positive side, the model was apparently stable and sensitivity runs generally produced the results that would have been predicted prior to doing the run. Further, the different datasets used in the assessment are generally consistent with each other, or at least not strongly in conflict. The Panel ultimately concluded, despite qualms about model limitations and assessment uncertainties, that the final base model and bracketing model runs were suitable for use in management decision-making.

One robust result of the assessment is that blue rockfish may be more vulnerable to exploitation than other nearshore species with which it is typically caught, such as gopher rockfish and black rockfish. The available data indicate that blue rockfish have lower natural mortality than these species, and most of the catch consists of females. Consequently, for a given level of fishing intensity, spawning output will be reduced to a greater degree for blue rockfish than for other nearshore species.

Analyses requested by the STAR Panel

Round 1 Requests

Request 1: Plot double age-reading data.
Reason for Request: To examine the precision of the age data used in the assessment.
Response to Request: A plot of the data was presented.
Discussion/Conclusion: The plot showed fairly good precision. The data are multiple readings by one age reader (not between reader values).

Request 2: Plot length at age to compare growth for the two putative species of blue rockfish.
Reason for Request: What is the importance of two species to the assessment? If they are demographically similar, there is less concern.
Response to Request: A plot was presented.
Discussion/Conclusion: Mean length at age was similar for the two putative species.

Request 3: Prepare a table to describe the assumptions made for both commercial and recreational catch reconstructions during specific time periods. Indicate where actual data were used versus expansion factors. (See longnosed skate STAR Panel report for an example).
Reason for Request: Historical commercial and recreational catch are uncertain and should be evaluated.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: The STAR Panel would like to keep this item on the list of requests as a priority for the next round of requests.

Request 4: Delta GLMs were used for the two CPUE indices of abundance: Provide diagnostics for goodness of fit, such as observed versus predicted for the proportion positive, and q-q plots.
Reason for Request: The Panel wanted to verify that the GLM error assumptions were reasonable.
Response to Request: A table was presented showing the number of CDFG CPFV trips by area. Plots were also prepared showing standardized residuals, normal q-q plots, leverage of residuals, and observed versus predicted values for the CDFG CPFV index. For the RecFIN CPUE Index, a table was presented showing sample sizes by area and year. A plot was prepared to show the RecFIN raw average CPUE by area and year. Plots were presented showing residuals, normal q-q plots, and leverage for the RecFin index as well. A plot was presented showing the predicted versus the observed proportion positive for the binomial component of the RecFIN index GLM.
Discussion/Conclusion: RecFIN sampling showed some thinness in the San Luis Obispo and Monterey areas. The STAT suggested dropping some years (1993-1996) from the RecFIN index, but this suggestion was not followed. Model residuals showed no severe departures from error assumptions.

Request 5: Provide histograms of bag frequency for pre and post bag-limit implementation.

Reason for Request: The STAR Panel wanted to look at the effect of changes in the bag limit.
Response to Request: A histogram of bag sizes over time was presented. A plot was presented of the ratio of the average catch divided by the average catch that would have resulted if there had always been a maximum bag limit of 10 fish.
Discussion/Conclusion: The STAT argued that the effect of the bag limit is minor. The STAR Panel suggested looking at the effect if the bag limit had not been put in place. When a new base model is selected, the Panel wanted to see a run with a change in CPUE catchability in 2000.

Request 6: Provide plots of age and length composition data and landed catch by stratum. Place priority on the age data.
Reason for Request: To look for potential problems of not weighting the age and length composition data.
Response to Request: Wade VanBuskirk (RecFIN) was contacted. He responded that he did not think that weighting by catch was an issue to be concerned about.
Discussion/Conclusion: When a new base model is selected, the Panel would like so see a model run with the weighted composition data.

Request 7: Ask Don Pearson to elaborate on his recollection of how the otoliths and lengths were collected for the 1979-1984 CDFG age dataset. Specifically enquire whether large fish were targeted to establish growth curves, or randomly selected.
Reason for Request: To see if there is any indication that biological sampling changed over time.
Response to Request: Don Pearson was queried and responded with his recollections. He did not recall a particularly non-random sampling process.
Discussion/Conclusion: The Panel concluded that it was appropriate to treat the sample as an unbiased sample of fishery length and age composition.

Request 8: Explain how the model's estimates of growth compare to Tom Laidig's length-at-age data, and find out what the Laidig age likelihood component in the model is based on.
Reason for Request: The characteristics of Laidig's length-at-age data were unclear and needed an explanation.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: When a new base model is selected, consider runs assuming Laidig growth parameters for the later period.

Request 9: For the STAT preferred model, explore the male selectivity dog-leg formulation: fix the slope and keep the shape the same while allowing the level to vary.
Reason for Request: The male selectivity curves were both much lower than the females and dome-shaped. The Panel wanted to see whether a simple offset to the female selectivity pattern would fit the data as well.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: The Panel decided to keep this on the list of requests.

Request 10: For the STAT preferred model, try estimating M for males and/or females.

Reason for Request: To consider reasons for the lack of old males in the catch.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: The Panel decided to keep this on the list of requests.

Round 2 Requests

Request 11: Follow-up on Request 3 (Round 1). Prepare a table to describe the assumptions made for both commercial and recreational catch reconstructions during specific time periods. Indicate where actual data were used versus expansion factors. (See longnosed skate STAR Panel report for an example).
Reason for Request: Historical commercial and recreational catch are uncertain and should be evaluated.
Response to Request: A detailed table was presented to document how the catch histories were assembled. The STAT also showed the spreadsheet calculations that were used to derive the assumed catch values, and explained the procedures used in detail.
Discussion/Conclusion: The Panel concluded that sensitivity runs where half and doubling of the historical catch should be evaluated.

Request 12: Develop a new STAT base model, using a σ_R of 0.5. Determine an appropriate start year for estimating recruit deviations. Use the standard deviation of the recruitment estimates as the basis for deciding when the age composition data is starting to become informative about recruitment strength.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT showed plots which varied the start year of recruitment deviations. The STAT recommended starting at 1960.
Discussion/Conclusion: The Panel agreed with the STAT recommendation.

Request 13: Follow-up on Request 5 (Round 1) regarding bag limit changes. When the base model is chosen, do a run with a change in catchability in 2000 to account for bag limit changes.
Reason for Request: The STAR Panel wanted to look at the effect of changes in the bag limit.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: The Panel decided to keep this on the list of requests.

Request 14: Follow-up on Request 6 (Round 1). When a new base model is selected, do a model run with weighted composition data.
Reason for Request: To look for potential concerns of not weighting the age and length composition data.
Response to Request: The STAT presented plots to show the effect of weighting the composition data.
Discussion/Conclusion: Differences between the weighted and un-weighted compositions were minor. The Panel concluded that use of un-weighted composition data would be acceptable.

Request 15: Follow-up on Request 8 (Round 1). When a new base model is selected, do a model run looking at two growth periods (using Laidig's growth parameters for the more recent period.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT presented plots showing length at age for various areas and time periods. The most recent period (2000's) showed a lower growth curve when compared to other externally generated growth curves from earlier periods (80's and 90's), and particularly the model generated growth curve. The STAT currently has no confidence in the base model if length-based information is used with the present growth model.
Discussion/Conclusion: The Panel decided that models including periods with different growth curves should continue to be explored.

Request 16: Follow-up on Request 9 (Round 1). When a new STAT base model is selected, explore the male selectivity dog leg formulation; fix slope and keep shape the same while allowing the level to vary.
Reason for Request: The male selectivity curves were both much lower than the females and dome-shaped. The Panel wanted to see whether a simple offset to the female selectivity pattern would fit the data as well.
Response to Request: The STAT reported that this could not be accomplished in SS2.
Discussion/Conclusion: The Panel decided to drop this issue. This is a technical limitation of SS2.

Request 17: Follow-up on Request 10 (Round 1). When a new STAT base model is selected, try estimating M for males and/or females.
Reason for Request: To refine the specifications of the base model.
Response to Request: There was not enough time for the STAT to respond to this request.
Discussion/Conclusion: The Panel decided to keep this on the list of requests.

Request 18: When a new STAT base model is selected, profile over a range of values for σ_R.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT presented plots showing results from runs with σ_R ranging from 0.1 to 0.5.
Discussion/Conclusion: The STAR Panel suggested looking at a run with $\sigma_R = 1.0$.

Round 3 Requests

Request 19: Follow-up on Request 11 (Round 2). Conduct sensitivity runs with the base model by halving and doubling recreational and commercial historical catches.
Reason for Request: Historical commercial and recreational catch are uncertain and should be evaluated.
Response to Request: Plots were presented to show the spawning biomass trends for the high catch, low catch and base case, and terminal depletion for each run.
Discussion/Conclusion: Little sensitivity was found in terminal depletion levels for the three runs. High – 29%, Base – 32%, Low – 36%.

Request 20: Follow-up on Request 18 (Round 2). Do a run with the base model using σ_R =1.0. Report the model output RMSE for comparison.
Reason for Request: To refine the specifications of the base model.
Response to Request: Runs were conducted to examine RMSE with respect to input σ_R. With input σ_R = 1.0, RMSE=0.93. With input σ_R = 0.5, RMSE = 0.63. The tuned σ_R was 0.83 (Input σ_R was 0.84).
Discussion/Conclusion: The tuned σ_R could be considered for the base model.

Request 21: Follow-up on Request 15 (Round 2). Explore time varying growth, possibly by time blocking in SS2.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT presented the results of a run where growth was fixed for two periods, with the change occurring in 1987. Conditional age at length was not used in this run.
Discussion/Conclusion: The Panel would like see a run with two growth periods that estimates growth in the early period.

Request 22: Estimate the coefficient of variation (CV) of length at age in the new base model
Reason for Request: To refine the specifications of the base model.
Response to Request: Tables were presented to show the estimated CVs of length at age.
Discussion/Conclusion: The females ranged from 0.07 (low) to 0.09 (high). Males ranged from 0.07 (low-bound) to 0.16 (high). The STAR recommended estimating a young and an old growth CV and making it the same for both sexes.

Round 4 Requests

Request 23: Follow-up on Request 21 (Round 3). Explore time varying growth, by time blocking in SS2. Estimate growth in the early period. Address a potential area bias in the growth data for the later period. Estimate selectivity. Turn on conditional age at length. Specify the CVs of length at age as suggested in Request 22 discussion (above). Set σ_R = 0.5.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT presented the model runs as requested.
Discussion/Conclusion: The STAT reported that attempts to model two growth periods resulted in model instability which could not be fully resolved in the time available. Panel agreed that further evaluation of models with two growth periods was not likely to

be useful. The available age data for the post-1987 period are simply not sufficient to support a model with the additional complexity.

Request 24: For comparison with a time-varying growth model (Request 23, above), do a run with constant growth over time.
Reason for Request: To refine the specifications of the base model.
Response to Request: The STAT presented the model runs as requested.
Discussion/Conclusion: Given the results from trying two growth periods (see Request 23 discussion, above), and reasonable results from the constant growth model, the STAT preferred the simpler model with a time-invariant growth curve. The Panel accepted this argument.

Round 5 Requests

Request 25: Run base model with the following specifications:

1. Set values for males and females CV for length at age as a function of age as follows:
   Young females: 0.085
   Young males: 0.085
   Old females: 0.095
   Old males: 0.110
2. Set the initial CV for the pre-recruit index to 0.35.

Reason for Request: The initial CVs had been set to the GLM error estimates, which are very small, and do not account for all sources of potential variability. The model may be over-fitting the index.
Response to Request:
Change in the CVs for the pre-recruit index resulted in plausible (not too good fits) to the index.
Discussion/Conclusion: The higher input CVs for the pre-recruit index were recommended for the base model.

Round 6 Requests

Request 26: Produce set of sensitivity runs with alternative values for male natural mortality:

1. Estimate male natural mortality.
2. Fix male natural mortality at 0.14.
3. Assume a ramp for male natural mortality between ages 10 and 20.
   a) Estimate old male natural mortality.
   b) Estimate both young and old male natural mortality.
   c) Fix young male mortality at 0.1 and the old male mortality at 0.15

Reason for Request: The lack of old males in the fishery data could be due to either selectivity or higher male mortality.
Response to Request: Run 1 produced modest improvements in fit and an estimate of 0.115 for male natural mortality. Run 2 resulted in some degradation of model fit compared to model 1. For the models with a ramp between ages 10 and 20 the estimate of old male mortality was 0.134. When both young and old male natural mortality were estimated, there was a counterintuitive result that the model estimated a higher natural mortality for the young males than the old males.

Discussion/Conclusion: The improvements in fit with a male natural mortality offset are large enough to justify inclusion in the model. The results with a ramp in male natural mortality are ambiguous, therefore it was decided that the new base model should have female natural mortality of 0.10 and male natural mortality of 0.12.

Request 27: Provide a run with a catchability break in the recreational fishery index in 2000.
Reason for Request: The bag limit was changed in 2000, and the panel wanted to see if adding an additional parameter would improve model fit.
Response to Request: Adding a catchability break (for 2000 bag limit change) reduced the estimated catchability by about one-half in the post-2000 period. Changes in assessment results are minor.
Discussion/Conclusion: The change in catchability is directionally consistent with prior expectations, and the approach is consistent with how black rockfish were treated. Therefore the Panel recommended including a catchability break in the base model. Initially the STAT had re-tuned the input variances for both portions of index after adding the catchability break. Upon further consideration, the Panel recommended that the model not be re-tuned. The addition of new parameter could only improve the fit to index, and it was considered inappropriate to reduce the assumed variances as a result of the catchability break.

Request 29: Provide a set of bracketing model runs with the following specifications:

Female M	Male M	Historical catches
0.08	0.10	High catch = Base catch * 2.0 (pre-CalCOM and RecFIN)
0.10	0.12	Base catch
0.12	0.14	Low catch = Base catch * 0.5 (pre-CalCOM and RecFIN)

Reason for Request: To identify a set of runs to bracket uncertainty.
Response to Request: The STAT presented the model runs as requested.
Discussion/Conclusion: There wasn't enough contrast between the high, base and low runs to capture the uncertainty thought to exist in the assessment.

Round 7 Requests

Request 30: Provide a set of bracketing model runs with the following specifications. (The response to this request was provided after the end of the meeting):

Female M	Male M	Historical catches
0.07	0.09	High catch = Base catch * 2.0 (pre-CalCOM and RecFIN)
0.10	0.12	Base catch
0.13	0.15	Low catch=Base catch * 0.5 (pre-CalCOM and RecFIN)

Also check to make sure that pairing high catch with low natural mortality, and low catch with high natural mortality gives the best contrast rather than the opposite pairing.
Reason for Request: To identify a set of runs to bracket uncertainty.
Response to Request: The STAT presented the model runs as requested.
Discussion/Conclusion: The requested bracketing runs gave depletion estimates (current biomass/unfished biomass) of 0.14, 0.30, and 0.49 respectively for the low M-high catch, base, and high M-low catch scenarios. The opposite pairing did not produce a useful result. The Panel recommended that the low M-high catch, base, and high M-low catch scenarios form the basis for a decision table. Because it is difficult to fully evaluate

major uncertainties in the assessment, the Panel chose not to assign probabilities to the bracketing runs.

Final base model description

The final base model was a modification of the preliminary base model. Changes included:

- Recruitment deviations were estimated back to 1960.
- The recruitment variability parameter σ_R was set to 0.5 rather than iterated to convergence.
- Length at age CVs were revised based on model fits.
- Male natural mortality was increased from 0.10 to 0.12.
- The RecFIN CPUE index was split with a new catchability period in 2000 to account for the change in the bag limit.
- An error in specification of spawning biomass was corrected. The preliminary base model had intended to use spawning output (which increases as a function of body weight), but was actually using female spawning biomass.
- The initial CVs for the pre-recruit index set at 0.35 rather than using the much smaller CVs that came from the ANOVA.

Comments on the technical merits and/or deficiencies of the assessment

Technical merits

- SS2 was used effectively to model population dynamics, growth, and size-specific fishery impacts. SS2 brings the advantages of a standard and well tested package.
- Substantial improvements were made to the historical catch estimates.
- The model was fit to conditional age at length distributions.

Technical Deficiencies

- Male selectivity was modeled using a dog-leg formulation that produced a dome-shaped patterns that were difficult to justify.
- Development of historical catch estimates should also consider uncertainty, not just the best estimates.
- Composition data were not weighted by landings.
- The diagnostic plots for gamma GLM for the RecFIN CPUE data were not useful in evaluating model fit and the appropriateness of error assumptions.

Areas of disagreement regarding STAR Panel recommendations

There were no important areas of disagreement between members of the STAR Panel or between the STAR Panel and the STAT.

Unresolved problems and major uncertainties

- The assessment area is based on management boundaries and not on population structure. The assessment covers only the core of the species range. Blue rockfish south of Point Conception were not assessed, but anecdotal information suggests that they have declined steeply, potentially in response to climate change and loss of kelp forest habitat. The status of blue rockfish off Oregon (and further north) is unknown.
- Recent genetic studies suggest that blue rockfish is two closely-related species that intermix in the area covered by the assessment.
- Historical catches of blue rockfish are highly uncertain.
- Natural mortality is highly uncertain and cannot be reliably estimated. The scarcity of males in the landings could be either due higher male natural mortality or lower fishery selectivity for the males.
- The assumed value of stock-recruit steepness was based on Dorn's meta-analysis of steepness and represents average for all West Coast rockfish. The assessment itself provides little indication of the appropriate value of steepness for blue rockfish. Consequently, how the stock will respond to the Council's harvest policy for rockfish is not well known.
- Growth of blue rockfish shows complex spatial and temporal patterns. Data are not available to adequately describe these patterns.
- Assessment results depend on an assumption of a constant proportionality between recreational fishery CPUE and stock abundance.

Issues of concern raised by GMT and GAP representatives during the meeting

The GAP representative suggested that industry reports during the pre-assessment workshop of unrecorded catches and dumping of blue rockfish might be somewhat motivated by self-interest.

Recommendations for future research and data collection

- Further genetic studies are needed to confirm that blue rockfish is two species. The sampling for genetic samples should be designed to address management issues, such as differences in spatial distribution, the extent of intermixing, differences in growth, longevity, and maturation schedules between the two species.
- Development of a fishery independent time series using fixed sites and volunteer fishers properly supervised using standard protocols. The CPFV dataset consisting of reef-specific CPUE data has been repeatedly identified as most valuable index for monitoring stock trends of nearshore species.
- The next assessment should provide documentation of historical blue rockfish catches off Oregon and south of Point Conception. A comprehensive assessment of blue rockfish throughout its West Coast range should be considered.
- This assessment was limited by inadequate biological sampling of the California recreational and commercial fishery for blue rockfish. Recreational fishery length data could not be expanded to landings because strata with large landings were

not sufficiently sampled. Reliable age data are unavailable for past 20 years, which made it impossible to evaluate temporal changes in growth or to compare geographic differences in growth. There have been positive steps towards sustainable management of nearshore species off California at the policy level, but the lack of investment in long-term sampling programs for biological data may make it difficult to achieve policy objectives.

- Given the availability of biological samples, studies are needed on spatial and temporal growth patterns of blue rockfish.
- Given the availability of biological samples, studies are needed on reproductive biology of blue rockfish. The apparent higher mortality of male blue rockfish, which is unique among assessed rockfish (female mortality is higher for several shelf and nearshore rockfish species), may also be linked to reproductive biology or behavior.
- The next assessment should provide a detailed justification for the use of fishery CPUE indices as indices of abundance. A detailed descriptive analysis of the data should be provided, with particular attention to annual changes that affect fundamental assumptions. Further, evaluate the robustness of the method to trip selection criteria and regulatory changes in the fishery.
- GLM diagnostics for both binomial and non-zero catch rate regressions should be provided routinely in all assessments that use this technique.
- For stocks whose primary assessment index is derived from recreational fishery CPUE, greater consideration should be given to the potential impact of management changes on the ability to assess the stock. Management tools such as bag limit and season closures may have different impacts on CPUE trend data. Each management change, e.g., a bag limit change, potentially reduces the value of fishery-dependent data.

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MEMORANDUM

DATE: September 4, 2007

TO: Overfished Groundfish Stock Assessment Teams, Scientific and Statistical Committee Groundfish Subcommittee, and Interested Persons

FROM: John DeVore, Groundfish Staff Officer

SUBJECT: Requested Rebuilding Analyses for Overfished Groundfish

The Pacific Fishery Management Council will convene a Groundfish Stock Assessment Review (STAR) Panel October 1-5, 2007 to review draft stock assessments for the southern portion of the black rockfish stock in waters off California and Oregon, the blue rockfish stock in waters off California, and draft rebuilding analyses for bocaccio, canary rockfish, cowcod, darkblotched rockfish, Pacific ocean perch, widow rockfish, and yelloweye rockfish.

In preparation for the October STAR Panel review, Stock Assessment Teams are asked to address requests A-C below before proceeding to the projections requested under D.

A. Define how virgin biomass (B_0) is to be calculated for the current rebuilding analysis (from the assessment; based on average recruitment over the early years, etc.).

B. Define how future recruitment is to be generated.

C. Provide the projected year to rebuild if all fishing mortalities were eliminated beginning in 2009 ($T_{F=0}$).

D. Provide the following projections:

   1) Projections of yields, median rebuilding times, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the SPR harvest rates specified in rebuilding plans adopted under Amendment 16-4 (see attached Table 4-2 from the FMP depicting the F_{SPR} harvest rates). NOTE: If the estimated mean generation time has changed in the assessment, T_{MAX} needs to be recalculated by adding estimated mean generation time to the T_{MIN} value specified in Table 4-2.

   2) Projections of yields, median rebuilding times, SPR harvest rates, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the harvest rates (solved for using new models) which produce the current optimum yield amounts in place for 2007-2008.

   3) Projections of yields and SPR harvest rates (solved for using new models) which rebuild the stock in 50 percent of the runs by the T_{TARGET} specified in Amendment 16-4.

4) Projections of yields, median rebuilding times, SPR harvest rates, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the ABC harvest rate.

Other suggested needs:

- ABC projections.
- Projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}. These projections should be determined by projecting the median rebuilding times under the most conservative rebuilding strategy (i.e., $T_{F=0}$) and the most liberal, allowable rebuilding strategy (i.e., T_{MAX}) and then parsing intermediate time intervals in even quartile increments. That is, if $T_{F=0}$ = 10 years and T_{MAX} = 50 years, then the intermediate alternatives would have rebuilding times equal to 20, 30, and 40 years, respectively. Through iteration, determine the SPR harvest rate, 2009 and 2010 OYs, and the probability of rebuilding by T_{MAX} (i.e., P_{MAX}) under each alternative rebuilding schedule. This will allow the Council to explore the tradeoff between economic impacts associated with alternative harvest levels and conservation needs of the stock.

Finally, one last bit of guidance on specifying total mortalities in 2007 and 2008 in your rebuilding analyses. All projections in the rebuilding analysis should begin in the year 2009. Total removals in 2007 and 2008 should either be the specified 2007 and 2008 OYs or the GMT's best impact projections from the most recent bycatch scorecard.

Please feel free to contact me (John.DeVore@noaa.gov; 503-820-2413) if you have any questions.

TABLE 4-2. Specified rebuilding plan parameters revised under Amendment 16-4.

Species	B_0	B_{MSY}	T_{MIN} *	T_{MAX}	$T_{F=0}$ *	P_{MAX}	T_{TARGET}	Harvest Control Rule (SPR Harvest Rate)
Darkblotched Rockfish	26,650 M eggs	10,660 M eggs	2009	2033	2010	100%	2011	F60.7%
Pacific Ocean Perch	37,838 units of spawning output	15,135 units of spawning output	2015	2043	2015	92.90%	2017	F86.4%
Canary Rockfish	34,155 mt	13,662 mt	2048	2071	2053	55.40%	2063	F88.7%
Bocaccio	13,402 B eggs in 2005	5,361 B eggs	2018	2032	2021	77.70%	2026	F77.7%
Cowcod	3,045 mt	1,218 mt	2035	2074	2035	90.60%	2039	F90.0%
Widow Rockfish	49,678 M eggs	19,871 M eggs	2013	2033	2013	95.20%	2015	F95.0%
Yelloweye Rockfish	3,322 mt	1,328 mt	2046	2096	2048	80%	2084	F71.9% **

* T_{MIN} is the shortest time to rebuild from the onset of the rebuilding plan or from the first year of a rebuilding plan, which is usually the year after the stock was declared overfished. The shortest possible time to rebuild the stocks with rebuilding plans under consideration in Amendment 16-4 is $T_{F=0}$, which is the median time to rebuild the stock if all fishing-related mortality were eliminated beginning in 2007. ***(NOTE: For 2007 rebuilding analyses, $T_{F=0}$ is the median rebuilding time if all fishing related mortality were eliminated beginning in 2009).***

** The yelloweye rebuilding plan specifies a harvest rate ramp-down strategy before resuming a constant harvest rate in 2011. F71.9% is the constant harvest rate beginning in 2011.

Bocaccio Rebuilding Analysis for 2007

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished biomass. Based on the stock assessment by Ralston et al. (1996), bocaccio was declared formally to be overfished, thereby requiring development of a rebuilding plan for consideration by the Council in the fall of 1999. Rebuilding was initiated by catch restrictions beginning in 2000.

A number of bocaccio stock assessments (MacCall et al. 1999, MacCall 2002, MacCall 2003a, MacCall 2005a, MacCall 2007) and rebuilding analyses (MacCall 1999, MacCall and He 2002, MacCall 2003b, MacCall 2005b) have now been conducted since the stock was declared overfished. In 2004, a formal rebuilding plan for bocaccio was enacted by the Pacific Fishery Management Council (PFMC) as part of Amendment 16-3 to the Pacific Coast Groundfish Fishery Management Plan (PFMC 2004). That plan was revised by Amendment 16-4, which was based ont he 2005 rebuilding analysis (MacCall 2005b).

The 2003 stock assessment examined three models of bocaccio. One of those, the STATc model, was used as the basis for subsequent fishery management and as the basis of FMP Amendments 16-3 and 16-4. The 2007 bocaccio stock assessment updated the 2003 and 2005 STATc models, and is the basis of this rebuilding analysis.

Management Performance

Details of management performance are provided in Table 1. Because total kill requires statistical estimation of discards, and an ongoing observer program is providing progressively more precise estimates, this accounting of management performance differs from those in MacCall (2005b).

2000-2002: The rebuilding OY was set at 100MT for all three years as a transition to a constant fishing mortality rate policy beginning in 2003. This was a learning period for fishery management, which required unprecedented restrictions on both commercial and recreational fishing opportunities. Although landed catch was below 100MT in all three years, total kill (including discards) exceeded targets in all three years, but with a smaller excess by the third year.

2003: In response to the 2002 bocaccio assessment, which indicated very low productivity, the 2003 OY was set at "less than" 20MT, and the retained catch was about 10MT, nearly all of which was in the recreational fishery. Including mortality of estimated discards, estimated 2003 total kill was 14MT.

2004: Based on the 2003 assessment, which showed a much more productive stock, the 2004 OY was set at an operational target of 199MT; the final catch was 66MT. Discards brought the estimated 2004 kill to 82MT.

2005: The OY was set at 307MT. Landed catch was 42MT, and estimated an discard of 45MT resulted in an estimated 2005 kill of 87MT.

2006: The OY was set at 306MT. Landed catch was 42MT, and estimated an discard of 25MT resulted in an estimated 2005 kill of 67MT.

2007: The 2007 and 2008 OYs were set at 218MT. The year is not yet complete, but as of August, the projected 2007 kill (landings plus discards) was 151MT (J. DeVore, PFMC, pers. comm.).

Summary: Although the rebuilding OY was exceeded during the first three years of rebuilding, kill during the subsequent five years (including the 2007 projection) has fallen far below the respective rebuilding OYs. For the eight years of rebuilding, the cumulative kill has fallen 40% below the cumulative OY, indicating excellent management performance overall.

Table 1. Recent history of bocaccio management performance.

	Commercial			Recreational			Total			ABC	OY
Year	Catch	Discard	Total	Catch	Discard	Total	Catch	Discard	Total		
2000	28	49	77	103	9	112	128	58	189	164	100
2001	22	76	98	103	6	109	125	82	207	122	100
2002	21	27	48	82	2	84	103	32	132	122	100
2003	1	2	3	9	2	11	10	12	14	244	<20
2004	12	8	20	55	8	62	66	18	82	400	199
2005	8	41	49	34	4	38	42	45	87	566	307
2006	5	20	25	37	5	42	42	25	67	549	306
2007			53**			98**			151**	602	218
2008										618	218

* Discarded commercial catch was not estimated and is assumed to be negligible.
** Projected as of August, 2007 (John. DeVore, pers. comm.)

Simulation Model

This analysis uses the SSC Default Rebuilding Analysis (version 2.11, dated September 2007). All data and parameters use as input to this analysis were taken from the STATc model in the 2007 assessment. An example input file is given in Appendix A. Future recruitments were simulated by re-sampling estimated historical recruits/spawning output (**R/B**) ratios from years 1970 to 2005. e-sampling **R/B** values is justified by the estimated Mace-Doonan steepness value of ***h*** = 0.2 in the 2007 stock assessment. This value of steepness indicates negligible curvature in the estimated stock-recruitment relationship. Probability distributions are based on 2000 simulations. Note: There may be minor differences between some values estimated in the stock assessment (STATc2007) and those estimated by the SSC Default Rebuilding Analysis.

Rebuilding Parameters/Management Reference Points

A history of recent changes in model parameters is given in Table 2.

$\mathbf{B_{unfished}}$**:**Unfished biomass (measures as spawning output) is estimated by multiplying average recruitment (**R**) by the spawning output per recruit achieved when the fishing mortality rate is zero ($\mathbf{SPR_{F=0}}$ = 2.49), spawning output in billion eggs, recruitment in thousand fish at age 1). Based on the 2007 bocaccio assessment, the estimated unfished spawning output ($\mathbf{B_{unfished}}$) is 13554 billion eggs, based on the average recruitment from spawning years between 1950 and 1985. This time period was chosen as representing a presumably "natural" range of stock abundance. Because recruitment is highly variable, this calculation of unfished abundance is imprecise (CV $10%; variability is underestimated because estimated recruitment in the first ten years is held constant).

$\mathbf{B_{msy}}$**:** The rebuilding target is the spawning abundance level that produces MSY. This value cannot be determined directly for bocaccio, so this analysis uses the PFMC proxy value of 40% of estimated unfished spawning output. Estimated $\mathbf{B_{msy}}$ is 5421 billion eggs.

Current status: According to the 2007 stock assessment as modified for input to the SSC Rebuilding Analysis model, the 2006 spawning output is 1727 billion eggs, which is 32% of the estimated $\mathbf{B_{msy}}$, and 13% of estimated $\mathbf{B_{unfished}}$.

Mean generation time: Mean generation time of bocaccio is estimated from the net maternity function, and is 14 years.

Table 2. Parameters and reference points for rebuilding

Date of Analysis	2003	2005	2007
Assessment model used as basis	STATc	STATc2005	STATc2007
Spawning output per recruit at F=0	2.50	2.50	2.49
Bunfished (billion eggs)	13387	13402	13554
Btarget=B40 (billion eggs)	5355	5361	5421
First year of rebuilding	2000	2000	2000
Present year (Final year of assessment)	2003	2005	2006
First simulated year	2004	2006	2007
Tmin estimated	2018	2018	2019
Mean Generation Time	14	14	14
Tmax estimated	2032	2032	2033
Adopted Policy	Amend 16-3	Amend 16-4	TBD
Prob rebuild by Tmax	0.7	0.8	
Rebuild SPR	0.693	0.777	
Exploitation Rate	0.0498	0.0340	
Ttarg (median rebuild date)	2027	2026	
Ttarg from Amendment 16-3 (wrong)	2023		

Simulation Runs

Nine new scenarios are examined. For comparison, a tenth scenario is taken from the 2005 rebuilding analysis, and was the basis for bocaccio management during 2007-2008. The scenarios include cases of no fishing (run C), three alternative interpretations of status quo management (runs D1, D2 and D3), two scenarios with 50% probability of rebuilding by the old and new values of $\mathbf{T_{max}}$ respectively, a 40-10 harvest policy scenario, and an $\mathbf{F_{msy}}$ scenario. One more scenario of $\mathbf{T_{target}}$ = 2029 was added as an intermediate solution.

Results

Simulated individual rebuilding trajectories are erratic due to rare large recruitments (Figure 1). The time series of percentiles and medians of simulated catch and abundance trajectories (Table 3, Figure 2) provide a more informative overview of likely rebuilding performance and uncertainty.

Simulation results, including time series of median catch and median spawning output relative to the rebuilding target are shown in Tables 3a and 3b, and in Figure 3. Previous projections for **SPR** = 0.777 (the policy adopted under Amendment 16-4) for comparison. The current projection indicates that at **SPR** = 0.777, rebuilding may occur about two years earlier than under the 2005 rebuilding scenario, and a policy of setting the 2009 fishing rate to a value that achieves the 2008 OY (218 mtons) would rebuild three years earlier. This difference is presumably mainly due to evidence of a strong 2003 yearclass. Alternatively, if the rebuilding policy seeks to maintain a 50% probability of rebuilding by $\mathbf{T_{target}}$ = 2026, the allowable catch could be increased substantially. It is noteworthy that the Council's 40-10 harvest policy (which normally is applied to healthy groundfish stocks) is now also a viable rebuilding policy, with a median rebuilding date of 2030.

Catches and biomasses projected under an ABC (i.e., $\mathbf{F_{msy}}$ proxy = $\mathbf{F_{50\%}}$) harvest policy do not correspond to the ABC for individual years under other policies, but rather represent projections under the maximum allowable harvest rate. Also note that the **F**=0 projection (no catches beginning in 2009) now has a median rebuilding date of 2020, as opposed to the original $\mathbf{T_{min}}$ of 2018 which assumed no harvest beginning in 2000, among other things.

Analysis of Sustainability

Under the fishing rates given by this rebuilding analysis, the probability of further long-term decline in bocaccio abundance is negligibly small (less than one percent over the next 100 years).

Acceptable Biological Catch (ABC) in 2007 and 2008

The value of ABC for 2009 is 793mtons, as given by the median catch for the ABC scenario in Table 3.

Postscript

A revised projected catch for year 2007 became available as this document was being finalized. The 2007 catch is now expected to be 104 mtons, which is substantially less than the 151 mtons in earlier projections (J. DeVore, PFMC, pers. comm.). Use of the revised 2007 catch results in insignificant changes to the projections presented in this document.

Table 3a. Results of rebuilding projections. Bold numbers are specifications for runs. Where applicable, rebuilding policy reverts to 40-10 policy upon achieving target abundance.

Run Name		from 2005	C	D2	D1	D3	Alt2029	Tmax2032	Tmax2033	ABC	40-10
Description		P(2032)=0.8	F=0	F(currentOY)	current SPR	P(Ttarg)=0.5	P(2029)=0.5	oldTmax	newTmax	**F50%(ABC)**	**40-10 Policy**
SPR		0.777	1.000	**0.8262**	**0.777**	0.6641	0.595	0.546	0.536	**0.5**	variable
F		0.034	**0**	**0.0287**	0.0381	0.0624	0.0798	0.0932	0.0964	0.0971	variable
P(by 2018)	old Tmin	0.080	0.320	0.191	0.146	0.085	0.047	0.032	0.028	0.017	0.042
P(by 2021)	old T(F=0)	0.240	0.585	0.432	0.363	0.234	0.149	0.097	0.112	0.064	0.139
P(by 2026)	old Ttarg	0.551	0.863	0.723	0.668	**0.500**	0.369	0.285	0.264	0.204	0.357
P(by 2029)		0.690	0.935	0.837	0.790	0.632	**0.500**	0.387	0.363	0.290	0.489
P(by 2032)	old Tmax	**0.800**	0.968	0.903	0.873	0.747	0.612	**0.500**	0.473	0.376	0.604
P(by 2033)	new Tmax	0.833	0.975	0.915	0.888	0.777	0.646	0.527	**0.500**	0.408	0.628
median Trebuild		2026	2020	2022	2023	**2026**	**2029**	**2032**	**2033**	2037	2030
Median Catch											
2006	actual	*150*	*67*	*67*	*67*	*67*	*67*	*67*	*67*	*67*	*67*
2007	projected	216	*151*	*151*	*151*	*151*	*151*	*151*	*151*	*151*	*151*
2008	assumed	219	*218*	*218*	*218*	*218*	*218*	*218*	*218*	*218*	*218*
2009		234	0	**218**	288	468	594	691	714	793	384
2010		254	0	227	302	482	606	698	719	793	422
2011		277	0	246	323	509	632	724	745	816	472
2012		306	0	265	354	549	676	767	788	858	535
2013		336	0	289	387	593	726	818	839	908	615
2014		365	0	316	426	646	782	876	897	965	702
2015		395	0	344	467	696	834	927	949	1015	811
2016		423	0	375	507	750	893	987	1007	1071	912
2017		453	0	409	546	796	937	1028	1048	1108	995
2018		485	0	440	586	842	982	1072	1090	1147	1089
2019		516	0	472	622	882	1018	1099	1116	1167	1167
2020		551	0	510	661	930	1064	1143	1160	1210	1237

Table 3b. Results of rebuilding projections. Bold numbers are specifications for runs. Shaded cells indicate median abundance exceeds rebuilding target. Where applicable, rebuilding policy reverts to 40-10 policy upon achieving target abundance.

Run Name	from 2005	C	D2	D1	D3	Alt2029	Tmax2032	Tmax2033	ABC	40-10
Description	P(2032)=0.8	F=0	F(currentOY)	current SPR	P(Ttarg)=0.5	P(2029)=0.5	oldTmax	newTmax	**F50%(ABC)**	**40-10 Policy**
SPR	0.777	1.000	**0.8262**	**0.777**	0.6641	0.595	0.546	0.536	**0.5**	variable
F	0.034	**0**	**0.0287**	0.0381	0.0624	0.0798	0.0932	0.0964	0.0971	variable
P(by 2018) old Tmin	0.080	0.320	0.191	0.146	0.085	0.047	0.032	0.028	0.017	0.042
P(by 2021) old T(F=0)	0.240	0.585	0.432	0.363	0.234	0.149	0.097	0.112	0.064	0.139
P(by 2026) old Ttarg	0.551	0.863	0.723	0.668	**0.500**	0.369	0.285	0.264	0.204	0.357
P(by 2029)	0.690	0.935	0.837	0.790	0.632	**0.500**	0.387	0.363	0.290	0.489
P(by 2032) old Tmax	**0.800**	0.968	0.903	0.873	0.747	0.612	**0.500**	0.473	0.376	0.604
P(by 2033) new Tmax	0.833	0.975	0.915	0.888	0.777	0.646	0.527	**0.500**	0.408	0.628
median Trebuild	2026	2020	2022	2023	**2026**	**2029**	**2032**	**2033**	2037	2030
Median Spawning Output Relative to Target										
2006	0.284	0.319	0.319	0.319	0.319	0.319	0.319	0.319	0.319	0.319
2007	0.298	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345
2008	0.309	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372
2009	0.320	0.393	0.393	0.393	0.393	0.393	0.393	0.393	0.393	0.393
2010	0.334	0.415	0.409	0.408	0.403	0.399	0.397	0.396	0.394	0.405
2011	0.354	0.440	0.428	0.424	0.414	0.407	0.401	0.400	0.396	0.418
2012	0.378	0.474	0.453	0.446	0.430	0.418	0.410	0.408	0.401	0.435
2013	0.405	0.512	0.482	0.472	0.449	0.434	0.422	0.419	0.410	0.456
2014	0.439	0.560	0.520	0.506	0.475	0.454	0.438	0.435	0.422	0.481
2015	0.477	0.617	0.563	0.546	0.506	0.479	0.458	0.454	0.438	0.510
2016	0.519	0.683	0.616	0.593	0.543	0.510	0.485	0.480	0.461	0.542
2017	0.564	0.762	0.676	0.646	0.584	0.543	0.514	0.507	0.484	0.579
2018 old Tmin	0.605	0.840	0.732	0.698	0.620	0.572	0.537	0.529	0.502	0.608
2019	0.648	0.923	0.797	0.752	0.662	0.604	0.563	0.554	0.523	0.642
2020	0.692	1.017	0.860	0.811	0.704	0.637	0.589	0.579	0.542	0.670
2021	0.741	1.106	0.921	0.863	0.742	0.664	0.611	0.598	0.557	0.699
2022	0.794	1.207	0.996	0.927	0.785	0.697	0.636	0.623	0.577	0.728
2023	0.849	1.327	1.078	0.998	0.832	0.734	0.665	0.650	0.599	0.763
2024	0.908	1.454	1.164	1.075	0.883	0.773	0.695	0.678	0.623	0.795
2025	0.953	1.601	1.266	1.159	0.939	0.817	0.731	0.712	0.650	0.829
2026 old Ttarg	1.000	1.743	1.357	1.236	0.972	0.848	0.755	0.735	0.667	0.857
2027	1.033	1.899	1.459	1.321	1.007	0.888	0.787	0.764	0.689	0.885
2028	1.065	2.085	1.585	1.420	1.040	0.931	0.820	0.795	0.713	0.916
2029	1.103	2.279	1.701	1.524	1.084	0.971	0.854	0.827	0.737	0.966
2030	1.144	2.518	1.843	1.648	1.128	1.012	0.897	0.868	0.770	1.003
2031	1.187	2.752	1.983	1.769	1.177	1.045	0.933	0.903	0.797	1.043
2032 old Tmax	1.241	3.031	2.166	1.907	1.220	1.084	0.971	0.945	0.828	1.080
2033	1.304	3.314	2.336	2.042	1.256	1.125	1.000	0.973	0.855	1.116

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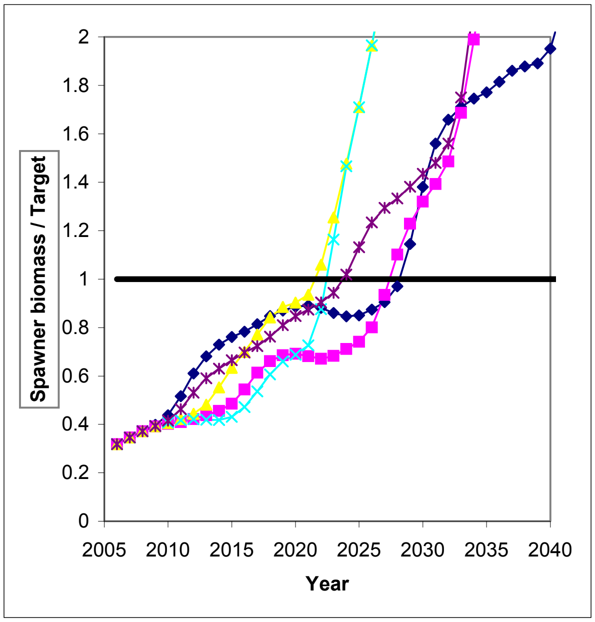

Figure 1. Example individual rebuilding trajectories for bocaccio.

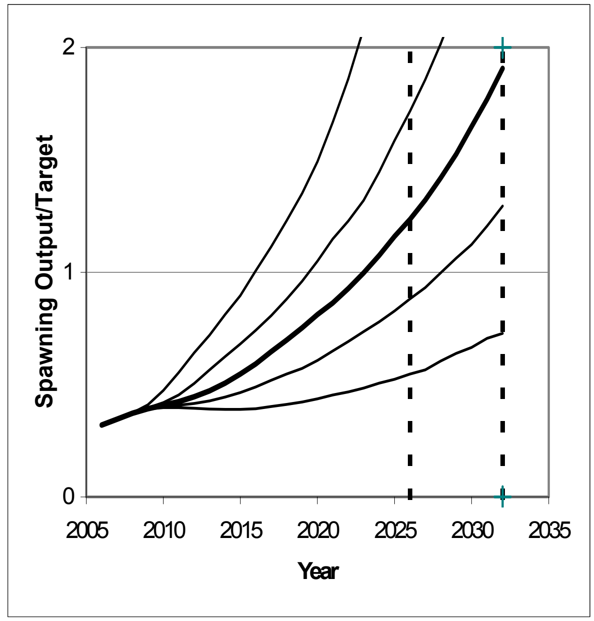

Figure 2. Envelope of rebuilding trajectories for current SPR = 0.777. Lines are 5, 25, 50, 75 and 95 percentiles of 2000 simulations.

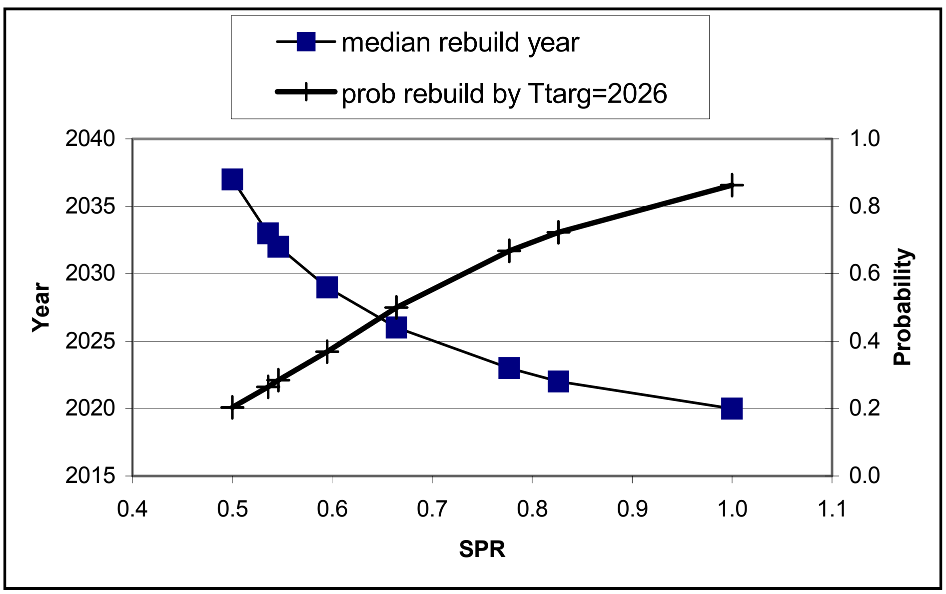

Figure 3. Relationship of median rebuild time and probability of rebuilding by 2026 as related to the SPR rate specified in alternaive rebuilding scenarios.

Appendix A. Projection data file for Run D1.

```
# Title
bocaccio model STATC2007revC at SPR=0.777
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
1 21
# Number of fleets to consider
1
# First year of the projection
2006
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
"# Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment (3)"
2
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
#  1  2  3  4  5  6  7  8  9 ...  21+
0.0001  0.0018  0.0257  0.1296  0.322   0.5436  0.7579  0.9606  1.155   1.3396  1.5077  1.6538  1.7766
        1.8782  1.9613  2.0289  2.0831  2.1266  2.1612  2.189   2.2466
# Age specific information (Females then males) weight and selectivit
# Females wt and composite selectivity
0.2227  0.4983  0.8752  1.3083  1.7649  2.2191  2.6541  3.0613  3.4362  3.7726  4.0643  4.3101  4.5145
        4.6831  4.8214  4.9333  5.0235  5.0958  5.1537  5.2002  5.2963
0.21    0.56    0.81    0.98    0.96    0.82    0.66    0.52    0.42    0.35    0.31    0.29    0.27
        0.26    0.25    0.24    0.24    0.23    0.23    0.23    0.22
# Males wt and composite selectivity
0.2235  0.4604  0.7631  1.0904  1.4172  1.7266  2.0089  2.2597  2.478   2.6652  2.8241  2.9578  3.0698
        3.163   3.2404  3.3044  3.3574  3.4008  3.4364  3.4656  3.5245
0.21    0.52    0.75    0.93    1       0.98    0.9     0.8     0.72    0.65    0.58    0.54    0.5
        0.47    0.45    0.44    0.42    0.41    0.4     0.4     0.39
"# Age specific information (Females then males), natural mortality and numbers at age in2006"
# Females
0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
        0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
524.5   394     1002.4  153     128.1   11.2    1119.3  57.1    31.1    105.3   36.8    52.8    43.6
        14      37.9    30.9    1.5     38.1    6.9     3.7     27.8
# Males

0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
        0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
524.5   393.9   1002.8  153.2   128.2   11.3    1119.6  57.1    31.2    104.9   36.5    52.5    43.3
        13.9    37.9    30.5    1.4     34.5    5.7     2.8     12.4
# Initial age-structure (for Tmin)

2972    156     87      296     102     144     117     37      100     81      4       99      18
        10      6       34      1       0       1       1       28
2972    156     87      298     104     148     121     38      104     83      4       93      15
        7       4       20      1       0       1       0       7
# Year for Tmin Age-structure
2000
# Number of simulations
2000
# Recruitment and Spanwer biomasses
# Number of historical assessment years
56
```

"# Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based"
"# on R, Used to project based on R/S"

1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
	1964	1965	1966	1967	1968	1969	1970	1971	1972	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					
3523	3523	3523	3523	3523	3523	3523	3523	3523	5698	1333	1192	52337
	860	757	890	1344	2156	3044	3199	14364	1818	1982	15876	5545
	1291	537	23791	1980	8373	1397	1599	151	637	10838	1454	1421
	1683	5857	143	1881	1527	385	869	796	435	1006	245	368
	5944	50	481	489	2732	917	1049					
3580	3560	3547	3486	3396	3285	3088	2858	2565	2359	2221	2213	2311
	2312	2801	4331	6221	7227	7736	7910	7766	7499	7063	6137	5034
	4335	3961	4027	3923	3600	3552	3584	3305	2837	2256	1858	1459
	1351	1349	1179	968	958	921	857	820	808	804	802	836
	871	901	958	1134	1386	1585	1727					
1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0					
0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	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	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	0	0					

Number of years with pre-specified catches
3
#line20Catches for years with pre-specified catches
2006 67
2007 151
2008 218
Number of future recruitments to override
0
Process for overiding (-1 for average otherwise index in data list)
"# Which probability to product detailed results for (1=0.5,2=0.6,etc.)"
2
Steepness and sigma-R and auto-correlations
0.2 1.0 0.0
#line26Target SPR rate (FMSY Proxy)
0.5
Target SPR information: Use (1=Yes) and power
0 20
Discount rate (for cumulative catch)
0.1
Truncate the series when 0.4B0 is reached (1=Yes)
0
Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
2
Percentage of FMSY which defines Ftarget
0.9
Maximum possible F for projection (-1 to set to FMSY)
-1
Conduct MacCall transition policy (1=Yes)
0
Defintion of recovery (1=now only;2=now or before)
2
Projection type
1
"# Definition of the ""40-10"" rule"

10 40
Produce the risk-reward plots (1=Yes)
0
Calculate coefficients of variation (1=Yes)
0
Number of replicates to use
20
First Random number seed
-89102
Conduct projections for multiple starting values (0=No;else yes)
0
File with multiple parameter vectors
MCMC.PRJ
Number of parameter vectors
100
#line44 User-specific projection (1=Yes); Output replaced (1->6)
1 2 0 0
Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2009 3 0.777
-1 -1 -1
Split of Fs
2006 1
-1 1
Five pre-specified years (used to define Ttarget for option 4)
2010 2011 2012 2013 2014
Year for which a probability of recovery is needed
2032
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv
Use bisection (0) or linear interpolation (1)
0
Target Depletion
0.4
Project with Historical recruitments when computing Tmin (1=Yes)
0
CV of implementation error
0

Rebuilding analysis for canary rockfish based on the 2007 stock assessment

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15 October, 2007

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Summary

Based on the 2007 stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. canary rockfish stock. The base case assessment results estimated that the canary rockfish resource is at 32.4% of the unexploited equilibrium spawning biomass at the beginning of 2007. Uncertainty in that result is included through the integration over two alternate (and less likely) states of nature corresponding to lower and higher stock-recruitment steepness (h), the parameter largely governing productivity and recent rebuilding trajectory. The 2007-2008 OYs have been set at 44 mt based on the rebuilding SPR rate of 88.7% used in the 2002 and 2005 rebuilding analyses. This level of harvest does not correspond to overfishing (based on the 2007 assessment).

Beginning in 2009, various management options are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (ABC catches). In the absence of any future fishing mortality, the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2019. In contrast, the stock is not projected to reach this level for 143 years (2152) if the ABC catches are removed. The current rebuilding harvest rate (SPR = 88.7%) would produce an OY of 155.2 mt in 2009 and has a 50% probability of rebuilding by 2021. The harvest rate that is consistent with the 2007-2008 OYs (44 mt) is SPR = 96.2%, and if continued, results in a 50% probability of recovery by 2020. Similarly, harvest rates based on a 2009 OY of 35-115 mt all result in a median year to rebuild of 2020, although they differ in the years for higher probabilities of recovery than 50%. A range of alternate management approaches to recovery based on past and recalculated reference points as well as harvest rates corresponding to short-term OYs are presented.

Introduction

The stock assessments conducted in 1999 for canary rockfish documented that the stock had declined below the overfished level in the northern (Columbia and U.S. Vancouver INPFC areas) and southern regions (Conception, Monterey and Eureka areas; Crone et al. 1999, Williams et al. 1999). Canary rockfish was determined to be in an "overfished" state on Jan. 1, 2000 and development of a rebuilding plan was initiated while preliminary rebuilding estimates were implemented through adjustments of annual management measures. The first rebuilding analysis for canary rockfish was conducted in 2000 based on the 1999 stock assessment (Methot 2000). This analysis has subsequently been updated on the basis of the 2002 (Methot and Piner), 2005 (Methot and Stewart) and now the 2007 stock assessment results (Stewart).

The first rebuilding analysis used results from the northern area assessment to project rates of potential stock recovery (Methot 2000). The stock was found to have long recovery times based on extremely low productivity. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057 and maintaining a constant catch throughout the rebuilding period.

The rebuilding analysis was updated in 2002 (Methot and Piner, 2002) to incorporate the coast-wide assessment results. This analysis was the basis of a change from a constant catch to a constant harvest rate rebuilding strategy, as was done for other west coast groundfish rebuilding plans. The results of the 2002 assessment and rebuilding analysis indicated that the relative spawning biomass had reached a low of 6.6% in 2000 (compared to the unfished equilibrium level), the year of the overfished declaration. By 2002 it had increased to 7.9%. The rate of rebuilding was based on the model-estimated stock-recruitment relationship with a steepness of 0.33 and stochastic projections sampling lognormal deviations about this relationship. The time to rebuild from the year of declaration with no fishing, T_{MIN}, was estimated to be year 2057. The mean generation time was calculated to be 19 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2076 (2057 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2074 on the basis of a harvest rate that would achieve a 60% probability of rebuilding by 2076 (T_{MAX}). This rebuilding harvest rate produced an OY in 2003 of 41 mt. The 2002 analysis demonstrated the sensitivity of the target harvest rate (and short-term OYs) to the commercial vs. recreational allocation, because of the difference in selectivity between the two gear groups. Final calculations were based upon a 50:50 division of rebuilding OYs.

The 2005 rebuilding analysis (Methot 2005) recalculated all rebuilding reference points on the basis of two alternate models for selectivity (sex-specific or not) and a profile of values for stock-recruitment steepness for each model. Rebuilding projections therefore included uncertainty in selectivity, steepness and future recruitment strength. The stock was estimated to be at 9.4% of unexploited spawning biomass in 2005. The time to rebuild from the year of declaration (2000) with no fishing, T_{MIN}, was estimated to be year 2048. Mean generation time was estimated to be 23 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2071 (2048 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2063 on the basis of the same harvest rate selected in 2002 (SPR= 88.7%). This harvest rate was projected to achieve a 55.4% probability of rebuilding by 2071 (T_{MAX}). Because of slightly below-average recruitments since the stock had been declared overfished, the projected year with a 50% probability of rebuilding to target stock size if fishing mortality were zero beginning in 2007 ($T_{F=0}$) was 2053. A list of reference points from the 2005 rebuilding analysis is presented in Table 1. The 2005 rebuilding analysis projected OYs based on three fishing fleets (trawl, non-trawl and recreational) maintaining a 50:50 split between commercial and recreation sectors, although this had not been realized in the actual removals during the intervening years since 2002.

2007 Assessment summary

The 2007 canary rockfish stock assessment estimated the unexploited spawning biomass (SB_0) to be 32,561 mt in the base case model (Stewart 2007). The stock was estimated to be at 32.4% of this level at the beginning of 2007. The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, was 0.511 in the base model, with the degree of recruitment variability (σ_r) set at 0.50. Two alternative states of nature were presented, representing lower stock-recruitment steepness (0.345) and higher steepness (0.72); each of these states was assigned a probability equal to half that of the base case model (0.5), based on a meta-analysis of west coast rockfish (M. Dorn, Alaska Fisheries Science Center, personal communication). These alternate models estimated the stock to be at a much lower (12%) or higher (56%) relative stock size.

Important changes in the 2007 assessment included:

- Updating the catch history (1981-2006).
- Addition of the NWFSC trawl survey data (2003-2006).
- Addition of the coast-wide pre-recruit index.
- Inclusion of extensive re-aging and exchange between WDFW and NMFS ageing labs.
- Addition of new fishery age and length data from port and observer sampling programs.
- Change to using GLMM instead of design-based estimators of survey abundance.
- Partitioning of the Triennial trawl survey into two periods of catchability (1980-1992, 1995-2004) based on changes in survey timing during the summer.
- Application of time-varying fishery selectivity based on changes in management identified *a priori*.

Changes in the results of the 2007 assessment compared to those in 2005 were due primarily to the division of the triennial survey into two time series, and the application of time-varying selectivity for recent fishery removals. The net result of these changes was a loss of information from canary-specific data about steepness, which led to the use of a higher value (0.511) based on meta-analysis results instead of estimating the value directly in the base case assessment model.

Management performance under rebuilding

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. Over that period, the total mortality was near the OY, and well below the ABC. The total 7-year catch (644 mt) was only 13% above the sum of the OYs for 2000-

2006. This level of removals represents only 35% of the sum of the ABCs for that period (Table 1).

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 2.11, September 2007) and includes the requested model runs outlined in a recent Council memorandum (4 September, 2007). The steps followed were:

1. Define how virgin biomass (SB_0) will be calculated.
2. Define how future recruitment will be generated.
3. Define the fishery selectivity and allocation to be applied during rebuilding.
4. Decide how to include uncertainty in input parameters from the stock assessment in the rebuilding analysis.
5. Recalculate rebuilding reference points from the most current assessment results
   a) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated ($T_{F=0}$).
   b) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (T_{MIN}).
   c) Calculate the mean generation time.
   d) Calculate the maximum allowable rebuilding time (T_{MAX}).
6. Identification and analysis of alternative harvest strategies for rebuilding.

1. Definition of SB_0

The equilibrium spawning biomass level (SB_0) used in this rebuilding analysis is calculated via the stock-recruitment relationship in order to be consistent with assessment model results. This level is estimated to be 32,561 mt in the base case assessment model, which dictates that the rebuilding target ($SB_{40\%}$) is 13,024 mt (Table 2).

2. Generation of future recruitment

The parameters of the stock recruitment relationship (unexploited equilibrium recruitment [natural log of R_0], steepness [h], and the degree of recruitment variability [σ_r]) from the 2007 stock assessment are used to generate future recruitments in the rebuilding analysis. These values are provided in Table 3.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the canary rockfish rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. Unlike previous rebuilding analyses, this analysis projects forward using selectivity and allocation averaged over recent years (2003-2006). This choice was made because the realized fraction of the catch coming from the recreational sector has been substantially lower than the 50% value used in previous rebuilding projections (average fraction of the catch from recreational sources over 2003-2006 = 33.7%). This choice also provides more consistency between assessment model results and short term-forecasts from the rebuilding analysis. Further, because the rebuilding software can only accommodate 5 fishing fleets, only the top five fleets in recent years (Oregon trawl, Washington trawl, Oregon-Washington non-trawl, northern California recreational and Oregon-Washington recreational fleets; based on total estimated catches) are included in forward projections. The effect of simplifying the fleet structure was relatively small and can be assessed via comparison of forecasts made in the assessment document and those made here. The resulting selectivity and weight at age are included in the basic input data files (Appendices A and B).

4. Inclusion of uncertainty

Uncertainty is included in this rebuilding analysis via integration of the three states of nature for stock-recruitment steepness reported in the 2007 assessment. Specifically, the model using a low value for steepness is given a probability of 25%, the base case 50% and the model using a high value for steepness 25%. This is achieved through the use of multiple parameter vectors in the rebuilding input files. Because these three states are discrete levels from a continuous probability distribution, it is expected that there will be a reasonably high degree of 'stair-stepping' in reported probabilities. This means that interpretation of the relative difference between 60% and 70% probabilities are probably not as meaningful as those between 70% and 80% where the upper tail is actually informing the difference. A similar pattern should exist in the lower tail as well. Addition of more parameter vectors would tend to smooth this pattern in the results, but is unlikely to substantially change the median values upon which decisions are generally made.

5. Recalculate reference points

With OYs already fixed for 2007-2008, the median year of recovery in the absence of fishing ($T_{F=0}$) was calculated by setting fishing mortality to zero in 2009 for all projections. The value for $T_{F=0}$ is 2019. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration is also 2019. This calculation reflects below average recruitments from 2000-2007. That T_{MIN} is equal to $T_{F=0}$ indicates harvest during this six-year period has had little effect on the stock trajectory.

The estimated generation time has decreased slightly to 22 years from 23 years as estimated in the 2005 analysis, primarily due to a slight change in the estimated natural mortality of older females. Revised vectors of weight-at-age through the explicit estimation of growth parameters in the 2007 assessment may also have contributed to this difference. In conjunction with T_{MIN}, the mean generation time dictates the revised estimate of T_{MAX}, 2041. Applying the same harvest rate (SPR_{TARGET} = 88.7%) used to find T_{TARGET} in the 2005 rebuilding analysis leads to a revised T_{TARGET} of 2021. This harvest rate generates a P_{MAX} (probability of recovery by T_{MAX}) of 74.9%.

All reference points from the 2005 rebuilding analysis and those recalculated here are summarized in Table 2.

6. Alternate rebuilding strategies

Assuming that a constant rate of harvest will be applied throughout a rebuilding period, the basis for rebuilding alternatives can be divided into three approaches: 1) strategies based on selection of a harvest rate, 2) strategies based selection of a T_{TARGET} (year for 50% probability of recovery) or 3) strategies based on selection of an OY for the next year under consideration (2009). This rebuilding analysis presents 20 alternate strategies spread among these three approaches and attempting to include all past and present reference points. Alternatives 1-9 correspond to the requests made in the recent Council memorandum (4 September, 2007), and 10-20 correspond to trajectories based on OYs that generate harvest rates lower than the current SPR target. Specifically, the alternatives are:

1) Eliminate all harvest beginning in 2009 (F=0).
2) Apply the current rebuilding harvest rate target (SPR_{TARGET}).
3) Apply the harvest rate which generates the 2007-2008 OYs (44 mt).
4) Apply a harvest rate that achieves a 50% probability of recovery by T_{TARGET} from Amendment 16-4 (2063).
5) Apply the ABC harvest rate ($SPR_{50\%}$).

Apply the harvest rate that achieves a 50% probability of recovery for years distributed between $T_{F=0}$ (2019) and T_{MAX} (2041):

6) 2023
7) 2029
8) 2035
9) 2041

Apply a harvest rate which generates a 2009 OY of:

10) 35 mt
11 55 mt
12) 65 mt
13) 75 mt
14) 85 mt
15) 95 mt
16) 105 mt
17) 115 mt
18) 125 mt
19) 135 mt
20) 145 mt

Results

Summary results from alternatives 1-9 are presented in Table 4. Detailed results are presented in Tables 6-8 and Figures 1-3. In the absence of any future fishing mortality, the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2019. In contrast, the stock is not projected to reach this level for 143 years (2152) if the ABC catches are removed (alternative 5). These two scenarios bound the range of fishing mortality between none and the overfishing level. All other scenarios lie within this range.

Fishing at the current SPR target (alternative 2) results in an increase from the 44 mt OY in 2008 to 155.2 mt in 2009. Retaining the harvest rate target also increases the probability of median recovery by T_{MAX} (over the 2005 value) to 75.0% even though T_{MAX} is reduced from 2071 to 2041. The current rebuilding harvest rate (SPR = 88.7%) results in a median year to rebuild (T_{TARGET}) of 2021. The harvest rate that is consistent with the 2007-2008 OYs (44 mt) is SPR = 96.2%, and if continued (alternative 3), results in a 50% probability of recovery achieved by 2020. Fishing at a rate that generates a median year of rebuilding that is equal to the existing T_{TARGET} of 2063 (alternative 4) corresponds to a 2009 OY of 800 mt. This suggests the need to consider ‘resetting’ the reference points from the 2005 rebuilding analysis in light of the changes to the assessment parameters and estimated current status. Alternatives 6-9 show the SPR targets required to achieve a median year of rebuilding that ranges from T_{TARGET} to T_{MAX}. These runs correspond to harvest rates in excess of the SPR = 88.7% value used in 2002 and 2005.

Summary results from alternatives 10-20 are presented in Table 5. Detailed results are presented in Tables 9-11 and Figures 4-6. These alternatives show the results of selecting a harvest rate target that is lower than the SPR = 88.7% value used in 2002 and 2005 based on the OY it would generate in 2009. Harvest rates based on a 2009 OY of 35-115 mt all result in a median year to rebuild of 2020, although they differ in the years for higher probabilities of recovery than 50%. For alternatives with 2009 OYs higher than 115 mt (alternative 15) the 2010 OY is lower than the 2009 OY, due to the continued effects of recent poor recruitment slowing the medium-term rate of recovery.

Acknowledgements

Richard Methot and Andre Punt provided assistance in using SS2 and the rebuilding software. John Devore provided guidance in interpreting Council requests and reference point calculations. This document benefited from the text and analysis presented in the 2005 canary rockfish rebuilding document. Jim Hastie and Stacey Miller provided preliminary comments that improved the quality of the document.

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Tables

Table 1. Canary rockfish management performance under rebuilding.

Year	ABC (mt)	OY (mt)	Landings (mt)[1]	Total Catch (mt)
2000	287	200	60.6	208.4
2001	228	93	42.8	133.6
2002	228	93	48.6	106.8
2003	272	44	8.5	51.0
2004	256	47.3	10.7	46.5
2005	270	46.8	10.9	51.4
2006	279	47	8.2	47.1

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

Table 2. Summary of rebuilding reference points for canary rockfish from the 2005 rebuilding analysis (and Amendment 16-4, table 4-2) and recalculated values based on the current rebuilding SPR_{TARGET} applied to the 2007 assessment results.

	Source	
Parameter	Amendment 16-4	2007 assessment
SB_0	34,155	32,561
Rebuilding target ($SB_{40\%}$)	13,662	13,024
SB_{2007}	NA	10,544
T_{MIN}	2048	2019
Mean generation time	23	22
T_{MAX}	2071	2041
$T_{F=0}$ (beginning in 2007)	2053	NA
$T_{F=0}$ (beginning in 2009)	NA	2019
P_{MAX}	55.4%	75.0%
T_{TARGET}	2063	2021
SPR_{TARGET}	88.7%	88.7%

Table 3. Stock-recruitment parameters for the three states of nature included in this rebuilding analysis.

	State of nature		
Parameter	Low steepness	Base case	High steepness
R_0 (1000s)	4,540	4,210	4,035
Steepness (h)	0.345	0.511	0.72
σ_r	0.50	0.50	0.50

Table 4. Results of rebuilding alternatives based on Council requests (memorandum, 4 September, 2007).

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2009 OY (mt)	0.0	155.2	44.2	800.0	936.9	328.1	541.4	636.9	700.0
2009 ABC (mt)	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9
2010 OY (mt)	0.0	155.0	44.3	777.3	905.1	325.2	531.8	623.1	683.1
2010 ABC (mt)	941.4	935.4	939.7	910.4	905.1	928.7	920.4	916.7	914.2
50% prob. recovery by:	2019	2021	2020	2063	2152	2023	2029	2035	2041
SPR_{TARGET}	100%	88.7%	96.6%	55.1%	50.0%	77.8%	66.4%	62.0%	59.2%
<u>Probability of recovery by reference points based on Amendment 16-4</u>:									
2048 (T_{MIN})	76.4%	75.0%	75.4%	40.8%	28.6%	75.0%	72.0%	64.8%	56.9%
2053 ($T_{F=0}$ from 2007)	79.4%	75.3%	77.3%	44.2%	29.7%	75.0%	73.4%	67.9%	61.3%
2063 (T_{TARGET})	91.4%	78.8%	87.8%	50.0%	32.3%	75.0%	74.5%	72.0%	66.8%
2071 (T_{MAX})	97.1%	84.6%	94.8%	54.3%	34.7%	75.3%	74.8%	73.5%	70.0%
<u>Probability of recovery by recalculated reference points</u>:									
2013 (T_{MIN})	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
2019 ($T_{F=0}$ from 2009)	55.0%	36.6%	48.7%	25.0%	25.0%	27.6%	25.5%	25.0%	25.0%
2021 (T_{TARGET})	70.2%	50.0%	67.8%	25.0%	25.0%	37.5%	27.4%	26.0%	25.6%
2041 (T_{MAX})	75.0%	75.0%	75.0%	35.4%	26.9%	74.9%	68.5%	58.6%	50.0%

Table 5. Results of rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2009 OY (mt)	35.2	44.2	55.2	64.7	75.6	85.3	95.0	104.8	114.7	125.0	134.8	145.0
2009 ABC (mt)	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9	936.9
2010 OY (mt)	35.3	44.3	55.3	64.8	75.7	85.4	95.1	104.8	114.7	124.9	134.7	144.8
2010 ABC (mt)	940.1	939.7	939.3	938.9	938.5	938.1	937.7	937.4	937.0	936.6	936.2	935.8
50% prob. recovery by:	2020	2020	2020	2020	2020	2020	2020	2020	2020	2021	2021	2021
SPR_{TARGET}	97.3%	96.2%	95.8%	95.1%	94.3%	93.6%	92.9%	92.2%	91.5%	90.8%	90.1%	89.4%
Probability of recovery by reference points based on Amendment 16-4:												
2048 (T_{MIN})	75.6%	75.4%	75.4%	75.4%	75.4%	75.2%	75.1%	75.0%	75.0%	75.0%	75.0%	75.0%
2053 ($T_{F=0}$ from 2007)	77.7%	77.3%	77.0%	76.7%	76.4%	76.3%	76.3%	76.2%	75.9%	75.6%	75.4%	75.4%
2063 (T_{TARGET})	88.3%	87.8%	86.7%	85.8%	84.5%	83.7%	82.6%	81.6%	81.0%	80.6%	80.1%	79.2%
2071 (T_{MAX})	95.2%	94.8%	94.2%	93.3%	92.4%	91.3%	90.4%	89.3	88.2%	86.8%	85.8%	85.0%
Probability of recovery by recalculated reference points:												
2013 (T_{MIN})	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
2019 ($T_{F=0}$ from 2009)	49.7%	48.7%	47.6%	46.2%	45.1%	44.6%	43.7%	42.4%	40.8%	39.6%	38.5%	37.5%
2021 (T_{TARGET})	68.5%	67.8%	67.1%	66.5%	65.5%	64.1%	62.6%	61.8%	60.5%	59.4%	58.9%	57.2%
2041 (T_{MAX})	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%

Table 6. Probability of recovery for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2008	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2009	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2010	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2011	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2012	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2013	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2014	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2015	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2016	0.251	0.250	0.251	0.250	0.250	0.250	0.250	0.250	0.250
2017	0.284	0.257	0.272	0.250	0.250	0.250	0.250	0.250	0.250
2018	0.407	0.288	0.360	0.250	0.250	0.258	0.250	0.250	0.250
2019	0.550	0.366	0.487	0.250	0.250	0.276	0.255	0.250	0.250
2020	0.660	0.473	0.599	0.250	0.250	0.320	0.260	0.256	0.251
2021	0.702	0.561	0.678	0.250	0.250	0.375	0.274	0.260	0.256
2022	0.732	0.633	0.714	0.253	0.250	0.440	0.293	0.267	0.261
2023	0.742	0.681	0.731	0.256	0.250	0.500	0.320	0.279	0.267
2024	0.746	0.707	0.742	0.257	0.250	0.560	0.344	0.290	0.275
2025	0.749	0.725	0.745	0.260	0.250	0.611	0.380	0.309	0.281
2026	0.749	0.735	0.747	0.265	0.250	0.647	0.401	0.321	0.293
2027	0.749	0.742	0.749	0.272	0.250	0.666	0.434	0.341	0.300
2028	0.750	0.746	0.749	0.278	0.250	0.687	0.465	0.358	0.313
2029	0.750	0.746	0.749	0.282	0.251	0.702	0.500	0.376	0.324
2030	0.750	0.747	0.750	0.287	0.252	0.713	0.526	0.402	0.336
2031	0.750	0.749	0.750	0.291	0.253	0.727	0.552	0.424	0.348
2041	0.750	0.750	0.750	0.354	0.269	0.749	0.685	0.586	0.500
2051	0.781	0.751	0.766	0.431	0.290	0.750	0.730	0.671	0.601
2061	0.895	0.776	0.854	0.494	0.317	0.750	0.745	0.714	0.660
2071	0.971	0.846	0.948	0.543	0.347	0.753	0.748	0.735	0.700

Table 7. Median spawning biomass (mt) for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544
2008	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841
2009	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073
2010	11,258	11,197	11,241	10,946	10,893	11,130	11,047	11,010	10,985
2011	11,383	11,260	11,348	10,753	10,647	11,123	10,955	10,880	10,831
2012	11,463	11,274	11,409	10,512	10,355	11,066	10,813	10,701	10,627
2013	11,524	11,268	11,450	10,251	10,045	10,987	10,649	10,501	10,403
2014	11,607	11,280	11,513	10,008	9,754	10,927	10,503	10,318	10,197
2015	11,751	11,351	11,636	9,816	9,516	10,920	10,408	10,186	10,041
2016	11,987	11,508	11,849	9,701	9,351	10,997	10,393	10,133	9,964
2017	12,328	11,765	12,165	9,669	9,269	11,164	10,462	10,163	9,969
2018	12,738	12,089	12,550	9,689	9,239	11,394	10,594	10,251	10,029
2019	13,181	12,432	12,964	9,737	9,237	11,648	10,744	10,357	10,113
2020	13,685	12,838	13,439	9,829	9,286	11,956	10,948	10,520	10,247
2021	14,236	13,293	13,963	9,959	9,361	12,312	11,192	10,721	10,419
2022	14,773	13,731	14,468	10,084	9,435	12,647	11,421	10,909	10,583
2023	15,350	14,210	15,017	10,235	9,536	13,024	11,686	11,130	10,775
2024	15,941	14,674	15,571	10,381	9,623	13,388	11,942	11,345	10,966
2025	16,500	15,133	16,099	10,493	9,693	13,735	12,165	11,515	11,105
2026	17,015	15,536	16,581	10,590	9,745	14,030	12,360	11,679	11,251
2027	17,517	15,959	17,061	10,704	9,812	14,366	12,582	11,852	11,391
2028	18,045	16,348	17,545	10,788	9,864	14,639	12,767	11,999	11,515
2029	18,600	16,811	18,074	10,933	9,958	15,004	13,020	12,211	11,699
2030	19,093	17,183	18,532	11,003	9,995	15,259	13,171	12,329	11,799
2031	19,528	17,519	18,934	11,046	9,996	15,504	13,316	12,432	11,877
2041	23,511	20,635	22,670	11,641	10,258	17,750	14,700	13,491	12,751
2051	26,282	22,743	25,229	12,043	10,419	19,302	15,662	14,238	13,357
2061	27,862	24,058	26,682	12,249	10,472	20,250	16,236	14,655	13,689
2071	28,903	24,832	27,667	12,531	10,621	20,841	16,739	15,097	14,073

Table 8. Median catches (mt) for rebuilding alternatives based on Council requests (memorandum, 4 September, 2007). Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8	9
Basis	F=0 2009+	SPR = 88.7%	SPR from 2007-2008 44 mt OYs	SPR that achieves 50% prob. recovery by 2063	ABC harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2023	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2041
2007	0.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2008	0.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2009	0.0	155.2	44.2	800.0	936.9	328.1	541.4	636.9	700.0
2010	0.0	155.0	44.3	777.3	905.1	325.2	531.8	623.1	683.1
2011	0.0	157.5	45.3	771.1	893.1	328.4	532.7	621.9	680.2
2012	0.0	163.7	47.2	783.3	902.9	339.2	546.1	635.4	693.4
2013	0.0	171.5	49.7	803.0	921.3	353.4	564.7	654.9	713.1
2014	0.0	179.7	52.2	823.9	940.6	368.2	584.6	675.9	734.4
2015	0.0	186.9	54.5	839.3	954.6	380.5	600.1	691.6	750.1
2016	0.0	193.4	56.6	850.4	962.3	391.6	613.3	705.3	763.1
2017	0.0	198.7	58.3	856.3	964.9	400.5	623.4	713.8	770.8
2018	0.0	205.1	60.4	864.4	969.4	410.9	634.4	724.3	780.5
2019	0.0	210.6	62.2	872.1	973.8	419.7	644.2	733.9	789.5
2020	0.0	216.8	64.3	879.0	978.0	430.0	656.0	744.3	798.9
2021	0.0	222.0	66.0	887.2	983.3	439.1	665.6	753.8	807.8
2022	0.0	228.3	68.1	896.1	988.0	449.0	677.4	765.2	818.8
2023	0.0	234.0	70.0	896.4	985.8	457.1	683.5	769.3	821.3
2024	0.0	239.0	71.7	904.5	990.9	465.0	692.6	778.8	830.7
2025	0.0	245.3	73.8	909.0	991.7	474.5	702.3	786.9	837.4
2026	0.0	250.0	75.5	915.7	996.6	482.2	710.7	795.2	845.3
2027	0.0	257.0	77.8	925.8	1,003.8	493.4	724.0	807.6	856.9
2028	0.0	261.7	79.4	930.2	1,004.9	501.1	731.8	814.0	862.9
2029	0.0	267.3	81.3	933.5	1,004.4	510.2	739.9	821.5	868.6
2030	0.0	272.3	83.0	941.3	1,012.3	518.3	750.0	830.5	877.2
2031	0.0	276.5	84.5	945.0	1,011.2	524.4	755.7	836.3	882.5
2041	0.0	318.0	98.6	989.0	1,035.8	588.5	823.0	897.1	938.2
2051	0.0	346.9	108.4	1,014.5	1,044.0	632.8	867.8	937.3	972.9
2061	0.0	365.2	114.5	1,040.5	1,059.9	664.0	899.8	967.1	1,002.9
2071	0.0	377.7	119.1	1,051.2	1,063.8	680.5	921.2	985.9	1,019.3

Table 9. Probability of recovery for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2008	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2009	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2010	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2011	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2012	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2013	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2014	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2015	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
2016	0.251	0.251	0.251	0.251	0.251	0.251	0.250	0.250	0.250	0.250	0.250	0.250
2017	0.275	0.272	0.270	0.268	0.264	0.264	0.263	0.262	0.261	0.260	0.260	0.260
2018	0.369	0.360	0.350	0.342	0.337	0.330	0.324	0.316	0.309	0.304	0.298	0.293
2019	0.497	0.487	0.476	0.462	0.451	0.446	0.437	0.424	0.408	0.396	0.385	0.375
2020	0.610	0.599	0.592	0.576	0.564	0.553	0.533	0.524	0.510	0.493	0.484	0.479
2021	0.685	0.678	0.671	0.665	0.655	0.641	0.626	0.618	0.605	0.594	0.589	0.572
2022	0.716	0.714	0.705	0.698	0.695	0.689	0.685	0.677	0.670	0.664	0.653	0.645
2023	0.733	0.731	0.727	0.724	0.721	0.717	0.713	0.709	0.702	0.698	0.695	0.691
2024	0.742	0.742	0.739	0.738	0.734	0.731	0.729	0.726	0.722	0.721	0.714	0.712
2025	0.745	0.745	0.743	0.742	0.742	0.741	0.738	0.738	0.736	0.734	0.730	0.727
2026	0.748	0.747	0.746	0.746	0.745	0.745	0.744	0.743	0.742	0.739	0.738	0.736
2027	0.749	0.749	0.749	0.749	0.747	0.746	0.746	0.746	0.746	0.746	0.744	0.744
2028	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.746	0.746	0.746	0.746	0.746
2029	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.748	0.746	0.746
2030	0.750	0.750	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749
2031	0.750	0.750	0.750	0.750	0.749	0.749	0.749	0.749	0.749	0.749	0.749	0.749
2041	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
2051	0.767	0.766	0.765	0.763	0.760	0.759	0.754	0.754	0.754	0.753	0.752	0.752
2061	0.865	0.854	0.842	0.830	0.822	0.811	0.807	0.802	0.794	0.790	0.784	0.782
2071	0.952	0.948	0.942	0.933	0.924	0.913	0.904	0.893	0.882	0.868	0.858	0.850

Table 10. Median spawning biomass (mt) for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544
2008	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841	10,841
2009	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073	11,073
2010	11,244	11,241	11,236	11,233	11,228	11,225	11,221	11,217	11,213	11,209	11,205	11,201
2011	11,355	11,348	11,339	11,332	11,323	11,315	11,308	11,300	11,292	11,284	11,276	11,268
2012	11,420	11,409	11,395	11,384	11,371	11,359	11,347	11,335	11,323	11,310	11,299	11,286
2013	11,465	11,450	11,432	11,417	11,398	11,383	11,366	11,350	11,334	11,317	11,301	11,284
2014	11,532	11,513	11,490	11,470	11,447	11,426	11,406	11,385	11,365	11,343	11,323	11,302
2015	11,660	11,636	11,608	11,583	11,555	11,530	11,505	11,480	11,455	11,428	11,403	11,377
2016	11,877	11,849	11,815	11,785	11,752	11,722	11,692	11,662	11,631	11,600	11,570	11,539
2017	12,198	12,165	12,125	12,091	12,051	12,016	11,981	11,946	11,910	11,873	11,838	11,802
2018	12,588	12,550	12,504	12,464	12,418	12,378	12,337	12,296	12,255	12,213	12,172	12,131
2019	13,008	12,964	12,910	12,864	12,811	12,765	12,718	12,671	12,623	12,575	12,528	12,480
2020	13,489	13,439	13,378	13,326	13,266	13,214	13,161	13,108	13,055	12,999	12,947	12,893
2021	14,018	13,963	13,896	13,838	13,771	13,712	13,653	13,594	13,534	13,473	13,414	13,354
2022	14,530	14,468	14,394	14,330	14,256	14,192	14,127	14,062	13,996	13,928	13,864	13,798
2023	15,085	15,017	14,935	14,865	14,784	14,714	14,643	14,571	14,500	14,425	14,355	14,283
2024	15,646	15,571	15,480	15,402	15,312	15,233	15,155	15,075	14,996	14,914	14,836	14,755
2025	16,180	16,099	16,001	15,916	15,820	15,735	15,650	15,565	15,479	15,390	15,306	15,219
2026	16,669	16,581	16,475	16,383	16,279	16,187	16,095	16,003	15,910	15,814	15,723	15,630
2027	17,153	17,061	16,949	16,854	16,744	16,648	16,552	16,455	16,358	16,257	16,160	16,059
2028	17,646	17,545	17,423	17,318	17,198	17,093	16,987	16,881	16,775	16,665	16,561	16,454
2029	18,180	18,074	17,945	17,835	17,708	17,597	17,486	17,374	17,262	17,147	17,037	16,924
2030	18,647	18,532	18,395	18,276	18,141	18,022	17,903	17,784	17,664	17,541	17,424	17,303
2031	19,054	18,934	18,789	18,665	18,523	18,398	18,273	18,148	18,022	17,893	17,770	17,645
2041	22,835	22,670	22,454	22,280	22,074	21,890	21,708	21,525	21,342	21,161	20,999	20,819
2051	25,448	25,229	24,969	24,749	24,498	24,278	24,056	23,838	23,618	23,391	23,177	22,956
2061	26,921	26,682	26,395	26,187	25,931	25,721	25,467	25,230	25,022	24,797	24,556	24,304
2071	27,918	27,667	27,381	27,127	26,837	26,588	26,325	26,073	25,817	25,580	25,329	25,097

Table 11. Median catches (mt) for rebuilding alternatives based on fishing mortality rates calculated from 2009 OYs. Note that after 25 years the table is compressed.

Run	10	*3*	11	12	13	14	15	16	17	18	19	20
Basis	SPR from 2009 OY of 35 mt	SPR from 2007-2008 44 mt OYs	SPR from 2009 OY of 55 mt	SPR from 2009 OY of 65 mt	SPR from 2009 OY of 75 mt	SPR from 2009 OY of 85 mt	SPR from 2009 OY of 95 mt	SPR from 2009 OY of 105 mt	SPR from 2009 OY of 115 mt	SPR from 2009 OY of 125 mt	SPR from 2009 OY of 135 mt	SPR from 2009 OY of 145 mt
2007	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2008	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
2009	35.2	44.2	55.2	64.7	75.6	85.3	95.0	104.8	114.7	125.0	134.8	145.0
2010	35.3	44.3	55.3	64.8	75.7	85.4	95.1	104.8	114.7	124.9	134.7	144.8
2011	36.0	45.3	56.5	66.1	77.2	87.0	96.9	106.8	116.8	127.2	137.0	147.2
2012	37.6	47.2	58.9	68.9	80.5	90.6	100.9	111.2	121.5	132.3	142.5	153.1
2013	39.6	49.7	61.9	72.4	84.5	95.2	105.9	116.7	127.5	138.7	149.4	160.4
2014	41.6	52.2	65.1	76.1	88.8	100.0	111.2	122.5	133.8	145.5	156.7	168.2
2015	43.5	54.5	67.9	79.4	92.6	104.2	115.9	127.6	139.3	151.5	163.0	174.9
2016	45.1	56.6	70.4	82.4	96.0	108.0	120.1	132.2	144.4	156.9	168.8	181.1
2017	46.5	58.3	72.6	84.9	98.9	111.2	123.6	136.0	148.5	161.3	173.5	186.1
2018	48.2	60.4	75.2	87.9	102.4	115.1	127.8	140.6	153.5	166.7	179.2	192.1
2019	49.7	62.2	77.4	90.5	105.4	118.4	131.5	144.6	157.8	171.4	184.2	197.4
2020	51.3	64.3	80.0	93.4	108.7	122.2	135.6	149.1	162.6	176.5	189.6	203.2
2021	52.7	66.0	82.1	95.8	111.5	125.2	139.0	152.8	166.6	180.8	194.3	208.2
2022	54.4	68.1	84.7	98.8	115.0	129.2	143.3	157.4	171.6	186.2	200.0	214.1
2023	55.9	70.0	87.0	101.6	118.2	132.7	147.1	161.6	176.1	191.0	205.1	219.6
2024	57.3	71.7	89.1	103.9	120.9	135.7	150.5	165.3	180.0	195.2	209.6	224.3
2025	59.0	73.8	91.7	106.9	124.3	139.5	154.7	169.8	185.0	200.5	215.2	230.2
2026	60.3	75.5	93.7	109.2	126.9	142.4	157.8	173.2	188.6	204.5	219.4	234.7
2027	62.2	77.8	96.5	112.5	130.8	146.7	162.6	178.4	194.2	210.4	225.7	241.4
2028	63.5	79.4	98.5	114.8	133.4	149.6	165.7	181.8	197.9	214.4	230.0	245.9
2029	65.0	81.3	100.9	117.6	136.5	153.1	169.6	186.0	202.4	219.2	235.0	251.2
2030	66.4	83.0	102.9	119.9	139.2	156.1	172.9	189.7	206.4	223.5	239.5	256.0
2031	67.6	84.5	104.7	122.0	141.6	158.7	175.7	192.7	209.6	226.9	243.2	259.9
2041	78.9	98.6	122.1	142.0	164.6	184.3	203.8	223.1	242.4	262.1	280.5	299.3
2051	86.9	108.4	134.2	156.0	180.6	202.1	223.3	244.4	265.5	286.7	306.6	326.9
2061	91.8	114.5	141.5	164.6	190.6	213.1	235.5	257.7	279.5	301.7	322.5	344.0
2071	95.5	119.1	147.2	171.0	197.9	221.2	244.2	267.0	289.6	312.6	334.1	356.2

Figures

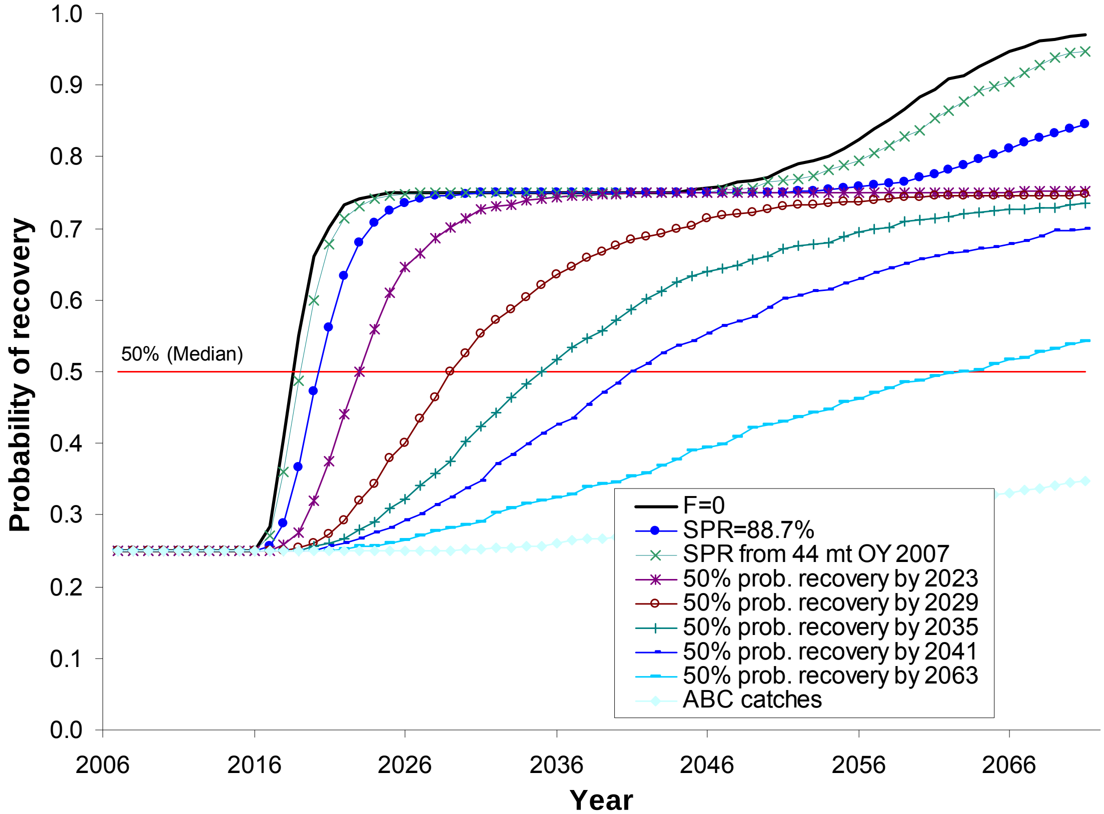

Figure 1. Probability of recovery for rebuilding alternatives (1-9) based on Council requests.

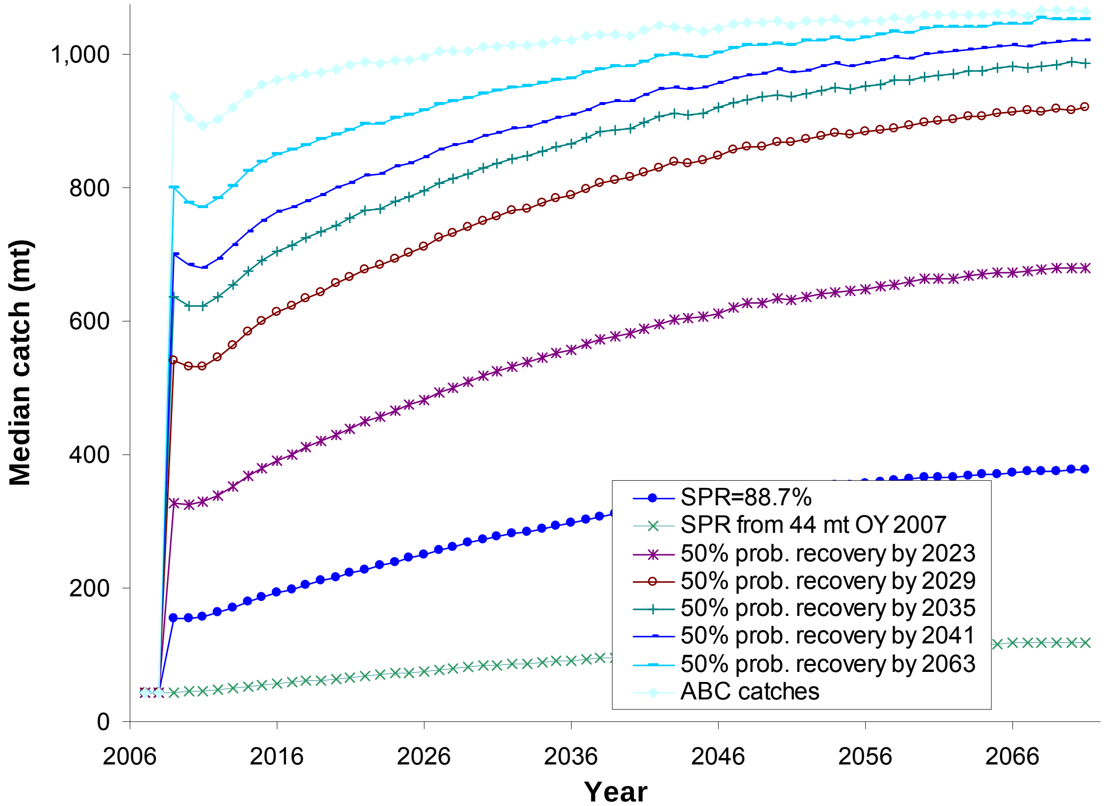

Figure 2. Projected median catch (mt) for rebuilding alternatives (1-9) based on Council requests.

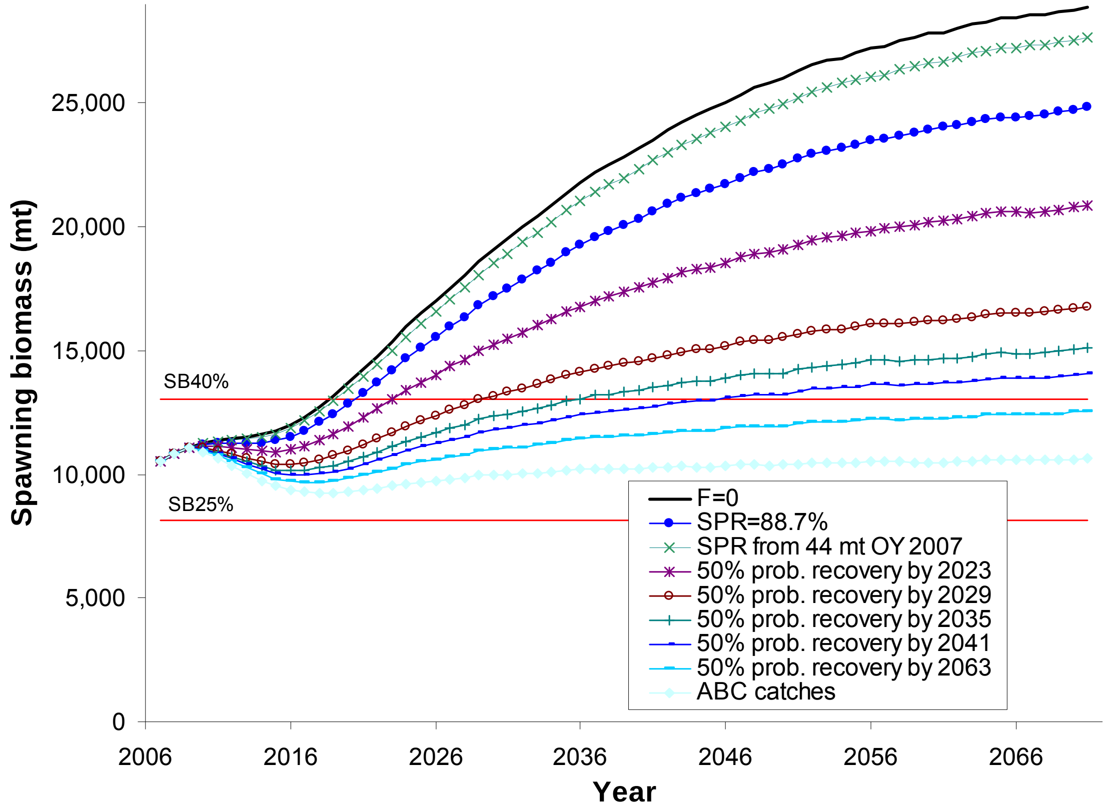

Figure 3. Projected median spawning biomass (mt) for rebuilding alternatives (1-9) based on Council requests.

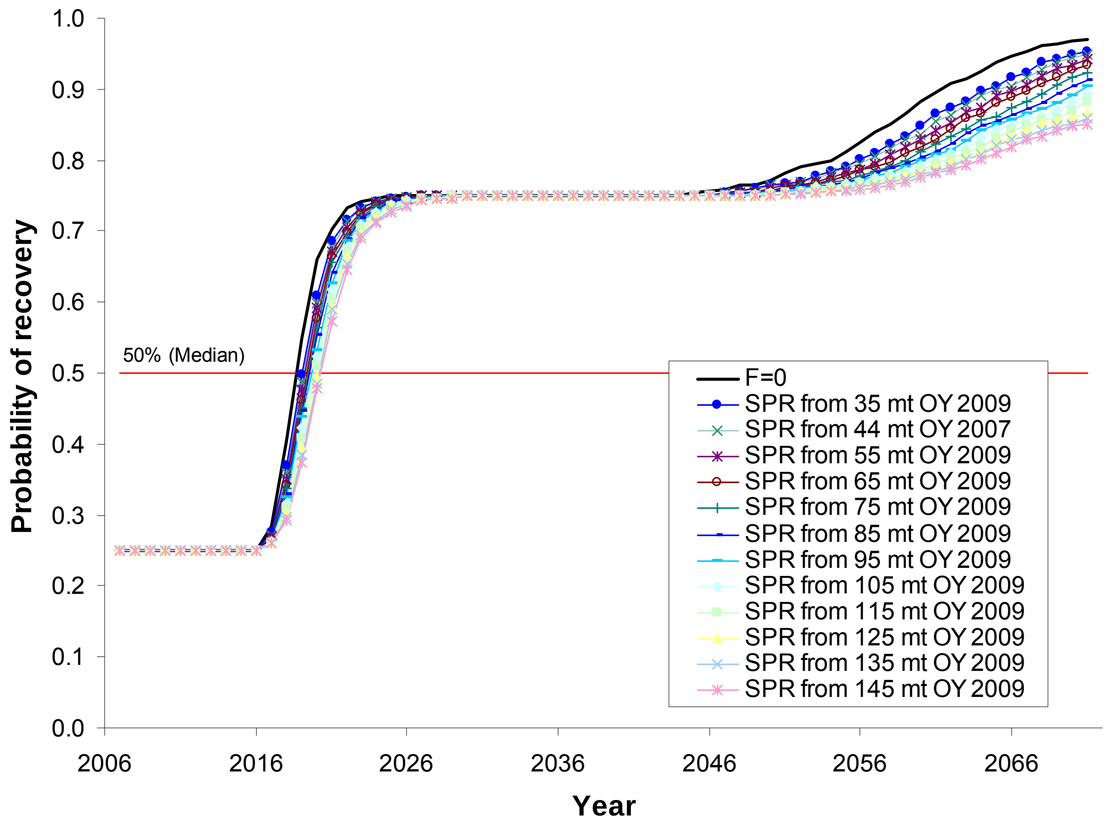

Figure 4. Probability of recovery for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

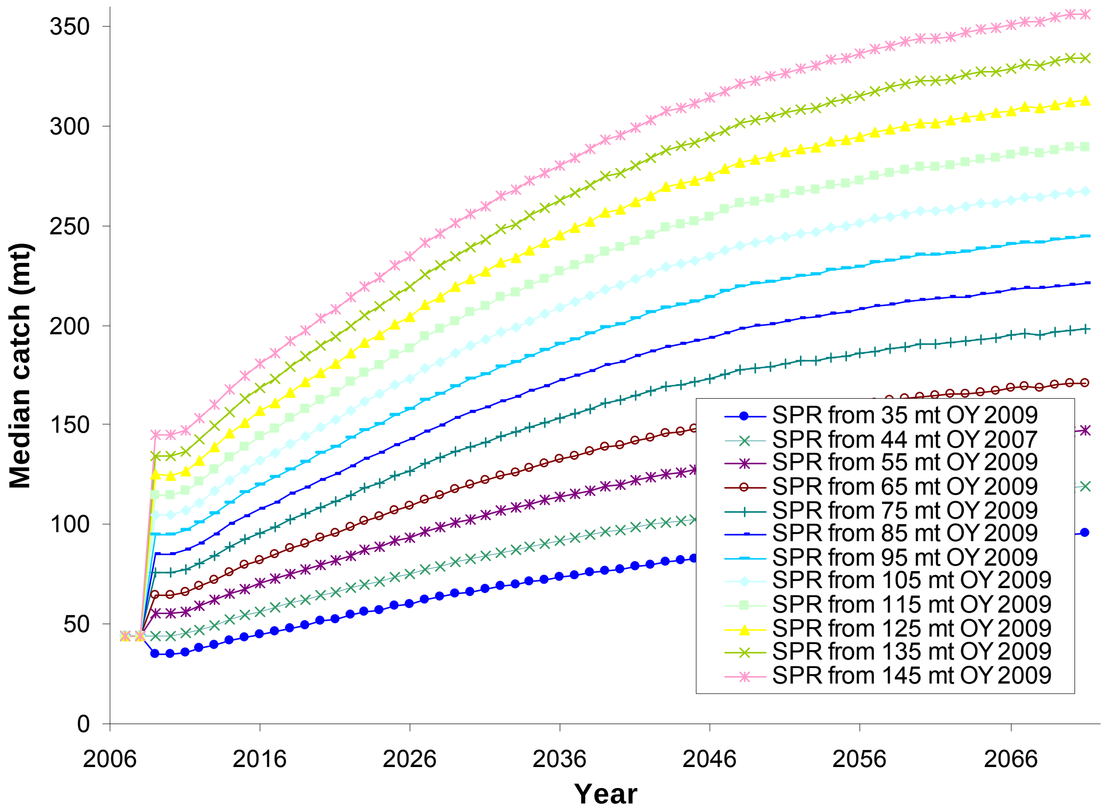

Figure 5. Projected median catch (mt) for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

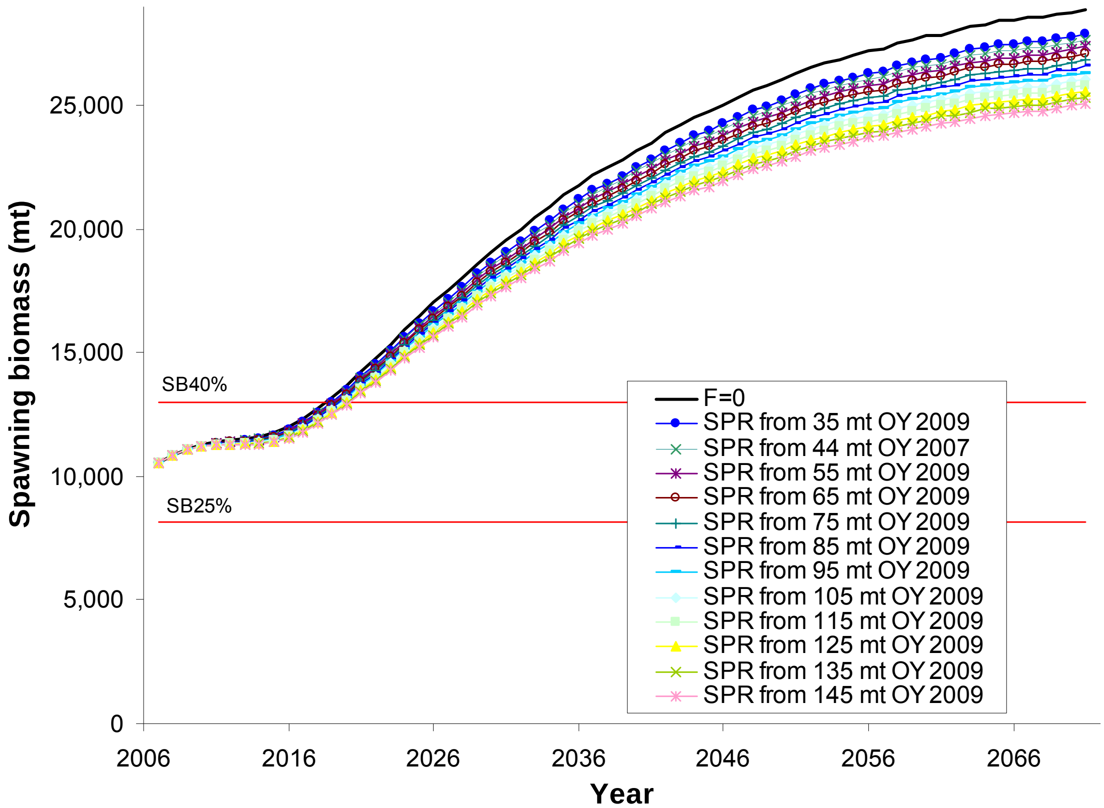

Figure 6. Projected median spawning biomass (mt) for rebuilding alternatives (10-20) based on fishing mortality rates calculated from 2009 OYs.

Appendix A. Basic input file for rebuilding analyses.

#Title
Canary rebuilding analysis 2007
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 40
Number of fleets
5
First year of projection (Yinit)
2007
First Year of rebuilding period (Ydecl)
2000
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
-1
Fecundity-at-age
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 #runnumber: 157 Canary_07.dat Canary_07.ctl 4393.42 32561 10543.9
0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692 0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093 2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168 3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741 3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and areas
Age specific selectivity and weight adjusted for discard and discard mortality
#wt and selex for gender,fleet: 1 3
0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946 1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693 2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204 3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243 3.57934 3.58536
0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784 0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702 0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813

0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045 0.574659 0.574332 0.574054 0.573816 0.573614 0.57344
#wt and selex for gender,fleet: 1 4
0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595 1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448 2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403 3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348 3.58126 3.58803 3.59392
0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191 0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318 0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473 0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128 0.994112 0.994099 0.994087 0.994077 0.994069 0.994062
#wt and selex for gender,fleet: 1 7
0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819 1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576 2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672 3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088 3.58707 3.59245
0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326 0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117 0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297 0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928 0.966301 0.966582 0.966793 0.966951 0.967069 0.967156
#wt and selex for gender,fleet: 1 9
0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738 1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343 2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154 3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219 3.58001 3.58681 3.59272
0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383 0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619 0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565 0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291 0.100281 0.100273 0.100266 0.10026 0.100254
#wt and selex for gender,fleet: 1 10
0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209 0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416 2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432 3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371 3.58149 3.58826 3.59414
0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761 0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108 0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557 0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555

#wt and selex for gender,fleet: 2 3
0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897 1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416 2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896 2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958 2.43091 2.43202
0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305 0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092 0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513 0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604 0.693939 0.693386 0.692925 0.692541 0.69222 0.691953
#wt and selex for gender,fleet: 2 4
0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786 1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025 2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441 2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162 2.46317 2.46446 2.46553
0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119 0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224 0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033 0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786 0.996776 0.996767 0.99676 0.996754 0.99675 0.996745
#wt and selex for gender,fleet: 2 7
0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181 1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709 2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469 2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195 2.51317 2.51418
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567 0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941 0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905 0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582 0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
#wt and selex for gender,fleet: 2 9
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735 1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732 2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925 2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142 2.44279 2.44394
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223 0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086 0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767 0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814 0.10808 0.108029 0.107988 0.107953 0.107924
#wt and selex for gender,fleet: 2 10

0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074
0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914
2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339
2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104
2.4626 2.4639 2.46498
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994
0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865
0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342
0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
M and current age-structure in year Yinit: 2007
gender = 1
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
gender = 2
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596
Age-structure at Ydecl= 2000
549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164
686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904
30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531
2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117
8.44202
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071
702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946
49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874
5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856
24.8011
Year for Tmin Age-structure (set to Ydecl by SS2)
2000
Number of simulations
1000

```
#  recruitment and biomass
# Number of historical assessment years
93
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1915  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930
1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946
1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962
1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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 #years (with
first value representing R0)
4209.78  4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82
4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04
4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71
4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69
3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4
2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94
4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72
1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15
2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13
1182.28 1144.05 2807.34 #recruits; first value is R0 (virgin)
32561  32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8
30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9
29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193
28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6
23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5
19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8
15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73
8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98
4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52
9749.45 10182.7 10543.9 #spbio; first value is S0 (virgin)
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  # in
Bzero
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  0 0 0 # in
R project
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  0 0 0 # in
R/S project
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches go next
2007 44
2008 44
```

```
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
7
# Steepness sigma-R Auto-correlation
0.511 0.5 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using
SPR_target
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.75
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
rebuild.ss2
# Number of parameter vectors: value is placeholder only, user needs to change it
4
# User-specific projection (1=Yes); Output replaced (1->9)
1  5  0  0.1
```

Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2009 3 .887
-1 -1 -1
Split of Fs
2007 0.000278016 0.000603547 0.000333243 0.001256765 0.00252228
-1 99 99 99 99 99
placeholder
2021 2035 2048 2053 2063
year for probability of recovery
2035
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
none
Use bisection (0) or linear interpolation (1)
1
Target Depletion
0.4
Project with Historical recruitments when computing Tmin (1=Yes)
1
CV of implementation error
0

Appendix B. Parameter vector input file for rebuilding analyses.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
0 0 3.98654e-005 0.000430292 0.00405503 0.0228594 0.0849975 0.222879 0.443985 0.723219 1.02371 1.31683 1.5874 1.83025 2.0454 2.23499 2.4017 2.54816 2.67676 2.78959 2.88852 2.97519 3.05105 3.1174 3.17537 3.22598 3.27014 3.30864 3.34219 3.3714 3.39683 3.41895 3.43819 3.45492 3.46946 3.48209 3.49307 3.5026 3.51088 3.51807 3.52431 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0367773 0.0367773 0.0552584 0.238092 0.455675 0.640631 0.817178 0.990531 1.16995 1.35807 1.5491 1.73684 1.91835 2.09204 2.25618 2.40893 2.54894 2.67561 2.78905 2.88989 2.97904 3.05756 3.1265 3.18692 3.23978 3.28596 3.32627 3.36143 3.39206 3.41874 3.44196 3.46217 3.47974 3.49501 3.50829 3.51983 3.52985 3.53855 3.54611 3.55267 3.55837 #wt and selex for gender,fleet: 1 3
0 0.000123399 0.000123885 0.000435367 0.013247 0.112131 0.36758 0.672224 0.871733 0.94027 0.92642 0.874904 0.812304 0.752681 0.702131 0.661994 0.631282 0.608225 0.591039 0.578225 0.568622 0.561366 0.555829 0.551559 0.54823 0.545609 0.543523 0.541847 0.54049 0.539382 0.538471 0.537717 0.537089 0.536564 0.536123 0.53575 0.535435 0.535168 0.53494 0.534745 0.534579
0.0367773 0.0367773 0.0550624 0.222582 0.479476 0.658428 0.824717 0.990195 1.16975 1.36818 1.576 1.78052 1.97402 2.15339 2.31766 2.46681 2.60129 2.72185 2.82942 2.925 3.00965 3.08439 3.15022 3.20808 3.25884 3.3033 3.3422 3.37619 3.40586 3.43173 3.45429 3.47393 3.49103 3.5059 3.51884 3.53009 3.53987 3.54836 3.55574 3.56215 3.56772 #wt and selex for gender,fleet: 1 4
0 0.000123399 0.000123449 0.000244194 0.00939853 0.102971 0.371622 0.692607 0.894696 0.973166 0.994001 0.997752 0.997788 0.997215 0.996621 0.996107 0.995682 0.995338 0.995062 0.99484 0.994661 0.994518 0.994402 0.994307 0.99423 0.994166 0.994114 0.99407 0.994033 0.994003 0.993977 0.993955 0.993936 0.993921 0.993907 0.993896 0.993886 0.993877 0.99387 0.993864 0.993859
0.0367773 0.0367773 0.0645306 0.195112 0.374892 0.585216 0.811312 1.04221 1.27043 1.49097 1.70059 1.89725 2.07981 2.24776 2.40108 2.54013 2.6655 2.77795 2.87836 2.96765 3.04676 3.11663 3.17815 3.23219 3.27956 3.321 3.3572 3.38879 3.41632 3.44029 3.46115 3.4793 3.49507 3.50878 3.52068 3.53102 3.54 3.5478 3.55457 3.56044 3.56554 #wt and selex for gender,fleet: 1 7
0 0.000123398 0.000191947 0.00123613 0.0065322 0.022802 0.0575983 0.114809 0.192419 0.283775 0.380537 0.475231 0.562547 0.639527 0.705138 0.759656 0.804107 0.839843 0.868279 0.890731 0.908358 0.922132 0.932855 0.941175 0.947608 0.952567 0.956379 0.959298 0.961528 0.963226 0.964514 0.965489 0.966224 0.966776 0.96719 0.967498 0.967727 0.967896 0.968021 0.968112 0.968178
0.0367773 0.0367773 0.0976356 0.215779 0.335178 0.478598 0.647828 0.826363 1.01235 1.20956 1.42028 1.64079 1.86064 2.06826 2.2566 2.42379 2.57094 2.70015 2.81357 2.91315 3.00056 3.07724 3.14446 3.20333 3.25484 3.29988 3.33921 3.37353 3.40347 3.42955 3.45228 3.47206 3.48927 3.50424 3.51725 3.52857 3.5384 3.54694 3.55436 3.5608 3.56639 #wt and selex for gender,fleet: 1 9

0 0.000123402 0.00144085 0.126225 0.6395 0.921546 0.853588 0.65522 0.457294 0.311079 0.218139 0.163518 0.132573 0.115226 0.105437 0.0998166 0.0965104 0.0945102 0.0932637 0.0924631 0.0919336 0.0915735 0.0913221 0.0911423 0.0910109 0.0909128 0.0908384 0.0907809 0.0907359 0.0907002 0.0906716 0.0906485 0.0906295 0.090614 0.0906011 0.0905903 0.0905813 0.0905737 0.0905672 0.0905618 0.0905572
0.0367773 0.0367773 0.0931349 0.226308 0.354684 0.491412 0.63491 0.769936 0.904352 1.06527 1.29406 1.59241 1.8824 2.11602 2.3034 2.46149 2.59938 2.72127 2.82936 2.92515 3.00988 3.08464 3.15048 3.20833 3.25909 3.30354 3.34243 3.37641 3.40607 3.43194 3.45449 3.47412 3.49122 3.50609 3.51903 3.53027 3.54005 3.54854 3.55592 3.56233 3.56789 #wt and selex for gender,fleet: 1 10
0 0.000123401 0.000579188 0.0621043 0.463754 0.850204 0.811638 0.529483 0.268675 0.121758 0.0586681 0.035497 0.0276704 0.0251159 0.0242817 0.0240023 0.0239046 0.0238686 0.0238545 0.0238486 0.023846 0.0238448 0.0238441 0.0238438 0.0238436 0.0238435 0.0238434 0.0238434 0.0238434 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433 0.0238433
0.0367773 0.0367773 0.0660735 0.288759 0.490034 0.666271 0.830184 0.98605 1.1394 1.29079 1.43549 1.56874 1.68852 1.7948 1.88829 1.96988 2.04059 2.10145 2.15354 2.1979 2.23553 2.26734 2.29417 2.31675 2.33572 2.35163 2.36496 2.37612 2.38546 2.39327 2.39979 2.40524 2.40979 2.41358 2.41675 2.41939 2.4216 2.42344 2.42497 2.42625 2.42732 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125016 0.000897363 0.0229917 0.149571 0.414495 0.694992 0.874721 0.947624 0.956018 0.934015 0.900064 0.863478 0.828877 0.798265 0.77219 0.750457 0.732559 0.71791 0.70595 0.696188 0.688212 0.681687 0.676337 0.671944 0.668328 0.665348 0.662887 0.660853 0.659168 0.657773 0.656615 0.655655 0.654857 0.654193 0.653642 0.653183 0.652801 0.652483 0.652219
0.0367773 0.0367773 0.0653412 0.290605 0.512633 0.681678 0.836177 0.985179 1.13744 1.29393 1.44747 1.59019 1.7181 1.83041 1.92785 2.01173 2.0835 2.14463 2.19651 2.24038 2.27741 2.30858 2.33479 2.35679 2.37523 2.39067 2.4036 2.41441 2.42345 2.431 2.4373 2.44257 2.44696 2.45063 2.45369 2.45624 2.45837 2.46014 2.46162 2.46286 2.46389 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.000123618 0.00047225 0.0174057 0.140667 0.421839 0.7175 0.897027 0.970066 0.992256 0.99761 0.998516 0.998401 0.99809 0.997771 0.997486 0.997242 0.997035 0.996863 0.99672 0.996601 0.996503 0.996421 0.996353 0.996297 0.99625 0.996212 0.99618 0.996153 0.996131 0.996112 0.996097 0.996084 0.996073 0.996065 0.996057 0.996051 0.996046 0.996042 0.996038
0.0367773 0.0367773 0.0795034 0.227294 0.415185 0.620913 0.829076 1.03005 1.21824 1.39069 1.5461 1.68434 1.80596 1.91202 2.00383 2.0828 2.15037 2.20795 2.25683 2.29819 2.33312 2.36254 2.38728 2.40805 2.42548 2.44008 2.4523 2.46252 2.47107 2.47821 2.48417 2.48916 2.49331 2.49678 2.49968 2.50209 2.50411 2.50579 2.50719 2.50836 2.50933 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000244049 0.0017938 0.0088778 0.0279557 0.0637563 0.116143 0.180618 0.250894 0.321197 0.387394 0.447121 0.499424 0.544291 0.582243 0.614048 0.640543 0.662535 0.680752 0.695828 0.708301 0.718623 0.727169 0.734249 0.740117 0.744985 0.749026 0.752381 0.75517 0.757487 0.759415 0.761019 0.762353 0.763464 0.764389 0.765159 0.765801 0.766335 0.76678 0.767151

0.0367773 0.0367773 0.115843 0.238634 0.36303 0.512725 0.678496 0.844385 1.00799 1.16882 1.32531 1.47461 1.61319 1.73819 1.84819 1.94324 2.02437 2.09308 2.15098 2.19964 2.24043 2.2746 2.30319 2.32708 2.34706 2.36374 2.37767 2.38929 2.39899 2.40709 2.41384 2.41948 2.42418 2.4281 2.43136 2.43409 2.43636 2.43826 2.43983 2.44115 2.44225 #wt and selex for gender,fleet: 2 9

0 0.000123402 0.00359569 0.207867 0.751099 0.93633 0.832413 0.644686 0.47081 0.34238 0.256799 0.202167 0.167643 0.145647 0.131375 0.121898 0.115447 0.110947 0.107733 0.105389 0.103647 0.102329 0.101318 0.100533 0.0999154 0.0994259 0.0990346 0.0987198 0.0984649 0.0982577 0.0980885 0.0979498 0.0978359 0.0977421 0.0976647 0.0976007 0.0975478 0.0975039 0.0974675 0.0974373 0.0974122

0.0367773 0.0367773 0.115435 0.251197 0.382068 0.521296 0.661455 0.789834 0.913878 1.04806 1.20783 1.39475 1.58394 1.74782 1.87887 1.98237 2.06528 2.1328 2.18846 2.23466 2.27316 2.30531 2.33218 2.35465 2.37342 2.38912 2.40223 2.41318 2.42233 2.42996 2.43634 2.44165 2.44609 2.44979 2.45288 2.45546 2.4576 2.45939 2.46089 2.46213 2.46317 #wt and selex for gender,fleet: 2 10

0 0.000123401 0.00137434 0.110631 0.584348 0.889723 0.787129 0.511476 0.276263 0.139907 0.0747348 0.0462073 0.0340195 0.0287345 0.0263534 0.0252245 0.0246579 0.0243567 0.0241873 0.024087 0.0240247 0.0239843 0.0239572 0.0239383 0.0239249 0.023915 0.0239077 0.0239021 0.0238978 0.0238944 0.0238917 0.0238896 0.0238879 0.0238866 0.0238854 0.0238845 0.0238838 0.0238832 0.0238827 0.0238823 0.0238819

0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0648671 0.0697341 0.0746012 0.0794683 0.0843353 0.0892024 0.0940695 0.0989365

495.349 172.634 172.859 217.201 118.648 164.566 220.628 112.088 248.202 131.62 120.471 160.162 163.446 215.066 146.016 156.866 174.147 139.309 121.12 92.5398 57.841 43.0955 18.4531 51.3507 11.0319 10.8291 14.5402 6.07902 3.43996 6.77431 4.36804 2.09952 3.58688 1.66073 1.81515 1.55671 1.02642 0.66062 0.548104 0.645864 4.92474

0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06

495.349 172.634 172.859 217.195 118.577 164.249 220.074 111.735 248.505 132.954 123.051 166.348 173.882 234.885 164.231 183.176 211.903 177.896 162.966 131.085 85.7093 66.363 29.4995 85.8524 19.509 20.3446 28.855 12.6084 7.34457 14.7043 9.56665 4.62571 7.96146 3.71739 4.10235 3.55408 2.36309 1.52805 1.2695 1.49512 13.5082

175.463 395.85 214.835 203.565 284.099 300.758 404.704 280.419 307.659 348.263 283.566 250.271 193.445 121.842 91.0946 38.9677 108.365 23.2695 22.8341 30.6521 12.8129 7.24953 14.2751 9.2038 4.42359 7.55704 3.49879 3.824 3.27946 2.16228 1.39165 1.15461 1.36053 1.66916 0.975746 0.670285 0.556064 0.533989 0.570153 0.616103 4.78225 #numbers in year Ydecl 2000

175.463 395.85 214.835 203.546 283.21 298.217 399.327 275.568 303.776 348.376 290.71 265.21 212.704 138.782 107.288 47.6357 138.511 31.4534 32.7832 46.4775 20.3019 11.8231 23.6656 15.3943 7.44253 12.8082 5.97989 6.59865 5.71642 3.80063

2.45751 2.04161 2.40439 2.94699 1.72355 1.18766 0.990702 0.958842 1.03466 1.13374
11.7454 #numbers in year Ydecl 2000
R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930
1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946
1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962
1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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 #years
4539.59 4539.59 4528.29 4510.52 4491.95 4480.55 4469.15 4460.46 4453.46 4445.14
4438.12 4429.67 4416.49 4406.38 4396.23 4387.12 4375.37 4363.88 4357 4352.5
4348.67 4344.39 4340.55 4337.45 4336.03 4335.43 4332.43 4327.85 4325.01 4299.57
4254.32 4148.78 4083.94 4049.24 4025.59 4002.7 3970.24 3939.51 3909.79 3884.24
3851.37 3817.17 3781.4 3723.86 3664.89 3635.69 3619.23 2974.57 2482.13 2302.38
2460.71 3152.24 4707.14 3320.09 2405.49 2431.27 3104.83 3799.65 3532.03 2564.44
4374.94 1999.17 3196.96 3766.99 1432.9 1865.91 3191.77 1652.87 1154.82 3717.84
955.468 1657.96 1684.37 2038.36 2011.9 1764.63 1729.2 1266.04 988.399 1252.28
836.945 725.803 487.498 484.461 840.656 350.926 642.915 447.226 302.017 520.223
389.855 366.617 990.698
34261.8 34261.9 34082.7 33802.9 33513 33336.3 33160.7 33027.5 32920.5 32793.7
32687.4 32559.6 32361.5 32210.3 32059.2 31924.3 31751.1 31582.6 31482.2 31416.7
31361.1 31299 31243.3 31198.6 31178 31169.4 31126.1 31060.2 31019.4 30656.3
30020.7 28588.1 27740.9 27297.3 26998.9 26712.9 26312.1 25937.8 25580.4 25276.7
24890.8 24494.8 24086.7 23442.6 22798 22228 21660.8 21235.2 20809 20455.2 20334.4
20116.7 19138 18838.3 18367.2 18145 17874.8 17557.8 17198.9 16526.4 16171.5
15845.7 15687.5 15296.1 14520.8 13623.4 12536.3 11705.3 10085.7 8729.99 8451.08
8041.33 7745.04 7035.64 6321.92 5473.78 4835.09 4009.08 3320.91 2882.1 2877.37
2931.74 2848.54 2760.97 2609.55 2644.29 2918.23 3184.11 3416.71 3628.46 3795.11
3918.33 4008.52
0.345 0.5 0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32 33 34 35 36 37 38 39 40
0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692
0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093
2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168
3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741
3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and
areas
0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946
1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693
2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204
3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243
3.57934 3.58536 #wt and selex for gender,fleet: 1 3
0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784
0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702
0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813

0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045
0.574659 0.574332 0.574054 0.573816 0.573614 0.57344
0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595
1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448
2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403
3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348
3.58126 3.58803 3.59392 #wt and selex for gender,fleet: 1 4
0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191
0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318
0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473
0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128
0.994112 0.994099 0.994087 0.994077 0.994069 0.994062
0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819
1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576
2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672
3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088
3.58707 3.59245 #wt and selex for gender,fleet: 1 7
0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326
0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117
0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297
0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928
0.966301 0.966582 0.966793 0.966951 0.967069 0.967156
0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738
1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343
2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154
3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219
3.58001 3.58681 3.59272 #wt and selex for gender,fleet: 1 9
0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383
0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619
0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565
0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291
0.100281 0.100273 0.100266 0.10026 0.100254
0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209
0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416
2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432
3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371
3.58149 3.58826 3.59414 #wt and selex for gender,fleet: 1 10
0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761
0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108
0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557
0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555
0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897
1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416
2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896

2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958 2.43091 2.43202 #wt and selex for gender,fleet: 2 3
0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305 0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092 0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513 0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604 0.693939 0.693386 0.692925 0.692541 0.69222 0.691953
0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786 1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025 2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441 2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162 2.46317 2.46446 2.46553 #wt and selex for gender,fleet: 2 4
0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119 0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224 0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033 0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786 0.996776 0.996767 0.99676 0.996754 0.99675 0.996745
0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181 1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709 2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469 2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195 2.51317 2.51418 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567 0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941 0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905 0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582 0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735 1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732 2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925 2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142 2.44279 2.44394 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223 0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086 0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767 0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814 0.10808 0.108029 0.107988 0.107953 0.107924
0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074 0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914 2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339 2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104 2.4626 2.4639 2.46498 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994 0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865 0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342

0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596
549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164
686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904
30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531
2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117
8.44202 #numbers in year Ydecl 2000
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071
702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946
49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874
5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856
24.8011 #numbers in year Ydecl 2000
R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930
1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946
1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962
1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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 #years
4209.78 4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82
4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04
4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71
4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69
3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4
2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94
4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72
1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15
2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13
1182.28 1144.05 2807.34

32561 32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8 30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9 29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193 28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6 23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5 19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8 15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73 8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98 4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52 9749.45 10182.7 10543.9

0.511 0.5 0

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

0 0 4.01976e-005 0.000437851 0.00402875 0.0224513 0.083262 0.218854 0.437692 0.715599 1.01587 1.30959 1.58127 1.82554 2.0423 2.23362 2.40214 2.55046 2.68093 2.79561 2.89636 2.98479 3.06234 3.13029 3.18977 3.2418 3.28728 3.32701 3.36168 3.39193 3.41831 3.4413 3.46133 3.47877 3.49396 3.50718 3.51869 3.5287 3.53741 3.54498 3.55157 #female fecundity; weighted by N in year Y_init across morphs and areas

0.0367773 0.0367773 0.0561806 0.23394 0.448076 0.634397 0.81376 0.989351 1.16946 1.35796 1.55009 1.73927 1.92193 2.09638 2.26105 2.41431 2.55496 2.68247 2.79693 2.89894 2.98935 3.06918 3.13946 3.20119 3.25532 3.30271 3.34417 3.3804 3.41204 3.43964 3.46371 3.4847 3.50298 3.51891 3.53277 3.54484 3.55534 3.56448 3.57243 3.57934 3.58536 #wt and selex for gender,fleet: 1 3

0 0.000123399 0.00012402 0.000435622 0.0122939 0.103285 0.345187 0.64784 0.858975 0.941709 0.93984 0.897823 0.842212 0.787198 0.739381 0.700711 0.670702 0.647922 0.630794 0.617936 0.608245 0.60089 0.595258 0.590902 0.587499 0.584813 0.582672 0.58095 0.579553 0.578412 0.577472 0.576694 0.576045 0.575502 0.575045 0.574659 0.574332 0.574054 0.573816 0.573614 0.57344

0.0367773 0.0367773 0.0562504 0.231639 0.444824 0.634203 0.817598 0.996595 1.17914 1.37255 1.5748 1.7767 1.96989 2.15002 2.31551 2.46612 2.60221 2.72448 2.83379 2.93113 3.01749 3.09391 3.16134 3.22073 3.27293 3.31874 3.35889 3.39403 3.42477 3.45162 3.47507 3.49553 3.51337 3.52892 3.54247 3.55427 3.56454 3.57348 3.58126 3.58803 3.59392 #wt and selex for gender,fleet: 1 4

0 0.000123399 0.000124219 0.000444908 0.0114748 0.0939603 0.317479 0.612191 0.837023 0.948071 0.986614 0.996457 0.998089 0.997868 0.997327 0.996789 0.996318 0.995922 0.995594 0.995325 0.995105 0.994925 0.994777 0.994656 0.994556 0.994473 0.994404 0.994346 0.994297 0.994256 0.994222 0.994192 0.994167 0.994146 0.994128 0.994112 0.994099 0.994087 0.994077 0.994069 0.994062

0.0367773 0.0367773 0.0632527 0.194498 0.374883 0.584609 0.80995 1.04028 1.26819 1.48873 1.69864 1.89587 2.07923 2.24819 2.40271 2.54308 2.66987 2.78382 2.88576 2.97658 3.05722 3.12857 3.19153 3.24694 3.2956 3.33826 3.37559 3.40822 3.43672 3.46157 3.48324 3.50212 3.51855 3.53286 3.54531 3.55614 3.56556 3.57375 3.58088 3.58707 3.59245 #wt and selex for gender,fleet: 1 7

0 0.000123398 0.000170931 0.000926685 0.0050456 0.0184818 0.0486662 0.100326 0.172735 0.260284 0.35508 0.449561 0.538022 0.617019 0.68509 0.742185 0.789117

0.82712 0.857552 0.881722 0.900802 0.915791 0.927521 0.936669 0.943783 0.949297 0.95356 0.956846 0.959373 0.96131 0.962792 0.963922 0.964781 0.965434 0.965928 0.966301 0.966582 0.966793 0.966951 0.967069 0.967156

0.0367773 0.0367773 0.0969633 0.214801 0.335665 0.479169 0.649093 0.828738 1.01561 1.21318 1.42347 1.64285 1.86145 2.06833 2.25667 2.42452 2.5728 2.70343 2.81843 2.91966 3.00872 3.08703 3.15582 3.2162 3.26913 3.3155 3.35607 3.39154 3.42254 3.4496 3.47321 3.4938 3.51175 3.52739 3.54102 3.55288 3.5632 3.57219 3.58001 3.58681 3.59272 #wt and selex for gender,fleet: 1 9

0 0.000123401 0.00150185 0.119822 0.621721 0.920996 0.870199 0.680724 0.483383 0.333759 0.236853 0.179073 0.145965 0.127237 0.116594 0.11045 0.106821 0.104619 0.103244 0.10236 0.101775 0.101377 0.101099 0.1009 0.100755 0.100647 0.100565 0.100501 0.100452 0.100412 0.100381 0.100355 0.100334 0.100317 0.100303 0.100291 0.100281 0.100273 0.100266 0.10026 0.100254

0.0367773 0.0367773 0.0930704 0.225321 0.35427 0.491479 0.636101 0.77209 0.907143 1.06942 1.30093 1.59989 1.88645 2.11691 2.30323 2.46172 2.60077 2.72416 2.8339 2.9314 3.01783 3.09426 3.16169 3.22106 3.27325 3.31905 3.35918 3.39432 3.42505 3.45189 3.47533 3.49579 3.51362 3.52917 3.54271 3.5545 3.56477 3.57371 3.58149 3.58826 3.59414 #wt and selex for gender,fleet: 1 10

0 0.000123401 0.000576464 0.0589803 0.450716 0.846958 0.823216 0.543855 0.27761 0.126181 0.0612489 0.0376 0.0297142 0.0271812 0.0263689 0.0261021 0.0260108 0.0259778 0.0259652 0.02596 0.0259577 0.0259567 0.0259562 0.0259559 0.0259557 0.0259556 0.0259556 0.0259556 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555 0.0259555

0.0367773 0.0367773 0.0674364 0.286834 0.486865 0.664163 0.82959 0.98622 1.13897 1.28923 1.43338 1.56679 1.68702 1.79375 1.88761 1.96954 2.04056 2.10174 2.15416 2.19886 2.23683 2.26899 2.29614 2.31903 2.33828 2.35446 2.36804 2.37943 2.38896 2.39695 2.40363 2.40922 2.4139 2.41781 2.42108 2.42381 2.42609 2.42799 2.42958 2.43091 2.43202 #wt and selex for gender,fleet: 2 3

0 0.000123399 0.000125488 0.000914953 0.0217441 0.139238 0.39002 0.667305 0.856726 0.94241 0.961463 0.947869 0.920669 0.889391 0.858793 0.831095 0.807092 0.786815 0.769935 0.755998 0.744537 0.735125 0.727397 0.721046 0.71582 0.711513 0.707958 0.70502 0.702588 0.700573 0.698902 0.697514 0.696361 0.695402 0.694604 0.693939 0.693386 0.692925 0.692541 0.69222 0.691953

0.0367773 0.0367773 0.0676428 0.283241 0.484172 0.664575 0.833515 0.992786 1.1468 1.29863 1.44658 1.58583 1.71231 1.82431 1.92196 2.00626 2.07856 2.14025 2.1927 2.23713 2.27469 2.30637 2.33304 2.35546 2.37429 2.39008 2.40332 2.41441 2.4237 2.43147 2.43797 2.4434 2.44794 2.45174 2.45491 2.45756 2.45977 2.46162 2.46317 2.46446 2.46553 #wt and selex for gender,fleet: 2 4

0 0.000123399 0.00012601 0.000914578 0.0200932 0.126599 0.359224 0.630119 0.830699 0.936296 0.979207 0.99357 0.997676 0.998611 0.99865 0.998459 0.998224 0.998 0.997801 0.997629 0.997482 0.997358 0.997254 0.997167 0.997094 0.997033 0.996982 0.99694 0.996904 0.996874 0.99685 0.996829 0.996812 0.996798 0.996786 0.996776 0.996767 0.99676 0.996754 0.99675 0.996745

0.0367773 0.0367773 0.0784031 0.228888 0.417876 0.623287 0.830662 1.03074 1.2181 1.38988 1.54483 1.68281 1.80436 1.91052 2.00255 2.08183 2.14979 2.20778 2.25709 2.2989 2.33425 2.36407 2.3892 2.41033 2.42808 2.44297 2.45546 2.46593 2.47469

2.48202 2.48815 2.49328 2.49757 2.50116 2.50415 2.50665 2.50874 2.51049 2.51195
2.51317 2.51418 #wt and selex for gender,fleet: 2 7
0 0.000123398 0.000208139 0.00135743 0.00698172 0.0229608 0.0542377 0.101567
0.161412 0.228089 0.296004 0.360911 0.420205 0.472673 0.518078 0.556774 0.58941
0.616748 0.639547 0.658513 0.674266 0.687342 0.698196 0.707206 0.714688 0.720905
0.726072 0.73037 0.733946 0.736923 0.739403 0.741468 0.743189 0.744624 0.74582
0.746817 0.747649 0.748343 0.748922 0.749405 0.749808
0.0367774 0.0367774 0.11628 0.239547 0.364627 0.513323 0.678619 0.844229 1.00735
1.1675 1.32314 1.4715 1.60926 1.7337 1.84345 1.93852 2.01988 2.08896 2.14732
2.19645 2.23774 2.27239 2.30143 2.32575 2.34611 2.36314 2.37738 2.38929 2.39925
2.40757 2.41452 2.42033 2.42518 2.42923 2.43262 2.43544 2.4378 2.43977 2.44142
2.44279 2.44394 #wt and selex for gender,fleet: 2 9
0 0.000123402 0.00379243 0.199295 0.733113 0.937519 0.850458 0.671613 0.499223
0.368446 0.279519 0.221834 0.18491 0.161139 0.145586 0.135188 0.128072 0.123086
0.119513 0.116899 0.11495 0.113474 0.112339 0.111456 0.110761 0.110209 0.109767
0.109411 0.109123 0.108888 0.108696 0.108538 0.108408 0.108302 0.108213 0.10814
0.10808 0.108029 0.107988 0.107953 0.107924
0.0367773 0.0367773 0.116746 0.252196 0.383079 0.521663 0.661344 0.789074
0.912109 1.04538 1.20469 1.39146 1.58039 1.74389 1.87469 1.97818 2.06128 2.12914
2.18521 2.23186 2.27083 2.30343 2.33072 2.35358 2.37273 2.38875 2.40217 2.41339
2.42277 2.43062 2.43718 2.44267 2.44725 2.45108 2.45428 2.45695 2.45918 2.46104
2.4626 2.4639 2.46498 #wt and selex for gender,fleet: 2 10
0 0.000123401 0.00140414 0.1069 0.57042 0.886137 0.798567 0.52779 0.288994
0.147828 0.079565 0.0495034 0.0366351 0.0310609 0.0285576 0.0273762 0.0267865
0.0264748 0.0263006 0.0261981 0.0261347 0.0260939 0.0260666 0.0260477 0.0260342
0.0260244 0.0260171 0.0260116 0.0260073 0.026004 0.0260013 0.0259992 0.0259976
0.0259962 0.0259951 0.0259942 0.0259935 0.0259929 0.0259924 0.025992 0.0259916
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.064613 0.069226 0.073839 0.078452 0.0830651
0.0876781 0.0922911 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
0.0969041 0.0969041 0.0969041 0.0969041 0.0969041
1403.67 538.714 524.26 653.583 375.426 529.451 715.062 357.744 743.587 392.015
338.845 444.835 454.442 576.254 382.705 401.111 442.08 355.032 312.683 241.156
156.134 110.069 50.4695 126.197 28.4389 27.3823 36.0401 15.0185 8.46823 15.9241
10.0754 5.03785 7.71588 3.78707 3.77586 3.25371 2.12318 1.38079 1.15342 1.31853
9.42277
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06
1403.67 538.714 524.26 653.579 375.356 529.123 714.46 357.354 746.058 396.823
347.314 463.913 484.821 630.993 431.755 469 536.549 448.917 413.046 333.174
225.256 165.56 79.2889 208.663 50.041 51.5833 72.5138 32.0366 18.9086 36.7784
23.8657 12.1775 19.0178 9.51033 9.6591 8.47399 5.61364 3.68723 3.09525 3.54388
30.1596

549.584 1153.32 616.799 544.778 736.868 774.549 1007.84 688.079 741.434 837.164 686.34 614.713 480.163 313.516 221.921 101.72 254.282 57.2928 55.1573 72.5904 30.2477 17.0544 32.0687 20.2898 10.145 15.5376 7.62598 7.6033 6.55181 4.27531 2.78037 2.32252 2.65499 2.94014 1.9282 1.33608 1.10025 1.03914 1.07639 1.11117 8.44202 #numbers in year Ydecl 2000
549.584 1153.32 616.799 544.756 735.944 771.847 1001.91 682.497 738.342 842.071 702.996 645.832 520.379 351.545 258.231 123.616 325.208 77.9704 80.3575 112.946 49.8932 29.4451 57.2679 37.159 18.9594 29.6081 14.8057 15.0369 13.1917 8.73874 5.73981 4.81823 5.51654 6.11011 4.01126 2.78885 2.30995 2.20016 2.30598 2.41856 24.8011 #numbers in year Ydecl 2000
R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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 #years
4209.78 4209.78 4204.09 4195.12 4185.7 4179.91 4174.1 4169.67 4166.09 4161.82 4158.26 4153.99 4147.33 4142.32 4137.34 4132.98 4127.29 4121.78 4118.76 4117.04 4115.71 4114.19 4112.94 4112.13 4112.25 4112.85 4112.16 4110.59 4109.89 4096.71 4072.46 4014.19 3978.35 3959.66 3947.34 3935.32 3917.64 3901.27 3885.57 3872.69 3855.67 3838.12 3820.13 3788.52 3756.27 3527.33 3495.79 2997.06 2570.55 2418.4 2597.3 3288.48 4359.05 3386.59 2510.37 2497.15 3122.75 3817.47 3490.46 2744.94 4363.78 2198.36 3345.54 3985.7 1581.22 2069.54 3591.11 1940.53 1429.23 4571.72 1367.16 2321.15 2630.93 3287.32 3478.27 3267.19 3429.34 2676.09 2231.65 2982.15 2116.49 1877.04 1304.53 1390.89 2449.28 1099.17 2060.68 1432.32 954.874 1565.13 1182.28 1144.05 2807.34
32561 32561.1 32377.9 32092.2 31796.4 31616.6 31437.9 31302.3 31193.5 31064.8 30957.8 30830.2 30632.8 30485.6 30340.6 30214.1 30050.4 29893.4 29807.7 29758.9 29721.5 29678.8 29643.7 29620.9 29624.2 29641 29621.6 29577.8 29558.2 29193 28538.7 27051.6 26192.2 25759.7 25480 25211.3 24823.5 24471.9 24141.3 23874.6 23528.6 23179 22828.2 22229.1 21640.1 21128.7 20619.1 20258.5 19899.2 19623.5 19587 19449.7 18491.5 18254.9 17839.6 17678.5 17472.2 17220.5 16919.9 16284.8 15978.8 15696.9 15588.1 15231.7 14471.9 13621.7 12575.5 11787.1 10205.8 8894.73 8676.1 8333.51 8113.88 7485.25 6867 6126.79 5615.83 4939.22 4426.46 4201.98 4462.87 4841.18 5144.2 5498.56 5826.36 6364.22 7149.2 7910.33 8603.13 9225.52 9749.45 10182.7 10543.9
0.511 0.5 0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
0 0 4.0526e-005 0.000445166 0.00402746 0.0222492 0.0822715 0.216378 0.433593 0.7104 1.01031 1.30428 1.57663 1.82181 2.03965 2.23215 2.40192 2.55152 2.68329 2.79927 2.90129 2.99095 3.06969 3.13877 3.19932 3.25235 3.29877 3.33936 3.37484 3.40584 3.43289 3.45651 3.47711 3.49507 3.51073 3.52437 3.53626 3.54662 3.55564 3.56349 3.57033 #female fecundity; weighted by N in year Y_init across morphs and areas

0.0367773 0.0367773 0.056937 0.232366 0.443859 0.630829 0.811818 0.988805
1.16926 1.35781 1.5506 1.74088 1.92455 2.09972 2.26486 2.41852 2.5596 2.68763
2.80273 2.90547 2.9967 3.07738 3.14854 3.21114 3.26613 3.31435 3.35659 3.39357
3.42589 3.45414 3.47881 3.50035 3.51913 3.53552 3.5498 3.56225 3.57309 3.58254
3.59077 3.59794 3.60418 #wt and selex for gender,fleet: 1 3
0 0.000123399 0.000124158 0.000443174 0.0118285 0.0980882 0.3306 0.630359
0.848524 0.941114 0.948071 0.913548 0.863988 0.813442 0.768662 0.73194 0.703136
0.681086 0.664396 0.6518 0.642266 0.635005 0.62943 0.625108 0.621726 0.619052
0.616918 0.6152 0.613805 0.612664 0.611723 0.610944 0.610294 0.609749 0.609291
0.608903 0.608575 0.608295 0.608056 0.607852 0.607677
0.0367773 0.0367773 0.0578791 0.229377 0.425865 0.618886 0.810697 0.998554
1.18556 1.37769 1.5761 1.77511 1.96725 2.14751 2.3137 2.46527 2.60245 2.72588
2.83639 2.93493 3.0225 3.10008 3.16864 3.2291 3.28231 3.32908 3.37011 3.40609
3.43758 3.46514 3.48923 3.51027 3.52865 3.54468 3.55867 3.57087 3.5815 3.59077
3.59884 3.60587 3.61199 #wt and selex for gender,fleet: 1 4
0 0.000123399 0.000127094 0.000705021 0.013305 0.0901424 0.286847 0.557124
0.787215 0.919997 0.975586 0.993331 0.997621 0.998126 0.997751 0.997232 0.99674
0.996312 0.995949 0.995648 0.995398 0.995192 0.995022 0.994881 0.994764 0.994667
0.994586 0.994518 0.99446 0.994412 0.994371 0.994336 0.994307 0.994281 0.99426
0.994241 0.994225 0.994211 0.9942 0.994189 0.994181
0.0367773 0.0367773 0.0626237 0.194296 0.375752 0.585339 0.81022 1.04008 1.26763
1.48796 1.69785 1.89525 2.07896 2.24844 2.40362 2.54477 2.67244 2.78732 2.89024
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R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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 #years

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3889.86 3882.66 3875.38 3861.96 3848.27 3563.11 3488.03 3026.4 2630.11 2491.66
2673.61 3332.31 4231.22 3418.14 2584.74 2557.82 3163.89 3838.36 3512.7 2876.95
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1780.76 2972.86 3602.74 4547.09 4986.73 4828.35 5212.89 4183.98 3595.03 4880.78
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22436.5 22120 21556.7 21006.8 20537.5 20072 19758.4 19447.2 19222.9 19241.5
19158.4 18243.6 18056.2 17684.5 17567.4 17403.4 17191.5 16926.5 16316.5 16031.8
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Agenda Item D.3.a
Attachment 8
November 2007

Cowcod Rebuilding Analysis

October 15, 2007

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Introduction

The status of cowcod (*Sebastes levis*) in the Southern California Bight was first assessed by Butler et al. (1999), who concluded that spawning biomass in 1998 was 7% of the unfished biomass. The stock was declared overfished in 2000 and the first rebuilding plan was adopted under Amendment 16-3 (PFMC, 2004). The stock was assessed again in 2005 (Piner et al., 2006) and the original rebuilding plan parameters were supplanted by the rebuilding analysis of Piner (2006). Parameters from the 2004 and 2006 rebuilding analyses are provided in Table 1.

This rebuilding analysis is based on the assessment of Dick et al. (2007). The 2007 base model included six major revisions to the prior assessment: 1) a correction to the gear selectivity curve, 2) updated commercial landings estimates, 3) separation of commercial and recreational fisheries, 4) a revised selectivity curve for the recreational fishery and commercial passenger fishing vessel (CPFV) logbook index, 5) a revised model structure for the CPFV logbook index, and 6) a correction to the data used in the length-at-age analysis. The 2007 base model also assumes that the steepness parameter in the Beverton-Holt stock-recruitment relationship is 0.6 (compared to 0.5 in the 2005 assessment). This change is based on a meta-analysis of several rockfish stocks (M. Dorn, pers. comm.). Dick et al. estimated spawning biomass in 2007 as 4.6% of the unfished level, however there was considerable uncertainty in this estimate. The 2007 assessment was modeled using Stock Synthesis II software (Methot, 2005).

In his addendum to the 2007 stock assessment, Dick (2007) describes a correction to the 2002 cowcod biomass estimate from the visual survey, and outlines its effects on the assessment results and the rebuilding analysis. The results in this document reflect the changes associated with this revised biomass estimate.

Simulation Model and Rebuilding Calculations

Estimation of Virgin Biomass (B_0)

The 2007 base model assumes a Beverton-Holt stock-recruitment relationship with steepness fixed at 0.6. Virgin recruitment (R_0) is estimated at 109,942 recruits. Spawning output is assumed to be directly proportional to spawning biomass. For each simulation, virgin biomass (B_0), is defined using the equation:

$$B_0 = 0.5 R_0 \sum_{a=a_{mat}}^{a_{last}} \phi_a e^{-\sum_{a'=a_{\min}}^{a-1} M_{a'}}$$

where a_{mat} is the minimum age-at-maturity, a_{last} is 5 times the last age group (to approximate the plus-group), $M_{a'}$ is the natural mortality rate at age a’, and ϕ_a is fecundity at age a. Age-specific values for fecundity, weight, and other model inputs are given in Table 2. Spawning biomass in the 2004 and 2005 rebuilding analyses included both males and females. Values reported in the 2007 assessment and rebuilding analysis are for female spawning biomass only.

Simulation of Future Recruitments

In each model run, 1000 simulated trajectories were generated with recruitment determined by a Beverton-Holt stock-recruitment (S-R) relationship. A major axis of uncertainty in the assessment was the assumed value of the steepness parameter in the S-R relationship. During the SSC's review of the assessment, it was decided that the rebuilding analysis would represent uncertainty about steepness by using a discrete distribution of parameter values (Fig. 1). The relative frequency of each value approximates the prior probability distribution from a meta-analysis of multiple rockfish stocks (M. Dorn, pers. comm.). Variability in future recruitment is therefore expressed as a weighted set of twenty-one different states of nature (steepness values), rather than random deviations from an average S-R relationship (i.e. σ_R is fixed at zero).

Mean Generation Time

Mean generation time for cowcod is estimated from the net maternity function, and is 38 years. This is one year shorter than the estimate in the 2005 assessment, due to changes in the assumed growth model.

Description of Model Runs

In a memo dated September 4, 2007, the Pacific Fishery Management Council requested that authors of rebuilding analyses present results for the following model runs (letters match requests in the 9/4/07 memo):

C. *Provide the projected year to rebuild if all fishing mortalities were eliminated beginning in 2009 ($T_{F=0}$).*

D. *Provide the following projections:*

   1. *Projections of yields, median rebuilding times, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the SPR harvest rates specified in rebuilding plans adopted under Amendment 16-4 (see attached Table 4-2 from the FMP depicting the F_{SPR} harvest rates). NOTE: If the estimated mean generation time has changed in the assessment, T_{MAX} needs to be recalculated by adding estimated mean generation time to the T_{MIN} value specified in Table 4-2.*

   2. *Projections of yields, median rebuilding times, SPR harvest rates, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the harvest rates (solved for using new models) which produce the current optimum yield amounts in place for 2007-2008.*

      [Note: The 4 mt coastwide OY for cowcod is based on the convention of doubling the OY for the stock in the SCB (2 mt) (PFMC and NMFS, 2006)]

   3. *Projections of yields and SPR harvest rates (solved for using new models) which rebuild the stock in 50 percent of the runs by the T_{TARGET} specified in Amendment 16-4.*

   4. *Projections of yields, median rebuilding times, SPR harvest rates, and rebuilding probabilities at T_{TARGET} and T_{MAX} under the ABC harvest rate.*

The following runs were also suggested:

Projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}. These projections should be determined by projecting the median rebuilding times under the most conservative rebuilding strategy (i.e., $T_{F=0}$) and the most liberal, allowable rebuilding strategy (i.e., T_{MAX}) and then parsing intermediate time intervals in even quartile increments. That is, if $T_{F=0}$ = 10 years and T_{MAX} = 50 years, then the intermediate alternatives would have rebuilding times equal to 20, 30, and 40 years, respectively. Through iteration, determine the SPR harvest rate, 2009 and 2010 OYs, and the probability of rebuilding by T_{MAX} (i.e., P_{MAX}) under each alternative rebuilding schedule. This will allow the Council to explore the tradeoff between economic impacts associated with alternative harvest levels and conservation needs of the stock.

Total removals (bycatch) in 2007 and 2008 are difficult to determine for cowcod in the Southern California Bight. The most recent coast wide estimate from the bycatch scorecard is 1.9 metric tons (Table 3). However, there is very little information to determine how much is caught within the defined stock boundary (south of Point Conception). The non-whiting limited entry trawl fishery accounts for and estimated 1.4 metric tons, but operates north of the assumed stock boundary. Bycatch from the recreational groundfish fishery in California is estimated at 0.1 mt. In this rebuilding analysis, total removals for 2007 and 2008 are assumed to be 0.5 mt, consistent with the 2007 stock assessment.

This rebuilding analysis uses the default SSC rebuilding program (version 2.11, September 2007).

Results

The results of this rebuilding analysis differ significantly from the previous analysis due to the combined effects of changes to the base model's structure (correction and revision of gear selectivity curves, separation of recreational and commercial fisheries, increased steepness) and revisions to data used in the assessment (commercial landings, length-at-age data). A summary of results for runs C and D1-D4 is presented in Tables 4 and 5. These results suggests that if fishing mortality was eliminated beginning in 2009, the median year for rebuilding ($T_{F=0}$) would be 2061 and the revised probability of rebuilding by the current T_{target} (2039) would be 21.6% (Table 4). T_{min} and $T_{F=0}$ were both 2035 in the previous analysis (Table 1). Amendment 16-4 specifies P_{max} (the probability of rebuilding by T_{max}) for cowcod as 90.6%. However, simulations based on the 2007 assessment indicate that fishing at the adopted harvest control rule ($F_{90\%}$) would rebuild by the adopted T_{max} (2074) with a 59.8% probability (Table 4).

The use of the discrete steepness distribution causes some model trajectories to have a "step" pattern (Fig. 2). As a result, proximal years often have the same probability of being above target and different catch streams appear to produce the same probability of rebuilding in a given year (Table 4). The effect is noticeable because this analysis does not consider recruitment variability in forward projections.

The distribution of virgin biomass (B_0) that results from the assumed distribution for steepness is skewed (Fig. 3), with a mean of 2550 mt and mode at 2488 mt. The corresponding values (mean and mode) of B_{MSY} are 1020 mt and 995 mt, respectively. The values reported in the 2007 stock assessment are the modes of these distributions, prior to correcting for the revised 2002 biomass estimate (Dick et al., 2007).

Run C estimates $T_{F=0}$ (2061) using the new model. Run D1 shows that fishing at the adopted harvest control rule ($F_{90\%}$) delays the median rebuilding time by four years relative to the case in which fishing mortality is set to zero (Table 5, Fig. 4). Run D2 fishes at the rate that produces the 2007-2008 OY for cowcod in the SCB (2 mt), and delays the median rebuilding time by eleven years relative to the case in which fishing mortality is set to zero. Run D3 does not apply for cowcod. The probability of rebuilding by the T_{target} specified in Amendment 16-4 (2039) is 21.6% in the absence of fishing. Run D4 fishes at the ABC harvest rate ($F_{50\%}$). Due to the discrete distribution, the probability of being above target biomass remains slightly below 0.5 for the entire simulation. The median spawning biomass trajectory for this run reaches 99% of target biomass in 2201. For this scenario, however, the probability of rebuilding by T_{MAX} is less than 50% (Table 4). Median catch for runs C, D1-D4, is plotted as Fig. 5.

The PFMC also requested projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}. Tables 6 and 7 summarize results from this set of runs. Trajectories of the probability that biomass is above target, median spawning biomass relative to target, and median catch are shown in figures 6, 7, and 8, respectively.

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Table 1. Parameters from the two previous rebuilding analyses. Biomass estimates from 2004 and 2006 were reported for males and females combined. The 2007 assessment and rebuilding analysis provide estimates of female spawning biomass only.

	Date of Analysis	
Rebuilding Parameter	**2004**	**2006**
B_0 [mt]	3367	3045
B_{MSY} [mt]	1350	1218
T_{MIN}	2062	2035
T_{MAX}	2099	2074
$T_{F=0}$	2062	2035
P_{MAX}	60%	90.6%
T_{TARGET}	2090	2039
Harvest Control Rule	$F_{78\%}$	$F_{90\%}$

Table 2. Age-specific quantities used in the rebuilding analysis.

	Female				Fleet 1		Fleet 2	
Age	Fecundity	M	Init N	Init N Tmin	Weight	Selectivity	Weight	Selectivity
0	0.00000	0.055	20.873	13.261	0.064	0	0.051	0
1	0.00000	0.055	18.718	11.932	0.169	0	0.130	0.002
2	0.00000	0.055	16.721	10.394	0.370	0.00005	0.256	0.009
3	0.00009	0.055	14.870	9.287	0.627	0.00059	0.392	0.038
4	0.00126	0.055	13.157	9.471	0.843	0.00427	0.513	0.105
5	0.00874	0.055	11.572	9.022	1.006	0.01840	0.626	0.214
6	0.03501	0.055	10.108	9.080	1.137	0.05302	0.737	0.349
7	0.09615	0.055	9.014	8.045	1.255	0.11464	0.852	0.489
8	0.20397	0.055	8.103	7.428	1.366	0.20253	0.975	0.618
9	0.36160	0.055	7.049	6.246	1.478	0.30968	1.109	0.726
10	0.56415	0.055	6.283	5.151	1.594	0.42609	1.256	0.812
11	0.80184	0.055	6.382	4.211	1.717	0.54175	1.416	0.876
12	1.06323	0.055	6.046	4.844	1.849	0.64862	1.590	0.921
13	1.33757	0.055	6.046	5.062	1.992	0.74137	1.777	0.952
14	1.61611	0.055	5.321	6.257	2.147	0.81741	1.975	0.972
15	1.89259	0.055	4.882	6.819	2.315	0.87650	2.184	0.984
16	2.16318	0.055	4.083	6.346	2.495	0.92006	2.400	0.991
17	2.42614	0.055	3.351	4.964	2.688	0.95053	2.622	0.995
18	2.68117	0.055	2.730	4.199	2.890	0.97075	2.848	0.997
19	2.92888	0.055	3.132	3.090	3.102	0.98348	3.075	0.999
20	3.17027	0.055	3.267	2.147	3.319	0.99107	3.303	0.999
21	3.40632	0.055	4.032	1.408	3.539	0.99537	3.530	1
22	3.63780	0.055	4.391	0.847	3.761	0.99768	3.756	1
23	3.86519	0.055	4.084	0.479	3.982	0.99887	3.980	1
24	4.08867	0.055	3.193	0.258	4.201	0.99946	4.200	1
25	4.30823	0.055	2.701	0.133	4.418	0.99974	4.417	1
26	4.52370	0.055	1.987	0.067	4.630	0.99988	4.630	1
27	4.73487	0.055	1.380	0.035	4.839	0.99994	4.839	1
28	4.94148	0.055	0.905	0.018	5.043	0.99997	5.043	1
29	5.14331	0.055	0.545	0.010	5.242	0.99999	5.242	1
30	5.34016	0.055	0.308	0.006	5.437	0.99999	5.437	1
31	5.53186	0.055	0.166	0.004	5.626	1	5.626	1
32	5.71826	0.055	0.085	0.003	5.809	1	5.809	1
33	5.89927	0.055	0.043	0.002	5.988	1	5.988	1
34	6.07482	0.055	0.022	0.002	6.161	1	6.161	1
35	6.24488	0.055	0.012	0.001	6.328	1	6.328	1
36	6.40942	0.055	0.007	0.001	6.490	1	6.490	1
37	6.56846	0.055	0.004	0.001	6.648	1	6.648	1
38	6.72610	0.055	0.003	0.001	6.803	1	6.803	1
39	6.87810	0.055	0.002	0.001	6.952	1	6.952	1
40	7.02454	0.055	0.001	0.001	7.096	1	7.096	1
41	7.16549	0.055	0.001	0.001	7.234	1	7.234	1
42	7.30106	0.055	0.001	0.000	7.367	1	7.367	1
43	7.43136	0.055	0.001	0.000	7.495	1	7.495	1
44	7.55650	0.055	0.001	0.000	7.617	1	7.617	1
45	7.67661	0.055	0.000	0.000	7.735	1	7.735	1
46	7.79183	0.055	0.000	0.000	7.848	1	7.848	1
47	7.90229	0.055	0.000	0.000	7.956	1	7.956	1
48	8.00812	0.055	0.000	0.000	8.059	1	8.059	1
49	8.10948	0.055	0.000	0.000	8.159	1	8.159	1
50	8.20650	0.055	0.000	0.000	8.253	1	8.253	1
51	8.29932	0.055	0.000	0.000	8.344	1	8.344	1
52	8.38810	0.055	0.000	0.000	8.431	1	8.431	1
53	8.47297	0.055	0.000	0.000	8.514	1	8.514	1
54	8.55408	0.055	0.000	0.000	8.593	1	8.593	1
55	8.63157	0.055	0.000	0.000	8.669	1	8.669	1
56	8.70556	0.055	0.000	0.000	8.741	1	8.741	1
57	8.77620	0.055	0.000	0.000	8.810	1	8.810	1
58	8.84362	0.055	0.000	0.000	8.876	1	8.876	1
59	8.90795	0.055	0.000	0.000	8.939	1	8.939	1
60	8.96931	0.055	0.000	0.000	8.999	1	8.999	1
61	9.02782	0.055	0.000	0.000	9.056	1	9.056	1
62	9.08361	0.055	0.000	0.000	9.111	1	9.111	1
63	9.13679	0.055	0.000	0.000	9.162	1	9.162	1
64	9.18747	0.055	0.000	0.000	9.212	1	9.212	1
65	9.23575	0.055	0.000	0.000	9.259	1	9.259	1
66	9.28175	0.055	0.000	0.000	9.304	1	9.304	1
67	9.32556	0.055	0.000	0.000	9.347	1	9.347	1
68	9.36728	0.055	0.000	0.000	9.387	1	9.387	1
69	9.40700	0.055	0.000	0.000	9.426	1	9.426	1
70	9.44481	0.055	0.000	0.000	9.463	1	9.463	1
71	9.48080	0.055	0.000	0.000	9.498	1	9.498	1
72	9.51506	0.055	0.000	0.000	9.532	1	9.532	1
73	9.54765	0.055	0.000	0.000	9.563	1	9.563	1
74	9.57867	0.055	0.000	0.000	9.594	1	9.594	1
75	9.60817	0.055	0.000	0.000	9.622	1	9.622	1
76	9.63624	0.055	0.000	0.000	9.650	1	9.650	1
77	9.66293	0.055	0.000	0.000	9.676	1	9.676	1
78	9.68832	0.055	0.000	0.000	9.701	1	9.701	1
79	9.71247	0.055	0.000	0.000	9.724	1	9.724	1
80	9.73543	0.055	0.000	0.000	9.746	1	9.746	1

Table 3. Recent estimates of cowcod catch.

Year	Estimated Coastwide Catch [mt]	Source
2004	2.4	Total Mortality Report (Hastie, Sep. '06)
2005	2.0	Total Mortality Report (Hastie, Dec. '06)
2006	2.6	GMT scorecard (Jan. '07)
2007	1.9	GMT scorecard (projected Sep. '07)

Table 4. Summary of requested model runs. The discrete distribution of steepness in the model runs causes the probability of being above target to change in a step-wise fashion (see Figure 2). This also causes the probability of being above target in run D4 to converge to a value just below 50%. Therefore, the median rebuilding year presented for run D4 is the year in which median spawning biomass is 99% of the target biomass. * Results from run D3 are not applicable to cowcod (see text for details).

	Run	C	D1	D2	D3*	D4
	SPR	1	**0.900**	0.790	n/a	**0.5**
	F	**0**	0.0038	0.0088	n/a	0.0295
	Median rebuilding year	2061	2065	2072	n/a	2201
Pr{above target}	by 2035 (old Tmin)	0.159	0.159	0.159	n/a	0.027
	by 2039 (old Ttarget)	0.216	0.216	0.216	n/a	0.062
	by 2060 (new Tmin)	0.467	0.467	0.402	n/a	0.159
	by 2074 (old Tmax)	0.662	0.598	0.533	n/a	0.216
	by 2098 (new Tmax)	0.784	0.724	0.662	n/a	0.338
Median Catch (metric tons)						
	2007	*0.5*	*0.5*	*0.5*	n/a	*0.5*
	2008	*0.5*	*0.5*	*0.5*	n/a	*0.5*
	2009	0	0.9	**2.0**	n/a	6.6
	2010	0	0.9	2.1	n/a	6.9
	2011	0	1.0	2.2	n/a	7.1
	2012	0	1.0	2.3	n/a	7.3
	2013	0	1.1	2.4	n/a	7.5
	2014	0	1.1	2.5	n/a	7.8
	2015	0	1.2	2.7	n/a	8.0
	2016	0	1.2	2.8	n/a	8.3
	2017	0	1.3	2.9	n/a	8.6
	2018	0	1.4	3.1	n/a	8.9

Table 5. Median spawning output relative to the rebuilding target for runs C and D1-D4.

Run	C	D1	D2	D3	D4	Run	C	D1	D2	D3	D4
SPR	1	0.900	0.790	n/a	0.5	SPR	1	0.900	0.790	n/a	0.5
F	0	0.0038	0.0088	n/a	0.0295	F	0	0.0038	0.0088	n/a	0.0295
Median Spawning Biomass Relative to Target						**Median Spawning Biomass Relative to Target**					
2007	0.094	0.094	0.094	n/a	0.094	2053	0.796	0.727	0.644	n/a	0.394
2008	0.100	0.100	0.100	n/a	0.100	2054	0.822	0.749	0.663	n/a	0.403
2009	0.106	0.106	0.106	n/a	0.106	2055	0.848	0.772	0.683	n/a	0.412
2010	0.112	0.112	0.111	n/a	0.109	2056	0.874	0.796	0.702	n/a	0.421
2011	0.119	0.118	0.117	n/a	0.112	2057	0.901	0.819	0.721	n/a	0.430
2012	0.125	0.124	0.122	n/a	0.116	2058	0.928	0.842	0.741	n/a	0.440
2013	0.132	0.131	0.128	n/a	0.119	2059	0.955	0.866	0.761	n/a	0.449
2014	0.140	0.137	0.134	n/a	0.123	2060	0.981	0.889	0.780	n/a	0.458
2015	0.147	0.145	0.141	n/a	0.127	2061	1.008	0.913	0.800	n/a	0.467
2016	0.155	0.152	0.148	n/a	0.131	2062	1.036	0.937	0.820	n/a	0.476
2017	0.164	0.160	0.155	n/a	0.135	2063	1.063	0.960	0.840	n/a	0.486
2018	0.173	0.168	0.162	n/a	0.140	2064	1.090	0.984	0.860	n/a	0.495
2019	0.182	0.177	0.170	n/a	0.144	2065	1.117	1.008	0.879	n/a	0.504
2020	0.192	0.186	0.178	n/a	0.149	2066	1.144	1.031	0.899	n/a	0.513
2021	0.202	0.195	0.186	n/a	0.155	2067	1.172	1.055	0.919	n/a	0.522
2022	0.213	0.205	0.195	n/a	0.160	2068	1.199	1.079	0.939	n/a	0.531
2023	0.224	0.215	0.204	n/a	0.166	2069	1.226	1.102	0.958	n/a	0.540
2024	0.236	0.226	0.214	n/a	0.172	2070	1.252	1.125	0.977	n/a	0.549
2025	0.248	0.237	0.224	n/a	0.178	2071	1.279	1.148	0.997	n/a	0.558
2026	0.260	0.249	0.234	n/a	0.184	2072	1.305	1.171	1.016	n/a	0.567
2027	0.274	0.261	0.245	n/a	0.190	2073	1.332	1.194	1.035	n/a	0.576
2028	0.287	0.273	0.256	n/a	0.196	2074	1.358	1.217	1.054	n/a	0.585
2029	0.301	0.286	0.267	n/a	0.203	2075	1.384	1.239	1.072	n/a	0.594
2030	0.316	0.300	0.279	n/a	0.209	2076	1.409	1.262	1.091	n/a	0.602
2031	0.331	0.313	0.291	n/a	0.216	2077	1.435	1.284	1.109	n/a	0.611
2032	0.347	0.328	0.304	n/a	0.223	2078	1.460	1.305	1.127	n/a	0.619
2033	0.364	0.342	0.316	n/a	0.230	2079	1.484	1.327	1.145	n/a	0.627
2034	0.380	0.358	0.330	n/a	0.237	2080	1.509	1.348	1.163	n/a	0.636
2035	0.398	0.373	0.343	n/a	0.244	2081	1.533	1.369	1.180	n/a	0.644
2036	0.416	0.390	0.357	n/a	0.252	2082	1.557	1.390	1.197	n/a	0.652
2037	0.434	0.406	0.372	n/a	0.259	2083	1.580	1.410	1.214	n/a	0.660
2038	0.454	0.423	0.386	n/a	0.267	2084	1.603	1.430	1.231	n/a	0.668
2039	0.473	0.441	0.401	n/a	0.275	2085	1.626	1.450	1.247	n/a	0.675
2040	0.493	0.459	0.417	n/a	0.282	2086	1.648	1.469	1.263	n/a	0.683
2041	0.514	0.477	0.433	n/a	0.290	2087	1.670	1.488	1.279	n/a	0.691
2042	0.535	0.496	0.449	n/a	0.299	2088	1.692	1.507	1.295	n/a	0.698
2043	0.557	0.515	0.465	n/a	0.307	2089	1.714	1.525	1.310	n/a	0.705
2044	0.579	0.535	0.482	n/a	0.315	2090	1.735	1.543	1.325	n/a	0.712
2045	0.601	0.555	0.499	n/a	0.324	2091	1.755	1.561	1.340	n/a	0.720
2046	0.624	0.575	0.516	n/a	0.332	2092	1.775	1.579	1.354	n/a	0.726
2047	0.648	0.596	0.534	n/a	0.341	2093	1.795	1.596	1.368	n/a	0.733
2048	0.672	0.617	0.551	n/a	0.349	2094	1.814	1.612	1.382	n/a	0.740
2049	0.696	0.638	0.570	n/a	0.358	2095	1.833	1.629	1.396	n/a	0.747
2050	0.720	0.660	0.588	n/a	0.367	2096	1.852	1.645	1.409	n/a	0.753
2051	0.745	0.682	0.606	n/a	0.376	2097	1.870	1.661	1.422	n/a	0.759
2052	0.770	0.704	0.625	n/a	0.385	2098	1.888	1.676	1.435	n/a	0.766

Table 6. Projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}.
* The median rebuilding year for $T_{F=0}$ is 2060.5, which was rounded to 2061. Therefore, results for a median target year of 2061 are slightly different from Run C (e.g. catch is not exactly zero).
** Due to the discrete distribution, the probability of being above target is less than 50%.

		Median Rebuilding Year				
		2061*	**2070**	**2080**	**2089**	**2098**
	SPR	0.990	0.806	0.697	0.638	0.599
	F	0.0003	0.0080	0.0140	0.0178	0.0207
Pr{above target}	by 2035 (old Tmin)	0.159	0.159	0.107	0.107	0.062
	by 2039 (old Ttarget)	0.216	0.159	0.159	0.107	0.107
	by 2060 (new Tmin)	0.467	0.402	0.338	0.276	0.276
	by 2074 (old Tmax)	0.662	0.533	0.467	0.402	0.402
	by 2098 (new Tmax)	0.784	0.662	0.598	0.533	0.467**
Median Catch (metric tons)						
	2007	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
	2008	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
	2009	0.1	1.8	3.2	4.0	4.7
	2010	0.1	1.9	3.3	4.2	4.9
	2011	0.1	2.0	3.5	4.4	5.0
	2012	0.1	2.1	3.6	4.6	5.2
	2013	0.1	2.2	3.8	4.7	5.4
	2014	0.1	2.3	3.9	4.9	5.7
	2015	0.1	2.4	4.1	5.1	5.9
	2016	0.1	2.5	4.3	5.4	6.1
	2017	0.1	2.7	4.5	5.6	6.4
	2018	0.1	2.8	4.7	5.8	6.6

Table 7. Median spawning output relative to the rebuilding target for projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}.

Median Rebuilding Year	2061	2070	2080	2089	2098
SPR	0.990	0.806	0.697	0.638	0.599
F	0.0003	0.0080	0.0140	0.0178	0.0207
Year	**Median Spawning Biomass Relative to Target**				
2007	0.094	0.094	0.094	0.094	0.094
2008	0.100	0.100	0.100	0.100	0.100
2009	0.106	0.106	0.106	0.106	0.106
2010	0.112	0.111	0.111	0.110	0.110
2011	0.119	0.117	0.116	0.115	0.114
2012	0.125	0.123	0.121	0.119	0.119
2013	0.132	0.129	0.126	0.124	0.123
2014	0.139	0.135	0.131	0.129	0.128
2015	0.147	0.141	0.137	0.134	0.132
2016	0.155	0.148	0.143	0.140	0.138
2017	0.163	0.155	0.149	0.146	0.143
2018	0.172	0.163	0.156	0.152	0.149
2019	0.182	0.171	0.163	0.158	0.155
2020	0.191	0.179	0.170	0.165	0.161
2021	0.201	0.188	0.178	0.172	0.167
2022	0.212	0.197	0.186	0.179	0.174
2023	0.223	0.206	0.194	0.186	0.181
2024	0.235	0.216	0.202	0.194	0.188
2025	0.247	0.226	0.211	0.202	0.196
2026	0.259	0.237	0.220	0.211	0.204
2027	0.272	0.247	0.230	0.219	0.211
2028	0.286	0.259	0.239	0.228	0.219
2029	0.300	0.270	0.249	0.237	0.228
2030	0.315	0.282	0.260	0.246	0.236
2031	0.330	0.295	0.270	0.255	0.245
2032	0.345	0.307	0.281	0.265	0.254
2033	0.362	0.321	0.292	0.275	0.263
2034	0.378	0.334	0.303	0.285	0.272
2035	0.396	0.348	0.315	0.296	0.282
2036	0.414	0.362	0.327	0.306	0.292
2037	0.432	0.377	0.339	0.317	0.302
2038	0.451	0.392	0.352	0.328	0.312
2039	0.470	0.408	0.365	0.340	0.322
2040	0.490	0.423	0.378	0.351	0.333
2041	0.511	0.439	0.391	0.363	0.344
2042	0.532	0.456	0.405	0.375	0.355
2043	0.553	0.473	0.419	0.388	0.366
2044	0.575	0.490	0.433	0.400	0.377
2045	0.597	0.507	0.447	0.413	0.389
2046	0.620	0.525	0.462	0.425	0.400
2047	0.643	0.543	0.477	0.438	0.412
2048	0.667	0.562	0.492	0.452	0.424
2049	0.691	0.580	0.507	0.465	0.436
2050	0.715	0.599	0.522	0.478	0.448
2051	0.740	0.618	0.538	0.492	0.460
2052	0.765	0.637	0.554	0.506	0.473

Median Rebuilding Year	2061	2070	2080	2089	2098
SPR	0.990	0.806	0.697	0.638	0.599
F	0.0003	0.0080	0.0140	0.0178	0.0207
Year	**Median Spawning Biomass Relative to Target**				
2053	0.790	0.657	0.570	0.519	0.485
2054	0.816	0.677	0.585	0.533	0.498
2055	0.842	0.696	0.602	0.547	0.510
2056	0.868	0.716	0.618	0.562	0.523
2057	0.894	0.736	0.634	0.576	0.536
2058	0.920	0.757	0.650	0.590	0.549
2059	0.947	0.777	0.667	0.604	0.562
2060	0.973	0.797	0.683	0.618	0.574
2061	1.000	0.818	0.700	0.633	0.587
2062	1.027	0.838	0.716	0.647	0.600
2063	1.054	0.858	0.732	0.661	0.613
2064	1.081	0.879	0.749	0.676	0.626
2065	1.108	0.899	0.765	0.690	0.639
2066	1.134	0.919	0.782	0.704	0.651
2067	1.161	0.940	0.798	0.718	0.664
2068	1.188	0.960	0.814	0.732	0.677
2069	1.214	0.980	0.830	0.746	0.690
2070	1.241	1.000	0.847	0.760	0.702
2071	1.267	1.020	0.863	0.774	0.715
2072	1.293	1.040	0.878	0.788	0.727
2073	1.319	1.059	0.894	0.802	0.739
2074	1.345	1.079	0.910	0.815	0.751
2075	1.370	1.098	0.925	0.829	0.763
2076	1.396	1.117	0.941	0.842	0.775
2077	1.421	1.136	0.956	0.855	0.787
2078	1.445	1.154	0.971	0.868	0.799
2079	1.470	1.173	0.985	0.881	0.811
2080	1.494	1.191	1.000	0.894	0.822
2081	1.518	1.209	1.014	0.906	0.833
2082	1.541	1.227	1.029	0.919	0.844
2083	1.564	1.244	1.043	0.931	0.855
2084	1.587	1.261	1.057	0.943	0.866
2085	1.610	1.278	1.070	0.955	0.877
2086	1.632	1.295	1.084	0.966	0.887
2087	1.654	1.311	1.097	0.978	0.898
2088	1.675	1.327	1.110	0.989	0.908
2089	1.696	1.343	1.122	1.000	0.918
2090	1.717	1.358	1.135	1.011	0.928
2091	1.737	1.373	1.147	1.022	0.937
2092	1.757	1.388	1.159	1.032	0.947
2093	1.776	1.403	1.171	1.042	0.956
2094	1.795	1.417	1.182	1.052	0.965
2095	1.814	1.431	1.194	1.062	0.974
2096	1.832	1.445	1.205	1.072	0.983
2097	1.850	1.458	1.216	1.081	0.992
2098	1.868	1.472	1.226	1.091	1.000

Fig. 1. Frequency distribution for twenty-one fixed steepness values used to characterize uncertainty in rebuilding projections. Steepness values are the midpoints of the bins.

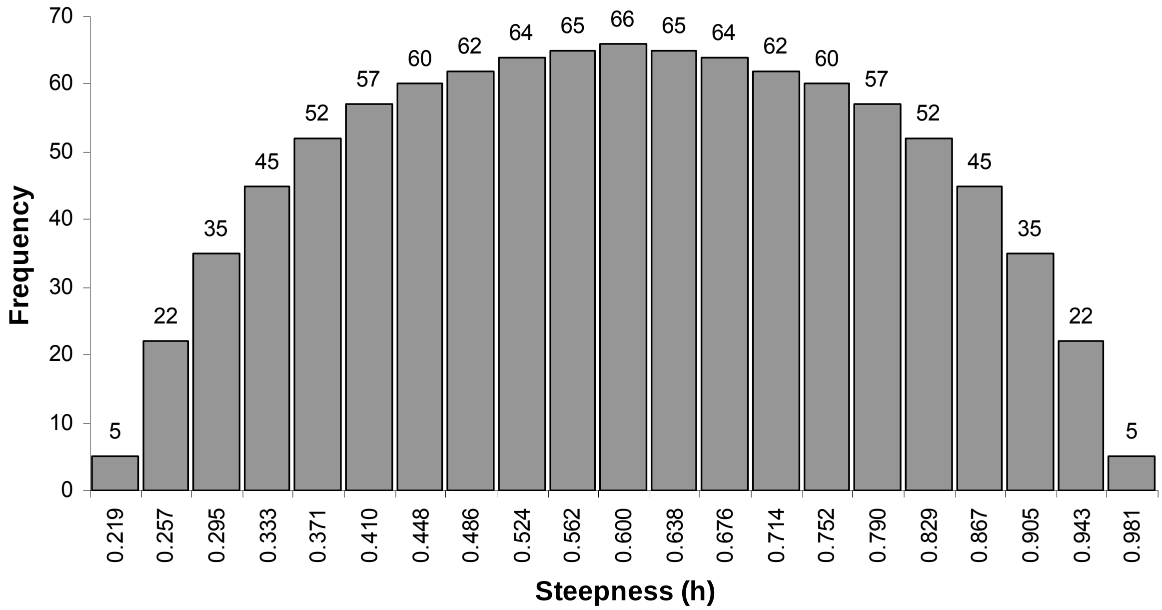


Fig. 2. Projected probability of being above target biomass for runs C and D1-D4. The discrete distribution for steepness causes a step-like characteristic.

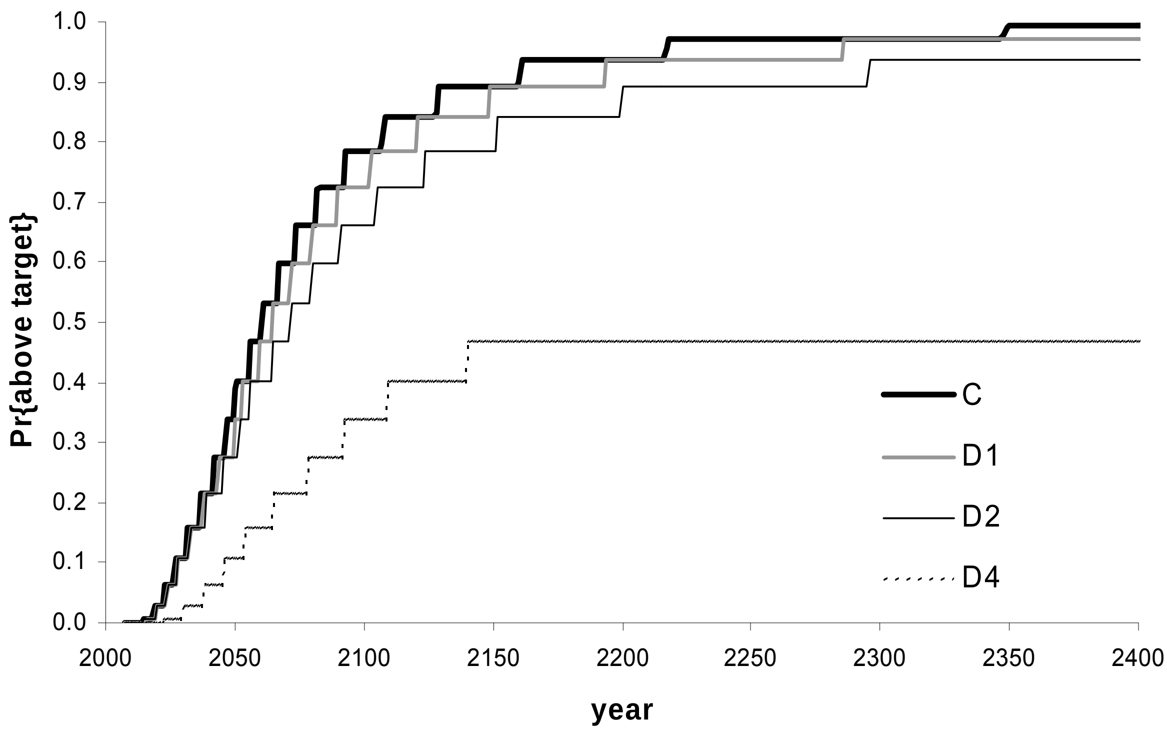


Fig. 3. Assumed frequency distribution of unfished female spawning biomass.

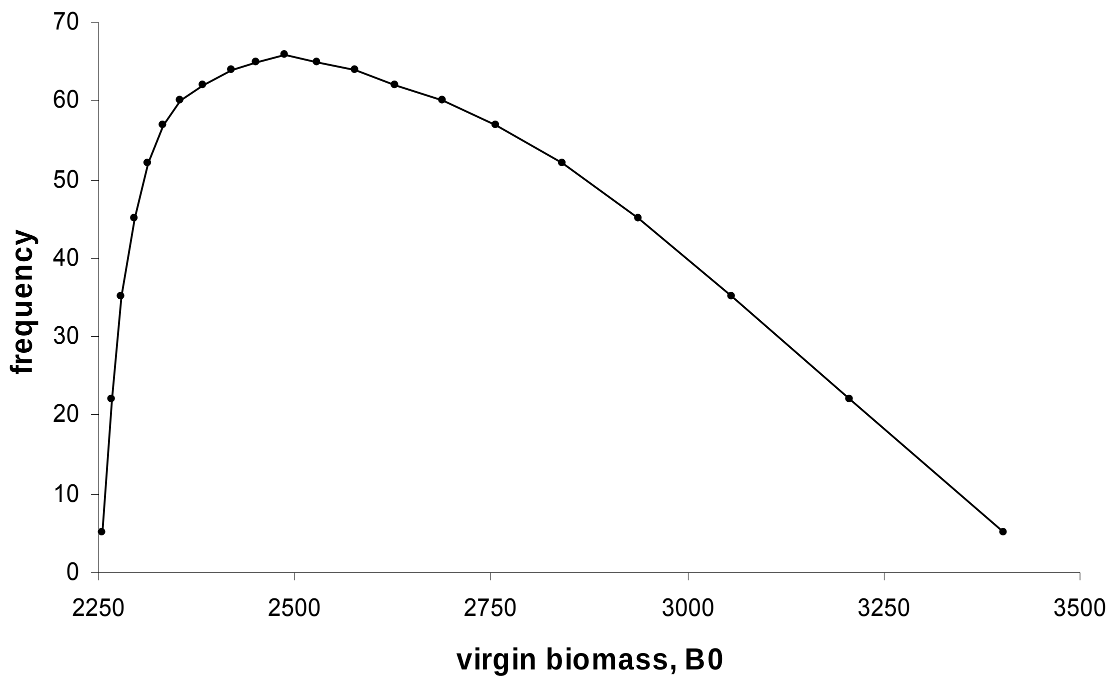


Fig. 4. Projections of median spawning biomass relative to target biomass for runs C and D1-D4.

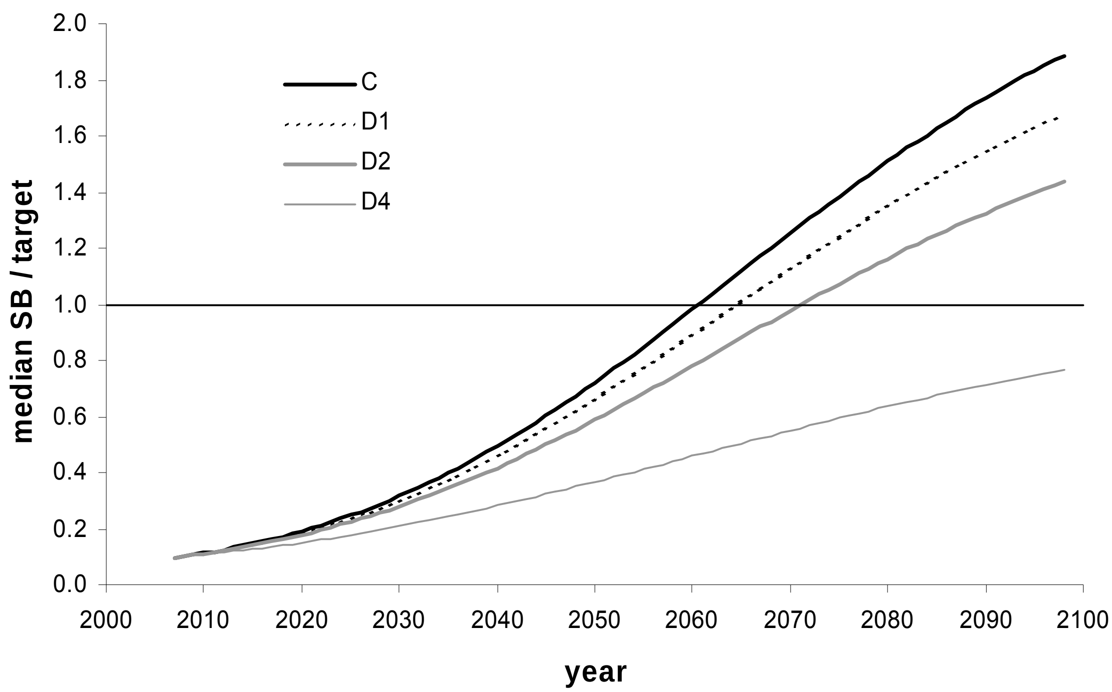


Fig. 5. Projected median catch trajectories for runs D1-D4.

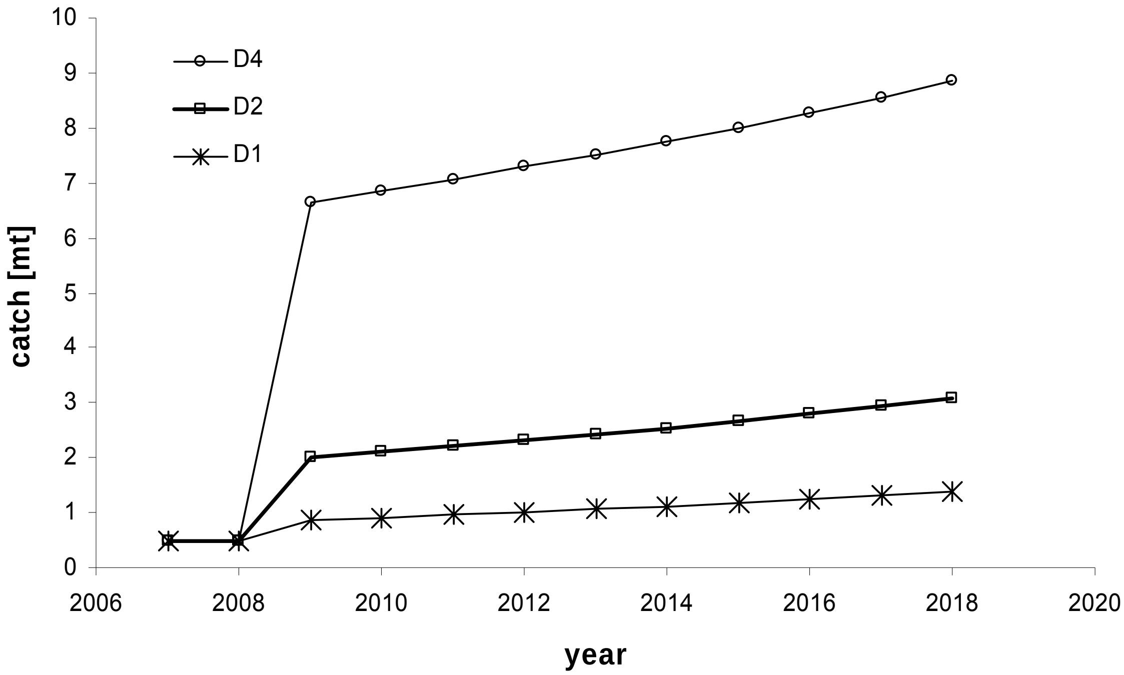


Fig. 6. Projected probability of being above target biomass for projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}.

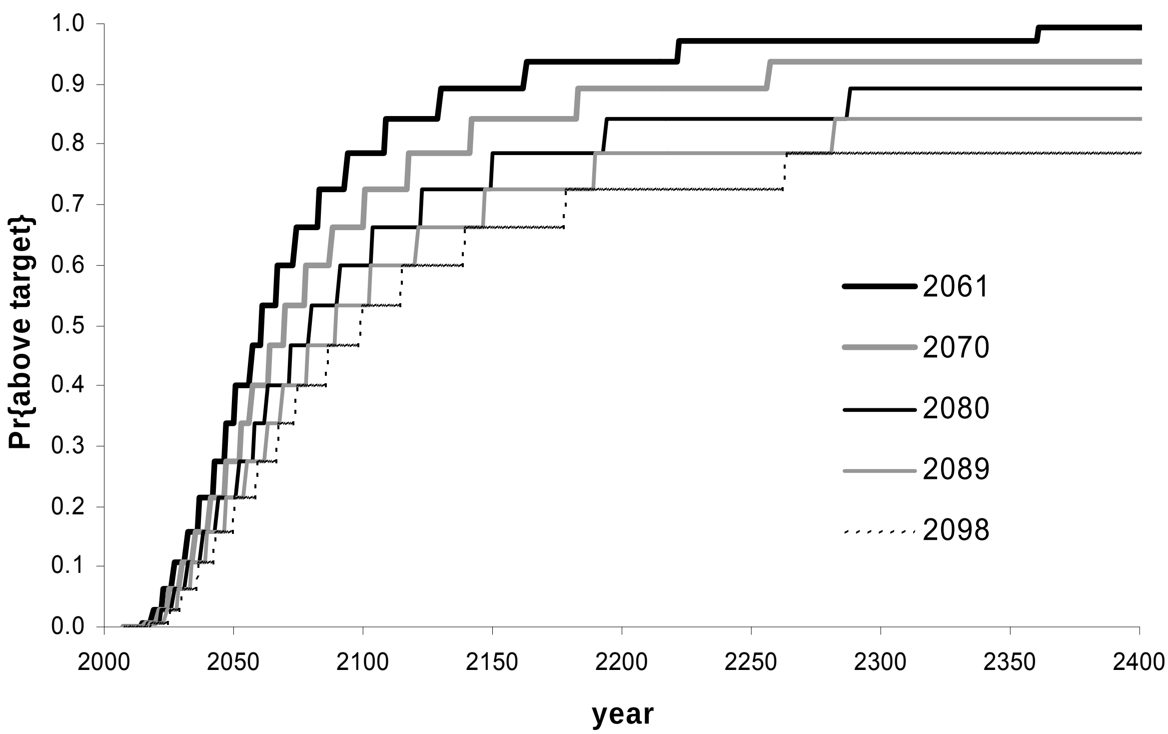


Fig. 7. Projections of median spawning biomass relative to target biomass for runs with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}.

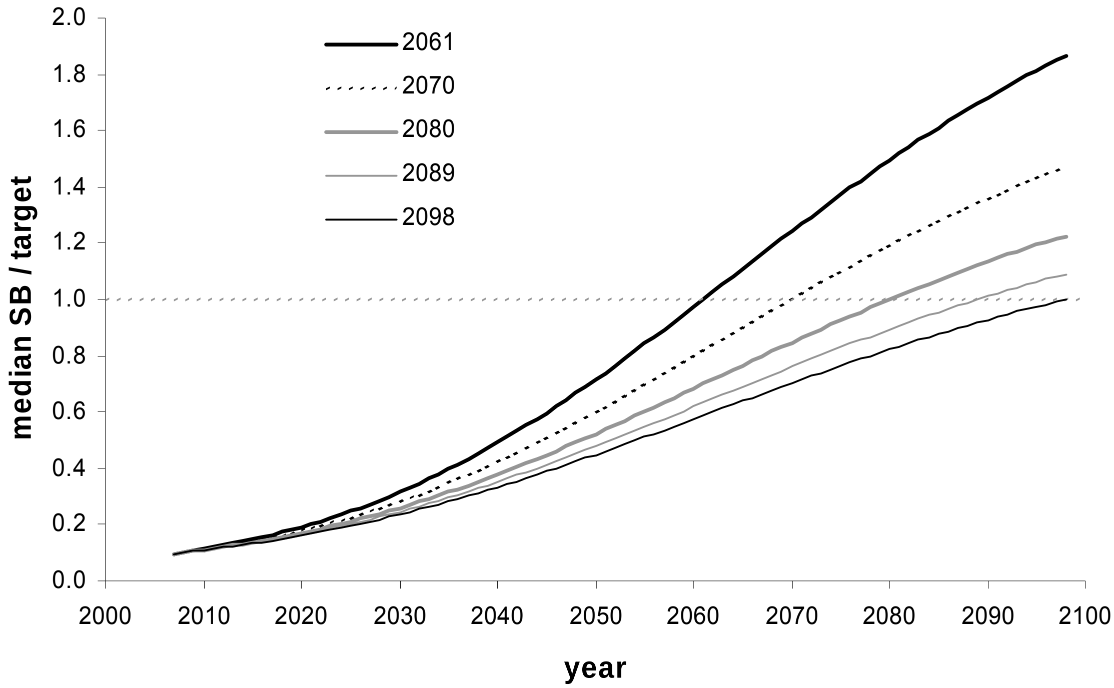
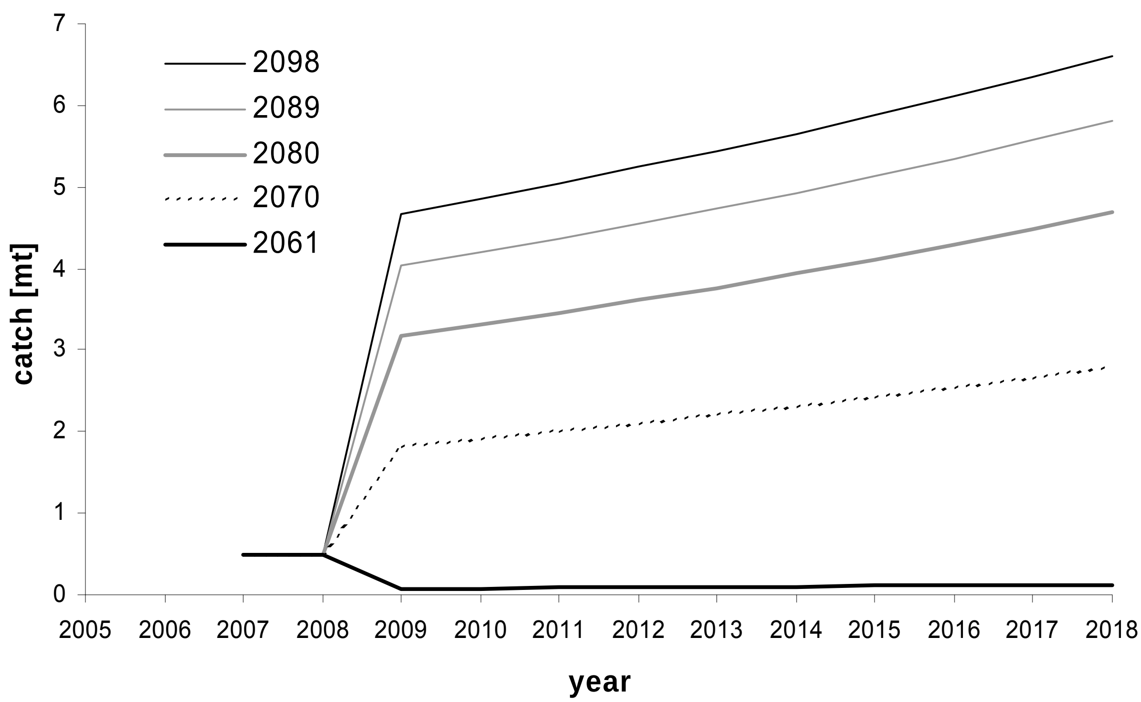


Fig. 8. Projected median catch trajectories for projections with median rebuilding times evenly distributed between $T_{F=0}$ and T_{MAX}. Since the new estimate of $T_{F=0}$ (2061) was rounded up from a fractional year, catches based on a target median rebuilding time for this (rounded) year are reported as slightly above zero.



Rebuild.dat file for run C

```
#Title # Run C, T(F=0)
```

```
moo3_rebuild.dat
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 80
# Number of fleets
2
# First year of projection (Yinit)
2007
# First Year of rebuilding period (Ydecl)
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical
recruits/spawner (2)  or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 #runnumber: 22
moo3_base.dat moo3_base.ctl 16.5365 4976.24 198.724
 0 1.27093e-007 3.34807e-006 9.01415e-005 0.00126286 0.00873566 0.0350091 0.0961502
0.203967 0.361596 0.564146 0.801836 1.06323 1.33757 1.61611 1.89259 2.16318 2.42614
2.68117 2.92888 3.17027 3.40632 3.6378 3.86519 4.08867 4.30823 4.5237 4.73487 4.94148
5.14331 5.34016 5.53186 5.71826 5.89927 6.07482 6.24488 6.40942 6.56846 6.7261 6.8781
7.02454 7.16549 7.30106 7.43136 7.5565 7.67661 7.79183 7.90229 8.00812 8.10948 8.2065
8.29932 8.3881 8.47297 8.55408 8.63157 8.70556 8.7762 8.84362 8.90795 8.96931 9.02782
9.08361 9.13679 9.18747 9.23575 9.28175 9.32556 9.36728 9.407 9.44481 9.4808 9.51506
9.54765 9.57867 9.60817 9.63624 9.66293 9.68832 9.71247 9.73543 #female fecundity;
weighted by N in year Y_init across morphs and areas
# Age specific selectivity and weight adjusted for discard and discard mortality
 #wt and selex for gender,fleet: 1 1
 0.0635516 0.168778 0.3697 0.627271 0.843211 1.00574 1.13742 1.25451 1.36626 1.47826
1.59429 1.71716 1.84912 1.99194 2.14689 2.31463 2.49513 2.68757 2.89041 3.10154
3.31853 3.53898 3.7607 3.9819 4.2012 4.41761 4.6304 4.83904 5.04316 5.24245 5.43671
5.62575 5.80946 5.98774 6.16055 6.32784 6.48963 6.64799 6.8028 6.95201 7.09569 7.23394
7.36686 7.49457 7.61718 7.73483 7.84764 7.95577 8.05935 8.15852 8.25342 8.34421
8.43102 8.51399 8.59327 8.66899 8.74129 8.81031 8.87617 8.93899 8.99892 9.05605
9.11052 9.16243 9.2119 9.25903 9.30392 9.34667 9.38738 9.42614 9.46303 9.49814 9.53156
9.56335 9.5936 9.62238 9.64975 9.67579 9.70055 9.72409 9.74648
 0 3.85763e-006 5.02165e-005 0.000590347 0.00426779 0.0184032 0.053019 0.114639
0.202529 0.309685 0.426087 0.541752 0.648622 0.74137 0.817414 0.876498 0.920056
0.950529 0.970754 0.98348 0.991073 0.995371 0.997684 0.998874 0.999463 0.999745
0.999878 0.999941 0.999971 0.999985 0.999992 0.999996 0.999998 0.999999 0.999999
0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1
 #wt and selex for gender,fleet: 1 2
 0.0509934 0.129586 0.256494 0.392248 0.513435 0.625602 0.736515 0.851737 0.975086
1.10922 1.25589 1.41608 1.58992 1.77679 1.97538 2.18386 2.40012 2.62203 2.84759
3.07509 3.30309 3.53045 3.75622 3.97965 4.20011 4.4171 4.63016 4.83893 5.0431 5.24243
5.43669 5.62574 5.80946 5.98774 6.16054 6.32784 6.48963 6.64799 6.8028 6.95201 7.09569
7.23394 7.36686 7.49457 7.61718 7.73483 7.84764 7.95577 8.05935 8.15852 8.25342
8.34421 8.43102 8.51399 8.59327 8.66899 8.74129 8.81031 8.87617 8.93899 8.99892
9.05605 9.11052 9.16243 9.2119 9.25903 9.30392 9.34667 9.38738 9.42614 9.46303 9.49814
9.53156 9.56335 9.5936 9.62238 9.64975 9.67579 9.70055 9.72409 9.74648
 0 0.00161388 0.0088351 0.037502 0.105252 0.21417 0.34888 0.488771 0.617605 0.726343
0.812095 0.875988 0.921252 0.951846 0.971613 0.983838 0.991087 0.995219 0.99749 0.9987
0.999331 0.999654 0.999819 0.999904 0.999947 0.999971 0.999983 0.99999 0.999994
0.999996 0.999998 0.999998 0.999999 0.999999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
# M and current age-structure in year Yinit: 2007
```

gender = 1
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055
20.8725 18.7177 16.7208 14.8702 13.1566 11.5717 10.1079 9.01391 8.10312 7.04934
6.28335 6.38181 6.04636 6.04576 5.32065 4.88158 4.08261 3.35113 2.73013 3.13227
3.26686 4.03243 4.3909 4.08379 3.19319 2.7009 1.98686 1.38048 0.905292 0.544862
0.308132 0.165958 0.0852645 0.0433505 0.0222229 0.0118263 0.00662999 0.00398906
0.00258374 0.00178995 0.00131948 0.0010184 0.000815456 0.000672306 0.000567825
0.000488118 0.000425903 0.000376046 0.000334929 0.000301046 0.000272505 0.000248303
0.000227066 0.000208253 0.000191258 0.000176002 0.000162309 0.000149712 0.000138242
0.00012779 0.000118272 0.000109622 0.000101736 9.45437e-005 8.80337e-005 8.20475e-005
7.66454e-005 7.16362e-005 6.70124e-005 6.27369e-005 5.88242e-005 5.51909e-005
5.19556e-005 4.90046e-005 4.62738e-005 4.37874e-005 4.15761e-005 3.93556e-005
3.71628e-005 3.5069e-005 0.000465183
Age-structure at Ydecl= 2000
13.2608 11.9315 10.3944 9.28739 9.47051 9.02246 9.08043 8.04518 7.42794 6.24644
5.15053 4.21102 4.84421 5.06212 6.25678 6.81911 6.34585 4.96372 4.19937 3.08957
2.14679 1.40788 0.847368 0.47921 0.258102 0.132605 0.0674198 0.0345617 0.0183926
0.0103111 0.00620389 0.0040183 0.00278378 0.00205208 0.00158383 0.00126821 0.00104558
0.000883091 0.000759129 0.00066237 0.000584831 0.000520884 0.000468189 0.000423801
0.000386162 0.000353133 0.000323874 0.000297444 0.000273717 0.000252422 0.00023283
0.000214992 0.000198737 0.000183934 0.000170481 0.000158217 0.000147031 0.000136906
0.000127596 0.000119195 0.000111404 0.000104213 9.75638e-005 9.14787e-005 8.58281e-005
8.07964e-005 7.6207e-005 7.196e-005 6.80931e-005 6.4654e-005 6.12006e-005 5.77902e-005
5.45339e-005 5.14618e-005 4.85115e-005 4.549e-005 4.24727e-005 3.94473e-005 3.64728e-005 3.36246e-005 0.000425943
Year for Tmin Age-structure (set to Ydecl by SS2)
2000
Number of simulations
1000
recruitment and biomass
Number of historical assessment years
109
Historical data
year recruitment spawner in B0 in R project in R/S project
1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915
1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966
1967 1968 1969 1970 1971 1972 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 #years (with first value representing R0)
109.942 109.942 109.942 109.923 109.886 109.83 109.755 109.662 109.551 109.42 109.271
109.102 108.914 108.706 108.478 108.228 107.956 107.662 107.344 106.787 106.274
105.999 105.695 105.446 105.207 104.846 104.309 103.692 102.858 102.178 101.685
101.251 100.648 99.7845 99.2896 99.0108 98.8291 98.7973 99.0277 99.2299 99.4799
99.7021 99.9078 100.067 100.356 100.625 100.956 101.259 101.505 101.7 101.828 101.896
101.933 101.867 101.886 101.924 101.828 101.654 101.361 101.139 100.906 100.737
100.441 100.157 99.9465 99.7048 99.5182 99.1501 98.4735 97.427 96.6073 95.6868 94.8613
94.0572 92.5541 90.7845 88.372 86.0066 82.5588 79.3452 75.9829 70.893 65.9361 60.6571
50.3715 46.592 37.1386 25.9435 16.4862 12.8416 9.42624 10.0745 10.9863 11.9928 12.0758
12.762 11.9293 11.8168 10.9567 11.6036 12.6061 13.2608 14.0668 15.2376 16.3951 17.5381
18.6651 19.776 20.8725 #recruits; first value is R0 (virgin)
4976.24 4976.24 4976.23 4971.13 4960.99 4945.89 4925.92 4901.18 4871.76 4837.77
4799.34 4756.56 4709.56 4658.45 4603.35 4544.37 4481.61 4415.19 4345.2 4226.92 4122.46
4068.26 4009.63 3962.55 3918.17 3852.68 3758.48 3654.62 3521.22 3417.86 3346.07 3284.6
3202.05 3089.34 3027.41 2993.34 2971.45 2967.65 2995.39 3020.07 3051 3078.89 3105.07
3125.54 3163.33 3198.98 3243.87 3285.71 3320.29 3348.2 3366.58 3376.54 3381.82 3372.24
3375.07 3380.57 3366.66 3341.61 3300.04 3269.03 3237 3214.06 3174.43 3137.19 3110.03
3079.24 3055.79 3010.29 2929.28 2810.26 2721.95 2627.54 2546.87 2471.66 2339.32 2195.9
2019.17 1863.9 1664.24 1501.71 1351.65 1155.94 994.367 847.003 614.672 543.371 389.928
243.616 142.128 107.32 76.5805 82.2828 90.4063 99.5164 100.275 106.583 98.9377 97.9125

```
90.1405 95.9752 105.144 111.215 118.781 129.958 141.231 152.586 164.008 175.49 187.049
#spbio; first value is S0 (virgin)
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  # in Bzero
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  0 0 0 # in R project
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  0 0 0 # in R/S project
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches go next
2007 0.5
2008 0.5
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
7
# Steepness sigma-R Auto-correlation
0.6 0 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using SPR_target
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.75
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
15
# Random number seed
-98765
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
Dorn_prior_2.ss2
# Number of parameter vectors: value is placeholder only, user needs to change it
1000
# User-specific projection (1=Yes); Output replaced (1->9)
0  5  0  0.1
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2009 1 1
-1 -1 -1
# Split of Fs
2007 1 1
-1  99  99
```

```
# Five pre-specified years (used to define Ttarget for projection type 4)
2009 2010 2011 2012 2013 # placeholder
#year for probability of recovery
2039
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.4
# Project with Historical recruitments when computing Tmin (1=Yes)
0
# CV of implementation error
0
```

Addendum to the 2007 Stock Assessment and Rebuilding Analysis for Cowcod, *Sebastes levis*

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October 15, 2007

Summary

The 2007 cowcod assessment and rebuilding analysis are updated with a revised biomass estimate from the 2002 submersible survey. An error in the calculation of mean size was recently corrected in the survey results, reducing the estimate of cowcod biomass in the survey area from 940 to 524 metric tons. The revised biomass estimate is more consistent with the trend in relative abundance observed in CPFV logbook data, reducing estimated depletion in 2007 to 3.8% of unfished biomass in the base model. Revised models for the low and high alternative states of nature estimate depletion at 3.4% and 16.3%, respectively. Results from the recent rebuilding analysis are only slightly changed, with a median rebuilding year of 2065 under the Amendment 16-4 harvest rate ($F_{90\%}$). The revised estimate of T_{max} is 2098.

Introduction and Background

In the most recent assessment of cowcod, *Sebastes levis*, in the Southern California Bight, Dick et al. (2007) estimate spawning stock biomass in 2007 at approximately 4.6% of the theoretical unfished biomass. The uncertainty in this estimate was characterized by two alternative “low” and “high” models, which estimate 2007 depletion at 4.1% and 27.3%, respectively. In the subsequent rebuilding analysis (Dick and Ralston, 2007) the estimated median time to rebuild (T_{target}) under the current harvest rate ($F_{90\%}$) was delayed by 23 years relative to the T_{target} of 2039 specified in Amendment 16-4 to the Pacific Coast Groundfish Fishery Management Plan (FMP). This change is largely driven by revised estimates of stock productivity, historical commercial landings, and a structural flaw detected in the 2005 assessment (Dick et al., 2007).

One of the data sets included in the 2007 assessment was an estimate of cowcod biomass in 2002 based on a visual transect survey conducted from an occupied submersible (Yoklavich et al., in press). A formal review of this survey was conducted in 2004 with the assistance of the Center for Independent Experts (http://www.rsmas.miami.edu/groups/cie/) and the biomass estimate was included in the last two assessments as a relative index of abundance with an informative prior on the catchability parameter (Piner et al., 2005; Dick et al., 2007). In this way, estimated biomass from the survey area was adjusted to reflect the expected biomass in the entire Southern California Bight.

An error was recently discovered in the visual survey methodology, related to the calculation of mean weight (M. Yoklavich, pers. comm.). During the survey, cowcod at greater distances were easier to detect if they were large. Although the originally reported numbers and densities of cowcod remain unchanged, the total biomass estimate (940 metric tons) was based on estimates of mean weight that did not account for this effect. The survey investigators therefore adjusted their estimates of mean weight to include only cowcod sighted within 2.7 meters of the transect line. Within this distance they found no relationship between fish size and distance. Their revised estimate of cowcod biomass in the survey area is 524 metric tons, 56% of the previous estimate.

Effect on the 2007 Cowcod Stock Assessment

The three models presented in the 2007 cowcod assessment were fit using the revised biomass estimate from the visual survey (Table 1). While changes to unfished biomass are minor (<1%), female spawning biomass in 2007 is estimated at 94 metric tons, compared to 113 mt in the original 2007 assessment. This reduces depletion in 2007 from 4.6% to 3.8% in the base model. The revised range of plausible depletion levels in 2007 is between 3.4% and 16.3%, based on point estimates from the alternative low and high models, respectively.

One of the unresolved issues with the 2007 assessment was a conflict between the CPFV logbook index and the visual survey. The 2002 biomass estimated from the visual survey was considerably higher than the model-predicted biomass, which was influenced by the declining trend in the CPFV index. Therefore, the prior distribution for the visual survey’s catchability coefficient (expansion factor) was not consistent with the posterior mode. The revised biomass estimate reduces, but does not eliminate, this discrepancy between the two data sets (Table 1).

Effect on the 2007 Rebuilding Analysis

Table 2 summarizes changes to the results for rebuilding model runs requested by the PMFC. A complete revision of the rebuilding analysis is presented as a separate document.

Literature Cited

Dick, E.J., S. Ralston, and D. Pearson. 2007. Status of cowcod, *Sebastes levis*, in the Southern California Bight. Document submitted to the PFMC, August 22, 2007.

Dick, E.J. and S. Ralston. 2007. Cowcod rebuilding analysis. Document submitted to the PFMC, October 3, 2007.

Piner, K., E. J. Dick, and J. Field. 2006. 2005 Stock Status of Cowcod in the Southern California Bight and Future Prospects. In Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses. Portland, OR: Pacific Fishery Management Council.

Yoklavich, M., M. Love, and K. Forney. In press. A fishery-independent assessment of cowcod (*Sebastes levis*) using direct observations from an occupied submersible. Canadian Journal of Fisheries and Aquatic Sciences.

Table 1. Comparison of results from the 2007 cowcod stock assessment, using original (940 mt) and revised (524 mt) estimates of cowcod biomass from the 2002 visual survey.

	Visual survey biomass = 940 mt			Visual survey biomass = 524 mt		
	h = 0.4	h = 0.6	h = 0.8	h = 0.4	h = 0.6	h = 0.8
Reference Points	CPFV index & visual survey	CPFV index & visual survey	Visual survey only	CPFV index & visual survey	CPFV index & visual survey	Visual survey only
Unfished female spawning biomass (SB_0)	2785	2494	2496	2777	2488	2389
Unfished summary (age-1+) biomass	5923	5303	5308	5905	5291	5080
40% of SB_0 (proxy for SB_{MSY})	1114	997	998	1111	995	956
Female spawning biomass in 2007	115	113	681	94	94	389
SB in 2007 / unfished SB	4.1%	4.6%	27.3%	3.4%	3.8%	16.3%
Parameter Estimates						
Unfished recruitment (R_0)	123.1	110.2	110.3	122.7	109.9	105.6
Catchability for CPFV logbook index	0.000197	0.000208	n/a	0.000205	0.000216	n/a
Catchability for visual survey	3.06	3.19	0.75	2.22	2.30	0.75
Likelihood components						
Total negative log likelihood	17.22	17.91	n/a	15.90	16.54	n/a
CPFV logbook index	12.28	12.67	n/a	12.92	13.34	n/a
Visual survey	0.99	1.05	n/a	0.64	0.68	n/a
Prior on visual survey	3.95	4.19	n/a	2.35	2.51	n/a

Table 2. Revised summary of requested model runs, based on 2007 cowcod assessment with revised 2002 biomass estimate. Refer to Ralston and Dick (2007) for a description of model runs. Values in bold are fixed. Run D3 does not apply to cowcod because the median time to recovery exceeds the Amendment16-4 value for T_{target} even in the absence of fishing.

	Run	C	D1	D2	D3*	D4
	SPR	1	**0.900**	0.790	n/a	**0.5**
	F	**0**	0.0038	0.0088	n/a	0.0295
	Median rebuilding year	2061	2065	2072	n/a	2201
Pr{above target}	by 2035 (old Tmin)	0.159	0.159	0.159	n/a	0.027
	by 2039 (old Ttarget)	0.216	0.216	0.216	n/a	0.062
	by 2060 (new Tmin)	0.467	0.467	0.402	n/a	0.159
	by 2074 (old Tmax)	0.662	0.598	0.533	n/a	0.216
	by 2098 (new Tmax)	0.784	0.724	0.662	n/a	0.338
Median Catch (metric tons)						
	2007	*0.5*	*0.5*	*0.5*	n/a	*0.5*
	2008	*0.5*	*0.5*	*0.5*	n/a	*0.5*
	2009	0	0.9	**2.0**	n/a	6.6
	2010	0	0.9	2.1	n/a	6.9
	2011	0	1.0	2.2	n/a	7.1
	2012	0	1.0	2.3	n/a	7.3
	2013	0	1.1	2.4	n/a	7.5
	2014	0	1.1	2.5	n/a	7.8
	2015	0	1.2	2.7	n/a	8.0
	2016	0	1.2	2.8	n/a	8.3
	2017	0	1.3	2.9	n/a	8.6
	2018	0	1.4	3.1	n/a	8.9

Literature Cited

Dick, E.J., S. Ralston, and D. Pearson. 2007. Status of cowcod, *Sebastes levis*, in the Southern California Bight. Document submitted to the PFMC, August 22, 2007.

Dick, E.J. and S. Ralston. 2007. Cowcod rebuilding analysis. Document submitted to the PFMC, October 3, 2007.

Piner, K., E. J. Dick, and J. Field. 2006. 2005 Stock Status of Cowcod in the Southern California Bight and Future Prospects. In Volume 1: Status of the Pacific Coast Groundfish Fishery Through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses. Portland, OR: Pacific Fishery Management Council.

Yoklavich, M., M. Love, and K. Forney. In press. A fishery-independent assessment of cowcod (*Sebastes levis*) using direct observations from an occupied submersible. Canadian Journal of Fisheries and Aquatic Sciences.

Agenda Item D.3.a
Attachment 9
November 2007

DRAFT

2007 Darkblotched Rockfish Rebuilding Analysis

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October 4, 2007

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1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). Darkblotched rockfish (*Sebastes crameri)* was declared overfished in January 2001 based on the most recent stock assessment at that time (Rogers et al. 2000). Rebuilding analyses were first conducted in mid-year 2001 (Methot and Rogers 2001) and included a partial update of the 2000 stock assessment.

The stock assessment for darkblotched rockfish was updated in 2003 (Rogers 2003). Full assessments were conducted in 2005 (Rogers 2005) and 2007 (Hamel 2007), using stock-synthesis II (SS2). In 2005 the natural mortality rate used in the assessment was changed from the previously used value of 0.05 (based largely on Hoenig's method) to 0.07 (as a balance between Hoenig's method and Gunderson's method based on gonadosomatic index (GSI)). This latter value was used in the 2007 assessment as well. The largest change in assumptions between the 2005 and 2007 assessments was the value of stock-recruitment steepness. In 2005, steepness was estimated at 1.0, and was set at 0.95. In 2007, a great deal more age data was included in the assessment, largely as conditional age-at length compositions, and steepness was estimated (using the prior from Dorn's meta-analysis) at 0.6 and that value was then fixed in the assessment. The SPR chosen following the 2005 rebuilding analysis (0.607) corresponded to a T_{target} (median rebuilding year) of 2011, which was much earlier than for previous rebuilding analyses, due largely to the high value of steepness (and thus productivity at low stock sizes) assumed in the 2005 assessment.

2. Specifications

2.1 Selection of B_0

The unfished spawning stock biomass, B_0, is determined from the fitted stock-recruitment relationship in order to be consistent with the assumptions underlying the current stock assessment. This is in contrast to previous rebuilding analyses for darkblotched rockfish which used a range of estimated historical recruitments to estimate B_0. The MPD estimate of B_0 is 30,640 units of spawning output[1].

2.2 Generation of future recruitment

Future recruitments are generated using the Beverton-Holt spawner recruit relationship with steepness = 0.6 and σ_r = 0.8 as estimated within the assessment (Hamel 2007). This is in contrast to previous rebuilding analyses which resampled from a range of estimated historical recruitments. Again, this choice is consistent with the assumptions underlying the current stock assessment.

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for a plot of net spawning output *versus* age). The best estimate of the mean generation time is 25 years (figure 1). This is one year longer than in the previous rebuilding analysis, likely due to new estimates of growth and therefore fecundity-at-age (Appendix 1).

[1] Spawning output is defined in units of 100 million eggs.

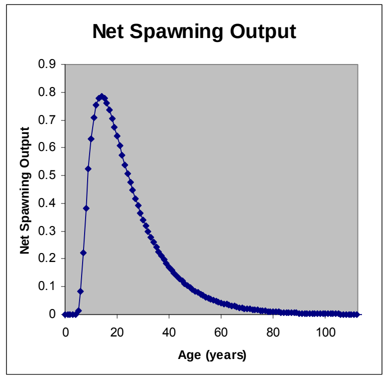

Figure 1: Relationship between net spawning output and age for darkblotched rockfish.

2.4 The harvest strategies

Table 1 summarizes those options considered in the rebuilding analyses. These include a 50% probability of rebuilding by T_{target} (2011; case 1; undefined); a no catch option (case 2); using the calculated SPR from the last rebuilding analysis (case 3); or the implied SPR in the current analysis from the 2007-8 OYs (290 and 330 mt; case 4); or using the ABC harvest rule (Case 5). These five cases were requested by the Council in a memorandum dated September 04, 2007. The other eight cases include four evenly spread intermediate values of T_{target} between $T_{F=0}$ (2018) up to either the current or newly calculated values of T_{max} (2033: cases 7,9,10,11 (2022, 2025, 2029, 2033); 2040: cases 8,10,12,13 (2023, 2029, 2035, 2040)) with one additional intermediate run (case 6: 2020).

Table 1: Harvest strategy options considered in this document ordered by SPR.

Case	Name	$T_{50\%}$	*2009 OY*	*SPR*	*2010 ABC*
1	**T_{target} = 2011 (Current)**	2011	NA	NA	NA
2	**F = 0**	2018	0	1.000	457
3	**SPR from 2005 rebuilding**	2030	300	0.607	445
4	**SPR from 2007-8 OYs**	2031	318	0.592	445
5	**ABC rule**	2052	437	0.500	440
6	T_{target} = 2020	2020	96	0.842	453
7	T_{target} = 2022	2022	160	0.756	451
8	T_{target} = 2023	2023	188	0.722	450
9	T_{target} = 2025	2025	229	0.677	448
10	T_{target} = 2029	2029	293	0.613	445
11	T_{target} = 2033	2033	341	0.572	444
12	T_{target} = 2035	2035	354	0.561	443
13	T_{target} = 2040	2040	385	0.537	442

2.5 Other specifications

The calculations of this document were performed using Version 2.11 of the rebuilding software developed by Punt (2007) and the results are based on 1,000 Monte Carlo replicates.

The definition of "recovery by year *y*" in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability). Appendix 1 provides a comparison of life history inputs in this rebuilding analysis to those in the 2005 rebuilding model. The input to the rebuilding program is given as Appendix 2. The catch for 2007 and 2008 were set to 290 and 330 mt respectively (the Council-selected *OYs* for 2007-2008).

3. Results

3.1 Time-to-recovery

The median year for rebuilding to the target level in the absence of fishing since the year of overfished declaration, and with randomly drawn recruitment after that year, is termed T_{min}. Figure 2 shows the distribution for the number of years beyond 2001 that it would have taken to recover to $0.4B_0$ under those assumptions. The number of years to T_{min} (14 years) is greater than that value for T_{min} from the 2001, 2003 and 2005 rebuilding analyses (12, 10 and 8 years, respectively). If T_{max} is determined using the new information on the depletion level and the age-structure of the population in 2000, it is calculated to be 2040 which is greater than the value from the 2005 rebuilding analysis (2033), though less than that from the 2001 or 2003 analyses (2047 and 2044 respectively) (Table 2).

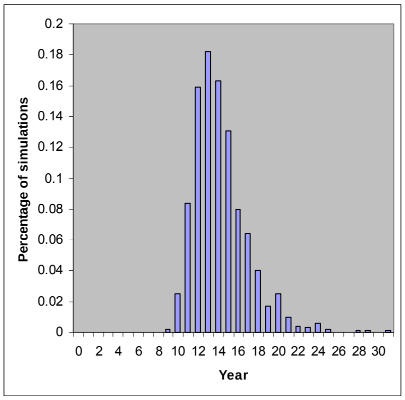

Figure 2: Time to recover to $0.4B_0$ in the absence of catches from 2001 on for the base-case analysis.

Table 2 gives summary statistics from the 2001, 2003 and 2005 rebuilding plans and the current analysis.

Table 2: Summary statistics.

Value	2001	2003	2005	2007
T_{min}	2014	2011	2009	2015
Mean generation time	33 years	33 years	24 years	25 years
T_{max}	2047	2044	2033	2040
P_{max}	80.0	>90.0	100	
T_{target}	2030	2019	2011	
SPR_{target}			60.7%	

3.2 OYs and fishing mortalities

Table 3 gives the probabilities of recovery at the established and new estimates of T_{max} (2033 and 2040) and at the mid point between the newly calculated $T_{F=0}$ and the established value of T_{max} (2025), and 10 year projected OY values based on the SPR for each of the 13 cases explored in this rebuilding analysis.

Table 3: Ten year OY/ABC projections.

Case	**1**	**2**		**3**		**4**		**5**	**6**		**7**		**8**		**9**		**10**		**11**		**12**		**13**	
RUN	**T_{target}**	**SPR'05**		**OY'7-8**		**F=0**		**ABC**	**2020**		**2022**		**2023**		**2025**		**2029**		**2033**		**2035**		**2040**	
SPR	NA	0.607		0.5917		1		0.5	0.842		0.756		0.722		0.677		0.613		0.572		0.561		0.537	
F	NA	0.0289		0.0306		0		0.0421	0.0091		0.0152		0.0180		0.0219		0.0282		0.0328		0.0342		0.0372	
T50%	2011	2030		2031		2018		2052	2020		2022		2023		2025		2029		2033		2035		2040	
P2025	NA	33.6		28.5		98.4		10.8	86.7		69.9		61.3		50.0		33.7		23.8		21.2		15.9	
P2033	NA	61.7		57.4		99.9		25.3	98.3		92.3		88.2		79.1		62.7		50.0		45.9		36.6	
P2040	NA	76.7		76.2		100		34.7	99.8		97.7		95.9		91.0		77.7		65.4		61.7		50.0	
10 Year projected **OYs** and ABCs at SPR rate above:																								
2009	NA	**300**	437	**318**	437	**0**	437	**437**	**96**	437	**159**	437	**188**	437	**229**	437	**293**	437	**341**	437	**354**	437	**385**	437
2010	NA	**306**	445	**323**	444	**0**	457	**440**	**99**	453	**165**	451	**193**	450	**235**	448	**299**	445	**346**	444	**360**	443	**390**	442
2011	NA	**312**	453	**329**	452	**0**	477	**443**	**103**	469	**170**	464	**199**	462	**240**	459	**305**	454	**351**	450	**364**	449	**394**	447
2012	NA	**317**	461	**334**	459	**0**	496	**445**	**106**	485	**174**	477	**204**	474	**246**	469	**310**	461	**356**	456	**369**	455	**398**	451
2013	NA	**322**	468	**339**	465	**0**	515	**448**	**110**	500	**179**	490	**209**	485	**251**	479	**315**	468	**361**	462	**373**	460	**402**	455
2014	NA	**327**	475	**344**	472	**0**	534	**451**	**113**	515	**183**	502	**214**	497	**256**	489	**320**	476	**365**	468	**378**	465	**406**	460
2015	NA	**332**	483	**349**	479	**0**	554	**454**	**116**	530	**188**	515	**219**	509	**262**	499	**325**	484	**370**	474	**383**	471	**410**	465
2016	NA	**337**	490	**354**	486	**0**	573	**457**	**119**	545	**193**	527	**224**	520	**267**	509	**331**	492	**375**	480	**387**	477	**414**	470
2017	NA	**344**	500	**360**	495	**0**	593	**462**	**123**	562	**198**	542	**229**	533	**273**	522	**338**	503	**381**	488	**393**	484	**420**	476
2018	NA	**350**	509	**366**	504	**0**	614	**468**	**127**	579	**203**	556	**235**	546	**279**	533	**344**	512	**387**	496	**399**	492	**426**	483

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Appendix 1: Comparison of life history inputs into 2005 rebuilding analysis to those in the 2007 rebuilding model.

Year of Analysis								
	2005				2007			
Age	M	Fecundity 10^7 eggs	Weight (kg) Females	Weight (kg) Males	M	Fecundity 10^7 eggs	Weight (kg) Females	Weight (kg) Males
0	0.07	0.00	0.01	0.01	0.07	0.00	0.01	0.01
1	0.07	0.00	0.06	0.06	0.07	0.00	0.05	0.05
2	0.07	0.00	0.16	0.16	0.07	0.00	0.14	0.14
3	0.07	0.00	0.31	0.30	0.07	0.00	0.26	0.27
4	0.07	0.00	0.45	0.44	0.07	0.00	0.41	0.39
5	0.07	0.04	0.59	0.55	0.07	0.02	0.54	0.51
6	0.07	0.07	0.63	0.59	0.07	0.13	0.66	0.60
7	0.07	0.44	0.81	0.71	0.07	0.36	0.77	0.68
8	0.07	0.78	0.91	0.77	0.07	0.67	0.86	0.74
9	0.07	1.13	1.00	0.82	0.07	0.98	0.95	0.78
10	0.07	1.44	1.08	0.86	0.07	1.28	1.02	0.82
11	0.07	1.71	1.14	0.89	0.07	1.53	1.09	0.85
12	0.07	1.94	1.20	0.91	0.07	1.75	1.14	0.88
13	0.07	2.14	1.24	0.93	0.07	1.93	1.19	0.90
14	0.07	2.30	1.28	0.94	0.07	2.09	1.22	0.91
15	0.07	2.44	1.31	0.95	0.07	2.22	1.26	0.92
16	0.07	2.55	1.34	0.96	0.07	2.33	1.28	0.93
17	0.07	2.64	1.36	0.96	0.07	2.42	1.30	0.94
18	0.07	2.72	1.37	0.97	0.07	2.49	1.32	0.94
19	0.07	2.78	1.39	0.97	0.07	2.55	1.33	0.94
20	0.07	2.83	1.40	0.97	0.07	2.60	1.34	0.95
21	0.07	2.87	1.41	0.97	0.07	2.64	1.35	0.95
22	0.07	2.90	1.41	0.98	0.07	2.68	1.36	0.95
23	0.07	2.93	1.42	0.98	0.07	2.70	1.36	0.95
24	0.07	2.95	1.42	0.98	0.07	2.72	1.37	0.95
25	0.07	2.97	1.43	0.98	0.07	2.74	1.37	0.95
26	0.07	2.98	1.43	0.98	0.07	2.76	1.38	0.95
27	0.07	2.99	1.43	0.98	0.07	2.77	1.38	0.95
28	0.07	3.00	1.44	0.98	0.07	2.78	1.38	0.95
29	0.07	3.01	1.44	0.98	0.07	2.78	1.38	0.95
30	0.07	3.01	1.44	0.98	0.07	2.79	1.38	0.96
31	0.07	3.02	1.44	0.98	0.07	2.80	1.38	0.96
32	0.07	3.02	1.44	0.98	0.07	2.80	1.39	0.96
33	0.07	3.02	1.44	0.98	0.07	2.80	1.39	0.96
34	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
35	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
36	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
37	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
38	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
39	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96
40	0.07	3.03	1.44	0.98	0.07	2.81	1.39	0.96

Appendix 2: Input File (for SPR based on 2007-8 OYs)

#Title #runnumber: 5 dat.txt ctl.txt 2216.95 30640.5 6853.44
SS2_default_rebuild.dat
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 45
Number of fleets
1
First year of projection (Yinit)
2007
First Year of rebuilding period (Ydecl)
2001
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
-1
Fecundity-at-age
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 #runnumber: 5 dat.txt ctl.txt 2216.95 30640.5 6853.44
0 0 3.63726e-007 3.70017e-005 0.00139436 0.0216256 0.129324 0.362901 0.669701 0.984996 1.27503 1.52954 1.74816 1.93372 2.08988 2.22041 2.32887 2.41853 2.49234 2.55289 2.60241 2.64281 2.67571 2.70246 2.72417 2.74177 2.75604 2.76759 2.77694 2.7845 2.79061 2.79554 2.79953 2.80276 2.80536 2.80746 2.80916 2.81053 2.81164 2.81254 2.81326 2.81384 2.81431 2.81469 2.815 2.81524 #female fecundity; weighted by N in year Y_init across morphs and areas
Age specific selectivity and weight adjusted for discard and discard mortality
#wt and selex for gender,fleet: 1 1
0.0125932 0.0511507 0.136097 0.264146 0.406618 0.540463 0.660554 0.766921 0.863341 0.94953 1.02461 1.08869 1.14263 1.18757 1.22476 1.25537 1.28047 1.30098 1.31769 1.33129 1.34234 1.3513 1.35857 1.36445 1.36921 1.37307 1.37618 1.3787 1.38073 1.38238 1.3837 1.38478 1.38564 1.38634 1.38691 1.38736 1.38773 1.38803 1.38827 1.38846 1.38862 1.38874 1.38885 1.38893 1.389 1.38905
0 0.102449 0.110254 0.183894 0.392269 0.656592 0.84795 0.940347 0.976457 0.989957 0.995239 0.997482 0.998525 0.999053 0.999343 0.999513 0.999619 0.999687 0.999734 0.999766 0.99979 0.999807 0.99982 0.99983 0.999837 0.999843 0.999848 0.999851 0.999854 0.999856 0.999858 0.999859 0.999861 0.999862 0.999862 0.999863 0.999863 0.999864 0.999864 0.999864 0.999864 0.999865 0.999865 0.999865 0.999865 0.999865
#wt and selex for gender,fleet: 2 1
0.0125932 0.0511507 0.13924 0.265181 0.39452 0.506737 0.600349 0.675537 0.735829 0.784301 0.822967 0.85347 0.877291 0.895748 0.909964 0.920865 0.929198 0.935552 0.940389 0.944065 0.946857 0.948976 0.950582 0.951801 0.952724 0.953423 0.953953 0.954354 0.954658 0.954888 0.955062 0.955194 0.955294 0.95537 0.955427 0.955471 0.955503 0.955528 0.955547 0.955561 0.955572 0.95558 0.955586 0.955591 0.955595 0.955597
0 0.102449 0.110976 0.184975 0.370547 0.592457 0.764326 0.867459 0.922361 0.951026 0.966494 0.975283 0.98055 0.983862 0.986029 0.987495 0.988512 0.989232 0.98975 0.990128 0.990405 0.99061 0.990763 0.990877 0.990963 0.991027 0.991076 0.991112 0.99114 0.99116 0.991176 0.991188 0.991197 0.991204 0.991209 0.991213 0.991216 0.991218 0.99122 0.991221 0.991222 0.991223 0.991223 0.991224 0.991224 0.991224
M and current age-structure in year Yinit: 2007
gender = 1
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
1043.75 912.92 870.077 768.622 660.282 197.911 174.858 1382.51 1376.81 138.127 482.116 357.396 916.513 215.36 46.9688 97.4119 55.1145 45.785 15.4174 148.8 81.3436 26.8732 22.5589 14.277 11.5256 13.6436 31.1807 42.9175 23.5594 7.50042 5.88939 10.347 7.44613 9.96087 9.05 8.22554 7.46925 6.75631 6.10291 5.65187 5.21305 4.83732 4.34285 3.87281 3.35793 34.0867
gender = 2
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
1043.75 912.92 870.077 768.614 660.263 197.969 175.083 1386.59 1383.35 138.98 485.933 361.427 931.622 220.778 48.7606 102.312 58.2569 48.5186 16.3718 158.313 86.6165 28.6743 24.1556 15.3231 12.3935 14.6945 33.5577 46.0612 25.1816 7.97811 6.23692 10.9136 7.82562 10.4375 9.454 8.56734 7.76521 7.01996 6.3436 5.8788 5.42275 5.02721 4.50627 4.02131 3.5074 35.5726
Age-structure at Ydecl= 2001
273.29 2204.39 2236.23 229.299 820.385 621.541 1615.63 382.007 83.5159 173.371 98.1283 81.5313 27.4567 265.008 144.874 47.8622 40.1788 25.4283 20.5279 24.3004 55.5355 76.44 41.9615 13.3589 10.4896 18.4289 13.2623 17.7413 16.1189 14.6505 13.3035 12.0337 10.8699 10.0665 9.28496 8.61576 7.73505 6.89787 5.98081 5.08334 4.35876 3.84681 3.48011 3.19041 2.94181 37.8106
273.29 2204.39 2236.23 229.285 820.262 622.536 1627.08 388.699 86.2178 181.325 103.382 86.1666 29.0894 281.376 153.979 50.9819 42.9523 27.2487 22.0402 26.1333 59.6821 81.9212 44.7869 14.1897 11.0929 19.4109 13.9188 18.5644 16.8152 15.2381 13.8115 12.486 11.283 10.4563 9.64512 8.94159 8.01503 7.15247 6.23842 5.35509 4.62674 4.08254 3.67219 3.34574 3.07076 39.118
Year for Tmin Age-structure (set to Ydecl by SS2)
2001
Number of simulations
1000
recruitment and biomass

Number of historical assessment years
81
Historical data
year recruitment spawner in B0 in R project in R/S project
1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953
1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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
#years (with first value representing R0)
3295.04 3295.05 3295.04 3294.99 3294.95 3294.94 3294.93 3294.92 3294.89 3294.86 3294.84 3294.81 3294.74 3294.63 3294.51 3294.37 3294.21
3293.56 3292 3287.9 3285.15 3283.52 3280.87 3278.09 3274.82 3270.53 3267.54 3264.67 3261.77 3259.06 3255.55 3251.65 3248.29 3245.1 3241.72
3239.56 3236.04 3231.64 3229.72 3223.59 3128.4 3044.53 2968.98 2968.17 2969.4 2966.46 2959.7 2945.02 1978.21 2453.36 1239.82 1388.69
3786.08 5920.69 3626.2 1314.88 908.778 912.592 1163.37 1120.56 2728.75 4053.94 341.823 819.728 797.824 1140.17 438.837 1625.41 5747.55
1923.03 2270.86 575.815 5188.11 4728.45 546.581 569.543 1760.82 1902.68 2004.81 1958.23 2087.49 #recruits; first value is R0 (virgin)
30640.5 30640.8 30640.2 30637.6 30635 30634.4 30633.8 30633.3 30631.8 30630.4 30629 30627.7 30623.5 30617.4 30610.5 30602.7 30594.2
30557.8 30471.6 30246 30096.7 30008.6 29866.3 29718 29545.9 29321.6 29167.3 29020.4 28873.4 28736.9 28561.6 28368.9 28204.9 28050.4
27888.1 27785.3 27618.7 27413.4 27324.6 27043.7 23219.2 20513.1 18469.8 18449.6 18480.4 18407.1 18240.4 17885.7 17640.1 17553.2 17465.9
17665 17737.6 17275.6 17169.8 16635.7 15861.9 15172.2 14204.3 12966.4 12376 10815.9 9777.41 8917.34 7597.51 6644 6220.72 5507.92 5133.39
4787.36 4414.81 3906.42 3272.46 3175.89 3230.14 3566.52 4071.45 4659.96 5230.82 6012.66 6853.44 #spbio; first value is S0 (virgin)
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
in Bzero
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
in R project
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
in R/S project
Number of years with pre-specified catches
2
catches for years with pre-specified catches go next
2007 290
2008 330
Number of future recruitments to override
0
Process for overiding (-1 for average otherwise index in data list)
Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
Steepness sigma-R Auto-correlation
0.6 0.8 0
Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using SPR_target
0.5
Target SPR information: Use (1=Yes) and power
0 20
Discount rate (for cumulative catch)
0.1
Truncate the series when 0.4B0 is reached (1=Yes)
0
Set F to FMSY once 0.4B0 is reached (1=Yes)
0
Percentage of FMSY which defines Ftarget
0.75
Maximum possible F for projection (-1 to set to FMSY)
-1
Conduct MacCall transition policy (1=Yes)
0
Defintion of recovery (1=now only;2=now or before)
2
Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2) 0r sustainability (3) or 5 years (4)
4
Definition of the 40-10 rule
10 40
Produce the risk-reward plots (1=Yes)
0
Calculate coefficients of variation (1=Yes)
0
Number of replicates to use
10
Random number seed
-99004
Conduct projections for multiple starting values (0=No;else yes)
0
File with multiple parameter vectors
rebuild.ss2
Number of parameter vectors: value is placeholder only, user needs to change it
1

```
# User-specific projection (1=Yes); Output replaced (1->9)
1 6  0  0.1
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2009 3 0.607
-1 -1 -1
# Split of Fs
2007 1
-1  99
#Years for rebuild
2020 2022 2025 2029  2033
#Year for probability of recovery
2033
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.4
# Project with Historical recruitments when computing Tmin (1=Yes)
0
# CV of implementation error
0
```

DRAFT

Rebuilding Update for Pacific Ocean Perch

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October 4, 2007

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1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). NMFS determined that a rebuilding plan was required for Pacific ocean perch (*Sebastes alutus*) in March 1999 based on the most recent stock assessment at that time (Ianelli and Zimmerman 1998). The PFMC began developing a rebuilding plan for Pacific ocean perch (based upon a rebuilding analysis; August 1999; A. MacCall, pers. comm.) and submitted this plan to NMFS in February 2000. However, NMFS deferred adoption of the plan until the stock assessment was updated and reviewed, which was later that year (Ianelli *et al.* 2000

A new stock assessment for Pacific ocean perch stock was conducted in 2003 (Hamel *et al*., 2003), and updated in 2005 and 2007 (Hamel 2005, 2007). This assessment, similar to that of Ianelli *et al*. (2000), involved fitting an age-structured population dynamics model to catch, catch-rate, length-frequency, age-composition, and survey data. Ianelli *et al*. (2000), Hamel *et al*. (2003), and Hamel (2005, 2007) presented results based on maximum likelihood and Bayesian estimation frameworks. A rebuilding analysis was conducted by Punt (2002), based upon the estimates corresponding to the maximum of the posterior density function (the MPD estimates) from Model 1c of Ianelli *et al*. (2000) because the STAR panel that evaluated the 2000 Pacific Ocean perch stock assessment selected this model variant as the "best assessment" (PFMC 2000). In contrast, the STAR panel that evaluated the 2003 assessment of Pacific ocean perch endorsed both the MPD estimates and the distributions for the model outputs that arose from the application of the MCMC algorithm to sample equally likely parameter vectors from the posterior distribution (PFMC 2003). Punt et al. (2003) conducted a rebuilding analysis with runs based upon both the MPD estimates and the MCMC outputs. The PFMC adopted a rebuilding plan based upon the results of the MCMC analysis (sampling from the full Bayesian posterior). This rebuilding analysis was updated in 2005. For this update, rebuilding plan parameters are those specified after the rebuilding analysis in 2005.

2. Specifications

2.1 Selection of B_0

The unfished spawning stock biomass, B_0, is determined from the fitted stock-recruitment relationship in order to be more consistent with the assumptions underlying the original stock assessment. The MPD estimate of B_0 is 36,983 mt of spawning output while the posterior median and 90% intervals for B_0 are 34,573 mt and (27,620; 44,097). The values for B_0 are slightly lower than those on which the previous rebuilding analyses were based (Table 1). The MPD depletion estimate at the start of 2007 is 0.275 while the posterior median and 90% intervals are 0.311 (0.228; 0.398)

Table 1. MPD and posterior median estimates of unfished spawning stock biomass (B_0) and depletion for the 2003, 2005 and 2007 stock assessments.

	2003	**2005**	**2007**
B_0 MPD (mt)	39,198	37,838	36,983
B_0 Posterior Median (mt)	37,230	35,371	34,573
B_0 90% Interval) (mt)	29,035 47,393	28,022 44,866	27,620 44,097
Depletion MPD	25.4%	23.4%	27.5%
Depletion Posterior Median	27.7%	27.6%	31.1%
Depletion 90% Intervals	20.1% 38.4%	19.8% 37.1%	22.8% 39.8%

2.2 Generation of future recruitment

Recruitment in the assessment and projection models for Pacific ocean perch relate to the abundance of 3 year olds. The assessment of Pacific ocean perch by Hamel *et al*. (2003) and its updates (Hamel 2005, 2007) include the assumption that, *apriori*, recruitment is related to spawning output according to a Beverton-Holt stock-recruitment relationship. The rebuilding analysis conducted by Punt et al. (2003) included three different approaches: 1) basing the projections on resampling historical recruitments or from those for the years 1965-2001, 2) basing the projections on resampling historical recruits per spawner for those same years, and 3) assuming a Beverton-Holt spawner recruit relationship. The first approach was chosen by the Council for the final rebuilding plan.

The rationale for generating future recruitment by sampling historical recruitment for the rebuilding analysis conducted by Punt (2002) was that 1965-1998 was a period of relative stability in recruitment. In contrast to recruitment, recruits / spawning output showed an increasing trend over time. The situation was less clear in 2003 and 2005, however in the current analysis there is again an increasing trend in recruits / spawning output over time and the recruitments, while not completely stable, are more consistent across time. Resampling historical recruitment (3 year olds from the years 1965-2005; year classes 1962-2002) is used exclusively for the analyses in this document in order to remain consistent with the adopted rebuilding plan. Figure 1 plots the MPD estimates of recruitment and recruits / spawning output from the assessments conducted by Hamel *et al*. (2003) and Hamel (2005, 2007). Hamel (2007) estimated steepness for Pacific ocean perch to be 0.65.

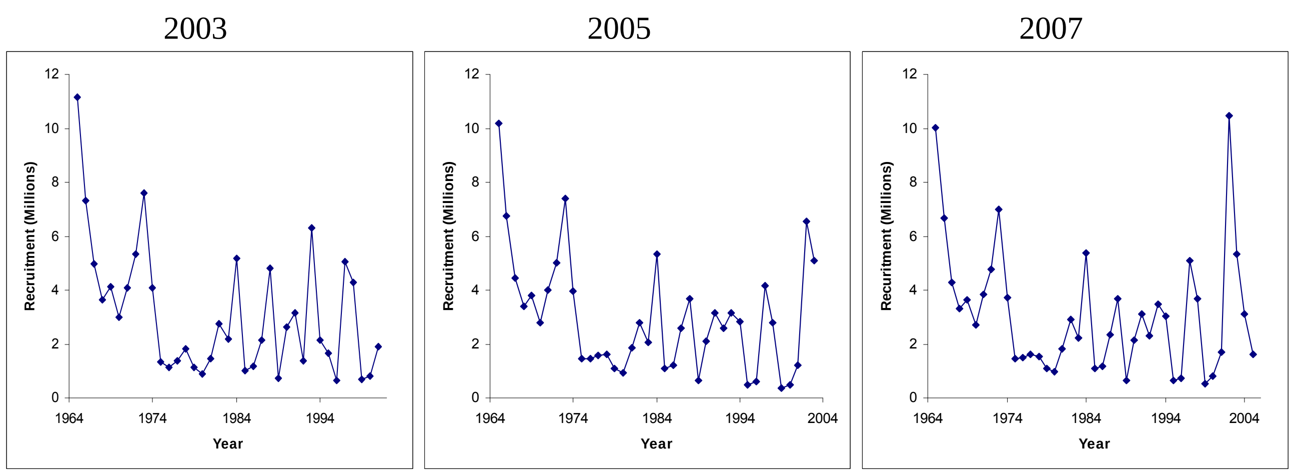

Figure 1: Recruitment from assessments of Pacific ocean perch conducted in 2003, 2005 and 2007.

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for a plot of net spawning output *versus* age based on the MPD estimates). The best estimate of the mean generation time for the full posterior is 28 years, and for the MPD it is 29 years. These are unchanged from the 2003 and 2005 rebuilding analyses (see Table 3).

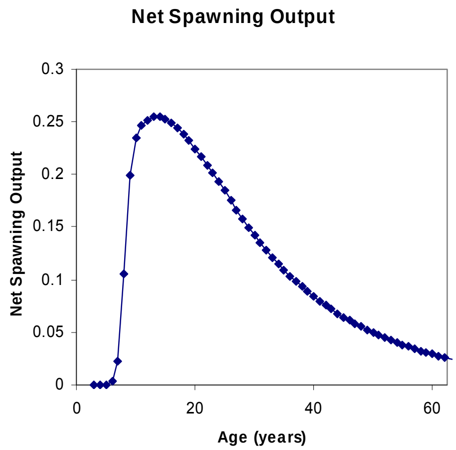

Figure 2: *Relationship between net spawning output and age for Pacific Ocean perch.*

2.4 The harvest strategies

Table 2 summarizes the options considered in the rebuilding analyses. These include a no catch option (case 1), using the calculated SPR from the last rebuilding analysis (case 2), using the implied SPR in the current analysis from the 2007-8 OYs (150 mt; case 3), a 50% probability of rebuilding by T_{target} of 2017 (case 4) or using the ABC harvest rule (Case 5). These 5 cases were requested by the Council in a memorandum dated September 04, 2007. The other 8 cases are intermediate values found by either diminishing T_{target} or, in case 13, picking an intermediate SPR to achieve a doubling of the current OY.

Case	**Name**	**$T_{50\%}$**	**2009 OY**	**SPR**	**P_{2017}**
1	$T_{F=0}$	2010	0	1.000	0.780
2	SPR from 2005 rebuilding	2011	189	0.864	0.721
3	SPR from 2007-8 OYs	2011	164	0.880	0.733
4	T_{target} = 2017 (Current)	2017	971	0.548	0.500
5	ABC rule	2021	1160	0.500	0.477
6	T_{target} = 2010	2010	130	0.903	0.741
7	T_{target} = 2011	2011	432	0.734	0.640
8	T_{target} = 2012	2012	565	0.678	0.600
9	T_{target} = 2013	2013	624	0.655	0.582
10	T_{target} = 2014	2014	744	0.614	0.548
11	T_{target} = 2015	2015	842	0.584	0.526
12	T_{target} = 2016	2016	909	0.565	0.512
13	SPR = 0.800	2011	299	0.800	0.685

2.5 Other specifications

The calculations in this document were performed using Version 2.8 of the rebuilding software developed by Punt (2005) and the results are based on 3,000 Monte Carlo replicates (3 simulations for each of 1,000 samples for the posterior).

The definition of "recovery by year *y*" in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability). Appendix 1 lists the MPD estimates for the biological and technological parameters and the age-structure of the population at the start of 2000 and 2007. Appendix 2 lists the MPD time-series of recruitment and spawning output. The input to the rebuilding program is given as Appendix 3. The catch for 2007 and 2008 were set to 150 mt (the Council-selected *OYs* for 2007-2008).

3. Results

3.1 Time-to-recovery

The median year for rebuilding to the target level in the absence of fishing since the year of overfished declaration, T_{min}, is 2014. Figure 3 shows the distribution for the number of years beyond the year 2000 that it would have taken to recover to $0.4B_0$ had there been no harvest since 2000. T_{max}, the maximum permissible time period for rebuilding the stock to its target biomass, is 2042 when using the new information on the depletion level and the age-structure of the population in 2000. Table 3 gives summary statistics from the 2003 and 2005 rebuilding plans and the current analysis for full posterior results. Note that $T_{F=0}$ (zero catch from 2009 onward) is less than T_{min} due to higher than average recruitment in years after y_{decl} (2000) that are not taken into account in the calculation of T_{min}.

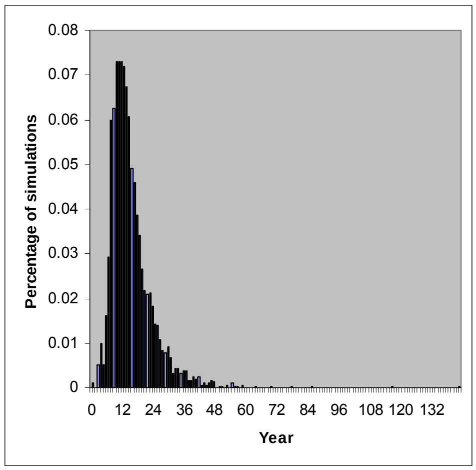

Figure 3: T_{min}, the median year for rebuilding to the target level $0.4B_0$ in the absence of fishing since 2000 for the base-case analysis.

Table 3: Summary statistics

Value	2003	2005	2007
T_{min}	2014	2015	2009
Mean generation time	28 years	28 years	28 years
T_{max}	2042	2043	2037
$T_{F=0}$ (No fishing mortality beginning in 2004, 2007, & 2009, respectively.	2014	2015	2010
P_{MAX}	70.0	92.9	
T_{TARGET}	2027	2017	
SPR_{TARGET}		86.4%	

3.2 OYs and fishing mortalities

Table 4 gives the probabilities of recovery at T_{target} (2017) and T_{max} (2042 (current and 2003 analyses) or 2043 (2005 analysis)), and 10 year projected OY values based on the SPR for each of the 13 cases explored in this rebuilding analysis.

Table 4: Ten year OY/ABC projections.

Case	**1**		**2**		**3**		**4**		**5**	**6**		**7**		**8**		**9**		**10**		**11**		**12**		**13**	
RUN	**F=0**		**SPR'05**		**OY'7-8**		**Ttarget**		**ABC**	**2010**		**2011**		**2012**		**2013**		**2014**		**2015**		**2016**		**SPR0.8**	
SPR	1		0.864		0.88		0.548		0.5	0.903		0.734		0.678		0.655		0.614		0.584		0.565		0.800	
F	0		0.0080		0.0070		0.0412		0.0493	0.0055		0.0183		0.0240		0.0265		0.0316		0.0358		0.0386		0.0127	
T50%	2010		2011		2011		2017		2021	2010		2011		2012		2013		2014		2015		2016		2011	
P2017	78.0		72.1		73.3		50.0		47.7	74.1		64.0		60.0		58.2		54.8		52.6		51.2		68.5	
P2037	97.5		94.4		95.0		65.0		58.3	95.6		86.7		81.8		79.1		74.3		70.1		67.5		91.4	
P2043	98.8		96.4		96.8		67.7		60.5	97.1		89.3		84.6		82.0		77.2		73.2		70.5		94.3	
10 Year projected **OYs** and ABCs at SPR rate above:																									
2009	**0**	1160	**189**	1160	**164**	1160	**971**	1160	**1160**	**130**	1160	**432**	1160	**565**	1160	**624**	1160	**744**	1160	**842**	1160	**909**	1160	**299**	1160
2010	**0**	1227	**200**	1217	**173**	1219	**992**	1181	**1173**	**137**	1220	**452**	1205	**589**	1199	**649**	1196	**769**	1191	**866**	1187	**932**	1184	**314**	1212
2011	**0**	1293	**207**	1275	**180**	1278	**997**	1198	**1179**	**143**	1281	**466**	1250	**602**	1238	**662**	1232	**782**	1221	**877**	1211	**939**	1205	**325**	1263
2012	**0**	1361	**215**	1333	**187**	1337	**1007**	1218	**1185**	**149**	1342	**479**	1296	**616**	1277	**676**	1268	**795**	1251	**888**	1237	**950**	1228	**337**	1316
2013	**0**	1422	**224**	1381	**195**	1387	**1015**	1224	**1183**	**155**	1394	**492**	1330	**630**	1303	**690**	1292	**807**	1268	**900**	1249	**960**	1236	**348**	1358
2014	**0**	1463	**229**	1415	**200**	1422	**1013**	1221	**1172**	**159**	1431	**501**	1353	**638**	1320	**697**	1304	**811**	1275	**900**	1252	**959**	1236	**355**	1388
2015	**0**	1497	**232**	1435	**203**	1443	**1005**	1209	**1151**	**162**	1454	**504**	1361	**641**	1323	**699**	1305	**811**	1271	**896**	1244	**953**	1226	**359**	1403
2016	**0**	1534	**237**	1465	**207**	1475	**1000**	1204	**1139**	**166**	1487	**510**	1381	**646**	1335	**702**	1314	**812**	1276	**896**	1243	**950**	1223	**365**	1426
2017	**0**	1573	**241**	1491	**211**	1502	**996**	1193	**1125**	**169**	1516	**516**	1392	**650**	1339	**707**	1316	**815**	1271	**896**	1237	**948**	1214	**370**	1445
2018	**0**	1602	**246**	1508	**215**	1520	**993**	1187	**1114**	**172**	1537	**521**	1401	**656**	1344	**712**	1321	**818**	1273	**897**	1236	**947**	1211	**376**	1458

References

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Appendix 1 : Biological and technological parameters used for the rebuilding analyses based on the MPD estimates.

Age	Fecundity	Weight (kg)	Selectivity	Natural mortality	*N* (2000)	*N* (2007)
3	0.000	0.169	0.001	0.0526	821	1485
4	0.000	0.241	0.003	0.0526	507	1408
5	0.000	0.317	0.011	0.0526	3319	1451
6	0.004	0.396	0.040	0.0526	4328	2670
7	0.028	0.474	0.131	0.0526	592	4336
8	0.137	0.550	0.306	0.0526	495	8038
9	0.274	0.622	0.518	0.0526	2168	1230
10	0.339	0.690	0.688	0.0526	2272	565
11	0.375	0.752	0.805	0.0526	1367	347
12	0.404	0.809	0.880	0.0526	1663	2255
13	0.431	0.861	0.952	0.0526	1006	2912
14	0.454	0.908	1.000	0.0526	271	393
15	0.475	0.950	1.000	0.0526	1307	325
16	0.494	0.987	1.000	0.0526	728	1405
17	0.510	1.021	1.000	0.0526	308	1461
18	0.525	1.050	1.000	0.0526	250	876
19	0.538	1.076	1.000	0.0526	1058	1066
20	0.550	1.099	1.000	0.0526	382	646
21	0.560	1.119	1.000	0.0526	433	174
22	0.569	1.137	1.000	0.0526	234	840
23	0.576	1.153	1.000	0.0526	107	468
24	0.583	1.166	1.000	0.0526	103	198
25+	0.589	1.178	1.000	0.0526	2680	3371

Appendix 2 : MPD historical series of spawning output and recruitment.

Year	Recruitment (age 3)	Spawning output
1956	3819	32748
1957	46795	31570
1958	4087	30490
1959	18633	30125
1960	8804	29944
1961	4153	30193
1962	3540	31992
1963	4867	33654
1964	14059	33291
1965	10012	32946
1966	6655	30407
1967	4295	21651
1968	3321	15806
1969	3639	13893
1970	2703	15520
1971	3842	16286
1972	4778	16609
1973	6986	16729
1974	3716	16357
1975	1466	16053
1976	1478	16073
1977	1616	15985
1978	1552	16311
1979	1079	16099
1980	974	15540
1981	1825	14687
1982	2914	13882
1983	2240	13295
1984	5386	12173
1985	1097	11156
1986	1160	10306
1987	2362	9702
1988	3664	9403
1989	660	9115
1990	2145	8752
1991	3131	8379
1992	2291	7829
1993	3455	7598
1994	3047	7215
1995	650	6917
1996	732	6856
1997	5072	6882
1998	3688	7055
1999	535	7249
2000	821	7331
2001	1691	7489
2002	10467	7826
2003	5353	8428
2004	3127	8791
2005	1612	8910
2006	1485	9210
2007	1485	10168

Appendix 3: Input File (for SPR based on 2007-8 OYs)

#Title
POP Re2007
Number of sexes
1
Age range to consider (minimum age; maximum age)
3 25
Number of fleets
1
First year of projection
2007
Year declared overfished
2000
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
1
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
34
Fecundity-at-age
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
3.84E-06 4.03E-05 0.000392248 0.003560962 0.028260766 0.1374925 0.273954602 0.338584679 0.375081501 0.404469053 0.430553194 0.453991276 0.4749965 0.493739 0.510395 0.52515 0.53818 0.549655 0.559745 0.568595 0.576345 0.58313 0.589055
Age specific information (Females then males) weight selectivity

0.169105 0.240603 0.317273 0.395966 0.474162 0.54997 0.62206 0.689572 0.752022 0.80921 0.861146 0.907988 0.949993 0.987478 1.02079 1.0503 1.07636 1.09931 1.11949 1.13719 1.15269 1.16626 1.17811

0.000760479 0.002833075 0.010718648 0.040106885 0.130877235 0.305548059 0.518406886 0.688311578 0.804965697 0.87984887 0.952139824 1 1 1 1 1 1 1 1 1 1 1 1
M and current age-structure

0.0526203 0.0526203
1484.56 1408.46 1450.8 2670.16 4335.9 8037.76 1229.81 564.926 347.218 2255.44 2911.84 392.941 324.523 1404.86 1460.57 876.037 1066.1 645.747 173.983 839.761 467.917 197.848 3371.03
Age-structure at declaration

821.335 507.381 3318.95 4327.91 591.682 495.103 2167.85 2272.35 1367.41 1663.14 1005.83 270.812 1307.12 728.332 307.958 250.322 1058.29 382.287 432.756 233.616 107.428 102.677 2679.78
Year for Tmin Age-structure
2000
Number of simulations
3000
recruitment and biomass
Number of historical assessment years
53
Historical data
year recruitment spawner in B0 in R project in R/S project

1955	4966.98	36982.9	1	0	0
1956	3819.3	32747.8	0	0	0
1957	46795.4	31570	0	0	0
1958	4086.68	30489.7	0	0	0
1959	18633.2	30125.3	0	0	1
1960	8803.5	29944.1	0	0	1
1961	4153.25	30192.5	0	0	1
1962	3539.56	31992.3	0	0	1
1963	4867.19	33654	0	0	1
1964	14059.3	33290.7	0	0	1
1965	10011.5	32945.8	0	1	1
1966	6655.08	30406.7	0	1	1
1967	4294.86	21651.3	0	1	1
1968	3321.22	15805.9	0	1	1
1969	3639.49	13892.8	0	1	1
1970	2703.11	15520.2	0	1	1
1971	3842.36	16285.7	0	1	1
1972	4777.8	16609.3	0	1	1
1973	6986.28	16728.6	0	1	1
1974	3715.97	16356.8	0	1	1
1975	1466.34	16052.5	0	1	1
1976	1478.25	16072.8	0	1	1
1977	1616.46	15985.3	0	1	1
1978	1551.99	16310.5	0	1	1
1979	1078.8	16099.3	0	1	1
1980	974.459	15539.6	0	1	1
1981	1824.85	14687.2	0	1	1
1982	2913.61	13882.1	0	1	1
1983	2239.62	13294.7	0	1	1
1984	5385.86	12172.6	0	1	1
1985	1096.93	11155.5	0	1	1
1986	1160.03	10305.7	0	1	1
1987	2361.52	9701.91	0	1	1
1988	3664.37	9403.31	0	1	1
1989	660.065	9114.8	0	1	1
1990	2144.62	8751.87	0	1	1
1991	3130.65	8378.66	0	1	1
1992	2291.45	7828.84	0	1	1
1993	3454.79	7598.36	0	1	1
1994	3046.79	7214.91	0	1	1
1995	650.304	6916.7	0	1	1
1996	732.357	6855.66	0	1	1
1997	5071.74	6881.98	0	1	1
1998	3687.98	7055.26	0	1	1
1999	534.815	7248.73	0	1	1
2000	821.335	7330.58	0	1	1
2001	1690.86	7488.57	0	1	1
2002	10466.9	7826.34	0	1	1
2003	5353.19	8428.21	0	1	1
2004	3127	8791.06	0	1	1
2005	1611.83	8909.98	0	1	1
2006	1484.56	9209.78	0	0	0
2007	1484.56	10168.2	0	0	0

Number of years with pre-specified catches
2
catches for years with pre-specified catches
2007 150
2008 150

```
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.652	1	0
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0	20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
"# Definition of the ""40-10"" rule"
10	40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
mcmcreb.dat
# Number of parameter vectors
1000
# User-specific projection (1=Yes); Output replaced (1->9)
1	5	0	0.1
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2009	3	0.88
-1	-1	-1
# Split of Fs
2007	1
-1	1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
```

Agenda Item D.3.a
Attachment 11
November 2007

Rebuilding analysis for widow rockfish in 2007 – An update

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October 2007

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished spawning potential. Based on the stock assessment in 2000 (Williams et al. 2000), widow rockfish was formally declared to be overfished in 2001, thereby requiring the development of a rebuilding plan. The 2003 stock assessment (He et al. 2003b) estimated that the spawning output in 2002 was just below 25% of unfished spawning output. However, in recent stock assessment (He et al. 2005, He et al. 2007), the assessment models estimated that the population has never been overfished. This rebuilding analysis is an update analysis based on this year's assessment. It provides information needed to develop the Rebuilding Plan for widow rockfish, and is in accord with the SSC Terms of Reference for Groundfish Rebuilding Analyses.

It is important to point out that although the widow population was declared to be overfished in 2001 (Williams et al. 2000), recent assessments (He et al. 2006a and He et al. 2007) have indicated that the population was never overfished. Depletion rates (ratio of current spawning output over virgin spawning output) in 2001 were estimated to be 31.6% in the 2005 assessment and 35.5% in the current assessment, respectively. Therefore, some rebuilding results presented in the report, such as rebuilding time and Pmax calculations, are solely based on the 2001 population status. These results are more for reference purposes to previous rebuilding analysis since no information on the population from 2002 to 2006 were considered in the analysis. Rebuilding results that use all information up to 2006 are also presented in this report, which are more appropriate as management references.

Data and Parameters

This rebuilding analysis uses the SSC Default Rebuilding Analysis program as implemented by Punt (2006) (Version 2.10a, December 2006). Historical estimates of spawning output and recruitment are taken from the 2007 assessment by He et al. (2007). Life history parameters and selectivity are based on a simplification of the two-area, two-sex, four-fishery selectivity model used in the assessment. The rebuilding analyses are based on a coastwide population. However, fecundity- and weight-at-age differ between the southern and northern areas. Therefore, spatially-averaged fecundity- and weight-at-age, based on a weighting factor computed from the total catches for two areas from the last seven years, are used in the rebuilding analysis. The age-specific selectivity pattern is calculated by averaging selectivity functions for four fisheries, using weighting factors computed from the total catches by each fishery over the last five years. Fecundity-at-age, weight-at-age and selectivity-at-age are presented in Figures 1 and 2. These functions are very similar to those used in the previous rebuilding analysis for widow rockfish (MacCall and Punt 2001, He et al. 2003a, He et al. 2006a). In this analysis, we calculate depletion rates using the same method as in the 2003 rebuilding analysis (He et al. 2003), and in the 2005 assessment and 2005 rebuilding analysis (He et al 2006a, He et al 2006b), which used the average of spawning outputs from 1958 to 1982 as unfished spawning output ($\boldsymbol{B_0}$).

Management Reference Points

***B_{MSY}*:** The rebuilding target is the spawning output that produces MSY, B_{MSY}. B_{MSY} cannot be determined easily, but experience in other fisheries has shown that B_{MSY} is often near 40% of the average initial unfished spawning output (B_0), and this value ($B_{40\%}$) is used here as a proxy for B_{MSY} (see the SSC's Terms of Reference). Values of B_0 are estimated by multiplying mean recruitment by the spawning output-per-recruit at F=0. As in the previous rebuilding analysis, the average recruitment used when computing B_0 was based on the pre-fishery recruitments (the 1958-79 year-classes). The following table shows the current population status from current (2007) stock assessment, and the population status estimated in the 2005 base model stock assessment.

Estimated parameter	Value (2007)	Value (2005)
Estimated B_0 (millions of eggs)	50,746	49,676
Rebuilding target (millions of eggs)	20,298	19,870
Current spawning output (millions of eggs)	17,999	15,444
Percent of B_t/B_0 (depletion rate)	35.47%	31.09%

Mean generation time: If the stock cannot be rebuilt within ten years, then the maximum time allowed for rebuilding, T_{max}, is the length of time required to rebuild at F=0 (T_{min}) plus one mean generation time. Mean generation time can be estimated from the net maternity function (product of survivorship and fecundity at age), and for widow rockfish is estimated to be 17 years, which is same as in the 2005 rebuilding analysis (He et al. 2006b).

Simulation Model

The simulation model tracks numbers at age, with age 20 being treated as a plus-group. Fecundity-, weight-, and selectivity-at-age are given in Appendix A and plotted in Figures 1 and 2. When computing $T_{\min}$, the population simulations begin with the age-structure at the start of 2001 because 2001 was the year in which widow rockfish was declared to be overfished. The 2006 age-structure was used for estimating the population status for 2007 and beyond at each proposed catch level. The detailed specifications of the simulation model are given by Punt (2006).

Initial test runs were conducted to determine the number of simulations needed to achieve stable outputs. The test was conducted using the base model from the stock assessment with 500, 1,000, 2,000, 3,000, 5,000, and 10,000 simulations. The results showed that the outputs did not change much with increasing numbers of simulations once the number of simulations reached 2,000. To be conservative, all of the model runs in this rebuilding analysis are based on 5,000 simulations.

Eleven simulation scenarios were constructed from a combination of starting year, future catch level, and pre-determined fishing mortalities and recovery year (Table 1). In all simulations, the stock-recruitment relationship estimated in the assessment model was used for generating future recruitments. Detail specifications of all eleven runs (Run0 to Run10) are listed in Table 1. Run 7 to Run10 were requested runs by the October 2007 Mop-up Panel. For Run0, starting year is 2001 (year declared overfished). This run (Run0) is mainly for comparing rebuilding parameters that were used in the 2005 rebuilding analysis (Table 2). Since no information on the population and fisheries is used in Run0, the results are not useful in determining future catch levels.

Run1 to Run6 use pre-determined future annual catch levels ranged from no catch to 4000mt. Run 7 to Run10 are based current SPR rates, Ttarget, and ABC level.

Rebuilding Projections

The rebuilding projections used $B_{40\%}$ as the rebuilding targets. Table 3a lists proposed future catch level and estimated exploitable biomass for six rebuilding runs (Run1 to Run6) from 2009 to 2018 (also see Figure 3). In all runs, the population is estimated to recover to 40% of pre-fishing biomass by 2009 with the probability of recovery of 1.0. Estimated average SPR rates and fishing mortalities are also presented. The estimated biomass is the highest for Run1, which simulates no fishing after 2007. All runs except Run6 show that the population will be able to sustain above the target biomass during the period (Figure 4). Run6 shows that the population will fall below the target biomass in 2015, and continues to decline in the following years.

These runs are probably very optimistic, given that the population was declared to be overfished just six years ago. The main reasons for this are probably related to the fact that (1) there have been relative low catches in the last few years, and (2) the relative strong recruitment of 1999 year class has grown to spawning class and they will remain in the population for next few years (see this year’s assessment document, He et al. 2007, for more discussions). Uncertainty in the assessment as well as in these rebuilding projections still remain as all projections depend on the estimated current population status and future recruitments.

Addition four runs (Run 7 to Run 10) were requested during the Mop-up Panel in October 2007. Corresponding annual catches (mt) for these four runs are plotted in Figure 5. Run 7 and Run8, that uses current SPR rates and have future catch levels ranged from 311 mt to 522 mt, shows that the population will be above the target level in all future years (Figure 6). Run 9 uses fishing mortality that corresponding to 50% probability of rebuilding by 1015 (Ttarget year). This run yields very high catch levels in the near future. However, the population will not be able to sustain above the target level (Figure 6). Run 10 uses fishing mortality at ABC level of F50%. It has the highest catches among all runs. However, the population will fell below the target level after 2011 (Figure 6).

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Table 1. Specifications of seven rebuilding runs based on different starting year and time series of total catches for future years (also see Figure 1). Future recruitments are generated using the stock-recruitment relationship estimated in the stock assessment. Maximum fishing mortalities for all future years are set to *Fmsy*. Note that for Run0, no information from 2002 to 2006 is used in the simulation.

Run name	Start Year	Catch time series
Run0	2002	No catch and no information after 2001
Run1	2007	368 mt of catch in 2007, and then no catch thereafter
Run2	2007	368 mt of catches in 2007 and 2008, 500 mt thereafter
Run3	2007	368 mt of catches in 2007 and 2008, 1000 mt thereafter
Run4	2007	368 mt of catches in 2007 and 2008, 1500 mt thereafter
Run5	2007	368 mt of catches in 2007 and 2008, 2000 mt thereafter
Run6	2007	368 mt of catches in 2007 and 2008, 4000 mt thereafter
Run7	2007	Using current SPR rate F95%
Run8	2007	Using SPR rate that corresponds 2009-10 OY of 368mt
Run9	2007	50% of probability of rebuilding by current Ttarget of 2015
Run10	2007	ABC level of F50%

Table 2. Comparisons of rebuilding parameters between this year's run (Run0) and the base model run (Model T2) in the 2005 rebuilding analysis. Note that because the population was declared overfished in 2001, no information on the population and fisheries from 2002 to current years were used in these simulations. This table is only for comparisons to the 2005 rebuilding run.

Parameter vale	Run0	Model T2 (2005 rebuilding run)
Virgin spawning output (million of eggs)	50,748	49,678
Target spawning output (million of eggs)	20,299	19,871
Current spawning output (million of eggs)	17,999	15,444
Spawning output in 2001 (million of eggs)	16,459	15,691
Minimum rebuilding time (number of year)	13	15
Maximum rebuilding time (number of year)	22	26
Year for rebuild	2031	2033

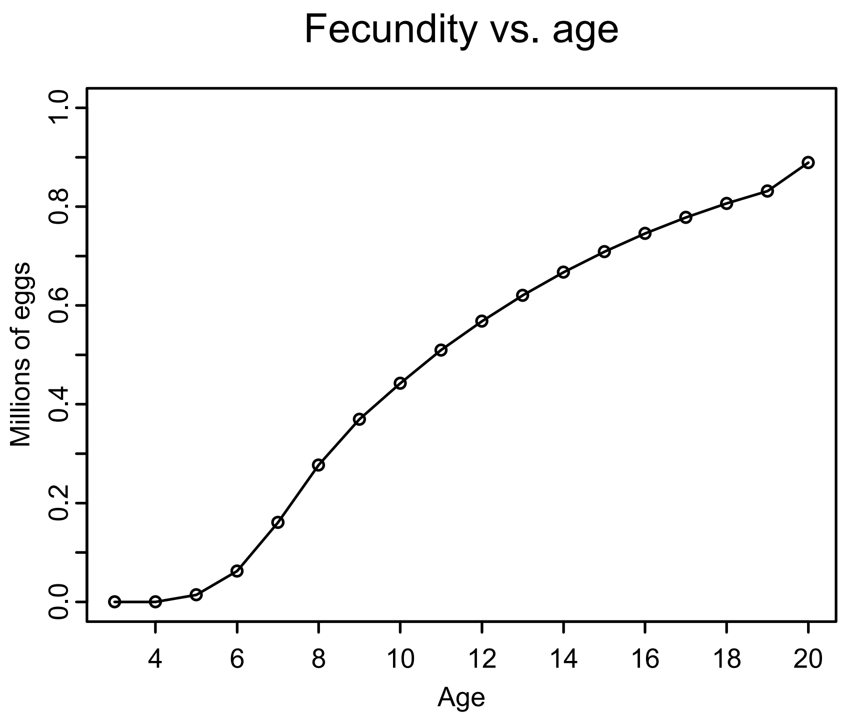
Table 3a. Proposed future catches (mt) and estimated exploitable biomass (mt) for ten rebuilding runs from 2009 to 2018. Run 7 to Run10 are requested runs by the October 2007 Mop-up Panel. The population is estimated to recover in 2009. SPR rates and fishing mortalities are average values from 2007 to 2018.

	Run1		Run2		Run3		Run4		Run5		Run6	
Probability of recovery	1.0		1.0		1.0		1.0		1.0		1.0	
Recovery time	2009		2009		2009		2009		2009		2009	
SPR rate	1.000		0.9479		0.8863		0.8356		0.7861		0.6020	
Fishing mortality	0.0000		0.0081		0.0155		0.0232		0.0313		0.0681	
	Catch	Biomass	Catch	Biomass	Catch	Biomass	Catch	Biomass	Catch	Biomass	Catch	Biomass
2009	0	67193	500	66703	1000	66501	1500	66299	2000	66097	4000	61109
2010	0	65869	500	65052	1000	64489	1500	63926	2000	63363	4000	56296
2011	0	63346	500	62275	1000	61420	1500	60565	2000	59710	4000	51885
2012	0	60671	500	59416	1000	58342	1500	57267	2000	56192	4000	48512
2013	0	58624	500	57239	1000	55995	1500	54749	2000	53508	4000	46276
2014	0	57431	500	55937	1000	54554	1500	53173	2000	51809	4000	45039
2015	0	57020	500	55442	1000	53985	1500	52503	2000	51020	4000	44389
2016	0	57275	500	55598	1000	54022	1500	52427	2000	50831	4000	43937
2017	0	57891	500	56093	1000	54400	1500	52690	2000	50962	4000	43381
2018	0	58480	500	56533	1000	54700	1500	52855	2000	50986	4000	42897

Table 3b. Proposed future catches (mt) and estimated exploitable biomass (mt) for ten rebuilding runs from 2009 to 2018. Run 7 to Run10 are requested runs by the October 2007 Mop-up Panel. The population is estimated to recover in 2009. SPR rates and fishing mortalities are average values from 2007 to 2018.

	Run7		Run8		Run9		Run10	
Probability of recovery	1.0		1.0		1.0		1.0	
Recovery time	2009		2009		2009		2009	
SPR rate	0.950		0.964		0.650		0.500	
Fishing mortality	0.0078		0.0056		0.0670		0.1210	
	Catch	Biomass	Catch	Biomass	Catch	Biomass	Catch	Biomass
2009	522	66694	371	66755	4338	65142	7728	63737
2010	509	65032	362	65201	4051	60840	6937	57215
2011	487	62260	347	62511	3738	56143	6191	51070
2012	465	59420	332	59729	3464	52033	5592	46125
2013	448	57274	320	57625	3266	49057	5174	42681
2014	438	55987	313	56365	3148	47283	4928	40655
2015	435	55546	311	55936	3092	46432	4801	39606
2016	436	55703	312	56124	3074	46175	4745	39139
2017	440	56217	315	56673	3067	46063	4676	38574
2018	444	56689	317	57163	3048	45783	4588	37845

Figure 1. Fecundity-at-age and weight-at-age by sex for widow rockfish as used in the rebuilding analyses.



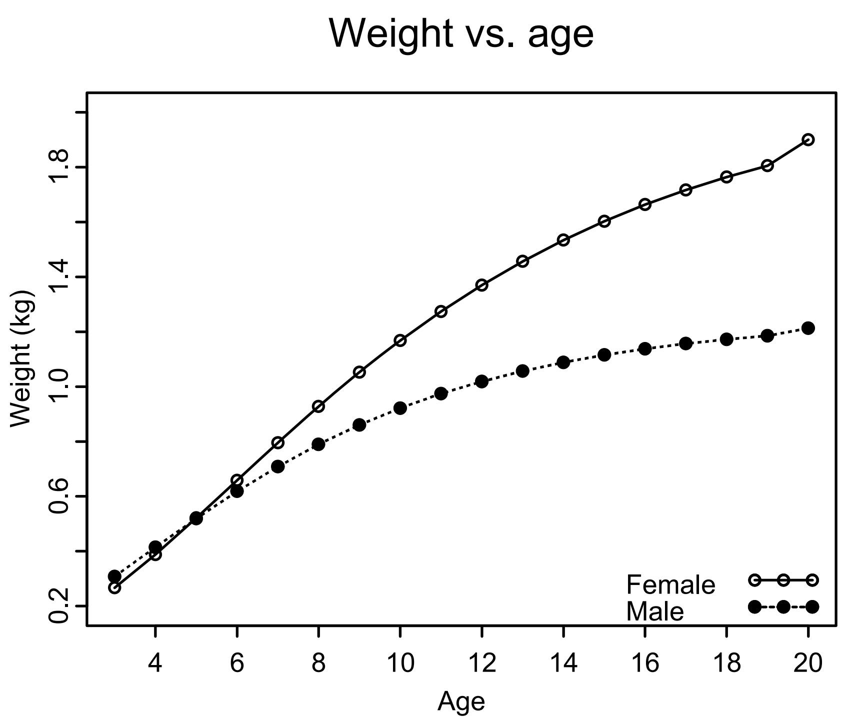


Figure 2. The selectivity pattern for widow rockfish used in the rebuilding analyses.

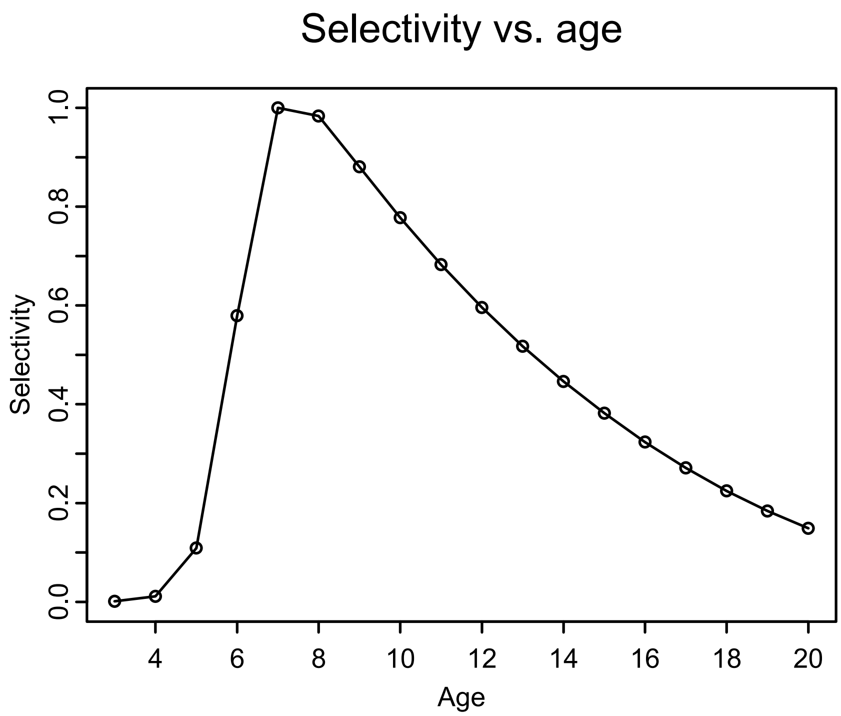


Figure 3. Proposed constant annual catches (mt) for six simulation runs (Run1 to Run6).

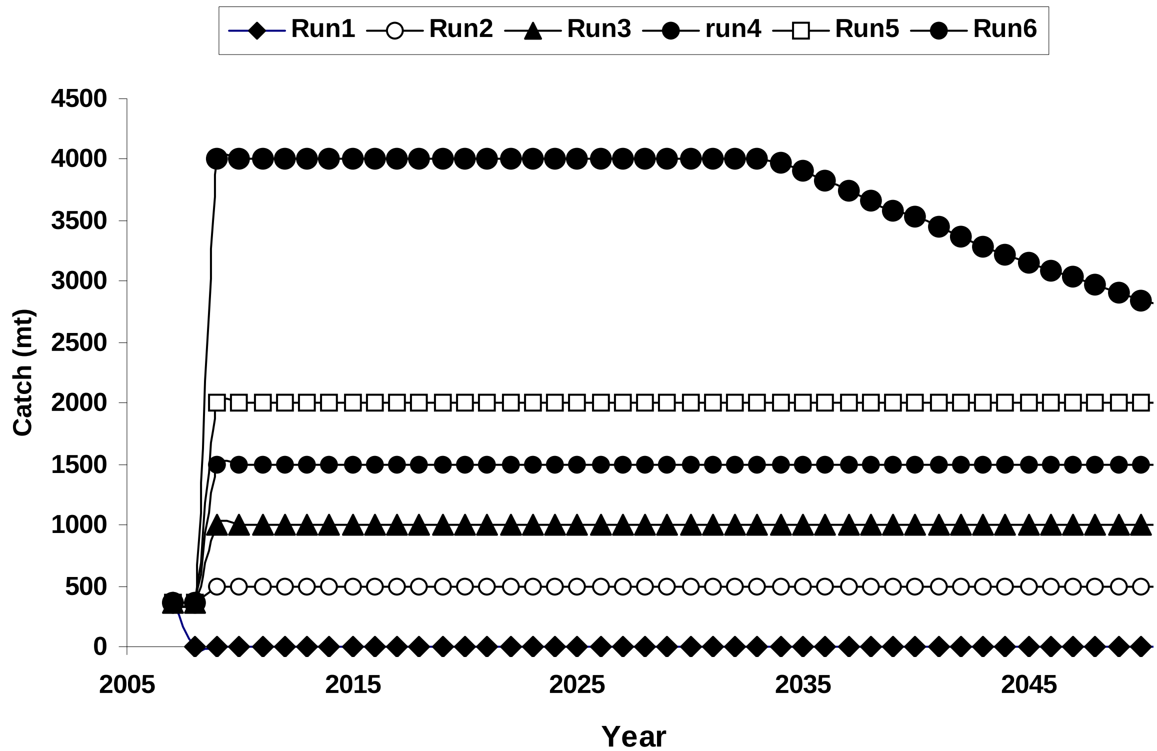


Figure 4. Time series of spawning biomass over target for six simulation runs with constant annual catches (Run1 to Run6). Note that only Run6 (annual catch of 4000mt) results in the spawning biomass fell below the target level (spawning biomass over target equals to 1).

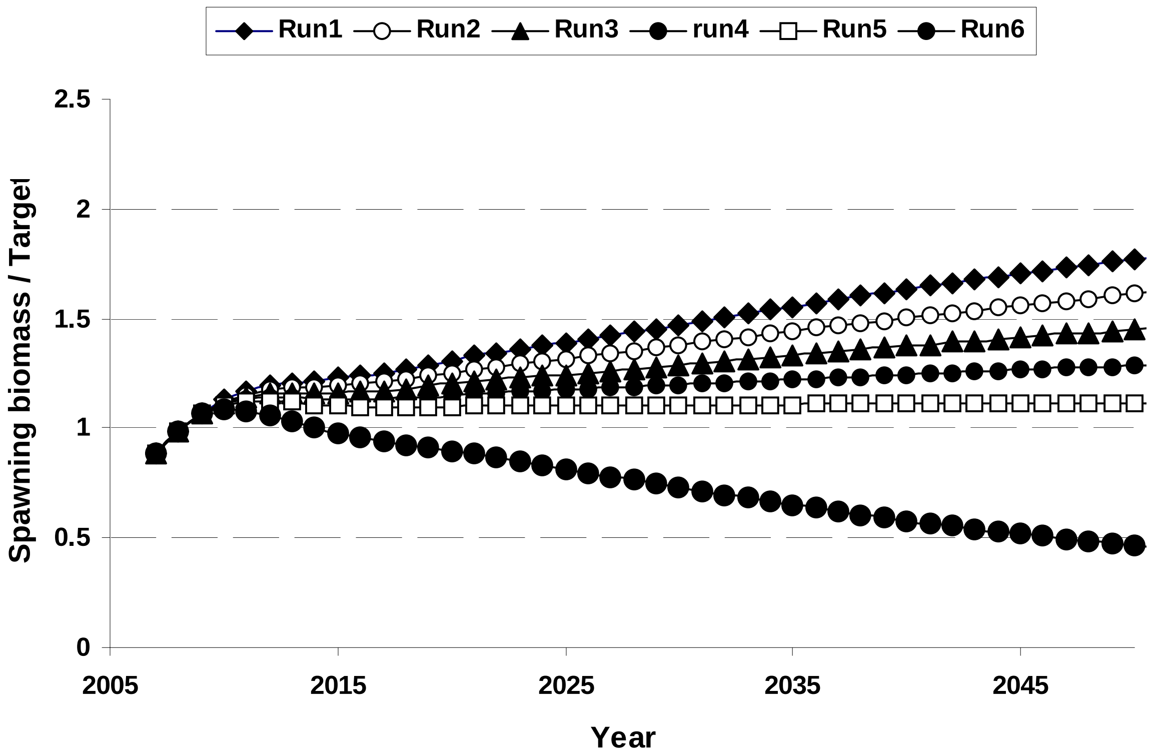


Figure 5. Time series of annual catches (mt) for proposed four runs (Run7 to Run10).

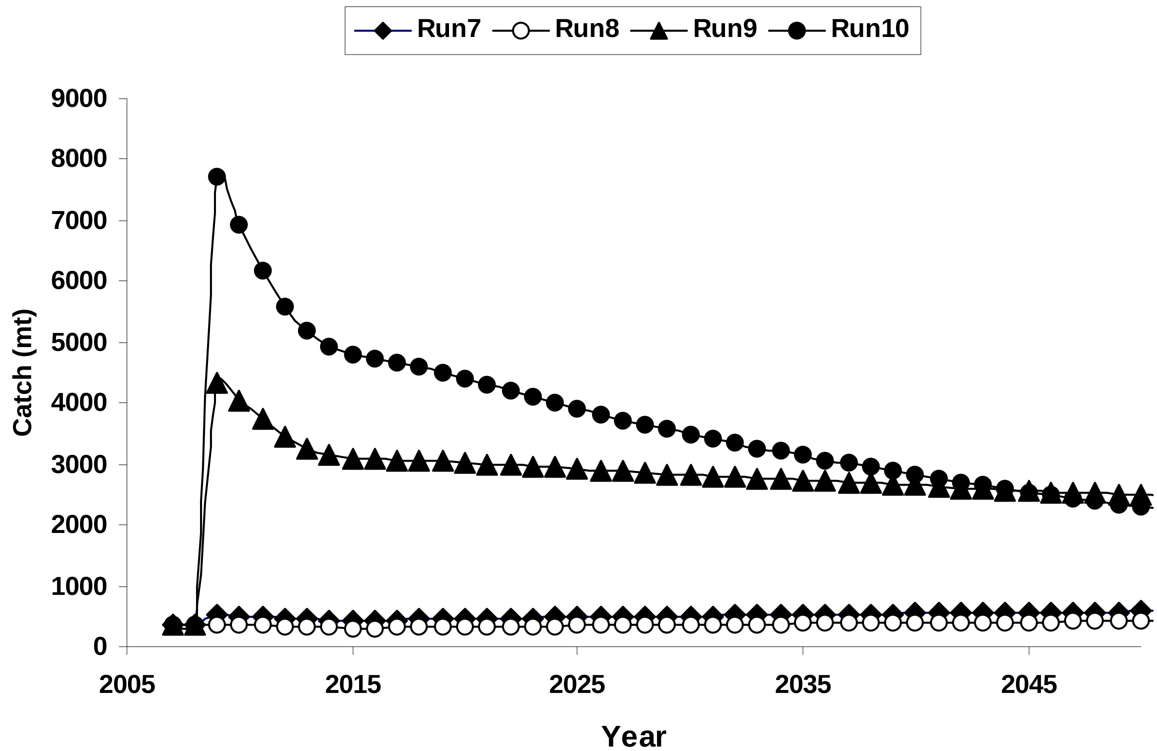
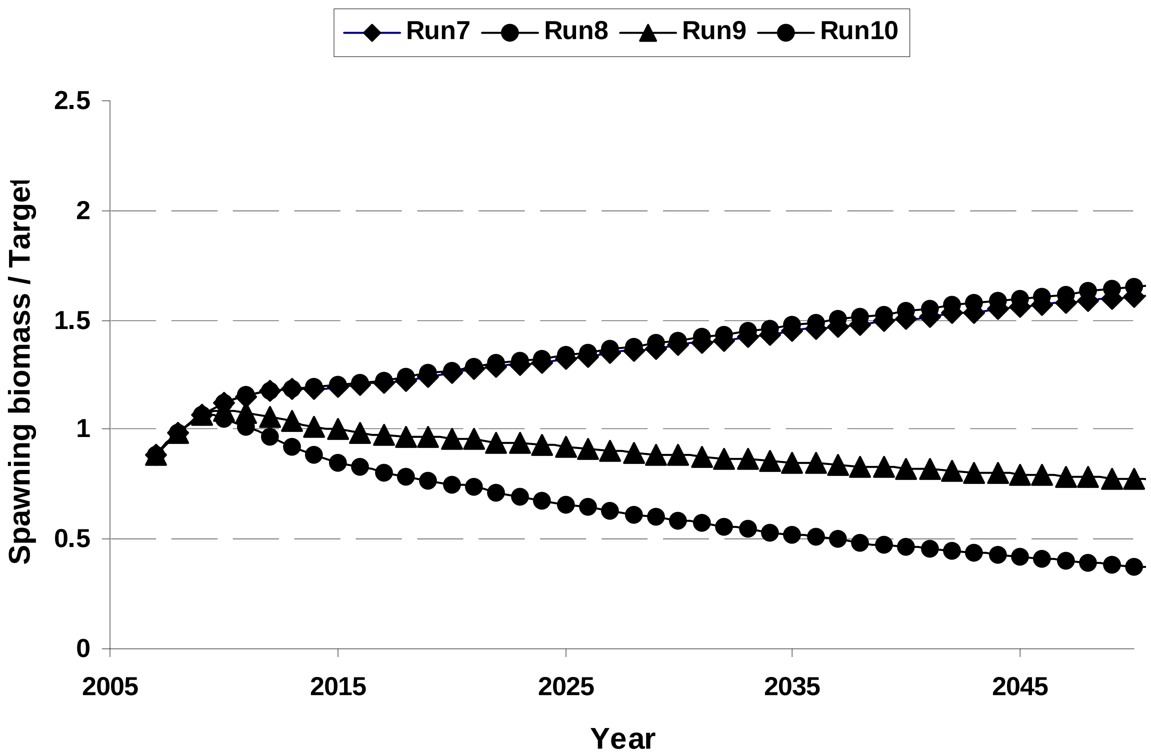


Figure 6. Time series of spawning biomass over target for four simulation runs requested by the October 2007 Mop-up Panel (Run7 to Run10).



Appendix A. The “rebuild.dat” file used in the rebuilding analysis for Run1.

```
# Rebuild.dat for 2007 widow rebuiding
Widow (RecruitOverRiding=0, UseXHhPrior=1, PowCoefficientSCLabIndex= )
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
3 20
# Number of fleets to consider
1
# First year of the projection
2007
# Year declared overfished
2001
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1), historical recruits/spawner
(2), or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# A blank comment line - needed for the program to run
 0.0000 0.0001 0.0141 0.0624 0.1609 0.2770 0.3698 0.4423 0.5099 0.5682 0.6206 0.6674 0.7090
0.7458 0.7782 0.8068 0.8318 0.8895
# Age specific information (Females then males), weight and selectivity
# Females
 0.2663 0.3880 0.5210 0.6587 0.7955 0.9276 1.0523 1.1681 1.2742 1.3704 1.4569 1.5342 1.6028
1.6636 1.7172 1.7642 1.8055 1.9008
 0.0010 0.0112 0.1087 0.5792 1.0000 0.9837 0.8811 0.7780 0.6827 0.5959 0.5174 0.4463 0.3819
0.3236 0.2712 0.2246 0.1839 0.1490
# Males
 0.3073 0.4137 0.5188 0.6180 0.7086 0.7893 0.8601 0.9214 0.9740 1.0187 1.0566 1.0886 1.1154
1.1379 1.1568 1.1725 1.1856 1.2133
 0.0010 0.0112 0.1087 0.5792 1.0000 0.9837 0.8811 0.7780 0.6827 0.5959 0.5174 0.4463 0.3819
0.3236 0.2712 0.2246 0.1839 0.1490
# Age specific information (Females then males), natural mortality and numbers at age
# Females
 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
0.1250 0.1250 0.1250 0.1250 0.1250
     8196.66     7605.13     6247.63    22727.19     5474.55     5967.47     2294.15     1551.54
1271.08     1854.62     1707.29     1204.61     3092.11     1568.31      653.18      512.84
627.09     4555.84
# Males
 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
0.1250 0.1250 0.1250 0.1250 0.1250
     8196.66     7605.13     6247.63    22727.19     5474.55     5967.47     2294.15     1551.54
1271.08     1854.62     1707.29     1204.61     3092.11     1568.31      653.18      512.84
627.09     4555.84
# Initial age-structure (for Tmin)
    11251.89     4344.48     2980.03     2532.77     3793.78     3476.26     2427.41     6168.87
3100.68     1281.04      998.69     1213.56      424.43      781.70      835.80      672.52
549.44     5381.58
    11251.89     4344.48     2980.03     2532.77     3793.78     3476.26     2427.41     6168.87
3100.68     1281.04      998.69     1213.56      424.43      781.70      835.80      672.52
549.44     5381.58
# Year for Tmin Age-structure
2001
# Number of simulations
5000
# Recruitment and Spanwer biomasses
# Number of historical assessment years
49
```

```
# Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
# on R, Used to project based on R/S
 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 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
   34152   34221   34248   34108   33555   32982   31526   31650   28162   35997   39154   40511
42282   44704   41551   90448   32579   13728   11264   17009   21795   11539   39262   59049
22302   66907   80725   29116   29471   29931   23296   10683   24898   16128   16102   29824
45363   13939   15758   13534    7470    7663    9847   22504   18126   66180   16045   17236
16393
   47481   47481   47488   47514   47576   47670   47776   47875   47941   47125   46127   45536
45384   45410   45694   46298   47013   48104   49697   51534   52503   52133   50269   43657
35867   28812   26352   25142   24840   25488   25960   26185   25053   23792   22929   21803
20150   18887   17764   17372   17280   17387   17107   16444   16040   15905   15963   16544
17839
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
 0 0 0 0 0 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1
# Number of years with pre-specified catches
2
# Catches for years with pre-specified catches
2007 368
2008 368
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5,2=0.6,etc.)
2
# Steepness and sigma-R and auto-correlations
  0.290376  0.500000 0.000000
# Target SPR rate (FMSY Proxy)
0.500000
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.100000
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
0
# Percentage of FMSY which defines Ftarget
0.900000
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# First Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
```

```
# User-specific projection (1=Yes); Output replaced (1->6)
1 2 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2009 2 500
2010 2 500
2011 2 500
2100 2 500
-1 -1 -1
# Split of Fs
2007 1
-1 1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
# User-specific projection (1=Yes); Output replaced (1->9)
0
# Target Depletion
0.400000
# Project with Historical recruitments when computing Tmin (1=Yes)
0
# CV of implementation error
0
```

Agenda Item D.3.a
Attachment 12
November 2007

Updated Rebuilding Analysis for Yelloweye Rockfish Based on the Stock Assessment Update in 2007

September 2007

by

John R. Wallace

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Introduction

The yelloweye rockfish (*Sebastes ruberrimus*) stock off the United States Pacific coast was declared to be in an "overfished" state in 2002 based on stock assessments by Wallace (2001) and Methot *et al*. (2002). Both assessments were length-based models and used an earlier version of the Stock Synthesis program (Methot 1990). The first assessment included data from two areas, California and Oregon (Wallace 2001). Washington catch and age data were incorporated by Methot *et al*. (2002) and the stock was treated as one single assemblage off the California, Oregon, and Washington (W-O-C) coast. Results from Methot *et al.* (2002) indicated that the stock was depleted at 24% of B_0 in 2002. A subsequent rebuilding analysis was conducted (Methot and Piner 2002) and the estimated rebuilding parameters were adopted by the Pacific Fishery Management Council in 2004 (PFMC 2004).

The stock assessment and rebuilding analysis were updated in 2005 (Wallace et al. 2005, Tsou and Wallace 2005). A full stock assessment was conducted the following year in order to incorporate new data sources and area-specific modeling in the assessment (Wallace et. al 2006). The rebuilding analysis was also updated (Tsou and Wallace, 2006) and the results were included in the revised rebuilding plan under Amendment 16-4 of the 2006 Pacific Coast Groundfish Fishery Management Plan (PFMC, 2006). The amendment re-evaluated and revised adopted rebuilding plans for seven depleted (overfished) groundfish species, including yelloweye rockfish, so that the rebuilding periods are as short as possible, taking into account the status and biology of the depleted species, the socioeconomic needs of West Coast fishing communities, and the interaction of the depleted species within the marine ecosystem.

The purpose of this document is to update the rebuilding analysis based on the most recent stock assessment update (Wallace 2007). The basic population estimates from previous assessments and rebuilding analyses as well as the 2007 assessment update are included in Table 1.

Summary of 2007 Updated Assessment

Landings, compositional data, and the catch per unit of effort (CPUE) time series were all updated through 2006 for the updated assessment. Some key issues identified in the update were: (1) correction of a technical error in the definition of age and length classes, (2) deleting Washington trawl-caught fish from hook-and-line age compositions, and (3) revising the natural mortality rate upwards from 0.036 to 0.043. The combination of these corrections led to an overall downward revision in the amount of spawning biomass and the level of depletion, relative to the 2006 assessment.

The update also considered the effect of including fishing trips that target halibut in the calculation of the Washington sport CPUE statistic, as well as the impact of dropping 2000 and 2001 from that particular time series. Neither of those two sensitivity analyses produced an appreciable effect on model outcome.

Rebuilding Calculations

Guidelines from John DeVore of the PFMC, (04 September 2007), and the SSC Default Rebuilding Analysis as implemented by Punt (September 2007, version 2.11) were used for these rebuilding calculations. The following steps were followed for this rebuilding analysis as requested by the Council:

A. Define how virgin biomass (SB_0) is calculated.
B. Define how future recruitment is generated.
C. Recalculate rebuilding reference points from the most current assessment results
   1) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated ($T_{F=0}$).
   2) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (T_{MIN}).
   3) Calculate the mean generation time.
   4) Calculate the maximum allowable rebuilding time (T_{MAX}).
D. Analysis of alternative harvest strategies for rebuilding.
E. Results

A. *Definition of SB_0*

The equilibrium spawning biomass level (SB_0) used in this rebuilding analysis is calculated via the stock-recruitment relationship in order to be consistent with assessment model results. This level is estimated to be 3,062 mt in the base case assessment model (M = 0.043), which implies a rebuilding target ($SB_{40\%}$) of 1,225 mt (Table 1).

B. *Generation of future recruitment*

The parameters of the stock recruitment relationship (unexploited equilibrium recruitment [natural log of R_0], steepness [h], and the degree of recruitment variability [σ_r]) from the 2007 stock assessment update are used to generate future recruitments in the rebuilding analysis.

C. *Recalculate reference points*

The median year of recovery in the absence of future fishing, $T_{F=0}$, was calculated by not using the ramp-down strategy and having no fishing after 2009. The value for $T_{F=0}$ is 2049. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration (2002) has not changed from 2046 given in Table 4-2 of Amendment 16-4 (PFMC 2006). The value for $T_{F=0}$ differs from T_{MIN} since the starting year of no fishing is seven years later.

The estimated mean generation time (MGT) decreased from 50 to 44 years resulting from a substantial increase in the rate of natural mortality used in the new model. The MGT is added to T_{MIN} to obtain an estimate of T_{MAX}, 2090. Since T_{MIN} did not change, this year is both the recalculated T_{MAX} (see guidelines under D-1 from J. DeVore) and the new $T_{MAX.}$ All reference points from earlier rebuilding analyses and those recalculated here are summarized in Table 1.

D. *Alternate harvest strategies for rebuilding*

The yelloweye rockfish rebuilding plan specifies a harvest ramp-down strategy before resuming a constant harvest rate (SPR = 71.9%) in 2011 (Table 2a). The ramp-down strategy involves a declining Optimum Yield (OY) from 23 to 14 mt during the years 2007 to 2010 and was adopted by the PFMC in 2006 to mitigate impacts of the proposed OY reduction on small fishing entities. The ABC projections under the new rebuilding analysis are also shown in Table 2a. Table 2b shows similar information for the no ramp-down strategy.

E. *Results*

This rebuilding analysis presents a number of alternate harvest strategies. The alternatives are numbered as follows:

1) No fishing beginning in 2009

2) SPR = 0.8

3) The current rebuilding harvest rate target (SPR=0.719)

4) The harvest rate that achieves a 50% probability of recovery by T_{TARGET} from Amendment 16-4 (2084).

5) The harvest rate that achieves a 50% probability of recovery in the recalculated T_{MAX} (2090)

6) The harvest rate (SPR=0.595) which generates the 2007-08 OY's (under the ramp-down strategy).

7) The ABC harvest rate

Table 3a shows the new rebuilding parameters for the above scenarios. The SPR values for these scenarios range from 1.0 (no fishing) to 0.5 (the F_{MSY} proxy rate). In the former case, the median year to rebuild is 2049, however, in the latter case, rebuilding does not occur over any duration. Note that with the ramp-down strategy in place, when the SPR that produces the average 2007-08 OY is used, the median year to rebuild increases to 2181 which is not only greater than T_{TARGET} but T_{MAX} as well.

The median year to rebuild under the current harvest control rule of SPR fishing rate (71.9%) is 2082. Amendment 16-4's T_{Target} of 2084 gives a SPR of 71.2% and an OY of 14.4 mt in 2011. Alternative 5 shows the median year to rebuild of 2090. The OY for 2011 under this scenario is 15.6 mt and the fishing SPR is 69.3%. Solving for the SPR which gives the average OY for 2007 and 2008 (21.5 mt, under the ramp-down) gives a value of 59.5% and an OY of 23.1 in 2011.

Table 3b shows all the same scenarios without the ramp-down strategy. Note that the median times to rebuild do not change under the no ramp-down scenarios.

Figure 1 shows data from Table 3a graphically. It contours the percent probability of rebuilding for yelloweye by year and 1 – SPR. If at least a 50% probability of rebuilding is desired then a position on or to the right of the 50% line is needed. Similarly, Figure 2 contours the OY's for the ramp-down strategy by year and 1 – SPR.

Acknowledgements

Richard Methot and Andre Punt provided assistance in using SS2 and the rebuilding software. Jim Hastie and Stacey Miller provided comments that improved the quality of the document.

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(http://www.pcouncil.org/bb/2007/0607/Groundfish_Assessments_E6/Yelloweye_Update_2007_Final.pdf)

Table 1. Summary of rebuilding reference points for yelloweye rockfish from the previous stock assessments and rebuilding analyses and recalculated values based on the current rebuilding analysis applied to the 2007 assessment results.

	Source		
Parameter	2002 Full Assmt./ Rebuilding Anlys. (2004 Rebuilding Plan)	2006 Full Assmt. / Rebuilding Anlys. (Amendment 16-4)	2007 Updated Assessment/ Rebuilding Analysis
B_0	3,875 mt	3,322 mt	3,062 mt
B_{MSY}	1,550 mt	1,328 mt	1,225 mt
Depletion $B_{CURRENT}/B_0$)	24% (2002)	17.7%	16.4%
T_{MIN}	2027	2046	2046
T_{MAX}	2071	2096	2090
T_{TARGET}	2058	2084	2084*
$T_{F=0}$	-	2048	2049
Harvest Control Rule	F=0.0153	SPR=71.9%	SPR=71.9%

* New T_{TARGET} shown unchanged from 2006 since the old T_{TARGET} is less than current T_{MAX}. (J. DeVore, personal communication)

Table 2a. OY and ABC projections for the harvest ramp-down strategy adopted by the Council. Years 2007-2010 show the ramp-down. The SPR of 71.9% is the constant harvest rate beginning in 2011.

Year	OY (mt)	ABC (mt)	SPR	1 - SPR
2007	23	29.8	0.574	0.426
2008	20	30.5	0.617	0.383
2009	17	31.1	0.663	0.337
2010	14	31.8	0.713	0.287
2011	13.9	32.5	0.719	0.281
2012	14.2	33.1	0.719	0.281
2013	14.5	33.8	0.719	0.281
2014	14.7	34.4	0.719	0.281
2015	15.0	34.9	0.719	0.281
2016	15.2	35.5	0.719	0.281
2017	15.5	36.1	0.719	0.281
2018	15.7	36.6	0.719	0.281
2019	15.9	37.1	0.719	0.281
2020	16.1	37.6	0.719	0.281

Table 2b. OY and ABC projections for harvest with no ramp-down. The SPR of 71.9% is kept as the constant harvest rate beginning now in 2009.

Year	OY (mt)	ABC (mt)	SPR	1 - SPR
2007	23	29.8	0.574	0.426
2008	20	30.5	0.617	0.383
2009	13.3	31.1	0.719	0.281
2010	13.6	31.9	0.719	0.281
2011	13.9	32.6	0.719	0.281
2012	14.2	33.3	0.719	0.281
2013	14.5	33.9	0.719	0.281
2014	14.8	34.5	0.719	0.281
2015	15.0	35.1	0.719	0.281
2016	15.3	35.7	0.719	0.281
2017	15.5	36.3	0.719	0.281
2018	15.7	36.8	0.719	0.281
2019	16.0	37.3	0.719	0.281
2020	16.2	37.9	0.719	0.281

Table 3a. Rebuilding parameters for ramp-down scenarios from no fishing mortality to fishing at the ABC, found by applying the *Rebuilding Analysis* program to the 2007 assessment update data.

Alternative	1. No Fishing Beginning in 2009	2. SPR = 0.800	3. SPR = 0.719 (From Amendment 16-4)	4. SPR that produces 50% prob. Recovery by T_{TARGET} = 2084	5. SPR produces 50% prob. Recovery by new T_{MAX} =2090	6. SPR that produces current ave. OY for 2007-08	7. ABC harvest rate SPR=50% (after ramp down)
Ramp-Down Used	No	Yes	Yes	Yes	Yes	Yes	Yes
SPR	1.000	0.800	0.719	0.712	0.693	0.595	0.5
1 - SPR	0.000	0.200	0.281	0.288	0.307	0.405	0.5
2011 OY/ABC (mt)	0.0/ 33.2	9.1/ 32.5	13.9/ 32.5	14.4/ 32.5	15.6/ 32.5	23.1/ 32.5	32.5/ 32.5
2012 OY/ABC (mt)	0.0/ 34.2	9.3/ 33.2	14.2/ 33.1	14.7/ 33.1	15.9/ 33.1	23.5/ 32.9	32.7/ 32.7
Median Year to Rebuild	2049	2066	2082	2084	2090	2181	NA
Percent Prob. to Rebuild by: 2046 (T_{MIN})	27.8	0. 1	0.0	0.0	0.0	0.0	0.0
2050	63.0	1.2	0.0	0.0	0.0	0.0	0.0
2060	98.0	24.5	2.6	1.8	0.8	0.0	0.0
2070	100.0	67.0	17.7	14.2	7.90	0.0	0.0
2080	100.0	90.4	45.1	38.9	26.9	0.2	0.0
2084 (T_{TARGET})	100.0	95.2	54.9	49.9	36.6	0.5	0.0
2090 (T_{MAX})	100.0	97.8	68.9	64.4	50.0	0.9	0.0

Table 3b. Rebuilding parameters for the no ramp-down scenarios from no fishing mortality to fishing at the ABC.

Alternative	1. No Fishing Beginning in 2009	2. SPR = 0.800	3. SPR = 0.719 (From Amendment 16-4)	4. SPR that produces 50% prob. Recovery by T_{TARGET} = 2084	5. SPR produces 50% prob. Recovery by new T_{MAX} =2090	6. SPR that produces current ave. OY for 2007-08	7. ABC harvest rate SPR=50% (after ramp down)
Ramp-Down Used	No	No	No	No	No	No	No
SPR	1.000	0.800	0.719	0.712	0.693	0.595	0.5
1 - SPR	0.000	0.200	0.281	0.288	0.307	0.405	0.5
2009 OY/ABC (mt)	0.0/ 33.2	8.7/ 31.1	13.3/ 31.1	13.8/ 31.1	15.0/ 30.5	22.1/ 31.1	31.1/ 31.1
2010 OY/ABC (mt)	0.0/ 34.2	9.0/ 32.0	13.6/ 33.8	14.1/ 31.9	15.3/ 31.1	22.5/ 31.7	31.5/ 31.5
Median Year to Rebuild	2049	2066	2082	2084	2090	2181	NA
Percent Prob. to Rebuild by: 2046 (T_{MIN})	27.8	0. 1	0.0	0.0	0.0	0.0	0.0
2050	63.0	1.4	0.0	0.0	0.0	0.0	0.0
2060	98.0	26.2	2.7	1.8	0.8	0.0	0.0
2070	100.0	68.1	18.3	14.4	7.8	0.0	0.0
2080	100.0	91.1	45.7	38.9	26.9	0.2	0.0
2084 (T_{TARGET})	100.0	95.8	55.8	50.1	36.3	0.5	0.0
2090 (T_{MAX})	100.0	98.0	69.5	64.4	49.9	0.9	0.0

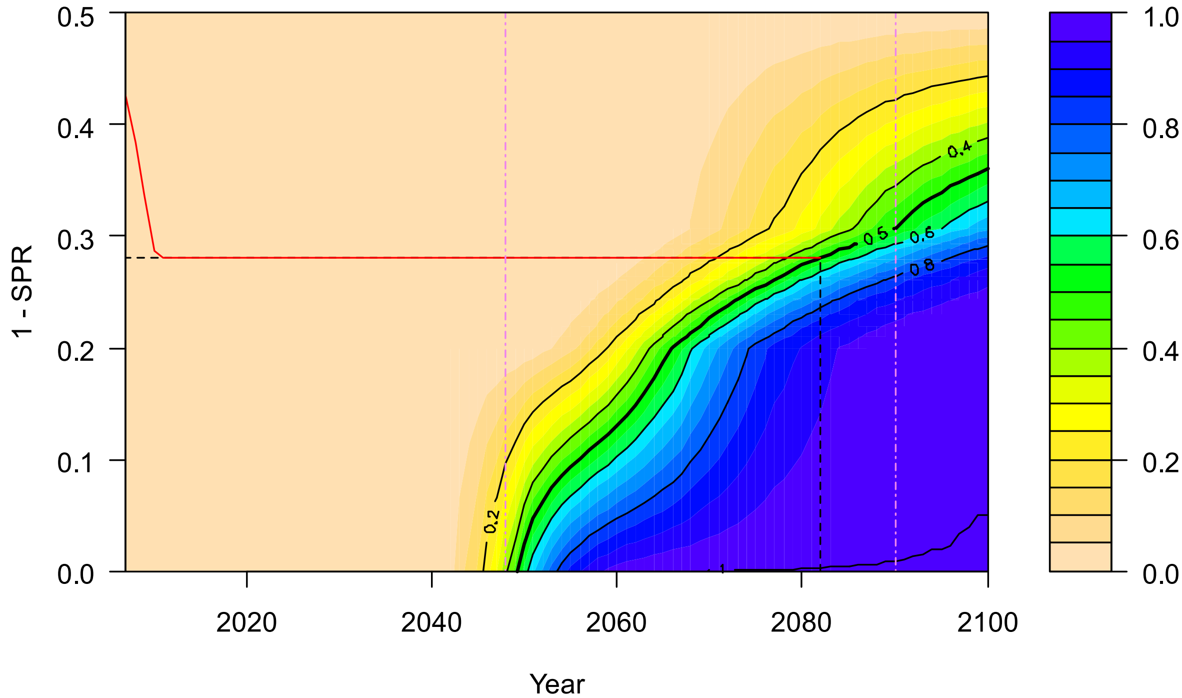

Figure 1. Estimated percent probability of rebuilding for yelloweye by year and 1 – SPR. Fishing increases as 1 – SPR increases. The black dashed lines show a SPR of 71.9% intersecting with the 50% median year to rebuild of 2082. The solid red (mostly horizontal) line shows the ramp-down strategy. The violet dashed–dotted lines show the limits of T_{MIN} (2046) and the new T_{MAX} of 2090.

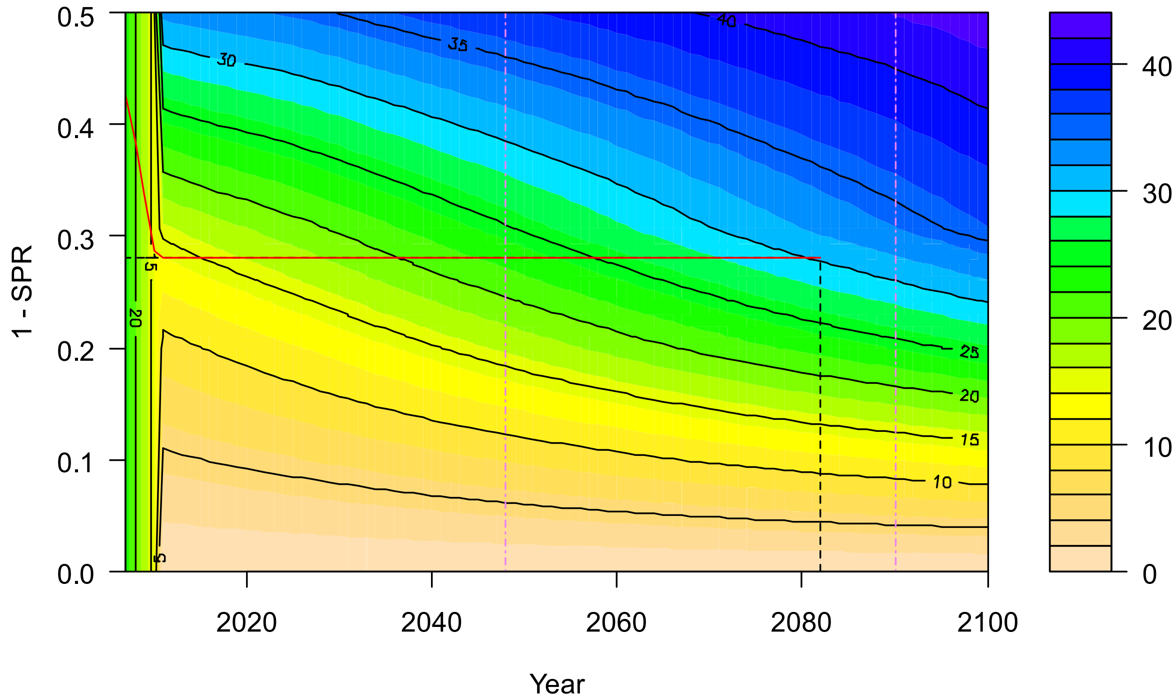

Figure 2. Estimated OY (with ramp-down) for yelloweye by year and 1 – SPR. Fishing increases as 1 – SPR increases. The black dashed lines show a SPR of 71.9% intersecting with the 50% median year to rebuild of 2082. The solid red (mostly horizontal) line shows the ramp-down strategy. The violet dashed–dotted lines show the limits of T_{MIN} (2046) and the new T_{MAX} of 2090.

Agenda Item D.3.c
Supplemental SSC Report
November 2007

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2009-2010 GROUNDFISH FISHERIES

SOUTHERN BLACK ROCKFISH

Dr. David Sampson presented the southern black rockfish stock assessment to the Scientific and Statistical Committee (SSC) and Dr. Martin Dorn presented the Stock Assessment Review (STAR) Panel report. The SSC endorses this assessment and the corresponding decision tables for use in the Pacific Fishery Management Council (Council) management process.

Due to the lack of adequate sampling for rockfish species composition during the pre-PacFIN years (prior to 1981), the southern black rockfish landings are highly uncertain during the early years of the assessment time series. These landings were re-estimated in this assessment and found to be considerably greater than the landings used in the last assessment (2003). Sensitivity analysis was conducted to examine the effect of the revised landings estimates. Ratio estimates from the assessment (e.g. depletion level) were not greatly affected but absolute estimates (e.g. maximum sustainable yield [MSY]) were appreciably greater when using the revised landings time series. More generally, species-specific landings estimates from the pre-PacFIN era are problematic for many rockfish species; and truly accurate estimates may not be attainable some 30 years after the fact. However, total rockfish landings are fairly well known. The SSC recommends that during the "off-year" (2008), a consistent, comprehensive process be developed for estimating species-specific landings for this period. This process should (1) provide consistency among stock assessments; (2) ensure that the sum of the species-specific landings corresponds to the better known total rockfish landings; and (3) develop a means to characterize the uncertainty in the species-specific landings estimates.

The assessment is hampered by a lack of reliable indices of abundance. Further, none of the available indices indicate a long term trend in abundance but the SS2 estimated biomass (ages 2+) increased approximately 50% over the last decade. This increase in estimated biomass (B) resulted from two strong year-classes (1994 and 1999). Similarly, the relatively healthy status of this stock (current B is 70% of B_0) is driven primarily by these strong year-classes. However, neither the age- nor length-composition data appear to provide evidence for the strength of these year-classes. This discrepancy should be investigated further in the next stock assessment.

The scale of the biomass estimates differed considerably between the current and previous assessments (B from the current assessment is larger). The primary causal factor appears to be the natural mortality rates (M) assumed in the respective assessments. Use of the larger M (in the current assessment) was recommended by the previous STAR Panel to provide consistency with the M used for the northern black rockfish assessment. The SSC concurs with this approach.

The decision table, coupled with the probabilities assigned to the various states of nature, provides a large contrast in possible outcomes – implying a highly uncertain assessment (relative to other rockfish assessments). The probabilities were not statistically-based (e.g. based on the relative likelihood of fitted models) but rather developed from a consensus-building process carried out near the end of the STAR Panel meeting. This process may have resulted in an overestimation of the uncertainty associated with the southern black rockfish assessment.

The STAT initially attempted to carry out this assessment using a spatially structured model (using Oregon- and California-based areas) but the results were not encouraging. Although no attempt was made to model fish movement across area boundaries (characteristic of a fully fledged spatial model), modeling difficulties arose in simply apportioning recruitment to the respective areas While the SSC encourages this approach and commends the STAT for its initiative, these results may be a bellwether for the likelihood of viable spatial assessment of the Council's other data poor stocks. On the other hand, stocks with richer data sets (e.g. a time series of trawl survey data) may prove to be more amenable to spatially explicit stock assessment and management.

BLUE ROCKFISH

The SSC reviewed the blue rockfish stock assessment and STAR Panel documents and heard a presentation by Meisha Key, the blue rockfish STAT lead. Items of major uncertainty in the assessment included: 1) unclear implications of the possible existence of two separate blue rockfish species, 2) unclear reasons for the lack of male blue rockfish, 3) evidence for spatial variability and a decrease in average size at age (observed but not incorporated into the model), 4) an uncertain historical catch data stream, and 5) an uncertain value for natural mortality.

The SSC was concerned about a statement found on page 13 of the blue rockfish assessment document: "Because of the numerous violations of model assumptions, the STAT does not consider the management quantities estimated in this assessment to be sufficiently reliable for quantitative fisheries management." The SSC discussed this issue with members of the STAT present to determine if confidence in the assessment was sufficient to proceed with a quantitative stock assessment review, noting the apparent conflict with the blue rockfish STAR Panel report which had endorsed the use of the assessment for management. The STAT offered to edit the statement in question, and to provide the new version in writing, to better reflect its position with regard to use of the assessment in management.

The SSC subsequently received the following assessment document revision from the STAT: "The STAT advises that this assessment for management purposes be used with caution. The STAT feels strongly that the decision table does not provide symmetrical bracketing of uncertainty (described in decision table section) and that the BASE and High M scenarios are most likely. It is recommended that the projections under those scenarios be considered for management purposes." The SSC reviewed this revision by the STAT and endorses the assessment for use in establishing optimum yields (OYs) for management.

The decision table presented for blue rockfish considered two axes of uncertainty: 1) the historical catch stream (high, medium (base), and low), and 2) the assumed value of natural mortality (high, medium (base), and low). The SSC discussion focused on the scenarios chosen to bound the base case. The STAT noted that the base and high (optimistic) scenarios were more likely than the low (pessimistic) scenarios. The SSC concurred that the decision table was not symmetrical with respect to the bounds chosen to bracket the base case to characterize uncertainty.

Finally, The SSC notes that the blue rockfish assessment was received quite late by most SSC members (on the Friday before the Council meeting), which added to difficulties in the final review.

REBUILDING ANALYSES

The Groundfish Subcommittee of the SSC met October 3-4, 2007 at the Alaska Fisheries Science Center in Seattle to review seven rebuilding analyses that were recently completed for overfished rockfish stocks managed by the Council, *viz*. bocaccio, Pacific ocean perch (POP), cowcod, canary rockfish, yelloweye rockfish, widow rockfish, and darkblotched rockfish

Current rebuilding harvest rates (expressed as spawning potential per recruit [SPR]) and median times to rebuild (T_{target}) for the overfished stocks are directly linked to one another and individually they reflect specific decisions the Council has previously made concerning rebuilding in as short a time as possible, taking into account the appropriate factors from the Magnuson Act. Amendment 16-4 to the groundfish FMP adopted specific SPRs and T_{target} values for each stock. From a regulatory basis, maintaining stability in current harvest rates (SPRs) would be desirable, presuming there have been no fundamental changes in our perceptions about stock productivity.

The SSC, therefore, determined (a) whether cumulative catches during the period of rebuilding exceeded the cumulative OY that was available, (b) whether the biological parameters in the stock assessment had been revised to such an extent as to warrant a change in T_{target}, (c) whether the proper data and software were used in order to satisfy all technical requirements for accuracy, (d) whether progress towards rebuilding is deemed to be adequate, (e) whether there is discrepancy between the current T_{target} and the median time to rebuild under the currently adopted rebuilding harvest rate ($T_{rebuild}$), and if so, what a new maximum time to rebuild ($T_{max(new)}$) should be, given the National Standard 1 guidelines and, secondarily, if the currently adopted SPR harvest rate will likely rebuild the stock before this $T_{max(new)}$. The SSC assessed whether the biological parameters in the stock assessment had been revised to such an extent as to warrant a change in T_{target} and examined, for example, whether $T_{rebuild}$ is beyond the value of T_{max} in Amendment 16-4.

Table 1 summarizes the deliberations of the SSC in regard to issues (a) – (e). Based on this table, the SSC notes the following:

1) Catches of six of the seven overfished rockfish stocks have been lower than what was available as a cumulative OY during the period of rebuilding. The only exception is canary rockfish, which exceeded its cumulative OY by 14% over the period 2000-2007. This overage was due primarily to an excess harvest of 40 mt in 2001, when constraints on the groundfish fishery were first being imposed. In some instances, catches have been far below the available OY (e.g., POP, cowcod, and widow rockfish). In general,

management has been quite effective at curtailing fishing mortality on the overfished stocks in order to rebuild them as quickly as possible.

2) All assessments that were completed in SS2 met the appropriate technical requirements by utilizing the latest version of the rebuilding program (2.11) and by using the appropriate outputs from the rebuilding program. Likewise, the two analyses completed in ADMB (i.e., POP and widow rockfish) also were implemented and executed properly.

3) There are four instances where calculated times to rebuild are very similar to the T_{target} in Amendment 16-4 (POP, bocaccio, widow rockfish, and yelloweye rockfish), with the greatest discrepancy being six years. For these stocks, progress towards rebuilding is considered adequate and the SSC recommends that no redefinition of T_{target} or adjustment to the rebuilding harvest rate is warranted.

4) There are three stocks that depart strongly from the T_{target} values adopted in Amendment 16-4: cowcod, darkblotched rockfish, and canary rockfish; canary rockfish is very much ahead of schedule (42 years), while darkblotched rockfish and cowcod are substantially behind schedule (19 years and 23 years, respectively). For canary rockfish and darkblotched rockfish, these deviations from T_{target} are due primarily to changes in our understanding of stock productivity and depletion. In the case of cowcod, the departure from the expected rebuilding trajectory is due to correction of a technical flaw that existed in the 2005 assessment. The effect of this correction was to lower the estimated depletion level substantially, implying a longer time to rebuild the cowcod stock than was originally estimated. These changes represent fundamental revisions to our understanding of the biology of these species, which in turns warrants a revision in T_{target}.

5) Given the results of this year's assessments, new maximum times to rebuild ($T_{max(new)}$) were calculated for each stock based on the most recent assessment models and National Standard 1 Guidelines. These are needed for the three stocks that are either markedly ahead or markedly behind schedule (canary rockfish, darkblotched rockfish, and cowcod). Rebuilding will occur for these stocks well before ($T_{max(new)}$) if the current target SPR harvest rates are maintained. For this reason the SSC suggests that considering *status quo* harvest rates for all overfished stocks is a reasonable starting point for the Council's deliberative process when developing OYs for the 2009-2010 biennial cycle.

Following the June Council meeting, an error was discovered in the visual survey estimate of abundance used in the cowcod assessment. This error was corrected and the results in Table 1 are based on the corrected assessment. The SSC recommends that the assessment document for cowcod be updated appropriately for inclusion in the SAFE.

The SSC notes that the Terms of Reference for Rebuilding Analyses was last revised in 2005. Given the changes in how rebuilding analyses are now used for Council decision making, the SSC intends to revise these Terms of Reference and will develop a standardized format to summarize results. Specifications for the associated rebuilding software will also be revised.

TABLE 1.

Species	Total Catch / Total OY	Adopted SPR Harvest Rate	Current T_{target}[1]	New Time To Rebuild At Current SPR[2]	Difference	$T_{max(new)}$[3]
Darkblotched	97% (2001-2007	60.7%	2011	2030	**-19**	2040
POP	42% (2000-2006)	86.4%	2017	2011	6	2037
Canary	114% (2000-2007)	88.7%	2063	2021	**42**	2041
Bocaccio	69% (2000-2006)	77.7%	2026	2023	3	2033
Cowcod	55% (2000-2007)	90.0%	2039	2065	**-26**	2098
Widow	48% (2002-2007)	95.0%	2015	2009	6	NA
Yelloweye	73% (2002-2007)	71.9%	2084	2084	0	2090

1. Current T_{target} is the value adopted in Amendment 16-4.

2. $T_{rebuild}$ is the new time to rebuild at the adopted SPR harvest rate.

3. $T_{max(new)}$ is the new maximum time to rebuild base on the updated stock assessment and rebuilding analysis.

Darkblotched Rockfish

The darkblotched rockfish rebuilding analysis presented to the SSC incorporated a number of changes to both the stock assessment on which the rebuilding analysis is based and the rebuilding analysis itself. The major changes to the 2007 assessment included use of more extensive age data, lower steepness in the stock-recruitment relationship. As such, the productivity of the darkblotched rockfish stock is perceived to be lower than implied from the 2005 assessment. Changes to the rebuilding analysis, which was last conducted in 2005, include parametric simulation of recruitments from the stock-recruitment relationship based on current estimates of productivity (i.e., B_0, steepness, natural mortality), instead of re-sampling a range of historically estimated recruitments. Optimum yields for 2007 and 2008 were specified at 190 mt and 330 mt, respectively. Based on the new rebuilding analysis, the darkblotched rockfish stock is projected to recover 19 years later (2030) than anticipated from the 2005 rebuilding analysis. The new rebuilding time is 2030 at the currently specified SPR of 60.7% compares with the current target of 2011. However, the new rebuilding analysis suggests that the current SPR is within legal requirements of rebuilding by a newly defined $T_{max(new)}$ of 2040. Due to the large difference in the rebuilding targets the SSC recommends a redefinition of T_{target}.

Pacific Ocean Perch (POP)

The 2007 stock assessment update of POP was reviewed at the June groundfish subcommittee, SSC, and Council meetings. Estimated steepness has increased from 0.55 to 0.65 and current depletion, estimated from the median of the MCMC posterior distribution, is now estimated to 31.0%, due, in large part, to an increase in the strength of the 1999 year class. POP is unusual in that the full MCMC results are used in the rebuilding analysis, which is desirable as it more adequately captures the uncertainty inherent in the assessment. Catches have been very low relative to the available OY, averaging 42% over the period 2000-2006. Moreover, the estimated time to rebuild the stock, if the current harvest rate is maintained at an SPR of 86.4%, is 2011, which is six years ahead of schedule (T_{target} = 2017). Given these conditions, the SSC concludes that no change is necessary to POP harvest policies and that progress towards rebuilding is adequate.

Canary Rockfish

A full assessment of canary rockfish was completed this year in SS2, which included a number of major changes to the data and modeling approach, i.e., a complete re-evaluation of the age data, simplification of time blocks for fishery selectivity, and splitting the triennial survey into two segments with separate catchability coefficients (q). Given the changes to the model structure, spawner-recruit steepness (h) could no longer be reliably estimated within the model, and a steepness prior from a hierarchical meta-analysis of west coast Sebastes was used instead (h = 0.511). Based on these revisions, the current depletion of canary rockfish is estimated to be 32.4%, compared with 9.4% from the 2005 assessment. For the rebuilding analysis, the full 2007-08 OY catches (44 mt) were pre-specified and account was taken of both uncertainty about the parameters of the spawner recruit curve and variability about that curve (σ_r = 0.50). Also, the 12 fleets represented in the stock assessment were simplified to 5 fleets in the rebuilding analysis. Rebuilding projections also incorporated uncertainty in h by weighting according to the three states of nature identified in the assessment. Results showed that if the current harvest rate is maintained (SPR = 88.7%) the stock will rebuild by 2021, which is 42 years before the T_{target}

(2063) specified in Amendment 16-4. Given this marked change in our perception of when recovery will most likely occur, a redefinition of T_{target} is appropriate. If so, a newly defined $T_{max(new)}$ is 2041. If the current harvest rate is maintained, stock recovery would be expected to occur some time around 2021.

Bocaccio

Bocaccio was declared overfished in 1999 and the first rebuilding analysis for this stock was conducted in 2000. The most recent full assessment was completed in 2003 using the SS1 modeling platform, which was then updated in 2005 and again this year. This year's update indicates that current depletion is 13% of unfished, compared to 6.5% at the beginning of rebuilding. The bocaccio rebuilding analysis does not use a spawner-recruit relationship, but instead defines B_0 based on average recruitments from 1950-85 (multiplied by $SPR_{F=0}$) and, in addition, resamples recruits-per-spawner from 1970-2005 to generate future recruitment. Resampling recruits-per-spawners in this instance is justified because the estimated steepness is close to 0.20 (no density-dependence). The analysis indicates that the median time to rebuild if the current SPR harvest rate (77.7%) is maintained is 2023, which is three years ahead of schedule (current T_{target} = 2026). Recovery is being driven by strong 1999 and 2003 year-classes. Given these results, the SSC concludes that progress towards rebuilding is adequate and that existing management practices are effective and not in need of change. The next full stock assessment will be implemented in SS2.

Cowcod

Although the cowcod assessment was originally scheduled to be an update during 2007, the Council recommended that a full assessment be completed, based on a number of issues that were raised in the June update review. The estimated depletion of cowcod was strongly affected as a result of including the recommended changes into a full assessment, dropping from 17.8% to 3.8%. The principal cause of the change was the correction of a technical error that was discovered in the 2005 assessment. The rebuilding projections indicate that it will not be possible to rebuild the cowcod stock by 2039 (the current T_{target}), even if all catches are eliminated. Although three states of nature were developed in the full assessment, the rebuilding analysis was conducted in a manner similar to the 2005 rebuilding analysis. Uncertainty in the outcomes of the stock assessment was propagated solely through a discretized distribution of steepness, developed from the Sebastes meta-analysis "prior" for cowcod; no variability in recruitment *per se* was modeled (σ_r = 0). Cumulative catches since 2000, which are very uncertain, are nevertheless substantially below the available rebuilding OY. Still, due to the substantial decline in relative abundance, the time to rebuild is now 26 years greater than the T_{target} adopted in Amendment 16-4. The SSC therefore advises a revision to T_{target} is warranted, but adherence to the current harvest rate (SPR = 90.0%) provides continuity with past management practices and should rebuild the stock within $T_{max(new)}$.

Widow Rockfish

The widow rockfish rebuilding analysis presented to the SSC was based on a 2007 update of the 2005 stock assessment and of the rebuilding analysis conducted in 2005. The new assessment update indicates that widow rockfish spawning stock biomass has increased since being declared overfished in 2001 due to low catches and recruitment of the strong 1999 year class into the spawning population, and that the current level of depletion is estimated to be 35.5%. The new projections are based on the same underlying model structure and rebuilding assumptions as before, except that recruitment is simulated from the stock-recruitment curve for 2007 and beyond, and 2007-2008 OYs are specified as 368 mt. The new median rebuilding time is 6 years earlier than previously calculated at the currently specified SPR of 95.0% (2009 compared to the current target of 2015). The widow rockfish stock is on track for recovery by the next assessment cycle.

Yelloweye Rockfish

The yelloweye rockfish rebuilding analysis presented to the SSC was based on a 2007 update of the 2006 stock assessment and of the rebuilding analysis conducted in 2006. The updated assessment corrected several technical issues associated with the previous assessment, but a change in the natural mortality rate revised the spawning stock biomass and associated depletion level down to 16.4% of B_0. Equilibrium unfished spawning biomass was calculated from the stock-recruitment relationship, with future recruitments generated using this relationship. Despite changes to the assessment, the yelloweye rockfish stock is on track to rebuild by 2084 if the current SPR of 71.9% is maintained. The calculated new $T_{\mathrm{max(new)}}$. is 2090. The SSC notes that the summary table is missing from the assessment document.

Other

The groundfish subcommittee considered how to treat recruitments from when a stock is declared overfished (T_0) to the start of the current update. The SSC recommended that the recruitments that occurred between T_0 and the present should be set to those estimated in the assessment because this incorporates the best available scientific information.

PFMC
11/06/07

SSC Groundfish Subcommittee Report on Rebuilding Analyses for Overfished Rockfish

The Groundfish Subcommittee of the Scientific and Statistical Committee (SSC) met October 3-4 at the Alaska Fisheries Science Center in Seattle to review seven rebuilding analyses that were recently completed for overfished rockfish stocks managed by the PFMC, viz. bocaccio, Pacific Ocean Perch (POP), cowcod, canary, yelloweye, widow, and darkblotched rockfish. The meeting was chaired by Martin Dorn, with participation from five other Subcommittee members (Owen Hamel, Tom Helser, Tom Jagielo, André Punt, and Steve Ralston), and was embedded within the "mop-up" panel, during which full blue and southern black rockfish stock assessments were reviewed.

In order to provide some legal and policy context during the meeting, the Subcommittee was briefed by Eileen Cooney, Mariam McCall from NOAA Office of General Counsel, and Frank Lockhart from the NWR. Current rebuilding harvest rates (expressed as spawning potential per recruit [SPR]) and median times to rebuild (T_{target}) for the overfished stocks are directly linked to one another and individually they reflect specific decisions the Council has previously made concerning rebuilding in as short a time as possible, taking into account the appropriate factors from the Magnuson Act. Amendment 16-4 to the groundfish FMP adopted specific SPRs and T_{target} values for each stock; there is a direct equivalency between T_{target} and SPR. When reviewing the results of the updated rebuilding analyses it was advised that, from a regulatory basis, maintaining stability in current harvest rates (SPRs) would be desirable, presuming there have been no fundamental changes in our perceptions about stock productivity. Specifically, in each case it would be important for the Subcommittee to determine if the biological parameters in the stock assessment had been revised to such an extent as to warrant a change in T_{target} and also, whether the technical basis of the rebuilding analysis was computationally correct.

Following upon these discussions with NWR staff, the Subcommittee considered how to proceed with its deliberations, with the goal of evaluating the rebuilding analyses and summarizing the review in an easy to understand, yet unified, way. First, as a technical matter, it was decided that year-specific recruitments occurring after the development of a rebuilding plan, which had been estimated in an assessment model (i.e., realized recruitments), would be incorporated as known quantities in subsequent rebuilding analyses when determining the time to rebuild in the absence of catch. The use of "realized" recruitments, as opposed to taking random draws from a probability distribution of recruitments, was justified on the basis of using the best available scientific information.

Generally, the subcommittee also decided to conduct its evaluation of each of the rebuilding analyses by following a sequence of steps. These were:

1) evaluate whether cumulative catches during the period of rebuilding exceeded the cumulative OY that was available.

2) determine whether or not the proper data and software were used in order to satisfy all technical requirements for accuracy.

3) using the most recent results from stock assessments conducted this year, determine the median time to rebuild ($T_{rebuild}$) under the currently adopted rebuilding harvest rate (SPR).

4) ascertain the degree of discrepancy between the current T_{target} and $T_{rebuild}$.

5) if the discrepancy is minor, progress towards rebuilding is deemed to be adequate.

6) if the discrepancy is large, determine the cause and, if appropriate, redefine a new maximum time to rebuild (T_{max}').

7) determine if the currently adopted SPR harvest rate will rebuild the stock before T_{max}' with reasonable certainty.

A table that summarizes the results of the Subcommittee applying these evaluation points to each rebuilding analysis is provided below:

Species	Total Catch ÷ Total OY	Current OY (2007-2008)	Current Harvest Rate (SPR)	Current T_{target}	New Time to Rebuild at Current SPR	Difference	New T_{max}
Darkblotched	97% (2001-2007)	2007 = 290 mt 2008 = 330 mt	60.7%	2011	2030	**-19**	2040
POP	42% (2000-2006)	2007 = 150 mt 2008 = 150 mt	86.4%	2017	2011	6	2037
Canary	114% (2000-2007)	2007 = 44 mt 2008 = 44 mt	88.7%	2063	2021	**42**	2041
Bocaccio	69% (2000-2006)	2007 = 218 mt 2008 = 218 mt	77.7%	2026	2023	3	2033
Cowcod	55% (2000-2007)	2007 = 4 mt 2008 = 4 mt	90.0%	2039	2065	**-26**	2098
Widow	48% (2002-2007)	2007 = 368 mt 2008 = 368 mt	95.0%	2015	2009	6	
Yelloweye	73% (2002-2007)	2007 = 23 mt 2008 = 20 mt	71.9%	2084	2084	0	2090

The SSC notes the following conclusions from the results presented in the above table:

1) Catches of six of the seven overfished rockfish stocks have been lower than what was available as a cumulative OY during the period of rebuilding. The only exception is canary rockfish, which exceeded its cumulative OY by 14% over the period 2000-2007. This overage was due primarily to an excess harvest of 40 mt in 2001, when constraints on the groundfish fishery were first being imposed. In some instances, catches have been far below the available OY (e.g., POP, cowcod, and widow rockfish). In general, management has been quite effective at curtailing fishing mortality on the overfished stocks in order to rebuild them as quickly as possible.

2) All assessments that were completed in SS2 met the appropriate technical requirements by utilizing the latest version of the rebuilding program (2.11) and by using the appropriate outputs from the model (e.g., realized recruitments). Likewise, the two analyses completed in ADMB (i.e., POP and widow rockfish) also were implemented and executed properly.

2) There are four instances where calculated times to rebuild are very similar to T_{target} (POP, bocaccio, widow, and yelloweye rockfish), with the greatest discrepancy being 6 years. For these stocks progress towards rebuilding is considered adequate and no redefinition of T_{target} or adjustment to the rebuilding harvest rate is required.

3) There are three stocks that depart strongly from the T_{target} values adopted in Amendment 16-4: cowcod, darkblotched, and canary rockfish; canary rockfish is very much ahead of schedule (42 years), while darkblotched rockfish and cowcod are substantially behind schedule (19 years and 23 years, respectively), given the most recent information on stock status and productivity. For canary and darkblotched rockfishes, these deviations from T_{target} are due to changes in our current view of stock productivity. Specifically the spawner-recruit steepness parameter (***h***) was increased in the recently completed canary rockfish stock assessment, whereas it was decreased in the assessment for darkblotched rockfish. These alterations represent a fundamental revision to our understanding of the biology of these species, which in turn warrants a revision in T_{target}. In the case of cowcod, the departure from the expected rebuilding trajectory is due to correction of a technical flaw that existed in the 2005 assessment. The effect of this correction was to lower the estimated depletion level substantially, necessitating a longer time to rebuild the cowcod stock than was originally estimated.

4) Given the results of this year's assessments, new maximum times to rebuild (T_{max}') were calculated for each stock using realized recruitments and estimates of the stock-recruitment parameters from the most recent assessment models. These are needed for the three stocks that are either markedly ahead or markedly behind schedule. For those stocks it is apparent that, if the current target SPR harvest rate is maintained, rebuilding will occur well within the required time if the maximum allowable time to rebuild is revised (T_{max}'). For example, if the current harvest rate for cowcod is maintained (SPR = 90.0%), the median time to recovery to 40% of B_0 is estimated to be 2065, which is well before T_{max}' (2098). For this reason the SSC suggests that considering *status quo* harvest rates for all overfished stocks is a reasonable starting point for the Council's deliberative process when developing OYs for the 2009-2010 biennial cycle.

Following are short descriptions of

Darkblotched Rockfish

The darkblotched rebuilding analysis presented to the SSC incorporated a number of changes to both the stock assessment on which the rebuilding analysis is based and the rebuilding analysis itself. The major changes to the 2007 assessment included use of more extensive age data, lower steepness in the stock-recruitment relationship, and a higher natural mortality rate. As such, the productivity of the darkblotched stock is perceived to be lower than implied from the 2005 assessment. Changes to the rebuilding analysis, which was last conducted in 2005, include parametric simulation of recruitments from the stock-recruitment relationship based on new estimates of productivity (i.e., B_0, steepness, natural mortality), instead of re-sampling a range of historically estimated recruitments. Optimum yields for 2007 and 2008 were specified at 1,118 mt and 1,273 mt, respectively. Based on the new rebuilding analysis, the darkblotched rockfish stock is projected to recover 19 years later (2030) than anticipated from the 2005 rebuilding analysis. The new rebuilding time in 2030 at the currently specified SPR of 60.7% compares with the current target of 2011. However, the new rebuilding analysis suggests that the current SPR is within legal requirements of rebuilding by a newly defined T_{max}' of 2040. Do to the large difference in the rebuilding targets the SSC recommends a redefinition of T_{target}.

Pacific Ocean Perch (POP)

The 2007 stock assessment update of POP was reviewed at the June groundfish subcommittee, SSC, and PFMC meetings. Estimated steepness has increased from 0.55 to 0.65 and current depletion, estimated from the median of the MCMC posterior distribution, is now estimated to 31.0%, due, in large part, to an increase in the strength of the 1999 year class,. POP is unusual in that the full MCMC results are used in the rebuilding analysis, which is desirable as it more adequately captures the uncertainty inherent in the assessment. Catches have been very low relative to the available OY, averaging 42% over the period 2000-2006. Moreover, the estimated time to rebuild the stock, if the current harvest rate is maintained at an SPR of 86.4%, is 2011, which is 6 years ahead of schedule (T_{target} = 2017). Given these conditions, the SSC concludes that no change is necessary to POP harvest policies and that progress towards rebuilding is adequate.

Canary Rockfish

A full assessment of canary rockfish was completed this year in SS2, which included a number of major changes in the data and modeling approach, i.e., a complete re-evaluation of the age data, simplification of time blocks for fishery selectivity, and splitting the triennial survey into two segments with separate catchability coefficients (q). Given changes to the model structure, spawner-recruit steepness (h) could no longer be reliably estimated internally, and a steepness prior from a hierarchical meta-analysis of west coast *Sebastes* was used instead (h = 0.511). Based on these revisions the current depletion of canary rockfish is estimated to be 32.4%, compared with 9.4% from the 2005 assessment. For the rebuilding analysis, the full 2007-08 OY catches (44 mt) were pre-specified and the spawner recruit curve was resampled (σ_r = 0.50). Also, the 12 fleets represented in the stock assessment were simplified to 5 fleets in the rebuilding analysis. Rebuilding projections also incorporated uncertainty in h by weighting according to the three states of nature identified in the assessment. Results showed that if the current harvest rate is maintained (SPR = 88.7%) the stock will rebuild by 2021, which is 42 years before the T_{target} (2063) specified in Amendment 16-4. Given this marked change in our perception of when recovery will most likely occur, a redefinition of T_{target} is appropriate. If so, a newly defined T_{max}' is 2041. If the current harvest rate is maintained, stock recovery would be expected to occur some time around 2021.

Bocaccio

Bocaccio was declared overfished in 1999 and the first rebuilding analysis for this stock was conducted in 2000. The most recent full assessment was completed in 2003 using the SS1 modeling platform, which was then updated in 2005 and again this year. This year's update indicates that current depletion is 13% of unfished, which is about double the depletion reported at the beginning of rebuilding. The bocaccio rebuilding analysis does not use a spawner-recruit relationship, but instead defines B_0 based on average recruitments from 1950-85 (multiplied by $SPR_{F=0}$) and, in addition, resamples recruits-per-spawner from 1970-2005. Resampling R/S in this instance is justified because the estimated steepness is close to 0.20 (no density-dependence). The analysis indicates that the median time to rebuild if the current SPR harvest rate (77.7%) is maintained is 2023, which is 3 years ahead of schedule (current T_{target} = 2026). Recovery is being driven by strong 1999 and 2003 year-classes. Given these results, the SSC concludes that progress towards rebuilding is adequate and that existing management practices are effective and not in need of change. The stock assessment model will be migrated to SS2 for the next biennial management cycle.

Cowcod

Although the cowcod assessment was originally scheduled to be an update during 2007, the Council recommended that a full assessment be completed, based on a number of issues that were raised in the June update review. The estimated depletion of cowcod was strongly affected as a result of including recommended changes into a full assessment, dropping from 17.8% to 3.8%. The principal cause of the change was the correction of a technical error that was discovered in the 2005 assessment. The rebuilding projections indicate that it will not be possible to rebuild the cowcod stock by 2039 (the current T_{target}), even if all catches are eliminated. Although three states of nature were developed in the full assessment, the rebuilding analysis was conducted in a manner similar to the 2005 rebuilding analysis. Uncertainty in the outcomes of the stock assessment was propagated solely through a discretized distribution of steepness, developed from the *Sebastes* meta-analysis "prior" for cowcod; no variability in recruitment *per se* was modeled ($\sigma_r = 0$). Cumulative catches since 2000, which are very uncertain, are nevertheless substantially below the available rebuilding OY. Still, due to the substantial decline in relative abundance, the time to rebuild is now 26 years greater than the T_{target} adopted in Amendment 16-4. The Subcommittee therefore advises a revision to T_{target} is warranted, but adherence to the current harvest rate (SPR = 90.0%) provides continuity with past management practices and should rebuild the stock within T_{max}'.

Widow Rockfish

The widow rebuilding analysis presented to the Subcommittee was based on a 2007 update of the 2005 stock assessment and of the rebuilding analysis conducted in 2005. The new assessment update indicates that widow spawning stock biomass has increased since being declared overfished in 2001 due to low catches and recruitment of the strong 1999 year class into the spawning population, and that the current level of depletion is estimated to be 35.5%. The new projections are based on the same underlying model structure and rebuilding assumptions as before, except that recruitment is simulated from the stock-recruitment curve for 2007 and beyond, and 2007-2008 OYs are specified as 368 mt. The new median rebuilding time is 6 years earlier than previously calculated at the currently specified SPR of 95.0% (2009 compared to the current target of 2015). The widow stock is on track for recovery by the next assessment cycle.

Yelloweye Rockfish

The yelloweye rockfish rebuilding analysis presented to the SSC was based on a 2007 update of the 2006 stock assessment and of the rebuilding analysis conducted in 2006. The updated assessment corrected several technical issues associated with the previous assessment, but a change in the natural mortality rate revised the spawning stock biomass and associated depletion level down to 16.4% of B_0. Equilibrium unfished spawning biomass was calculated from the stock-recruitment relationship, with future recruitments generated from the S-R curve. Despite changes from the assessment, the yelloweye stock is on track to rebuild by 2084 if the current SPR of 71.9% is maintained. The calculated new T_{max}' is 2090.

Notes:

In forecasting stock rebuilding the subcommittee considered how to treat recruitments during the period of time between when a stock is declared overfished (T_0) and the time of the current update. Two points of view were expressed: (1) all recruitments should be forecasted from T_0 and (2) realized recruitments that occurred between T_0 and the present should be fixed in the rebuilding model. The former approach has been used to estimate T_{min}, while estimates from the latter approach have been variously referred to as T_{min}'. After some discussion the subcommittee decided that the latter method, i.e., incorporating explicit realized recruitment estimates for known years, was the preferred approach because this incorporated the best available scientific information.

MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES—PART I

At this meeting, the initial development of management recommendations for 2009-2010 Groundfish fisheries has been divided into two parts. The tasks under this agenda item (Part I of management recommendations) are to adopt for public review and analysis (1) 2009-2010 acceptable biological catches (ABCs) recommended by the Scientific and Statistical Committee (SSC); (2) a range of optimum yields (OYs): and if possible, (3) preferred OYs for some stocks and stock complexes. Guidance on a preliminary range of 2009-2010 management measures (Part II) will occur under Agenda Item D.9.

To aid the Council in setting harvest specifications, new stock assessments and rebuilding analyses (Agenda Item D.3) were considered by the Groundfish Management Team (GMT) at their October meeting to develop a recommended range of 2009-2010 harvest levels (Agenda Item D.4.a, Attachment 1). The GMT-recommended alternative harvest specifications in Attachment 1 should be characterized as draft recommendations which will be further refined by the GMT at this meeting. Agenda Item D.4.c, Supplemental GMT Report will provide the final range of alternative 2009-2010 groundfish harvest specifications recommended by the GMT. The basis for the alternative OYs recommended by the GMT is provided in Agenda Item D.4.a, Attachment 2. Agenda Item D.4.a, Attachment 3 depicts the predicted rebuilding times associated with the OY alternatives recommended for overfished species. This display of the trade-off between duration of rebuilding and the allowable harvest of overfished species was a featured element in the Fishery Management Plan Amendment 16-4 decision on rebuilding plans and should likewise be helpful in deciding 2009-2010 harvest specifications for overfished species.

The Council should consider the advice of the GMT, other Council advisory bodies, and the general public before adopting ABCs and a range of OYs for public review and analysis. The Council is also tasked with adopting preferred OYs for as many fishery management plan stocks and stock complexes as possible to facilitate a better focus on 2009-2010 management measures under Agenda Item D.9.

<u>Council Action:</u>

1. **Adopt ABCs recommended by the SSC and a range of OYs.**
2. **If possible, adopt preferred OYs for some stocks and stock complexes.**

Reference Materials:

1. Agenda Item D.4.a, Attachment 1: TABLE 2-1(a-c). DRAFT GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009 and 2010.
2. Agenda Item D.4.a, Attachment 2: TABLE 2-2. Basis for the 2009-2010 optimum yield alternatives recommended by the GMT for analysis.
3. Agenda Item D.4.a, Attachment 3: TABLE 2-3. Estimated time to rebuild relative to alternative 2009-2010 OYs for depleted West Coast groundfish species.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Agency and Tribal Comments
c. Report of the Groundfish Management Team (GMT) — Kelly Ames
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. **Council Action:** Adopt a Range of Preliminary Acceptable Biological Catches and Optimum Yields (OY), and if Possible, Preferred OYs for some Stocks and Stock Complexes

PFMC
10/19/07

TABLE 2-1a. DRAFT GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009 and 2010. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 and 2010 Action Alternatives (ave. 2009-10 OYs)						
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,383	4,383			
S of 42º (CA)			612			612	671			
Pacific Cod	3,200	3,200	1,600	3,200	3,200	1,600				
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	9,392				
N of 36º (Monterey north)			5,723			9,063				
S of 36º (Conception area)			210			329				
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	134	169	195	982
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	367	516	4,195	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	630
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	2,807		
BOCACCIO	602	618	218	793	793	0	223	295	475	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548	4,562	4,562	4,562				
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,600				
Shortspine Thornyhead - S of 34º27'			421			412				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,203				
Longspine Thornyhead - S of 34º27'			476			390				
COWCOD	36	36	4	13	14	0	2	4	8	
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	162	303	321	388
YELLOWEYE	47	47	Ramp-down c/	31	32	0	13	Ramp-down c/	15	
Black Rockfish (WA)	540	540	540	505	478	125	492			
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	870	1,379			
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish South complex			**TBD d/**	**TBD d/**	**TBD d/**				
Minor Rockfish North	3,680	3,680	2,270	3,680	3,680	2,270				
Nearshore Species			142			142				
Shelf Species			968			968				
Slope Species			1,160			1,160				
Minor Rockfish South	3,403	3,403	1,904	**TBD d/**	**TBD d/**	**TBD d/**				
Nearshore Species			564			**TBD d/**				
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249	101	175			
Cabezon (off CA only)	94	94	69			69	74			
Dover Sole	28,522	28,442	16,500	29,453	28,582	16,500				
English Sole	6,773	5,701	6,237	14,326	9,745	12,036				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,413				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	902	1,349	3,349		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	10,690			
Starry Flounder	1,221	1,221	890	1,509	1,578	1,040				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**				
Kelp Greenling HG (OR)			OR HG			OR HG				

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

d/ TBD = to be determined. ABCs are decided by the SSC and OYs are decided by the Council

TABLE 2-1b. DRAFT GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 Action Alternatives						
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,593	4,593			
S of 42º (CA)			612			612	685			
Pacific Cod	3,200	3,200	1,600							
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	9,795				
N of 36º (Monterey north)			5,723			9,452				
S of 36º (Conception area)			210			343				
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	130	164	189	971
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	371	522	4,338	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	637
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	3,037		
BOCACCIO	602	618	218	793	793	0	218	288	468	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548							
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,608				
Shortspine Thornyhead - S of 34º27'			421			414				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,231				
Longspine Thornyhead - S of 34º27'			476			395				
COWCOD	36	36	4	13	14	0	2	4	8	
S of 36º (Conception area)	17	17								
N of 36º (Monterey area)	19	19								
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	159	300	318	385
YELLOWEYE	47	47	Ramp-down c/	31	32	0	13	17	15	
Black Rockfish (WA)	540	540	540	505	478	118	505			
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	909	1,454			
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish South complex			**TBD d/**	**TBD d/**	**TBD d/**				
Minor Rockfish North	3,680	3,680	2,270	3,680	3,680	2,270				
Nearshore Species			142			142				
Shelf Species			968			968				
Slope Species			1,160			1,160				
Minor Rockfish South	3,403		1,904	**TBD d/**	**TBD d/**	**TBD d/**				
Nearshore Species			564			**TBD d/**				
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249					
Cabezon (off CA only)	94	94	69							
Dover Sole	28,522	28,442	16,500							
English Sole	6,773	5,701	6,237	14,326	9,745	14,326				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,433				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	901	1,349	3,428		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	11,267			
Starry Flounder	1,221	1,221	890	0	1,578	0				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**				
Kelp Greenling HG (OR)			OR HG			OR HG				

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

d/ TBD = to be determined. ABCs are decided by the SSC and OYs are decided by the Council

TABLE 2-1c. DRAFT GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2010. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2010 Action Alternatives						
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,173	4,173			
S of 42º (CA)			612			612	656			
Pacific Cod	3,200	3,200	1,600							
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	8,988				
N of 36º (Monterey north)			5,723			8,673				
S of 36º (Conception area)			210			315				
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	137	173	200	992
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	362	509	4,051	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	623
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	2,576		
BOCACCIO	602	618	218	793	793	0	227	302	482	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548							
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,591				
Shortspine Thornyhead - S of 34º27'			421			410				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,175				
Longspine Thornyhead - S of 34º27'			476			385				
COWCOD	36	36	4	13	14	0	2	4	8	
S of 36º (Conception area)	17	17								
N of 36º (Monterey area)	19	19								
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	165	306	323	390
YELLOWEYE	47	47	Ramp-down c/	31	32	0	14	14	15	
Black Rockfish (WA)	540	540	540	505	478	132	478			
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	831	1,303			
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish South complex			**TBD d/**	**TBD d/**	**TBD d/**				
Minor Rockfish North	3,680		2,270							
Nearshore Species			142							
Shelf Species			968							
Slope Species			1,160							
Minor Rockfish South	3,403		1,904	**TBD d/**	**TBD d/**	**TBD d/**				
Nearshore Species			564			**TBD d/**				
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249					
Cabezon (off CA only)	94	94	69							
Dover Sole	28,522	28,442	16,500							
English Sole	6,773	5,701	6,237	14,326	9,745	9,745				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,393				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	902	1,349	3,269		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	10,112			
Starry Flounder	1,221	1,221	890	1,509	0	0				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300							
Kelp Greenling HG (OR)										

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

d/ TBD = to be determined. ABCs are decided by the SSC and OYs are decided by the Council

Table 2.2. Basis for the DRAFT 2009-2010 Optimum Yield Alternatives Recommended by the GMT for Analysis.

TABLE 2-2. Basis for the DRAFT 2009-2010 optimum yield alternatives recommended by the GMT for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide					
N of 42º (OR & WA)	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg			
S of 42º (CA)	Status quo	Adjusted the projected OY for S of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was subtracted from the projected ave. 2009-10 OY for S of 43 deg. to determine an appropriate OY for S of 42 deg			
Pacific Cod	Status quo				
Pacific Whiting (U.S.)	50% of 2007 U.S. OY	2007 U.S. OY	150% of 2007 U.S. OY		
Sablefish (Coastwide)	From Schirripa 2007; Note: 2009-10 ave. OY > 2010 ABC				
N of 36 (Monterey north)	96.5% of coastwide OY, which is the status quo apportionment. **Note: this may be too high in the north given NWFSC trawl survey results. GMT will be discussing this and other sablefish OY alts. in Nov.**				
S of 36 (Conception area)	3.5% of coastwide OY, which is status quo apportionment				
PACIFIC OCEAN PERCH	T (@ F=0) = 2010	SPR = F90.3%; Ttarg = 2010; Pmax = 97.0%	SPR = F88% (HR that produces the 0708 ave. OYs); Ttarg = 2011; Pmax = 96.5%	Status quo SPR = F86.4%; Ttarg = 2011; Pmax = 96.1%	SPR = F54.8%; Ttarg = 2017 (Ttarg in the rebuilding plan); Pmax =50%
Shortbelly Rockfish	25% of status quo ABC/OY; stock projected to rebuild	50% of status quo ABC/OY; stock projected to remain in equlibrium	Status quo ABC/OY; stock projected to decrease dramatically		
WIDOW ROCKFISH	T (@ F=0) = 2009	SPR = F96.4% (HR that produces the 0708 ave. OYs); Ttarg = 2009; Pmax = 100%	Status quo SPR = F95%; Ttarg = 2009; Pmax = 100%	SPR = F65%; Ttarg = 2009; Pmax = 100%	
CANARY ROCKFISH	T (@ F=0) = 2019	SPR = F95.8%; Ttarg = 2020; Pmax = 75.0%	SPR = F92.9%; Ttarg = 2020; Pmax = 75.0%	Status quo SPR = F88.7%; Ttarg = 2021; Pmax = 74.9%	SPR = F62%; Ttarg = 2035 (longest allowable rebuilding time under NS1 guidelines); Pmax = 50%

Chilipepper Rockfish	Status quo	Long-term equilibrium MSY at F50%	OY= ABC, stock depletion at B67% in 2009 and B65% in 2010 under base model		
BOCACCIO	T (@ F=0) = 2020	SPR = F82.6% (HR that produces the 0708 ave. OYs); Ttarg = 2022; Pmax = x%	Status quo SPR = F77.7%; Ttarg = 2023; Pmax = x%	SPR = 66.4% (HR that predicts current Ttarget as the median rebuilding time); Ttarget = 2026; Pmax = x%	
Splitnose Rockfish	Status quo				
Yellowtail Rockfish	OY = ABC projected from 2005 assessment				
Shortspine Thornyhead - coastwide	No coastwide OY (status quo)				
Shortspine Thornyhead - N of 34º27'	OY = 66% of the projected coastwide ABC/OY since the 2005 assessment indicated 66% of the biomass occurs N. of Pt. Conception (status quo methodology)				
Shortspine Thornyhead - S of 34º27'	OY = 34% of the projected coastwide ABC/OY since the 2005 assessment indicated 34% of the biomass occurs S of Pt. Conception with an additional 50% precautionary reduction to account for the paucity of survey data S of Pt. Conception (status quo methodology)				
Longspine Thornyhead - coastwide	No coastwide OY (status quo)				
Longspine Thornyhead - N of 34º27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 79% of the assessed coastwide biomass occurs N of Pt. Conception, with a 25% precautionary reduction to account for relatively higher assessment uncertainty (status quo methodology).				
Longspine Thornyhead - S of 34º27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 21% of the assessed coastwide biomass occurs S of Pt. Conception, with a 50% precautionary reduction to account for relatively higher assessment uncertainty and a paucity of survey data for the Conception area (status quo methodology).				
COWCOD	T (@ F=0) = 2061; Pmax = 78.4%	Status quo SPR = F90%; Ttarg = 2065; Pmax = 72.4%	SPR = F82.1% (produces the 2007-08 OY); Ttarg = 2072; Pmax = 66.2%	SPR = F63.8%; Ttarg = 2089 (closest to max. allowable rebuilding time which corresponds to a Pmax = 50%); Pmax = 53.3%	

DARKBLOTCHED	T (@ F=0) = 2018	SPR = F75.6%; Ttarg = 2022; Pmax = 97.7%	Status quo SPR = F60.7%; Ttarg = 2030; Pmax = 76.7%	SPR = F59.2% (HR that produces the 0708 ave. OYs); Ttarg = 2031; Pmax = 76.2%	SPR = F53.7%; Ttarg = 2040 (= Tmax); Pmax = 50%
YELLOWEYE	T (@F=0) = 2049	Constant HR strategy; SPR = F71.9%; Ttarg = 2082; Pmax = 69.5%	HR ramp-down strategy (2009 OY = 17 mt, SPR HR = F66.3%; 2010 OY = 14 mt, SPR HR = F71.3%); Ttarg = 2082; Pmax = 68.9%	Constant HR strategy; SPR = F69.3%; Ttarg = 2090 (= Tmax); Pmax = 50%	
Black Rockfish (WA)	OY under the low natural mortality model (M=0.12 males; M=0.18 females); **Note: Assessment is bounded at Cape Falcon, OR -GMT will decide appropriate correction factor to specify OYs N & S of the Col. R.**	OY under the base model (M=0.16 males, M=0.24 females); **Note: Assessment is bounded at Cape Falcon, OR -GMT will decide appropriate correction factor to specify OYs N & S of the Col. R.**			
Black Rockfish (OR-CA)	OY under the low productivity model scenario; **Note: Assessment is bounded at Cape Falcon, OR -GMT will decide appropriate correction factor to specify OYs N & S of the Col. R.**	OY under the medium productivity scenario (base case); **Note: Assessment is bounded at Cape Falcon, OR -GMT will decide appropriate correction factor to specify OYs N & S of the Col. R.**			
Blue Rockfish (CA)	TBD				
Minor Rockfish North	Status quo				
Nearshore Species	Status quo				
Shelf Species	Status quo				
Slope Species	Status quo				
Minor Rockfish South	TBD				
Nearshore Species	TBD				
Shelf Species	Status quo				
Slope Species	Status quo				
California scorpionfish					
Cabezon (off CA only)					
Dover Sole	Equilibrium MSY from 2005 assessment				
English Sole	OY from base model				
Petrale Sole (coastwide)	Projected from 2005 assessment: sum of ave. 40-10 adjusted northern OYs and 75% of 40-10 adjusted southern OYs (75% precautionary adjustment for assessment uncertainty)				
Longnose Skate	Projected OY under the current estimated exploitation rate	OY based on a 50% increase in average landings and discard mortality relative to the base model	OY = ABC under the proxy SPR HR (F45%); Note: OY > 2010 ABC		
Arrowtooth Flounder	MSY under the proxy HR (SPR = F40%)	OY = ABC from base model; Note OY > 2010 ABC			
Starry Flounder	Projected OY from 2005 assessment with a 25% precautionary reduction (data-poor assessment)				
Other Flatfish	Status quo				
Other Fish	TBD				
Kelp Greenling HG (OR)	Status quo				

TABLE 2-3. Estimated time (T) to rebuild relative to alternative 2009-2010 OYs for depleted West Coast groundfish species.

Species	Ttarget in the FMP	OY Alternative	Median Time to Rebuild	2009-10 OY (mt)	T @ F=0	Current Tmax	Re-estimated Tmax
Bocaccio (S of 40º10')	2026	1	2020	0	2020	2032	2033
		2	2022	223			
		3	2023	295			
		4	2026	475			
Canary	2063	1	2019	0	2019	2071	2035
		2	2020	55			
		3	2020	95			
		4	2021	155			
			2023	327			
		5	2035	630			
Cowcod	2039	1	2061	0	2061	2074	2098
		2	2065	2			
		3	2072	4			
			2080	7			
		4	2089	8			
Darkblotched	2011	1	2018	0	2018	2033	2040
		2	2022	162			
		3	2030	303			
		4	2031	321			
		5	2040	388			
POP	2017	1	2010	0	2010	2043	2042
		2	2010	134			
		3	2011	169			
		4	2011	195			
		5	2017	982			
Widow	2015	1	2009	0	2009	2027	2023
		2	2009	367			
		3	2009	516			
		4	2009	4,195			
Yelloweye	2084	1	2049	0	2049	2096	2090
		2	2082	13			
		3	2082	Ramp-down			
		4	2090	15			

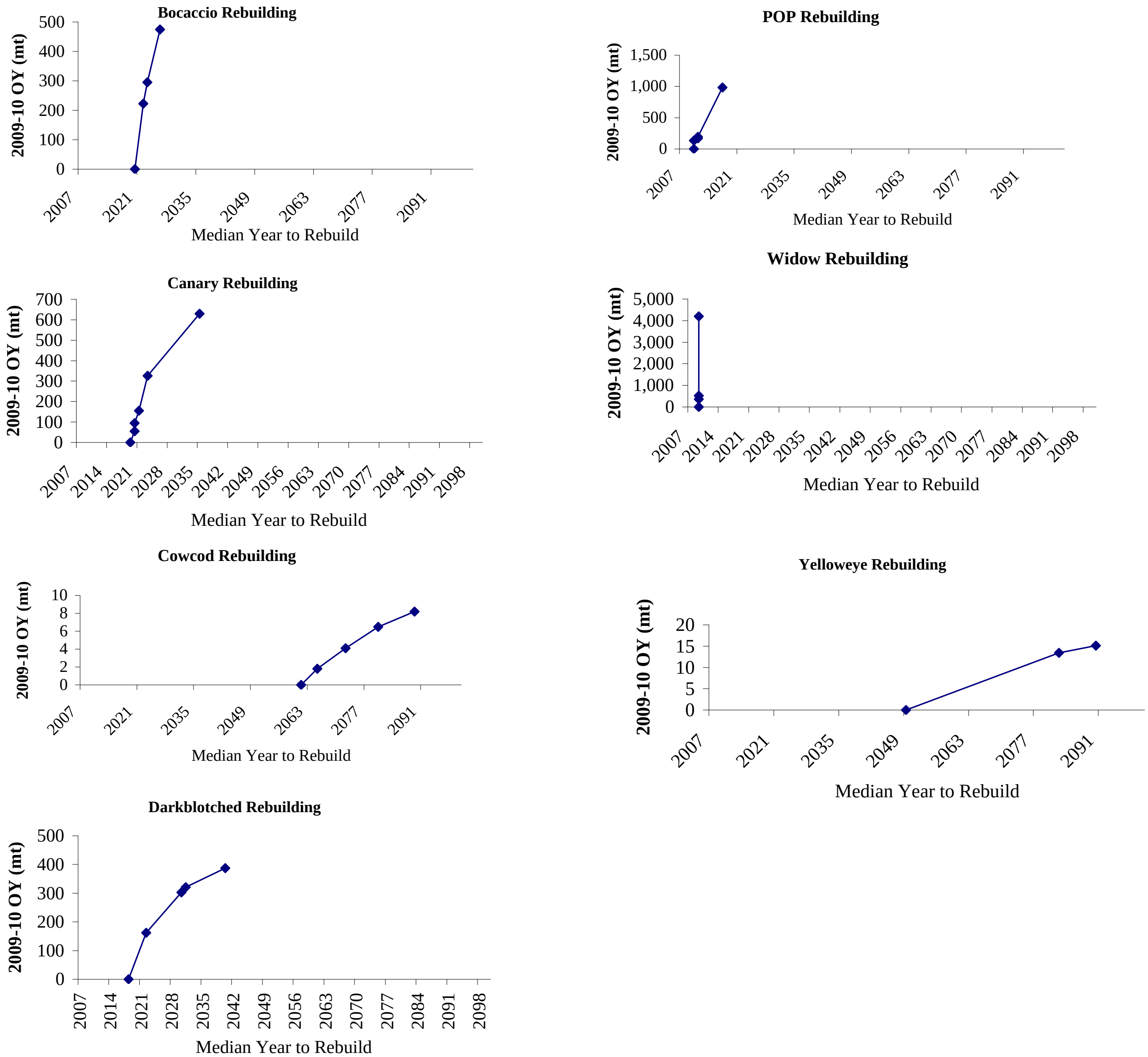

Figure 2-2. Average 2009-2010 optimum yields (mt) vs. predicted rebuilding times for overfished species.

Recreational Chilipepper EFP November, 2007

To: Dr. Donald O. McIsaac
Executive Director
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Subject: (Revised) RFA/GGFA Exempted Fishery Permit Proposal for 2008
Title: Recreational Rockfish Catch Composition in the Area Seaward of Rockfish Conservation Area
Date: October 17th, 2007

Applicants:

Recreational Fishing Alliance
Contact: Jim Martin, West Coast Regional Director
P.O. Box 2420, Fort Bragg, CA 95437
(707) 357-3422

Golden Gate Fishermen's Association
Contact: Roger Thomas, President
P.O. Box 40
Sausalito CA 94966
(415) 760-9362

Justification: Since the implementation of the Rockfish Conservation Area as a bycatch reduction measure to protect overfished species such as canary rockfish, over 90% of the EEZ has been closed to recreational rockfishing. This proposal would exempt a specific number of CPFV vessels in north-central California to fish seaward of the RCA for underutilized species such as chilipepper.

Potential impacts: There is some historical data for recreational catches of rockfish on the slope, but no recent data is available. Impacts on canary rockfish and cowcod should be very low.

Purpose and goal of the experiment: To use selective recreational fishing gear, hook and line, to access underutilized species such as chilipepper rockfish. While this study will test different weight limits to discover ways to avoid overfished species, this experiment is primarily an area-based study. The data provided from this series of trips on CPFV vessels would provide management guidance to open a new market for fishing trips on the charter fleet in northern and central California (from Point Conception to the Oregon Border). Experimenting with different types of terminal tackle results in a more selective fishery. Anglers will retain all legal fish after contributing scales, otoliths, or any other physical evidence needed by data collectors. Any prohibited species landed will be donated to the CDFG for scientific purposes. This EFP would be limited to the CPFV fleet to control effort, and to provide observer coverage, but the data gathered could result in a new fishery for the entire recreational fishing fleet.

Broader Significance: the data collected should prove that a recreational fishery can be conducted for abundant and underutilized species such as chilipepper rockfish and reduce impacts overfished species. If successful, management can shift some of the recreational effort away from inshore species and areas where interaction with canary rockfish are common.

Duration of the EFP: One year (2008).

Number of vessels: 20 Charter Passenger Fishing Vessels (CPFVs). Angler loads will be limited to 15 people per trip. The following vessels and captains have expressed an interest in running trips for this EFP; the list may change according to their ability to market the trips and other factors.

Participants in the EFP:

- Capt. Brent Williamson, *Chubasco,* Monterey, (831) 372-7440
- Capt. Brian Cutting, *Sir Randy,* Monterey (831) 901-5725
- Capt. Ken Stagnaro *Velocity*, Santa Cruz (831) 425-7003
- Capt. Tim Zolniak, *Makaira*, Santa Cruz (831) 426-4690
- Capt. Chris Arcoleo, *Checkmate*, Monterey (831) 375-5951
- Capt. Tim Gillespie, *Seahawk,* Fort Bragg (707) 964-1881
- Capt. Jason Rosetti, *Lady Irma II*, Fort Bragg (707) 964-3854
- Capt. Don Akin, *Rumblefish,* Noyo Harbor, Fort Bragg (707) 964-3000
- Capt. Randy Thornton, *Telstar,* Noyo Harbor, Fort Bragg (707) 964-8770
- Capt. Bob Ingles, *Queen of Hearts,* Half Moon Bay (650) 728-3377
- Capt. Alan Chin, *Tigerfish,* Half Moon Bay (650) 726-7133
- Capt. Dennis Baxter, *New Captain Pete*, Half Moon Bay (650) 726-6224
- Capt. Darby Neill, Morro Bay (805) 772-1222
- Capt. Tom Mattusch, *Hulicat*, Half Moon Bay (650) 726-2926
- Capt. Jay Yokomizo, *Huck Finn*, Emeryville (510) 527-3768
- Capt. Craig Shimokusu, *New Salmon Queen*, Emeryville (510) 385-1135
- Capt. Robert Gallia, *Eldorado*, Berkeley (415) 298-3948
- Capt. Joe Gallia, *New Easy Rider*, Berkeley Marina 510-849-3333
- Capt. Bill Parducci, *Profish'nt*, Bodega Bay (707) 463-3618

Funding: This EFP will be self-funding with individual anglers paying for an offshore rockfish trip. Grant funding is available for data analysis and observer coverage.

Description of Target species: Chilipepper rockfish. This species can be targeted in midwater and is vastly underutilized (1000+ mt under OY).

Harvest Control: Under current regulations, anglers are limited to two hooks per line, with a bag limit of ten rockfish. For a load of 15 anglers, a vessel would retain a maximum of 150 fish per trip, with observer coverage at-sea and dockside. CPFV logbooks will record species landed. While recent catch data is unavailable for the recreational fishery in deep water, a review of mortality impacts from the commercial sablefish fishery indicate zero bycatch of cowcod, zero bycatch of widow rockfish, and a total projected bycatch of canary rockfish for 2007 in the combined fixed gear (sablefish and non-sablefish) of 1.1 metric tons. We have revised our proposed bycatch caps:

- Vessel-level bycatch caps:
  - Cowcod: 4 fish
  - Canary: 20 fish
- Total bycatch caps:
  - Cowcod: 40 fish
  - Canary: Option A: 200 fish; Option B: 100 fish

Proposed Data Collection and Analysis Methodology: Data collection will be consistent with the existing CRFS data collection and analysis system. Expansion of the data modeling can provide an estimate of potential catches for both private boaters and the CPFV fleet, should the Council decide at a future time it would consider providing more fishing opportunity to the entire recreational sector. Onboard observers will count and identify the fish, with 100% retention to guarantee accurate identification and age class data. Type of terminal tackle (weights, lures, hook sizes) would be recorded for comparison purposes and bycatch reduction data. Vessels will record other information such as location, depth and water temperatures. By fishing different depth strata throughout an entire year, variations by depth and month can be identified. The goal of the data collection format and data analysis will be to gather enough information to project the outcomes for an expansion of the fishery throughout the recreational sector.

Participation: Commercial Passenger Fishing Vessels with a clean logbook reporting record will be chosen (from those captains who have expressed an interest in the project, or by lottery amongst interested captains if more than 20 vessels want to participate) from various ports such as Monterey, Santa Cruz, Bodega Bay, Half Moon Bay, San Francisco Bay Area, Morro Bay and Fort Bragg where the slope is reachable on a day trip.

Time, Place and Amount of Gear Used: This EFP would be conducted during fair weather days during the entire year of 2008, with anglers limited to one rod apiece, two hooks per line, with a 3-10 pound weight limit. All fishing would occur seaward of the Rockfish Conservation Area between Pt. Conception and the Oregon border, from depths ranging from 900 to 2000 feet and beyond. Each vessel will have one line rigged with an in-line depth gauge device, and a line counter unit to help target fish schools using onboard sonar electronics. By logging the line out, the actual depth from the depth logger, the line diameters (braided and mono) and the time, etc., good information about how much weight can be allowed before reaching the bottom. To the extent we can keep off the bottom, we expect that we can avoid some of the overfished species. Fishing gear will be modified using a 30-foot leader between the weight and the hooks to keep lures off the bottom.

Data Analysis:
There is a minimum set proportion of trips that CRFS is required to sample – 50% north of Bodega, 25% of trips south in any given month. A similar number of trips targeting chilipepper rockfish can provide data and an estimate for catch rates for the wider recreational fishery. The results of a discovery curve with the number of trips on the X axis with number of species on the Y axis can show whether enough trips have been conducted to get useful data covering all species for expansion throughout the recreational sector. Comparisons to bycatch rates in this EFP to current catch rates in the nearshore should be evaluated, because we believe this fishery would reduce bycatch of canary rockfish in the nearshore by shifting effort offshore. The sampling method will be consistent with CRFS methodology. Expansion of the data can provide an estimate of potential catches for both private boaters and the CPFV fleet and allow fishery managers to model potential deep water rockfish seasons.

Signature of Applicant:

Jim Martin

James Martin, RFA

[original signed]

Roger Thomas, GGFA

WASHINGTON DEPARTMENT FISH AND WILDLIFE SUPPORT FOR APPLYING THE RAMP-DOWN APPROACH TO REBUILD YELLOWEYE ROCKFISH

The Washington Department of Fish and Wildlife (WDFW) continues to support the ramp-down approach for setting the optimum yield (OY) for yelloweye rockfish under its rebuilding plan. Reducing the OY from the 2008 level of 20 mt to 13 mt in 2009 would have drastic effects on Washington's recreational and commercial fisheries. While, under the ramp-down approach, the OY is reduced to 14 mt in 2010, having a median OY of 17 mt in 2009 would provide a smoother transition. This transitional period would be used to: 1) collect additional data to be used in future yelloweye stock assessments; 2) work with commercial and recreational constituents to develop additional yelloweye rockfish protection measures; and 3) provide an opportunity for coastal communities to prepare for anticipated additional economic loss.

Status of the Stock and Rebuilding Analysis

Yelloweye rockfish are especially long-lived and late to mature. According to the rebuilding analysis, in the absence of fishing beginning in 2009 ($T_{F=0}$), the stock would be rebuilt in 2049. Therefore, slight changes in the OY at the beginning of the rebuilding schedule make little to no difference in the time needed to rebuild (see Tables 3a. and 3b. in the rebuilding analysis, Agenda Item D.3.a, Attachment 12). Continuing the ramp-down strategy in 2009 and 2010, and then applying the current spawning biomass per recruit (SPR) of 0.719 beginning in 2011 produces a median year to rebuild of 2082 (Table 3a., Alternative 3). Conversely, applying the SPR of 0.719 beginning in 2009 (which would produce an OY of 13.3 mt in 2009 and 13.6 mt in 2010) produces the same median year to rebuild (Table 3b., Alternative 3).

Additional Data Needed

As noted in the Environmental Impact Statement (EIS) for the 2007-08 Groundfish Specifications and Management Measures, Amendment 16-4, and the Status of the Yelloweye Rockfish in 2006, the yelloweye rockfish stock assessment is data poor and highly uncertain.
The baseline assessment model assumed a single coastwide stock and complete mixing. Given the apparent sedentary nature of this species, this assumption may be unrealistic; however, sufficient data are not currently available to support area-specific models. This is especially problematic in trying to reconstruct the historical population required to model the population off Washington. Although data are too sparse for a specific model off the Washington coast, previous assessment authors have stated that the data would suggest a less depleted yelloweye resource in this area than what the model would indicate.

Funding for Research

Rockfish research, especially using non-extractive data collection methods, is costly. While WDFW would very much have liked to repeat the submersible survey we conducted in 2002, the project was cost-prohibitive. However, in early 2007, WDFW was successful in securing additional rockfish research funds through legislative action.

At our request, the Washington State Legislature and Governor approved a measure to add a $35.00 surcharge to commercial licenses used for directed groundfish fishing, which would include charter licenses and non-limited entry delivery licenses, and licenses that allow the landing of incidentally caught groundfish. A $.50 surcharge was also added to all recreational saltwater fishing licenses, both short-term and season licenses. These fees are deposited into a dedicated account to be used by WDFW for rockfish research and stock assessments. The Westport Charterboat Association, the Coastal Coalition of Commercial Fisheries, and individual anglers supported this measure in recognition of the need to collect additional data for yelloweye rockfish.

Data Collection Efforts

WDFW is working on several initiatives to collect additional biological data and fishery information, including:

- In 2006 and 2007, WDFW partnered with the International Pacific Halibut Commission to enhance their longline halibut survey by setting additional stations in "untrawlable" areas off Washington's north coast. WDFW plans to continue this effort in 2008 and understands that the Oregon Department of Fish and Wildlife would also like to expand the enhanced survey with additional stations off Oregon.

- WDFW is working with scientists from Alaska and British Columbia to assemble and review data on yelloweye growth and natural mortality; these data could potentially be used to address the assumption for natural mortality (M) in the next stock assessment.

- Collection of biological and species distribution information from federal and state at-sea observer and logbook programs.

In addition to these efforts, WDFW is exploring additional research projects, including using a remotely operated vehicle, to collect additional data for future assessments. We are currently going through an internal review process to identify priority projects for the newly created research fund.

WDFW is also continuing to develop a yelloweye occurrence and habitat Geographic Information System database and working with stakeholders to refine yelloweye rockfish conservation areas (YRCAs).

Impacts to Washington Recreational Fisheries

Under the $T_{F=0}$ yelloweye OY, the estimated loss to recreational fisheries is about 1,150,000 angler trips. Washington recreational bottomfish and halibut angler trips are estimated to decline by 30% under the yelloweye OY of 13 mt . These projected reductions in angler trips would cause undue hardship on Washington's coastal communities that are already depressed.

For reference, the status of Washington's coastal communities was described in the 2000 U.S. census. In 2000, Neah Bay had an unemployment rate of 24% with a median household income of $21,635; these data indicate that 29.9% of the Neah Bay population is below the poverty level. A lot of the employment in Neah Bay is seasonal in nature, with fisheries employing about 300 people per year. The coastal community of La Push had an unemployment rate of 27.4%, with a similar median household income, indicating that 34.5% of the population is below the poverty level. In Westport, the median household income is $32,037, which indicates that 14.3% of the population is below the poverty level.

In 2006 and 2007, Washington's recreational fisheries were further constrained by the implementation of depth restrictions off our North Coast and central areas, where yelloweye are caught. These include a 20-fm depth restriction applied to the fisheries operating out of Neah Bay and La Push from late May through the end of September, and a 30-fm depth restriction from mid-March through mid-June to the recreational fishery out of Westport. Given the location of the continental shelf off Neah Bay, the 20-fm depth restriction is about 0.5 to one mile offshore. These depth restrictions, especially in the North Coast area, have severely impacted recreational bottomfish fisheries targeting healthy lingcod and black rockfish stocks, and have resulted in additional economic loss to the coastal communities, which are highly vulnerable and have very low resiliency.

Impacts to Washington Commercial Fisheries

Under the $T_{F=0}$ yelloweye OY, the estimated loss to commercial fisheries is over $100 million in ex-vessel revenues, which would result from complete closures of the tribal groundfish fisheries and closures of Washington longline and pot fisheries. Commercial ex-vessel revenues could decline by as much as 40% under the yelloweye OY of 13 mt. To ensure this low OY was not exceeded, the non-trawl rockfish conservation area would have to expand from the shoreline to 150 fms offshore, precluding access to prime sablefish and dogfish areas that are the backbone of Washington's longline fishery. The economic impacts resulting from these measures, again, would cause undue hardship on Washington's coastal communities that are already depressed. Areas labeled "most vulnerable" with regard to commercial fishing in Washington include Neah Bay and Ilwaco; other commercial vulnerable areas with low resiliency include La Push, Westport and Bellingham.

In closing, as mentioned above, WDFW continues to support the ramp-down strategy for setting the OY for yelloweye rockfish. This approach would allow us to collect additional data to be used in future yelloweye stock assessments and work with commercial and recreational constituents to develop additional yelloweye rockfish protection measures.

Agenda Item D.4.c
Supplemental GMT Report
November 2007

GROUDNFISH MANAGEMENT TEAM REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART I

ABC/OY TABLES

The Groundfish Management Team (GMT) has compiled a table of preliminary acceptable biological catch (ABC) and optimum yield (OY) values for the 2009 and 2010 management cycle, based on the results of new stock assessments and rebuilding analyses (attached tables).

For species that are not overfished, and for which there is new information from this assessment cycle, the GMT has presented the Scientific and Statistical Committee (SSC) and Council with a single ABC based on the base model for most assessments. OY alternatives are specified in order to not exceed that ABC, but may be lower based on the alternative states of nature included in the assessment tables. This is based on the assumption that alternative ABC values should not exceed the ABC values provided in base assessment models.

Overfished Species

A range of alternatives are included in Tables 1 and 2 and the rationale for those alternatives is provided in Attachment 1. Alternatives include OYs based on the spawning biomass per recruit (SPR) harvest rates associated with the '07-'08 OYs, status quo SPRs, as well as variations necessary to adequately encompass a range of reasonable alternatives. For reference purposes the GMT has identified the 2009-2010 OY of overfished species that is associated with the status quo SPR:

Species	Metric Tons
• POP	195
• Widow	516
• Canary	155
• Yelloweye	ramp-down
• Bocaccio	295
• Cowcod	2
• Darkblotched	303

Blue Rockfish
The blue rockfish stock assessment is geographically confined to California north of Point Conception. Due to the considerable uncertainty within the blue rockfish assessment, the GMT is not recommending setting an independent ABC/OY, but keeping blue rockfish within the minor nearshore rockfish complex south. However, Alternative 3 shows a separate blue rockfish OY for south of 40° 10' based on the base model with a 40:10 adjustment, and including a contribution from South of Point Conception based on the status quo. Alternative 4 is based on setting the OY equal to the ABC (essentially, this represents adoption of the high productivity model as constrained by the base model ABC). This alternative is included based on the STAT

Team's recommendation that the high productivity scenario is more plausible than the low productivity scenario. Trip limits will be set by the states to prevent negative impacts on other stocks in the minor nearshore rockfish complexes.

Black Rockfish

North

Based on Council guidance from September 2007, only the base model OY is included for analysis. In order to account for the geographic differences between management and assessment areas, 3% of the ABC and OY from the northern assessment is transferred to the south. This percentage is based on recent catch history from 1999-2006.

South

Due to uncertainties in the new combined OR/CA model, the GMT requested a constant catch series (800, 1,000, and 1,200 mt) to better inform a low alternative OY. The results of a constant catch series indicated that depletion levels resulting from a constant catch of 800 mt did not differ from that of the current low OY alternative (870 mt). The high constant catch (1,200 mt) did not differ from the base case OY (1,379). The constant catch of 1,000 mt did result in a depletion level that was intermediate to the low and base case OY alternatives. The GMT therefore recommends that an OY alternative be added for the 1,000 mt constant catch series.

Sablefish

The GMT discussed the applicability of using swept area biomass estimates from the shelf/slope survey data to construct an OY alternative for the Conception Area. The 2003-2006 average from the combined shelf/slope survey results in 28% of the sablefish biomass occurring in the Conception Area. The GMT also notes that although recent catches in the Conception Area have been on the order of 200 mt per year, historical landings have been considerably greater. Total landings of sablefish in the Conception area averaged approximately 1,900 tons between 1976 and 1984, and peaked at 5,064 tons in 1979. Over 95% of the catch in these early years was taken in pot fisheries.

The GMT notes that if the survey biomass estimates are utilized to distribute the coastwide OY, it would result in a large OY for the Conception Area relative (CCA) to recent catches. The GMT also notes that the Cowcod Conservation Area closes a significant amount of the Conception Area to fishing, and that the area-swept biomass estimates for the Conception area are based on the assumption that catch rates outside of the CCAs are comparable to those inside (the survey does not sample within the CCAs). The Alternative 2 Conception area OY, which is based on the swept-area biomass approach, includes a precautionary reduction of 50% to account for the uncertainty inherent in using a short time-series of relative abundance for setting the OY.

Although the GMT does not have a model to inform sablefish bycatch impacts in the Conception Area, we note that this should not preclude the analysis of a higher OY. Various steps could be taken to provide greater safeguards against impacts to overfished species if such an OY is adopted. Implementing a deeper depth restriction in that area could reduce overfished species impacts. Sablefish is a very important stock that is currently listed in the precautionary zone. Due to the above factors and uncertainties, the GMT recommends a 50% precautionary reduction to the survey catch option for the southern Conception Area OY, which results in 1,315 metric tons.

Longnose skate

Due to uncertainty in the assessment the GMT recommends that longnose skate remain with Other Fish and managed under status quo, but identify a point of concern based on proposed alternatives.

Cabezon (off California)

The GMT discussed the 2005 cabezon assessment and considered the averaging of the OYs that was done starting in 2007. The GMT believes that consideration should be given to year-specific OYs of cabezon because of the additional opportunity provided to fisheries in 2010. The GMT has identified this option under Alternative 3.

PFMC
11/6/07

TABLE 2-1a. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009 and 2010. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 and 2010 Action Alternatives (ave. 2009-10 OYs)						
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,383	4,383			
S of 42º (CA)			612			612	671			
Pacific Cod	3,200	3,200	1,600	3,200	3,200	1,600				
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	9,392	9,392			
N of 36º (Monterey north)			5,723			9,063	6,762			
S of 36º (Conception area)			210			329	1,315			
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	134	169	195	982
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	367	516	4,195	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	630
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	2,807		
BOCACCIO	602	618	218	793	793	0	223	295	475	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548	4,562	4,562	4,562				
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,600				
Shortspine Thornyhead - S of 34º27'			421			412				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,203				
Longspine Thornyhead - S of 34º27'			476			390				
COWCOD	36	36	4	13	14	0	2	4	8	
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	162	303	321	388
YELLOWEYE	47	47	Ramp-down c/	31	32	0	13	Ramp-down c/	15	
Black Rockfish (WA)	540	540	540	490	464	477				
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	876	1,000	1,393		
Blue Rockfish (CA S of 40º 10')	Managed under the Minor Nearshore Rockfish South complex			223	221	Managed under minor NS south		182	202	
Minor Rockfish North	3,680	3,680	2,270	3,680	3,680	2,270				
Nearshore Species			142			152	155			
Shelf Species			968			968				
Slope Species			1,160			1,160				
Minor Rockfish South	3,403	3,403	1,904	**TBD d/**	**TBD d/**	1,970				
Nearshore Species			564			630	650	442		
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249	101	175			
Cabezon (off CA only)	94	94	69			69	74	69 in 2009 79 in 2010		
Dover Sole	28,522	28,442	16,500	29,453	28,582	16,500				
English Sole	6,773	5,701	6,237	14,326	9,745	12,036				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,413				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	902	1,349	3,349		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	10,690			
Starry Flounder	1,221	1,221	890	1,509	1,578	0				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**				
Kelp Greenling HG (OR)			OR HG			OR HG				

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

d/ TBD = to be determined. ABCs are decided by the SSC and OYs are decided by the Council

TABLE 2-1b. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 Action Alternatives							
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,593	4,593			
S of 42º (CA)			612			612	685			
Pacific Cod	3,200	3,200	1,600							
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	9,795	9,795			
N of 36º (Monterey north)			5,723			9,452	7,052			
S of 36º (Conception area)			210			343	1,371			
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	130	164	189	971
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	371	522	4,338	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	637
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	3,037		
BOCACCIO	602	618	218	793	793	0	218	288	468	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548							
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,608				
Shortspine Thornyhead - S of 34º27'			421			414				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,231				
Longspine Thornyhead - S of 34º27'			476			395				
COWCOD	36	36	4	13	14	0	2	4	8	
S of 36º (Conception area)	17	17								
N of 36º (Monterey area)	19	19								
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	159	300	318	385
YELLOWEYE	47	47	Ramp-down c/	31	32	0	13	17	15	
Black Rockfish (WA)	540	540	540	490	464	490				
Black Rockfish (OR-CA)	725	719	722	1,469	1,317	920	1,469			
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish South complex			**TBD d/**	**TBD d/**	**TBD d/**				

Minor Rockfish North	3,680	3,680	2,270	3,680	3,680	2,270				
Nearshore Species			142			142				
Shelf Species			968			968				
Slope Species			1,160			1,160				
Minor Rockfish South	3,403		1,904	**TBD d/**	**TBD d/**	**TBD d/**				
Nearshore Species			564			**TBD d/**				
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249					
Cabezon (off CA only)	94	94	69			69	74	69		
Dover Sole	28,522	28,442	16,500							
English Sole	6,773	5,701	6,237	14,326	9,745	14,326				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,433				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	901	1,349	3,428		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	11,267			
Starry Flounder	1,221	1,221	890	0	1,578	0				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**				
Kelp Greenling HG (OR)			OR HG			OR HG				

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

TABLE 2-1c. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2010. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2010 Action Alternatives						
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide b/	6,706	5,853		5,278	4,829					
N of 42º (OR & WA)			5,558			4,173	4,173			
S of 42º (CA)			612			612	656			
Pacific Cod	3,200	3,200	1,600							
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887		
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	8,988	8,988			
N of 36º (Monterey north)			5,723			8,673	6,471			
S of 36º (Conception area)			210			315	1,258			
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	137	173	200	992
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900		
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	362	509	4,051	
CANARY ROCKFISH	172	179	44	937	940	0	55	95	155	623
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	2,576		
BOCACCIO	602	618	218	793	793	0	227	302	482	
Splitnose Rockfish	615	615	461	615	615	461				
Yellowtail Rockfish	4,585	4,510	4,548							
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411					
Shortspine Thornyhead - N of 34º27'			1,634			1,591				
Shortspine Thornyhead - S of 34º27'			421			410				
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671					
Longspine Thornyhead - N of 34º27'			2,220			2,175				
Longspine Thornyhead - S of 34º27'			476			385				
COWCOD	36	36	4	13	14	0	2	4	8	
S of 36º (Conception area)	17	17								
N of 36º (Monterey area)	19	19								
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	165	306	323	390
YELLOWEYE	47	47	Ramp-down c/	31	32	0	14	14	15	
Black Rockfish (WA)	540	540	540	490	464	464				
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	831	1,317			
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish South complex			**TBD d/**	**TBD d/**	**TBD d/**				

Minor Rockfish North	3,680		2,270							
Nearshore Species			142							
Shelf Species			968							
Slope Species			1,160							
Minor Rockfish South	3,403		1,904	**TBD d/**	**TBD d/**	**TBD d/**				
Nearshore Species			564			**TBD d/**				
Shelf Species			714			714				
Slope Species			626			626				
California scorpionfish	374	319	175	277	249					
Cabezon (off CA only)	94	94	69			69	74	79		
Dover Sole	28,522	28,442	16,500							
English Sole	6,773	5,701	6,237	14,326	9,745	9,745				
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,393				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	902	1,349	3,269		
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	10,112			
Starry Flounder	1,221	1,221	890	1,509	0	0				
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884				
Other Fish	14,600	14,600	7,300							
Kelp Greenling HG (OR)										

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

TABLE 2-2. Basis for the 2009-2010 optimum yield alternatives recommended by the GMT for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY
Lingcod - coastwide					
N of 42° (OR & WA)	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg			
S of 42° (CA)	Status quo	Adjusted the projected OY for S of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was subtracted from the projected ave. 2009-10 OY for S of 43 deg. to determine an appropriate OY for S of 42 deg			
Pacific Cod	Status quo				
Pacific Whiting (U.S.)	50% of 2007 U.S. OY	2007 U.S. OY	150% of 2007 U.S. OY		
Sablefish (Coastwide)	From Schirripa 2007; Note: 2009-10 ave. OY > 2010 ABC	From Schirripa 2007; Note: 2009-10 ave. OY > 2010 ABC			
N of 36 (Monterey north)	96.5% of coastwide OY, which is the status quo apportionment.	72% of coastwide OY, which is the 2003-06 ave. proportion of the estimated swept-area biomass from the NWFSC shelf-slope survey			
S of 36 (Conception area)	3.5% of coastwide OY, which is the status quo apportionment	28% of the coastwdie OY (based on 2003-06 ave. estimated swept-area biomass from the NWFSC shelf-slope survey) with a 50% precautionary adjustment due to assessment uncertainty			
PACIFIC OCEAN PERCH	T (@ F=0) = 2010	SPR = F90.3%; Ttarg = 2010; Pmax = 95.6%	SPR = F88% (HR that produces the 0708 ave. OYs); Ttarg = 2011; Pmax = 95%	Status quo SPR = F86.4%; Ttarg = 2011; Pmax = 94.4%	SPR = F54.8%; Ttarg = 2017 (Ttarg in the rebuilding plan); Pmax =65%
Shortbelly Rockfish	25% of status quo ABC/OY; stock projected to rebuild	50% of status quo ABC/OY; stock projected to remain in equlibrium	Status quo ABC/OY; stock projected to decrease dramatically		

WIDOW ROCKFISH	T (@ F=0) = 2009	SPR = F96.4% (HR that produces the 0708 ave. OYs); Ttarg = 2009; Pmax = 100%	Status quo SPR = F95%; Ttarg = 2009; Pmax = 100%	SPR = F65%; Ttarg = 2009; Pmax = 100%	
CANARY ROCKFISH	T (@ F=0) = 2019	SPR = F95.8%; Ttarg = 2020; Pmax = 75.0%	SPR = F92.9%; Ttarg = 2020; Pmax = 75.0%	Status quo SPR = F88.7%; Ttarg = 2021; Pmax = 74.9%	SPR = F62%; Ttarg = 2035 (longest allowable rebuilding time under NS1 guidelines); Pmax = 50%
Chilipepper Rockfish	Status quo	Long-term equilibrium MSY at F50%	OY= ABC, stock depletion at B67% in 2009 and B65% in 2010 under base model		
BOCACCIO	T (@ F=0) = 2020	SPR = F82.6% (HR that produces the 0708 ave. OYs); Ttarg = 2022; Pmax = x%	Status quo SPR = F77.7%; Ttarg = 2023; Pmax = x%	SPR = 66.4% (HR that predicts current Ttarget as the median rebuilding time); Ttarget = 2026; Pmax = x%	
Splitnose Rockfish	Status quo				
Yellowtail Rockfish	OY = ABC projected from 2005 assessment				
Shortspine Thornyhead - coastwide	No coastwide OY (status quo)				
Shortspine Thornyhead - N of 34°27'	OY = 66% of the projected coastwide ABC/OY since the 2005 assessment indicated 66% of the biomass occurs N. of Pt. Conception (status quo methodology)				
Shortspine Thornyhead - S of 34°27'	OY = 34% of the projected coastwide ABC/OY since the 2005 assessment indicated 34% of the biomass occurs S of Pt. Conception with an additional 50% precautionary reduction to account for the paucity of survey data S of Pt. Conception (status quo methodology)				
Longspine Thornyhead - coastwide	No coastwide OY (status quo)				
Longspine Thornyhead - N of 34°27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 79% of the assessed coastwide biomass occurs N of Pt. Conception, with a 25% precautionary reduction to account for relatively higher assessment uncertainty (status quo methodology).				

Longspine Thornyhead - S of 34°27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 21% of the assessed coastwide biomass occurs S of Pt. Conception, with a 50% precautionary reduction to account for relatively higher assessment uncertainty and a paucity of survey data for the Conception area (status quo methodology).				
COWCOD	T (@ F=0) = 2061; Pmax = 78.4%	Status quo SPR = F90%; Ttarg = 2065; Pmax = 72.4%	SPR = F82.1% (produces the 2007-08 OY); Ttarg = 2072; Pmax = 66.2%	SPR = F63.8%; Ttarg = 2089 (closest to max. allowable rebuilding time which corresponds to a Pmax = 50%); Pmax = 53.3%	
DARKBLOTCHED	T (@ F=0) = 2018	SPR = F75.6%; Ttarg = 2022; Pmax = 97.7%	Status quo SPR = F60.7%; Ttarg = 2030; Pmax = 76.7%	SPR = F59.2% (HR that produces the 0708 ave. OYs); Ttarg = 2031; Pmax = 76.2%	SPR = F53.7%; Ttarg = 2040 (= Tmax); Pmax = 50%
YELLOWEYE	T (@F=0) = 2049	Constant HR strategy; SPR = F71.9%; Ttarg = 2082; Pmax = 69.5%	HR ramp-down strategy (2009 OY = 17 mt, SPR HR = F66.3%; 2010 OY = 14 mt, SPR HR = F71.3%); Ttarg = 2082; Pmax = 68.9%	Constant HR strategy; SPR = F69.3%; Ttarg = 2090 (= Tmax); Pmax = 50%	
Black Rockfish (WA)	OY under the base model (M=0.16 males, M=0.24 females); with a 3% reduction to account for the portion of the stock estimated between Cape Falcon and the Columbia River.				
Black Rockfish (OR-CA)	OY under the low productivity model scenario; with the addition of 3% of the northern ABC to account for the portion of the stock estimated between Cape Falcon and the Columbia River.	OY under the medium productivity scenario (base case); with the addition of 3% of the northern ABC to account for the portion of the stock estimated between Cape Falcon and the Columbia River.			
Blue Rockfish (CA)	Managed under minor NS south		Represents 173 mt from central portion of 40:10 base case scenario plus 9 mt from original 94-99 Pt Conception South contribution of blue to minor NS south.	Based on setting the OY equal to the ABC (essentially, adoption of the high productivity model as constrained by the base model ABC)	
Minor Rockfish North	Status quo				
Nearshore Species	Status quo	Based on revising the contribution of blue rockfish using the 40:10 base case scenario from the blue rockfish assessment	Based on revising the contribution of blue rockfish using the 40:10 high productivity scenario (as constrained by the ABC) from the blue rockfish assessment		
Shelf Species	Status quo				
Slope Species	Status quo				
Minor Rockfish South	TBD				

Nearshore Species	Based on keeping blue within the minor nearshore complex, and with the OY from 40:10 applied to blue rockfish. contribution	Based on keeping blue rockfish within the minor nearshore, but assuming the high productivity OY (as constrained by the blue rockfish ABC)	Removes blue rockfish contribution (based on historic landings data) from the complex		
Shelf Species	Status quo				
Slope Species	Status quo				
California scorpionfish					
Cabezon (off CA only)	Status quo	Average of 2009-2010 OY from the 2006 base model	Individual 2009-2010 OYs (without averaging) from the 2006 base model		
Dover Sole	Equilibrium MSY from 2005 assessment				
English Sole	OY from base model				
Petrale Sole (coastwide)	Projected from 2005 assessment: sum of ave. 40-10 adjusted northern OYs and 75% of 40-10 adjusted southern OYs (75% precautionary adjustment for assessment uncertainty)				
Longnose Skate	Projected OY under the current estimated exploitation rate	OY based on a 50% increase in average landings and discard mortality relative to the base model	OY = ABC under the proxy SPR HR (F45%); Note: OY > 2010 ABC		
Arrowtooth Flounder	MSY under the proxy HR (SPR = F40%)	OY = ABC from base model; Note OY > 2010 ABC			
Starry Flounder	Projected OY from 2005 assessment with a 25% precautionary reduction (data-poor assessment)				
Other Flatfish	Status quo				
Other Fish	TBD				
Kelp Greenling HG (OR)	Status quo				

GROUNDFISH ADVISORY SUBPANEL REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART I

The Groundfish Advisory Subpanel (GAP) discussed the range of optimum yield (OY) alternatives being recommended by the Groundfish Management Team (GMT). The GAP believes the range of alternatives is reasonable and sufficient for analysis with two exceptions. With regards to canary rockfish, the GAP recommends including an OY option of 327 mt. With regards to cowcod, the GAP recommends including an OY option of 7 mt. These two options are included in Table 2-3 from Agenda Item D.4.a, Attachment 3.

The GAP recommends the range of OY alternatives for overfished species needs to be adequately broad since status quo harvest specifications are not meeting the needs of fishing communities. All of the overfished species OYs in the proposed range result in rebuilding and the GAP believes that these OYs are legally defensible when considering the needs of fishing communities. The GAP is prepared to identify a preliminary preferred option including justifications for those recommendations during Agenda Item D.9, Management Recommendations for 2009-2010 Groundfish Fisheries – Part II.

PFMC
11/06/07

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART I

The Scientific and Statistical Committee (SSC) reviewed briefing materials pertaining to management measures being developed for 2009-2010 groundfish fisheries, especially Agenda Item D.4.a, Attachment 1, Table 2-1a (DRAFT GMT-recommended alternatives for acceptable biological catch [ABCs] and total catch optimum yields [OYs] for 2009 and 2010). The SSC discussion was facilitated by Dr. John Field, who focused the committee's attention on three topics that are of concern to the Groundfish Management Team (GMT). These were: (1) partitioning the sablefish OY north and south of 36° N lat., (2) establishing a reasonable range of OY for the northern black rockfish stock, and (3) determining the blue rockfish ABC. Beyond these three points of discussion, the SSC concurs with the remaining ABCs presented in Attachment 1 and endorses their use by the Council in developing management measures for the 2009-2010 management cycle.

In the case of sablefish, the coastwide OY has traditionally been allocated to "Monterey north" and the Conception International North Pacific Fishery Commission (INPFC) areas based on recent landings, with 96.5% of the coastwide OY going to areas north of 36° N lat. However, recent trawl survey results collected by the Northwest Fisheries Science Center (NWFSC) indicate that 28% of sablefish biomass is found in the Conception area. Theoretically, the best way to estimate region-specific OYs is to conduct a spatially explicit stock assessment, which might include adult movement patterns and spatial variability in growth, mortality, and recruitment. However, in situations where that type of detailed model is not available (as is the case here), the SSC advises that partitioning stock assessment results into sub-areas based on the distribution of fish observed in a fishery-independent survey is generally preferable to assignments based on the history of catches from sub-areas. In any case, neither of the two methods of allocating catch is ideal. Furthermore, for the allocation option that utilized the NWFSC trawl survey data, the GMT reduced the Conception area OY by 50%, due to concerns about uncertainty in the estimates. Another factor to consider is the Cowcod Conservation Area (CCA), which restricts fishing in large portions of the Conception management area. Due to those prohibitions, the SSC concurs that some reduction in sablefish OY is justifiable.

With respect to a range of alternative OYs for black rockfish north, Dr. Field noted that the GMT was considering a low OY option that departed from the "low" state of nature scenario contained in the revised assessment. While the specifics of the options being considered by the GMT were not available during its discussion, the SSC notes that the range presented in Attachment 1 (125 – 492 mt) is consistent with the most recent version of the stock assessment that was approved by the SSC at the September meeting, being based on the "low" and "base" models in the approved assessment. Moreover, it has been common practice to use the low and base models to establish a range of potential OYs in developing management measures. The SSC advises that a range of 125 – 492 mt for northern black rockfish provides a reasonable starting point for Council deliberations.

The SSC reviewed the newly completed blue rockfish stock assessment under Agenda Item D.3 and endorsed the results of the assessment for use in managing the stock. In situations where a stock assessment has been completed and a base model has been identified, the ABC is drawn from the base model using the Council's default harvest rate (F50% for *Sebastes* spp.). For blue rockfish the estimated ABC in 2009 is 223 mt and in 2010 it is 221 mt, which the SSC endorses for use by management. Dr. Field reported that the GMT is considering an option to keep blue rockfish within the "minor nearshore rockfish south" management unit and avoid actively managing the species. As a general matter the SSC recommends that the Council manage fisheries based on stock targets and thresholds that are defined at a level concordant with stock assessments, not based on an assemblage aggregate. However, if the Council elects to continue managing blue rockfish as part of the southern nearshore assemblage, a point of concern should be identified, should the catch of blue rockfish exceed the ABC. The same concern applies to longnose skate, which was also assessed this year. Given the estimate of the ABC for that species (3,428 mt) it would be sensible to manage to that threshold of catch and to re-evaluate the ABCs for the remaining species in the "other fish" assemblage.

PFMC
11/06/07

Oct-31-07 05:14A P.01

PACIFIC COAST FEDERATION of FISHERMEN'S ASSOCIATIONS

http://www.pcffa.org

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23 October 2007

Dr. Donald McIsaac, Executive Director
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RECEIVED
OCT 3 1 2007
PFMC

ATTN: Mr. John DeVore

By FAX and Mail

RE: November Agenda Item D4 –Groundfish Management

Dear Dr. McIsaac and Council Members:

Nearly 20 years ago the Pacific Coast Federation of Fishermen's Associations was involved in developing legislation in the State of California aimed at resolving a conflict between longline fishermen and those fishermen fishing nearshore waters – mostly within a few hundred feet of shore. At that time there were no restrictions on the take of groundfish by the longline fleet, including trip limits or limits on the take of various groundfish species. To resolve the conflict a one-mile closure was agreed to by the longline fleet – mostly all displacement vessels that could not operate in nearshore waters anyway.

What has taken place since that time is the State of California has enacted a management plan for its commercial nearshore fishery where the harvest is primarily with vertical, non-fixed hook-and-line gear, and some traps. This fishery is conducted primarily with shallow hauled vessels operating mainly just outside the surf line. Recreational fishing for nearshore species also take place within this narrow band on the coast.

Probably the most important change that has been made, however, since the state legislation was enacted were the regulations adopted by the Pacific Council to conserve groundfish resources. The vessels are limited to catches that vary between 600 and 800 lbs every two months. The longline fishery here targets primarily gopher and China cod and Cabezon. As they fish further from shore they encounter much more of the canary and yellow eye rockfish. Moreover, the area outside of 30 fathoms is closed meaning there are few areas along the coast where a longline vessel can operate outside this one-mile state line.

Thus, since the passage of the state's one-mile limit, there are now federal limits in place on total catch, species that can be taken and the areas where they may be taken.

Although the one-mile line is a state statute, it appears now to be conflicting with federal efforts to conserve rockfish, since allowing the longline vessels to operate nearer to shore – they are still restricted on how close they can operate by virtue of their deeper draft – would seem to be in order, particularly since it could help to reduce any incidental take of canary or yellow-eye.

In considering its upcoming management measures for the groundfish fishery, PCFFA respectfully requests the PFMC consider the one-mile line imposed on the longline fishery and support efforts in California to modify that line by moving it to not closer than ¼ mile from the shore. This modification should still provide for a separation between the nearshore commercial and recreational fisheries while allowing the longline fleet a slightly larger area to operate in. More importantly it should help this fleet to reduce its contact rate with canary and yellow-eye.

Your attention to this matter is appreciated. If you or staff have any questions, please do not hesitate to contact our offices.

Sincerely,

W.F. "Zeke" Grader, Jr.
Executive Director

WFG:rtd

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November 2, 2007

Mr. Donald K. Hansen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

Mr. D. Robert Lohn, Administrator
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way NE
Seattle, WA 98115-0070

RE: **Groundfish Management: Management Recommendations for 2009-2010**

Dear Mr. Hansen and Mr. Lohn:

As the Pacific Fishery Management Council (PFMC) and National Marine Fisheries Service (NMFS) review the groundfish stock assessments and make preliminary decisions on the 2009-2010 rebuilding analyses and management measures, we ask that you pay particular attention to rebuilding overfished stocks as quickly as possible, address uncertainty with precaution, minimize bycatch, and provide protection for the marine ecosystem in setting catch levels. It is important that decisions for setting catch levels and management measures are not made in isolation of each other, but rather in a holistic and programmatic manner.

1. Account for the protection of the ecosystem in setting catch levels

It is increasingly clear that fishing has ecosystem-wide impacts and the current MSY-based approach does not adequately consider fishing in an ecosystem context. As the National Research Council Committee on Ecosystem Effects of Fishing states:

> If the United States is to manage fisheries within an ecosystem context, food-web interactions, life-history strategies, and trophic effects will need to be explicitly accounted for when developing harvesting strategies. Other uses and values derived from marine resources should also be considered, because fishing activities directly or indirectly impact other ecosystem components and the goods and services they provide.[1]

An example of fishery-induced ecosystem impacts is the shift in West Coast fish assemblages from large to small species of rockfishes and from rockfish to flatfish dominated communities. In *Shifts in a Pacific Ocean Fish Assemblage: the Potential Influence of Exploitation*, the authors find that in the California Current marine ecosystem:

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[1] National Research Council. 2006, at 4. Dynamic Changes in Marine Ecosystems; Fishing, Food Webs, and Future Options. The National Academies Press. Washington D.C.

> Fishing affects more than the trends of individual species; it influences the state of the entire community (Steneck et al. 2002). In this paper, we have not only shown changes in populations, but we have also documented a shift in the fish assemblage from large to small species of rockfish and from rockfish to flatfish domination. To the extent that fishing caused these shifts, it has clearly affected not only individual populations, but has also disturbed the entire community.[2]

The MSA gives the PFMC and NMFS the necessary framework and authority for integrating ecological considerations into setting catch levels. In defining the "optimum" yield (OY) of a fishery, Congress specifically mandated that fishery managers "*tak[e] into account the protection of marine ecosystems,*" and specified that optimum yield be calculated as MSY "*as reduced by any relevant…ecological factor*" (16 USC §1802 (33)).

In past years, decisions for determining OY for Pacific groundfish have been based on achieving MSY and social and economic objectives. NMFS and the PFMC have the opportunity in the 2009-2010 rebuilding plans and proposed harvest specifications to explicitly analyze and consider how proposed catch levels affect ecosystem interactions. Such analyses should consider fishing impacts on biodiversity, direct and indirect impacts on predators, impacts to local population and age structure, and habitat.

II. Rebuilding analyses must account for age structure, not biomass alone

In the article, *Pacific Rockfish Management: Are We Circling the Wagons around the Wrong Paradigm?* (2006), Dr. Steve Berkeley, states "One of the critical assumptions underlying this management strategy [Pacific rockfish management] is that all larvae have an equal probability of survival regardless of their parents' age. Recent evidence suggests, however, that maternal age can have a substantial influence on larval survival."[3] Rebuilding plans require a management strategy that accounts for old growth age structure in rockfish populations and does not simply focus on spawning biomass.

We recommend that rebuilding plans consider management measures and OYs designed to preserve mega-spawners and natural extended age structures.

III. Account for uncertainty in management decisions and rebuild as quickly as possible.

The recent stock assessments highlight the high degree of uncertainty in estimating groundfish population size. It is imperative that managers understand this uncertainty and incorporate it into decisions determining OY and management measures. Below are a few specific examples.

A. Canary rockfish

The 2005 rebuilding analyses for canary rockfish estimated that the stock was at 9.4% unfished biomass. The 2007 assessment estimates the population to be at 32% unfished biomass with alternative models estimating the stock to be between 12% and 56%.[4] The dramatic change in biomass from the 2005

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[2] Levin, P.S., E.E. Holmes, K.R. Piner, and C.J. Harvey. 2006. Shifts in a Pacific Ocean Fish Assemblage: The Potential Influence of Exploitation. Conservation Biology 20(4): 1181–90.
[3] Berkeley, S.A. 2006. Pacific rockfish management: Are we circling the wagons around the wrong paradigm? Bulletin of Marine Science 78(3): 655-668.
[4] Rebuilding analysis for canary rockfish based on the 2007 stock assessment. PFMC Agenda Item D.3.a Attachment 7. November 2007.

estimate to the 2007 estimate hinges largely on a new estimate of "steepness", a measure of how fast recruitment increases as stock size increases. In the 2007 assessment, estimates of steepness ranged from 0.345 to 0.72, with 0.511 being used in the "base" model. This estimate of steepness is highly uncertain and is based on a meta-analysis of rockfish in general, excluding canary, rather than any canary-specific data about steepness.

The high degree of uncertainty of key parameters used in stock assessments raises serious questions about how to manage rockfish populations. We recommend using increased precaution with higher levels of uncertainty, by incorporating a large buffer between OY and ABC. Specifically to canary, we recommend that catch levels not be raised above current levels. The canary stock must be rebuilt as quickly as possible. If steepness has been overestimated, and the model is wrong about the current state of nature, raising catch levels may adversely impact the canary population and significantly delay rebuilding.

B. Blue Rockfish

The 2007 blue rockfish assessment, the first that has been performed, indicates the stock was overfished by 1982 and is currently depleted at 29.7% unfished biomass. Further, it is likely that overfishing is occurring. "According to the base model, blue rockfish may be experiencing overfishing (current F exceeds proxy FMSY), and the total catch should be reduced."[5] This stock assessment provides significant warning that overfishing is occurring and actions must be taken to stop overfishing and rebuild blue rockfish as quickly as possible. We recommend NMFS and the PFMC take action to stop overfishing immediately along with a risk-averse OY and management measures to ensure rebuilding of this population as quickly as possible. Uncertainty associated with this stock assessment should not be interpreted as a reason to delay action, but to advance precautionary management actions.

C. Bronzespotted Rockfish

In March 2007 the PFMC received a report on bronzespotted rockfish describing that this species is highly vulnerable to fishing impacts and that the stock is likely depleted.[6] The report states that commercial landings, after peaking in 1982, declined rapidly in the late 1980s. It is likely that this species experienced overfishing prior to the decline of other rockfish species such as cowcod. The Council and NMFS would be remiss to ignore this type information suggesting such a conservation concern. The report suggests that there are measures that would increase protection considerably, such as a zero fish limit on recreational and commercial trips. Precautionary management measures must be analyzed in the 2009-2010 harvest specifications and management measures EIS and ultimately adopted.

IV. Prevent Overfishing

A. Whiting

We continue to have concerns about the declining whiting population - catch levels are bringing the stock toward an overfished condition, and there are adverse effects on the ecosystem associated with high catch levels of this important prey species. As we have submitted in previous comments, the 2007-2008 whiting catch levels are projected to bring the stock to within 1% of overfished by

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[5] Blue rockfish assessment. Agenda Item D.3.a. Attachment 3. November 2007.

[6] PFMC March 2007. Agenda Item E.2.b. Attachment 3. Summary of Bronzespotted rockfish *(Sebastes gilli)* conservation concerns.

2009 (based on the catchability coefficient (q_{mid}) used by NMFS and the PFMC).[7] This fishing strategy is irresponsible, at best, if not unlawful.

The 2007-2008 whiting catch level sets the overfished level as a target. We are concerned that the PFMC and NMFS will again set risky catch levels in 2009-2010 that will continue to bring the stock towards or cross the overfished threshold. The GMT recommended range of OYs for 2009-2010 considers three alternatives, 50% of the 2007 OY, the 2007 OY and 150% of the 2007 OY.[8] Alternative 3 (150% of the U.S. OY, or 363,887 mt) is unreasonable since it represents setting an OY that would result in the stock being overfished. The March 2007 GMT report found that any U.S. OY over 271,500 mt (based on q_{mid}) would bring the stock below the overfished threshold.[9] The Council and agency must construct an adequate range of lawful alternatives that will not continue to manage whiting at the overfished margin.

In closing, the 2007-2009 groundfish harvest specifications, management measures and rebuilding analyses are major federal actions with significant environmental, social and economic impacts. We expect the PFMC and NMFS to be mindful of its legal requirements under NEPA and the MSA at every step of this process. The agency must analyze and ultimately adopt plans that rebuild stocks as quickly as possible, prevent overfishing, minimize bycatch, and account for ecosystem needs in catch levels.

We look forward to continuing to work with the Council and NMFS to ensure a healthy ocean ecosystem for this and future generations.

Sincerely,

Ben Enticknap
Pacific Project Manager

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[7] 72 Federal Register, 19390 (April 18, 2007).
[8] PFMC Agenda Item D.4.a, Attachment 2. November 2007.
[9] PFMC Agenda Item E.3.b Supplemental GMT Report March 2007.

AMENDMENT 21: INTERSECTOR ALLOCATION

The Council has decided to pursue a Groundfish Fishery Management Plan (FMP) amendment (Amendment 21) in consideration of formal allocations of groundfish species and species' complexes for sectors of the groundfish fishery. Intersector allocations are needed to support rationalization of the limited entry trawl fishery (Amendment 20), implementation of FMP Amendment 18 bycatch mitigation policies, and development of biennial groundfish specifications and management measures. An environmental impact statement (EIS) or an environmental assessment (EA) will be developed, which will analyze intersector allocation alternatives to support decision-making in this process. The Council is scheduled to finalize alternatives for analysis at this meeting and take final action at the April 2008 Council meeting (see Agenda Item C.1.a, Attachment 1 for the long term schedule).

The Council adopted a range of preliminary intersector alternatives for further analysis and public review at their June 2007 meeting (Agenda Item D.5.a, Attachment 1). These alternatives are informed by a mix of historical landings (1995-2005) and total catch (2003-2005) data (Agenda Item D.5.a, Attachment 2). The Council also requested some changes to these data in June, including removal of recreational discard mortalities from the landed catch data and stratification of the catch data appropriate to the sectors defined in the alternatives. All of these data sets have been modified according to the Council's requests.

In June, the Council also decided to first pursue trawl allocations in the first phase of deciding intersector allocations with non-trawl sector allocations decided in one or more trailing amendments. Finally, the Council recommended development of an allocation framework for the trawl-dominant overfished species. Tables 1-3 in Agenda Item D.5.a, Attachment 3 display sector catch percentages of darkblotched rockfish, Pacific Ocean perch, and widow rockfish- the three trawl-dominant overfished species.

The Groundfish Allocation Committee (GAC) convened on September 27, 2007, to discuss refinements to the preliminary range of intersector allocation alternatives and the data informing those alternatives (Agenda Item D.5.c, GAC Report on Intersector Allocation). The GAC first discussed how to manage a rationalized trawl fishery using individual fishing quotas and/or harvesting cooperatives when there is a high risk of non-trawl sectors exceeding an allocation, especially an allocation of an overfished species. The GAC therefore recommended analyzing the concept of multi-year optimum yields (OYs) and a mechanism allowing some sector carryover of yield surpluses and deficits. Agenda Item D.5.a, Attachment 4 is a draft issue paper further describing this concept, related issues, and other topics for analysis. Further, they discussed the implications of making long term allocation decisions for non-trawl-dominant overfished species (i.e., bocaccio, canary rockfish, cowcod, and yelloweye rockfish) versus long term allocations of trawl-dominant overfished species (i.e., darkblotched rockfish, Pacific Ocean perch, and yelloweye rockfish). They agreed the analysis of allocating the non-trawl-dominant overfished species would be much more complex and therefore recommended modifying Intersector Allocation Alternatives 1-3 to remove those species from the analysis. Under this recommendation, allocations for non-trawl-dominant overfished species would be considered for a shorter (i.e., two-year) term under the biennial specifications decision-making process. Other GAC recommendations affecting the Intersector Allocation analysis (i.e., open access allocations and intersector allocation of Pacific halibut) can be found in Agenda Item G.5.c, GAC Report on Intersector Allocation.

The Council task at this meeting is to adopt a final range of intersector allocation alternatives for analysis. The Council may also decide a preliminary preferred alternative for Intersector Allocations at this meeting. The Council should consider the GAC materials and recommendations; advisory body advice; and public comments before taking action.

Council Action:

Adopt intersector allocation alternatives for analysis and public review.

Reference Materials:

1. Agenda Item D.5.a, Attachment 1: Preliminary Intersector Allocation Alternatives Recommended by the Council in June 2007.
2. Agenda Item D.5.a, Attachment 2: Tables Summarizing Historical Catch Data by Fishing Sector Relevant to the Intersector Allocation Process.
3. Agenda Item D.5.a, Attachment 3: Tables Displaying Sector Catch Percentages of Trawl-Dominant Overfished Species.
4. Agenda Item D.5.a, Attachment 4: Managing Yields in a Groundfish Management Regime of Individual Fishing Quotas, Intersector Allocations, and Stringent Rebuilding Requirements: Potential Mechanisms Designed to Avoid Overharvest and Optimize Sector Fishing Opportunities.
5. Agenda Item D.5.c, GAC Report on Intersector Allocation: Draft Summary Minutes of the September 25-27, 2007 Groundfish Allocation Committee Meeting.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Agenda and Tribal Comments
c. Recommendations of the Groundfish Allocation Committee — Don Hansen
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. **Council Action:** Adopt Alternatives for Public Review

PFMC
10/22/07

Table 1a. Intersector Allocation Alternatives Decided by the Council in June 2007.						
Feature	**Status Quo**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**
Species with Allocations a/	Sablefish, Pacific whiting, and all nearshore species allocated by the states	Status quo plus all other species	Status quo plus all other species	Status quo plus all other species	Status quo plus all but overfished species	Status quo plus all but overfished species
Sectors with Allocations b/	Status quo described in scoping information document	4 LE trawl sectors + all other sectors combined	4 LE trawl sectors, LE fixed gear, directed open access, recreational	4 LE trawl sectors + all other sectors combined	4 LE trawl sectors + all other sectors combined	4 LE trawl sectors + all other sectors combined
Variation in Allocation Percentages (Analytical Basis for an Allocation Scheme)	Status quo described in scoping information document	2003-05 sector total catch percentages	2003-05 sector total catch percentages	1995-2005 sector landed catch percentages	2003-05 sector total catch percentages	1995-2005 sector landed catch percentages
Set-Asides	Set-asides will be determined for projected research catches, EFPs, incidental open access catches, and yield buffers of 5%, 15%, and 25%.					
a/ Under any alternative, there may be different allocation schemes decided for overfished versus non-overfished groundfish species.						
b/ Tribal allocations may be considered in a separate government to government process (see October 2006 Groundfish Allocation Committee minutes for details). Projected tribal catches by species will be deducted from available yields in the analysis of intersector allocation alternatives.						

Table 1b. Intersector allocation alternative 1 (SQ + all other spp.; 4 non-treaty, trawl sectors + all non-treaty, non-trawl sectors combined; 2003-05 avg. % of annual non-treaty total catch).

Stock or Complex	2003-05 Average Total Catch Percentage					
	LE Trawl					All Non-Treaty
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting	All Non-Treaty Trawl Sectors	Non-Trawl Sectors
Lingcod - coastwide	0.0%	0.1%	0.4%	19.3%	19.8%	80.2%
N. of 42° (OR & WA)	0.1%	0.2%	0.9%	38.7%	39.9%	60.1%
S. of 42° (CA)	0.0%	0.0%	0.0%	4.9%	4.9%	95.1%
Pacific Cod	0.0%	0.0%	0.1%	98.1%	98.2%	1.8%
PACIFIC OCEAN PERCH	1.8%	0.3%	0.5%	96.9%	99.5%	0.5%
Shortbelly Rockfish	4.9%	26.9%	0.5%	64.8%	97.2%	2.8%
WIDOW ROCKFISH	22.3%	16.8%	43.7%	8.6%	91.4%	8.6%
CANARY ROCKFISH	0.7%	3.5%	2.5%	50.0%	56.7%	43.3%
Chilipepper Rockfish	0.0%	0.0%	0.0%	94.0%	94.0%	6.0%
BOCACCIO	0.0%	0.0%	0.0%	27.6%	27.7%	72.3%
Splitnose Rockfish	0.0%	0.0%	0.0%	99.8%	99.8%	0.2%
Yellowtail Rockfish	6.3%	4.3%	39.2%	38.6%	88.4%	11.6%
Shortspine Thornyhead - coastwide	0.9%	0.0%	0.0%	84.0%	85.0%	15.0%
N. of 34°27'	2.1%	0.1%	0.1%	96.2%	98.4%	1.6%
S. of 34°27'	0.0%	0.0%	0.0%	58.0%	58.0%	42.0%
Longspine Thornyhead - coastwide	0.0%	0.0%	0.0%	98.4%	98.4%	1.6%
N. of 34°27'	0.0%	0.0%	0.0%	99.4%	99.4%	0.6%
S. of 34°27'	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Other thornyheads	0.0%	0.0%	0.0%	57.4%	57.4%	42.6%
COWCOD	0.0%	0.0%	0.0%	78.6%	78.6%	21.4%
DARKBLOTCHED	2.7%	1.6%	1.5%	93.0%	98.7%	1.3%
YELLOWEYE	0.0%	0.0%	0.0%	6.9%	6.9%	93.1%
Minor Rockfish North	8.5%	1.9%	6.3%	44.0%	60.7%	39.3%
Shelf Species	2.9%	1.9%	14.3%	64.0%	83.1%	16.9%
Slope Species	9.0%	1.4%	0.9%	69.7%	81.0%	19.0%
Minor Rockfish South	0.0%	0.0%	0.0%	15.6%	15.6%	84.4%
Shelf Species	0.0%	0.0%	0.0%	3.0%	3.0%	97.0%
Slope Species	0.0%	0.0%	0.0%	63.3%	63.3%	36.7%
Dover Sole	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
English Sole	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
N of 40°10'	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
S of 40°10'	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
Arrowtooth Flounder	0.0%	0.0%	0.0%	99.1%	99.2%	0.8%
Starry Flounder	0.0%	0.0%	0.0%	87.5%	87.5%	12.5%
Other Flatfish	0.2%	0.0%	0.0%	97.5%	97.7%	2.3%
Spiny Dogfish	8.5%	0.9%	2.9%	61.9%	74.1%	25.9%
Other Fish	0.0%	0.0%	0.0%	91.2%	91.2%	8.8%

Table 1c. Intersector allocation alternative 2 (SQ + all other spp.; 4 non-treaty trawl sectors + LEFG + Dir. OA + Rec. sectors; 2003-05 avg. % of annual non-treaty total catch).

Stock or Complex	2003-05 Average Total Catch Percentage							
	At-sea Catcher-Processors	At-sea Motherships	LE Trawl Shoreside Whiting	Shoreside Non-	All Non-Treaty Trawl Sectors	LE Fixed Gear	Directed OA	Recreational
Lingcod - coastwide	0.0%	0.1%	0.4%	19.3%	19.8%	1.4%	7.7%	71.1%
N. of 42° (OR & WA)	0.1%	0.2%	0.9%	38.7%	39.9%	2.4%	8.7%	49.0%
S. of 42° (CA)	0.0%	0.0%	0.0%	4.9%	4.9%	0.6%	7.0%	87.5%
Pacific Cod	0.0%	0.0%	0.1%	98.1%	98.2%	0.6%	0.1%	1.1%
PACIFIC OCEAN PERCH	1.8%	0.3%	0.5%	96.9%	99.5%	0.2%	0.1%	0.3%
Shortbelly Rockfish	4.9%	26.9%	0.5%	64.8%	97.2%	0.0%	2.8%	0.0%
WIDOW ROCKFISH	22.3%	16.8%	43.7%	8.6%	91.4%	0.8%	0.8%	7.0%
CANARY ROCKFISH	0.7%	3.5%	2.5%	50.0%	56.7%	0.4%	3.9%	39.0%
Chilipepper Rockfish	0.0%	0.0%	0.0%	94.0%	94.0%	1.9%	0.7%	3.4%
BOCACCIO	0.0%	0.0%	0.0%	27.6%	27.7%	2.4%	4.4%	65.6%
Splitnose Rockfish	0.0%	0.0%	0.0%	99.8%	99.8%	0.2%	0.1%	0.0%
Yellowtail Rockfish	6.3%	4.3%	39.2%	38.6%	88.4%	0.4%	0.7%	10.4%
Shortspine Thornyhead - coastwide	0.9%	0.0%	0.0%	84.0%	85.0%	14.5%	0.6%	0.0%
N. of 34°27'	2.1%	0.1%	0.1%	96.2%	98.4%	1.5%	0.0%	0.0%
S. of 34°27'	0.0%	0.0%	0.0%	58.0%	58.0%	41.7%	0.3%	0.0%
Longspine Thornyhead - coastwide	0.0%	0.0%	0.0%	98.4%	98.4%	1.4%	0.2%	0.0%
N. of 34°27'	0.0%	0.0%	0.0%	99.4%	99.4%	0.6%	0.0%	0.0%
S. of 34°27'	0.0%	0.0%	0.0%	0.0%	0.0%	99.2%	0.8%	0.0%
Other thornyheads	0.0%	0.0%	0.0%	57.4%	57.4%	40.4%	2.2%	0.0%
COWCOD	0.0%	0.0%	0.0%	78.6%	78.6%	0.0%	0.1%	21.3%
DARKBLOTCHED	2.7%	1.6%	1.5%	93.0%	98.7%	0.7%	0.6%	0.0%
YELLOWEYE	0.0%	0.0%	0.0%	6.9%	6.9%	9.3%	15.1%	68.7%
Minor Rockfish North	8.5%	1.9%	6.3%	44.0%	60.7%	12.7%	9.6%	17.0%
Shelf Species	2.9%	1.9%	14.3%	64.0%	83.1%	8.5%	3.7%	4.7%
Slope Species	9.0%	1.4%	0.9%	69.7%	81.0%	16.3%	2.6%	0.0%
Minor Rockfish South	0.0%	0.0%	0.0%	15.6%	15.6%	5.0%	12.5%	66.9%
Shelf Species	0.0%	0.0%	0.0%	3.0%	3.0%	1.5%	4.4%	91.1%
Slope Species	0.0%	0.0%	0.0%	63.3%	63.3%	17.7%	18.8%	0.2%
Dover Sole	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%	0.0%	0.0%
English Sole	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%	0.0%	0.0%
N of 40°10'	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%
S of 40°10'	0.0%	0.0%	0.0%	99.9%	99.9%	0.0%	0.0%	0.1%
Arrowtooth Flounder	0.0%	0.0%	0.0%	99.1%	99.2%	0.7%	0.2%	0.0%
Starry Flounder	0.0%	0.0%	0.0%	87.5%	87.5%	0.0%	0.1%	12.5%
Other Flatfish	0.2%	0.0%	0.0%	97.5%	97.7%	0.0%	0.1%	2.1%
Spiny Dogfish	8.5%	0.9%	2.9%	61.9%	74.1%	20.0%	5.4%	0.5%
Other Fish	0.0%	0.0%	0.0%	91.2%	91.2%	2.8%	3.6%	2.3%

Table 1d. Intersector allocation alternative 3 (SQ + all other spp.; 4 non-treaty, trawl sectors + all non-treaty, non-trawl sectors combined; 1995-05 avg. % of annual non-treaty landed catch).

Stock or Complex	1995-05 Average Landed Catch Percentage					
	LE Trawl					
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting	All Non-Treaty Trawl Sectors	All Non-Treaty Non-Trawl Sectors
Lingcod - coastwide	0.0%	0.0%	0.1%	39.3%	39.5%	60.5%
N. of 42° (OR & WA)	0.0%	0.1%	0.3%	57.9%	58.3%	41.7%
S. of 42° (CA)	0.0%	0.0%	0.0%	21.4%	21.5%	78.5%
Pacific Cod	0.0%	0.0%	0.1%	99.0%	99.1%	0.9%
PACIFIC OCEAN PERCH	1.7%	1.1%	2.1%	94.4%	99.4%	0.6%
Shortbelly Rockfish	5.4%	14.0%	4.0%	76.1%	99.6%	0.4%
WIDOW ROCKFISH	2.6%	2.3%	5.1%	88.0%	98.0%	2.0%
CANARY ROCKFISH	0.1%	0.2%	0.2%	68.0%	68.5%	31.5%
Chilipepper Rockfish	0.0%	0.0%	0.0%	79.5%	79.5%	20.5%
BOCACCIO	0.0%	0.0%	0.0%	38.6%	38.6%	61.4%
Splitnose Rockfish	0.0%	0.0%	0.0%	97.2%	97.2%	2.8%
Yellowtail Rockfish	5.3%	8.2%	10.7%	72.1%	96.3%	3.7%
Shortspine Thornyhead - coastwi	0.7%	0.0%	0.0%	90.4%	91.2%	8.8%
N. of 34°27'	1.1%	0.0%	0.1%	96.7%	97.9%	2.1%
S. of 34°27'	0.0%	0.0%	0.0%	78.8%	78.8%	21.2%
Longspine Thornyhead - coastwi	0.0%	0.0%	0.0%	98.3%	98.3%	1.7%
N. of 34°27'	0.0%	0.0%	0.0%	98.8%	98.9%	1.1%
S. of 34°27'	0.0%	0.0%	0.0%	0.3%	0.3%	99.7%
Other thornyheads	0.0%	0.0%	0.0%	46.6%	46.6%	53.4%
COWCOD	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
DARKBLOTCHED	2.3%	0.8%	0.6%	95.3%	99.0%	1.0%
YELLOWEYE	0.5%	0.0%	0.1%	38.1%	38.6%	61.4%
Minor Rockfish North	2.8%	0.9%	1.7%	63.8%	69.3%	30.7%
Shelf Species	0.8%	0.9%	2.4%	64.4%	68.5%	31.5%
Slope Species	6.7%	1.2%	1.1%	78.5%	87.5%	12.5%
Minor Rockfish South	0.0%	0.0%	0.0%	24.2%	24.2%	75.8%
Shelf Species	0.0%	0.0%	0.0%	13.6%	13.6%	86.4%
Slope Species	0.0%	0.0%	0.0%	69.9%	69.9%	30.1%
Dover Sole	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
English Sole	0.0%	0.0%	0.1%	99.9%	100.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
N of 40°10'	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
S of 40°10'	0.0%	0.0%	0.0%	99.5%	99.5%	0.5%
Arrowtooth Flounder	0.1%	0.0%	0.0%	99.8%	99.9%	0.1%
Starry Flounder	0.0%	0.0%	0.0%	48.9%	48.9%	51.1%
Other Flatfish	0.2%	0.0%	0.1%	97.0%	97.3%	2.7%
Spiny Dogfish	14.4%	8.8%	4.1%	45.2%	72.5%	27.5%
Other Fish	0.1%	0.0%	0.0%	53.6%	53.7%	46.3%

Table 1e. Intersector allocation alternative 4 (SQ + all other spp. except overfished spp.; 4 non-treaty, trawl sectors + all non-treaty, non-trawl sectors combined; 2003-05 avg. % of annual non-treaty total catch).

Stock or Complex	2003-05 Average Total Catch Percentage					
	At-sea Catcher-Processors	At-sea Motherships	LE Trawl Shoreside Whiting	Shoreside Non-whiting	All Non-Treaty Trawl Sectors	All Non-Treaty Non-Trawl Sectors
Lingcod - coastwide	0.0%	0.1%	0.4%	19.3%	19.8%	80.2%
N. of 42° (OR & WA)	0.1%	0.2%	0.9%	38.7%	39.9%	60.1%
S. of 42° (CA)	0.0%	0.0%	0.0%	4.9%	4.9%	95.1%
Pacific Cod	0.0%	0.0%	0.1%	98.1%	98.2%	1.8%
Shortbelly Rockfish	4.9%	26.9%	0.5%	64.8%	97.2%	2.8%
Chilipepper Rockfish	0.0%	0.0%	0.0%	94.0%	94.0%	6.0%
Splitnose Rockfish	0.0%	0.0%	0.0%	99.8%	99.8%	0.2%
Yellowtail Rockfish	6.3%	4.3%	39.2%	38.6%	88.4%	11.6%
Shortspine Thornyhead - coastwid	0.9%	0.0%	0.0%	84.0%	85.0%	15.0%
N. of 34°27'	2.1%	0.1%	0.1%	96.2%	98.4%	1.6%
S. of 34°27'	0.0%	0.0%	0.0%	58.0%	58.0%	42.0%
Longspine Thornyhead - coastwid	0.0%	0.0%	0.0%	98.4%	98.4%	1.6%
N. of 34°27'	0.0%	0.0%	0.0%	99.4%	99.4%	0.6%
S. of 34°27'	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Other thornyheads	0.0%	0.0%	0.0%	57.4%	57.4%	42.6%
Minor Rockfish North	8.5%	1.9%	6.3%	44.0%	60.7%	39.3%
Shelf Species	2.9%	1.9%	14.3%	64.0%	83.1%	16.9%
Slope Species	9.0%	1.4%	0.9%	69.7%	81.0%	19.0%
Minor Rockfish South	0.0%	0.0%	0.0%	15.6%	15.6%	84.4%
Shelf Species	0.0%	0.0%	0.0%	3.0%	3.0%	97.0%
Slope Species	0.0%	0.0%	0.0%	63.3%	63.3%	36.7%
Dover Sole	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
English Sole	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
N of 40°10'	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
S of 40°10'	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
Arrowtooth Flounder	0.0%	0.0%	0.0%	99.1%	99.2%	0.8%
Starry Flounder	0.0%	0.0%	0.0%	87.5%	87.5%	12.5%
Other Flatfish	0.2%	0.0%	0.0%	97.5%	97.7%	2.3%
Spiny Dogfish	8.5%	0.9%	2.9%	61.9%	74.1%	25.9%
Other Fish	0.0%	0.0%	0.0%	91.2%	91.2%	8.8%

Table 1f. Intersector allocation alternative 5 (SQ + all other spp. except overfished spp.; 4 non-treaty, trawl sectors + all non-treaty, non-trawl sectors combined; 1995-05 avg. % of annual non-treaty landed catch).

Stock or Complex	1995-05 Average Landed Catch Percentage					
	LE Trawl					All Non-Treaty Non-Trawl Sectors
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting	All Non-Treaty Trawl Sectors	
Lingcod - coastwide	0.0%	0.0%	0.1%	39.3%	39.5%	60.5%
N. of 42° (OR & WA)	0.0%	0.1%	0.3%	57.9%	58.3%	41.7%
S. of 42° (CA)	0.0%	0.0%	0.0%	21.4%	21.5%	78.5%
Pacific Cod	0.0%	0.0%	0.1%	99.0%	99.1%	0.9%
Shortbelly Rockfish	5.4%	14.0%	4.0%	76.1%	99.6%	0.4%
Chilipepper Rockfish	0.0%	0.0%	0.0%	79.5%	79.5%	20.5%
Splitnose Rockfish	0.0%	0.0%	0.0%	97.2%	97.2%	2.8%
Yellowtail Rockfish	5.3%	8.2%	10.7%	72.1%	96.3%	3.7%
Shortspine Thornyhead - coastwide	0.7%	0.0%	0.0%	90.4%	91.2%	8.8%
N. of 34°27'	1.1%	0.0%	0.1%	96.7%	97.9%	2.1%
S. of 34°27'	0.0%	0.0%	0.0%	78.8%	78.8%	21.2%
Longspine Thornyhead - coastwide	0.0%	0.0%	0.0%	98.3%	98.3%	1.7%
N. of 34°27'	0.0%	0.0%	0.0%	98.8%	98.9%	1.1%
S. of 34°27'	0.0%	0.0%	0.0%	0.3%	0.3%	99.7%
Other thornyheads	0.0%	0.0%	0.0%	46.6%	46.6%	53.4%
Minor Rockfish North	2.8%	0.9%	1.7%	63.8%	69.3%	30.7%
Shelf Species	0.8%	0.9%	2.4%	64.4%	68.5%	31.5%
Slope Species	6.7%	1.2%	1.1%	78.5%	87.5%	12.5%
Minor Rockfish South	0.0%	0.0%	0.0%	24.2%	24.2%	75.8%
Shelf Species	0.0%	0.0%	0.0%	13.6%	13.6%	86.4%
Slope Species	0.0%	0.0%	0.0%	69.9%	69.9%	30.1%
Dover Sole	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
English Sole	0.0%	0.0%	0.1%	99.9%	100.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	99.9%	99.9%	0.1%
N of 40°10'	0.0%	0.0%	0.0%	99.9%	100.0%	0.0%
S of 40°10'	0.0%	0.0%	0.0%	99.5%	99.5%	0.5%
Arrowtooth Flounder	0.1%	0.0%	0.0%	99.8%	99.9%	0.1%
Starry Flounder	0.0%	0.0%	0.0%	48.9%	48.9%	51.1%
Other Flatfish	0.2%	0.0%	0.1%	97.0%	97.3%	2.7%
Spiny Dogfish	14.4%	8.8%	4.1%	45.2%	72.5%	27.5%
Other Fish	0.1%	0.0%	0.0%	53.6%	53.7%	46.3%

Agenda Item D.5.a
Attachment 2
November 2007

Tables Summarizing Historical Catch Data by Fishing Sector Relevant to the Intersector Allocation Process

Index of Attached Tables:

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	1995														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.0	-	0.1	1,069.7	1,069.9	42.1	0.3	278.1	69.1	391.7	712.2	1,782.1	-	-	-
N. of 42° (OR & WA)	0.0	-	0.1	775.0	775.2	8.9	0.3	79.4	59.0	139.6	228.2	1,003.4	-	-	-
S. of 42° (CA)	-	-	-	294.7	294.7	33.2	0.0	198.7	10.1	252.1	484.0	778.7	-	-	-
Pacific Cod	-	0.0	0.1	490.7	490.8	1.0	0.0	1.0	8.7	-	2.0	492.8	1.3	-	1.3
PACIFIC OCEAN PERCH	13.4	28.1	29.9	824.7	896.2	3.9	0.2	1.8	4.9	0.0	5.9	902.1	-	-	-
Shortbelly Rockfish	4.8	4.2	0.0	29.9	38.9	0.0	-	0.2	-	-	0.2	39.1	-	-	-
WIDOW ROCKFISH	87.0	95.3	236.1	6,165.3	6,583.6	8.2	0.0	83.5	20.6	6.1	97.8	6,681.4	-	-	-
CANARY ROCKFISH	0.2	0.2	0.5	675.4	676.3	59.5	-	124.3	12.6	108.7	292.5	968.8	0.0	-	0.0
Chilipepper Rockfish	-	-	-	1,474.8	1,474.8	15.7	-	382.1	9.0	7.2	405.0	1,879.9	-	-	-
BOCACCIO	-	-	-	326.2	326.2	4.3	-	345.7	3.3	31.4	381.4	707.5	-	-	-
Splitnose Rockfish	-	-	-	274.5	274.5	1.5	-	22.3	0.3	-	23.8	298.4	-	-	-
Yellowtail Rockfish	81.4	505.3	294.2	4,006.9	4,887.8	14.6	-	59.3	221.6	29.8	103.7	4,991.5	0.2	-	0.2
Shortspine Thornyhead - coastwide	5.6	0.2	0.5	1,855.0	1,861.3	32.3	0.1	15.7	2.9	-	48.1	1,909.4	7.1	-	7.1
N. of 34°27'	5.6	0.2	0.5	1,212.6	1,218.8	19.0	0.1	5.3	2.7	-	24.4	1,243.2	7.1	-	7.1
S. of 34°27'	-	-	-	642.4	642.4	13.3	-	10.4	0.2	-	23.7	666.2	-	-	-
Longspine Thornyhead - coastwide	0.0	0.0	2.8	5,311.4	5,314.2	25.9	0.0	27.0	2.4	-	52.9	5,367.1	0.6	-	0.6
N. of 34°27'	0.0	0.0	2.8	5,311.4	5,314.2	25.9	0.0	27.0	2.4	-	52.9	5,367.1	0.6	-	0.6
S. of 34°27'	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-
Other thornyheads	-	-	-	4.7	4.7	20.2	-	76.9	0.2	-	97.1	101.9	-	-	-
COWCOD	-	-	-	-	0.0	3.1	-	13.3	0.5	1.7	18.2	18.2	-	-	-
DARKBLOTCHED	48.9	3.3	0.5	709.9	762.7	2.0	-	2.2	2.6	-	4.2	766.9	-	-	-
YELLOWEYE	-	0.0	0.0	135.1	135.1	26.5	-	40.9	0.3	32.4	99.8	234.9	-	-	-
Minor Rockfish North	59.2	7.9	2.8	1,673.0	1,743.0	546.5	2.2	229.8	139.1	40.7	819.2	2,562.2	52.0	0.0	52.0
Shelf Species	30.4	4.0	2.5	963.4	1,000.3	396.9	2.1	181.1	130.8	6.1	586.2	1,586.5	52.0	0.0	52.0
Slope Species	28.8	3.8	0.4	708.8	741.8	136.9	0.1	6.1	8.2	0.0	143.1	884.9	0.0	0.0	0.0
Minor Rockfish South	0.0	0.0	0.0	701.0	701.0	164.2	0.2	1,053.1	27.6	646.7	1,864.2	2,565.2	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	186.3	186.3	83.4	0.0	537.5	21.6	316.0	936.9	1,123.2	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	505.8	505.8	62.7	0.1	229.6	1.8	3.0	295.4	801.2	0.0	0.0	0.0
Dover Sole	0.0	0.0	0.4	10,376.9	10,377.3	3.2	0.2	2.2	84.9	-	5.6	10,382.9	0.8	-	0.8
English Sole	0.0	0.0	0.0	1,106.8	1,106.8	0.0	-	1.9	13.2	0.0	1.9	1,108.7	-	-	-
Petrale Sole (coastwide)	0.0	0.0	0.0	1,588.5	1,588.5	0.9	-	6.9	15.3	0.7	8.6	1,597.0	-	-	-
N of 40°10'	0.0	0.0	0.0	1,247.7	1,247.7	0.0	-	-	8.4	0.1	0.1	1,247.8	-	-	-
S of 40°10'	-	-	-	340.8	340.8	0.9	-	6.9	6.9	0.7	8.5	349.2	-	-	-
Arrowtooth Flounder	0.2	1.5	0.2	2,304.8	2,306.7	1.5	0.1	0.7	20.0	-	2.3	2,309.0	0.1	-	0.1
Starry Flounder	-	-	-	49.8	49.8	0.0	-	0.2	8.4	3.8	4.0	53.8	-	-	-
Other Flatfish	0.4	0.1	0.0	2,363.9	2,364.4	0.5	-	6.1	49.8	15.6	22.3	2,386.7	-	-	-
Spiny Dogfish	145.4	40.7	0.1	355.3	541.6	7.3	0.0	0.8	0.2	17.7	25.9	567.4	-	-	-
Other Fish	-	0.0	0.1	848.5	848.6	63.1	0.0	76.6	16.1	157.2	296.9	1,145.5	-	-	-

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	1996														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	**At-Sea Catcher-Processors**	**At Sea Motherships**	**Shoreside Whiting LE Trawl**	**Shoreside Non-whiting LE Trawl**	**LE Trawl Total**	**Shoreside LE Line Gear**	**Shoreside LE Pot Gear**	**Shoreside Directed OA**	**Shoreside Incidental OA**	**Recreational**	**Non-Trawl Dir. Total**	**Non-Treaty Dir. Total**	**Shoreside**	**At-Sea**	**Treaty Totals**
Lingcod - coastwide	0.1	0.0	0.7	1,204.1	1,204.9	54.0	0.1	238.8	64.4	473.7	766.6	1,971.5	1.2	-	1.2
N. of 42° (OR & WA)	0.1	0.0	0.7	911.0	911.8	10.2	0.1	110.9	48.2	145.8	267.0	1,178.8	1.2	-	1.2
S. of 42° (CA)	-	-	0.0	293.1	293.1	43.8	-	127.9	16.2	327.9	499.6	792.7	-	-	-
Pacific Cod	-	0.0	0.4	433.0	433.5	1.4	0.0	0.5	8.6	0.6	2.5	436.0	0.7	0.1	0.8
PACIFIC OCEAN PERCH	3.9	2.1	32.8	819.7	858.5	9.7	0.2	0.9	6.0	0.2	11.0	869.5	-	0.0	0.0
Shortbelly Rockfish	6.2	-	0.0	35.9	42.1	0.0	-	0.0	0.4	0.1	0.1	42.2	-	-	-
WIDOW ROCKFISH	119.9	117.3	571.5	5,403.2	6,211.9	7.8	0.0	47.1	13.8	24.3	79.2	6,291.1	-	11.5	11.5
CANARY ROCKFISH	0.1	1.4	1.2	966.6	969.3	67.8	0.0	156.3	25.7	85.6	309.7	1,279.0	0.1	0.0	0.1
Chilipepper Rockfish	-	-	-	1,395.6	1,395.6	12.4	-	277.7	9.5	30.3	320.4	1,716.1	-	-	-
BOCACCIO	-	-	-	275.7	275.7	6.7	-	149.0	1.8	88.8	244.5	520.2	-	-	-
Splitnose Rockfish	-	-	-	401.7	401.7	0.9	-	4.5	0.1	-	5.4	407.1	-	-	-
Yellowtail Rockfish	237.4	350.4	482.6	4,157.9	5,228.3	32.6	0.1	71.0	310.9	31.7	135.4	5,363.6	0.6	92.6	93.2
Shortspine Thornyhead - coastwide	2.0	-	0.1	1,512.0	1,514.1	78.1	0.2	14.4	1.3	0.0	92.7	1,606.7	7.3	-	7.3
N. of 34°27'	2.0	-	0.1	1,081.6	1,083.6	18.8	0.2	2.4	1.1	0.0	21.4	1,105.0	7.3	-	7.3
S. of 34°27'	-	-	-	430.4	430.4	59.3	-	12.0	0.1	-	71.3	501.8	-	-	-
Longspine Thornyhead - coastwide	-	-	0.0	4,751.1	4,751.1	96.1	0.0	9.5	0.9	-	105.6	4,856.7	0.2	-	0.2
N. of 34°27'	-	-	0.0	4,751.1	4,751.1	79.1	0.0	9.2	0.9	-	88.3	4,839.4	0.2	-	0.2
S. of 34°27'	-	-	-	-	0.0	17.0	-	0.3	-	-	17.3	17.3	-	-	-
Other thornyheads	-	-	-	44.0	44.0	49.5	0.0	17.0	0.1	-	66.4	110.4	-	-	-
COWCOD	-	-	-	0.0	0.0	1.9	-	13.9	0.0	5.6	21.5	21.5	-	-	-
DARKBLOTCHED	6.2	0.7	5.9	721.6	734.3	1.6	-	0.6	2.5	0.0	2.2	736.5	-	-	-
YELLOWEYE	0.5	-	0.1	100.6	101.2	35.6	-	35.6	0.7	30.2	101.3	202.5	-	-	-
Minor Rockfish North	14.0	16.7	21.5	1,710.9	1,763.2	427.9	2.6	202.0	221.6	52.4	684.9	2,448.1	36.1	0.0	36.1
Shelf Species	0.4	1.6	18.3	1,072.6	1,092.9	339.8	2.6	149.4	211.6	4.4	496.3	1,589.2	36.1	0.0	36.1
Slope Species	13.6	15.1	3.2	638.3	670.3	75.4	0.0	10.3	9.9	0.4	86.1	756.3	0.0	0.0	0.0
Minor Rockfish South	0.0	0.0	0.0	951.4	951.4	237.0	0.6	834.2	27.1	965.5	2,037.2	2,988.7	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	208.6	208.6	85.6	0.3	406.3	19.7	476.3	968.4	1,177.0	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	724.3	724.3	115.3	0.3	142.5	2.8	21.8	279.9	1,004.2	0.0	0.0	0.0
Dover Sole	0.1	-	1.4	12,160.6	12,162.1	4.1	0.4	4.1	96.8	-	8.6	12,170.8	1.1	-	1.1
English Sole	0.0	0.0	0.5	1,129.1	1,129.6	0.0	-	0.9	31.0	0.0	1.0	1,130.6	0.0	-	0.0
Petrale Sole (coastwide)	-	-	0.6	1,803.6	1,804.2	0.3	0.0	2.1	24.7	0.6	3.0	1,807.2	0.0	-	0.0
N of 40°10'	-	-	0.6	1,357.0	1,357.6	0.1	0.0	0.1	20.1	0.0	0.2	1,357.8	0.0	-	0.0
S of 40°10'	-	-	-	446.6	446.6	0.2	-	2.0	4.6	0.6	2.8	449.4	-	-	-
Arrowtooth Flounder	0.2	0.4	1.1	2,172.9	2,174.6	0.2	0.0	0.2	5.7	-	0.5	2,175.1	0.0	0.1	0.1
Starry Flounder	-	-	-	27.9	27.9	0.0	-	0.2	14.7	3.1	3.3	31.2	0.0	-	0.0
Other Flatfish	0.2	0.0	1.5	1,868.4	1,870.1	0.5	0.0	5.7	84.4	49.0	55.3	1,925.4	0.0	0.0	0.0
Spiny Dogfish	46.7	104.1	3.8	195.2	349.8	22.2	-	29.2	0.3	19.8	71.2	421.0	2.5	195.5	198.0
Other Fish	-	0.0	0.0	746.7	746.7	577.1	0.0	297.7	22.5	78.7	953.6	1,700.3	-	0.0	0.0

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	**1997**														
	Non-Treaty Sectors												**Treaty Sectors**		
	LE Trawl Sectors					**Non-LE Trawl Sectors**									
Stock or Complex	**At-Sea Catcher-Processors**	**At Sea Motherships**	**Shoreside Whiting LE Trawl**	**Shoreside Non whiting LE Trawl**	**LE Trawl Total**	**Shoreside LE Line Gear**	**Shoreside LE Pot Gear**	**Shoreside Directed OA**	**Shoreside Incidental OA**	**Recreational**	**Non-Trawl Dir. Total**	**Non-Treaty Dir. Total**	**Shoreside**	**At-Sea**	**Treaty Totals**
Lingcod - coastwide	0.1	0.1	0.5	1,170.2	1,170.9	65.2	0.4	278.8	59.9	427.9	772.3	1,943.2	0.7	-	0.7
N. of 42° (OR & WA)	0.1	0.1	0.5	856.0	856.6	28.0	0.3	131.8	47.4	164.0	324.1	1,180.7	0.7	-	0.7
S. of 42° (CA)	-	-	0.0	314.3	314.3	37.3	0.1	147.0	12.4	263.9	448.2	762.5	-	-	-
Pacific Cod	-	0.0	0.0	589.4	589.4	0.6	-	1.3	3.7	0.3	2.2	591.6	1.0	0.0	1.0
PACIFIC OCEAN PERCH	2.0	1.6	6.4	663.0	672.9	1.6	0.4	1.7	4.0	0.5	4.2	677.1	-	6.5	6.5
Shortbelly Rockfish	0.5	0.3	0.0	78.2	79.0	-	-	-	0.1	0.0	0.0	79.1	-	-	-
WIDOW ROCKFISH	72.6	122.0	163.3	6,213.3	6,571.2	8.8	-	61.1	10.5	42.3	112.2	6,683.3	-	9.6	9.6
CANARY ROCKFISH	1.0	0.4	1.0	793.5	795.9	79.3	0.0	214.6	22.7	145.7	439.5	1,235.5	0.0	1.7	1.7
Chilipepper Rockfish	-	-	-	1,535.2	1,535.2	13.6	-	394.2	4.7	73.5	481.2	2,016.3	-	-	-
BOCACCIO	-	-	-	220.5	220.5	11.8	-	69.1	1.0	146.3	227.2	447.6	-	-	-
Splitnose Rockfish	-	-	-	429.4	429.4	0.8	-	6.7	0.4	-	7.5	436.9	-	-	-
Yellowtail Rockfish	120.1	146.5	226.5	1,338.7	1,831.8	36.4	-	99.8	157.6	41.1	177.3	2,009.1	1.1	121.3	122.4
Shortspine Thornyhead - coastwide	0.4	0.0	0.2	1,398.4	1,399.0	52.2	0.2	2.8	2.8	-	55.2	1,454.2	7.7	-	7.7
N. of 34°27'	0.4	0.0	0.2	996.3	996.9	21.5	0.2	1.2	2.7	-	22.9	1,019.8	7.7	-	7.7
S. of 34°27'	-	-	-	402.1	402.1	30.7	-	1.6	0.1	-	32.3	434.4	-	-	-
Longspine Thornyhead - coastwide	-	-	0.4	3,851.3	3,851.7	69.6	0.0	12.6	3.3	-	82.2	3,933.9	0.1	-	0.1
N. of 34°27'	-	-	0.4	3,851.3	3,851.7	56.3	0.0	12.6	3.3	-	68.9	3,920.6	0.1	-	0.1
S. of 34°27'	-	-	-	-	0.0	13.3	-	-	0.0	-	13.3	13.3	-	-	-
Other thornyheads	-	-	-	33.6	33.6	75.2	-	3.9	1.0	-	79.1	112.7	-	-	-
COWCOD	-	-	-	-	0.0	1.3	-	4.0	0.2	2.5	7.8	7.8	-	-	-
DARKBLOTCHED	1.8	0.9	0.5	810.4	813.5	0.5	-	0.2	5.6	-	0.7	814.2	-	-	-
YELLOWEYE	0.0	-	0.1	83.4	83.5	47.5	-	52.4	0.6	35.8	135.6	219.1	-	-	-
Minor Rockfish North	26.9	3.9	23.1	1,529.5	1,583.4	283.7	3.0	209.4	47.4	91.0	587.2	2,170.6	29.5	0.7	30.2
Shelf Species	0.2	1.2	22.3	863.3	887.0	256.3	2.0	146.8	40.3	6.6	411.7	1,298.8	29.5	0.7	30.2
Slope Species	26.7	2.7	0.8	665.9	696.1	15.1	1.0	2.0	7.1	0.0	18.1	714.2	0.0	0.0	0.0
Minor Rockfish South	0.0	0.0	0.0	916.6	916.6	248.8	1.9	708.5	30.7	1,144.6	2,103.9	3,020.4	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	261.9	261.9	125.0	0.0	344.8	24.2	602.5	1,072.2	1,334.1	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	641.4	641.4	69.9	1.9	106.3	1.7	11.7	189.8	831.2	0.0	0.0	0.0
Dover Sole	-	-	1.6	10,114.5	10,116.1	2.0	0.6	0.5	72.4	-	3.1	10,119.2	0.6	0.0	0.6
English Sole	-	0.0	0.6	1,428.7	1,429.3	0.0	-	0.2	65.6	-	0.3	1,429.6	0.1	-	0.1
Petrale Sole (coastwide)	-	-	0.6	1,862.9	1,863.4	1.6	0.0	0.6	62.3	0.3	2.5	1,866.0	0.0	-	0.0
N of 40°10'	-	-	0.6	1,389.6	1,390.1	0.2	0.0	0.0	56.3	0.1	0.3	1,390.4	0.0	-	0.0
S of 40°10'	-	-	-	473.3	473.3	1.4	-	0.6	6.0	0.2	2.2	475.5	-	-	-
Arrowtooth Flounder	0.1	0.1	0.9	2,325.1	2,326.1	0.3	0.2	0.0	4.3	-	0.5	2,326.6	-	0.2	0.2
Starry Flounder	-	-	-	58.9	58.9	0.0	-	0.3	28.9	3.3	3.6	62.6	0.0	-	0.0
Other Flatfish	0.0	0.0	3.3	1,815.7	1,819.0	0.9	-	7.1	152.9	35.0	43.0	1,862.0	0.0	-	0.0
Spiny Dogfish	139.2	65.3	3.3	335.6	543.4	2.5	-	82.4	0.7	5.1	90.1	633.5	-	111.5	111.5
Other Fish	0.1	0.1	0.1	566.0	566.3	296.5	-	147.0	18.6	65.2	508.7	1,075.0	-	-	-

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	1998														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	-	0.1	0.4	217.3	217.8	24.8	0.5	88.8	20.3	335.7	449.8	667.6	2.4	-	2.4
N. of 42° (OR & WA)	-	0.1	0.1	143.2	143.4	13.8	0.2	32.2	13.0	100.7	146.9	290.2	2.4	-	2.4
S. of 42° (CA)	-	-	0.3	74.1	74.4	11.1	0.4	56.6	7.3	235.0	303.0	377.4	-	-	-
Pacific Cod	-	-	0.8	405.7	406.5	0.9	0.0	0.4	2.4	1.5	2.8	409.3	2.2	0.0	2.2
PACIFIC OCEAN PERCH	14.8	8.3	22.3	610.0	655.4	0.1	0.0	0.2	1.2	-	0.3	655.7	-	0.4	0.4
Shortbelly Rockfish	0.0	-	1.3	18.8	20.2	0.0	-	0.0	0.2	0.0	0.0	20.2	-	-	-
WIDOW ROCKFISH	120.9	173.7	349.6	3,346.7	3,990.8	12.2	-	155.4	10.3	51.9	219.4	4,210.3	0.0	14.8	14.8
CANARY ROCKFISH	0.3	2.5	0.9	902.6	906.2	105.5	0.0	165.8	19.1	80.4	351.7	1,257.9	0.4	2.7	3.1
Chilipepper Rockfish	-	-	-	1,036.2	1,036.2	15.6	-	266.5	11.7	5.4	287.5	1,323.6	-	-	-
BOCACCIO	-	-	-	55.9	55.9	7.5	-	70.0	2.1	51.4	128.8	184.7	-	-	-
Splitnose Rockfish	-	-	-	1,304.8	1,304.8	0.1	-	45.3	8.9	-	45.3	1,350.1	-	-	-
Yellowtail Rockfish	63.7	334.8	499.7	1,691.0	2,589.2	43.7	0.0	123.7	156.1	64.0	231.4	2,820.6	6.2	159.0	165.3
Shortspine Thornyhead - coastwide	2.5	0.0	0.8	1,184.1	1,187.4	57.5	0.2	0.9	1.5	-	58.6	1,245.9	3.7	0.0	3.7
N. of 34°27'	2.5	0.0	0.8	855.7	859.0	16.7	0.2	0.5	1.3	-	17.4	876.4	3.7	0.0	3.7
S. of 34°27'	-	-	-	328.4	328.4	40.7	0.0	0.4	0.3	-	41.1	369.5	-	-	-
Longspine Thornyhead - coastwide	0.0	-	0.1	2,223.6	2,223.7	15.4	-	0.1	2.7	-	15.5	2,239.2	0.0	-	0.0
N. of 34°27'	0.0	-	0.1	2,223.6	2,223.7	4.5	-	0.0	2.6	-	4.5	2,228.3	0.0	-	0.0
S. of 34°27'	-	-	-	-	0.0	10.9	-	0.1	0.1	-	11.0	11.0	-	-	-
Other thornyheads	-	-	-	16.6	16.6	29.7	-	1.7	0.6	-	31.4	48.0	-	-	-
COWCOD	-	-	-	-	0.0	0.6	-	1.1	0.2	2.8	4.5	4.5	-	-	-
DARKBLOTCHED	6.9	12.9	5.1	901.8	926.7	6.2	0.0	11.0	10.6	-	17.1	943.8	-	0.0	0.0
YELLOWEYE	0.0	-	0.2	29.4	29.6	15.8	-	22.4	0.1	39.0	77.2	106.9	-	-	-
Minor Rockfish North	22.8	8.3	41.2	1,471.1	1,543.4	345.7	2.9	158.0	53.9	92.7	599.3	2,142.7	29.6	2.2	31.8
Shelf Species	2.4	1.0	23.0	1,012.8	1,039.3	249.9	2.9	104.9	46.6	9.1	366.8	1,406.1	29.6	2.2	31.8
Slope Species	20.4	7.2	18.2	453.6	499.5	76.7	0.1	2.2	7.1	0.1	79.0	578.5	0.0	0.0	0.0
Minor Rockfish South	0.0	0.0	0.0	814.5	814.5	223.6	3.1	771.7	25.4	770.9	1,769.3	2,583.8	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	244.1	244.1	87.3	0.1	376.3	21.7	302.6	766.2	1,010.3	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	569.6	569.6	102.0	0.2	167.0	1.0	3.0	272.1	841.8	0.0	0.0	0.0
Dover Sole	0.0	0.0	3.5	8,058.8	8,062.2	1.7	0.3	0.3	52.9	-	2.4	8,064.6	2.0	-	2.0
English Sole	-	0.0	1.2	1,122.7	1,123.9	0.0	-	0.4	26.0	-	0.4	1,124.4	0.8	-	0.8
Petrale Sole (coastwide)	-	-	1.4	1,458.9	1,460.3	0.6	-	0.4	25.3	0.0	1.0	1,461.4	1.5	-	1.5
N of 40°10'	-	-	1.4	1,203.6	1,205.0	0.2	-	-	17.9	0.0	0.2	1,205.2	1.5	-	1.5
S of 40°10'	-	-	-	255.3	255.3	0.4	-	0.4	7.4	-	0.8	256.1	-	-	-
Arrowtooth Flounder	0.1	0.7	0.3	3,191.9	3,193.0	0.6	0.1	0.0	5.4	-	0.7	3,193.8	0.1	0.5	0.7
Starry Flounder	-	-	-	53.0	53.0	0.0	-	0.1	25.4	8.0	8.1	61.1	-	-	-
Other Flatfish	0.3	0.0	4.1	1,534.5	1,539.0	1.1	-	4.0	65.2	13.5	18.5	1,557.5	1.1	0.0	1.1
Spiny Dogfish	57.8	162.3	56.2	402.3	678.5	0.7	-	2.0	0.2	2.5	5.1	683.6	-	98.8	98.8
Other Fish	0.7	0.3	0.3	622.4	623.7	157.7	0.9	73.0	26.7	63.0	294.6	918.4	-	0.2	0.2

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	1999														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.0	0.0	0.6	216.6	217.3	32.1	0.3	73.8	45.7	444.9	551.2	768.4	3.2	-	3.2
N. of 42° (OR & WA)	0.0	0.0	0.6	134.1	134.7	22.1	0.2	32.2	37.2	119.0	173.6	308.3	3.2	-	3.2
S. of 42° (CA)	-	-	0.0	82.5	82.5	10.1	0.1	41.6	8.6	325.9	377.6	460.2	-	-	-
Pacific Cod	0.0	0.0	0.2	276.8	277.1	1.3	-	0.3	1.7	0.4	1.9	279.0	1.2	0.1	1.3
PACIFIC OCEAN PERCH	9.4	4.1	1.9	520.2	535.6	1.1	0.1	0.3	9.0	-	1.5	537.1	0.0	1.2	1.2
Shortbelly Rockfish	-	0.0	5.5	2.2	7.7	-	-	-	0.4	-	0.0	7.7	-	0.0	0.0
WIDOW ROCKFISH	104.1	58.1	194.4	3,691.1	4,047.7	15.4	-	39.7	12.7	32.7	87.8	4,135.5	0.2	36.5	36.7
CANARY ROCKFISH	1.0	0.6	1.9	513.8	517.3	62.4	-	69.5	38.7	97.8	229.6	747.0	0.6	4.3	4.9
Chilipepper Rockfish	-	-	-	783.1	783.1	12.9	-	97.7	7.0	24.3	134.9	918.0	-	-	-
BOCACCIO	-	-	-	31.3	31.3	4.4	-	22.5	1.3	120.2	147.0	178.3	-	-	-
Splitnose Rockfish	-	-	-	205.7	205.7	0.6	-	0.2	0.2	-	0.8	206.4	-	-	-
Yellowtail Rockfish	426.3	325.4	477.3	1,641.4	2,870.4	34.2	-	39.2	68.2	25.8	99.3	2,969.6	16.0	469.9	485.8
Shortspine Thornyhead - coastwide	0.0	-	0.4	713.0	713.5	99.2	0.1	7.4	1.4	0.6	107.2	820.6	6.1	0.0	6.1
N. of 34°27'	0.0	-	0.4	526.6	527.1	16.3	0.1	0.0	1.0	0.5	16.9	543.9	6.1	0.0	6.1
S. of 34°27'	-	-	-	186.4	186.4	82.9	0.0	7.4	0.4	0.1	90.3	276.7	-	-	-
Longspine Thornyhead - coastwide	-	-	0.2	1,770.1	1,770.4	26.0	-	1.9	2.6	-	27.8	1,798.2	-	-	-
N. of 34°27'	-	-	0.2	1,770.1	1,770.4	11.8	-	1.1	2.6	-	12.9	1,783.2	-	-	-
S. of 34°27'	-	-	-	-	0.0	14.2	-	0.8	0.0	-	15.0	15.0	-	-	-
Other thornyheads	-	-	-	36.1	36.1	4.1	-	0.9	0.2	-	5.1	41.2	-	-	-
COWCOD	-	-	-	-	0.0	0.3	-	1.8	0.0	5.6	7.6	7.6	-	-	-
DARKBLOTCHED	6.9	4.2	0.6	345.7	357.5	0.8	-	0.2	7.8	-	1.0	358.5	0.0	0.0	0.0
YELLOWEYE	0.0	-	0.1	25.5	25.7	50.7	-	16.3	0.8	48.3	115.3	141.0	0.0	-	0.0
Minor Rockfish North	12.2	11.4	14.8	734.0	772.3	266.2	2.8	81.9	52.3	75.4	426.4	1,198.7	27.4	5.9	33.2
Shelf Species	1.0	4.2	10.7	418.3	434.2	243.9	2.8	35.4	44.5	10.5	292.6	726.8	27.2	5.8	33.1
Slope Species	11.2	7.2	4.1	315.5	338.0	6.7	0.0	1.5	7.9	0.0	8.2	346.2	0.1	0.0	0.1
Minor Rockfish South	0.0	0.0	0.0	123.5	123.5	63.4	4.5	279.6	13.0	1,150.6	1,498.0	1,621.5	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	35.8	35.8	32.2	0.1	77.3	10.1	653.2	762.7	798.5	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	74.8	74.8	16.3	0.3	18.5	0.7	5.6	40.7	115.4	0.0	0.0	0.0
Dover Sole	0.0	-	0.0	9,129.1	9,129.1	2.4	0.1	0.4	119.0	-	2.9	9,132.0	5.3	-	5.3
English Sole	0.0	0.0	0.1	888.0	888.1	0.0	-	0.1	33.9	-	0.1	888.1	0.3	0.0	0.3
Petrale Sole (coastwide)	-	-	0.2	1,473.2	1,473.4	0.3	-	0.1	36.1	0.1	0.5	1,473.9	0.2	-	0.2
N of 40°10'	-	-	0.2	1,224.5	1,224.7	0.2	-	-	32.5	0.0	0.2	1,224.9	0.2	-	0.2
S of 40°10'	-	-	-	248.7	248.7	0.1	-	0.1	3.6	0.1	0.3	249.0	-	-	-
Arrowtooth Flounder	2.6	0.6	3.4	5,336.8	5,343.3	1.6	0.0	0.0	14.6	-	1.7	5,345.0	6.0	3.2	9.2
Starry Flounder	-	-	-	22.2	22.2	0.0	-	0.2	25.1	4.9	5.2	27.4	-	-	-
Other Flatfish	0.0	0.0	1.5	1,882.8	1,884.3	0.4	0.0	4.7	68.2	20.9	26.0	1,910.4	0.4	0.0	0.4
Spiny Dogfish	121.5	155.4	39.8	429.6	746.3	38.4	0.2	8.9	0.0	10.5	58.0	804.3	0.4	191.8	192.2
Other Fish	0.2	0.1	0.2	318.8	319.2	101.4	-	102.6	34.3	71.8	275.7	595.0	-	0.0	0.0

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2000														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	**At-Sea Catcher-Processors**	**At Sea Motherships**	**Shoreside Whiting LE Trawl**	**Shoreside Non whiting LE Trawl**	**LE Trawl Total**	**Shoreside LE Line Gear**	**Shoreside LE Pot Gear**	**Shoreside Directed OA**	**Shoreside Incidental OA**	**Recreational**	**Non-Trawl Dir. Total**	**Non-Treaty Dir. Total**	**Shoreside**	**At-Sea**	**Treaty Totals**
Lingcod - coastwide	-	0.3	0.8	66.1	67.2	15.5	0.3	37.3	27.6	264.8	317.9	385.0	3.1	-	3.1
N. of 42° (OR & WA)	-	0.3	0.8	38.1	39.2	10.5	0.2	17.2	25.6	84.5	112.4	151.6	3.1	-	3.1
S. of 42° (CA)	-	-	0.0	28.0	28.0	5.0	0.0	20.2	2.0	180.2	205.5	233.4	-	-	-
Pacific Cod	0.2	-	0.1	274.0	274.2	1.1	-	0.0	1.8	-	1.1	275.4	2.1	0.0	2.1
PACIFIC OCEAN PERCH	6.5	2.1	0.3	135.4	144.3	0.4	-	0.0	0.4	0.0	0.4	144.7	0.0	0.0	0.0
Shortbelly Rockfish	0.9	0.0	2.3	17.1	20.3	-	-	-	-	-	0.0	20.3	-	-	-
WIDOW ROCKFISH	69.8	141.2	83.3	3,718.5	4,012.8	5.4	-	15.0	3.2	14.9	35.3	4,048.1	0.9	9.6	10.5
CANARY ROCKFISH	0.9	0.3	1.1	36.1	38.3	7.6	-	5.5	13.8	94.0	107.1	145.4	0.4	0.9	1.3
Chilipepper Rockfish	-	-	-	359.5	359.5	8.4	-	47.5	2.4	38.9	94.8	454.3	-	-	-
BOCACCIO	-	-	-	17.2	17.2	2.3	-	4.9	0.8	103.4	110.6	127.8	-	-	-
Splitnose Rockfish	-	-	-	83.5	83.5	5.2	-	0.3	0.0	-	5.5	89.0	-	-	-
Yellowtail Rockfish	269.5	227.9	190.2	2,621.9	3,309.5	3.8	-	2.4	100.4	23.9	30.1	3,339.6	35.4	99.1	134.5
Shortspine Thornyhead - coastwide	19.5	0.2	1.9	762.5	784.1	51.5	0.1	7.6	0.4	-	59.2	843.3	4.1	-	4.1
N. of 34°27'	19.5	0.2	1.9	481.9	503.4	12.0	0.1	0.4	0.2	-	12.5	515.9	4.1	-	4.1
S. of 34°27'	-	-	-	280.7	280.7	39.6	-	7.2	0.2	-	46.8	327.4	-	-	-
Longspine Thornyhead - coastwide	0.0	-	0.6	1,426.4	1,426.9	51.4	-	7.3	0.8	-	58.6	1,485.5	-	-	-
N. of 34°27'	0.0	-	0.6	1,426.4	1,426.9	31.4	-	0.4	0.8	-	31.8	1,458.7	-	-	-
S. of 34°27'	-	-	-	-	0.0	20.0	-	6.8	-	-	26.8	26.8	-	-	-
Other thornyheads	-	-	-	58.5	58.5	9.8	-	3.7	0.0	-	13.5	72.1	-	-	-
COWCOD	-	-	-	-	0.0	0.0	-	0.3	0.1	5.9	6.2	6.2	-	-	-
DARKBLOTCHED	3.8	4.7	3.7	239.0	251.1	9.5	-	0.5	1.6	-	10.1	261.2	0.0	-	0.0
YELLOWEYE	4.1	-	0.0	1.2	5.3	4.3	-	2.1	0.2	27.8	34.1	39.5	0.0	-	0.0
Minor Rockfish North	79.3	34.1	45.1	347.3	505.7	80.2	5.7	36.9	15.3	63.5	186.3	692.0	31.7	0.4	32.1
Shelf Species	1.1	30.3	30.5	52.7	114.6	24.5	0.3	6.9	5.5	6.3	37.9	152.5	22.4	0.4	22.8
Slope Species	78.3	3.8	14.5	294.2	390.8	44.3	4.8	2.5	9.0	0.1	51.8	442.6	9.3	0.0	9.3
Minor Rockfish South	0.0	0.0	0.0	175.7	175.7	73.4	0.5	168.1	9.6	859.4	1,101.4	1,277.0	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	29.6	29.6	12.1	0.0	26.6	6.4	436.8	475.5	505.0	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	145.7	145.7	42.0	0.0	7.8	0.5	2.7	52.6	198.3	0.0	0.0	0.0
Dover Sole	0.3	0.0	0.3	8,813.5	8,814.1	1.6	1.1	0.5	63.9	-	3.1	8,817.2	0.9	0.0	0.9
English Sole	0.1	0.2	0.5	743.6	744.3	0.0	-	0.0	26.2	-	0.0	744.3	0.5	0.1	0.5
Petrale Sole (coastwide)	-	-	0.2	1,849.4	1,849.6	0.4	-	0.1	50.4	0.2	0.7	1,850.3	0.0	-	0.0
N of 40°10'	-	-	0.2	1,613.6	1,613.8	0.3	-	-	47.1	0.0	0.3	1,614.2	0.0	-	0.0
S of 40°10'	-	-	-	235.8	235.8	0.1	-	0.1	3.3	0.1	0.3	236.1	-	-	-
Arrowtooth Flounder	3.8	3.1	1.9	3,277.6	3,286.5	1.0	0.9	0.1	18.4	-	2.0	3,288.5	0.2	1.9	2.0
Starry Flounder	-	-	-	25.1	25.1	0.0	-	0.3	12.2	6.0	6.2	31.4	-	-	-
Other Flatfish	5.1	1.6	0.6	1,521.8	1,529.2	0.2	-	7.5	45.4	61.4	69.2	1,598.4	0.1	0.0	0.1
Spiny Dogfish	25.6	47.9	34.6	274.5	382.6	313.9	-	4.7	2.0	10.0	328.6	711.2	2.8	37.2	40.0
Other Fish	1.1	0.1	0.3	236.5	238.1	34.7	0.0	119.1	21.4	53.4	207.1	445.2	-	0.0	0.0

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2001														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.2	0.5	0.8	58.0	59.4	16.2	1.3	57.9	17.0	243.2	318.6	378.0	4.3	-	4.3
N. of 42° (OR & WA)	0.2	0.5	0.8	31.4	32.8	12.5	1.3	28.2	14.5	96.2	138.2	171.0	4.3	-	4.3
S. of 42° (CA)	-	-	-	26.6	26.6	3.7	0.0	29.7	2.5	147.1	180.5	207.0	-	-	-
Pacific Cod	0.0	0.0	0.1	315.2	315.2	1.3	-	0.4	1.5	0.0	1.7	317.0	4.0	0.2	4.2
PACIFIC OCEAN PERCH	19.7	0.1	0.1	187.3	207.1	0.0	0.0	0.0	0.1	-	0.0	207.1	0.0	0.7	0.7
Shortbelly Rockfish	0.0	27.2	0.6	4.4	32.2	-	-	0.3	-	0.0	0.3	32.5	-	-	-
WIDOW ROCKFISH	139.7	27.7	44.3	1,729.6	1,941.3	1.3	0.0	12.9	1.4	13.8	28.0	1,969.3	7.4	3.3	10.7
CANARY ROCKFISH	0.7	1.1	1.4	23.6	26.8	7.0	0.0	4.9	3.7	45.4	57.3	84.1	2.5	2.4	4.9
Chilipepper Rockfish	-	-	-	297.3	297.3	2.9	-	27.0	0.8	51.7	81.6	379.0	-	-	-
BOCACCIO	-	-	-	13.3	13.3	2.4	-	6.0	0.5	103.1	111.6	124.9	-	-	-
Splitnose Rockfish	-	-	-	90.3	90.3	0.9	-	1.1	0.1	-	2.0	92.3	-	-	-
Yellowtail Rockfish	33.2	88.8	102.9	1,484.1	1,709.0	3.5	-	1.3	68.0	19.2	24.1	1,733.1	98.7	87.0	185.7
Shortspine Thornyhead - coastwide	15.2	0.0	0.1	471.4	486.6	50.8	0.2	1.6	0.5	-	52.5	539.2	5.0	-	5.0
N. of 34°27'	15.2	0.0	0.1	349.6	364.9	8.4	0.2	0.1	0.2	-	8.7	373.6	5.0	-	5.0
S. of 34°27'	-	-	-	121.7	121.7	42.3	-	1.5	0.3	-	43.8	165.6	-	-	-
Longspine Thornyhead - coastwide	-	-	0.0	1,131.7	1,131.7	36.9	0.0	6.5	0.7	-	43.4	1,175.2	-	-	-
N. of 34°27'	-	-	0.0	1,131.7	1,131.7	12.6	0.0	0.2	0.6	-	12.8	1,144.6	-	-	-
S. of 34°27'	-	-	-	-	0.0	24.2	-	6.4	0.1	-	30.6	30.6	-	-	-
Other thornyheads	-	-	-	21.5	21.5	22.8	-	3.4	0.2	-	26.2	47.7	-	-	-
COWCOD	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-
DARKBLOTCHED	11.5	0.6	4.7	152.5	169.3	2.2	0.0	0.3	0.4	-	2.5	171.8	0.1	-	0.1
YELLOWEYE	-	-	0.0	2.0	2.0	6.5	-	2.9	0.0	24.1	33.5	35.5	0.0	-	0.0
Minor Rockfish North	46.6	16.9	5.0	327.6	396.2	61.6	2.6	45.9	5.9	58.6	168.8	565.0	36.0	1.8	37.9
Shelf Species	0.8	14.8	2.5	188.7	206.8	20.3	0.0	4.8	3.3	6.1	31.2	238.0	10.2	1.2	11.4
Slope Species	45.8	2.1	2.6	138.4	188.9	21.8	2.6	3.8	2.3	0.0	28.2	217.1	25.8	0.7	26.5
Minor Rockfish South	0.0	0.0	0.0	214.9	214.9	65.9	0.0	171.8	8.7	740.7	978.4	1,193.3	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	22.9	22.9	9.3	0.0	16.5	4.9	264.2	290.0	312.8	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	191.7	191.7	40.3	0.0	24.1	1.3	0.6	65.0	256.8	0.0	0.0	0.0
Dover Sole	1.5	0.0	0.3	6,830.4	6,832.2	1.1	0.5	1.1	32.4	-	2.7	6,834.9	2.1	-	2.1
English Sole	0.1	0.0	1.3	958.6	959.9	0.0	-	0.3	24.1	-	0.3	960.3	3.2	0.0	3.2
Petrale Sole (coastwide)	-	-	1.8	1,775.8	1,777.7	0.5	0.0	1.0	35.7	0.1	1.6	1,779.3	0.9	-	0.9
N of 40°10'	-	-	1.8	1,508.4	1,510.2	0.5	0.0	0.0	32.3	0.0	0.6	1,510.8	0.9	-	0.9
S of 40°10'	-	-	-	267.4	267.4	-	-	1.0	3.4	0.1	1.1	268.5	-	-	-
Arrowtooth Flounder	2.7	0.9	1.3	2,450.2	2,455.1	0.6	0.4	0.6	1.6	0.0	1.6	2,456.7	0.4	0.7	1.1
Starry Flounder	-	-	-	7.3	7.3	0.0	-	0.1	15.5	380.8	380.9	388.2	0.0	-	0.0
Other Flatfish	18.0	0.5	0.8	1,596.4	1,615.7	0.2	-	8.2	76.5	44.0	52.5	1,668.2	1.7	0.0	1.7
Spiny Dogfish	67.6	6.2	12.7	332.9	419.4	216.3	-	0.7	3.7	9.3	226.3	645.7	-	153.3	153.3
Other Fish	0.5	0.2	0.1	234.1	234.9	63.2	7.1	86.8	20.3	57.7	214.7	449.6	-	-	-

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2002														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.2	0.1	0.4	102.3	102.9	10.8	1.4	68.4	13.6	606.9	687.4	790.4	11.3	-	11.3
N. of 42° (OR & WA)	0.2	0.1	0.4	65.8	66.4	6.3	1.3	30.4	11.0	129.7	167.6	234.0	11.3	-	11.3
S. of 42° (CA)	-	-	0.0	36.5	36.5	4.4	0.1	38.0	2.5	477.2	519.8	556.3	-	-	-
Pacific Cod	-	-	0.4	690.3	690.7	0.5	-	0.3	2.0	4.6	5.4	696.1	58.3	0.0	58.3
PACIFIC OCEAN PERCH	1.4	2.2	0.2	147.3	151.1	0.2	0.2	0.0	0.0	0.5	0.9	152.0	0.3	0.2	0.5
Shortbelly Rockfish	0.5	0.1	0.1	0.1	0.7	-	-	-	-	-	0.0	0.7	-	-	-
WIDOW ROCKFISH	114.8	20.4	5.1	254.9	395.3	0.0	0.0	0.5	0.4	2.9	3.4	398.6	12.7	19.5	32.2
CANARY ROCKFISH	1.6	0.8	0.5	42.3	45.2	1.6	-	0.2	1.4	16.6	18.5	63.7	3.2	2.8	6.1
Chilipepper Rockfish	-	-	-	153.8	153.8	0.5	-	3.2	0.2	12.0	15.7	169.5	-	-	-
BOCACCIO	-	-	-	17.7	17.7	0.5	-	2.7	0.4	81.5	84.8	102.5	-	-	-
Splitnose Rockfish	-	-	-	55.7	55.7	1.3	-	1.3	0.1	-	2.6	58.3	-	-	-
Yellowtail Rockfish	12.9	1.4	42.5	694.3	751.1	0.6	0.0	2.1	28.6	20.8	23.4	774.6	259.9	179.3	439.2
Shortspine Thornyhead - coastwide	11.9	0.0	0.2	665.6	677.7	102.8	0.2	2.6	1.3	1.1	106.6	784.4	4.8	0.0	4.8
N. of 34°27'	11.9	0.0	0.2	427.0	439.2	7.8	0.2	0.1	0.1	1.1	9.1	448.3	4.8	0.0	4.8
S. of 34°27'	-	-	-	238.6	238.6	95.0	-	2.5	1.2	-	97.5	336.1	-	-	-
Longspine Thornyhead - coastwide	-	-	-	1,896.7	1,896.7	12.0	0.0	2.3	0.2	-	14.2	1,910.9	-	-	-
N. of 34°27'	-	-	-	1,896.3	1,896.3	1.9	0.0	0.2	0.1	-	2.1	1,898.4	-	-	-
S. of 34°27'	-	-	-	0.5	0.5	10.0	-	2.1	0.1	-	12.1	12.5	-	-	-
Other thornyheads	-	-	-	52.2	52.2	5.3	-	0.8	0.1	-	6.1	58.2	-	-	-
COWCOD	-	-	-	0.0	0.0	0.0	-	-	-	0.6	0.6	0.6	-	-	-
DARKBLOTCHED	2.2	0.9	0.0	107.0	110.1	0.2	0.1	0.4	0.6	0.0	0.6	110.8	1.5	0.1	1.6
YELLOWEYE	0.0	-	0.0	0.9	1.0	0.0	0.0	0.0	0.3	5.4	5.4	6.4	2.2	-	2.2
Minor Rockfish North	22.4	3.2	1.0	124.2	150.8	57.8	2.2	43.5	1.6	41.2	144.7	295.5	25.7	2.2	27.8
Shelf Species	10.3	2.3	0.8	44.0	57.3	3.5	0.2	4.0	0.9	6.3	14.0	71.3	8.2	2.2	10.3
Slope Species	12.1	0.9	0.2	79.5	92.8	42.9	1.9	1.7	0.7	0.1	46.7	139.4	17.4	0.0	17.4
Minor Rockfish South	0.0	0.0	0.0	391.8	391.8	57.1	0.0	172.5	4.3	711.4	941.0	1,332.8	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	14.6	14.6	4.6	0.0	12.1	1.9	196.6	213.3	227.9	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	376.4	376.4	44.8	0.0	58.9	0.7	3.1	106.7	483.1	0.0	0.0	0.0
Dover Sole	0.6	0.0	1.6	6,317.7	6,319.9	1.0	0.7	0.3	17.1	-	1.9	6,321.8	16.1	-	16.1
English Sole	0.1	0.0	1.7	1,124.8	1,126.7	-	-	0.1	9.4	0.0	0.1	1,126.7	40.2	-	40.2
Petrale Sole (coastwide)	-	-	0.6	1,783.1	1,783.7	0.7	0.0	0.2	14.2	0.3	1.2	1,784.9	20.6	-	20.6
N of 40°10'	-	-	0.6	1,561.7	1,562.3	0.7	0.0	-	13.1	0.0	0.7	1,563.1	20.6	-	20.6
S of 40°10'	-	-	-	221.4	221.4	-	-	0.2	1.1	0.2	0.4	221.9	-	-	-
Arrowtooth Flounder	2.2	0.0	0.7	2,075.3	2,078.1	5.1	0.3	0.2	1.3	0.1	5.6	2,083.7	3.2	3.5	6.7
Starry Flounder	-	-	0.0	18.4	18.4	0.2	-	0.1	11.2	14.8	15.1	33.5	0.1	-	0.1
Other Flatfish	11.6	0.2	0.3	1,621.7	1,633.8	0.1	-	7.1	40.9	74.6	81.7	1,715.5	19.9	0.0	19.9
Spiny Dogfish	35.9	1.2	11.4	447.0	495.5	403.7	0.0	4.4	18.3	8.1	416.2	911.7	1.2	262.2	263.4
Other Fish	-	-	-	182.9	182.9	60.5	6.8	100.5	18.1	57.9	225.7	408.6	-	-	-

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2003														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.4	0.1	0.4	60.4	61.2	7.2	1.2	64.9	10.8	1,014.2	1,087.5	1,148.7	22.3	-	22.3
N. of 42° (OR & WA)	0.4	0.1	0.4	48.2	49.1	5.2	0.9	31.1	6.5	173.6	210.8	259.9	22.3	-	22.3
S. of 42° (CA)	-	-	0.0	12.2	12.2	2.0	0.3	33.8	4.3	840.6	876.7	888.9	-	-	-
Pacific Cod	0.2	-	0.0	1,040.7	1,041.0	2.3	0.0	0.5	7.0	11.0	13.8	1,054.8	213.8	0.5	214.4
PACIFIC OCEAN PERCH	5.0	0.1	0.3	131.6	137.0	0.3	0.0	0.0	0.0	1.0	1.3	138.4	0.1	1.1	1.2
Shortbelly Rockfish	0.5	0.0	0.0	0.2	0.8	-	-	0.3	-	-	0.3	1.1	-	-	-
WIDOW ROCKFISH	11.6	0.7	12.5	4.0	28.8	0.0	-	1.1	0.2	1.3	2.4	31.2	9.3	2.1	11.5
CANARY ROCKFISH	0.2	0.1	0.1	7.6	8.0	0.1	0.0	-	0.2	23.3	23.3	31.3	1.5	0.7	2.1
Chilipepper Rockfish	-	-	-	7.4	7.4	0.1	-	0.1	0.1	0.0	0.2	7.6	-	-	-
BOCACCIO	-	-	-	0.1	0.1	0.2	-	0.2	0.0	8.9	9.4	9.5	-	-	-
Splitnose Rockfish	-	-	-	150.6	150.6	0.4	-	0.1	0.0	-	0.5	151.1	-	-	-
Yellowtail Rockfish	1.7	0.6	43.9	100.4	146.7	0.5	0.0	1.3	4.7	22.8	24.6	171.3	273.2	34.0	307.1
Shortspine Thornyhead - coastwide	15.5	0.2	0.1	665.0	680.7	155.2	0.3	2.1	0.6	0.1	157.8	838.5	5.8	-	5.8
N. of 34°27'	15.5	0.2	0.1	462.2	477.9	6.7	0.3	0.0	0.2	0.1	7.1	485.0	5.8	-	5.8
S. of 34°27'	-	-	-	202.8	202.8	148.6	-	2.1	0.5	-	150.7	353.5	-	-	-
Longspine Thornyhead - coastwide	-	-	0.0	1,552.1	1,552.1	19.3	0.0	0.3	0.0	-	19.6	1,571.7	0.1	-	0.1
N. of 34°27'	-	-	0.0	1,552.1	1,552.1	8.8	0.0	0.1	0.0	-	9.0	1,561.1	0.1	-	0.1
S. of 34°27'	-	-	-	-	0.0	10.5	-	0.2	0.0	-	10.7	10.7	-	-	-
Other thornyheads	-	-	-	37.2	37.2	3.4	-	0.3	0.2	-	3.7	40.9	-	-	-
COWCOD	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-
DARKBLOTCHED	4.2	0.1	0.3	79.2	83.8	0.2	0.0	0.3	0.0	-	0.5	84.3	0.0	0.0	0.0
YELLOWEYE	0.0	-	-	1.0	1.0	0.1	0.0	0.0	0.2	7.1	7.2	8.2	0.3	-	0.3
Minor Rockfish North	24.3	1.7	10.4	148.9	185.2	31.1	3.9	29.3	0.9	46.9	111.2	296.4	22.1	0.5	22.5
Shelf Species	8.2	1.1	9.9	18.9	38.0	4.5	0.0	3.5	0.4	6.5	14.6	52.6	2.2	0.5	2.6
Slope Species	16.1	0.6	0.5	129.7	147.0	23.8	3.8	2.4	0.2	0.0	30.0	176.9	19.9	0.0	19.9
Minor Rockfish South	0.0	0.0	0.0	189.6	189.6	81.5	0.0	153.8	5.3	954.7	1,190.1	1,379.7	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	2.7	2.7	1.8	0.0	7.0	2.6	351.6	360.4	363.1	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	186.5	186.5	78.2	0.0	82.8	1.1	1.1	162.1	348.5	0.0	0.0	0.0
Dover Sole	0.9	0.0	0.0	7,458.0	7,458.9	0.8	1.3	0.5	13.0	0.0	2.5	7,461.4	32.9	-	32.9
English Sole	0.0	0.0	0.4	853.9	854.3	-	-	0.0	18.9	0.0	0.0	854.3	67.7	-	67.7
Petrale Sole (coastwide)	0.0	-	0.0	1,940.2	1,940.2	0.5	-	0.1	52.3	0.2	0.8	1,941.0	84.2	-	84.2
N of 40°10'	0.0	-	0.0	1,692.7	1,692.7	0.5	-	0.1	51.1	0.1	0.8	1,693.5	84.2	-	84.2
S of 40°10'	-	-	-	247.5	247.5	-	-	-	1.2	0.1	0.1	247.6	-	-	-
Arrowtooth Flounder	2.8	0.0	0.2	2,304.8	2,307.8	3.6	0.1	0.1	14.5	0.1	3.9	2,311.7	22.6	1.4	24.0
Starry Flounder	-	-	0.0	28.9	28.9	0.0	-	0.1	14.1	15.8	15.9	44.8	0.0	-	0.0
Other Flatfish	6.7	0.2	0.0	1,470.7	1,477.6	0.3	0.0	2.2	38.8	43.1	45.6	1,523.1	11.0	0.0	11.0
Spiny Dogfish	10.1	1.0	4.2	197.0	212.4	192.9	-	52.8	0.1	18.0	263.7	476.1	3.8	257.5	261.3
Other Fish	0.0	0.1	-	223.7	223.9	47.7	1.0	104.7	14.9	74.6	228.0	451.9	-	0.4	0.4

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2004														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.4	0.8	4.1	58.0	63.3	9.0	2.8	73.2	8.9	297.3	382.3	445.7	23.8	-	23.8
N. of 42° (OR & WA)	0.4	0.8	4.1	42.3	47.6	6.3	2.0	33.3	5.3	173.0	214.6	262.2	23.8	-	23.8
S. of 42° (CA)	-	-	0.1	15.7	15.7	2.7	0.7	39.9	3.6	124.3	167.7	183.4	-	-	-
Pacific Cod	0.0	-	1.1	1,102.1	1,103.2	4.7	0.0	0.4	0.2	11.8	16.9	1,120.1	307.7	0.0	307.7
PACIFIC OCEAN PERCH	1.0	0.1	1.0	130.2	132.2	0.0	0.0	0.0	-	-	0.1	132.3	3.9	0.0	3.9
Shortbelly Rockfish	0.0	0.0	0.0	0.1	0.1	-	-	0.0	-	-	0.0	0.1	-	-	-
WIDOW ROCKFISH	8.2	11.4	34.3	8.8	62.7	0.1	0.0	0.1	0.1	15.2	15.4	78.2	21.5	1.5	22.9
CANARY ROCKFISH	0.5	4.1	1.2	6.5	12.3	0.0	-	0.0	0.1	10.3	10.4	22.7	3.1	0.6	3.7
Chilipepper Rockfish	-	-	-	39.2	39.2	2.3	-	1.3	0.6	5.8	9.4	48.6	-	-	-
BOCACCIO	-	-	-	6.1	6.1	2.1	-	3.8	0.1	54.5	60.4	66.5	-	-	-
Splitnose Rockfish	-	-	-	163.7	163.7	0.0	-	0.1	0.0	-	0.1	163.8	-	-	-
Yellowtail Rockfish	6.3	12.2	127.5	92.9	238.8	1.2	-	2.2	8.0	34.7	38.1	276.9	351.8	28.0	379.8
Shortspine Thornyhead - coastwide	5.3	0.0	0.5	663.3	669.1	133.3	0.4	0.5	0.3	0.0	134.2	803.3	6.4	-	6.4
N. of 34°27'	5.3	0.0	0.5	438.0	443.8	5.4	0.4	0.3	0.0	-	6.1	449.9	6.4	-	6.4
S. of 34°27'	-	-	-	225.3	225.3	127.9	-	0.2	0.3	0.0	128.1	353.4	-	-	-
Longspine Thornyhead - coastwide	0.0	-	0.0	722.2	722.2	8.5	-	0.1	0.3	-	8.5	730.7	0.0	-	0.0
N. of 34°27'	0.0	-	0.0	722.2	722.2	0.9	-	0.0	0.3	-	0.9	723.1	0.0	-	0.0
S. of 34°27'	-	-	-	-	0.0	7.6	-	0.0	0.0	-	7.6	7.6	-	-	-
Other thornyheads	-	-	-	0.8	0.8	24.2	-	0.9	0.0	-	25.1	25.8	-	-	-
COWCOD	-	-	-	-	0.0	-	-	-	-	0.2	0.2	0.2	-	-	-
DARKBLOTCHED	4.4	3.0	1.9	186.6	195.9	0.2	0.0	0.5	0.0	-	0.7	196.7	0.1	-	0.1
YELLOWEYE	-	0.0	0.0	0.3	0.3	0.0	0.0	-	0.5	0.8	0.9	1.2	0.8	-	0.8
Minor Rockfish North	26.3	1.7	26.2	215.9	270.0	37.8	3.5	27.7	0.7	50.8	119.7	389.7	27.2	0.2	27.4
Shelf Species	3.2	1.4	22.3	11.7	38.7	3.4	0.2	2.5	0.5	4.6	10.7	49.4	3.9	0.2	4.0
Slope Species	23.1	0.2	3.9	202.9	230.1	32.7	3.3	3.3	0.2	0.0	39.4	269.5	23.4	0.0	23.4
Minor Rockfish South	0.0	0.0	0.0	239.9	239.9	56.7	1.0	154.3	3.0	620.5	832.5	1,072.4	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	1.8	1.8	6.4	0.0	20.9	1.4	283.8	311.1	312.9	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	238.0	238.0	48.4	1.0	51.1	0.5	0.5	101.0	338.9	0.0	0.0	0.0
Dover Sole	0.1	0.0	0.0	7,127.9	7,128.1	1.5	0.7	0.3	3.7	0.0	2.5	7,130.6	83.6	-	83.6
English Sole	0.0	0.0	0.7	886.6	887.3	-	-	0.2	5.9	-	0.2	887.5	81.1	-	81.1
Petrale Sole (coastwide)	-	-	0.3	1,904.0	1,904.3	1.1	0.0	0.1	5.2	0.5	1.6	1,905.9	84.1	-	84.1
N of 40°10'	-	-	0.3	1,638.6	1,638.9	1.1	0.0	0.1	3.8	0.1	1.3	1,640.1	84.1	-	84.1
S of 40°10'	-	-	-	265.4	265.4	-	-	-	1.4	0.3	0.3	265.7	-	-	-
Arrowtooth Flounder	1.1	0.0	0.6	2,386.3	2,388.0	1.0	0.3	0.1	0.8	0.0	1.4	2,389.5	81.9	1.8	83.7
Starry Flounder	-	-	0.0	118.3	118.3	-	-	0.1	21.3	3.4	3.4	121.7	2.3	-	2.3
Other Flatfish	1.7	0.2	0.4	1,269.3	1,271.5	0.4	-	3.8	41.0	44.9	49.2	1,320.8	17.3	0.0	17.3
Spiny Dogfish	331.6	9.8	30.3	119.2	490.9	131.4	-	91.4	0.1	2.4	225.2	716.1	40.1	273.9	314.0
Other Fish	0.7	0.3	0.2	109.6	110.7	23.9	-	101.4	11.2	63.8	189.1	299.8	-	0.4	0.4

Table 1. Landings or Deliveries of PFMC-managed Groundfish by Westcoast Fishery Sectors (mt): 1995 to 2005	2005														
	Non-Treaty Sectors												Treaty Sectors		
	LE Trawl Sectors					Non-LE Trawl Sectors									
Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	LE Trawl Total	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational	Non-Trawl Dir. Total	Non-Treaty Dir. Total	Shoreside	At-Sea	Treaty Totals
Lingcod - coastwide	0.4	2.0	5.9	77.6	85.9	11.8	2.9	70.7	3.7	489.8	575.2	661.1	29.9	1.0	30.9
N. of 42° (OR & WA)	0.4	2.0	5.9	57.3	65.6	9.0	2.2	33.5	3.1	206.2	251.0	316.6	29.9	1.0	30.9
S. of 42° (CA)	-	-	0.1	20.3	20.3	2.7	0.7	37.1	0.5	283.7	324.2	344.6	-	-	-
Pacific Cod	-	0.0	1.2	730.8	732.1	2.0	0.0	0.6	0.1	7.2	9.8	741.8	123.7	0.0	123.8
PACIFIC OCEAN PERCH	0.8	0.9	0.5	59.1	61.3	0.2	0.0	0.2	0.0	-	0.3	61.6	3.4	0.1	3.5
Shortbelly Rockfish	0.0	2.7	-	-	2.7	-	-	-	-	-	0.0	2.7	-	-	-
WIDOW ROCKFISH	43.1	35.5	76.8	3.0	158.5	0.1	0.0	0.3	0.9	3.1	3.6	162.0	28.6	1.4	30.0
CANARY ROCKFISH	0.3	0.7	2.2	5.6	8.8	0.0	-	0.1	0.0	2.3	2.4	11.2	4.3	0.4	4.7
Chilipepper Rockfish	-	-	0.1	30.2	30.3	2.9	-	0.5	0.1	3.1	6.4	36.8	-	-	-
BOCACCIO	-	-	0.0	3.7	3.7	1.6	-	1.4	0.3	33.9	37.0	40.8	-	-	-
Splitnose Rockfish	-	-	0.0	86.3	86.3	0.7	-	0.1	-	-	0.7	87.0	-	-	-
Yellowtail Rockfish	47.4	25.4	173.1	30.3	276.3	0.5	0.0	2.3	7.0	29.9	32.8	309.0	539.1	39.3	578.4
Shortspine Thornyhead - coastwide	6.3	0.7	0.3	503.9	511.2	141.7	0.3	0.5	0.2	-	142.5	653.8	10.8	-	10.8
N. of 34°27'	6.3	0.7	0.3	359.6	366.9	6.8	0.3	0.2	0.0	-	7.3	374.3	10.8	-	10.8
S. of 34°27'	-	-	-	144.3	144.3	134.9	-	0.3	0.2	-	135.2	279.5	-	-	-
Longspine Thornyhead - coastwide	-	-	0.0	631.3	631.3	15.0	-	0.0	-	-	15.0	646.3	0.2	-	0.2
N. of 34°27'	-	-	0.0	631.3	631.3	7.1	-	0.0	-	-	7.1	638.4	0.2	-	0.2
S. of 34°27'	-	-	-	-	0.0	7.9	-	-	-	-	7.9	7.9	-	-	-
Other thornyheads	-	-	-	7.9	7.9	4.7	-	0.6	-	-	5.2	13.2	-	-	-
COWCOD	-	-	-	-	0.0	-	-	0.0	-	0.0	0.0	0.0	-	-	-
DARKBLOTCHED	5.9	5.1	5.5	77.1	93.7	2.0	0.0	2.2	0.0	-	4.2	97.9	0.1	0.0	0.1
YELLOWEYE	-	-	0.0	0.3	0.3	-	-	0.0	-	1.6	1.6	1.9	0.8	-	0.8
Minor Rockfish North	40.4	17.1	31.0	108.3	196.9	56.4	3.8	45.9	0.4	78.5	184.6	381.4	38.3	0.4	38.6
Shelf Species	0.6	5.5	27.1	9.3	42.4	4.0	0.0	3.7	0.3	7.4	15.1	57.5	8.8	0.4	9.1
Slope Species	39.9	11.6	3.9	98.8	154.2	49.9	3.8	10.8	0.0	0.0	64.6	218.8	29.3	0.0	29.3
Minor Rockfish South	0.0	0.0	0.0	116.7	116.7	35.1	0.0	127.6	1.1	683.5	846.3	962.9	0.0	0.0	0.0
Shelf Species	0.0	0.0	0.0	5.8	5.8	7.5	0.0	18.0	0.7	282.2	307.7	313.5	0.0	0.0	0.0
Slope Species	0.0	0.0	0.0	110.9	110.9	26.2	0.0	29.7	0.1	0.4	56.3	167.1	0.0	0.0	0.0
Dover Sole	0.3	0.0	0.0	6,952.2	6,952.6	1.0	1.3	0.3	3.7	0.0	2.7	6,955.3	145.0	-	145.0
English Sole	0.0	0.1	0.0	867.8	867.9	-	-	-	5.2	0.0	0.0	867.9	65.9	-	65.9
Petrale Sole (coastwide)	-	-	0.0	2,753.8	2,753.8	0.3	-	0.0	11.4	0.3	0.7	2,754.5	29.7	-	29.7
N of 40°10'	-	-	0.0	2,381.3	2,381.3	0.3	-	0.0	11.4	0.0	0.3	2,381.6	29.7	-	29.7
S of 40°10'	-	-	-	372.5	372.5	-	-	0.0	0.0	0.3	0.3	372.9	-	-	-
Arrowtooth Flounder	0.8	0.5	0.9	2,120.0	2,122.1	2.3	1.4	0.9	1.7	0.0	4.6	2,126.7	158.2	2.3	160.5
Starry Flounder	-	-	0.0	25.0	25.0	-	-	-	0.3	8.9	8.9	33.9	1.3	-	1.3
Other Flatfish	2.0	1.2	0.2	1,091.0	1,094.4	0.5	-	1.9	0.9	30.5	32.9	1,127.3	46.9	-	46.9
Spiny Dogfish	42.2	27.9	95.5	126.0	291.6	229.8	-	10.3	0.7	2.7	242.9	534.5	5.9	284.9	290.8
Other Fish	0.6	1.1	0.0	99.0	100.7	29.0	0.1	97.5	0.3	100.8	227.4	328.1	-	0.5	0.5

Table 2a. Limited Entry Trawl Sector* Share (%) of Non-Treaty Landings or Deliveries (including recreational type A catch only) of PFMC-managed Groundfish: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average** Share
Lingcod - coastwide	57.8%	59.2%	58.5%	31.7%	26.7%	16.3%	15.0%	12.8%	5.3%	13.9%	12.9%	28.2%
N. of 42° (OR & WA)	73.0%	74.3%	69.7%	47.3%	39.0%	22.1%	17.7%	27.1%	18.4%	17.8%	20.5%	38.8%
S. of 42° (CA)	37.4%	36.2%	40.6%	19.3%	17.6%	11.9%	12.7%	6.5%	1.4%	8.4%	5.9%	18.0%
Pacific Cod	97.9%	97.5%	99.0%	98.7%	98.7%	98.9%	99.0%	98.9%	98.0%	98.5%	98.7%	98.5%
PACIFIC OCEAN PERCH	98.8%	98.1%	98.8%	99.8%	98.1%	99.5%	100.0%	99.4%	99.0%	100.0%	99.5%	99.2%
Shortbelly Rockfish	99.4%	98.7%	99.9%	98.6%	95.2%	100.0%	99.1%	100.0%	73.5%	97.8%	100.0%	96.6%
WIDOW ROCKFISH	98.2%	98.5%	98.2%	94.6%	97.6%	99.0%	98.5%	99.1%	91.7%	80.2%	97.3%	95.7%
CANARY ROCKFISH	68.9%	74.3%	63.3%	71.0%	65.8%	24.1%	30.5%	69.5%	25.3%	54.0%	78.7%	56.9%
Chilipepper Rockfish	78.1%	80.9%	76.0%	77.6%	84.7%	78.7%	78.3%	90.6%	96.0%	79.7%	82.2%	82.1%
BOCACCIO	45.9%	52.8%	49.1%	29.9%	17.4%	13.4%	10.6%	17.2%	1.2%	9.1%	9.1%	23.3%
Splitnose Rockfish	91.9%	98.7%	98.2%	96.0%	99.5%	93.8%	97.7%	95.5%	99.6%	99.9%	99.2%	97.3%
Yellowtail Rockfish	93.8%	92.1%	84.5%	87.0%	94.5%	96.2%	94.9%	93.5%	83.3%	83.8%	87.4%	90.1%
Shortspine Thornyhead - coastwide	97.3%	94.2%	96.0%	95.2%	86.8%	92.9%	90.2%	86.3%	81.1%	83.3%	78.2%	89.2%
N. of 34°27'	97.8%	98.0%	97.5%	97.9%	96.7%	97.5%	97.6%	97.9%	98.5%	98.6%	98.0%	97.8%
S. of 34°27'	96.4%	85.8%	92.5%	88.8%	67.3%	85.7%	73.4%	70.7%	57.3%	63.7%	51.6%	75.7%
Longspine Thornyhead - coastwide	99.0%	97.8%	97.8%	99.2%	98.3%	96.0%	96.2%	99.2%	98.7%	98.8%	97.7%	98.1%
N. of 34°27'	99.0%	98.2%	98.2%	99.7%	99.1%	97.8%	98.8%	99.9%	99.4%	99.8%	98.9%	99.0%
S. of 34°27'		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	0.4%
Other thornyheads	4.6%	39.8%	29.6%	34.2%	87.2%	81.2%	44.9%	89.5%	90.5%	3.1%	60.2%	51.3%
COWCOD	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		1.4%		0.0%	0.0%	0.2%
DARKBLOTCHED	99.1%	99.4%	99.2%	97.1%	97.6%	95.6%	98.3%	98.9%	99.4%	99.6%	95.7%	98.2%
YELLOWEYE	57.5%	49.8%	38.0%	27.7%	18.1%	13.4%	5.6%	14.4%	11.7%	19.5%	14.1%	24.5%
Minor Rockfish North	64.5%	66.0%	71.4%	70.3%	61.7%	71.5%	69.4%	50.8%	62.3%	69.2%	51.6%	64.4%
Shelf Species	58.2%	60.7%	66.2%	71.5%	56.3%	72.5%	85.7%	79.4%	71.7%	77.5%	73.3%	70.3%
Slope Species	83.1%	87.5%	96.5%	85.3%	95.5%	86.5%	86.1%	66.2%	83.0%	85.3%	70.5%	84.1%
Minor Rockfish South	27.0%	31.5%	30.0%	31.2%	7.6%	13.7%	17.9%	29.3%	13.7%	22.3%	12.1%	21.5%
Shelf Species	16.3%	17.4%	19.3%	23.6%	4.4%	5.8%	7.2%	6.4%	0.7%	0.6%	1.8%	9.4%
Slope Species	63.0%	71.9%	77.0%	67.6%	64.4%	73.3%	74.3%	77.8%	53.3%	70.1%	66.3%	69.0%
Dover Sole	99.1%	99.1%	99.3%	99.3%	98.7%	99.2%	99.5%	99.7%	99.8%	99.9%	99.9%	99.4%
English Sole	98.7%	97.3%	95.6%	97.7%	96.3%	96.6%	97.5%	99.2%	97.8%	99.3%	99.4%	97.8%
Petrale Sole (coastwide)	98.6%	98.5%	96.7%	98.2%	97.5%	97.3%	97.9%	99.1%	97.3%	99.6%	99.6%	98.2%
N of 40°10'	99.3%	98.5%	96.1%	98.5%	97.3%	97.0%	97.9%	99.1%	97.0%	99.7%	99.5%	98.2%
S of 40°10'	95.7%	98.3%	98.3%	96.9%	98.6%	98.6%	98.4%	99.3%	99.4%	99.4%	99.9%	98.4%
Arrowtooth Flounder	99.0%	99.7%	99.8%	99.8%	99.7%	99.4%	99.9%	99.7%	99.2%	99.9%	99.7%	99.6%
Starry Flounder	80.1%	60.8%	64.4%	61.3%	42.3%	57.7%	1.8%	41.1%	49.2%	82.7%	73.1%	55.9%
Other Flatfish	97.0%	93.1%	90.3%	94.8%	95.2%	93.0%	92.6%	93.0%	94.6%	93.4%	97.0%	94.0%
Spiny Dogfish	95.4%	83.0%	85.7%	99.2%	92.8%	53.6%	64.6%	53.3%	44.6%	68.5%	54.5%	72.3%
Other Fish	73.1%	43.3%	51.8%	66.0%	50.7%	51.0%	50.0%	42.9%	48.0%	35.6%	30.7%	49.4%

* "Limited Entry Trawl Sector" includes At Sea Catcher Processors, At Sea Motherships, Shoreside Whiting, and Shoreside Non-whiting Trawl sectors.
** Arithmetic average of non-empty cells in each row. Empty cell means total recorded species catch by non-treaty sectors in that year = 0.

Table 2b. Limited Entry Fixed Gear Sector* Share (%) of Non-Treaty Landings or Deliveries (including recreational type A catch only) of PFMC-managed Groundfish: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average** Share
Lingcod - coastwide	2.3%	2.7%	3.3%	3.7%	4.0%	3.8%	4.4%	1.5%	0.7%	2.6%	2.2%	2.8%
N. of 42° (OR & WA)	0.9%	0.8%	2.3%	4.6%	6.5%	6.1%	7.4%	3.1%	2.3%	3.1%	3.5%	3.7%
S. of 42° (CA)	4.2%	5.4%	4.8%	3.0%	2.2%	2.1%	1.8%	0.8%	0.3%	1.8%	1.0%	2.5%
Pacific Cod	0.2%	0.3%	0.1%	0.2%	0.4%	0.4%	0.4%	0.1%	0.2%	0.4%	0.3%	0.3%
PACIFIC OCEAN PERCH	0.5%	1.1%	0.3%	0.0%	0.2%	0.2%	0.0%	0.2%	0.3%	0.0%	0.3%	0.3%
Shortbelly Rockfish	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WIDOW ROCKFISH	0.1%	0.1%	0.1%	0.3%	0.4%	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%
CANARY ROCKFISH	6.1%	5.2%	6.3%	8.3%	7.9%	4.8%	7.9%	2.5%	0.2%	0.1%	0.0%	4.5%
Chilipepper Rockfish	0.8%	0.7%	0.7%	1.2%	1.4%	1.8%	0.8%	0.3%	1.1%	4.6%	7.8%	1.9%
BOCACCIO	0.6%	1.3%	2.6%	4.0%	2.4%	1.8%	1.9%	0.5%	2.3%	3.2%	4.0%	2.2%
Splitnose Rockfish	0.5%	0.2%	0.2%	0.0%	0.3%	5.8%	1.0%	2.2%	0.3%	0.0%	0.8%	1.0%
Yellowtail Rockfish	0.3%	0.6%	1.7%	1.5%	1.1%	0.1%	0.2%	0.1%	0.3%	0.4%	0.2%	0.6%
Shortspine Thornyhead - coastwide	1.7%	4.9%	3.6%	4.6%	12.1%	6.1%	9.4%	13.1%	18.5%	16.6%	21.7%	10.2%
N. of 34°27'	1.5%	1.7%	2.1%	1.9%	3.0%	2.3%	2.3%	1.8%	1.4%	1.3%	1.9%	1.9%
S. of 34°27'	2.0%	11.8%	7.1%	11.0%	29.9%	12.1%	25.5%	28.2%	42.0%	36.2%	48.2%	23.1%
Longspine Thornyhead - coastwide	0.5%	2.0%	1.8%	0.7%	1.4%	3.5%	3.1%	0.6%	1.2%	1.2%	2.3%	1.7%
N. of 34°27'	0.5%	1.6%	1.4%	0.2%	0.7%	2.1%	1.1%	0.1%	0.6%	0.1%	1.1%	0.9%
S. of 34°27'		98.2%	100.0%	99.1%	95.0%	74.6%	79.0%	79.2%	98.5%	99.0%	100.0%	92.2%
Other thornyheads	19.8%	44.8%	66.1%	61.1%	10.0%	13.6%	47.5%	9.1%	8.4%	93.3%	35.4%	37.2%
COWCOD	16.6%	8.6%	16.9%	13.6%	4.0%	0.6%		3.0%		0.0%	0.0%	7.0%
DARKBLOTCHED	0.3%	0.2%	0.1%	0.6%	0.2%	3.6%	1.3%	0.2%	0.3%	0.1%	2.1%	0.8%
YELLOWEYE	11.2%	17.5%	21.6%	14.8%	35.8%	10.8%	18.3%	0.4%	0.8%	2.7%	0.0%	12.2%
Minor Rockfish North	20.3%	16.1%	12.9%	15.9%	21.5%	12.2%	11.3%	20.2%	11.7%	10.6%	15.8%	15.3%
Shelf Species	23.2%	19.0%	19.3%	17.4%	32.0%	15.6%	8.4%	5.0%	8.6%	7.2%	6.9%	14.8%
Slope Species	15.3%	9.8%	2.2%	13.1%	1.9%	10.9%	11.1%	32.0%	15.6%	13.4%	24.6%	13.6%
Minor Rockfish South	6.3%	7.9%	8.2%	8.7%	4.2%	5.7%	5.5%	4.3%	5.9%	5.4%	3.6%	6.0%
Shelf Species	7.3%	7.2%	9.2%	8.5%	4.0%	2.4%	2.9%	2.0%	0.5%	2.0%	2.4%	4.4%
Slope Species	7.8%	11.5%	8.6%	12.1%	14.3%	21.2%	15.6%	9.3%	22.4%	14.6%	15.7%	13.9%
Dover Sole	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
English Sole	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
N of 40°10'	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
S of 40°10'	0.3%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Arrowtooth Flounder	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.2%	0.1%	0.2%	0.1%
Starry Flounder	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%
Other Flatfish	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Spiny Dogfish	1.3%	5.3%	0.4%	0.1%	4.8%	44.0%	33.3%	43.4%	40.5%	18.3%	42.9%	21.3%
Other Fish	5.4%	33.5%	27.1%	16.8%	16.1%	7.4%	14.9%	15.8%	10.4%	7.7%	8.9%	14.9%

* "LE Fixed Gear Sector" includes LE line gear and LE pot gear sectors.

** Arithmetic average of non-empty cells in each row. Empty cell means total recorded species catch by non-treaty sectors in that year = 0.

Table 2c. Open Access Sector* Share (%) of Non-Treaty Landings or Deliveries (including recreational type A catch only) of PFMC-managed Groundfish: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average** Share
Lingcod - coastwide	18.8%	14.9%	16.9%	15.9%	14.7%	15.7%	19.0%	10.2%	6.5%	18.1%	11.2%	14.7%
N. of 42° (OR & WA)	13.0%	13.0%	14.6%	14.9%	20.1%	24.1%	23.0%	16.9%	14.1%	14.4%	11.5%	16.3%
S. of 42° (CA)	26.5%	17.8%	20.6%	16.6%	10.7%	9.4%	15.4%	7.3%	4.3%	23.3%	10.9%	14.8%
Pacific Cod	1.9%	2.0%	0.8%	0.7%	0.7%	0.7%	0.6%	0.3%	0.7%	0.1%	0.1%	0.8%
PACIFIC OCEAN PERCH	0.7%	0.8%	0.8%	0.2%	1.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.5%
Shortbelly Rockfish	0.5%	1.1%	0.1%	1.3%	4.8%	0.0%	0.9%	0.0%	26.5%	2.2%	0.0%	3.4%
WIDOW ROCKFISH	1.6%	1.0%	1.1%	3.9%	1.3%	0.4%	0.7%	0.2%	4.2%	0.3%	0.7%	1.4%
CANARY ROCKFISH	14.0%	14.0%	18.9%	14.5%	13.8%	12.1%	9.8%	2.4%	0.8%	0.5%	0.7%	9.2%
Chilipepper Rockfish	20.7%	16.6%	19.7%	20.8%	11.3%	10.9%	7.3%	2.0%	2.8%	3.8%	1.6%	10.7%
BOCACCIO	49.1%	28.9%	15.6%	38.6%	13.2%	4.5%	5.2%	3.0%	2.4%	5.8%	4.2%	15.5%
Splitnose Rockfish	7.6%	1.1%	1.6%	4.0%	0.2%	0.4%	1.3%	2.3%	0.1%	0.0%	0.1%	1.7%
Yellowtail Rockfish	5.4%	6.7%	11.9%	9.4%	3.5%	3.0%	3.8%	3.8%	3.4%	3.6%	3.0%	5.2%
Shortspine Thornyhead - coastwide	1.0%	1.0%	0.4%	0.2%	1.1%	1.0%	0.4%	0.5%	0.3%	0.1%	0.1%	0.5%
N. of 34°27'	0.6%	0.3%	0.4%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.2%
S. of 34°27'	1.6%	2.4%	0.4%	0.2%	2.8%	2.3%	1.1%	1.1%	0.7%	0.1%	0.2%	1.2%
Longspine Thornyhead - coastwide	0.5%	0.2%	0.4%	0.1%	0.2%	0.5%	0.6%	0.1%	0.0%	0.0%	0.0%	0.3%
N. of 34°27'	0.5%	0.2%	0.4%	0.1%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%
S. of 34°27'		1.8%	0.0%	0.9%	5.0%	25.4%	21.0%	17.2%	1.5%	1.0%	0.0%	7.4%
Other thornyheads	75.6%	15.4%	4.3%	4.7%	2.9%	5.2%	7.6%	1.5%	1.1%	3.6%	4.4%	11.5%
COWCOD	74.0%	65.0%	51.8%	27.2%	23.6%	5.0%		0.0%		0.0%	9.0%	28.4%
DARKBLOTCHED	0.6%	0.4%	0.7%	2.3%	2.2%	0.8%	0.4%	0.9%	0.4%	0.3%	2.2%	1.0%
YELLOWEYE	17.5%	17.9%	24.1%	21.0%	12.0%	5.9%	8.2%	5.3%	2.1%	30.1%	1.9%	13.3%
Minor Rockfish North	13.7%	15.9%	11.6%	9.6%	10.7%	7.4%	9.1%	15.2%	10.2%	7.3%	12.1%	11.2%
Shelf Species	18.2%	20.0%	14.0%	10.4%	10.4%	7.8%	3.4%	6.8%	7.4%	6.0%	7.0%	10.1%
Slope Species	1.6%	2.6%	1.3%	1.6%	2.6%	2.6%	2.7%	1.7%	1.5%	1.3%	5.0%	2.2%
Minor Rockfish South	41.7%	28.6%	24.2%	30.6%	17.9%	13.8%	15.0%	13.2%	11.5%	14.6%	13.4%	20.4%
Shelf Species	48.8%	35.6%	27.2%	38.6%	10.8%	6.5%	6.7%	6.1%	2.6%	7.1%	6.0%	17.8%
Slope Species	28.8%	14.4%	13.0%	19.9%	16.5%	4.2%	9.9%	12.3%	24.0%	15.2%	17.8%	16.0%
Dover Sole	0.8%	0.8%	0.7%	0.7%	1.3%	0.7%	0.5%	0.3%	0.2%	0.1%	0.1%	0.6%
English Sole	1.3%	2.7%	4.4%	2.3%	3.7%	3.4%	2.5%	0.8%	2.2%	0.7%	0.6%	2.2%
Petrale Sole (coastwide)	1.3%	1.5%	3.2%	1.8%	2.4%	2.7%	2.0%	0.8%	2.7%	0.3%	0.4%	1.7%
N of 40°10'	0.6%	1.5%	3.9%	1.5%	2.7%	2.9%	2.1%	0.8%	3.0%	0.2%	0.5%	1.8%
S of 40°10'	3.9%	1.5%	1.4%	2.9%	1.4%	1.3%	1.5%	0.6%	0.5%	0.5%	0.0%	1.4%
Arrowtooth Flounder	0.9%	0.3%	0.2%	0.2%	0.3%	0.6%	0.1%	0.1%	0.6%	0.0%	0.1%	0.3%
Starry Flounder	13.8%	32.4%	32.0%	29.5%	48.3%	28.6%	3.9%	25.3%	24.0%	15.0%	0.9%	23.0%
Other Flatfish	2.3%	4.5%	7.9%	4.3%	3.7%	3.2%	4.9%	2.7%	2.6%	3.3%	0.2%	3.6%
Spiny Dogfish	0.2%	7.0%	13.1%	0.3%	1.1%	0.9%	0.7%	2.4%	11.1%	12.8%	2.1%	4.7%
Other Fish	8.0%	18.6%	15.1%	10.6%	21.7%	30.1%	22.8%	27.8%	25.6%	36.2%	29.8%	22.4%

* "Open Access Sector" includes Directed OA and Incidental OA sectors.

** Arithmetic average of non-empty cells in each row. Empty cell means total recorded species catch by non-treaty sectors in that year = 0.

Table 2d. Recreational Sector* Share (%) of Non-Treaty Landings or Deliveries (including recreational type A catch only) of PFMC-managed Groundfish: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average** Share
Lingcod - coastwide	21.2%	23.3%	21.4%	48.8%	54.6%	64.2%	61.6%	75.5%	87.5%	65.4%	73.7%	54.3%
N. of 42° (OR & WA)	13.1%	11.9%	13.4%	33.2%	34.5%	47.7%	51.9%	52.9%	65.2%	64.7%	64.5%	41.2%
S. of 42° (CA)	32.0%	40.5%	34.1%	61.1%	69.5%	76.5%	70.2%	85.4%	94.1%	66.5%	82.2%	64.7%
Pacific Cod	0.0%	0.1%	0.1%	0.4%	0.1%	0.0%	0.0%	0.7%	1.0%	1.0%	1.0%	0.4%
PACIFIC OCEAN PERCH	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%	0.7%	0.0%	0.0%	0.1%
Shortbelly Rockfish	0.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
WIDOW ROCKFISH	0.1%	0.4%	0.6%	1.2%	0.8%	0.4%	0.7%	0.7%	4.1%	19.4%	1.9%	2.8%
CANARY ROCKFISH	11.1%	6.6%	11.6%	6.3%	12.4%	59.0%	51.7%	25.6%	73.7%	45.4%	20.5%	29.5%
Chilipepper Rockfish	0.4%	1.8%	3.6%	0.4%	2.6%	8.5%	13.6%	7.1%	0.1%	11.9%	8.4%	5.3%
BOCACCIO	4.4%	17.0%	32.6%	27.5%	66.9%	80.3%	82.2%	79.3%	94.1%	81.9%	82.7%	59.0%
Splitnose Rockfish	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Yellowtail Rockfish	0.6%	0.6%	1.9%	2.1%	0.9%	0.7%	1.1%	2.6%	12.9%	12.2%	9.5%	4.1%
Shortspine Thornyhead - coastwide	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
N. of 34°27'	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
S. of 34°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%
Longspine Thornyhead - coastwide	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
N. of 34°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%
S. of 34°27'		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other thornyheads	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
COWCOD	9.4%	26.3%	31.3%	59.2%	72.5%	94.4%		95.6%		100.0%	91.0%	64.4%
DARKBLOTCHED	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YELLOWEYE	13.8%	14.8%	16.3%	36.5%	34.1%	70.0%	67.9%	79.9%	85.4%	47.8%	84.0%	50.0%
Minor Rockfish North	1.5%	2.0%	4.1%	4.2%	6.0%	9.0%	10.3%	13.9%	15.8%	13.0%	20.6%	9.1%
Shelf Species	0.4%	0.2%	0.5%	0.6%	1.4%	4.0%	2.5%	8.8%	12.3%	9.3%	12.8%	4.8%
Slope Species	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Minor Rockfish South	24.9%	32.0%	37.5%	29.5%	70.4%	66.8%	61.6%	53.2%	68.9%	57.7%	70.9%	52.1%
Shelf Species	27.6%	39.8%	44.4%	29.3%	80.8%	85.4%	83.1%	85.6%	96.1%	90.3%	89.8%	68.4%
Slope Species	0.4%	2.2%	1.4%	0.4%	4.8%	1.4%	0.2%	0.6%	0.3%	0.1%	0.2%	1.1%
Dover Sole	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
English Sole	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
N of 40°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%
S of 40°10'	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%
Arrowtooth Flounder	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Starry Flounder	6.1%	6.7%	3.6%	9.2%	9.4%	13.7%	94.3%	33.1%	26.9%	2.3%	26.0%	21.0%
Other Flatfish	0.6%	2.4%	1.7%	0.8%	1.1%	3.7%	2.5%	4.2%	2.8%	3.3%	2.7%	2.4%
Spiny Dogfish	3.1%	4.7%	0.8%	0.4%	1.3%	1.4%	1.4%	0.9%	3.8%	0.3%	0.5%	1.7%
Other Fish	13.5%	4.6%	6.0%	6.7%	11.4%	11.4%	12.3%	13.6%	16.0%	20.5%	30.7%	13.3%

* "Recreational Sector" includes Washington, Oregon and Calfornia sport fisheries for Council-managed groundfish.

** Arithmetic average of non-empty cells in each row. Empty cell means total recorded species catch by non-treaty sectors in that year = 0.

Table 3. Maximum, Minimum and Average Shares (%) of Non-Treaty Landings or Deliveries of PFMC-managed Groundfish by West Coast Fishery Sectors: 1995 to 2005.

MAXIMUM shares (%)

Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational
Lingcod - coastwide	0.08%	0.30%	0.91%	59.14%	4.10%	0.61%	16.11%	6.70%	87.47%
N. of 42° (OR & WA)	0.15%	0.63%	1.83%	74.25%	6.73%	0.76%	15.23%	14.44%	65.19%
S. of 42° (CA)	-	-	0.08%	40.55%	5.41%	0.39%	25.19%	2.00%	94.11%
Pacific Cod	0.07%	0.01%	0.20%	99.00%	0.45%	0.01%	0.21%	1.93%	1.05%
PACIFIC OCEAN PERCH	9.51%	3.10%	3.74%	98.41%	1.10%	0.11%	0.29%	1.65%	0.72%
Shortbelly Rockfish	67.69%	99.69%	67.78%	98.85%	0.09%	-	26.54%	4.77%	0.18%
WIDOW ROCKFISH	36.78%	21.78%	47.15%	92.82%	0.37%	0.01%	3.68%	0.61%	19.44%
CANARY ROCKFISH	3.00%	18.08%	19.88%	74.09%	8.26%	0.03%	17.05%	8.68%	73.69%
Chilipepper Rockfish	-	-	-	96.03%	7.83%	-	20.23%	1.18%	13.62%
BOCACCIO	-	-	-	52.82%	4.01%	-	48.63%	1.11%	94.10%
Splitnose Rockfish	-	-	-	99.93%	5.82%	-	7.47%	0.66%	-
Yellowtail Rockfish	15.01%	11.25%	54.77%	86.45%	1.68%	0.00%	4.61%	7.27%	12.94%
Shortspine Thornyhead - coastwide	2.81%	0.11%	0.22%	97.01%	21.67%	0.05%	0.90%	0.19%	0.14%
N. of 34°27'	4.06%	0.20%	0.36%	97.78%	3.00%	0.09%	0.42%	0.26%	0.24%
S. of 34°27'	-	-	-	96.41%	48.22%	0.00%	2.66%	0.36%	0.02%
Longspine Thornyhead - coastwide	0.00%	0.00%	0.05%	99.25%	3.46%	0.00%	0.56%	0.14%	-
N. of 34°27'	0.00%	0.00%	0.05%	99.89%	2.15%	0.00%	0.50%	0.14%	-
S. of 34°27'	-	-	-	3.58%	100.00%	-	25.43%	0.89%	-
Other thornyheads	-	-	-	90.49%	93.35%	0.01%	75.41%	1.22%	-
COWCOD	-	-	-	1.43%	16.93%	-	71.26%	4.41%	100.00%
DARKBLOTCHED	6.68%	5.21%	5.61%	98.85%	3.63%	0.05%	2.25%	2.13%	0.00%
YELLOWEYE	10.30%	0.24%	0.47%	57.43%	35.78%	0.60%	23.83%	30.07%	85.45%
Minor Rockfish North	11.21%	4.82%	8.13%	68.96%	21.28%	1.30%	14.64%	8.30%	20.56%
Shelf Species	15.44%	19.15%	46.81%	78.23%	31.63%	0.36%	10.97%	11.75%	12.82%
Slope Species	20.90%	5.28%	3.21%	92.32%	30.64%	2.15%	4.95%	2.22%	0.06%
Minor Rockfish South	-	-	-	31.55%	8.57%	0.27%	40.62%	1.06%	70.91%
Shelf Species	-	-	-	23.65%	9.20%	0.02%	46.95%	2.10%	96.12%
Slope Species	-	-	-	77.79%	22.36%	0.29%	28.60%	0.56%	4.84%
Dover Sole	0.02%	0.00%	0.04%	99.91%	0.03%	0.02%	0.03%	1.29%	0.00%
English Sole	0.01%	0.02%	0.15%	99.39%	0.00%	-	0.17%	4.39%	0.00%
Petrale Sole (coastwide)	0.00%	0.00%	0.10%	99.63%	0.08%	0.00%	0.43%	3.23%	0.04%
N of 40°10'	0.00%	0.00%	0.12%	99.68%	0.06%	0.00%	0.01%	3.89%	0.01%
S of 40°10'	-	-	-	99.90%	0.29%	-	1.94%	2.81%	0.19%
Arrowtooth Flounder	0.12%	0.09%	0.06%	99.83%	0.24%	0.06%	0.04%	0.86%	0.00%
Starry Flounder	-	-	0.04%	82.68%	0.42%	-	0.58%	47.84%	94.33%
Other Flatfish	1.03%	0.11%	0.25%	97.02%	0.07%	0.00%	0.47%	7.59%	4.25%
Spiny Dogfish	46.30%	24.71%	17.85%	62.60%	44.02%	0.02%	13.00%	1.97%	4.69%
Other Fish	0.23%	0.33%	0.07%	73.04%	33.50%	1.60%	32.59%	5.45%	30.71%

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Table 3. Maximum, Minimum and Average Shares (%) of Non-Treaty Landings or Deliveries of PFMC-managed Groundfish by West Coast Fishery Sectors: 1995 to 2005.

MINIMUM shares (%)

Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational
Lingcod - coastwide	-	-	0.01%	5.20%	0.62%	0.01%	5.59%	0.55%	21.16%
N. of 42° (OR & WA)	-	-	0.01%	15.83%	0.83%	0.01%	7.47%	0.97%	11.88%
S. of 42° (CA)	-	-	-	1.36%	0.22%	-	3.78%	0.16%	31.96%
Pacific Cod	-	-	0.00%	97.40%	0.07%	-	0.01%	0.02%	-
PACIFIC OCEAN PERCH	0.29%	0.03%	0.02%	90.41%	0.00%	-	0.00%	-	-
Shortbelly Rockfish	-	-	0.00%	0.00%	-	-	-	-	-
WIDOW ROCKFISH	1.08%	1.40%	1.28%	1.87%	0.00%	-	0.11%	0.07%	0.09%
CANARY ROCKFISH	0.01%	0.02%	0.05%	22.64%	0.05%	-	-	0.03%	6.29%
Chilipepper Rockfish	-	-	-	75.96%	0.27%	-	1.24%	0.11%	0.09%
BOCACCIO	-	-	-	1.18%	0.52%	-	2.23%	0.14%	4.42%
Splitnose Rockfish	-	-	-	91.92%	0.00%	-	0.04%	0.00%	-
Yellowtail Rockfish	0.99%	0.18%	5.30%	9.58%	0.07%	-	0.07%	2.21%	0.56%
Shortspine Thornyhead - coastwide	0.00%	-	0.01%	77.04%	1.69%	0.00%	0.06%	0.04%	-
N. of 34°27'	0.00%	-	0.01%	93.36%	1.20%	0.01%	0.00%	0.00%	-
S. of 34°27'	-	-	-	51.58%	1.99%	-	0.05%	0.02%	-
Longspine Thornyhead - coastwide	-	-	-	95.96%	0.48%	-	0.00%	0.00%	-
N. of 34°27'	-	-	-	97.72%	0.10%	-	0.00%	0.00%	-
S. of 34°27'	-	-	-	-	74.57%	-	-	-	-
Other thornyheads	-	-	-	3.06%	8.38%	-	0.73%	0.00%	-
COWCOD	-	-	-	-	-	-	-	-	9.37%
DARKBLOTCHED	0.22%	0.09%	0.01%	78.78%	0.06%	-	0.02%	0.00%	-
YELLOWEYE	-	-	-	3.07%	0.00%	-	-	0.00%	13.78%
Minor Rockfish North	0.52%	0.18%	0.11%	28.36%	9.67%	0.08%	5.22%	0.11%	1.51%
Shelf Species	0.02%	0.07%	0.14%	16.02%	4.79%	0.00%	2.00%	0.59%	0.25%
Slope Species	1.78%	0.08%	0.04%	45.16%	1.89%	-	0.27%	0.01%	0.00%
Minor Rockfish South	-	-	-	7.56%	3.64%	-	11.10%	0.11%	24.94%
Shelf Species	-	-	-	0.57%	0.50%	-	1.92%	0.24%	27.60%
Slope Species	-	-	-	53.33%	7.81%	-	3.93%	0.06%	0.13%
Dover Sole	-	-	0.00%	98.68%	0.01%	0.00%	0.00%	0.05%	-
English Sole	-	0.00%	0.00%	95.55%	-	-	0.00%	0.60%	-
Petrale Sole (coastwide)	-	-	0.00%	96.61%	0.01%	-	0.00%	0.27%	0.00%
N of 40°10'	-	-	0.00%	96.05%	0.00%	-	-	0.23%	0.00%
S of 40°10'	-	-	-	95.69%	-	-	-	0.01%	-
Arrowtooth Flounder	0.00%	0.00%	0.01%	98.96%	0.01%	0.00%	0.00%	0.03%	-
Starry Flounder	-	-	-	1.81%	-	-	0.00%	0.88%	2.35%
Other Flatfish	0.00%	0.00%	0.00%	90.11%	0.01%	-	0.14%	0.08%	0.64%
Spiny Dogfish	2.12%	0.13%	0.02%	16.64%	0.10%	-	0.11%	0.00%	0.34%
Other Fish	-	-	-	30.16%	5.43%	-	6.60%	0.08%	4.57%

Table 3. Maximum, Minimum and Average Shares (%) of Non-Treaty Landings or Deliveries of PFMC-managed Groundfish by West Coast Fishery Sectors: 1995 to 2005.

AVERAGE shares (%) (average of annual percentages)

Stock or Complex	At-Sea Catcher-Processors	At Sea Motherships	Shoreside Whiting LE Trawl	Shoreside Non-whiting LE Trawl	Shoreside LE Line Gear	Shoreside LE Pot Gear	Shoreside Directed OA	Shoreside Incidental OA	Recreational
Lingcod - coastwide	0.02%	0.07%	0.23%	27.87%	2.66%	0.17%	11.56%	3.14%	54.28%
N. of 42° (OR & WA)	0.05%	0.14%	0.44%	38.19%	3.39%	0.30%	10.83%	5.50%	41.17%
S. of 42° (CA)	-	-	0.01%	17.97%	2.42%	0.07%	13.54%	1.24%	64.74%
Pacific Cod	0.01%	0.00%	0.07%	98.45%	0.28%	0.00%	0.10%	0.69%	0.40%
PACIFIC OCEAN PERCH	2.43%	0.91%	1.26%	94.55%	0.26%	0.02%	0.09%	0.36%	0.11%
Shortbelly Rockfish	13.58%	20.47%	9.60%	52.90%	0.01%	-	2.76%	0.64%	0.04%
WIDOW ROCKFISH	11.00%	5.38%	14.95%	64.38%	0.13%	0.00%	1.15%	0.25%	2.76%
CANARY ROCKFISH	0.88%	2.52%	2.64%	50.82%	4.48%	0.00%	6.70%	2.51%	29.45%
Chilipepper Rockfish	-	-	0.02%	82.04%	1.93%	-	10.12%	0.58%	5.31%
BOCACCIO	-	-	0.00%	23.26%	2.24%	-	15.01%	0.49%	59.00%
Splitnose Rockfish	-	-	0.00%	97.27%	1.03%	-	1.58%	0.12%	-
Yellowtail Rockfish	5.18%	6.27%	18.01%	60.64%	0.58%	0.00%	1.37%	3.86%	4.09%
Shortspine Thornyhead - coastwide	0.98%	0.02%	0.05%	88.18%	10.20%	0.02%	0.44%	0.11%	0.02%
N. of 34°27'	1.59%	0.03%	0.08%	96.14%	1.90%	0.04%	0.10%	0.10%	0.03%
S. of 34°27'	-	-	-	75.74%	23.08%	0.00%	1.06%	0.11%	0.00%
Longspine Thornyhead - coastwide	0.00%	0.00%	0.01%	98.06%	1.66%	0.00%	0.21%	0.05%	-
N. of 34°27'	0.00%	0.00%	0.01%	98.96%	0.87%	0.00%	0.10%	0.05%	-
S. of 34°27'	-	-	-	0.36%	92.24%	-	7.19%	0.21%	-
Other thornyheads	-	-	-	51.33%	37.18%	0.00%	11.11%	0.38%	-
COWCOD	-	-	-	0.16%	7.04%	-	27.19%	1.22%	64.39%
DARKBLOTCHED	3.04%	1.18%	1.15%	92.80%	0.81%	0.01%	0.47%	0.55%	0.00%
YELLOWEYE	0.99%	0.02%	0.10%	23.40%	12.11%	0.07%	9.77%	3.51%	50.04%
Minor Rockfish North	5.31%	1.52%	2.81%	54.78%	14.78%	0.53%	8.74%	2.41%	9.12%
Shelf Species	3.65%	3.99%	12.49%	50.16%	14.63%	0.17%	6.49%	3.62%	4.80%
Slope Species	8.92%	1.29%	1.17%	72.75%	12.82%	0.81%	1.28%	0.94%	0.02%
Minor Rockfish South	-	-	-	21.49%	5.91%	0.06%	19.74%	0.66%	52.14%
Shelf Species	-	-	-	9.41%	4.39%	0.00%	16.57%	1.24%	68.38%
Slope Species	-	-	-	69.00%	13.83%	0.07%	15.74%	0.26%	1.10%
Dover Sole	0.00%	0.00%	0.01%	99.40%	0.02%	0.01%	0.01%	0.54%	0.00%
English Sole	0.00%	0.00%	0.06%	97.69%	0.00%	-	0.03%	2.21%	0.00%
Petrale Sole (coastwide)	0.00%	0.00%	0.03%	98.19%	0.04%	0.00%	0.06%	1.67%	0.02%
N of 40°10'	0.00%	0.00%	0.04%	98.17%	0.02%	0.00%	0.00%	1.77%	0.00%
S of 40°10'	-	-	-	98.42%	0.07%	-	0.29%	1.14%	0.07%
Arrowtooth Flounder	0.06%	0.03%	0.04%	99.50%	0.07%	0.01%	0.01%	0.29%	0.00%
Starry Flounder	-	-	0.01%	55.86%	0.05%	-	0.24%	22.80%	21.03%
Other Flatfish	0.25%	0.03%	0.06%	93.66%	0.03%	0.00%	0.30%	3.30%	2.36%
Spiny Dogfish	14.21%	9.08%	4.15%	44.86%	21.31%	0.00%	4.41%	0.29%	1.69%
Other Fish	0.08%	0.05%	0.02%	49.21%	14.60%	0.31%	19.42%	2.97%	13.33%

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Table 4a. Limited Entry Trawl Sector* Landings or Deliveries as a Share (%) of Associated OYs: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum share (%)	Minimum share (%)	Average share (%)
Lingcod - coastwide	44.58%	50.20%	48.79%	25.99%	29.76%	17.77%	9.72%	17.84%	9.41%	8.62%	3.56%	50.20%	3.56%	24.20%
N. of 42° (OR & WA)											3.64%	3.64%	3.64%	3.64%
S. of 42° (CA)											3.32%	3.32%	3.32%	3.32%
Pacific Cod								21.58%	32.53%	34.47%	45.75%	45.75%	21.58%	33.59%
PACIFIC OCEAN PERCH	68.94%	114.46%	89.72%	100.83%	90.01%	53.45%	68.33%	43.18%	36.35%	29.78%	13.71%	114.46%	13.71%	64.43%
Shortbelly Rockfish	0.17%	0.18%	0.34%	0.09%	0.03%	0.15%	0.23%	0.01%	0.01%	0.00%	0.02%	0.34%	0.00%	0.11%
WIDOW ROCKFISH	101.29%	95.57%	101.09%	80.46%	80.58%	92.61%	84.41%	46.18%	3.46%	22.09%	55.60%	101.29%	3.46%	69.39%
CANARY ROCKFISH	79.56%	114.04%	79.59%	86.72%	60.37%	19.17%	28.81%	48.65%	18.16%	25.95%	18.82%	114.04%	18.16%	52.71%
Chilipepper Rockfish					21.03%	17.97%	14.87%	7.69%	0.37%	1.96%	1.52%	21.03%	0.37%	9.34%
BOCACCIO	19.19%	16.22%	56.97%	24.31%	13.61%	17.21%	13.34%	17.69%	0.56%	2.43%	1.22%	56.97%	0.56%	16.61%
Splitnose Rockfish					23.69%	13.58%	19.59%	12.08%	32.66%	35.51%	18.72%	35.51%	12.08%	22.26%
Yellowtail Rockfish	77.10%	84.74%	66.32%	83.04%	83.56%	93.51%	54.32%	23.88%	4.66%	5.53%	7.09%	93.51%	4.66%	53.07%
Shortspine Thornyhead - coastwide	124.08%	100.94%	101.38%	91.34%	53.85%	68.48%	64.80%	70.97%	71.28%	68.07%	51.18%	124.08%	51.18%	78.76%
N. of 34°27'											36.73%	36.73%	36.73%	36.73%
S. of 34°27'														
Longspine Thornyhead - coastwide											23.77%	23.77%	23.77%	23.77%
N. of 34°27'	88.57%	79.19%	64.20%	54.21%	43.16%	34.79%	45.99%	77.05%	63.07%	29.35%	25.65%	88.57%	25.65%	55.02%
S. of 34°27'				0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	0.23%	0.00%	0.03%
Other thornyheads														
COWCOD						0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.18%	0.00%	0.03%
DARKBLOTCHED							130.20%	65.55%	48.73%	81.64%	34.82%	130.20%	34.82%	72.19%
YELLOWEYE								7.15%	4.41%	1.53%	1.00%	7.15%	1.00%	3.52%
Minor Rockfish North	37.81%	42.38%	54.71%	53.33%	33.22%	13.26%	12.63%	4.84%	8.23%	12.00%	8.75%	54.71%	4.84%	25.56%
Shelf Species											4.38%	4.38%	4.38%	4.38%
Slope Species											13.29%	13.29%	13.29%	13.29%
Minor Rockfish South	6.10%	8.27%	10.30%	9.92%	4.99%	9.25%	10.54%	19.44%	9.41%	12.19%	5.93%	19.44%	4.99%	9.67%
Shelf Species											0.81%	0.81%	0.81%	0.81%
Slope Species											17.35%	17.35%	17.35%	17.35%
Dover Sole	76.30%	110.06%	91.55%	85.53%	96.85%	93.51%	89.00%	84.94%	100.25%	95.81%	93.00%	110.06%	76.30%	92.44%
English Sole									27.56%	28.62%	28.00%	28.62%	27.56%	28.06%
Petrale Sole (coastwide)									68.90%	67.36%	99.70%	99.70%	67.36%	78.66%
N of 40°10'														
S of 40°10'														
Arrowtooth Flounder									39.79%	41.17%	36.59%	41.17%	36.59%	39.18%
Starry Flounder														
Other Flatfish									19.19%	16.51%	22.29%	22.29%	16.51%	19.33%
Spiny Dogfish														
Other Fish									1.52%	0.75%	1.38%	1.52%	0.75%	1.22%

* "Limited Entry Trawl Sector" includes At Sea Catcher Processors, At Sea Motherships, Shoreside Whiting, and Shoreside Non-whiting Trawl sectors.

Table 4b. Limited Entry Fixed-Gear Sector* Landings or Deliveries as a Share (%) of Associated OYs: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum share (%)	Minimum share (%)	Average share (%)
Lingcod - coastwide	1.77%	2.25%	2.73%	3.03%	4.45%	4.17%	2.86%	2.11%	1.29%	1.60%	0.61%	4.45%	0.61%	2.44%
N. of 42° (OR & WA)											0.62%	0.62%	0.62%	0.62%
S. of 42° (CA)											0.56%	0.56%	0.56%	0.56%
Pacific Cod								0.01%	0.07%	0.15%	0.12%	0.15%	0.01%	0.09%
PACIFIC OCEAN PERCH	0.32%	1.32%	0.27%	0.02%	0.20%	0.13%	0.00%	0.10%	0.09%	0.00%	0.04%	1.32%	0.00%	0.23%
Shortbelly Rockfish	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%
WIDOW ROCKFISH	0.13%	0.12%	0.14%	0.25%	0.31%	0.13%	0.06%	0.00%	0.00%	0.04%	0.03%	0.31%	0.00%	0.11%
CANARY ROCKFISH	7.00%	7.97%	7.93%	10.10%	7.28%	3.81%	7.50%	1.74%	0.17%	0.03%	0.01%	10.10%	0.01%	4.87%
Chilipepper Rockfish					0.35%	0.42%	0.15%	0.02%	0.00%	0.11%	0.14%	0.42%	0.00%	0.17%
BOCACCIO	0.25%	0.39%	3.05%	3.26%	1.90%	2.32%	2.36%	0.54%	1.08%	0.85%	0.54%	3.26%	0.25%	1.50%
Splitnose Rockfish					0.07%	0.84%	0.21%	0.28%	0.09%	0.01%	0.14%	0.84%	0.01%	0.23%
Yellowtail Rockfish	0.23%	0.53%	1.32%	1.40%	1.00%	0.11%	0.11%	0.02%	0.02%	0.03%	0.01%	1.40%	0.01%	0.43%
Shortspine Thornyhead - coastwide	2.16%	5.22%	3.80%	4.43%	7.49%	4.51%	6.78%	10.79%	16.29%	13.60%	14.21%	16.29%	2.16%	8.12%
N. of 34°27'											0.71%	0.71%	0.71%	0.71%
S. of 34°27'														
Longspine Thornyhead - coastwide											0.56%	0.56%	0.56%	0.56%
N. of 34°27'	0.43%	1.32%	0.94%	0.11%	0.29%	0.76%	0.51%	0.08%	0.36%	0.04%	0.29%	1.32%	0.04%	0.47%
S. of 34°27'				2.55%	3.31%	4.66%	12.44%	5.14%	5.38%	3.88%	4.04%	12.44%	2.55%	5.17%
Other thornyheads														
COWCOD						0.76%	0.00%	0.38%	0.00%	0.00%	0.00%	0.76%	0.00%	0.19%
DARKBLOTCHED							1.71%	0.14%	0.13%	0.09%	0.75%	1.71%	0.09%	0.57%
YELLOWEYE								0.19%	0.29%	0.21%	0.00%	0.29%	0.00%	0.18%
Minor Rockfish North	11.90%	10.35%	9.91%	12.05%	11.57%	2.25%	2.05%	1.93%	1.55%	1.83%	2.68%	12.05%	1.55%	6.19%
Shelf Species											0.41%	0.41%	0.41%	0.41%
Slope Species											4.63%	4.63%	4.63%	4.63%
Minor Rockfish South	1.43%	2.07%	2.82%	2.76%	2.74%	3.89%	3.23%	2.83%	4.05%	2.93%	1.78%	4.05%	1.43%	2.78%
Shelf Species											1.05%	1.05%	1.05%	1.05%
Slope Species											4.10%	4.10%	4.10%	4.10%
Dover Sole	0.02%	0.04%	0.02%	0.02%	0.03%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.02%	0.03%
English Sole									0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Petrale Sole (coastwide)									0.02%	0.04%	0.01%	0.04%	0.01%	0.02%
N of 40°10'														
S of 40°10'														
Arrowtooth Flounder									0.06%	0.02%	0.06%	0.06%	0.02%	0.05%
Starry Flounder														
Other Flatfish									0.00%	0.01%	0.01%	0.01%	0.00%	0.01%
Spiny Dogfish														
Other Fish									0.33%	0.16%	0.40%	0.40%	0.16%	0.30%

* "Limited Entry Fixed Gear Sector" includes LE line gear and LE pot gear sectors.

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Table 4c. Open Access Sector* Landings or Deliveries as a share (%) of associated OYs: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum share (%)	Minimum share (%)	Average share (%)
Lingcod - coastwide	14.47%	12.64%	14.11%	13.02%	16.38%	17.19%	12.26%	14.20%	11.62%	11.18%	3.08%	17.19%	3.08%	12.74%
N. of 42° (OR & WA)											2.04%	2.04%	2.04%	2.04%
S. of 42° (CA)											6.16%	6.16%	6.16%	6.16%
Pacific Cod								0.07%	0.23%	0.02%	0.04%	0.23%	0.02%	0.09%
PACIFIC OCEAN PERCH	0.51%	0.92%	0.76%	0.22%	1.57%	0.16%	0.02%	0.01%	0.01%	0.01%	0.04%	1.57%	0.01%	0.38%
Shortbelly Rockfish	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%
WIDOW ROCKFISH	1.60%	0.94%	1.10%	3.34%	1.04%	0.42%	0.62%	0.10%	0.16%	0.07%	0.42%	3.34%	0.07%	0.89%
CANARY ROCKFISH	16.11%	21.42%	23.73%	17.69%	12.62%	9.64%	9.23%	1.69%	0.56%	0.24%	0.17%	23.73%	0.17%	10.28%
Chilipepper Rockfish					2.81%	2.50%	1.39%	0.17%	0.01%	0.09%	0.03%	2.81%	0.01%	1.00%
BOCACCIO	20.53%	8.87%	18.12%	31.32%	10.32%	5.76%	6.58%	3.06%	1.16%	1.54%	0.56%	31.32%	0.56%	9.80%
Splitnose Rockfish					0.05%	0.05%	0.26%	0.30%	0.04%	0.02%	0.02%	0.30%	0.02%	0.10%
Yellowtail Rockfish	4.43%	6.19%	9.32%	8.97%	3.13%	2.90%	2.20%	0.97%	0.19%	0.24%	0.24%	9.32%	0.19%	3.53%
Shortspine Thornyhead - coastwide	1.24%	1.04%	0.41%	0.19%	0.66%	0.70%	0.28%	0.41%	0.29%	0.08%	0.08%	1.24%	0.08%	0.49%
N. of 34°27'											0.02%	0.02%	0.02%	0.02%
S. of 34°27'														
Longspine Thornyhead - coastwide											0.00%	0.00%	0.00%	0.00%
N. of 34°27'	0.49%	0.17%	0.26%	0.06%	0.09%	0.03%	0.03%	0.01%	0.01%	0.01%	0.00%	0.49%	0.00%	0.11%
S. of 34°27'				0.02%	0.18%	1.59%	3.32%	1.12%	0.08%	0.04%	0.00%	3.32%	0.00%	0.79%
Other thornyheads														
COWCOD						6.57%	0.00%	0.00%	0.00%	0.00%	0.05%	6.57%	0.00%	1.10%
DARKBLOTCHED							0.56%	0.60%	0.19%	0.21%	0.82%	0.82%	0.19%	0.48%
YELLOWEYE								2.62%	0.80%	2.36%	0.14%	2.62%	0.14%	1.48%
Minor Rockfish North	8.00%	10.18%	8.87%	7.32%	5.77%	1.37%	1.65%	1.45%	1.34%	1.26%	2.06%	10.18%	1.26%	4.48%
Shelf Species											0.42%	0.42%	0.42%	0.42%
Slope Species											0.93%	0.93%	0.93%	0.93%
Minor Rockfish South	9.40%	7.49%	8.31%	9.71%	11.82%	9.36%	8.85%	8.78%	7.89%	7.99%	6.54%	11.82%	6.54%	8.74%
Shelf Species											2.63%	2.63%	2.63%	2.63%
Slope Species											4.66%	4.66%	4.66%	4.66%
Dover Sole	0.64%	0.91%	0.66%	0.56%	1.27%	0.68%	0.44%	0.23%	0.18%	0.05%	0.05%	1.27%	0.05%	0.52%
English Sole									0.61%	0.20%	0.17%	0.61%	0.17%	0.33%
Petrale Sole (coastwide)									1.90%	0.19%	0.42%	1.90%	0.19%	0.83%
N of 40°10'														
S of 40°10'														
Arrowtooth Flounder									0.25%	0.02%	0.04%	0.25%	0.02%	0.10%
Starry Flounder														
Other Flatfish									0.53%	0.58%	0.06%	0.58%	0.06%	0.39%
Spiny Dogfish														
Other Fish									0.81%	0.77%	1.34%	1.34%	0.77%	0.97%

* "Open Access Sector" includes Directed OA and Incidental OA sectors.

Table 4d. Recreational Sector* Landings or Deliveries (type A only) as a Share (%) of Associated OYs: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum share (%)	Minimum share (%)	Average share (%)
Lingcod - coastwide	16.32%	19.74%	17.83%	40.06%	60.95%	70.04%	39.81%	105.18%	155.80%	40.45%	20.29%	155.80%	16.32%	53.31%
N. of 42° (OR & WA)											11.45%	11.45%	11.45%	11.45%
S. of 42° (CA)											46.35%	46.35%	46.35%	46.35%
Pacific Cod								0.14%	0.34%	0.37%	0.45%	0.45%	0.14%	0.33%
PACIFIC OCEAN PERCH	0.00%	0.03%	0.07%	0.00%	0.00%	0.00%	0.00%	0.15%	0.26%	0.00%	0.00%	0.26%	0.00%	0.05%
Shortbelly Rockfish	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%
WIDOW ROCKFISH	0.09%	0.37%	0.65%	1.05%	0.65%	0.34%	0.60%	0.34%	0.15%	5.36%	1.10%	5.36%	0.09%	0.97%
CANARY ROCKFISH	12.79%	10.07%	14.57%	7.69%	11.41%	47.00%	48.83%	17.89%	52.89%	21.83%	4.92%	52.89%	4.92%	22.72%
Chilipepper Rockfish					0.65%	1.95%	2.59%	0.60%	0.00%	0.29%	0.15%	2.59%	0.00%	0.89%
BOCACCIO	1.85%	5.23%	37.80%	22.33%	52.25%	103.38%	103.14%	81.55%	44.69%	21.81%	11.05%	103.38%	1.85%	44.10%
Splitnose Rockfish					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellowtail Rockfish	0.47%	0.51%	1.49%	2.05%	0.75%	0.68%	0.61%	0.66%	0.72%	0.80%	0.77%	2.05%	0.47%	0.87%
Shortspine Thornyhead - coastwide	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.11%	0.01%	0.00%	0.00%	0.11%	0.00%	0.02%
N. of 34°27'											0.00%	0.00%	0.00%	0.00%
S. of 34°27'														
Longspine Thornyhead - coastwide											0.00%	0.00%	0.00%	0.00%
N. of 34°27'	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%
S. of 34°27'				0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Other thornyheads														
COWCOD						122.88%	0.00%	12.04%	0.00%	5.04%	0.55%	122.88%	0.00%	23.42%
DARKBLOTCHED							0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
YELLOWEYE								39.67%	32.32%	3.76%	5.98%	39.67%	3.76%	20.43%
Minor Rockfish North	0.88%	1.26%	3.15%	3.20%	3.24%	1.66%	1.87%	1.32%	2.09%	2.26%	3.49%	3.49%	0.88%	2.22%
Shelf Species											0.77%	0.77%	0.77%	0.77%
Slope Species											0.00%	0.00%	0.00%	0.00%
Minor Rockfish South	5.62%	8.40%	12.86%	9.39%	46.49%	45.26%	36.31%	35.30%	47.38%	31.53%	34.73%	47.38%	5.62%	28.48%
Shelf Species											39.53%	39.53%	39.53%	39.53%
Slope Species											0.06%	0.06%	0.06%	0.06%
Dover Sole	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%
English Sole									0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Petrale Sole (coastwide)									0.01%	0.02%	0.01%	0.02%	0.01%	0.01%
N of 40°10'														
S of 40°10'														
Arrowtooth Flounder									0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Starry Flounder														
Other Flatfish									0.56%	0.58%	0.62%	0.62%	0.56%	0.59%
Spiny Dogfish														
Other Fish									0.51%	0.43%	1.38%	1.38%	0.43%	0.77%

* "Recreational Sector" includes Washington, Oregon and California sport fisheries for Council-managed groundfish.

Table 4e. Treaty Sector* Landings or Deliveries as a Share (%) of Associated OYs: 1995 to 2005.

Stock or Complex	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum share (%)	Minimum share (%)	Average share (%)
Lingcod - coastwide	0.00%	0.05%	0.03%	0.28%	0.44%	0.82%	0.70%	1.95%	3.43%	3.24%	1.28%	3.43%	0.00%	1.11%
N. of 42° (OR & WA)											1.71%	1.71%	1.71%	1.71%
S. of 42° (CA)											0.00%	0.00%	0.00%	0.00%
Pacific Cod								1.82%	6.70%	9.62%	7.73%	9.62%	1.82%	6.47%
PACIFIC OCEAN PERCH	0.00%	0.00%	0.87%	0.06%	0.20%	0.02%	0.24%	0.13%	0.31%	0.88%	0.78%	0.88%	0.00%	0.32%
Shortbelly Rockfish	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%
WIDOW ROCKFISH	0.00%	0.18%	0.15%	0.30%	0.73%	0.24%	0.46%	3.76%	1.38%	8.08%	10.52%	10.52%	0.00%	2.35%
CANARY ROCKFISH	0.00%	0.01%	0.17%	0.30%	0.57%	0.66%	5.28%	6.52%	4.86%	7.82%	10.01%	10.01%	0.00%	3.29%
Chilipepper Rockfish					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BOCACCIO	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%
Splitnose Rockfish					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellowtail Rockfish	0.00%	1.51%	4.43%	5.30%	14.14%	3.80%	5.90%	13.96%	9.76%	8.79%	14.84%	14.84%	0.00%	7.50%
Shortspine Thornyhead - coastwide	0.47%	0.48%	0.56%	0.28%	0.46%	0.36%	0.66%	0.50%	0.60%	0.66%	1.08%	1.08%	0.28%	0.56%
N. of 34°27'											1.08%	1.08%	1.08%	1.08%
S. of 34°27'														
Longspine Thornyhead - coastwide											0.01%	0.01%	0.01%	0.01%
N. of 34°27'	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.01%	0.01%	0.00%	0.00%
S. of 34°27'				0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Other thornyheads														
COWCOD						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DARKBLOTCHED							0.08%	0.93%	0.02%	0.06%	0.04%	0.93%	0.02%	0.23%
YELLOWEYE								16.57%	1.22%	3.59%	3.19%	16.57%	1.22%	6.14%
Minor Rockfish North	1.13%	0.87%	1.04%	1.10%	1.43%	0.84%	1.21%	0.89%	1.00%	1.22%	1.72%	1.72%	0.84%	1.13%
Shelf Species											0.94%	0.94%	0.94%	0.94%
Slope Species											2.53%	2.53%	2.53%	2.53%
Minor Rockfish South	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%
Shelf Species											0.00%	0.00%	0.00%	0.00%
Slope Species											0.00%	0.00%	0.00%	0.00%
Dover Sole	0.01%	0.01%	0.01%	0.02%	0.06%	0.01%	0.03%	0.22%	0.44%	1.12%	1.94%	1.94%	0.01%	0.35%
English Sole									2.18%	2.61%	2.13%	2.61%	2.13%	2.31%
Petrale Sole (coastwide)									3.05%	3.05%	1.07%	3.05%	1.07%	2.39%
N of 40°10'														
S of 40°10'														
Arrowtooth Flounder									0.41%	1.44%	2.77%	2.77%	0.41%	1.54%
Starry Flounder														
Other Flatfish									0.14%	0.23%	0.95%	0.95%	0.14%	0.44%
Spiny Dogfish														
Other Fish									0.00%	0.00%	0.01%	0.01%	0.00%	0.00%

* "Treaty Sector" includes shoreside landings and at-sea deliveries of Council-managed groundfish species.

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Table 5a. Total Catch (mt) of Groundfish Species and Stock Complexes by Non-Treaty Sector in 2003.

Stock or Complex	2003 Total Catch															
	LE Trawl						LE Fixed Gear			Directed OA			Recreational			Total Catch All Non-treaty Sectors
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting Landings	Shoreside Non-whiting Discard mort.	Shoreside Non-whiting Total	Landing	Discard mort.	Total	Landing	Discard mort.	Total	Landing	Discard mort.	Total	
Lingcod - coastwide	0.4	0.1	0.4	60.4	70.3	130.7	8.4	1.0	9.4	64.9	3.1	68.0	1,014.2	194.1	1,208.3	1,417.2
N. of 42° (OR & WA)	0.4	0.1	0.4	48.2	61.8	110.0	6.1	1.0	7.1	31.1	2.2	33.3	173.6	35.4	209.1	360.3
S. of 42° (CA)	-	-	0.0	12.2	8.6	20.7	2.3	0.0	2.3	33.8	0.9	34.7	840.6	158.6	999.2	1,057.0
Pacific Cod	0.2	-	0.0	1,040.7	30.9	1,071.6	2.3	1.1	3.4	0.5	0.3	0.7	11.0	0.8	11.8	1,087.8
PACIFIC OCEAN PERCH	5.0	0.1	0.3	131.6	12.2	143.8	0.3	0.0	0.4	0.0	0.0	0.0	1.0	-	1.0	150.6
Shortbelly Rockfish	0.5	0.0	0.0	0.2	0.5	0.7	0.0	0.0	0.0	0.3	0.0	0.3	-	-	0.0	1.6
WIDOW ROCKFISH	11.6	0.7	12.5	4.0	0.1	4.1	0.0	0.3	0.3	1.1	0.1	1.3	1.3	-	1.3	31.8
CANARY ROCKFISH	0.2	0.1	0.1	7.6	20.1	27.7	0.1	0.2	0.3	-	1.7	1.7	23.3	6.3	29.6	59.7
Chilipepper Rockfish	-	-	-	7.4	7.1	14.5	0.1	0.0	0.1	0.1	0.0	0.1	0.0	-	0.0	14.7
BOCACCIO	-	-	-	0.1	2.4	2.5	0.2	0.0	0.2	0.2	0.9	1.1	8.9	1.9	10.8	14.6
Splitnose Rockfish	-	-	-	150.6	51.1	201.7	0.4	0.1	0.6	0.1	0.1	0.2	-	-	0.0	202.5
Yellowtail Rockfish	1.7	0.6	43.9	100.4	1.0	101.4	0.5	0.1	0.6	1.3	0.0	1.4	22.8	0.2	23.0	172.6
Shortspine Thornyhead - coastwide	15.5	0.2	0.1	665.0	472.8	1,137.8	155.6	15.8	171.3	2.1	12.1	14.2	0.1	-	0.1	1,339.2
N. of 34°27'	15.5	0.2	0.1	462.2		462.2	7.0		7.0	0.0		0.0	0.1	-	0.1	485.0
S. of 34°27'	-	-	-	202.8		202.8	148.6		148.6	2.1		2.1	-	-	0.0	353.5
Longspine Thornyhead - coastwide	-	-	0.0	1,552.1	289.8	1,841.9	19.3	7.1	26.4	0.3	5.5	5.8	-	-	0.0	1,874.2
N. of 34°27'	-	-	0.0	1,552.1		1,552.1	8.8		8.8	0.1		0.1	-	-	0.0	1,561.1
S. of 34°27'	-	-	-	-		0.0	10.5		10.5	0.2		0.2	-	-	0.0	10.7
Other thornyheads	-	-	-	37.2		37.2	3.4		3.4	0.3		0.3	-	-	0.0	40.9
COWCOD	-	-	-	-	0.1	0.1	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.1
DARKBLOTCHED	4.2	0.1	0.3	79.2	88.0	167.3	0.2	0.2	0.4	0.3	0.1	0.4	-	-	0.0	172.6
YELLOWEYE	0.0	-	-	1.0	0.2	1.2	0.1	1.6	1.7	0.0	2.3	2.3	7.1	3.1	10.2	15.4
Minor Rockfish North	24.3	1.7	10.4	148.9		148.9	34.9		34.9	29.3		29.3	46.9	0.8	47.8	297.3
Shelf Species	8.2	1.1	9.9	18.9	108.9	127.8	4.6	3.7	8.3	3.5	0.9	4.4	6.5	0.2	6.7	166.4
Slope Species	16.1	0.6	0.5	129.7	120.7	250.4	27.6	3.4	31.0	2.4	0.9	3.2	0.0	-	0.0	301.9
Minor Rockfish South	0.0	0.0	0.0	189.6		189.6	81.5		81.5	153.8		153.8	954.7	50.9	1,005.7	1,430.6
Shelf Species	0.0	0.0	0.0	2.7	2.3	5.0	1.8	0.2	2.0	7.0	0.2	7.2	351.6	13.8	365.4	379.6
Slope Species	0.0	0.0	0.0	186.5	5.0	191.4	78.2	0.2	78.4	82.8	0.2	83.0	1.1	-	1.1	353.9
Dover Sole	0.9	0.0	0.0	7,458.0	756.3	8,214.3	2.0	4.2	6.2	0.5	2.2	2.7	0.0	-	0.0	8,224.1
English Sole	0.0	0.0	0.4	853.9	533.1	1,387.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	1,387.5
Petrale Sole (coastwide)	0.0	-	0.0	1,940.2	106.2	2,046.4	0.5	0.0	0.6	0.1	0.0	0.1	0.2	-	0.2	2,047.3
N of 40°10'	0.0	-	0.0	1,692.7	100.9	1,793.6	0.5	0.0	0.6	0.1	0.0	0.1	0.1	-	0.1	1,794.5
S of 40°10'	-	-	-	247.5	5.2	252.7	0.0	0.0	0.0	-	0.0	0.0	0.1	-	0.1	252.8
Arrowtooth Flounder	2.8	0.0	0.2	2,304.8	7,122.2	9,427.0	3.7	24.4	28.1	0.1	6.2	6.3	0.1	-	0.1	9,464.6
Starry Flounder	-	-	0.0	28.9	1.3	30.2	0.0	0.0	0.0	0.1	0.0	0.1	15.8	-	15.8	46.1
Other Flatfish	6.7	0.2	0.0	1,470.7	850.0	2,320.6	0.3	0.0	0.3	2.2	0.0	2.2	43.1	8.7	51.8	2,381.8
Spiny Dogfish	10.1	1.0	4.2	197.0	668.1	865.1	192.9	73.6	266.5	52.8	22.2	75.0	18.0	-	18.0	1,240.0
Other Fish	0.0	0.1	-	223.7	4,434.6	4,658.3	48.7	31.7	80.4	104.7	40.7	145.5	74.6	1.1	75.7	4,960.0

Table 5b. Total Catch (mt) of Groundfish Species and Stock Complexes by Non-Treaty Sector in 2004.

Stock or Complex	2004 Total Catch															
	LE Trawl						LE Fixed Gear			Directed OA			Recreational			Total Catch
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting												All Non-treaty
				Landings	Discard mort.	Total	Landings	Discard mort.	Total	Landings	Discard mort.	Total	Landings	Discard mort.	Total	Sectors
Lingcod - coastwide	0.4	0.8	4.1	58.0	91.7	149.7	11.7	0.9	12.6	73.2	3.5	76.7	297.3	8.5	305.9	550.3
N. of 42° (OR & WA)	0.4	0.8	4.1	42.3	78.5	120.8	8.3	0.8	9.1	33.3	2.3	35.6	173.0	3.2	176.2	347.1
S. of 42° (CA)	-	-	0.1	15.7	13.2	28.9	3.4	0.1	3.5	39.9	1.2	41.1	124.3	5.3	129.7	203.2
Pacific Cod	0.0	-	1.1	1,102.1	6.6	1,108.7	4.7	6.8	11.5	0.4	1.1	1.5	11.8	0.5	12.3	1,135.1
PACIFIC OCEAN PERCH	1.0	0.1	1.0	130.2	24.2	154.4	0.0	0.0	0.1	0.0	0.0	0.1	-	-	0.0	156.5
Shortbelly Rockfish	0.0	0.0	0.0	0.1	4.6	4.7	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	4.8
WIDOW ROCKFISH	8.2	11.4	34.3	8.8	5.1	13.9	0.1	1.1	1.2	0.1	0.2	0.3	15.2	0.0	15.3	84.6
CANARY ROCKFISH	0.5	4.1	1.2	6.5	9.2	15.7	0.0	0.1	0.2	0.0	1.9	2.0	10.3	6.0	16.3	39.9
Chilipepper Rockfish	-	-	-	39.2	126.9	166.1	2.3	0.0	2.3	1.3	0.0	1.3	5.8	0.1	6.0	175.7
BOCACCIO	-	-	-	6.1	7.0	13.0	2.1	0.0	2.1	3.8	1.1	4.9	54.5	8.0	62.5	82.5
Splitnose Rockfish	-	-	-	163.7	149.7	313.4	0.0	0.0	0.0	0.1	0.0	0.1	-	-	0.0	313.5
Yellowtail Rockfish	6.3	12.2	127.5	92.9	86.4	179.4	1.2	1.0	2.2	2.2	0.2	2.4	34.7	1.2	35.9	365.7
Shortspine Thornyhead - coastwide	5.3	0.0	0.5	663.3	207.5	870.8	133.7	7.9	141.6	0.5	3.3	3.8	0.0	-	0.0	1,021.9
N. of 34°27'	5.3	0.0	0.5	438.0		438.0	5.8		5.8	0.3		0.3	-	-	0.0	449.9
S. of 34°27'	-	-	-	225.3		225.3	127.9		127.9	0.2		0.2	0.0	-	0.0	353.4
Longspine Thornyhead - coastwide	0.0	-	0.0	722.2	128.0	850.2	8.5	0.2	8.6	0.1	0.1	0.1	-	-	0.0	859.0
N. of 34°27'	0.0	-	0.0	722.2		722.2	0.9		0.9	0.0		0.0	-	-	0.0	723.1
S. of 34°27'	-	-	-	-		0.0	7.6		7.6	0.0		0.0	-	-	0.0	7.6
Other thornyheads	-	-	-	0.8		0.8	24.2		24.2	0.9		0.9	-	-	0.0	25.8
COWCOD	-	-	-	-	0.6	0.6	0.0	0.0	0.0	-	0.0	0.0	0.2	0.2	0.5	1.1
DARKBLOTCHED	4.4	3.0	1.9	186.6	38.0	224.6	0.2	0.4	0.7	0.5	0.1	0.6	-	-	0.0	235.2
YELLOWEYE	-	0.0	0.0	0.3	0.4	0.8	0.0	1.4	1.4	-	2.3	2.3	0.8	6.3	7.2	11.6
Minor Rockfish North	26.3	1.7	26.2	215.9		215.9	41.3		41.3	27.7		27.7	50.8	2.2	52.9	391.9
Shelf Species	3.2	1.4	22.3	11.7	41.3	53.1	3.6	8.7	12.3	2.5	1.4	3.9	4.6	0.2	4.9	101.1
Slope Species	23.1	0.2	3.9	202.9	39.0	242.0	36.0	9.7	45.7	3.3	1.6	4.9	0.0	-	0.0	319.8
Minor Rockfish South	0.0	0.0	0.0	239.9		239.9	57.6		57.6	154.3		154.3	620.5	10.0	630.5	1,082.4
Shelf Species	0.0	0.0	0.0	1.8	11.8	13.6	6.4	0.0	6.4	20.9	0.0	20.9	283.8	5.1	288.9	329.9
Slope Species	0.0	0.0	0.0	238.0	5.9	243.8	49.4	0.0	49.4	51.1	0.0	51.1	0.5	0.0	0.5	344.8
Dover Sole	0.1	0.0	0.0	7,127.9	371.9	7,499.9	2.2	1.6	3.8	0.3	0.5	0.9	0.0	-	0.0	7,504.7
English Sole	0.0	0.0	0.7	886.6	199.2	1,085.8	0.0	0.0	0.0	0.2	0.0	0.2	-	-	0.0	1,086.7
Petrale Sole (coastwide)	-	-	0.3	1,904.0	80.4	1,984.4	1.1	0.0	1.1	0.1	0.0	0.1	0.5	-	0.5	1,986.3
N of 40°10'	-	-	0.3	1,638.6	68.9	1,707.5	1.1	0.0	1.1	0.1	0.0	0.1	0.1	-	0.1	1,709.1
S of 40°10'	-	-	-	265.4	11.5	276.9	0.0	0.0	0.0	-	0.0	0.0	0.3	-	0.3	277.2
Arrowtooth Flounder	1.1	0.0	0.6	2,386.3	3,211.4	5,597.7	1.3	28.5	29.9	0.1	4.6	4.7	0.0	-	0.0	5,634.0
Starry Flounder	-	-	0.0	118.3	23.5	141.8	0.0	0.0	0.0	0.1	0.0	0.1	3.4	-	3.4	145.2
Other Flatfish	1.7	0.2	0.4	1,269.3	498.3	1,767.6	0.4	0.0	0.5	3.8	0.0	3.8	44.9	2.4	47.3	1,821.5
Spiny Dogfish	331.6	9.8	30.3	119.2	588.0	707.2	131.4	168.0	299.3	91.4	27.5	118.9	2.4	0.0	2.4	1,499.6
Other Fish	0.7	0.3	0.2	109.6	2,707.1	2,816.7	23.9	77.7	101.6	101.4	18.5	119.9	63.8	16.3	80.1	3,119.4

Table 5c. Total Catch (mt) of Groundfish Species and Stock Complexes by Non-Treaty Sector in 2005.

Stock or Complex	2005 Total Catch															
	LE Trawl						LE Fixed Gear			Directed OA			Recreational			Total Catch All Non-treaty Sectors
	At-sea Catcher-Processors	At-sea Motherships	Shoreside Whiting	Shoreside Non-whiting												
				Landings	Discard mort.	Total	Landings	Discard mort.	Total	Landings	Discard mort.	Total	Landings	Discard mort.	Total	
Lingcod - coastwide	0.4	2.0	5.9	77.6	191.7	269.3	14.7	1.8	16.5	70.7	4.1	74.8	489.8	19.1	509.0	877.9
N. of 42° (OR & WA)	0.4	2.0	5.9	57.3	181.9	239.2	11.2	1.8	13.0	33.5	2.7	36.3	206.2	3.0	209.2	506.0
S. of 42° (CA)	0.0	-	0.1	20.3	9.9	30.1	3.4	0.0	3.5	37.1	1.4	38.5	283.7	16.1	299.8	371.9
Pacific Cod	-	0.0	1.2	730.8	4.5	735.4	2.0	1.7	3.7	0.6	0.5	1.1	7.2	0.5	7.7	749.1
PACIFIC OCEAN PERCH	0.8	0.9	0.5	59.1	10.8	69.9	0.2	0.2	0.4	0.2	0.1	0.2	-	-	0.0	72.7
Shortbelly Rockfish	0.0	2.7	-	-	1.1	1.1	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	3.8
WIDOW ROCKFISH	43.1	35.5	76.8	3.0	3.3	6.4	0.1	0.6	0.7	0.3	0.3	0.6	3.1	0.1	3.2	166.3
CANARY ROCKFISH	0.3	0.7	2.2	5.6	21.6	27.1	0.0	0.1	0.1	0.1	1.7	1.7	2.3	6.8	9.1	41.4
Chilipepper Rockfish	-	-	0.1	30.2	51.7	82.0	2.9	0.0	2.9	0.5	0.0	0.5	3.1	0.5	3.6	89.0
BOCACCIO	-	-	0.0	3.7	27.7	31.4	1.6	0.0	1.6	1.4	0.0	1.5	33.9	4.2	38.1	72.7
Splitnose Rockfish	-	-	0.0	86.3	143.9	230.2	0.7	0.0	0.7	0.1	0.0	0.1	-	-	0.0	230.9
Yellowtail Rockfish	47.4	25.4	173.1	30.3	28.6	58.9	0.5	0.3	0.8	2.3	0.1	2.4	29.9	3.0	32.9	341.0
Shortspine Thornyhead - coastwide	6.3	0.7	0.3	503.9	138.0	641.9	142.0	0.8	142.8	0.5	0.3	0.8	-	-	0.0	792.9
N. of 34°27'	6.3	0.7	0.3	359.6		359.6	7.1		7.1	0.2		0.2	-	-	0.0	374.3
S. of 34°27'	-	-	-	144.3		144.3	134.9		134.9	0.3		0.3	-	-	0.0	279.5
Longspine Thornyhead - coastwide	-	-	0.0	631.3	95.1	726.4	15.0	0.0	15.0	0.0	0.0	0.0	-	-	0.0	741.4
N. of 34°27'	-	-	0.0	631.3		631.3	7.1		7.1	0.0		0.0	-	-	0.0	638.4
S. of 34°27'	-	-	-	-		0.0	7.9		7.9	-		0.0	-	-	0.0	7.9
Other thornyheads	-	-	-	7.9		7.9	4.7		4.7	0.6		0.6	-	-	0.0	13.2
COWCOD	-	-	-	-	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.6
DARKBLOTCHED	5.9	5.1	5.5	77.1	23.7	100.8	2.0	0.4	2.4	2.2	0.2	2.4	-	-	0.0	122.1
YELLOWEYE	-	-	0.0	0.3	0.6	0.9	0.0	0.7	0.7	0.0	1.6	1.7	1.6	9.4	11.0	14.3
Minor Rockfish North	40.4	17.1	31.0	108.3		108.3	60.2		60.2	45.9		45.9	78.5	3.8	82.3	385.2
Shelf Species	0.6	5.5	27.1	9.3	74.8	84.0	4.0	10.8	14.8	3.7	3.3	7.0	7.4	0.3	7.7	146.7
Slope Species	39.9	11.6	3.9	98.8	22.3	121.2	53.7	13.4	67.2	10.8	4.2	15.0	0.0	-	0.0	258.7
Minor Rockfish South	0.0	0.0	0.0	116.7		116.7	35.1		35.1	127.6		127.6	683.5	15.0	698.5	977.9
Shelf Species	0.0	0.0	0.0	5.8	6.3	12.1	7.5	0.0	7.5	18.0	0.0	18.1	282.2	8.4	290.6	328.3
Slope Species	0.0	0.0	0.0	110.9	4.7	115.5	26.2	0.0	26.2	29.7	0.1	29.7	0.4	0.0	0.4	171.9
Dover Sole	0.3	0.0	0.0	6,952.2	672.6	7,624.7	2.4	2.6	5.0	0.3	1.1	1.4	0.0	-	0.0	7,631.6
English Sole	0.0	0.1	0.0	867.8	338.7	1,206.5	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	1,206.6
Petrale Sole (coastwide)	-	-	0.0	2,753.8	59.3	2,813.1	0.3	0.0	0.3	0.0	0.0	0.1	0.3	-	0.3	2,813.9
N of 40°10'	-	-	0.0	2,381.3	55.7	2,437.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	-	0.0	2,437.4
S of 40°10'	-	-	-	372.5	3.6	376.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-	0.3	376.5
Arrowtooth Flounder	0.8	0.5	0.9	2,120.0	1,423.2	3,543.2	3.7	62.7	66.4	0.9	20.0	20.9	0.0	-	0.0	3,632.6
Starry Flounder	-	-	0.0	25.0	1.0	26.0	0.0	0.0	0.0	-	0.0	0.0	8.9	0.1	9.0	35.1
Other Flatfish	2.0	1.2	0.2	1,091.0	845.4	1,936.5	0.5	0.0	0.5	1.9	0.0	1.9	30.5	1.3	31.8	1,974.0
Spiny Dogfish	42.2	27.9	95.5	126.0	1,104.9	1,230.9	229.8	111.3	341.1	10.3	38.3	48.6	2.7	0.1	2.8	1,789.2
Other Fish	0.6	1.1	0.0	99.0	2,410.0	2,509.0	29.1	95.4	124.5	97.5	32.2	129.6	100.8	0.5	101.3	2,866.2

Notes:

- Sources: PacFIN, RecFIN and NorPac downloads. PacFIN source files are <ext_trips_pfmc_mg.dat.XX> where "XX" is the two-digit year 1995-2005. These files have a unique record for each vessel-day-SPID delivery to a given buyer code. Species codes (SPIDs) have been been adjusted by PacFIN using estimated species composition distributions for certain market categories. PacFIN records include roundweight of landings. RecFIN records include estimated weight of retained plus observed discarded dead (A+B1). NorPac records include observed total catch (retained plus discards) for the at-sea
- Recreational entries include estimated weight of retained catch (type A only). Recreational data is divided into four regions: WA, OR, Northern CA (34° 27' N. latitude and north to OR border), and Southern CA (34° 27' and south to Mexico border). Note that this division is different than the 40°10' N. latitude line used for managing commercial catch of rockfish species. However since groundfish recreational angler effort and catch in CA is concentrated south of 40°10' N. latitude, for 1995 - 2003, all catch of "minor rockfish" species in both the Northern CA and Southern CA regions is included as "minor rockfish-south". For 2004 and 2005, catch recorded using new more detailed geographical strata was used to split Northern CA catch of Minor Rockfish north and
- Recreational totals were provided by the states and include RecFIN ocean, shore and estuary (including SF Bay but excluding Puget Sound) catch of Council-managed species. Oregon shore and estuary boat survey, which was conducted from July 2003 – June 2005, is not currently in the RecFIN database. In order to estimate this mortality, the average mortality of the shore and estuary catch from 1998-2002 was calculated and prorated.
- "Shoreside Directed OA" is defined as commercial landings where gear used was not endorsed by an LE permit, where at least 50% of the total round weight was groundfish and less than 100 lbs was pink shrimp, and one or more of the following gear types were used: hook and line gear (longlines, vertical hook and line, setline, pole, jig, and bottom troll gear), fish pots, dive gear, or set net gear.
- "Shoreside Incidental OA" is defined as commercial landings containing groundfish where other types of gear such as shrimp trawl, seine, drift net, salmon troll, crab pot, or exempt trawl gear were used. This category includes all groundfish landings by vessels targeting Pink Shrimp, whether or not they held an LE trawl permit, and excludes landings records where groundfish outweighed California halibut.
- Numerous occurances of large PacFIN landings by non-LE endorsed vessels were investigated. These landings were concentrated from 1995 to 1999. While investigation showed some of these to actually be LE landings, the vast majority were by Canadian vessels delivering to WA ports. These records
- Species and species groups listed in the tables are adapted from the ABC/OY tables in the 2007-2008 Groundfish Specifications EIS.
- "Other Flatfish" includes all the unassessed flatfish species in the Groundfish FMP. These include butter sole (Isopsetta isolepis), curlfin sole (Pleuronichthys decurrens), flathead sole (Hippoglossoides elassodon), Pacific sanddab (Citharichthys sordidus), rex sole (Glyptocephalus zachirus), rock sole (Lepidopsetta bilineata), and sand sole (Psettichthys melanostictus).
- "Other Fish" contains all the unassessed Groundfish FMP species that are neither rockfish (family Scorpaenidae) nor flatfish. These species include big skate (Raja binoculata), California skate (Raja inornata), leopard shark (Triakis semifasciata), longnose skate (Raja rhina), soupfin shark (Galeorhinus zyopterus), finescale codling (Antimora microlepis), Pacific rattail (Coryphaenoides acrolepis), ratfish (Hydrolagus colliei), and cabezon (Scorpaenichthys marmoratus) north of the California-Oregon border at 42° N latitude. "Other Fish" does not include spiny dogfish, kelp greenling or cabezon in California.
- The Minor Nearshore Rockfish complex north of 40°10' N latitude includes the following species: black and yellow rockfish (S. chrysomelas); blue rockfish (S. mystinus); brown rockfish (S. auriculatus); calico rockfish (S. dalli); China rockfish (S. nebulosus); copper rockfish (S. caurinus); gopher rockfish (S. carnatus); grass rockfish (S. rastrelliger); kelp rockfish (S. atrovirens); olive rockfish (S. serranoides); quillback rockfish (S. maliger); and

- The Minor Shelf Rockfish complex north of 40°10' N latitude includes the following species: bronzespotted rockfish (S. gilli); bocaccio (Sebastes paucispinis); chameleon rockfish (S. phillipsi); chilipepper rockfish (S. goodei); cowcod (S. levis); dusky rockfish (S. ciliatus); dwarf-red rockfish (S. rufianus); flag rockfish (S. rubrivinctus); freckled rockfish (S. lentiginosus); greenblotched rockfish (S. rosenblatti); greenspotted rockfish (S. chlorostictus); greenstriped rockfish (S. elongatus); halfbanded rockfish (S. semicinctus); harlequin rockfish (S. variegatus); honeycomb rockfish (S. umbrosus); Mexican rockfish (S. macdonaldi); pink rockfish (S. eos); pinkrose rockfish (S. simulator); pygmy rockfish (S. wilsoni); redstripe rockfish (S. proriger); rosethorn rockfish (S. helvomaculatus); rosy rockfish (S. rosaceus); silvergray rockfish (S. brevispinis); speckled rockfish (S. ovalis); squarespot rockfish (S.
- The Minor Slope Rockfish complex north of 40°10' N latitude includes the following species: aurora rockfish (S. aurora); bank rockfish (S. rufus); blackgill rockfish (S. melanostomus); redbanded rockfish (S. babcocki); rougheye rockfish (S. aleutianus); sharpchin rockfish (S. zacentrus); shortraker rockfish (S. borealis); splitnose rockfish (S. diploproa); and yellowmouth rockfish (S. reedi).
- The Minor Nearshore Rockfish complex south of 40°10' N latitude, is further subdivided into the following management categories: 1) shallow nearshore rockfish [black and yellow rockfish (S. chrysomelas); China rockfish (S. nebulosus); gopher rockfish (S. carnatus); grass rockfish (S. rastrelliger), and kelp rockfish (S. atrovirens)]; and 2) deeper nearshore rockfish: [blue rockfish (S. mystinus); brown rockfish (S. auriculatus); calico rockfish (S. dalli); copper rockfish (S. caurinus); olive rockfish (S. serranoides); quillback rockfish (S. maliger); and treefish (S. serriceps)].
- The Minor Shelf Rockfish complex south of 40°10' N latitude includes the following species: bronzespotted rockfish (S. gilli); chameleon rockfish (S. phillipsi); dusky rockfish (S. ciliatus); dwarf-red rockfish (S. rufianus); flag rockfish (S. rubrivinctus); freckled rockfish (S. lentiginosus); greenblotched rockfish (S. rosenblatti); greenspotted rockfish (S. chlorostictus); greenstriped rockfish (S. elongatus); halfbanded rockfish (S. semicinctus); harlequin rockfish (S. variegatus); honeycomb rockfish (S. umbrosus); Mexican rockfish (S. macdonaldi); pink rockfish (S. eos); pinkrose rockfish (S. simulator); pygmy rockfish (S. wilsoni); redstripe rockfish (S. proriger); rosethorn rockfish (S. helvomaculatus); rosy rockfish (S. rosaceus); silvergray rockfish (S. brevispinis); speckled rockfish (S. ovalis); squarespot rockfish (S. hopkinsi); starry rockfish (S. constellatus); stripetail rockfish (S. saxicola); swordspine
- The Minor Slope Rockfish complex south of 40°10' N latitude includes the following species: aurora rockfish (S. aurora); bank rockfish (S. rufus); blackgill rockfish (S. melanostomus); Pacific ocean perch (S. alutus); redbanded rockfish (S. babcocki); rougheye rockfish (S. aleutianus); sharpchin rockfish (S. zacentrus); shortraker rockfish (S. borealis); and yellowmouth rockfish (S. reedi).
- Some sector totals in these tables were updated and revised in December 2006 - January 2007 based on analysis of permit and vessel catch data for the TIQ allocation process, and receipt of revised recreational catch estimates for 2004. Sector totals for 2005 were also added at that time. Periodic updates and corrections in the PacFIN and RecFIN databases may result in further revisions of these data in the future.

Table 1. Sector catch percentages of darkblotched rockfish by year, 1995-2005.

Year	At-Sea Catcher-Processors			At Sea Motherships			Shoreside Whiting LE Trawl			Shoreside Non-whiting LE Trawl		
	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors
1995	48.9	6.4%	6.4%	3.3	0.4%	0.4%	0.5	0.1%	0.1%	709.9	92.3%	93.1%
1996	6.2	0.8%	0.8%	0.7	0.1%	0.1%	5.9	0.8%	0.8%	721.6	97.6%	98.3%
1997	1.8	0.2%	0.2%	0.9	0.1%	0.1%	0.5	0.1%	0.1%	810.4	98.8%	99.6%
1998	6.9	0.7%	0.7%	12.9	1.3%	1.4%	5.1	0.5%	0.5%	901.8	94.5%	97.3%
1999	6.9	1.9%	1.9%	4.2	1.2%	1.2%	0.6	0.2%	0.2%	345.7	94.4%	96.7%
2000	3.8	1.4%	1.5%	4.7	1.8%	1.9%	3.7	1.4%	1.5%	239.0	90.9%	95.2%
2001	11.5	6.7%	6.8%	0.6	0.3%	0.3%	4.7	2.7%	2.8%	152.5	88.6%	90.1%
2002	2.2	2.0%	2.0%	0.9	0.8%	0.8%	0.0	0.0%	0.0%	107.0	96.1%	97.2%
2003	4.2	5.0%	5.0%	0.1	0.1%	0.1%	0.3	0.3%	0.3%	79.2	93.6%	94.5%
2004	4.4	2.2%	2.2%	3.0	1.5%	1.5%	1.9	1.0%	1.0%	186.6	94.7%	95.2%
2005	5.9	6.0%	6.4%	5.1	5.2%	5.4%	5.5	5.6%	5.9%	77.1	78.3%	82.3%
Average catch shares (95-05 avg)	9.3	2.2%	2.3%	3.3	0.8%	0.8%	2.6	0.6%	0.6%	393.7	94.6%	96.3%
Catch shares under healthy darkblotched (95-00 avg)	12.4	1.9%	1.9%	4.4	0.7%	0.7%	2.7	0.4%	0.4%	621.4	95.3%	96.9%
Catch shares under darkblotched rebuilding (01-05 avg)	5.6	4.2%	4.3%	1.9	1.5%	1.5%	2.5	1.9%	1.9%	120.5	90.7%	92.3%

Year	Non-Treaty Trawl Sector Totals			Non-Treaty Non-Trawl Sector Totals			Treaty Sector Totals		Total catch (mt)
	mt	% non-treaty sectors	% total	mt	% non-treaty sectors	% total	mt	% total	
1995	762.7	99.1%	99.1%	6.8	0.9%	0.9%	0	0.0%	769.5
1996	734.3	99.4%	99.4%	4.7	0.6%	0.6%	0.0	0.0%	739.0
1997	813.5	99.2%	99.2%	6.3	0.8%	0.8%	0.0	0.0%	819.9
1998	926.7	97.1%	97.1%	27.8	2.9%	2.9%	0.0	0.0%	954.4
1999	357.5	97.6%	97.6%	8.8	2.4%	2.4%	0.0	0.0%	366.3
2000	251.1	95.6%	95.5%	11.7	4.4%	4.4%	0.0	0.0%	262.8
2001	169.3	98.3%	98.2%	3.0	1.7%	1.7%	0.1	0.1%	172.3
2002	110.1	98.9%	97.5%	1.2	1.1%	1.1%	1.6	1.4%	112.9
2003	83.8	99.0%	99.0%	0.8	1.0%	1.0%	0.0	0.0%	84.7
2004	195.9	99.4%	99.3%	1.2	0.6%	0.6%	0.1	0.1%	197.3
2005	93.7	95.1%	95.0%	4.8	4.9%	4.9%	0.1	0.1%	98.6
Average catch shares (95-05 avg)	409.0	98.3%	98.3%	7.0	1.7%	1.7%	0.2	0.0%	416.2
Catch shares under healthy darkblotched (95-00 avg)	641.0	98.3%	98.3%	11.0	1.7%	1.7%	0.0	0.0%	652.0
Catch shares under darkblotched rebuilding (01-05 avg)	130.6	98.3%	98.0%	2.2	1.7%	1.7%	0.4	0.3%	133.2

Table 2. Sector catch percentages of Pacific ocean perch by year, 1995-2005.

Year	At-Sea Catcher-Processors			At Sea Motherships			Shoreside Whiting LE Trawl			Shoreside Non-whiting LE Trawl		
	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors
1995	13.4	1.5%	1.5%	28.1	3.1%	3.1%	29.9	3.3%	3.3%	824.7	90.9%	92.0%
1996	3.9	0.4%	0.5%	2.1	0.2%	0.2%	32.8	3.7%	3.8%	819.7	93.6%	95.5%
1997	2.0	0.3%	0.3%	1.6	0.2%	0.2%	6.4	0.9%	0.9%	663.0	97.3%	98.5%
1998	14.8	2.2%	2.3%	8.3	1.3%	1.3%	22.3	3.4%	3.4%	610.0	92.9%	93.1%
1999	9.4	1.7%	1.8%	4.1	0.7%	0.8%	1.9	0.3%	0.3%	520.2	95.3%	97.1%
2000	6.5	4.5%	4.5%	2.1	1.4%	1.4%	0.3	0.2%	0.2%	135.4	93.3%	93.9%
2001	19.7	9.5%	9.5%	0.1	0.0%	0.0%	0.1	0.0%	0.0%	187.3	90.4%	90.4%
2002	1.4	1.0%	1.0%	2.2	1.4%	1.4%	0.2	0.1%	0.1%	147.3	96.9%	97.5%
2003	5.0	3.3%	3.4%	0.1	0.1%	0.1%	0.3	0.2%	0.2%	143.8	95.5%	96.4%
2004	1.0	0.6%	0.6%	0.1	0.1%	0.1%	1.0	0.6%	0.6%	154.2	98.7%	98.7%
2005	0.8	1.1%	1.1%	0.9	1.2%	1.2%	0.5	0.7%	0.7%	69.9	96.2%	97.0%
Average catch shares (95-05 avg)	7.1	1.7%	1.7%	4.5	1.1%	1.1%	8.7	2.1%	2.1%	388.7	94.0%	95.0%
Catch shares under healthier POP (95-99 avg)	8.7	1.2%	1.2%	8.9	1.2%	1.2%	18.6	2.5%	2.6%	687.5	93.8%	95.0%
Catch shares under POP rebuilding (00-05 avg)	5.7	3.9%	3.9%	0.9	0.6%	0.6%	0.4	0.3%	0.3%	139.6	94.8%	95.2%

Year	Non-Treaty Trawl Sector Totals			Non-Treaty Non-Trawl Sector Totals			Treaty Sector Totals		Total catch (mt)
	mt	% non-treaty sectors	% total	mt	% non-treaty sectors	% total	mt	% total	
1995	896.2	98.8%	98.8%	10.8	1.2%	1.2%	0	0.0%	907.0
1996	858.5	98.1%	98.1%	17.0	1.9%	1.9%	0.0	0.0%	875.5
1997	672.9	98.8%	97.9%	8.2	1.2%	1.2%	6.5	1.0%	687.6
1998	655.4	99.8%	99.7%	1.5	0.2%	0.2%	0.4	0.1%	657.3
1999	535.6	98.1%	97.9%	10.6	1.9%	1.9%	1.2	0.2%	547.3
2000	144.3	99.5%	99.4%	0.8	0.5%	0.5%	0.0	0.0%	145.1
2001	207.1	100.0%	99.6%	0.1	0.0%	0.0%	0.7	0.4%	207.9
2002	151.1	99.4%	99.1%	0.9	0.6%	0.6%	0.5	0.3%	152.5
2003	149.2	99.1%	98.3%	1.4	0.9%	0.9%	1.2	0.8%	151.8
2004	156.2	100.0%	97.5%	0.1	0.0%	0.0%	3.9	2.4%	160.2
2005	72.1	99.1%	94.6%	0.6	0.9%	0.8%	3.5	4.6%	76.2
Average catch shares (95-05 avg)	409.0	98.9%	98.5%	4.7	1.1%	1.1%	1.6	0.4%	415.3
Catch shares under healthier POP (95-99 avg)	723.7	98.7%	98.5%	9.6	1.3%	1.3%	1.6	0.2%	735.0
Catch shares under POP rebuilding (00-05 avg)	146.7	99.6%	98.5%	0.6	0.4%	0.4%	1.6	1.1%	149.0

Table 3. Sector catch percentages of widow rockfish by year, 1995-2005.

Year	At-Sea Catcher-Processors			At Sea Motherships			Shoreside Whiting LE Trawl			Shoreside Non-whiting LE Trawl		
	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors	mt	% non-treaty sectors	% non-treaty trawl sectors
1995	87.0	1.3%	1.3%	95.3	1.4%	1.4%	236.1	3.5%	3.6%	6165.3	92.0%	93.6%
1996	119.9	1.9%	1.9%	117.3	1.9%	1.9%	571.5	9.1%	9.2%	5403.2	85.7%	87.0%
1997	72.6	1.1%	1.1%	122.0	1.8%	1.9%	163.3	2.4%	2.5%	6213.3	92.8%	94.6%
1998	120.9	2.9%	3.0%	173.7	4.1%	4.4%	349.6	8.3%	8.8%	3346.7	79.3%	83.9%
1999	104.1	2.5%	2.6%	58.1	1.4%	1.4%	194.4	4.7%	4.8%	3691.1	89.0%	91.2%
2000	69.8	1.7%	1.7%	141.2	3.5%	3.5%	83.3	2.1%	2.1%	3718.5	91.8%	92.7%
2001	139.7	7.1%	7.2%	27.7	1.4%	1.4%	44.3	2.2%	2.3%	1729.6	87.8%	89.1%
2002	114.8	28.8%	29.0%	20.4	5.1%	5.2%	5.1	1.3%	1.3%	254.9	63.9%	64.5%
2003	11.6	36.2%	40.0%	0.7	2.1%	2.4%	12.5	39.3%	43.4%	4.1	12.9%	14.3%
2004	8.2	9.7%	12.1%	11.4	13.5%	16.9%	34.3	40.5%	50.6%	13.8	16.3%	20.4%
2005	43.1	26.4%	27.2%	35.5	21.7%	22.4%	76.8	47.0%	48.5%	3.0	1.9%	1.9%
Average catch shares (95-05 avg)	81.1	2.6%	2.6%	73.0	2.3%	2.4%	161.0	5.1%	5.2%	2776.7	87.8%	89.8%
Catch shares under healthy widow (95-00 avg)	95.7	1.8%	1.8%	117.9	2.2%	2.3%	266.3	5.0%	5.1%	4756.4	88.8%	90.8%
Catch shares under widow rebuilding (03-05 avg)	21.0	22.5%	24.7%	15.9	17.0%	18.7%	41.2	44.2%	48.5%	7.0	7.5%	8.2%

Year	Non-Treaty Trawl Sector Totals			Non-Treaty Non-Trawl Sector Totals			Treaty Sector Totals		Total catch (mt)
	mt	% non-treaty sectors	% total	mt	% non-treaty sectors	% total	mt	% total	
1995	6583.6	98.2%	98.2%	118.4	1.8%	1.8%	0	0.0%	6702.0
1996	6211.9	98.5%	98.3%	93.3	1.5%	1.5%	11.5	0.2%	6316.7
1997	6571.2	98.2%	98.0%	123.3	1.8%	1.8%	9.6	0.1%	6704.1
1998	3990.8	94.5%	94.2%	230.2	5.5%	5.4%	14.8	0.4%	4235.9
1999	4047.7	97.6%	96.7%	100.5	2.4%	2.4%	36.7	0.9%	4184.9
2000	4012.8	99.0%	98.8%	39.0	1.0%	1.0%	10.5	0.3%	4062.4
2001	1941.3	98.5%	98.0%	29.4	1.5%	1.5%	10.7	0.5%	1981.4
2002	395.3	99.1%	91.7%	3.7	0.9%	0.9%	32.2	7.5%	431.2
2003	28.9	90.6%	66.6%	3.0	9.4%	6.9%	11.5	26.5%	43.4
2004	67.7	80.0%	63.0%	16.9	20.0%	15.7%	22.9	21.3%	107.6
2005	158.5	97.1%	82.0%	4.8	2.9%	2.5%	30.0	15.5%	193.2
Average catch shares (95-05 avg)	3091.8	97.8%	97.3%	69.3	2.2%	2.2%	17.3	0.5%	3178.4
Catch shares under healthy widow (95-00 avg)	5236.3	97.8%	97.6%	117.4	2.2%	2.2%	13.9	0.3%	5367.6
Catch shares under widow rebuilding (03-05 avg)	85.0	91.2%	74.1%	8.2	8.8%	7.2%	21.5	18.7%	114.7

Managing Yields in a Groundfish Management Regime of Individual Fishing Quotas, Intersector Allocations, and Stringent Rebuilding Requirements

Potential Mechanisms Designed to Avoid Overharvest and Optimize Sector Fishing Opportunities

A Draft Issue Paper Developed by Council Staff for the Pacific Fishery Management Council's Consideration
(NOTE: suggested analyses and key questions for consideration are noted in this document in *bold italics*)

Introduction

The Pacific Fishery Management Council (Council) is considering a trawl individual quota (TIQ) program for rationalizing the limited entry trawl groundfish fishery. Concurrently, the Council is considering an allocation of the available harvest of managed groundfish stocks and stock complexes to each of four different non-tribal sectors of the West Coast groundfish fishery: limited entry trawl, limited entry fixed gear, directed open access (i.e., vessels commercially targeting groundfish without a federal permit), and recreational[1]. This intersector allocation process supports development of a TIQ program, where trawlers will need a set allocation of species to manage their fishery using individual transferable quotas and/or fishing cooperatives, as well as other Council objectives such as bycatch reduction and a more stable management regime.

The reauthorized Magnuson Stevens Act includes a new provision to end overfishing once it is detected. Overfishing is defined in federal regulations as a realized harvest rate in excess of that which produces maximum sustainable yield (MSY). In terms of absolute harvest of West Coast groundfish stocks, this would equate to a total catch in excess of the acceptable biological catch (ABC). In the Pacific Council process, precautionary management measures and frequent inseason adjustments to ongoing fisheries are used to stay within specified ABCs and OYs. While occurrences of overfishing groundfish stocks on the West Coast have been rare using this process, there have been recent instances of overfishing. Significant uncertainty in current catch monitoring systems has led to unanticipated occurrences of overharvest (i.e., harvest in excess of sector catch limits and/or sector catch projections) in recent years in both commercial and recreational fisheries. These reasons and the need to protect fishing sectors from premature closures due to catch overages in other sectors compel consideration of a different management framework.

Challenges to Managing Low Yields with Intersector Allocations

The Council has identified the four non-tribal groundfish fishing sectors for consideration of set allocations of groundfish species and complexes. The Council proposes set-asides of needed yields to account for the unavoidable, incidental groundfish bycatch in non-groundfish and tribal fisheries and total mortalities accrued in research activities. These set-asides would be deducted from the allowable harvest before intersector allocations are made. There is a high likelihood

[1] Tribal allocations may be pursued in a separate government-to-government process and treated as a yield set-aside in the analyses in the intersector allocation EIS.

that very low yields of the most constraining groundfish stocks will be available to groundfish fishing sectors once this management regime is implemented. Implicit in this process is that each sector would be responsible for maximizing their fishing opportunities while not overharvesting their allocated quotas of groundfish. Each sector has unique challenges to overcome that depend on the sector's ability to avoid constraining species and the relative uncertainty of their catch monitoring systems.

Limited Entry Trawl Management Challenges

Current fishing opportunities for the limited entry non-whiting trawl sector are most constrained on the shelf by the bycatch of canary, bocaccio (south of 40°10' N latitude), and widow rockfish; and on the slope north of 38° N latitude by darkblotched rockfish and Pacific ocean perch. Gear restrictions, depth-based rockfish conservation area (RCA) and essential fish habitat area closures, and trip limits are used to target healthy species while minimizing bycatch. At-sea observers track discards in this fishery with about 25% of the trips sampled under the West Coast Groundfish Observer Program (WCGOP).

The whiting-directed trawl sectors are most constrained by canary, darkblotched, and widow rockfish. Fixed allocations of whiting and hard bycatch caps for the three most constraining rockfish species are used to target whiting while minimizing bycatch. Attainment of the hard bycatch caps during the primary whiting season triggers closure of the non-tribal sectors even if sector whiting allocations have not been caught. Unlike the non-whiting trawl fleet, whiting vessels are exempt from RCA restrictions, but are subject to specific Chinook salmon conservation area closures adjacent to the mouths of the Klamath and Columbia rivers. Further depth-based area closures are implemented inseason if Chinook salmon bycatch approaches critical levels as determined in a consultation process pursuant to the Endangered Species Act. The at-sea fleets (catcher vessels delivering to motherships, and catcher-processor vessels) have 100% at-sea observation requirements. Whiting vessels delivering to shoreside plants are required to fully retain and deliver all their catch. Electronic monitoring is contemplated for the shore-based whiting sector to ensure maximum retention of catches.

Due to catch monitoring uncertainty and other facets of the current management regime, none of the trawl fleets are without risk of exceeding their harvest guidelines and/or allocations. The whiting fleets, which receive almost real time reports of their total catch, are at risk of attaining the bycatch cap for an overfished species before achieving their annual whiting quotas. The non-whiting trawl fleet is at greater risk of exceeding their allocations due to greater variance of catch estimates since only about a quarter of the fleet is sampled at any one time under the WCGOP. There is also a lag of about two months for receiving landings information from fish tickets, and an even longer lag for receiving trawl logbooks; both streams of data are needed to reconcile observer data and provide final trawl catch estimates.

While the limited entry trawl fleets are observed at-sea more frequently than any other West Coast fishing sector, fishing opportunities are still compromised by random "disaster" tows, i.e., significantly large catches of a constraining species. Disaster tows are unpredictable and rare events. ***[Determine frequency and magnitude of disaster tows in the various trawl sectors from the WCGOP]***. Depth-based management is currently the most effective strategy for reducing bycatch. Seasonally variable trip limits and selective trawl gear configurations also contribute to bycatch reduction. In spite of these measures, the fleets are still hampered by overcapacity and uncertain fishing prospects due to unpredictable disaster tows. Therefore, to achieve mandated economic and conservation objectives, the Council is considering rationalizing the limited entry trawl sector using individual transferable quotas and/or a cooperative system, enabling vessels to combine quotas, risks, and profits.

Under the contemplated trawl rationalization system, quota pounds would be allocated and could be transferred between vessels. Vessels could no longer fish once their allocation of quota pounds for a target or bycatch species is exhausted. More quota pounds would need to be purchased to cover any deficits before that vessel could again go fishing. This mechanism should reduce bycatch given a strong economic incentive for fishermen to more carefully and selectively prosecute their fishery. However, the risk of sector catch overages (i.e., catches exceeding the sector's annual allocation of a given species) would not be entirely eliminated since a single disaster tow of a more constraining species (e.g., canary rockfish) could easily be large enough to exceed the sector's allocation and adversely affect further fishing opportunities for that sector and possibly other sectors as well. (The worst case scenario is a disaster tow or series of tows that are sufficiently large to risk exceeding the species' OY or ABC and prematurely closing the IFQ fishery). Furthermore, the availability of quota to cover catch overages may be scarce. It is also possible that the demand for quota pounds of the most constraining stocks may drive the price of this quota up to a point where it is not economically feasible to continue fishing. These inherent risks are not fully mitigated with a TIQ management system.

Limited Entry Fixed Gear Management Challenges

Current fishing opportunities for the limited entry fixed gear sector are most constrained on the shelf by canary and yelloweye coastwide, bocaccio south of 40°10' N latitude, and cowcod south of 34°27' N latitude. Depth-based RCA closures and seasonally varying trip limits are used to target healthy species while minimizing bycatch. At-sea observers track discards in this fishery, although the fleet is observed at less than a 25% rate under the WCGOP. ***[Determine the current WCGOP sample rate].***

The primary target groundfish species for the limited entry fixed gear sector are nearshore species, which are managed using limited entry state permits in California and Oregon (there are no nearshore commercial fisheries allowed in Washington waters), sablefish, and slope rockfish. Fixed gears are particularly effective at targeting rockfish in high relief, rocky habitats. The management measures most often used to manage harvest in this sector are trip limits and specification of the non-trawl RCA. There is very little information to justify seasonally varying the boundary lines of the non-trawl RCA due to the lack of a logbook program and other area/season-specific catch information. Therefore, the non-trawl RCA has been static since its inception and its configuration is likely to remain unchanged given the very low harvest rates allowed for canary and yelloweye rockfish in their respective rebuilding plans. This fact also limits further fishing opportunities for this sector. Any liberalization of management measures in the latitudes and depths these species are distributed increases the risk of exceeding harvest guidelines and quotas allocated to this sector.

Open Access Management Challenges

Current fishing opportunities for the directed open access sector are most constrained on the shelf by canary and yelloweye coastwide, bocaccio south of 40°10' N latitude, and cowcod south of 34°27' N latitude. Depth-based RCA closures and seasonally varying trip limits are used to target healthy species while minimizing bycatch. At-sea observers track discards in this fishery, although the fleet is observed at a very low rate under the WCGOP, especially south of 40°10' N latitude. ***[Determine the current WCGOP sample rate north and south of 40°10' N latitude].***

Like the limited entry fixed gear sector, the primary target groundfish species for the directed open access sector are nearshore species, sablefish, and slope rockfish, and the same types of management measures are used for this sector. However, trip limits for the directed open access sector are typically much less than those for the limited entry fixed gear sector. Beginning sometime in 2007, any open access vessel landing groundfish species on the West Coast will be required to carry a vessel monitoring system (VMS) to ensure compliance with the RCA closure.

The directed open access sector is at great risk of exceeding specified harvest guidelines and quotas primarily due to the lack of effort controls and the paucity of at-sea observations of discards in the sector. Effort is currently controlled by varying the trip limits and, most frequently, the daily or weekly limits in the daily-trip-limit (DTL) sablefish fishery. This strategy is, at best, an inexact instrument for controlling open access effort. The Council is currently contemplating a limited entry scheme for the directed open access fishery, whereby any vessel catching and retaining groundfish in federal waters would be required to have a federal permit. This process is at too early a stage to predict fleet size, qualification criteria for a federal permit, or any of the effects of implementing a limited entry system for this sector.

Recreational Management Challenges

Current fishing opportunities for recreational groundfish fisheries are most constrained by canary and yelloweye rockfish coastwide, bocaccio south of 40°10' N latitude, and cowcod south of 34°27' N latitude. Seasons, bag and size limits, and depth-based closures are used to manage recreational groundfish catch. Retention of cowcod, canary, and yelloweye rockfish is prohibited coastwide to prevent targeting. A small bocaccio bag limit is specified in California to reduce discards and accommodate unavoidable bycatch. State and federal harvest guidelines are set for many of the harvestable stocks. Federal harvest guidelines are also specified for canary and yelloweye rockfish to control the amount of discard mortality allowed for the sector. Automatic management actions, such as season and/or depth-based closures, are invoked when it is projected that these federal harvest guidelines will be prematurely attained.

Recreational catch monitoring is based on stratified, random creel surveys in each state and the resulting mortality estimates for the sector are highly variable. Discard estimates are particularly uncertain since they are primarily based on angler interviews, with unobserved estimates of the magnitude and species composition of discards. There is an at-sea observer and mandatory logbook program for Commercial Passenger Fishing Vessels (CPFVs or charterboats) in California; total mortality estimates for this fleet are therefore more precise. The precision of overall recreational catch projections is compromised by this uncertainty and the highly variable nature of effort. Angler effort is hard to predict sine it is influenced by the relative abundance of various target species, weather, and competing fishing and non-fishing activities. These factors contribute to a high risk of recreational fisheries exceeding harvest guidelines and quotas. ***[Determine recreational groundfish sample rates by state and mode. Variance of catch estimates- landings and discards- by state and mode?]***

Tribal Management Challenges

There are four tribes that fish groundfish (Makah, Quileute, Hoh, and Quinault), all located in Washington. Current fishing opportunities are most constrained by canary and yelloweye rockfish. Of the four tribes, only the Makah Tribe fishes with trawl gear. Therefore, the Makah tribal fishing opportunities could also be constrained by darkblotched rockfish and Pacific ocean perch. The Makah Tribe requires full retention of groundfish and has an at-sea observation program to monitor compliance and provide area-specific bycatch information to the rest of the fleet. The Makah observer program targets a sample rate of 15% of all trips on a monthly and annual basis.

While tribal fishing activities are not subject to RCA restrictions, they are restricted to their usual and accustomed fishing areas, which are limited to discrete areas off the central and northern Washington coast. Two of the most constraining stocks on the West Coast, canary and yelloweye rockfish, are most abundant off the northern Washington coast within the usual and accustomed fishing areas of the Makah, Quileute, and Hoh tribes. Conducting tribal fisheries in areas where the most constraining stocks occur poses a significant risk of exceeding tribal sector allocations for those species.

Potential Mechanisms Designed to Avoid Overharvest and Optimize Sector Fishing Opportunities

There are a variety of mechanisms currently used by the Council to avoid overharvest and optimize fishing opportunities, such as buffers, bycatch caps, and sideboards. Other mechanisms, such as multiyear OYs and carryover provisions, are not currently used by the Council to achieve these objectives, but are posed for Council consideration to meet the challenges of managing harvest under a system of fixed sector allocations and trawl individual quotas.

Buffers

Buffers are residual yields at the beginning of a season not anticipated to be caught by any directed fishery. The Council often specifies management measures that are not expected to catch the entire OY of a given species. Any left over yield is reserved as a buffer to be used by any sector or dedicated to a given sector if catch is higher than anticipated. Buffers are particularly useful for managing total catch in a sector when catch accountability is highly uncertain. In theory, the higher the catch uncertainty of a given stock, the larger the buffer should be. As catch data is collected inseason, reducing annual catch uncertainty over the course of a season, fishing opportunities may be enhanced by reducing the buffer to allow higher mortality that is still within a specified annual catch limit or OY. This management strategy tends to break down when catch uncertainty is very high and time runs out in the season before management measures can be adjusted to achieve but not exceed OYs. Therefore, the risks and benefits of buffer management need to be constantly weighed to achieve mandated conservation and economic objectives.

Bycatch Caps

Bycatch caps are yield set-asides of species specified for a sector that, when attained, would trigger closure of a fishery. Bycatch caps are currently used on the West Coast to manage groundfish bycatch in whiting-directed trawl fisheries and, in most cases, approved exempted fishing permit (EFP) activities. The non-tribal whiting sectors are currently managed with bycatch caps for canary, darkblotched, and widow rockfish. When these caps are projected to be attained, the non-tribal whiting fishery automatically closes even if whiting quotas have not yet been attained. Bycatch caps specified for approved EFPs are used to close fishing activities by a participating vessel or vessels when they are attained. (EFP bycatch caps are often specified for individual vessels and all participating vessels on a monthly and/or annual basis). Bycatch caps are allowed under the groundfish FMP, but they have not yet been used more extensively.

Bycatch caps are often very small yield set-asides that require almost real-time reporting of total catch to be effective. Therefore, management using bycatch caps is compromised when sector catch accountability is poor. In such cases, there is an increased probability of a sector's catch overage co-opting fishing opportunities for other sectors, especially when the stock's OY is low.

Sideboards

Sideboards are very much like bycatch caps, but with perhaps more flexibility. A sideboard is a catch threshold that, when attained, would trigger an automatic action to reduce or eliminate mortality of that species. Such automatic actions include adjustment of RCAs, implementation of new regulations seaward or shoreward of the RCA, and/or trip limits. For instance, if a canary rockfish sideboard was specified and attained inseason in the non-whiting trawl fishery, the automatic action could be closure of all areas shoreward of the trawl RCA. Such an action would eliminate further catch of canary rockfish while still allowing opportunities to fish on the slope for flatfish and species in the Dover sole-thornyheads-sablefish (DTS) complex. While such an action may adversely affect vessels incapable of fishing in deep water, other vessels in the fleet would retain some fishing opportunity.

Carryover Provisions and Multiyear Optimum Yields

The use of buffers, bycatch caps, and sideboards are all effective strategies for reducing bycatch, but they alone will not eliminate the risk of exceeding sector quotas and OYs for some species. If each sector is ultimately responsible for limiting its bycatch, there would be less risk of one sector's overharvest compromising fishing opportunities for other sectors. An incentive/disincentive mechanism may be needed to change fishing behaviors to more selectively harvest healthy target species, while avoiding species of concern. Such a mechanism is managing constraining stocks with carryover provisions and multiyear OYs.

Carryover provisions would allow a transfer of yield surpluses or deficits of some species at the sector level (or permit/co-op level under a TIQ program) from one year to the next. Sector accounts would be settled by the end of the prescribed multiyear OY period. Management risk of exceeding a sector bycatch limit in any one year could then be spread over a longer period. Any one sector, or trawl vessel/co-op under a TIQ program, could consider a management strategy in the first year of a multiyear OY period and, if the annual bycatch target was exceeded, could adopt more conservative management measures in following years. This reduces the risk that management miscues might pre-empt future fishing opportunities for that or other sectors, and promotes more precautionary and selective fishing practices.

Stock life history characteristics should be considered when determining an appropriate multiyear OY period. Faster growing stocks with shorter mean generation times and fewer age classes should probably be managed with shorter OY periods. The most constraining rockfish stocks on the West Coast (i.e., cowcod, canary, and yelloweye rockfish) have many age classes in their populations and might be better managed with longer OY periods. Factors such as mean generation time and recruitment variability may be important considerations in selecting a risk-averse multiyear OY period.

Another consideration in determining the length of a multiyear OY period and implementing a carryover of sector or vessel yield surpluses and deficits is how this strategy could be managed across a period when new assessments are being approved for management use. Currently, all the overfished species are assessed every other year (i.e., as frequently as possible under the biennial management regime) to understand whether progress has been made in rebuilding these species. Other stocks may also potentially be assessed during a multiyear OY period. This begs the question of whether a carryover mechanism can work when an OY changes as a result of a new assessment partway through a multiyear OY management period. One possible solution may be to carry over yield surpluses and deficits based on the proportion of the OY this surplus or deficit represents. For instance, if a sector exceeds its previous year's quota by 10% and a new assessment of that stock resulted in a change to the OY, the new quota for that sector would be reduced by the proportion of the sector's previous catch overage (i.e., 10% of the OY) applied to the new OY. ***[SSC: Are there any adverse biological stock effects managing groundfish species under such a mechanism?]***

Managing OYs over a longer period may also be more responsive to new mandates in the Magnuson-Stevens Act to end overfishing. While current Council practices have led to few incidents of overfishing in recent years, spreading overfishing risk over a longer period may reduce the frequency of overfishing. The Council and NMFS may need to pose these considerations when developing new National Standard 1 Guidelines interpreting the re-authorized Magnuson-Stevens Act. The groundfish FMP and current groundfish rebuilding plans would need to be amended to accommodate multiyear OYs.

Groundfish Allocation Committee
Intersector Allocation

Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

September 27, 2007

Allocating Overfished Species

The GAC acknowledged that it is difficult to discuss Intersector Allocation (IA) without also thinking about trawl rationalization. The IA and trawl rationalization processes would have to be reconciled.

In the trawl individual fishing quota (IFQ) alternative, there is an option for surplus individual quota pounds (QP) (or a deficit of QP) to carryover to the next year. The GAC was reminded of a staff paper regarding the overage/underage provision in the trawl IFQ alternative. The trawl sector would get a percentage of the total allocation for a species in a given year, and that sector allocation is further divided into QS which could then be traded amongst the players in that sector. The rules for the QP carryover mechanism would be spelled out in the IFQ alternative. There is no provision for the sector level rollover or buffers that would be needed to accommodate the individual vessel carryover without violating harvest caps, and the IA could potentially provide for that. The GAC wanted to keep the overage/underage concept alive for now and should provide more direction at the November Council meeting.

Without the Intersector Allocation process, there is no way to divide the available Optimum Yield (OY) for each of the fisheries. It seems that the IA could be simplified, and still allow the Council to accomplish their goals. The big threat of going over the OY is outside of the trawl sector, and managers cannot act quickly enough inseason to protect from the risk of non-trawl sector catch overages. If the Council is worried about another sector exceeding their allocation, then specifying a buffer for the sector from their allocation would be logical. The Council may wish to implement a multi-year OY, rather than a single-year OY, and put sector restrictions on individual sector allocations.

The GAC discussed the possibility of not making a long term allocation of non trawl-dominant overfished species (i.e., bocaccio, canary rockfish, cowcod, and yelloweye rockfish). There are an infinite number of possible allocations and management regimes dependent on the relative harvestable surpluses of these species. Therefore, non trawl-dominant overfished species should be allocated using short-term (2-year) allocations developed as part of the biennial specifications process. Such an allocation framework would be more flexible and more manageable for species that tend to constrain fishing opportunities for trawl and non-trawl sectors. Longer term allocations for the trawl-dominant species (i.e., darkblotched rockfish, Pacific ocean perch, and widow rockfish) can be more readily considered since it is easier to understand the implications of alternative allocation schemes.

***Recommendation**: Move forward with analysis of modified alternatives 1, 2 and 3, which contemplate long-term allocations for the non-overfished species (except Pacific whiting, sablefish, and nearshore species) and the trawl-dominant overfished species (Pacific ocean perch, darkblotched rockfish, and widow rockfish). Remove the non-trawl-dominant overfished species from the analysis.*

Open Access Allocations

The GAC acknowledged that it should provide guidance to the working group for this issue. Understanding the future needs of the non-trawl sectors would be helpful in developing this guidance. Having this information would not change decisions to be made at the November Council meeting, but down the line it will inform decisions. Alternative 2 considers a split in the allocation to the sectors, and the GAC may need additional information to assess that alternative, although there is some information readily available. If Alternative 2 is not selected by the Council, there will be less need to have more refined information on open access. A more detailed discussion by the GAC would help guide the working group, but that GAC discussion can be deferred.

Discussion deferred to a later GAC meeting.

IFQs: Halibut Intersector Allocation (A-4)
[Note: This discussion took place during the trawl rationalization portion of the GAC meeting.]

The International Pacific Halibut Commission is proposing a new stock assessment that would dramatically reduce how much Pacific halibut is allocated to Area 2A off of Washington and Oregon. The trawl portion of the halibut catch comes off the top of the area's total halibut quota, and thus limits other halibut fishing opportunities. A mechanism to allocate halibut to the trawl fishery might help save some halibut for the other sectors.

The GAC discussed the means by which an allocation of halibut to accommodate expected trawl bycatch might be established. It was stated in the GAC meeting that the Intersector Allocation process is the appropriate venue for discussing the halibut allocation to the trawl sector, but there should be further Council discussion in November. Halibut is not on the list of species currently being considered in the current IA process.

> ***Recommendation:** Determine the appropriate forum for addressing an allocation of halibut bycatch for the trawl sector. Consider the Council agenda.*

GROUNDFISH ADVISORY SUBPANEL REPORT ON AMENDMENT 21: INTERSECTOR ALLOCATION

The Groundfish Advisory Subpanel (GAP) reviewed the suite of options being considered for analysis as well as the associated Groundfish Allocation Committee comments and recommendations.

The GAP recommends that all of the options contained in Attachment 1 should be forwarded for analysis with the modifications to Options 1, 2, & 3 recommended by the Groundfish Allocation Committee with regards to overfished species. The GAP believes this is a reasonable range of alternatives to fulfill analysis obligations under National Environmental Policy Act.

The GAP also recommends delaying long-term allocations of minor shelf rockfish until a later date. These species are currently available in negligible amounts to the trawl fishery and they can continue to be managed through the 2-year specifications process.

PFMC
11/06/07

GROUNDFISH MANAGEMENT TEAM REPORT ON AMENDMENT 21: INTERSECTOR ALLOCATION

The Groundfish Management Team (GMT) discussed the deliberations of the Groundfish Allocation Committee's (GAC) September 25-27 meeting as well as their report in Agenda Item D.5.c, GAC Report and has the following comments:

Overfished Stocks

The GMT agrees with the GAC recommendation to remove non-trawl dominant overfished species (bocaccio, canary, cowcod, and yelloweye) from Alternatives 1-3. The GMT notes that attempting to allocate overfished stocks on a long-term basis may not be informative to the Council, because of variations in stock status, and the effect on future fishing opportunities across sectors. The GMT notes that short-term allocations for non-trawl dominant overfished species would continue to be set through the two-year biennial specifications and management measures process.

The GMT supports the analysis of long-term allocation of trawl dominant overfished species (darkblotched rockfish, widow rockfish, and Pacific Ocean perch), but believes that within trawl allocation may need to be revisited as stocks rebuild.

Minor Shelf Rockfish

The GMT recommended removing minor shelf rockfish from all alternatives since access has been constrained by overfished species in recent years. The GMT acknowledges that once the co-occurring overfished stocks are rebuilt, then consideration of long-term allocations for minor shelf rockfish species may be appropriate. The GMT also notes that such an analysis would be onerous and may delay the analysis and implementation of intersector allocations.

"Other Fish"

The GMT discussed long-term allocations for the "Other Fish" complex. Currently, only one data-poor assessment exists for species within this category. Due to current lack of information, the GMT does not recommend analyzing intersector allocation at this point, but notes that establishing acceptable biological catch and optimum yield, as well as intersector allocation could be considered as part of the 2011-2012 biennial specifications and management measures.

Changes in Stock Status

The GMT recommends that the current fishery management plan language be maintained such that any long-term allocations are eliminated if the stock is declared overfished. Once a stock becomes rebuilt, the Council may develop long-term allocations where appropriate.

Yield Buffers

The GMT is requesting Council guidance on the purpose of yield buffers, specifically whether the yield buffers should be exclusively used to account for management uncertainty or whether they should also be used for such things as research catch, exempted fishing permits and incidental open access catches.

GMT Recommendations:

1. Remove non-trawl dominant overfished species (yelloweye, canary, cowcod, and bocaccio) and minor shelf rockfish species from alternatives going forward for analysis.
2. Remove minor shelf rockfish species from alternatives going forward for analysis.
3. Remove other fish from the analysis.
4. Development of long-term allocations for rebuilt stocks where appropriate.

PFMC
11/07/07
2:32 PM

Agenda Item D.5.d
Supplemental TIQC Report
November 2007

TRAWL INDIVIDUAL QUOTA COMMITTEE (TIQC) REPORT ON AMENDMENT 21: INTERSECTOR ALLOCATION

The TIQC met October 11-12, 2007 to talk about the trawl rationalization alternatives and had the following comment on the closely related intersector allocation amendment.

Intersector Allocation

The recent allocation of catch among sectors has been based on bycatch needs. In the mid-1990s, Council approved harvest levels allowed targeting on currently overfished stocks. When a stock is rebuilt, the new optimum yields may provide an opportunity to re-establish some of those target fisheries. Maintaining the current allocation among sectors would not be viewed as equitable by those who gave up their target fisheries to provide bycatch necessary to support other fisheries. There is concern that the Council may not revisit an allocation once the stock is rebuilt. At the same time, some members were concerned about stability for business planning purposes.

> ***Recommendation:*** *When a species is rebuilt, a new intersector allocation should be required (Majority)*

PFMC
10/31/07

CONSIDERATION OF INSEASON ADJUSTMENTS TO 2007 AND 2008 FISHERIES, INCLUDING PACIFIC WHITING FISHERY OPENING DATES

Management measures for the 2007 and 2008 groundfish season were set by the Council with the understanding these measures would likely need to be adjusted throughout the biennial period in order to attain, but not exceed, the optimum yields (OYs). This agenda item will consider inseason adjustments to ongoing 2007 fisheries as well as adjustments to 2008 fisheries. Potential inseason adjustments under this agenda item include adjustments to 2008 recreational fishery management measures, adjustments to bottom trawl fishery cumulative limits, gear definitions and Rockfish Conservation Area boundaries, and adjustments to Pacific whiting fishery bycatch limits.

In addition to considering routine inseason adjustments, this agenda item will consider a change in the opening date to the Pacific whiting fishery, beginning in 2008, and a staggered release of bycatch in the whiting fishery throughout the 2008 season. NOAA General Counsel has advised that both concepts do not qualify as routine management measures and do not meet the standards necessary to waive the notice and comment requirements of the Administrative Procedures Act. Therefore, changing the season date and implementing a staggered release of bycatch would require a two meeting process and the drafting of an Environmental Assessment, and a Proposed Rule that would be published prior to the March 2008 Council meeting. Appropriate consideration of this issue in November could be the start of a two-meeting process. Final Council action on any changes to the Pacific whiting fishery opening date or the staggered release of bycatch would occur at the March 2008 Council meeting.

In early 2007, West Coast Groundfish Observer Program (WCGOP) data was released showing that bycatch rates of canary rockfish in the bottom trawl fishery during the 2005 season were much higher than expected. As a result the Council elected to close two large areas to bottom trawling off the Washington and Oregon Coasts that showed higher than average bycatch of canary rockfish. During the spring and summer of 2007, staff at the Oregon Department of Fish and Wildlife (ODFW) and the Northwest Fisheries Science Center (NWFSC) reviewed the performance of the Selective Flatfish Trawl (SFFT) in the 2005 fishery. During this review, staff uncovered information that suggested multiple vessels had configured the SFFT in a way that met regulatory requirements, but that those configurations were not consistent with what was originally intended and analyzed. Research efforts suggest this inappropriate gear configuration may be one reason for the higher than expected bycatch rate. Agenda Item D.6.c is an informational report that documents the joint ODFW/NWFSC research effort on SFFT performance and provides findings. Based on the information contained in this report, the Groundfish Management Team may present clarifying regulatory language to the Council that is intended to better meet the original intent of the SFFT design.

The Groundfish Management Team (GMT) and the Groundfish Advisory Subpanel (GAP) will begin meeting on Sunday, November 4, 2007, to discuss and recommend inseason adjustments to ongoing 2007 groundfish fisheries, 2008 groundfish fisheries, potential changes in the opening date to the Pacific whiting fishery, and a staggered release of bycatch in the 2008 Pacific whiting fishery. Under this agenda item, the Council is scheduled to hear advisory body advice and public comment on the status of 2007 and 2008 fisheries and consider preliminary or final inseason adjustments. Agenda Item D.8 is scheduled for Friday, November 9, should further analysis or clarifications be needed.

Council Action:

1. **Consider information on the status of ongoing 2007 fisheries and adopt inseason adjustments as necessary.**
2. **Consider information on the status of 2008 fisheries and adopt inseason adjustments as necessary.**
3. **Consider information on the opening date of the 2008 Pacific whiting fishery and adopt proposed changes as necessary.**
4. **Consider information on the staggered release of bycatch in the Pacific whiting fishery and adopt proposed changes as necessary.**

Reference Materials:

1. Agenda Item D.6.b, GMT Report: 2007 Groundfish Bycatch Scorecard after September 2007 Council Action.
2. Agenda Item D.6.c, CDFG Report: Possible Changes to the 2008 California Recreational Groundfish Fishery Regulatory Specifications.
3. Agenda Item D.6.c, ODFW/NWFSC Report: Effectiveness of Selective Flatfish Trawl in the 2005 U.S. West Coast Groundfish Trawl Fishery.

Agenda Order:

a. Agenda Item Overview — Merrick Burden
b. Report of the Groundfish Management Team — Kelly Ames
c. Agency and Tribal Comments
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. **Council Action:** Adopt Preliminary or Final Recommendations for Adjustments to 2007 and 2008 Fisheries

PFMC
10/19/07

2007 projected mortality impacts (mt) of overfished groundfish species with the inseason adjustments recommended at the September 2007 Council meeting.

9/11/07

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	25.2	**10.1**	1.4	242.1	79.6	1.8	0.4
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/					1.9		0.0
At-sea whiting cat-proc a/		4.7		25.0		**275.0**	0.0
Shoreside whiting a/					0.0		0.0
Tribal whiting		0.7		0.0	0.6	6.1	0.0
Tribal							
Midwater Trawl		1.8		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Limited Entry Fixed Gear		1.1		1.3	0.4		2.8
Sablefish	13.4		0.0			0.0	
Non-Sablefish			0.1			0.5	
Open Access: Directed Groundfish		1.0					
Sablefish DTL	0.0	**0.2**		0.2	0.1	0.0	0.3
Nearshore (North of 40°10' N. lat.)	0.0	1.7	0.1	0.0	0.0	0.5	1.5
Nearshore (South of 40°10' N. lat.)	0.0			0.0	0.0		
Other	10.6			0.0	0.0	0.0	0.1
Open Access: Incidental Groundfish							
CA Halibut	0.1	0.0		0.0	0.0		
CA Gillnet c/	0.5			0.0	0.0	0.0	
CA Sheephead c/				0.0	0.0	0.0	0.0
CPS- wetfish c/	0.3						
CPS- squid d/							
Dungeness crab c/	0.0		0.0	0.0	0.0		
HMS b/		0.0	0.0	0.0			
Pacific Halibut c/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pink shrimp	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	0.8	0.0	0.0	0.0	0.3	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)							
Recreational Groundfish e/							
WA		5.7					6.0
OR						1.4	
CA	53.2	10.1	0.1			9.0	7.2
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs. f/							
	2.0	**3.7**	0.2	3.8	3.6	0.9	1.9
TOTAL	105.7	43.3	1.9	272.5	89.9	335.6	22.9
2007 OY	218	44.0	4.0	290	150	368	23
Difference	112.3	0.7	2.1	17.6	60.1	32.5	0.1
Percent of OY	48.5%	98.4%	47.5%	93.9%	60.0%	91.2%	99.4%
Key	(shaded)	= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting numbers for canary, darkblotched, and widow rockfish represent bycatch caps for the non-tribal whiting sectors.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts. However, harvest guidelines for 2007 are as follows: canary in WA and OR combined = 8.2 mt and in CA = 9.0 mt; yelloweye in WA and OR combined = 6.8 mt and in CA = 2.1 mt.

f/ Research projections updated August 2007. Canary and yelloweye updated Sept. 10, 2007. Estimate based on combination of actual 2006 catches and projected 2007 catch.

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2007 AND 2008 FISHERIES, INCLUDING PACIFIC WHITING FISHERY OPENING DATES

The Groundfish Management Team (GMT) considered the most recent information on the status of ongoing fisheries and provides the following considerations and recommendations for both the 2007 and 2008 seasons.

2007 INSEASON ADJUSTMENTS

RECREATIONAL

California

The final California Recreational Fisheries Survey catch estimates through July and the projected catch through the remainder of the year did not increase since September. The projected impacts of canary or yelloweye rockfish in the scorecard did not increase. Therefore, no changes are proposed for the recreational fisheries in California.

Oregon

No changes are proposed for the recreational fisheries in Oregon for the remainder of the year.

Washington

No changes are proposed for the recreational fisheries in Washington for the remainder of the year.

COMMERCIAL

<u>Open Access</u>

Sablefish north of 36° N. Lat.

The GMT received a request to increase the open access sablefish limits north of 36° N. Lat. for December 2007. While this fishery is tracking behind attainment of its sector allocation, yelloweye concerns that were addressed at the September meeting still exist and liberalization of fishing opportunities may increase yelloweye impacts. Since an increase in sablefish opportunities would be expected to increase yelloweye impacts, the GMT does not recommend increasing opportunities for that fishery at this time.

2008 INSEASON ADJUSTMENTS

Research Catch Estimates

The GMT reviewed the catch data for the Northwest Fisheries Science Center (NWFSC) trawl survey to estimate the amounts of overfished rockfish that would be taken in the 2008 NWFSC trawl survey. In 2007, the NWSFC trawl survey caught 3.2 mt of canary; however, in 2006, the catch was 7.2 mt. As a precautionary measure, the GMT included the high estimate of 7.5 mt (7.2 plus additional research) for canary rockfish in the 2008 preseason scorecard. The GMT notes that, given the timing of the survey, preliminary data may be available at the Council's September 2008 meeting. If a lower canary rockfish estimate is used in the scorecard and, in September, the GMT receives NWFSC survey data indicating that canary catches are projecting higher than anticipated, commercial and recreational fisheries in the October-December time period could be at risk.

The GMT also discussed the expanded International Pacific Halibut Commission's standard stock assessment survey to include rockfish stations necessary to inform the yelloweye rockfish stock assessment. The principal investigators (Washington Department of Fish and Wildlife [WDFW] and Oregon Department of Fish and Wildlife [ODFW]) of the expanded rockfish survey have a mechanism and the ability to control the amount of yelloweye rockfish take in the expanded survey. If the catch of yelloweye rockfish is expected to be higher than the rockfish station survey design, the project will be terminated. However, the standard stock assessment survey would continue and have some yelloweye impacts. Given the unique situation of this research, the 3 mt in the scorecard represents our best estimate of catch.

RECREATIONAL

California
The GMT reviewed and discussed the California Department of Fish and Game (CDFG) report regarding 2008 recreational management measures (Agenda Item D.6.c, CDFG Report). After receiving final catch estimates in December of 2007, CDFG will analyze reduced bag limits, shallower depth restrictions, reduced season lengths, and closures of high yelloweye rockfish catch areas to prevent exceeding harvest guidelines for yelloweye and canary rockfish through inseason action. The GMT will review the potential management measures at our January meeting and recommendations will be presented to the Council at the March 2008 meeting.

COMMERCIAL

<u>Open Access</u>
Conception Area Sablefish (south of 36° N. Latitude)
The GMT reviewed sablefish catch information through 2007 and compared current trip limits with historical catches and trip limits. From 2003 to 2006, the non-trawl sablefish catches were 89.8 – 181.1 mt compared the existing optimum yield (OY) of 210 mt. Available information indicates that increased effort and increased per-vessel catch have been responsible for an increase in Conception Area sablefish landings. In particular, the June Council action to increase open access limits in the Conception area from 300 lbs per day or 1 landing per week of up to 700 lbs, to 350 lbs per day or 1 landing per week of up to 1,050 lbs, starting August 1 appears to have caused both an increase in effort and per-vessel catch. If this catch rate continues through 2008, the Conception area sablefish OY is projected to be exceeded.

Available data indicates that inseason adjustments to the sablefish open access fishery in the Conception Area will be required to keep the fishery within the 2008 OY (Table 1). If the Nature Conservancy (TNC) Exempted Fishing Permit (EFP) receives final approval with a 50 mt sablefish cap, the GMT recommends that the open access sablefish weekly limits in the Conception Area be reduced by 50 lbs and that a 2-month cumulative limit of 2,400 lbs per 2 months is introduced to prevent exceeding the OY (Table 1).

Table 1. Proposed Conception Area Open Access Sablefish Limits

	Daily	Weekly	Bimonthly
Without TNC EFP	300 lb	850 lb	None
With TNC EFP	300 lb	800 lb	2,400 lb

Limited Entry (LE) Fixed Gear

Chilipepper Rockfish- between 34° 27' N. Lat. and 40°10' N. Lat.
The GMT received a request to increase the chilipepper rockfish limit between 34° 27' N. Lat. and 40°10' N. Lat. and recombine it with the minor shelf rockfish, shortbelly, widow, and bocaccio rockfish trip limit. Originally, chilipepper rockfish were included in the trip limit for minor shelf rockfish but were later removed to provide more fishing opportunity seaward of the Rockfish Conservation Area (RCA). The GMT reviewed the request and recommends a recombined limit of 2,500 lb/2 months of which no more than 500 lb/2 months can be any species other than chilipepper rockfish. The GMT notes that this also increases the chilipepper rockfish limit from 2,000 lb/2 months to 2,500 lb/2 months; however, chilipepper rockfish is currently under-utilized and the increase is not expected to have any adverse impacts.

Limited Entry Non-Whiting Trawl
In October 2007 the NWFSC released the most recent West Coast Groundfish Observer Program data, with observations from 2006 fisheries. These data were stratified on an area basis to compliment the area-based management implemented shoreward of the RCA off Washington and Oregon in 2007. The data revealed increased canary bycatch rates in areas with a considerable amount trawl effort in 2006, which resulted in higher canary impacts overall.

Data were explored in an attempt to identify possible relationships between certain target species and canary rockfish. Two relationships became evident: arrowtooth and canary rockfish as well as Pacific cod and canary rockfish. The GMT previously identified the relationship between arrowtooth and canary rockfish catches. The 2001-2004 Washington Arrowtooth EFP fishery was focused on reducing the bycatch rate of canary rockfish in arrowtooth fisheries. Additionally, the GMT believes a relationship likely exists between petrale sole shoreward of the trawl RCA and canary rockfish bycatch because petrale range into hard bottom habitat more than other flatfish.

A review of logbook data was completed to identify the accessibility of target species at certain depths and areas. In particular, attention was given to 75 fathom areas and 60 fathom areas off Washington and Oregon. The available data suggests that fishing grounds off Oregon are much less productive as the RCA is moved from 75 to 60 fathoms, but off southern Washington target species can still be readily accessed during part of the year at 60 fathoms. This is consistent with past research that indicates many species are distributed at shallower depths further up the coast.

Moving the shoreward boundary from 75 fm to 60 fm may have negative consequences on Dungeness crab. The GMT requested data to inform these impacts; the NWFSC is currently processing these data and will provide a summary to the GMT at a later date.

Additionally, a seaward boundary of 150 fm off Washington is recommended during periods 3-5 to encourage vessels to fish seaward of the RCA where canary rockfish are less abundant. The timing of the 150 fathom line adjustment is intended to correspond with availability of target species in deeper depths throughout the course of the year (target species migrate deeper during winter months). Reductions in the Pacific ocean perch (POP) and slope rockfish trip limits are also recommended to reduce impacts to darkblotched rockfish and POP.

Based on the relationships and patterns described above, two alternatives were developed for the non-whiting trawl fishery:

- Alternative 1 examines the impacts of leaving the area north of Cape Alava open for periods 4-5.
- Alternative 2 closes the area north of Cape Alava and takes into account the GAP recommendation to provide higher arrowtooth and petrale trip limits, relative to the first alternative.

Both alternatives propose to leave the area between Cape Arago and Mt. Humbug closed throughout the year. This is because this area has the highest canary bycatch rates observed off Oregon and Washington. Both alternatives also reduce opportunities for target species in areas shoreward of the trawl RCA. These proposed reductions are targeted toward species that are believed to have a relatively higher canary bycatch rate. In other words, target species reductions are proposed for arrowtooth flounder, Pacific cod, and petrale sole in both alternatives for vessels using selective flatfish gear in the north because available data suggests these species are more highly associated with canary. Dover sole limits are increased in the north for vessels using Selective Flatfish Trawl (SFFT) gear to compensate for some of the decrease in arrowtooth opportunity. Sablefish and thornyhead limits are increased for large footrope gear because under-attainment of these target species is expected to occur under status quo cumulative limits.

Additionally, cumulative limits for both alternatives reduce petrale sole opportunities in the north during period 1 from 50,000 lb / 2 months to 40,000 lb/ 2 months for large footrope gear. This change is in response to events over the last two years where petrale sole catch in the north during period 1 exceeded expectations and jeopardized the period 6 petrale fishery. Historically there was no period 1 limit for petrale sole. In 2006 a 60,000 lb/2 months limit was imposed and it was decreased to 50,000/ 2 months in 2007. In February 2007 NMFS issued a request that industry slow their fishing activities to allow for a year round fishery. Therefore, the GMT recommends a reduction in period 1 trip limits for petrale sole.

The predicted amount of canary estimated to be taken in Alternative 1 is 10.5 mt while Alternative 2 results in canary impacts of 8.0 mt. Under both alternatives, sablefish and petrale sole are predicted to reach target catch levels, but other stocks are not expected to reach their target levels because of other constraining stocks.

Table 2. Proposed RCA adjustments under Alternative 1.

<table>
<tr><td></td><td colspan="6">North of 40 10 RCA Boundaries</td></tr>
<tr><td rowspan="2">Sub-Area</td><td colspan="6">Bimonthly Period</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>N. Cape Alava</td><td>0-200*</td><td>0-200</td><td>0-150</td><td colspan="2">75-150</td><td>0-200*</td></tr>
<tr><td>Cape Alava-Queets</td><td rowspan="5">75-200*</td><td rowspan="3">60-200</td><td colspan="2" rowspan="3">60-150</td><td rowspan="3">75-150</td><td rowspan="5">75-200*</td></tr>
<tr><td>Queets-Leadbetter</td></tr>
<tr><td>Leadbetter-Col R</td></tr>
<tr><td>Col R - Cascade Head</td><td colspan="4" rowspan="2">75-200</td></tr>
<tr><td>Cascade Head - Cape Arago</td></tr>
<tr><td>Cape Arago - Mt. Humbug</td><td>0-200*</td><td colspan="4">0-200</td><td>0-200*</td></tr>
<tr><td>Mt. Humbug - Cape Mendocino</td><td>75-200*</td><td colspan="4">75-200</td><td>75-200*</td></tr>
</table>

* Modified petrale areas in effect during that period

Table 3. Proposed RCA adjustments under Alternative 2.

<table>
<tr><td></td><td colspan="6">North of 40 10 RCA Boundaries</td></tr>
<tr><td rowspan="2">Sub-Area</td><td colspan="6">Bimonthly Period</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>N Cape Alava</td><td>0-200*</td><td>0-200</td><td colspan="3">0-150</td><td>0-200*</td></tr>
<tr><td>Cape Alava-Queets</td><td rowspan="5">75-200*</td><td rowspan="3">60-200</td><td colspan="2" rowspan="3">60-150</td><td rowspan="3">75-150</td><td rowspan="5">75-200*</td></tr>
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</table>

* Modified petrale areas in effect during that period

Table 4. Proposed trip limit adjustments under Alternative 1.

AREA	Period	RCA Boundaries INLINE	OUTLINE	Cumulative Limits (lbs) Sabl	Longsp	Shortsp	Dovr	Otr Flat	Petrl	Arrowtth	Slope Rk	P cod
	1			14,000	25,000	12,000	80,000	110,000	40,000	100,000	1,500	30,000
North 40 10	2			14,000	25,000	12,000	80,000	110,000	30,000	100,000	1,500	30,000
Large	3	SEE ATTACHED		17,000	25,000	12,000	80,000	110,000	20,000	100,000	1,500	30,000
Footrope	4	TABLE		17,000	25,000	12,000	80,000	110,000	20,000	100,000	1,500	30,000
	5			17,000	25,000	12,000	80,000	110,000	20,000	100,000	1,500	30,000
	6			14,000	25,000	12,000	80,000	110,000	40,000	100,000	1,500	30,000
North 40 10	1			5,000	3,000	3,000	40,000	70,000	10,000	10,000	1,500	30,000
SFFT	2			5,000	3,000	3,000	50,000	70,000	18,000	10,000	1,500	30,000
	3	SEE ATTACHED		5,000	3,000	3,000	50,000	70,000	18,000	10,000	1,500	30,000
	4	TABLE		5,000	3,000	3,000	50,000	70,000	18,000	10,000	1,500	30,000
	5			5,000	3,000	3,000	40,000	70,000	15,000	10,000	1,500	30,000
	6			5,000	3,000	3,000	40,000	70,000	10,000	10,000	1,500	30,000
38 - 40 10	1	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	15,000	30,000
	2	100	150	14,000	25,000	12,000	80,000	110,000	30,000	10,000	15,000	30,000
	3	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	15,000	30,000
	4	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	10,000	30,000
	5	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	10,000	30,000
	6	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	15,000	30,000
S 38	1	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	55,000	30,000
	2	100	150	14,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000	30,000
	3	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000	30,000
	4	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000	30,000
	5	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000	30,000
	6	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	55,000	30,000

*****POP reduced to 1,500 pounds per 2 months in periods 1-6.

Table 5. Proposed trip limit adjustments under Alternative 2.

Subarea	Period	RCA Boundaries INLINE	OUTLINE	Cumulative Limits Sable	Longsp	Shortsp	Dover	Otr Flat	Petrale	Arrowtth	Slope Rk
North 40 10	1			14,000	25,000	12,000	80,000	110,000	40,000	150,000	1,500
Large	2			14,000	25,000	12,000	80,000	110,000	30,000	150,000	1,500
Footrope	3	See Attached		17,000	25,000	12,000	80,000	110,000	20,000	150,000	1,500
	4	Table		17,000	25,000	12,000	80,000	110,000	20,000	150,000	1,500
	5			17,000	25,000	12,000	80,000	110,000	20,000	150,000	1,500
	6			14,000	25,000	12,000	80,000	110,000	40,000	150,000	1,500
North SFFT	1			5,000	3,000	3,000	40,000	70,000	10,000	10,000	1,500
	2			5,000	3,000	3,000	50,000	70,000	18,000	10,000	1,500
	3	See Attached		5,000	3,000	3,000	50,000	70,000	22,000	10,000	1,500
	4	Table		5,000	3,000	3,000	50,000	70,000	22,000	10,000	1,500
	5			5,000	3,000	3,000	40,000	70,000	22,000	10,000	1,500
	6			5,000	3,000	3,000	40,000	70,000	10,000	10,000	1,500
38 - 40 10	1	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	15,000
	2	100	150	14,000	25,000	12,000	80,000	110,000	30,000	10,000	15,000
	3	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	15,000
	4	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	10,000
	5	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	10,000
	6	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	15,000
S 38	1	100	150	14,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000
	2	100	150	14,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000
	3	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000
	4	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000
	5	100	150	17,000	25,000	12,000	80,000	110,000	30,000	10,000	55,000
	6	100	150	14,000	25,000	12,000	80,000	110,000	50,000	10,000	55,000

*****POP reduced to 1,500 pounds per 2 months in periods 1-6.

Table 6. Project impacts of rebuilding species and target species under Alternative 1.

		North	South	Total
REBUILDING SPECIES	CANARY	7.8	2.7	10.5
	POP	84.9	0.0	84.9
	DRKBLTCH	188.4	28.5	217.0
	WIDOW	1.6	5.1	6.7
	BOCACCIO	0.0	11.5	11.5
	Y'EYE	0.6	0.0	0.6
	COWCOD	0.0	1.4	1.4
TARGET SPECIES	SABLE	1,909	477	2,386
	LONGSP	509	385	894
	SHORTSP	754	244	998
	DOVER	8,212	2,191	10,403
	ARRWTTH	1,692	64	1,756
	PETRALE	2,017	347	2,364
	OTR FLAT	2,117	559	2,676
	SLOPE ROCK	45	115	160

Table 7. Project impacts of rebuilding species and target species under Alternative 2.

		North	South	Total
REBUILDING SPECIES	CANARY	5.3	2.7	8.0
	POP	80.9	0.0	80.9
	DRKBLTCH	180.5	28.5	209.1
	WIDOW	1.6	5.1	6.6
	BOCACCIO	0.0	11.5	11.5
	Y'EYE	0.5	0.0	0.5
	COWCOD	0.0	1.4	1.4
TARGET SPECIES	SABLE	1,909	477	2,386
	LONGSP	509	385	894
	SHORTSP	754	244	998
	DOVER	8,212	2,191	10,403
	ARRWTTH	1,443	64	1,507
	PETRALE	1,937	347	2,284
	OTR FLAT	1,431	559	1,989
	SLOPE ROCK	45	115	160

Chilipepper – South of 40°10' N. Lat.

The GMT received a request to increase trip limits for chilipepper rockfish south of 40°10' N. Lat. using small footrope gear. The GMT did not have time to analyze this request and will report back to the Council during the final inseason discussion on Friday.

<u>Treaty Fisheries</u>

Lingcod

The GMT was informed that the tribes are proposing to change lingcod management beginning in 2008. Rather than the current trip limits of 1,000 lbs/day and 4,000 lbs/week for troll and 600 lbs/day and 1,800 lbs/week for all other fisheries, the tribes will manage all fisheries to stay within an overall harvest guideline of 250 mt. The tribes will manage their fisheries to stay within the current scorecard estimates of canary and yelloweye impacts regardless of any new targeting of lingcod.

Limited Entry Non-Tribal Whiting

The GMT recommends that the Council consider adjusting management measures specified for 2008 whiting trawl fisheries in an attempt to avoid the early fishery closure that occurred in 2007 due to attainment of the widow rockfish bycatch limit.

Industry members have requested a different management plan for the 2008 whiting fishery to minimize the bycatch concern that were observed in 2007. Options such as changing the season start date for each non-treaty sector, sector-specific bycatch caps for the three overfished rockfish species, and timed releases of bycatch caps have been alternatively recommended by industry representatives. However, no one strategy is a consensus recommendation from industry representatives and many of those ideas do not qualify as routine and do not meet standards necessary to waive notice and comment.

The GMT understands that actions such as changing season start dates, specifying sector-specific bycatch caps, and specifying an automatic release schedule of yields to the whiting bycatch caps are not routine and would require a two-meeting process and analysis in an environmental assessment tiered to the 2007-08 specifications EIS. Such actions would necessarily require re-prioritization of Council initiatives since the GMT, state, NMFS, and Council staffs are fully subscribed with assigned duties. Therefore, unless workload priorities are re-aligned, it is the GMT's understanding that inseason adjustments of whiting fishery bycatch caps are the only mechanism available through inseason action in 2008. This mechanism will use historical projection and may allow the Council to examine fishery data throughout the season and modify bycatch limits to more appropriately reflect fishing opportunities. In addition, more frequent adjustments to bycatch caps through inseason adjustments may provide the added benefit of ensuring bycatch is available for more months of the year. For example, the Council may wish to set a relatively low widow bycatch limit at the March meeting with the intention of gathering fishery information in order to re-evaluate the appropriateness of that limit at the June meeting. This strategy would also reserve bycatch for later months and reduce the probability of one sector pre-empting another. However, caution should be taken in approaching bycatch limit management in this way to minimize the chance of fishery stop and starts which can be costly to industry. A trade off exists between starting and stopping the fishery and being more strategic with bycatch limit adjustments.

One approach to calculate inseason adjustments of the bycatch limits is to 1) calculate the average proportion of bycatch rates by month, over all sectors, from 2004-2007, 2) multiply this proportion by the 2008 OY to find the expected metric tons of whiting expected each month, 3) calculate the anticipated bycatch (mt) by multiplying the expected hake by the overfished species monthly catch rates (by weight), and 4) lastly find the percentage of overfished species by inseason release period. The GMT is conducting this analysis as well as examining changes in seasonal bycatch rates by sector will report back to the Council during the final inseason session on Friday.

Selective Flatfish Proposed Language
The GMT reviewed the report entitled the *Effectiveness of Selective Flatfish Trawls in the 2005 U.S. West Coast Groundfish Trawl Fishery* (Agenda Item D.6.c). The report recommends changes to the regulatory language to meet the intent of the selective flatfish trawl design. The GMT recognizes that, if substantive gear changes are required, a proposed and final rulemaking

process would need to occur, which would not be an inseason action. The GMT met with Enforcement Consultants and members of the trawl industry to discuss a possible process to consider modifications to the legal definition of selective flatfish trawl. There was consensus that the first step in such a process would be further involvement of the trawl industry, for example, re-convening the Ad Hoc Legal Gear Committee.

In the interim, it would be useful to continue outreach efforts from selective gear researchers to the trawl industry, as well as facilitating communication among trawl fishers to maximize rockfish exclusion in current legal gears.

GMT Recommendations:

1. Maintain OA DTL limits north of the conception area as currently specified for the remainder of 2007.
2. Choose a canary rockfish research catch estimate that takes into consideration uncertainty in research catch.
3. Consider adjustments to OA sablefish limits in the Conception area in 2008 as described in Table 1
4. Recombine chilipepper rockfish with minor shelf rockfish, shortbelly, widow, and bocaccio between 34° 27' N. Lat. and 40° 10' N. Lat. The 2008 trip limits are recommended to be 2,500 lbs/2 month of which no more than 500 lbs/2 months can be any species other than chilipeper rockfish.
5. Consider the LE non-whiting trawl proposal presented above. Adopt either alternative:
    a. Alternative 1: RCA adjustments in Table 2, trip limit adjustments in Table 4, which result in projected impacts of rebuilding and target species outlined in Table 6.
    b. Alternative 2: RCA adjustments in Table 3, trip limit adjustments in Table 5, which result in projected impacts of rebuilding and target species outlined in Table 7.

6. Consider 2008 Pacific whiting fishery management measures and provide guidance on whether the GMT should analyze inseason adjustments of bycatch caps or changes to the season start dates.

PFMC
11/07/07

Agenda Item D.6.b
Supplemental GMT Report
Attachment 1
November 2007

2008 Projected mortality impacts (mt) of overfished groundfish species with most constraining LE non-whiting trawl proposal, preliminarily approved EFPS, and a low estimate of canary in research catches .

11/06/07

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	**11.5**	**8.0**	1.4	**209.1**	**80.9**	**6.6**	**0.5**
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/					1.9		0.0
At-sea whiting cat-proc a/		4.7		25.0		**220.0**	0.0
Shoreside whiting a/					0.0		0.0
Tribal whiting		0.7		0.0	0.6	6.1	0.0
Tribal							
Midwater Trawl		1.8		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Limited Entry Fixed Gear		1.1		1.3	0.4		2.8
Sablefish	13.4		0.0			0.0	
Non-Sablefish			0.1			0.5	
Open Access: Directed Groundfish		1.0					
Sablefish DTL	0.0	0.2		0.2	0.1	0.0	0.3
Nearshore (North of 40°10' N. lat.)	0.0	1.7	0.1	0.0	0.0	0.5	1.5
Nearshore (South of 40°10' N. lat.)	0.0			0.0	0.0		
Other	10.6			0.0	0.0	0.0	0.1
Open Access: Incidental Groundfish							
CA Halibut	0.1	0.0		0.0	0.0		
CA Gillnet c/	0.5			0.0	0.0	0.0	
CA Sheephead c/				0.0	0.0	0.0	0.0
CPS- wetfish c/	0.3						
CPS- squid d/							
Dungeness crab c/	0.0		0.0	0.0	0.0		
HMS b/		0.0	0.0	0.0			
Pacific Halibut c/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pink shrimp	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	0.8	0.0	0.0	0.0	0.3	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)							
Recreational Groundfish							
WA		**8.2**					**6.8**
OR						**1.4**	
CA	**66.3**	**9.0**	**0.3**			**8.0**	**2.1**
Preliminarily EFP	**11.0**	**0.1**	**0.2**	**1.0**		**3.4**	**0.1**
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs. e/							
	2.0	**3.4**	0.2	**2.0**	**2.0**	**1.1**	**3.0**
TOTAL	116.1	42.4	2.3	238.7	89.6	288.0	19.9
2008 OY	218	44.0	4.0	290	150	368	20
Difference	101.9	1.6	1.7	51.4	60.4	80.1	0.1
Percent of OY	53.3%	96.4%	57.5%	82.3%	59.8%	78.2%	99.3%
Key	(shaded)	= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting numbers reflect bycatch limits for the non-tribal whiting sectors.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Research projections updated November 2007. Estimate based on combination of actual 2007 catches and projected 2008 catch.

2008 Projected mortality impacts (mt) of overfished groundfish species with least constraining LE non-whiting trawl proposal, preliminarily approved EFPS, and a high estimate of canary in research catches .

11/06/2007

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	**11.5**	**10.5**	1.4	**217.0**	**84.9**	**6.7**	**0.6**
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/					1.9		0.0
At-sea whiting cat-proc a/		4.7		25.0		**220.0**	0.0
Shoreside whiting a/					0.0		0.0
Tribal whiting		0.7		0.0	0.6	6.1	0.0
Tribal							
Midwater Trawl		1.8		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Limited Entry Fixed Gear		1.1		1.3	0.4		2.8
Sablefish	13.4		0.0			0.0	
Non-Sablefish			0.1			0.5	
Open Access: Directed Groundfish		1.0					
Sablefish DTL	0.0	0.2		0.2	0.1	0.0	0.3
Nearshore (North of 40°10' N. lat.)	0.0	1.7	0.1	0.0	0.0	0.5	1.5
Nearshore (South of 40°10' N. lat.)	0.0			0.0	0.0		
Other	10.6			0.0	0.0	0.0	0.1
Open Access: Incidental Groundfish							
CA Halibut	0.1	0.0		0.0	0.0		
CA Gillnet c/	0.5			0.0	0.0	0.0	
CA Sheephead c/				0.0	0.0	0.0	0.0
CPS- wetfish c/	0.3						
CPS- squid d/							
Dungeness crab c/	0.0		0.0	0.0	0.0		
HMS b/		0.0	0.0	0.0			
Pacific Halibut c/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pink shrimp	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	0.8	0.0	0.0	0.0	0.3	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)							
Recreational Groundfish							
WA		**8.2**					**6.8**
OR						**1.4**	
CA	**66.3**	**9.0**	**0.3**			**8.0**	**2.1**
Preliminarily EFP	**11.0**	**0.1**	**0.2**	**1.0**		**3.4**	**0.1**
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs. e/							
	2.0	**7.5**	0.2	**2.0**	**2.0**	**1.1**	**3.0**
TOTAL	116.1	49.0	2.3	246.6	93.6	288.1	20.0
2008 OY	218	44.0	4.0	290	150	368	20
Difference	101.9	-5.0	1.7	43.5	56.4	80.0	0.0
Percent of OY	53.3%	111.4%	57.5%	85.0%	62.4%	78.3%	99.8%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting numbers reflect bycatch limits for the non-tribal whiting sectors.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Research projections updated November 2007. Estimate based on combination of actual 2007 catches and projected 2008 catch.

2007 Projected mortality impacts (mt) of overfished groundfish species updated at the November meeting.

11/05/2007

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	25.2	10.1	1.4	242.1	79.6	1.8	0.4
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/					1.9		0.0
At-sea whiting cat-proc a/		4.7		25.0		275.0	0.0
Shoreside whiting a/					0.0		0.0
Tribal whiting		0.7		0.0	0.6	6.1	0.0
Tribal							
Midwater Trawl		1.8		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Limited Entry Fixed Gear		1.1		1.3	0.4		2.8
Sablefish	13.4		0.0			0.0	
Non-Sablefish			0.1			0.5	
Open Access: Directed Groundfish		1.0					
Sablefish DTL	0.0	0.2		0.2	0.1	0.0	0.3
Nearshore (North of 40°10' N. lat.)	0.0	1.7	0.1	0.0	0.0	0.5	1.5
Nearshore (South of 40°10' N. lat.)	0.0			0.0	0.0		
Other	10.6			0.0	0.0	0.0	0.1
Open Access: Incidental Groundfish							
CA Halibut	0.1	0.0		0.0	0.0		
CA Gillnet c/	0.5			0.0	0.0	0.0	
CA Sheephead c/				0.0	0.0	0.0	0.0
CPS- wetfish c/	0.3						
CPS- squid d/							
Dungeness crab c/	0.0		0.0	0.0	0.0		
HMS b/		0.0	0.0	0.0			
Pacific Halibut c/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pink shrimp	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	0.8	0.0	0.0	0.0	0.3	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)							
Recreational Groundfish e/							
WA		5.7					6.0
OR						1.4	
CA	**53.1**	10.1	**0.2**			**8.9**	7.2
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs. f/							
	2.0	3.7	0.2	3.8	3.6	0.9	1.9
TOTAL	105.6	43.3	2.0	272.5	89.9	335.5	22.9
2007 OY	218	44.0	4.0	290	150	368	23
Difference	112.4	0.7	2.0	17.6	60.1	32.6	0.1
Percent of OY	48.4%	98.4%	50.0%	93.9%	60.0%	91.2%	99.4%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting numbers reflect bycatch limits set in regulation.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts. However, harvest guidelines for 2007 are as follows: canary in WA and OR combined = 8.2 mt and in CA = 9.0 mt; yelloweye in WA and OR combined = 6.8 mt and in CA = 2.1 mt.

f/ Research projections updated August 2007. Canary and yelloweye updated Sept. 10, 2007. Estimate based on combination of actual 2006 catches and projected 2007 catch.

POSSIBLE CHANGES TO THE 2008 CALIFORNIA RECREATIONAL GROUNDFISH FISHERY REGULATORY SPECIFICATIONS

At the September 2007 Council meeting, the Council took action to close portions of California's recreational groundfish fishery on October 1, 2007 due to concerns that the harvest guidelines for canary and yelloweye rockfish would be exceeded if the fishery continued. Subsequently, the state took conforming action to close the North and North Central management areas and California will be monitoring recreational catches for the remainder of the year to determine the total take of these species. To prevent exceeding canary and yelloweye rockfish harvest guidelines for the California recreational fishery in 2008, the CDFG will develop alternative management options for the 2008 season and request conforming actions in federal waters at the March 2008 Council meeting. The CDFG will be analyzing and considering use of some or all of the following management actions to prevent the harvest guidelines from being exceeded for these species in the 2008 recreational fishery:

- Reduction of bag limits in the Northern Management Region.
- Shallower depth restrictions in the Northern and North-Central Management Regions to reduce the by-catch of these restricted species which are found in greater abundance at depths over 20fm.
- Shortened fishing seasons in the Northern (as short as 2 – 3 months).and North Central Management Regions (as short as 4 – 5 months)
- Yelloweye rockfish conservation areas (temporary no take areas) where there is high catch of this species.
- Use of the existing management line at Point Arena (Mendocino County), south of which the catch of yelloweye rockfish is greatly decreased.

These measures will be evaluated using the complete 2007 California Recreational Fishery Survey (CRFS) data for the Northern and North-Central Management Regions updated to December 31st standards (see the June 2007 Council meeting Agenda Item B.3, Recreational Fishery Information Network Data and Sampling Refinements.) In addition, the CRFS program has proposed shifts in district boundary lines used in estimates and the analyses will also incorporate these resulting changes in catch estimates. The changes to the catch estimation methods and district boundary lines will change the catch estimates used as baseline data in the groundfish catch projection model (RecFISH). Substitution of the current CRFS catch estimates with the revised CRFS estimates as baseline data will alter the output of the RecFISH model from the present estimations and thus the outcome of proposed management actions modeled in RecFISH. Incorporation of the revised CRFS data prior to modeling management options will ensure that the data used in modeling the 2008 season is comparable to the data that will be used in inseason catch tracking in 2008. Therefore, it is prudent to use the revised CRFS data (available after December 31st) to model the 2008 season.

Effectiveness of selective flatfish trawls in the 2005 U.S. west coast groundfish trawl fishery

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September 2007

INTRODUCTION

Beginning in 2005, the Pacific Fishery Management Council (PFMC) required the use of selective flatfish trawls for all groundfish trawling on the U.S. west coast north of 40° 10' N latitude shoreward of the rockfish conservation area (RCA) (PFMC 2006). This requirement was enacted in an effort to maintain nearshore flatfish trawl fisheries while reducing the bycatch of depleted stocks of canary rockfish (*Sebastes pinniger*). Previous management actions to protect canary rockfish had greatly expanded the closed RCA, moving the eastern boundary shoreward. This change, while decreasing canary rockfish catch rates, also severely limited access to productive flatfish stocks (PFMC 2006). Research trials and fishery-scale tests of selective flatfish trawls showed a consistent 70-80% reduction in canary rockfish catch rates, providing a tool to allow flatfish trawling in traditional areas while reducing canary rockfish bycatch from levels projected for a fishery based on conventional trawls (King et al. 2004, Parker et al. 2004).

Selective flatfish trawls are very low-rise nets with a cutback headrope design that allows them to effectively catch bottom-tending fishes while avoiding species that are either distributed off-bottom or tend to rise when disturbed (King et al. 2004, Hannah et al. 2005). The bycatch reduction obtained with selective flatfish trawls for a particular species is dependent on a variety of factors, including how far the headrope follows behind the footrope, the maximum headrope height obtained, the height of the wing portions of the trawl, available light, and species-specific behaviors (King et al. 2004, Hannah et al. 2005). The numerous design factors influencing selective flatfish trawl performance create the potential for a large difference between the bycatch reduction obtained in research trials and that obtained by a fishery required to adopt the new technology. Commonly, fisheries adopting new gear technology for bycatch reduction fall short of bycatch reduction goals based on research trials (e.g. Richards and Hendrickson 2006, Foster 2004) but in some cases have met bycatch reduction goals (Hannah and Jones 2007). The primary objective of this study was to evaluate the evidence for, and magnitude of, any "performance gap" with regard to canary rockfish bycatch reduction in the U.S. west coast nearshore groundfish fishery now required to use selective flatfish trawls.

The federal regulation that defined a selective flatfish trawl was drafted after consideration of several factors including effectiveness, clarity, simplicity, and ease of enforcement (Appendix A). These rules included a specific ratio between headrope and footrope length to ensure that selective flatfish trawls had no overhanging "hood" or top panel to restrict the escape of fish that swim upwards when disturbed. The definition also relied on several measures to restrict overall trawl height or "rise" and height of the trawl wings. These included a restriction on the location of headrope floats, an upper limit on footrope length (to limit the scale of the trawl) and a 3 foot maximum length for the breastlines of the net. As the current definition of a selective flatfish trawl was developed, managers recognized that the criteria designed to restrict headrope rise might not be as effective as more detailed technical criteria. However, a more complex definition was considered more difficult to enforce. The language adopted was a compromise between ease of enforcement and the complexity needed to ensure that all selective flatfish trawls would incorporate essential design features. As a result, some vessels fishing in 2005 may have used trawls that met the legal definition of selective flatfish trawls but that still produced too much rise to meet bycatch reduction targets. Also, some nets may not have met the design criteria and been detected by enforcement. A second objective of this analysis was to determine if variation in the design of selective flatfish trawls fished in 2005 reduced the level of bycatch reduction achieved by the fishery, and whether changes to the legal definition of selective flatfish trawls are warranted.

METHODS

Fishery Performance

We evaluated the success of the 2005 selective flatfish trawl fishery in reducing canary rockfish bycatch by comparing bycatch rates from observed trips in 2005 to similar data collected in 2003 as part of a large-scale Exempted Fishing Permit (EFP) test-fishery of selective flatfish trawls (Parker et al. 2004). Observer data for vessels using selective flatfish trawls in 2005 were obtained from the NOAA National Marine Fisheries Service West Coast Groundfish Observer Program (WCGOP). In the WCGOP, trawl vessels were selected randomly for observer coverage, after stratification by primary port of landing, and sampled for a complete two-month catch limit period. The shipboard sampling and data analysis methods used by the WCGOP have been described by the NMFS Northwest Fisheries Science Center (2003).

In the 2003 EFP fishery, selected vessels were allowed higher flatfish landing limits and fishing access to a portion of the closed RCA (PFMC 2002) in exchange for building and using trawls that had been inspected and certified as meeting the design criteria for selective flatfish trawls (King et al. 2004). Vessels also agreed to 100% observer coverage. To allow the best possible comparison between EFP data and 2005 fishery observer data, we considered only data from the months of May-October and limited the EFP data to hauls made shallower than 100 fathoms, the shoreward limit of the RCA for most of 2005 (Table 1). Only 2 of 78 total observed EFP trips were conducted north of Cape Alava on the Washington coast, so we restricted our comparisons to data collected off Oregon and off Washington south of Cape Alava. We also included 2003 canary rockfish bycatch rates from non-EFP vessels from the WCGOP for comparison with 2005 bycatch rates for selective flatfish trawls.

We calculated bycatch rates for canary rockfish and other species using the ratio estimator (Cochran 1977), with the catch of "northern target" species in the denominator (Table 2). Mean bycatch rates were calculated separately for vessels landing into Oregon and Washington.

Indicators of Trawl Height

Canary rockfish catch rates in selective flatfish trawls can be influenced by a variety of factors including fishing location, season, and substrate, as well as net design criteria including headrope height, wing height, and headrope length in relation to footrope length (King et al. 2004). We conducted three analyses to try and separate trawl performance issues, specifically trawl height, from factors related primarily to fishing location.

First, we compared Pacific hake (*Merluccius productus*) catch rates (lb/h) from the 2005 selective flatfish trawl fishery, the 2001-2002 selective flatfish trawl research trials (King et al. 2004), the 2003 EFP fishery (Parker et al. 2004) and the 2003 non-EFP fishery that used conventional trawls. Canary rockfish are very patchily distributed, mostly found over or near hard-bottom substrates. Pacific hake are a very common fish off the Pacific coast in the summer months and are widely distributed (Dark et al. 1980). Both research data and comments from fishermen participating in the 2003 EFP indicate that properly designed selective flatfish trawls have very low catch rates for Pacific hake (97% reduction in shelf research trials, 86% reduction in slope trials). If trawls fished in the 2005 fishery generated Pacific hake catch rates that were comparable to those observed in research trials, then 2005 canary rockfish bycatch rates are likely to have been driven primarily by the choice of fishing location rather than by variation in trawl configuration. Conversely, if Pacific hake catch rates in the 2005 fishery were much higher than expected based on the research and EFP data, then problems with net configuration and excessive trawl height in particular could have influenced the observed canary rockfish bycatch rates. For this particular comparison, we used catch rates (lb/h) rather than bycatch rates to facilitate comparison with 2001-02 research haul data. Bycatch rates are difficult to calculate for research haul data because all catch is enumerated and it's uncertain how much of the catch would have been retained under fishing conditions. As with canary rockfish bycatch rates, the Pacific hake catch data used were restricted to observed trips fishing south of Cape Alava, Washington in depths of 0-100 fathoms. Data from research trials did not match these spatial and depth criteria, as they were collected only in waters off Oregon and at somewhat deeper maximum depths than the 2005 trawl fishery (85% of the research hauls were conducted in water depths less than 131 fathoms, King et al. 2004).

Next, we examined 2005 canary rockfish and Pacific hake bycatch rates by individual vessel to determine how specific vessels were influencing bycatch rates in the selective flatfish trawl fishery. Some vessels in the Oregon fleet were known to be using properly configured selective flatfish trawl nets in 2005. Eight Oregon vessels developed certified, inspected nets as part of the 2003 EFP fishery (Parker et al. 2004). If the 2005 observed Oregon fleet was fishing a mixture of properly-configured and poorly-configured selective flatfish trawls, this should have resulted in canary rockfish and Pacific hake bycatch being highly concentrated in a small group of vessels.

Finally, we examined the effect that "technical help" from net shops and agency staff may have had on the performance of vessels participating in the 2005 selective flatfish trawl fishery. Vessels participating in the 2003 EFP fishery produced canary rockfish bycatch rates that were comparable to those produced by selective flatfish trawls in research trials (Parker et al. 2004). However, these EFP fishermen either had significant help in modifying their existing trawl nets to meet the design criteria for selective flatfish trawls, or opted to buy a new trawl from the Newport, Oregon net shop (Foulweather Trawl Inc.) that designed and produced the initial west coast selective flatfish trawl used in research trials. Although a series of Oregon Seagrant workshops was conducted to introduce the rest of the fleet to the new trawl design, it's likely that some vessel operators entering the fishery in 2005 modified their trawl nets to meet the legal guidelines for selective flatfish trawls without help from knowledgeable net shops or agency staff. Therefore, these vessels could have utilized technically legal nets in 2005 that still produced excessive headrope height, which would tend to increase both Pacific hake and canary rockfish bycatch rates. This assertion is supported by the fact that many vessel operators participating in the 2003 EFP fishery initially submitted net designs that would have produced too much height and had to be convinced by agency staff and net shops that lower rise nets would still effectively catch flatfish (pers. observ, R.W. Hannah). With the help of Foulweather Trawl Inc., we assembled information on which vessels had "technical help" in configuring their nets. We then compared canary rockfish and Pacific hake bycatch rates between these two groups:

1) Vessels that had technical help in meeting the trawl design criteria (purchased their selective net from Foulweather Trawl Inc. prior to fishing in 2005 or participated in the 2003 EFP). All were Oregon-based.
2) Oregon and Washington vessels with no known technical help.

As in other graphical comparisons, we examined mean values of the canary rockfish bycatch rate and Pacific hake catch rate, by state, for hauls south of Cape Alava, Washington. However, for statistical tests, we further restricted the data used for these two groups to hauls south of 47.0° N latitude. This further restriction was chosen to minimize any spatial differences between the two groups. For the statistical test, bycatch rates were normalized via log transformation and randomization tests were used to test for significant differences. Randomization tests avoid the problems that standard methods, such as t-tests, have with highly skewed data with many zero values. The hypothesis tested was that the catch rates from the vessels with known assistance were the same as the rates from the other vessels. The specific statistic tested was the ratio of the bycatch rate of the vessels "with help" to the rate of the "unknown help" vessels:

$$R_{Comp} = \frac{\dfrac{\sum_i b_{help\ i}}{\sum_i t_{help\ i}}}{\dfrac{\sum_j b_{unknown\ j}}{\sum_j t_{unknown\ j}}}$$

where

$b_{help\ i}$ = bycatch from vessels with help on haul *i*
$t_{help\ i}$ = Retained northern target from vessels with help on haul *i*
$b_{unknown\ j}$ = bycatch from the "unknown help" vessels on haul *j*
$t_{unknown\ j}$ = Retained northern target from the "unknown help" vessels on haul *j*
R_{Comp} = Ratio of rates

The test statistics were compared to a reference distribution created by randomly assigning hauls to the "help" or "unknown help" categories 1000 times. The sample size and the number of vessels per category remained the same. The significance of the statistic was determined using the quantiles from the test distribution. If the null hypothesis is true, then the test statistic should be equal to one.

A randomization test was also used to compare the *variance* of canary rockfish bycatch rates between groups, and the test statistic evaluated was:

$$R_{Var} = \frac{Var(r_{unknown})}{Var(r_{help})}$$

where

$r_{unknown}$ = bycatch rate from the "unknown help" vessels
r_{help} = bycatch rate from the vessels with help
R_{Var} = ratio of the variances

The variances were calculated using the formula from Cochran (1977).

RESULTS

Fishery Performance

The expected incidental catch rates for both Pacific hake and canary rockfish should change with changes in their stock abundance in relation to the abundance of the target species. Between 2003 and 2005, the spawning biomass of hake declined 17.7%, while the spawning biomass of canary rockfish increased 16.2% (Methot and Stewart 2005, Helser et al. 2006). Therefore, even if selective flatfish trawls were performing well in 2005, we would expect canary rockfish bycatch rates to be somewhat higher than those observed in 2003, while hake catch rates would be somewhat reduced.

The 2005 observer data show that the Oregon and Washington trawl vessels fishing selective flatfish trawls in 2005 greatly exceeded the expected canary rockfish bycatch rates that were projected from the 2003 selective flatfish trawl EFP fishery (Figure 1). Oregon and Washington vessels produced canary rockfish bycatch rates 4.1 and 5.5 times higher than expected, respectively. This is a much larger difference than would be expected based on changes in stock abundance. However, despite less restrictive RCA boundaries (deeper shoreward boundary) in May-August 2005 (Table 1) and increased canary rockfish abundance, the selective flatfish trawl fishery produced canary rockfish bycatch rates comparable to Oregon vessels fishing conventional trawls in 2003 and much lower than Washington vessels in 2003, (Figure 1). These summary data suggest that the introduction of the selective flatfish trawl in 2005 achieved some reduction in canary rockfish bycatch rates for Washington vessels and probably for vessels from both states combined, but much less than expected based on 2001-02 research trials (King et al. 2004) and the 2003 EFP test-fishery.

Indicators of Trawl Height – Pacific hake catches

Pacific hake catch rates for vessels fishing selective flatfish trawls in 2005 were 3.9 and 3.5 times higher for Oregon and Washington vessels, respectively, than in the 2001-02 selective flatfish trawl research trials (Figure 2). However, they were comparable to catch rates obtained by EFP vessels in 2003 and much lower than any of the data generated by conventional trawls (Figure 2). Given the estimated 17.7% decline in Pacific hake abundance between 2003 and 2005, the 2005 catch rates with selective trawls suggest that the trawls fished in 2005 were less effective at reducing Pacific hake catch rates than expected, supporting the hypothesis that some selective flatfish trawls had excessive rise in 2005.

Indicators of Trawl Height – Individual vessel catches

Some of the Oregon vessels fishing selective flatfish trawls in 2005 did achieve low canary rockfish bycatch rates (Figure 3); 8 of 22 vessels produced canary rockfish bycatch rates at or below the expected value of 0.0011 based on the 2003 EFP fishery. Only 5 of 22 observed Oregon vessels had rates higher than the average rate of 0.0046. Just six vessels accounted for over 81% of the total observed canary rockfish bycatch poundage. These 6 vessels also had 4 of the 7 highest catch rates for Pacific hake. In Washington, only seven vessels with hauls south of Cape Alava were observed, making it difficult to separate vessel effects from other factors, however generally canary rockfish bycatch was spread more evenly across the Washington vessels with only 2 of 7 producing bycatch rates at or below the 0.0011 level (Figure 3). For Washington vessels, the association between Pacific hake catch and canary rockfish catch was very weak. Considering vessels from both states, the agreement between a vessel's canary rockfish and Pacific hake bycatch rates was less than would be expected if excessive trawl height was the dominant factor creating higher than expected canary rockfish bycatch rates.

Indicators of Trawl Height – Vessels with technical help vs. "unknown help" status

Vessels that were known to have had technical help in configuring their selective flatfish trawls produced mean canary rockfish bycatch rates that were 50% lower than vessels of "unknown help" status, a difference that was not statistically significant (Figure 4, $P > 0.13$, one haul for the "help"group was included in the randomization tests but deleted from Figure 4 because it had 26 lbs of canary rockfish but no catch of northern target species, causing the rate to be undefined). The variance of canary rockfish bycatch rates for vessels with "unknown help" status however, was much greater than for vessels that had help ($P < 0.01$, Figure 5); vessels of "unknown help" status produced much higher extreme values of the bycatch rate (note that the log transformation reduces the influence of extreme values on the mean; the mean transformed values for the two groups are almost the same in Figure 5, while the means of the untransformed data are quite different in Figure 4).

Vessels with "unknown help" status produced much higher Pacific hake catch rates in 2005 ($P < 0.01$, Figures 6 and 7, one haul for "unknown help" vessels was included in randomization tests but deleted from the Figure because it produced 8 lbs of Pacific hake and no catch of northern target, causing the rate to be undefined). Vessels that were known to have had help produced lower Pacific hake catch rates in 2005 than the EFP vessels did in 2003, consistent with a decline in Pacific hake abundance over time (Figure 6). The vessels with help produced canary rockfish bycatch rates higher than the 2003 EFP vessels, again consistent with the time trend in abundance (Figure 4). For both species though, the difference in catch or bycatch rates was much greater than would be expected based on the modest changes in stock abundance over time (Figures 4 and 6).

DISCUSSION

The results presented here do not provide a clear explanation as to why the selective flatfish trawl fishery performed so poorly in 2005 in meeting bycatch rate targets based on the 2003 EFP fishery (Parker et al. 2004). The high catch rates for Pacific hake and high variance in canary rockfish bycatch rates within the "unknown help" vessel group are indicative of excessive headrope height for some of the nets being fished by these vessels in 2005. However, the lack of a significant difference in canary rockfish bycatch rates between vessels with help and the "unknown help" vessels and the poor correspondence between individual vessel's canary rockfish and Pacific hake bycatch rates (Figure 3) weaken this argument. The confounding factors within these data sets that make more definitive conclusions difficult include changes in species abundance and distribution over time, different vessels being sampled in different years, and in the depth, spatial and habitat distributions of hauls in different years.

The evidence presented here for excessive height in some selective flatfish trawls in 2005 is inconclusive, however there are some reasonable arguments for modifying the definition of selective flatfish trawls to better prevent the use of trawls with excessive headrope height. First, anecdotal evidence suggests that some trawls with excessive headrope height have been used. Fishery observers in 2005 reported that some vessel operators were attaching additional floats to portions of the body of their nets to increase net rise. Selective flatfish trawls with extreme numbers of ribline floats have also been observed by agency staff. Recent comments by net shop operators also suggest that some vessels made only the very minimum adjustments to their flatfish trawls in 2005 to meet the legal definition prior to fishing, leaving a configuration that could still generate a high headrope height. Comments from one operator and one net shop owner suggest that two vessels actively tried to achieve higher headrope height to make their nets fish more effectively, without consideration of the impact on canary rockfish bycatch.

The anecdotal evidence suggests that the current rule defining selective flatfish trawls allows nets that may generate excessive rise to be built and fished, which makes interpretation of observer-generated canary rockfish bycatch data more difficult. If excessive rise in some trawls is contributing to the high canary rockfish bycatch rates observed in 2005, a more effective legal definition of selective flatfish trawls could reduce the need for other management actions, such as closing areas to fishing. If a change in the legal definition of selective flatfish trawls can result in consistently lower canary rockfish bycatch rates in this fishery, observed differences in bycatch rates can be more reliably attributed to other important factors such as RCA boundaries, catch limits, bycatch "hotspots" and latitudinal and habitat-based differences in the distribution of canary rockfish. A more rigorous legal definition for selective flatfish trawls has the potential to improve the PFMC's management performance as it relates to limiting canary rockfish bycatch in this fishery segment.

RECOMMENDATION

Considering all of the factors discussed above, management actions to improve the performance of the selective flatfish trawl fishery would be precautionary, and should include consideration of some changes to the definition of selective flatfish trawls that more effectively restrict headrope and wing height. Such an initiative may need to be coordinated with additional training for enforcement officers on how to evaluate selective flatfish trawls effectively under a more complex legal definition. It should be noted though, that while changes in the selective flatfish trawl definition may help control canary rockfish bycatch, it is not likely to be sufficient on its own. Factors other than trawl configuration clearly also contributed to the poor performance of the 2005 selective flatfish trawl fishery in meeting the projected canary rockfish bycatch rates. The vessels that had technical help with their nets only achieved a bycatch rate of 0.0025, still more than double the rate of 0.0011 projected from the 2003 EFP fishery. This performance gap could be due to an unusual distribution of canary rockfish in 2005 or to differences in the specific habitats, species and areas trawled in 2005 or due to differences in incentives between EFP vessels in 2003 and regular trawl vessels in 2005. When they become available, an analysis of 2006 observer data for vessels fishing selective flatfish trawls may help further define what will improve the performance of the selective flatfish trawl fishery.

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Table 1. Depth boundaries (fathoms) of the Rockfish Conservation Area by fishing period and year, 2003-2005.

Year	January - February	March - April	May- June	July - August	September - October	November - December
2005	75-200[1]	100-200	100-200	100-200	100[2]-250	0-250
2004	75-200[1]	60-200	60-150	75-150	75[2]-200	0-250[1]
2003	100-250[1]	100-250	50-200	75-200	50-200	0-200[1]

[1] Modified to include winter petrale sole fishing areas.
[2] Changed to 0 fathoms mid-period.

Table 2. List of "northern target" species (or market categories) used for calculation of bycatch rates in the selective flatfish trawl fishery.

Arrowtooth flounder (*Atherestes stomias*)
Butter sole (*Isopsetta isolepis*)
Curlfin sole (*Pleuronichthys decurrens)*
Dover sole (*Microstomus pacificus*)
English sole (*Parophrys vetulus*)
Petrale sole (*Eopsetta jordani*)
Rex sole (*Glyptocephalus zachirus*)
Rock sole (*Lepidopsetta bilineata*)
Sand sole (*Psettichthys melanostictus*)
Sanddab (*Citharichthys* sp.)
Starry flounder (*Platichthys stellatus*)
Longspine thornyhead (*Sebastolobus altivelis*)
Sablefish (*Anoplopoma fimbria*)
Shelf rockfish (*Sebastes* sp.)
Shortspine thornyhead (*Sebastolobus alascanus*)
Slope rockfish (*Sebastes* sp.)
Yellowtail rockfish (*Sebastes flavidus*)

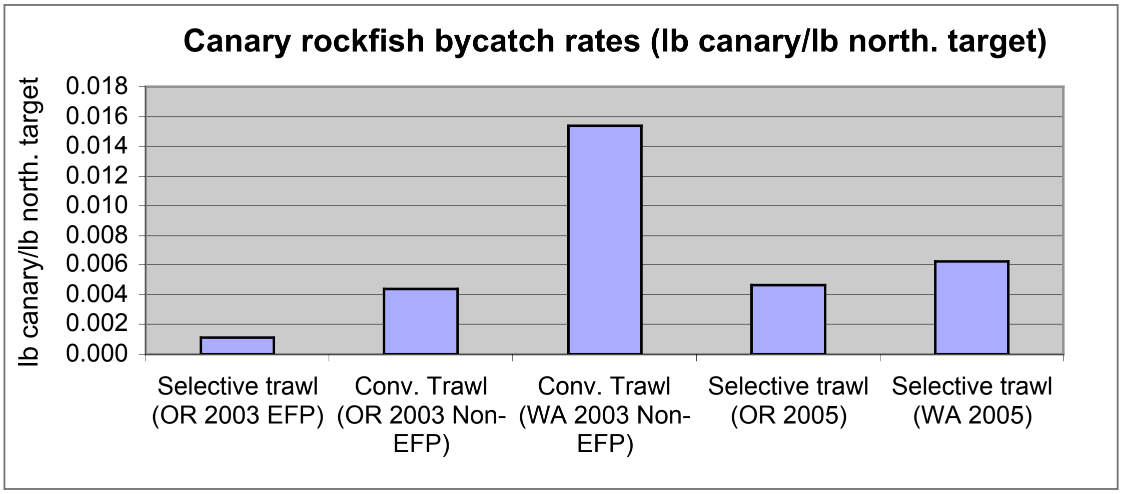

Figure 1. Mean canary rockfish bycatch rates (lbs/lb of northern target) for the 2003 selective flatfish trawl EFP fishery, the 2003 conventional trawl fisheries inside 100 fathoms landing into Oregon and Washington and observed vessels fishing selective flatfish trawls landing into Oregon and Washington in 2005. Hauls included are from the months of May-October and had haul locations south of Cape Alava, Washington (see text).

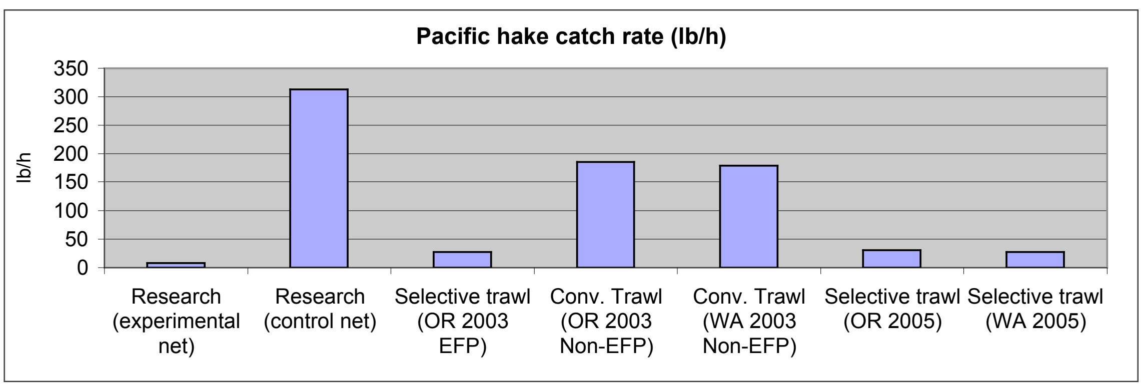

Figure 2. Mean Pacific hake catch rates (lbs/h) for 2001-02 selective flatfish trawl research hauls (experimental and control nets), the 2003 selective flatfish trawl EFP fishery, the 2003 conventional trawl fisheries inside 100 fathoms landing into Oregon and Washington and observed vessels fishing selective flatfish trawls landing into Oregon and Washington in 2005. Hauls included are from the months of May-October and had haul locations south of Cape Alava, Washington (see text).

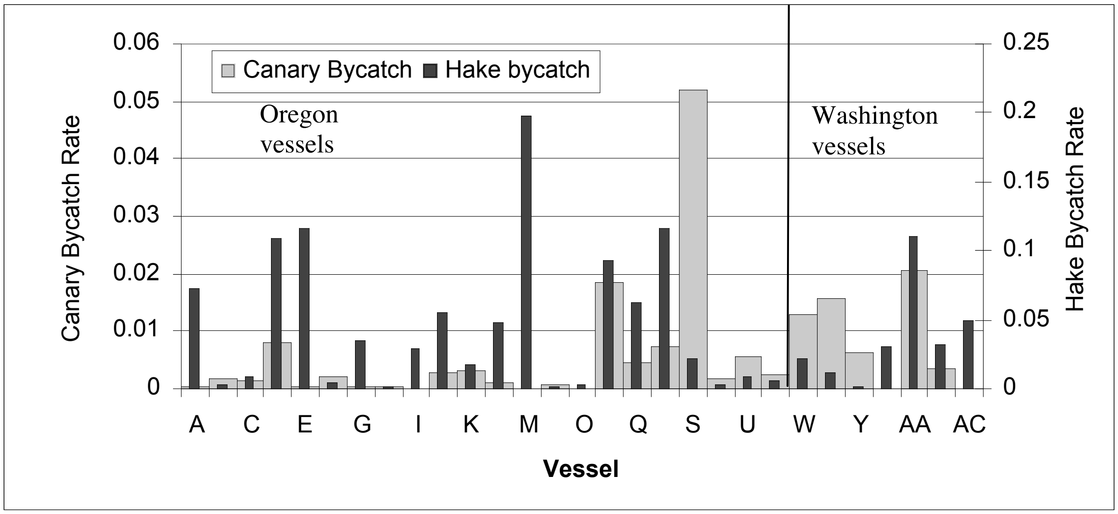

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Figure 3. Canary rockfish and Pacific hake bycatch rates (lbs/lb of northern target) by vessel and state of landing, for observed vessels fishing selective flatfish trawls in 2005. Hauls included are from the months of May-October and had haul locations (see text) south of Cape Alava, Washington.

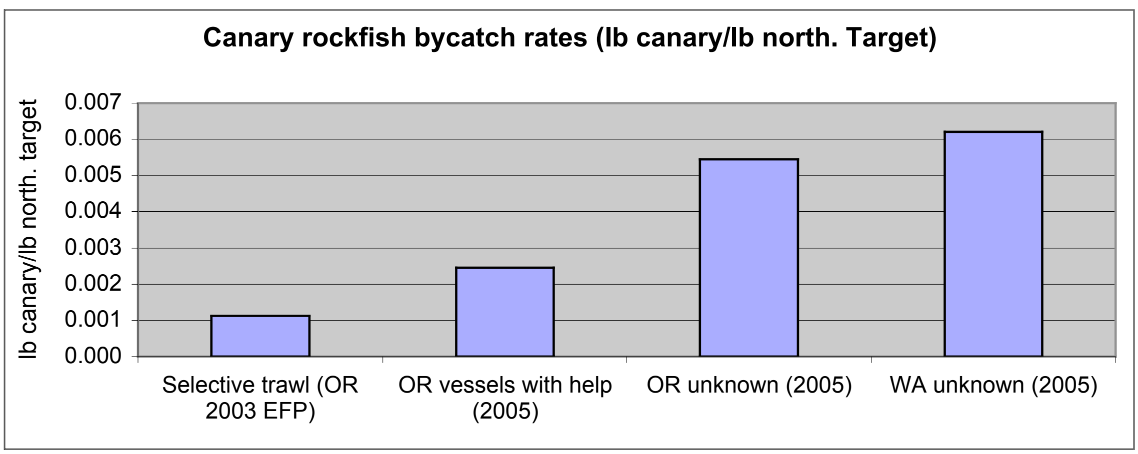

Figure 4. Mean canary rockfish bycatch rates (lbs/lb of northern target) for the 2003 selective flatfish trawl EFP fishery, and three classes of observed vessels fishing selective flatfish trawls in 2005: vessels landing into Oregon ports that were known to have had technical assistance in configuring their selective flatfish trawl nets (see text) and vessels landing into Oregon and Washington ports for which the level of technical help was unknown. Hauls included are from the months of May-October and had haul locations south of Cape Alava, Washington (see text).

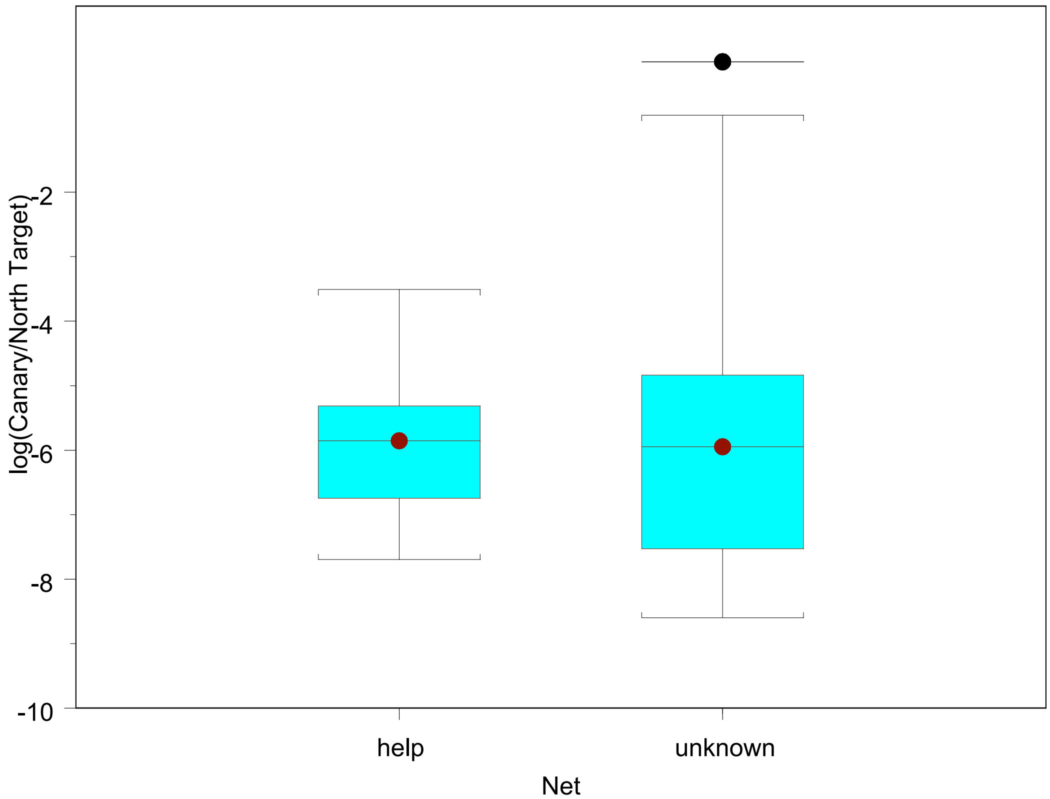

Figure 5. Box plot of the log of the canary bycatch rate (lb canary rockfish/lb northern target) for vessels with assistance (help) in configuring their selective flatfish trawls and vessels of "unknown help" status with regard to assistance in net configuration. Data are from the 2005 observer program for vessels fishing selective flatfish trawls in the months of May-October, including hauls off Oregon and Washington south of 47.0° N. latitude. One haul for the "help" group was deleted because it yielded 26 lbs of canary rockfish and no catch of northern target species. The line in the middle of the bar is the median. The whiskers extend to the range of the distribution up to 1.5 times the inter-quartile range. Any observations outside the whiskers are considered extreme values.

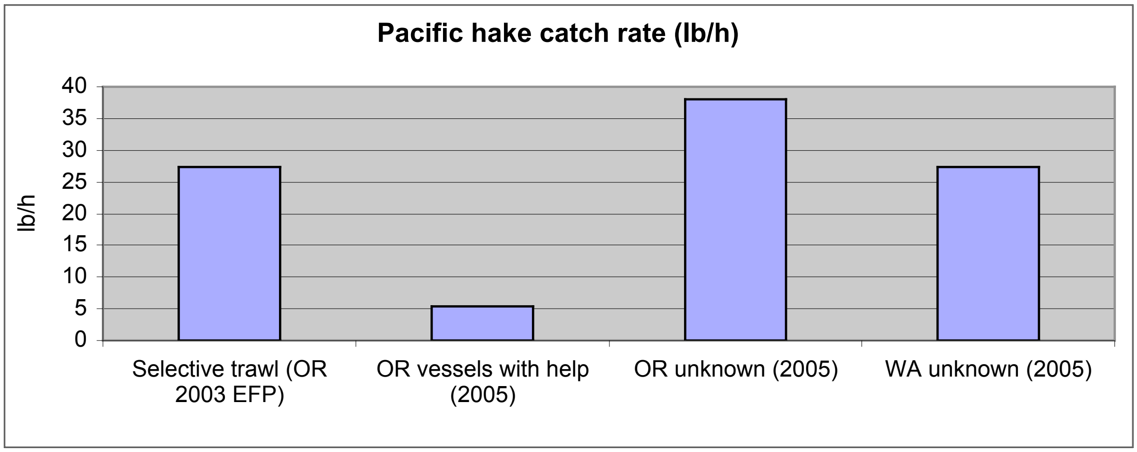

Figure 6. Mean Pacific hake catch rates (lbs/h) for the 2003 selective flatfish trawl EFP fishery, and three classes of observed vessels fishing selective flatfish trawls in 2005: vessels landing into Oregon ports that were known to have had technical assistance in configuring their selective flatfish trawl nets (see text) and vessels landing into Oregon and Washington ports for which the level of technical assistance was unknown. Hauls included are from the months of May-October and had haul locations south of Cape Alava, Washington (see text).

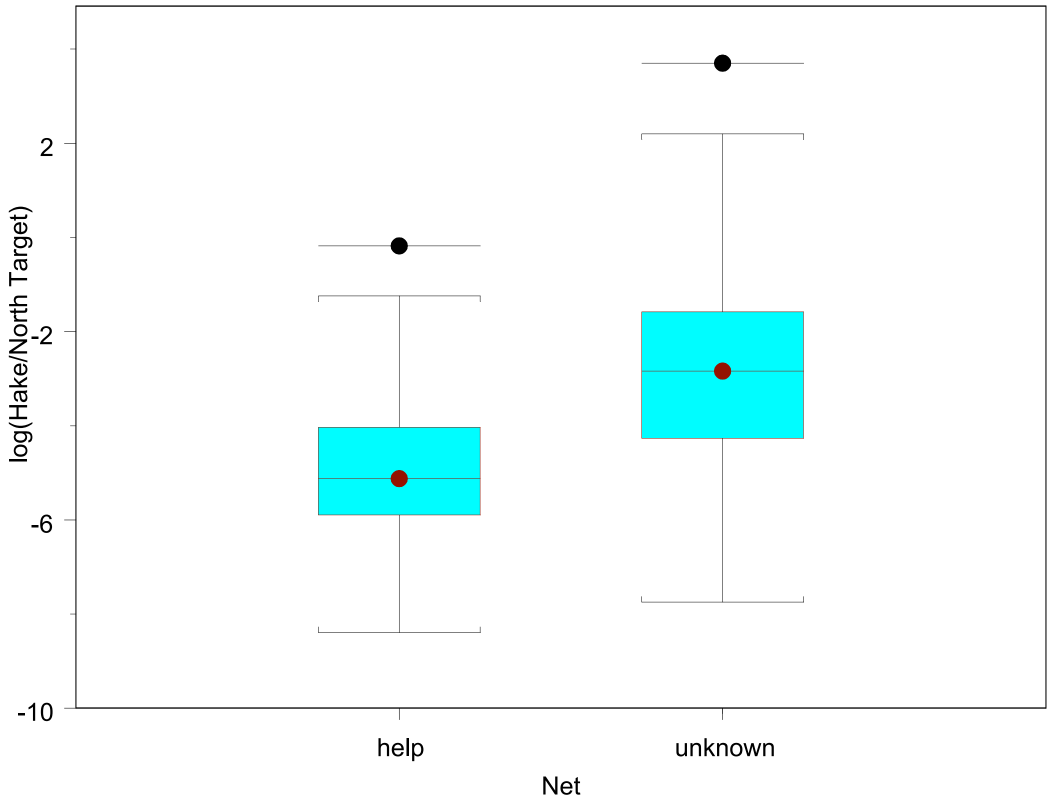

Figure 7. Box plot of log of the Pacific hake bycatch rate (lb Pacific hake/lb northern target) for vessels with assistance (help) in configuring their selective flatfish trawls and vessels of "unknown help" status with regard to assistance in net configuration. Data are from the 2005 observer program for vessels fishing selective flatfish trawls in the months of May-October, including hauls off Oregon and Washington south of 47.0° N. latitude. One haul for the "unknown help" group was deleted because it yielded 8 lbs of Pacific hake and no catch of northern target species. The line in the middle of the bar is the median. The whiskers extend to the range of the distribution up to 1.5 times the inter-quartile range. Any observations outside the whiskers are considered extreme values.

Appendix A. Current federal rule defining selective flatfish trawls.

(c) Selective flatfish trawl gear is a type of small footrope trawl gear. The selective flatfish trawl net must be a two-seamed net with no more than two riblines, excluding the codend. The breastline may not be longer than 3 ft (0.92 m) in length. There may be no floats along the center third of the selective flatfish trawl net's headrope or attached to the top panel except on the riblines. The footrope must be shorter than 105 ft (32.26 m) in length. The headrope must be at least 30 percent longer in length than the footrope. An explanatory diagram of the selective flatfish trawl net is provided as figure 1 of Part 660, Subpart G in Title 50 Code of *Federal Regulations*.

Appendix B. Proposed modified rule (changes highlighted) to better restrict rise in selective flatfish trawls.

(c) Selective flatfish trawl gear is a type of small footrope trawl gear. The selective flatfish trawl net must be a two-seamed net with no more than two riblines, excluding the codend. The breastline may not be longer than 3 ft (0.92 m) in length. **All floats on the trawl must be placed on the headrope between the breastline and the point where the ribline joins the headrope, or on the headrope within 4 feet of this point or on the codend.** There may be no floats along the center **40%** of the selective flatfish trawl net's headrope~~ or attached to the top panel except on the riblines~~. **The stretched distance between the footrope and the headrope, measured at the point where the ribline joins the headrope, cannot exceed 47 meshes and cannot exceed 7 ft (2.13m). Counted at the breastline, the trawl netting between the footrope and the headrope cannot exceed 20 meshes.** The footrope must be shorter than 105 ft (32.26 m) in length. The headrope must be at least 30 percent longer in length than the footrope. An explanatory diagram of the selective flatfish trawl net is provided as figure 1 of Part 660, Subpart G in Title 50 Code of *Federal Regulations*.

GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2007 AND 2008 FISHERIES, INCLUDING PACIFIC WHITING SEASON DATES

2007

Open Access Daily Trip Limit (DTL) Fishery North of 36°

The Groundfish Advisory Subpanel (GAP) recommends an increase to the sablefish DTL fishery north of 36° to 900 lbs per week and 2700 lbs per two-month period. According to the November 2nd quota species monitoring (QSM), catches reflect only 55% of the 2007 harvest guideline. The GAP questions the validity of yelloweye impacts in a fishery that takes place outside 150 fathoms.

Limited Entry Trawl Fishery North of 36°

The GAP requests an increase to trawl sablefish for the month of December. The November 2nd QSM report, catches of DTL sablefish are at 64% of the harvest guideline. There is substantial fish available under both shortspine (currently at 43% of harvest guideline) and longspine (31% of harvest guideline). This fishery takes place outside of 200 fathoms, therefore the impacts on darkblotch rockfish are negligible.

2008

Open Access DTL Fishery South of 36°

The GAP supports the Groundfish Management Team (GMT) proposal:

1. 300 lbs per day, 1 landing of 850 lbs per week with no cap.
2. If the Nature Conservancy/Environmental Defense (TNC/ED) exempted fishing permit (EFP) is implemented, a 300 lb daily limit, 1 landing of 800 lbs per week with a 2-month cap of 2,400 lbs.

Open Access DTL fishery North of 36°

The GAP proposes a 300 lb daily limit, 1 landing per week of 800 lbs with a 2-month cap of 2,400 lbs regardless of whether the TNC/ED EFP is implemented.

Limited Entry Fixed-Gear South of 40°10'

The GAP supports the GMT proposal combining chilipepper, shelf, short belly, widow, and bocaccio into one limit which would be 2500 lbs per 2-month period with no more than 500 lbs of any of those species with the exception of chilipepper.

Limited Entry Fixed-Gear South of 34°27' (Conception Area)

The GAP proposes continuing the shortspine thornyhead trip limit of 3,000 lbs per 2-month period for the start of the 2008 season.

Non-Whiting Trawl South of 40°10'

The GAP is seeking guidance from the GMT on efforts to increase trawl trip limits in this area. Currently the trawlers are discarding significant amounts of chilipepper rockfish which they would like the opportunity to retain.

Non-Whiting Trawl North of 40°10'

The GMT is proposing 2 options to reduce canary impacts in the non-whiting trawl limited entry fishery. One of the proposals reduces canary impacts to 8 mt while the other reduces impacts to 10.5 mt. The GAP is supportive of the proposal which results in reducing impacts to 10.5 mt.

Whiting Trawl

The GAP proposes two options for releasing bycatch during the 2008 season. The GAP does not propose any changes to the season start dates for any sector.

Option 1:

- April 1: release 50% of the overall bycatch cap
- June 15: release 45% of the overall bycatch cap
- September 15: release 5% of the overall bycatch cap

Option 2

- April 1: release 20% of the overall bycatch cap
- June 15: release 35% of the overall bycatch cap
- August 15: release 20% of the overall bycatch cap
- September 15: release 25% of the overall bycatch cap

General Comments

The GAP continues to feel frustration with how the scorecard is used and managed. For example, some GAP members are fairly certain that restrictive measures to be taken in the California Recreational Fishery will result in significantly less canary impacts then the current harvest guideline indicates. Other GAP members recognize that the single line which is examined and adjusted downwards continues to be the limited entry non-trawl whiting. The trawl fishery continues to be impacted in order to balance the scorecard and potentially accommodate EFPs. The GAP realizes that if the process were working with hundreds of tons of fish that this would not be such a large issue – but as we continue to work with tenths of a ton this is a significant problem.

The GAP is also concerned about data collection when fisheries or areas are completely closed. For example, both limited entry non-whiting trawl proposals close the area between Humbug Mountain and Cape Arago in Oregon due to canary impacts based on the 2006 observer data. If you eliminate fishing completely in this area you lose access to newer observer and fisheries-dependent data.

PFMC
11/07/07

Agenda Item D.6.e
Supplemental Public Comment
November 2007

<<DRAFT 2008 Whiting dates_caps-options.doc>> This is being discussed amongst some in industry as an alternative approach to our present start up process. It is thought that it may lend itself to a majority of industry supporting it however it is too early to say what reception we may achieve. Briefly objectives by Priority: Use season start up dates to mitigate by-catch. Allow the greatest number of industry participants in all sectors to realize the best individual economic gain. And as a subset of this second sentence is the goal of allowing present whiting participants that participate in two whiting sectors presently, not to give up present opportunity and; for those that participate in the Pollock fishery a better chance to realize full economic opportunity in that fishery. Some of us think this would be accomplished if we followed one of these options.

Thank you
Best regards

Mike Okoniewski
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Pacific Woodland Division,
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DRAFT OPTION 1 FOR 2008 WHITING SEASON OPENING DATES / BYCATCH CAPS

April 1 – May 1 (date to be determined)
California shore-based fishery between 42° and 40° 30’, limited to 5% of the shore-based whiting allocation

April 1 – May 1 (same date as above)
California shore-based fishery south of 40° 30’

Bycatch amount available: 2% of total cap (includes all fishing south of 42°)

June 1
Catcher-processor and mothership fisheries open

Bycatch amount available: (options: 13% - 15% - 18%) of total cap (less amount taken in California fishery)

July 5
Primary shore-based fishery opens, mothership and catcher-processor fisheries continue

Bycatch amount available: (options: 68% - 73% - 75%) of total cap (less amount taken in previous openings)

August 15 - September 1

Bycatch amount available: 100% of total cap (less amount taken in previous openings)

DRAFT OPTION 2 FOR 2008 WHITING SEASON OPENING DATES / BYCATCH CAPS

April 1 – May 1 (date to be determined)
California shore-based fishery between 42° and 40° 30’, limited to 5% of the shore-based whiting allocation

April 1 – May 1 (same date as above)
California shore-based fishery south of 40° 30’

Bycatch amount available: 2% of total cap (includes all fisheries south of 42°)

July 5
Primary shore-based fishery opens
Bycatch amount available: 42% of total cap (less amount taken in previous openings)

August 15 - September 1 (date to be determined)

Mothership and catcher-processor fisheries open
Bycatch amount available: 100% of total cap (less amount taken in previous openings)

EXPLANATION

1. From a procedural standpoint,* Council will set total bycatch cap in March at a value equal to 2% of the presumed final value of the cap for each species. In April, Council will take in-season action to raise the bycatch cap to the higher values for the June (if option 1) and July openings. In June, Council will take in-season action to raise the bycatch cap to 100% of the final value as of August 15 - September 1, whatever date is chosen to open the offshore sectors.

Using darkblotch rockfish as an example, the bycatch caps could look as follows after each inseason action:

Option 1 Example	Option 2 Example
April 15 - .5 mt	April 15 - .5 mt
June 1 – 3.75 mt	July 5 – 10.5 mt
July 5 – 18.25 mt	September 1 – 25 mt
September 1 – 25 mt	

* NOTE: If possible, Council could do all of this in a single action in March so that there is some certainty for the whiting industry and enable fishermen and processors to make appropriate business plans.

2. The opening date for the CA whiting fishery will have to be decided by the participants based on weather, fish quality and availability, and impacts on salmon bycatch. The bycatch level of 2% is approximately equal to what a pro rata share of the cap would be.

3. The bycatch releases at each date are based on the goals of:

a) accommodating the fishery that is likely to occur

b) moving as much of the fishery as possible to later in the year to reduce bycatch and improve recovery

c) preventing any one sector or group of sectors from pre-empting the others

d) allowing vessels that participate in both mothership and shore-based fisheries, or whiting and pollock fisheries (or any other combination that has historically occurred) to continue to do so.

e) for option 2, letting vessels that fish in Alaska complete their pollock “B” season early, then move down to the west coast to prosecute the whiting fishery. Along with the bycatch savings advantages to the whiting fishery, it reduces cost and promotes efficiency for the vessels that fish in both areas.

Agenda Item D.6
November 7, 2007
2007/2008 Inseason
Adjustments

Late, handed out
during Public Testimony.
Administrative Record

SEA STATE

P.O. Box 74, Vashon, WA 98070

Ph: (206)463-7370
Fax: (206)463-7371
Email: karl@seastateinc.com

November 7, 2007

Re: PWCC catch to date

Date	Whiting	Chinook	Widow	Canary	Darkblotched
Total fall fishery	16,321	0.0000	0.0000	0.0000	0.0000
Total pre-10/7	42,359	432	71.8	0.3	5.3
2007 Allocation	70,751				
Remaining	12,071				

Regards,

Karl

Agenda Item D
November 2007
2007/2008 Increase
Adjustments

AMERICAN DYNASTY CATCHER-PROCESSOR BYCATCH

Vessel	Date	Hake (mt)	Chinook (N)	Widow Rate (kg/mt)	Canary Rate (kg/mt)	Dark Blotched Rate (kg/mt)
American Dynasty	10/08/07	125.68	0	0.000	0.000	0.000
American Dynasty	10/09/07	154.28	0	0.000	0.000	0.000
American Dynasty	10/10/07	287.82	0	0.000	0.000	0.000
American Dynasty	10/11/07	309.51	0	0.000	0.000	0.000
American Dynasty	10/12/07	281.98	0	0.000	0.000	0.000
American Dynasty	10/13/07	363.67	0	0.000	0.000	0.000
American Dynasty	10/14/07	262.11	0	0.000	0.000	0.000
American Dynasty	10/15/07	344.73	0	0.000	0.000	0.000
American Dynasty	10/16/07	366.89	0	0.000	0.000	0.000
American Dynasty	10/17/07	508.70	0	0.000	0.000	0.000
American Dynasty	10/18/07	148.28	0	0.000	0.000	0.000
American Dynasty	10/19/07	379.82	0	0.000	0.000	0.000
American Dynasty	10/20/07	Underway				
American Dynasty	10/21/07	Offloading				
American Dynasty	10/22/07	Underway				
American Dynasty	10/23/07	260.41	0	0.00001	0.0000000	0.0000000
American Dynasty	10/24/07	41.59	0	0.000	0.000	0.000
American Dynasty	10/25/07	338.09	0	0.000	0.000	0.000
American Dynasty	10/26/07	332.77	0	0.000	0.000	0.000
American Dynasty	10/27/07	265.17	0	0.000	0.000	0.000
American Dynasty	10/28/07	447.57	0	0.000	0.000	0.000
American Dynasty	10/29/07	300.43	0	0.000	0.000	0.000
American Dynasty	10/30/07	304.88	0	0.000	0.000	0.000
American Dynasty	10/31/07	217.46	0	0.000	0.000	0.000
American Dynasty	11/01/07	392.42	0	0.000	0.000	0.000
American Dynasty	11/02/07	285.26	0	0.000	0.000	0.000
American Dynasty	11/03/07	193.79	0	0.000	0.000	0.000
American Dynasty	11/04/07	Underway				
American Dynasty	11/05/07	Offloading	&	Underway		
American Dynasty	11/06/07	84.20	0	0.000	0.000	0.000
American Dynasty	11/07/07					

Agenda item D
November 200
2007/2008 INSEA
ADJUSTMENTS

Ocean Rover mothership weekly bycatch
(~~2002-2007~~)

Week	WidowRate	CanaryRate	DarkBlotchedrate	ChinookRate	sWhiting	sWidow	sCanary	sDarkBlotched	sChinook
15	0.00	0.08	0.00	0.00	25	0.00	0.00	0.00	0
16	0.59	0.00	0.12	0.03	2,282	1.34	0.00	0.27	65
17	1.56	0.01	0.00	0.02	1,530	2.39	0.02	0.00	35
18	0.03	0.00	0.00	0.06	2,483	0.07	0.00	0.00	149
20	1.63	0.01	0.11	0.02	10,569	17.27	0.07	1.12	201
21	1.50	0.01	0.08	0.02	30,816	46.15	0.23	2.33	697
22	1.40	0.01	0.04	0.01	25,080	35.15	0.13	0.97	296
23	1.74	0.01	0.21	0.05	11,869	20.61	0.10	2.53	640
24	2.08	0.55	0.34	0.04	7,752	16.16	4.25	2.66	326
25	1.39	0.00	0.01	0.00	857	1.19	0.00	0.00	2
38	0.47	0.01	0.00	0.00	601	0.28	0.01	0.00	2
39	0.16	0.02	0.00	0.00	2,453	0.39	0.06	0.00	2
42	0.21	0.01	0.02	0.01	1,508	0.31	0.01	0.04	8
43	0.00	0.00	0.00	0.00	2,353	0.01	0.00	0.00	0
44	0.00	0.00	0.00	0.00	1,244	0.00	0.00	0.00	0
45	0.00	0.00	0.00	0.01	2,481	0.00	0.01	0.00	13
46	0.00	0.00	0.00	0.03	1,029	0.00	0.00	0.00	31
47	0.00	0.00	0.00	0.00	2,025	0.01	0.00	0.00	9
48	0.00	0.00	0.00	0.01	274	0.00	0.00	0.00	3

Agenda Item D.7
Situation Summary
November 2007

AMENDMENT 20: TRAWL RATIONALIZATION ALTERNATIVES (TRAWL INDIVIDUAL QUOTAS AND COOPERATIVES)

The reauthorized Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that the Council submit a fully analyzed proposal for a rationalization program for the trawl groundfish and whiting fisheries, including the shorebased sector of the whiting fishery, by January 2009. The Council is scheduled to approve a preliminary Environmental Impact Statement (EIS) with preferred alternatives for public review in June 2008 and to take final action to adopt an alternative for submission to Congress and recommendation to NMFS in November 2008 (see Agenda Item C.1.a, Attachment 1, the long-term schedule). At this meeting, the Council is scheduled to formally adopt the alternatives for intensified analysis in the draft preliminary EIS. Additionally, an opportunity is provided for the Council to provide comment on the planned analysis.

At its March and June 2007 meetings, the Council substantially simplified, revised, and reduced the total number of alternatives. However, there were a number of issues that remained outstanding, for example, methods for reallocating quota share in response to changes latitudinal lines used for area management, minimum quota pound holding requirements, allocation of overfished species based on bycatch rates applied to target species quota shares. These issues are listed and described briefly in Agenda Item D.7.a, Attachment 1. This attachment also provides a summary of the Groundfish Allocation Committee (GAC) and Ad Hoc Groundfish Trawl Individual Quota Committee (TIQC) recommendations pertaining to outstanding issues.

The GAC met September 25-27, 2007 and the TIQC met October 11-12, 2007. Each committee received reports on the preliminary analysis available at the time of their meeting. The analysis presented to these committees is provided in Agenda Item D.7.b, Attachment 1 along with additional analysis developed for the briefing book.

The alternatives, as they were provided to the GAC and TIQC, are provided in Agenda Item D.7.b, Attachment 2. However, over the summer issues were identified regarding completeness of some aspects of the mothership and shoreside co-op alternatives (e.g. explicit identification of provisions pertaining to co-ops joining together to for inter-co-ops) and the need to identify those elements that would require Council/NMFS action as distinct from those that the industry would undertake independently. The staff has therefore provided a proposed reorganization for the purpose of stimulating further discussion (Agenda Item D.7.b, Attachment 2).

A summary of the approach and methods that will be used in the analysis is provided in Agenda Item D.7.b, Attachment 4. The approach includes the analysis of various combinations of possible elements, termed here “analytical alternatives.” Analytical alternatives array sets of options together to facilitate efficient development of the analysis and communication of the results. The analytical alternatives do not constrain the Council from mixing and matching provisions of the alternatives when it takes final action. In June 2008, when the Council selects a preferred alternative, that alternative will be added to the suite of analytical alternatives. Each component of the analytical alternatives will receive a full and separate analysis in an appendix.

On Monday evening, November 5, there will be an evening presentation covering results from analysis of some of the components on which Council direction is sought at this meeting, mandatory data collection provisions, and the scenarios that will be used as the starting point around which the analytical alternatives will be developed.

At its June 2007 meeting, the Council requested that the NOAA General Counsel Northwest Region office provide comments on legal aspects of the trawl rationalization alternatives under consideration by the Council. A report will be provided under this agenda item.

Since the June 2007 meeting, NMFS has been working on developing tracking and monitoring program options based on the tracking and monitoring design elements specified in the Council IFQ alternatives. A progress report is provided (Agenda Item D.7.d, NMFS Report).

Council Action:

1. **Refine and finalize the alternatives for analysis in the draft preliminary EIS.**
2. **Provide comments on plans for the analysis, as appropriate.**

Reference Materials:

1. Agenda Item D.7.a, Attachment 1: Outstanding Trawl Rationalization Issues
2. Agenda Item D.7.b, Attachment 1: Components Discussion Paper
3. Agenda Item D.7.b, Attachment 2: Trawl Rationalization Alternatives (Rev 9/17/2007)
4. Agenda Item D.7.b, Attachment 3: Restatement of the Mothership and Shoreside Co-op Programs
5. Agenda Item D.7.b, Attachment 4: Approach and Methods for Analysis
6. Agenda Item D.7.d, NMFS Report
7. Agenda Item D.7.e, GAC Report
8. Agenda Item D.7.g, Supplemental TIQC Report
9. Agenda Item D.7.g, GMT Report
10. Agenda Item D.7.h, Public Comment

Agenda Order:

a. Agenda Item Overview — Jim Seger
b. Staff Summary of Alternatives and Plans for Analysis — Jim Seger/Merrick Burden
c. Comments from NOAA General Counsel — Mariam McCall
d. NMFS Report on Tracking and Monitoring — Steve Freese
e. Recommendations of the Groundfish Allocation Committee — Don Hansen
f. Agency and Tribal Comments
g. Reports and Comments of Advisory Bodies
h. Public Comment
i. **Council Action:** Refine Alternatives for Analysis

PFMC
10/22/07

Agenda Item D.7.a
Attachment 1
November 2007

OUTSTANDING ISSUES AND SUMMARY OF GAC AND TIQC RECOMMENDATIONS

The following are the main issues to be resolved and a summary of the GAC and TIQC recommendations pertaining to those issues.

IFQs and Co-ops

Qualifying Eligibility and Allocation Time Periods (A-2.1 and Co-op Programs)

Can the qualifying and allocation time period options be narrowed and more consistent years used?

Description of the issue: There are a variety of time periods used for the qualifying and allocating periods. In some cases, it would be good to have more rationale articulated for the differences. For example:

For the IFQ allocations to permits and motherships, why is the period ending date 2003 but for the IFQ allocation to shoreside the period ending date is 2004?

For motherships, why does the recent participation period end in 2004 but the allocation period end in 2003?

Among the years used to start the qualification periods for processors, why is:

1997 used for catcher-processor co-op endorsements;
1998 used for mothership IFQ qualification and processor permits; and
1998 and 1999 used for shoreside processor permits (co-op program) and IFQ qualification, respectively?

> ***GAC Recommendation:*** *Adopt the GAC recommended dates for the qualifying and allocation periods, as displayed in the shaded cells of Table 1. If industry believes that other dates are more appropriate, they should bring those dates forward for consideration along with a supporting rationale.*

The following table contains all the options which are being considered for both the IFQ and co-op alternatives. The GAC recommended eliminating all options except those in *shaded italics*. In some cases, the GAC is recommending a new period (not part of the previous suite of options). In such cases, the GAC recommendation is in *underlined shaded italics.*

Table 1. Qualifying and allocation criteria options and GAC recommended time periods.

	Qualifying for Participation				Allocation			
	IFQ Recent Participation	R	Co-op Alt Endorsement/ Permit	R	IFQ Allocation	R	Co-op Catch History	R
Permit Owners								
Nonwhtg SS Catcher Ves	None	Y	N/A		*’94-’03 (drop 3)*	Y	N/A	
Whtg SS Catcher Ves	None	Y	~~’98-’04 (>500 mt)~~ ~~’98-’03 “~~ ~~’94-‘04 “~~ ~~’94-’03 “~~ ~~’01-‘03 “~~ *’97-’03* (>500 mt)	N	*’94-’03 (drop 2)*	Y	~~’98-‘04 (drop 1)~~ ~~’94-’04 (drop 2)~~ ~~’98-’03 (drop 1)~~ ~~’94-’03 (drop 1?)~~ *97-’03 (drop 1)*	N
Whtg MS Catcher Ves	None	Y	~~’98-‘04 (>500 mt)~~ ~~’94-‘03 (>500 mt)~~ *97-’03* (>500 mt)	N	*’94-’03 (drop 2)*	Y	~~’98-‘04 (drop 1)~~ ~~’94-’04 (drop 2)~~ ~~’98-’03 (drop 1)~~ ~~’94-’03 (drop 2)~~ *97-’03 (drop 1)*	N
Cather-Processor Permit Owners	None	N	~~’97-’04 (>0 in at least 1 yr)~~ *97-’03 (>0 in at least 1 yr)*	N	*’94-’03 (drop 0)*	N	N/A	
Mothership (Operators or Owners?)	~~’98-’04 (>1K mt in 2 yrs)~~ *’97-’03 (>1K mt in 2 yrs)*	N	~~’98-‘04(>1K mt in 2 yrs)~~ *97-’03 (>1K mt in 2 yrs)*	N	~~’98-’03 (drop 0)~~ *97-’03 (drop 0)*	N	N/A	
Shoreside Processing Companies	~~’99-’04 (TBD)~~ *’98-’03 (amount pending data review -- see section on recent participation)*	N	~~98-’04 (>1K mt in 2 yrs)~~ *98-’03 (>1K mt in 2 yrs)*	N	’94-’04 (drop 2) *94-’03 (drop 2)*	N	N/A	

N/A = Not Applicable
R = Column header. Has data been presented previously and reviewed? Y=Yes; N=No
TBD = To be determined.

TIQC Report: The GAC recommendation indicated a possible problem with the use of 1997 as the start of some of the qualifying periods. The TIQC informed that the main data quality issue of concern with respect to 1997 at-sea data was that observers did not witness every delivery but relied on vessel logbooks for some deliveries.
TIQC Recommendation: *Support the GAC recommendation for the MS and MS C/V qualifying years of 1997-2003. (Majority)*

IFQs

Entities Qualifying for An Initial Allocation (A-2.1.1)

Initial Allocation to Processors

Should there be an adjustment to the range of allocations of initial QS between vessel permits and processors?

A decision is not necessarily needed on this issue; however, the TIQC did discuss it.

TIQC Recommendation: *Change the option that would give QS to processors from a 50% processor share for all whiting sectors to a 25% processor share for all whiting sectors to make it consistent with the non-whiting shoreside processing option. (Majority)*

Successor In Interest for Shoreside Processors

Is it the Council's intent to recognize successors in interest with respect to the accrual of history of shoreside processors?

> ***GAC Recommendation:*** *In allocating IFQ to processors, recognize successor in interest.*
>
> > **GAC Guidance:** Transfer of physical assets alone should not be considered a basis for successor in interest. Business relationships such as transfer of the company name and customer base might be reasonable evidence of successor in interest.
>
> ***TIQC Recommendation:*** *The TIQC endorses the GAC recommendation regarding the successor in interest issue with the understanding that NMFS will need to develop criteria to evaluate successor in interest and that this criteria should include consideration of the terms and intention of a contract. (Consensus)*

Identification of the Mothership Entity That Would Qualify For An Allocation

What entity associated with a mothership should receive the QS, if processors receive an initial allocation?

> ***GAC Recommendation:*** *In the IFQ Alternative, the initial allocation to motherships will go to the owner of the vessel, unless a bareboat charter, in which case it will go to the charterer.*
>
> ***TIQC Recommendation:*** *With respect to the entity that would receive the IFQ or mothership permit (co-op alternative), add a second option that would allocate to the owner and exclude the bare boat charterer (the current provision would allocate to the charterer in a bare boat charter situation). (Majority)*

Recent Participation (A-2.1.2)

What level of participation, if any, should be considered for a shoreside processor to qualify for an initial allocation of harvester quota shares?

> **GAC Guidance:** The GAC requested information on the following with respect to shoreside processing entities that have purchased less than 1 mt during the allocation period (1994-2003): what are the entities, what are they buying, what are they doing with the fish, and where on the coast are they located?
>
> ***TIQC Recommendation:*** *Add two options for shoreside whiting processor qualification: 1) in the years 1998-2003 any company that bought 1 mt of whiting in any 2 of those years, and 2) 1 delivery of any size. (Consensus)*
>
> ***TIQC Recommendation:*** *Add two options for shoreside non-whiting groundfish processor qualification: 1) 6 mt in each of 3 years, and 2) 1 delivery option. (Consensus)*

QS Allocation Formulas (A-2.1.3)

Allocation of Overfished Species Using Target Species QS and Applying Bycatch Rates

Is the option to allocate overfished species by the application of bycatch rates to target species QS ready for analysis?

> ***GAC Recommendation:*** *Revise the formula for allocating overfished species such that depth and latitudinal strata used for allocation of overfished species based on bycatch rates will be based on the logbooks associated with each permit rather than fleet wide average logbook information.*
> ***TIQC Recommendation:*** *The TIQC concurred with the GAC recommendation to use individual permit logbooks as part of the allocation formulas for both* ***overfished species QS*** *and halibut IBQ but recommends that 1994-2003 logbooks be used to determine the location of target species catch instead of 2003-2006 logbooks. (Consensus)*

Allocation of Rare Overfished Species Using an Auction Approach

Should an option be considered to allocate rare overfished species using an auction?

> ***GAC Recommendation:*** *Further explore the allocation of rare overfished species by auction.*
> ***TIQC Recommendation:*** *The TIQC recommends considering allocations of QP for rare overfished species on some alternative basis (a basis other than giving it to the holders of QS for those species). An auction, occurring periodically throughout the year, is one means of allocating QP for rare overfished species on an as needed basis. Work on the auction concept should continue.* ***Other approaches should also be explored, keeping in mind the need to provide individual incentive for avoiding bycatch of overfished species.*** *(Consensus)*

Direct Reallocation After Initial Issuance (A-2.1.6)

Changes in Management Areas

Should a process for re-allocation of quota shares be established now in the event that management areas change?

Following previous direction by the Council, staff has developed an option for the reallocation of QS with changes in management areas.

> ***GAC Recommendation:*** *Move ahead with the alternative for geographic reallocation, however, indicate that such area changes are expected to be rare.*
> ***TIQC Recommendation:*** *Concur with GAC recommendation to move forward with the option. (Consensus)*

Changes in Stock Status

Should the process for re-allocation of quota shares be established now in the event that overfished species are rebuilt or become overfished?

Following previous direction by the Council, staff has developed an option for the reallocation of QS when a species becomes rebuilt or overfished.

> ***GAC Recommendation:*** *Drop options for reallocation when a stock is rebuilt. Acknowledge in the alternatives that some change in the quota share allocations could occur when a species status moves from overfished to not overfished, and mention ways that allocation could happen. Also, when a species becomes overfished, the QS may be reallocated to facilitate harvest of as many target species as possible.*
> **TIQC Report:** The TIQC discussed this issue and the GAC recommendation but made no specific recommendation. A related recommendation on limiting transfers in the first year of the program is provided under "***Temporary Transfer Prohibition.***"

Vessel QP Minimum Holding Requirement (A-2.2.1)

Should vessel minimum holding requirements be eliminated from the proposed trawl rationalization program?

> ***GAC Recommendation:*** *Drop the option that would require a vessel to hold some minimum amount of QP before departing from port.*
> ***TIQC Recommendation:*** *Concur with GAC recommendation to eliminate the holding requirement. (Consensus)*

Vessel QP Overage Resolution (A-2.2.1)

What avenues for resolving quota pound overages should be provided?

Description of the issue: Concern has been expressed that a disaster tow on a rare overfished species could result in a vessel being tied up for years trying to cover the overage. Some might consider this "victimization" of the fisherman. On this basis, an attempt has been made to develop alternative means of compliance.

> ***GAC Recommendation:***
> ***Retain***
> *Option 1 (vessel ties up until the overage is covered with QP),*
> ***Request*** *that NOAA General Counsel provide input on*
> *Option 2 (vessel ties up or can continue fishing by surrendering QS of other species) and*
> *Option 3 (vessel ties up or can continue fishing by posting a bond).*
> ***Drop***
> *Options 4 (vessel ties up or can continue by payment of an amount based on the target species typically associated with the overage) and*

Option 5 (vessel ties up or can continue by payment of an amount based on fish on board),

TIQC Recommendation:

*R**etain** Option 1 and Option 2. **Drop** Options 3, Option 4, and Option 5. (Consensus)*

Temporary Transfer Prohibition (A-2.2.3.c)

Should there be a "cooling-off" period at the beginning of the trawl rationalization program when QS are not permanently saleable? (Note: QP could be traded during the "cooling-off" period".)

GAC Recommendation: *Include in the alternatives a cooling-off period for trading QS during the first 2-3 years of the TIQ program.*

TIQC Recommendation: *Direct Council staff to do an analysis of two scenarios: 1) all species quota shares are not permanently transferable in the first year and 2) no prohibition on transferability. (Consensus)*

Accumulation Limits (A-2.2.3.e)

At what levels should accumulation limits be set?

GAC Recommendation: *Change the Option 1 control cap to the percentages in the Table2 below with none higher than 5%, except English sole and other flatfish; Option 2 control cap to be 1.5 times the percentages from Option 1; and Option 3 control cap for all nonwhiting groundfish to be a 3% accumulation cap. For all options, the vessel cap would be double the control cap amount, except whiting. Decimal points should be rounded to the tenth. For species left blank use the values from page three of GAC Meeting, Agenda Item I, E Historic and Recent Total Shares, GAC September 2007 (as now reflected in Table 2).*

GAC Guidance: Provide the geographic distribution and number of vessels that achieve the maximum limits.

GAC Guidance: With respect to consolidation issues, evaluate control of the limited liability corporations that own the at-sea processors.

Should there be a maximum set on the grandfather clause?

GAC Recommendation: *Add a sub-option for analysis that would limit the grandfather clause to 2 times the accumulation limit amount that is finally adopted for Section A-2.2.3.e.*

TIQC Recommendation*: Three options should be included in the analysis: no grandfather clause, full grandfather clause, and a grandfather clause that is 2x the vessel accumulation limit cap. (Consensus)*

Table 2. Control cap, and vessel cap options to define QS/QP accumulation limits in IFQ Program Alternatives.

Stock	Option 1			Option 2			Option 3	
	Control Cap (%)	Vessel Cap (%)		Control Cap (%)	Vessel Cap (%)		Control Cap (%)	Vessel Cap (%)
All nonwhiting groundfish (in aggregate)	1.5	3.0		2.2	4.4		3.0	6.0
Lingcod - coastwide c/	5	10		7.5	15			
N. of 42 (OR & WA)	5	10		7.5	15			
S. of 42 (CA)	5	10		7.5	15			
Pacific Cod	5	10		7.5	15			
Pacific Whiting				0	0			
Shoreside Sector	10	7.5		15	11.3		25	12
Mothership Sector	10	25		15	37.5		25	50
Catcher Processors	50	65		75	97.5		60	75
Alll Whiting Sectors Combined	15	25		22.5	37.5		40	50
Sablefish (Coastwide)	1.9	3.8		2.9	5.7			
N. of 36 (Monterey north)	2	6.2		3	9.3			
S. of 36 (Conception area)	5	6.2		7.5	9.3			
PACIFIC OCEAN PERCH	5	6.2		7.5	9.3			
Shortbelly Rockfish	5	6.2		7.5	9.3			
WIDOW ROCKFISH	3.4	6.8		5.1	10.2			
CANARY ROCKFISH	5	10		7.5	15			
Chilipepper Rockfish	5	10		7.5	15			
BOCACCIO	5	10		7.5	15			
Splitnose Rockfish	5	10		7.5	15			
Yellowtail Rockfish	5	10		7.5	15			
Shortspine Thornyhead - coastwide	3.1	6.2		4.7	9.3			
Shortspine Thornyhead - N. of 34deg27'	4.8	9.6		7.2	14.4			
Shortspine Thornyhead - S. of 34deg27'	4.7	9.4		7.1	14.1			
Longspine Thornyhead - coastwide	2	4		3	6			
Longspine Thornyhead - N. of 34deg27'	2	4		3	6			
Longspine Thornyhead - S. of 34deg27'	5	10		7.5	15			
COWCOD - Conception and Monterey	5	10		7.5	15			
DARKBLOTCHED	5	10		7.5	15			
YELLOWEYE g/	5	10		7.5	15			
Black Rockfish	5	10		7.5	15			
Black Rockfish (WA)	5	10		7.5	15			
Black Rockfish (OR-CA)	5	10		7.5	15			
Minor Rockfish North	5	10		7.5	15			
Nearshore Species	5	10		7.5	15			
Shelf Species	4	8		6	12			
Slope Species	5	10		7.5	15			
Minor Rockfish South	5	10		7.5	15			
Nearshore Species	5	10		7.5	15			
Shelf Species	5	10		7.5	15			
Slope Species	5	10		7.5	15			
California scorpionfish	5	10		7.5	15			
Cabezon (off CA only)	5	10		7.5	15			
Dover Sole	1.8	3.6		2.7	5.4			
English Sole	10	20		15	30			
Petrale Sole (coastwide) c/	2.9	5.8		4.4	8.7			
Arrowtooth Flounder	5	10		7.5	15			
Starry Flounder	5	10		7.5	15			
Other Flatfish	10	20		15	30			
Other Fish	5	10		7.5	15			

Tracking and Monitoring (A-2.3.1 and A-2.3.3)

How should the Council proceed in development of the tracking and monitoring options and collection of fees?

There were no recommendations to deviate from the NMFS approach.

> **GAC Guidance:** Deficits in implementing current fishery management should be documented so that they are not falsely attributed to ITQ implementation.

Mandatory Data Collection for the IFQ Alternative (A-2.3.2)

Is the mandatory data collection provision ready to move forward?

> ***GAC Recommendation:*** *Add provisions that would allow audits to validate data submitted in response to a mandatory data collection requirement.*
> **TIQC Guidance:** Provide information on the number of man-hours each company will have to provide in order to comply with a mandatory data collection requirement.

Allocation of Pacific Halibut IBQ (A-4)

Is the option to allocate halibut individual bycatch quota by the application of bycatch rates ready for analysis?

The formula for allocating halibut IBQ is similar to the formula for allocating overfished species QS.

> ***GAC Recommendation:*** *Move ahead with the formula for allocating halibut bycatch quota based on bycatch rates.*
> ***TIQC Recommendation:*** *The TIQC concurred with the GAC recommendation to use individual permit logbooks as part of the allocation formulas for both overfished species QS and* ***halibut IBQ*** *but recommends that 1994-2003 logbooks be used to determine the location of target species catch instead of 2003-2006 logbooks. (Consensus)*

Trading IFQ with Limited Entry Fixed Gear Vessels (New)

Should an option be added to allow trawl IFQ to be traded to and from the LE fixed gear sector?

> ***GAC Recommendation:*** *If time allows, the TIQC should address a proposal to allow trawl IFQ for some species to be used with LE fixed gear permits. The proposal would also consider elimination of the length endorsement and would address the observation requirement that would go along with the harvest of trawl IFQ species on fixed gear vessels. Ms. Culver and Mr. Alverson will develop a proposal for consideration by the TIQC.*
>
> > **GAC Guidance:** Clarify that gear switching (ability to move back and forth between gears) is different from gear conversion (permanent transition from one gear to another). The IFQ program covers only gear switching.

TIQC Recommendation: *This item should be tabled, and should be taken up as part of a future FMP amendment when there is time to fully discuss the issue. If the Council decides to have this analyzed, the TIQC recommends the following be included among things to be considered in specification of the option:*

- *payment of taxes for the buyback program,*
- *the need for 100% observation (100% accountability),*
- *adjustments that may be needed for accumulation caps,*
- *transferability of quota shares both ways between trawl and fixed gear,*
- *overfished species quota transferability among gear types,*
- *the bycatch rates to be used for allocation (if overfished species are allocated annually using a formula based on bycatch rates), and*
- *the Rockfish Conservation Areas that would apply. (No votes opposed, 2 abstentions)*

Vessel Size Endorsement (New)

Should the vessel size limit endorsement be eliminated with the implementation of an IFQ program?

GAC Report: The GAC recommended this be considered by the TIQC as part of its recommendation on transferring IFQ to the limited entry fixed gear fleet.
TIQC Recommendation: *Remove the size limit endorsement under an IQ program. (Consensus)*

Bycatch Species Caps in the Whiting Fishery (A-5 and B)

Under a system in which there are allocations and hard caps for the nonwhiting and whiting sectors, in the whiting fishery, which species should be managed with caps?

This issue pertains to both the IFQ alternative (option under which bycatch species in the whiting fishery would <u>not</u> be managed with IFQs) and the co-op alternative (bycatch management).

TIQC Recommendation: *Move ahead with the guidelines for determining which species will be managed using caps, in consultation with NMFS. (Consensus)*

Co-op Alternative

Bycatch Management in the Mothership and Shoreside Sector Co-op Programs (B-1 and B-2)

Should co-ops have bycatch caps; and should provisions be included regarding inter-co-op agreements?

GAC Recommendation: *Add an option for co-op bycatch caps and inter-co-op agreements.*
TIQC Recommendation: *Endorse the GAC recommendation for an option to assign bycatch to co-ops and explicitly incorporate provisions for inter-co-op agreements, and keep the current option as well. (Consensus)*

Mothership Sector Co-op Alternative (B-1)

Is the mothership sector co-op alternative ready to move ahead?

No GAC Recommendations or Guidance.
TIQC Recommendation: *Add an option that would allow a vessel to operate either as a harvester or as a mothership in the same year. (Majority)*
TIQC Recommendation: *Allow a mothership permit to be transferred once during a year. (Majority)*

TIQC Guidance: Modify the processor tie provision for CVs moving among motherships to clarify the intent that the initial linkage of a CV to a MS is established based on the MS to which the CV chooses to deliver the majority of its fish in the most recent year that it fished before the program is implemented. Once the program is implemented, a CV is required to participate in the non-coop fishery when moving from one MS to another MS. (Consensus)

TIQC Guidance: Modify the mothership withdrawal provision to clarify the intent that when a mothership withdraws from the fishery and its permit is not transferred or a mutual agreement is not reached to transfer delivery to another mothership, a co-op vessel obligated to that mothership may go into another co-op of its choosing, keep the original co-op together and find another mothership but in either case will not have to go into the non-co-op fishery first.

TIQC Guidance: NMFS should clarify what they will and won't do for implementation of the entire co-op option. (Consensus)

Continuation of the Shoreside Sector Co-op Program (B-2)

Should the shoreside sector co-op alternative move ahead and is it ready?

While discontinuation of the co-op alternative for the shoreside whiting sector is not an issue that necessarily needs to be addressed, both the GAC and TIQC have recommendations in this regard.

GAC Recommendation: *Drop from the analysis the co-op alternative for the whiting shoreside, due to waning industry support and questionable legality of the option.*
TIQC Recommendation: *Move forward with this alternative, even with the advice that this option may not be legal, in order to comply with the MSA requirement. (Consensus)*

Mandatory Data Collection for Co-ops (New)

Should there be a mandatory data collection provision for the co-op alternative?

GAC Recommendation: *Include the mandatory data collection option as part of the co-op alternative.*
TIQC Recommendation: *Add a mandatory data collection requirement to the co-op alternative. (Majority)*

Other Guidance from the GAC

GAC Guidance: Provide a list of efforts that have been made to reach out to communities

OUTSTANDING COMPONENTS DISCUSSION PAPER

Qualifying Eligibility and Allocation Time Periods (A-2.1 and Co-op Programs)

This section provides possible rationale for the selection of various start and end periods for qualifying and allocation periods. Appendix 1 contains data for use in an initial assessment of the effects of various qualifying periods. Also provided in Table 1-28 of the appendix is a table illustrating the total amount of landings by the 62 buyers which purchased fewer than 1 mt of groundfish during the entirety of the 1994 through 2003 period.

Rational for Various Time Periods

The following is a discussion of the rationale for start and end years being considered for the landings history qualifying periods. 1994, the first year of the License Limited Entry program, and 2003, the control date established by NOAA Fisheries, serve as the bookends for the allocation years under discussion below.

1994. The earliest year for the allocation period options was set at 1994, because this was the first year of the license limitation program. If the program is to allocate based on permit history, there would be no permit history before 1994 unless it is determined that permit history includes vessel history prior to that time. However, given the complexities of the qualification requirements for the original license limitation program, history prior to 1994 may be difficult to track and treat in an equitable fashion. For example, LE permits were issued to vessels that replaced qualifying vessels prior to the start of the license limitation program. Additionally, LE permits were granted to vessels under construction or conversion on a par with vessels that qualified based on 1984-1988 landings history. The use of vessel landings history prior to 1994 may be inconsistent with the equal treatment afforded vessels under construction or conversion in 1994 and those that had a 1984-1988 landings history, the former having had no opportunity to establish landings history prior to their completion. An allocation period from 1994 to 2003, 10 years, would not be unprecedented. The fixed gear sablefish tier program used 1984-1994 as the allocation period, an 11 year period.

1997. The catcher-processor co-op portion of the rationalization program has identified 1997 to 2004 as a potential qualifying allocation period for catcher-processor vessels. 1997 was the year that the LE groundfish fishery went from two sectors (shoreside and at-sea) to three sectors (shoreside, catcher/processor, and mothership). Using 2004 instead of 2003 would allow vessels with recent participation and possibly less longevity in the fishery to have an additional qualifying year.

1998. This year is used to start a period from 1998 to 2003 or 2004 (six or seven years) that is of sufficient length to allow vessels to demonstrate their level of activity in the fishery and landings mix. Excluding 1994-1997 puts more emphasis on recent participation patterns. The six-year period starting in 1998 includes landings history two years prior to the large footrope restrictions and four years under the large footrope restriction. Thus, using 1998 as a start date for the allocation period, covers a greater variety of fishing strategy opportunities than a period that excludes 1998 and 1999 landings. In the at-sea fishery, prior to 1998 some hauls were not observed because there was only one observer on at least some at-sea processors.

1999. Regulations prior to 2000 allowed extensive use of large footropes on trawl gear. In 2000, the imposition of restrictions on the use of large footropes shifted trawl effort away from reef and rocky bottom substrates. This substantially changed fishing opportunities and the mix of species landed. An allocation period that starts in 1999 would place less emphasis on the mix of opportunities that was available when small and large footropes could be used, as compared to periods including earlier years. It would emphasize participation by those able to function under the period when there were greater RCA and trip limit constraints.

For comparison, the license limitation program used a four year period for vessels to demonstrate a pattern of activities that would qualify for a permit. A comparable period of 1999 to 2003 or 2004 would reflect how vessels operated under the opportunities present under a more recent management regime.

2003. In order to prevent speculative effort and the consequent exacerbated management problems, a control date of November 6, 2003 was announced. This announcement put fishery participants on notice that fishing after 2003 would not be counted toward qualifying for IFQ. Since there was little fishing opportunity in the last two months of 2003, all of 2003 is being included in the allocation period. Additionally, the trawl permit buyback program occurred at the end of 2003, resulting in a substantial change in the number of vessels in the fleet.

2004. Using 2004 instead of 2003 as the final year for the qualification period would allow vessels with more recent participation and less longevity in the fishery to have one additional qualifying year. With respect to the co-op alternative, the year 2004 was the last year prior to the development of the industry proposal.

Table 1. Allocation Years and Justification

Allocation Years	**Potential Justification for This Period**	**Sectors to Which the Period Has Thus Far Been Applied**
1994-2003	From the beginning of Limited Entry (1994) to the Control Date (2003).	IFQ - Catcher and C/P permits. Co-op – Shoreside and Mothership permits.
1994-2004	From Limited Entry (1994) to a year that represents recent participation patterns.	IFQ – Shoreside processor. Co-op – Shoreside and Mothership permits.
1997-2004	A block of years that reflects the fishery before and after changes in footropes, declaration of overfished species, and RCA creation.	Co-op – C/P endorsement.
1998-2003	A block of years that reflects the fishery before and after changes, and acknowledges the Control Date (2003). Also, 1998 is the first year in which every at-sea delivery was observed.	IFQ – Mothership business qualification. Co-op – Shoreside and Mothership permits.
1998-2004	A block of years that reflects the fishery before and after changes, and adds a year beyond the control date to include more recent participation and the period up through development of the co-op alternative..	IFQ – Mothership recent participation qualification. Co-op – Shoreside permits and business qualification, And Mothership permits, and vessel qualification.
1999-2004	A start date that placed more emphasis on conditions under the large footrope restriction, and an end date that includes more recent participation.	IFQ – Shoreside Processor business qualification.
2001-2003	A period of time that most closely reflects the current conditions for the fisher and acknowledges the Control Date (2003).	Co-op – Shoreside permit.

Entities Qualifying for An Initial Allocation (A-2.1.1)

Successor In Interest for Shoreside Processors

Questions have arisen with respect to the treatment of processing history as one company purchases all or a piece of another company. In general, what constitutes the continuation of an entity and what constitutes its termination as these sales occur? For harvesters and catcher processors, successor interest will be determined by the transfer of the permit. For motherships, it will be determined based on the entity associated with ownership or operation of the mothership vessel. For shoreside processors, the question still needs to be resolved.

For shoreside processors, the decision was made to issue quota shares to the company on the landing ticket rather than the owner of the processing facility. This was done for two reasons: (1) the availability of the necessary legal documentation, and (2) the variety of ownership situations that might be involved in a processing facility (e.g. the land, building, and processing line equipment could each be owned by different entities none of which is the company listed as the processor on the fish ticket).

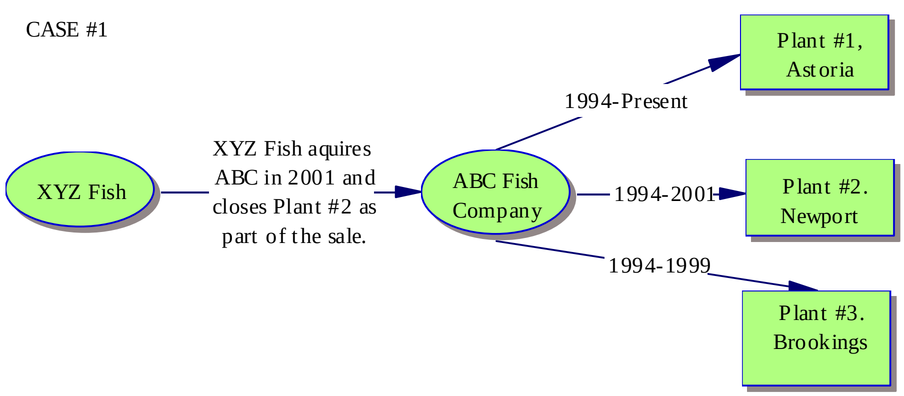
The following are two scenarios that illustrate the transfer of processor business entities based on actual cases in the data.

Case 1

ABC Fish had three plants with the following histories

Plant1 in Astoria	1994 to present
Plant2 in Newport	1994 to 2001
Plant3 in Brookings	1994 to 1999

ABC Fish was purchased by XYZ Fish in 2001, closing Plant2 as part of the sale.



Question: How will the history for Plant1, Plant2, and Plant3 be attributed?

Plant1 goes to XYZ Fish
Plant3 history is not attributed to any (existing) company
Plant2 history:
a. is not attributed to an existing company; or
b. goes to XYZ Fish

Case 2

KLM Fish in California has two plants, Plant4 and Plant5, both operating in 2002
KLM Fish is dissolved, and:
Plant4 is purchased by PDQ, and
Plant5 is purchased by RST

Q. How is the history for KLM Fish distributed among PDQ and RST,
if some of the history is attributed only to the Main Office (i.e., suffix code 00)?

Identification of the Mothership Entity That Would Qualify For An Allocation

Considerable attention has gone into who is eligible to own or control IFQ but there may be some vagueness with respect to who is allowed to receive an initial allocation, particularly with respect to mothership operations. On the one hand, the Council has adopted a definition of processor which includes the following language:

> ***At-sea processors*** *are those vessels that operate as motherships in the at-sea whiting fishery and those permitted vessels operating as catcher-processors in the at-sea whiting fishery. [emphasis added]*

However, different language is used in the co-op alternative to determine to whom the initial allocation should be given:

> *The vessel owners of qualifying motherships will be issued MS permits. In the case of bareboat charters, the charterer of the bareboat will be issued the permit.*

The GAC has recommended application of this language to the IFQ alternative.

Those eligible to receive QS should also be eligible to own QS. The “eligible to own or hold” language anticipates IFQ ownership by entities eligible to control a vessel, under the AFA, but not necessarily eligible to own.

> *Those eligible to own QS/QP will be restricted to (i) any person or entity eligible to own and control a US fishing vessel with a fishery endorsement pursuant to 46 USC 12108 (general fishery endorsement requirements) and 12102(c) (75% citizenship requirement for entities) and (ii) any person or entity eligible to own or control a US fishing vessel with a fishery endorsement pursuant to sections 203(g) and 213(g) of the AFA. [emphasis added]*

The TIQC rationale in recommending this definition was to allow continued participation by entities currently active in the fishery.

The AFA sections cited in this definition makes exceptions that grandfathers in certain vessels the owners of which would not meet the US ownership requirements. Some clarification may be needed as to the nature of the entities grandfathered in and the duration of the grandfather clause. For example, the grandfather clause expires for these vessels if there more than 50% of the ownership interest in the vessels changes. How would such an expiration for the vessel affect the status of the company that qualifies to own groundfish IFQ.

> *203 (g) CERTAIN VESSELS.—The vessels EXCELLENCE . . . , GOLDEN ALASKA. . ., OCEAN PHOENIX . . .), NORTHERN TRAVELER . . ., and NORTHERN VOYAGER . . . (or a replacement vessel for the NORTHERN VOYAGER that complies with paragraphs (2), (5), and (6) of section 208(g) of this Act) shall be exempt from section 12102(c), as amended by this Act, until such time after October 1, 2001 as more than 50 percent of the interest owned and controlled in the vessel changes, provided that the vessel maintains eligibility for a fishery endorsement under the federal law that was in effect the day before the date of the enactment of this Act, and unless, in the case of the NORTHERN TRAVELER or the NORTHERN VOYAGER (or such replacement), the vessel is used in any fishery under under the authority of a regional fishery management council other than the New England Fishery Management Council or Mid-Atlantic Fishery Management Council established, respectively, under subparagraphs (A) and (B) of section 302(a)(1) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1852(a)(1)(A) and (B)), or in the case of the EXCELLENCE, GOLDEN ALASKA, or OCEAN PHOENIX, the vessel is used to harvest any fish.*

> *213 (g) INTERNATIONAL AGREEMENTS.—In the event that any provision of section 12102(c) or section 31322(a) of title 46, United States Code, as amended by this Act, is determined to be inconsistent with an existing international agreement relating to foreign investment to which the United States is a party with respect to the owner or mortgagee on October 1, 2001 of a vessel with a fishery endorsement, such provision shall not apply to that owner or mortgagee with respect to such vessel to the extent of any such inconsistency. The provisions of section 12102(c) and section 31322(a) of title 46, United States Code, as amended by this Act, shall apply to all subsequent owners and mortgagees of such vessel, and shall apply, notwithstanding the preceding sentence, to the owner on October 1, 2001 of such vessel if any ownership interest in that owner is transferred to or otherwise acquired by a foreign individual or entity after such date.*

Recent Participation Requirements (A-2.1.2)

Shoreside Processors: For shoreside processors, a period has been selected and a determination needs to be made as to the amount of processing that should be required to qualify. Consideration might be given to whether different amounts should be required for whiting and nonwhiting landings. The GAC may wish to consider whether a processor must meet the recent participation requirements for whiting and nonwhiting IFQ separately, or if meeting the criteria for one would entitle it to an allocation for IFQ for both sectors. Until the recent participation requirement was dropped for vessel permits, it stated that if a permit met the non-whiting requirement it would also be considered qualified to receive whiting allocation.

Whiting

The GAC selected an "allocation period" of 1994 to 2003 for shoreside processors to qualify for participation. Furthermore, they selected a "qualifying period" of 1998 to 2003 for processors that may be eligible to receive shares. During the period 1994 through 2006, there were 26 companies that received whiting from targeted whiting trips; of those, 21 received whiting during the allocation period. The companies are distributed fairly evenly across the three states, with 12 in California, 11 in Oregon, and 7 in Washington (three companies operate in more than one state).

Two options are considered for whiting processor participation:

- At least one delivery of whiting from a targeted trip during 1998 through 2003; and
- At least 1 metric ton (MT) in any two years of delivered whiting from targeted whiting trips during 1998 through 2003.

As shown in 2, 17 companies received at least one delivery of whiting and nine did not, during the years of 1998-2003. The deliveries to these companies represent 94.3 percent of all allocation period deliveries. The option limiting participation to 1 MT in any two years will reduce the companies to nine that qualify; however, the change in shares of the allocation period is nearly imperceptible. This is because the six companies with one year of activity received about 67 MT combined, compared to nearly 750 thousand MT for all participants.

Table 2 Companies, Years of Activity, and Percent Share of 1994-2003 History for Two Options, Whiting Receivers, 1998-2003 Participation Period

No. of Yrs	1 delivery (>0 MT)	Share of '94-'03	At Least 1 MT	Share of '94-'03
0	9	5.7%	11	5.7%
1	8	0.0%	6	0.0%
2	0	0.0%	0	0.0%
3	1	3.5%	1	3.5%
4	2	3.8%	2	3.8%
5	1	4.5%	1	4.5%
6 or more	5	82.5%	5	82.5%

The geographic distribution of companies that received whiting are shown in 3 and Table . As shown, the companies that would not qualify (zero years of participation) are located primarily in California and Oregon.

Table 3 Number of Companies Operating within Each State, by Years of Activity During the Period, (Any Receipts >0 MT in the Year)

	California		Oregon		Washington	
No. of Yrs	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003
0	4	5	2	5	0	2
1	4	4	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

Table 4 Number of Companies Operating within Each State, by Years of Activity During the Period, (at Least 1 MT in the Year)

	California		Oregon		Washington	
No. of Yrs	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003
0	6	7	2	5	0	2
1	2	2	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

Nonwhiting

The allocation period of 1994 to 2003 applies as well to shoreside processors of nonwhiting. During the period 1994 through 2006, there were 208 companies that received groundfish (whiting and nonwhiting) from targeted nonwhiting trips; of those, 190 received groundfish during the 1994 to 2003 allocation period. A substantial majority (144) of nonwhiting receivers are located in California, with 45 in Oregon, and 30 in Washington. There are ten of these companies that operate in more than one state.

Three options are being considered for nonwhiting processor participation:

- At least one delivery of groundfish from a nonwhiting trip during 1998 through 2003;
- At least 1 MT in a single year of delivered groundfish from a nonwhiting trip during 1998 through 2003; and
- At least 6 MT in any three years of delivered groundfish during 1998 through 2003.

As shown in 5, a total of 124 companies received at least one delivery of groundfish and 84 did not, during the years of 1998-2003. The deliveries to these companies represent 96.3 percent of all allocation period deliveries. The option limiting participation to 1 MT in a year will reduce the companies to 84 that qualify and 124 that do not; however, the change in shares of the allocation period is also nearly imperceptible. There is a large proportion of companies that received very small amounts of groundfish, often in just one year during the period.

Table 5 Companies, Years of Activity, and Percent Share of 1994-2003 History for Two Options, Nonwhiting Receivers, 1998-2003 Participation Period

No. of Yrs	1 delivery (>0 MT)	Share of '94-'03	At Least 1 MT	Share of '94-'03	At Least 6 MT	Share of '94-'03
0	84	3.7%	124	3.7%	139	4.0%
1	41	4.8%	26	4.9%	25	4.9%
2	31	2.3%	16	2.3%	12	3.7%
3	17	6.8%	15	8.3%	12	6.8%
4	6	3.6%	5	3.6%	5	4.2%
5	8	3.6%	7	2.0%	2	1.4%
6 or more	21	75.1%	15	75.0%	13	75.0%

The third option is most restrictive, requiring at least 6 MT in each of three years during 1998-2003. As shown above in Table , although fewer companies qualify (just 32 participated in three or more years with at least 6 MT), these companies represent 87.3 percent of the groundfish received during the allocation period.

The geographic distribution of the three options is summarized in Table . In each case, the number of companies that would qualify under the option is displayed below the dotted line, and those that would not qualify are displayed above the dotted line. Because most of the companies involved with receipt of nonwhiting are in located in California, so too are the effects in terms of number of companies affected when moving from least to most restrictive option. The options have a proportional effect on companies in Oregon and Washington.

Table 6 Number of Companies Operating within Each State, by Years of Activity During the Period, for Three Options

	California		Oregon		Washington	
Options	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003
No Activity	10	59	7	18	2	10
>0 MT in any year	134	85	38	27	28	20
<= 1 MT	65	88	19	27	5	13
>1 MT in 1 yr	79	56	26	18	25	17
<= 6 MT in <3 years	118	127	36	40	21	23
>6 MT in at least 3 years	26	17	9	5	9	7

While the number of companies affected by the "1 MT" and "6 MT in three years" options is large, the proportion of the groundfish received by the non-qualifying companies is small relative to the total received by all companies. This is illustrated in Table 7, which summarizes the effects on quantity and raw product cost of the three options on companies that received groundfish from nonwhiting targeted trips. The three options are compared for illustration purposes to the totals of quantity and raw product cost for all companies receiving nonwhiting within the allocation period.

Table 7 Quantity (in MT) and Raw Product Cost (RPC) by Species, 1994-2003 Receipts, for Three Options during 1998-2003 Qualifying Period

	California		Oregon		Washington	
Options	**Quantity (MT)**	**RPC ($MM)**	**Quantity (MT)**	**RPC ($MM)**	**Quantity (MT)**	**RPC ($MM)**
Any Activity (>0 MT)	7,062.9	$7.83	4,538.4	$4.35	1,904.0	$1.63
	48 companies		10 companies		8 companies	
>1 MT in any year	7,080.5	$7.87	4,542.6	$4.36	1,910.0	$1.64
	77 companies		19 companies		11 companies	
> 6 MT in three years	17,639.3	$19.64	17,894.5	$17.26	10,225.5	$9.17
	114 companies		28 companies		19 companies	
ALL COMPANIES	133,998.6	$144.78	170,424.8	$178.31	61,366.1	$49.44
	134 companies		38 companies		28 companies	

Catcher Processor Permits: The rationale for not requiring recent participation for vessels was that at reasonable levels such a requirement would have little effect on the distribution of the allocation. Therefore, it seemed likely that more equity issues might arise from screening a permit out than allowing all permits to qualify. Data is provided to verify whether or not a similar rationale would hold for catcher processors.

Motherships: A criterion has been previously proposed. Data are provided for an initial evaluation of whether the criteria are performing as expected.

QS Allocation Formulas (A-2.1.3)

Allocation of Overfished Species Using Target Species QS and Applying Bycatch Rates

Introduction

The options for allocating overfished species are as follows:

> **Overfished Species Option 1:** as it is calculated for non-overfished species.
> **Overfished Species Option 2:** use target species QS as a proxy based on the following approach: Apply fleet average bycatch rates and depth and seasonal distributions to each permit's target species QS allocations. Fleet average bycatch rates for the areas shoreward and seaward of the RCA will be developed from West Coast Observer Program data for 2003-2006. For the purposes of the allocation, it will be assumed that a permit's QS for each target species will be distributed shoreward and seaward of the RCA based on the fleet average for that species derived from logbook information for 2003-2006. Both the fleet bycatch rates and the distribution of fleet target catch will be stratified by latitudinal area.

This section describes a proposed methodology for implementing Overfished Species Option 2. It would modify option 2 by distributing the location of overfished species catch using each permit's logbooks, rather than fleet averages derived from 2003-2006 logbook information.

This general concept was originally proposed by the Groundfish Management Team as a mechanism to allocate overfished species in a manner that would allow for the prosecution of current fishing practices given the constraints overfished species place on access to target species.

Empirical evidence from other quota programs throughout the world have shown that initial allocations of IFQ that differ substantially from current or recent fishing practices result in some negative consequences during the initial years of the program (dislocation of fishermen, high discard rates). Over time these consequences are fixed through the natural trading of quota on the market, but a more refined initial allocation may still be able to avoid such negative consequences in the first place.

Preliminary analysis of initial allocation options has shown that, in general, if allocations of overfished species are made based on landings history, the distribution of overfished species quota would be heavily weighted toward a relatively few number of permits. This is because those were the permits that had previously targeted those species when they were abundant, and because under more recent regulations catch of overfished species in the shoreside non-whiting fishery has been largely discarded rather than landed. For the foreseeable future, overfished species will be a constraint to the access of target species, so an argument can be made for a more refined and equitable distribution of overfished species in order to allow permits to gain access to target species. While the market is likely to end up making necessary adjustments to the ownership of quota, overfished species quota is likely to be extremely costly because it will constrain access to target species. This means that those permits not receiving enough overfished species quota would be forced to essentially buy-in to the fishery again at a high cost, or leave the fishery all together. Allocating overfished species based on a bycatch rate is an attempt at making the initial allocation more equitable and avoiding such negative consequences.

General Description
The objective of allocating based on a bycatch rate is to allocate those species in a way that accommodates the current and recent spatial fishing patterns of LE non-whiting trawl vessels, to the extent possible. The bycatch rate of overfished species exhibit clear patterns across depth and latitude, and matching those patterns in the bycatch rate against relevant target fishing patterns can result in allocations that better accommodate recent fishing practices. Several sources of information are available for making allocations in a manner that accommodates these fishing practices:

- Logbooks are required of LE trawl vessels that deliver shoreside. Logbook information shows location, depth, and quantity of species that have been harvested by a particular vessel, among other things.
- The West Coast Groundfish Observer program samples the LE trawl fishery and records depth and location of species caught in observed fisheries.
- Information from these two data sets can be merged to allocate overfished species based on the spatial distribution of catch by LE trawl vessels and the corresponding spatial bycatch rates as estimated from WCGOP data.

During a recent meeting of West Coast fisheries management agencies, it was revealed that logbook compliance in the shoreside trawl fishery was over 90 percent in recent years for all three West Coast states. This information was contrary to the belief that logbook compliance was around 60-70 percent in some cases. Based on this information, the GMT recommended using permit-specific logbook information to determine a vessel's spatial and temporal catch history in recent years. In cases where there are no logbook records for a particular permit, then the fleet average would be used.

Data used in Application
The information used in this application includes fish ticket data, logbook data, and overfished species bycatch rates from the observer program. Fish ticket data is used because it is treated as the record of landed catch made by a vessel. Logbook data is used to stratify landed catch recorded on fish tickets into shoreward or seaward of-the-RCA locations for use in applying an overfished species bycatch rate, and to also identify the latitudinal area of catch. Observer program data is used for estimating shoreward and seaward bycatch rates of overfished species that are differentiated by latitudinal area – in this case the area north of 40° 10' North Latitude and the area south of 40° 10' North Latitude.

Logbook records are used for estimating the location of catch. Location of catch in this case is defined as being either north or south of 40° 10' North Latitude, and whether that location was shoreward or seaward of the RCA. These estimates of catch location are developed on a species-specific basis for those species categorized as "target species" in existing trawl management. Hypothetical catch location percentages (in terms of seaward and shoreward of the RCA) are shown in the table below[1].

[1] Note: dogfish is also labeled as a target species, however data was not available at the time of document production to include dogfish in the list

Table 8 Hypothetical Percentage of Target Species Catch that were caught Shoreward and Seaward of the RCA (2003-2006)

TARGET SPECIES	Shoreward Catch Percentage	Seaward Catch Percentage
ARROWTOOTH FLOUNDER	48%	52%
BUTTER SOLE	100%	0%
CURLFIN SOLE	100%	0%
DOVER SOLE	11%	89%
ENGLISH SOLE	79%	21%
FLATHEAD SOLE	98%	2%
NOM. BANK ROCKFISH	4%	96%
NOM. BLACKGILL ROCKFISH	0%	100%
NOM. LONGSPINE THORNYHEAD	0%	100%
NOM. PACIFIC SANDDAB	88%	12%
NOM. SHORTSPINE THORNYHEAD	1%	99%
NOM. SPECKLED SANDDAB	100%	0%
NOM. SPLITNOSE ROCKFISH	1%	99%
NOR. UNSP. SLOPE ROCKFISH	1%	99%
PACIFIC COD	98%	2%
PACIFIC SANDDAB	99%	1%
PETRALE SOLE	40%	60%
REX SOLE	33%	67%
ROCK SOLE	100%	0%
SABLEFISH	9%	91%
SAND SOLE	100%	0%
STARRY FLOUNDER	100%	0%
THORNYHEADS (MIXED)	0%	100%
UNSP. FLATFISH	83%	17%
UNSP. SANDDABS	100%	0%
UNSP. SLOPE ROCKFISH	2%	98%

Model Development and Application

The model for this approach uses fish ticket data during the qualifying period, logbook data from 2003-2006, and observer data from 2003-2006. Quota shares of target species are first calculated, then target species quota shares are split into areas north and south of 40° 10’ North Latitude, and by shoreward and seaward amounts based on catch depth recorded in 2003 – 2006 logbook data. This information is then multiplied by the trawl allocation amount of target species in place during the implementation year to get an estimate of implementation year quota pounds that are stratified by latitudinal area, and by seaward and shoreward of the RCA. These depth-stratified quota pounds are then multiplied by West Coast Groundfish Observer Program bycatch rates that are stratified by latitudinal area and by shoreward and seaward of the RCA for the years 2003 – 2006. The result is then converted to an overfished species quota share by dividing each permit’s overfished species calculation by the sum of all non-whiting overfished species calculations.

1. The first step is to estimate each permit’s target species quota shares.

2. The second step is to estimate the latitudinal area and depth of target species catch from logbooks for determining what each permit has caught by area over the period 2003-2006.
3. The third step is to stratify each permits' target species quota shares by latitudinal area and shoreward and seaward catch amounts based on each permits' depth stratified catch from step 1.
4. The fourth step is to multiply the depth and area stratified quota shares by the trawl allocation amounts during the initial implementation year to get quota pounds for the initial implementation year.
5. The fifth step is to multiply the corresponding latitudinal area and shoreward and seaward fleet average overfished species bycatch rates by the implementation year quota pounds of target species given to each permit.
6. The final step is to calculate overfished species quota shares by summing together the shoreward and seaward implementation year quota pounds for each permit and dividing that amount by the total non-whiting trawl sector amount of implementation year quota pounds for those overfished species. This final step calculates the overfished species share.

The following tables illustrate the development and application of the proposed method. The table above shows the first step in the model. The second step is to stratify each permit's target species quota shares into shoreward and seaward of the RCA portions and then estimate shoreward and seaward implementation year quota pounds. The following table shows an example of splitting quota shares for a hypothetical permit into seaward and shoreward areas.

Table 9 Derivation of Seaward and Shoreward Quota Shares to a Hypothetical Permit

Area	Target Species	Quota Shares to Permit X	Seaward Share	Shoreward Share
North of 40 10	ARROWTOOTH FLOUNDER	1.00%	0.476%	0.524%
	BUTTER SOLE	2.00%	2.000%	0.000%
	CURLFIN SOLE		0.000%	0.000%
	DOVER SOLE	3.00%	0.317%	2.683%
	ENGLISH SOLE	2.50%	1.981%	0.519%
	FLATHEAD SOLE	1.00%	0.984%	0.016%
	NOM. BANK ROCKFISH	1.00%	0.041%	0.959%
	NOM. BLACKGILL ROCKFISH	1.00%	0.001%	0.999%
	NOM. LONGSPINE THORNYHEAD	3.50%	0.001%	3.499%
	NOM. PACIFIC SANDDAB	0.50%	0.442%	0.058%
	NOM. SHORTSPINE THORNYHEAD	3.20%	0.028%	3.172%
	NOM. SPECKLED SANDDAB	0.08%	0.080%	0.000%
	NOM. SPLITNOSE ROCKFISH	0.00%	0.000%	0.000%
	NOR. UNSP. SLOPE ROCKFISH	2.20%	0.022%	2.178%
	PACIFIC COD	1.80%	1.764%	0.036%
	PACIFIC SANDDAB	1.00%	0.989%	0.011%
	PETRALE SOLE	2.20%	0.886%	1.314%
	REX SOLE	0.08%	0.026%	0.054%
	ROCK SOLE	0.90%	0.896%	0.004%
	SABLEFISH	1.80%	0.154%	1.646%
	SAND SOLE	1.20%	1.196%	0.004%
	STARRY FLOUNDER	0.80%	0.799%	0.001%
	THORNYHEADS (MIXED)	0.00%	0.000%	0.000%
	UNSP. FLATFISH	1.00%	0.834%	0.166%
	UNSP. SANDDABS	1.00%	0.998%	0.002%
	UNSP. SLOPE ROCKFISH	0.00%	0.000%	0.000%

The table below shows hypothetical quota shares for a permit that has only caught fish north of 40 degrees 10 minutes N lat. Target species quota shares are differentiated by seaward and shoreward of the RCA from logbook information as shown in the table above. The trawl allocation is then multiplied by those shares to derive an implementation year quota poundage of target species for that permit. This amount is shown in the right two columns of the table.

Table 10 Hypothetical Development of Seaward and Shoreward Implementation Year Target Species Quota Pounds

Area	Target Species	Seaward Share	Shoreward Share	Implementation Year Trawl Allocation (mt)	Seaward Pounds	Shoreward Pounds
N 40 10	ARROWTOOTH FLOUNDER	0.476%	0.524%	5000	52,464.2	57,766.8
	BUTTER SOLE	2.000%	0.000%	100	4,409.2	-
	CURLFIN SOLE	0.000%	0.000%	100	-	-
	DOVER SOLE	0.317%	2.683%	16000	111,744.0	946,473.6
	ENGLISH SOLE	1.981%	0.519%	4000	174,729.5	45,732.5
	FLATHEAD SOLE	0.984%	0.016%	100	2,170.4	34.2
	NOM. BANK ROCKFISH	0.041%	0.959%	100	89.7	2,114.9
	NOM. BLACKGILL ROCKFISH	0.001%	0.999%	100	1.8	2,202.8
	NOM. LONGSPINE THORNYHEAD	0.001%	3.499%	2000	64.0	154,259.4
	NOM. PACIFIC SANDDAB	0.442%	0.058%	1200	11,702.6	1,525.1
	NOM. SHORTSPINE THORNYHEAD	0.028%	3.172%	1000	624.5	69,923.3
	NOM. SPECKLED SANDDAB	0.080%	0.000%	100	176.3	0.1
	NOM. SPLITNOSE ROCKFISH	0.000%	0.000%	800	-	-
	NOR. UNSP. SLOPE ROCKFISH	0.022%	2.178%	800	396.8	38,404.5
	PACIFIC COD	1.764%	0.036%	1000	38,889.7	793.4
	PACIFIC SANDDAB	0.989%	0.011%	800	17,438.3	198.6
	PETRALE SOLE	0.886%	1.314%	2500	48,828.7	72,425.4
	REX SOLE	0.026%	0.054%	200	116.4	236.4
	ROCK SOLE	0.896%	0.004%	200	3,951.7	16.6
	SABLEFISH	0.154%	1.646%	2500	8,465.0	90,742.9
	SAND SOLE	1.196%	0.004%	200	5,274.6	16.5
	STARRY FLOUNDER	0.799%	0.001%	1000	17,624.4	12.5
	THORNYHEADS (MIXED)	0.000%	0.000%		-	-
	UNSP. FLATFISH	0.834%	0.166%	1000	18,392.8	3,653.4
	UNSP. SANDDABS	0.998%	0.002%	1000	22,013.1	33.1
	UNSP. SLOPE ROCKFISH	0.000%	0.000%	800	-	-

After determining a seaward and shoreward implementation year quota poundage, seaward and shoreward bycatch rates are applied to determine hypothetical darkblotched poundage. That poundage is then divided by the sum of all permits' poundage to derive a quota share of overfished species. The following table illustrates this method by continuing the use of shoreward and seaward implementation year quota pounds. Hypothetical darkblotched bycatch rates are multiplied by this amount in order to determine a darkblotched poundage. That poundage is then divided by a hypothetical fleetwide poundage to derive that permits quota shares of darkblotched rockfish.

Table 11 Hypothetical Derivation of Darkblotched Quota Shares Using Proposed Method

Area	Target Species	Seaward Pounds	Shoreward Pounds	Seaward Bycatch Rt	Shoreward Bycatch Rt	Seaward Drkbltch LBS	Shoreward Drkbltch LBS	Total	Fleet Total	Drkbltch Share
N 40 10	ARROWTOOTH FLOUNDER	52,464.2	57,766.8	0.02	0.0001	1,049.28	5.78			
	BUTTER SOLE	4,409.2	-	0.02	0.0001	88.18	-			
	CURLFIN SOLE	-	-	0.02	0.0001	-	-			
	DOVER SOLE	111,744.0	946,473.6	0.02	0.0001	2,234.88	94.65			
	ENGLISH SOLE	174,729.5	45,732.5	0.02	0.0001	3,494.59	4.57			
	FLATHEAD SOLE	2,170.4	34.2	0.02	0.0001	43.41	0.00			
	NOM. BANK ROCKFISH	89.7	2,114.9	0.02	0.0001	1.79	0.21			
	NOM. BLACKGILL ROCKFISH	1.8	2,202.8	0.02	0.0001	0.04	0.22			
	NOM. LONGSPINE THORNYHEAD	64.0	154,259.4	0.02	0.0001	1.28	15.43			
	NOM. PACIFIC SANDDAB	11,702.6	1,525.1	0.02	0.0001	234.05	0.15			
	NOM. SHORTSPINE THORNYHEAD	624.5	69,923.3	0.02	0.0001	12.49	6.99			
	NOM. SPECKLED SANDDAB	176.3	0.1	0.02	0.0001	3.53	0.00			
	NOM. SPLITNOSE ROCKFISH	-	-	0.02	0.0001	-	-			
	NOR. UNSP. SLOPE ROCKFISH	396.8	38,404.5	0.02	0.0001	7.94	3.84			
	PACIFIC COD	38,889.7	793.4	0.02	0.0001	777.79	0.08			
	PACIFIC SANDDAB	17,438.3	198.6	0.02	0.0001	348.77	0.02			
	PETRALE SOLE	48,828.7	72,425.4	0.02	0.0001	976.57	7.24			
	REX SOLE	116.4	236.4	0.02	0.0001	2.33	0.02			
	ROCK SOLE	3,951.7	16.6	0.02	0.0001	79.03	0.00			
	SABLEFISH	8,465.0	90,742.9	0.02	0.0001	169.30	9.07			
	SAND SOLE	5,274.6	16.5	0.02	0.0001	105.49	0.00			
	STARRY FLOUNDER	17,624.4	12.5	0.02	0.0001	352.49	0.00			
	THORNYHEADS (MIXED)	-	-	0.02	0.0001	-	-			
	UNSP. FLATFISH	18,392.8	3,653.4	0.02	0.0001	367.86	0.37			
	UNSP. SANDDABS	22,013.1	33.1	0.02	0.0001	440.26	0.00			
	UNSP. SLOPE ROCKFISH	-	-	0.02	0.0001	-	-			
								10,940.02	705,478.4	**1.6%**

Allocation of Rare Overfished Species Using an Auction Approach

The following describes a proposal for managing relatively rare overfished species in a trawl IQ program. This proposal is not intended to apply to a system of harvest cooperatives or to relatively abundant species where a ITQ system may work effectively.

Discussion of Problem

The problem with managing overfished species in a trawl IQ program is that A) the amount of several overfished species available to the fishery is very small, B) there is some uncertainty associated with catch when a vessel deploys it's net and C) there is a likelihood that one trawl vessel could exceed it's holding of quota and have a substantial inability to cover that overage by purchasing quota. This could be because the cost of that overfished species quota is extremely costly and the vessel owner/operator may not have access to sufficient funds, and/or the amount of overfished species quota available on the market may not be sufficient to cover that overage.

Available information shows that there are more trawl tows that result in zero encounters of relatively rare overfished species (such as yelloweye) than there are tows where there are substantial quantities. Given that targeting of overfished species has been eliminated and avoiding overfished species is encouraged in all sectors, this information suggests that encounters of such species are relatively uncommon, but the magnitude of those encounters can be relatively large. This creates a case where the encounters of overfished species may not affect the entire fishery by a large degree since more vessels are avoiding them than not, but the implication to the individual catching those fish may be quite large if that individual is held individually accountable.

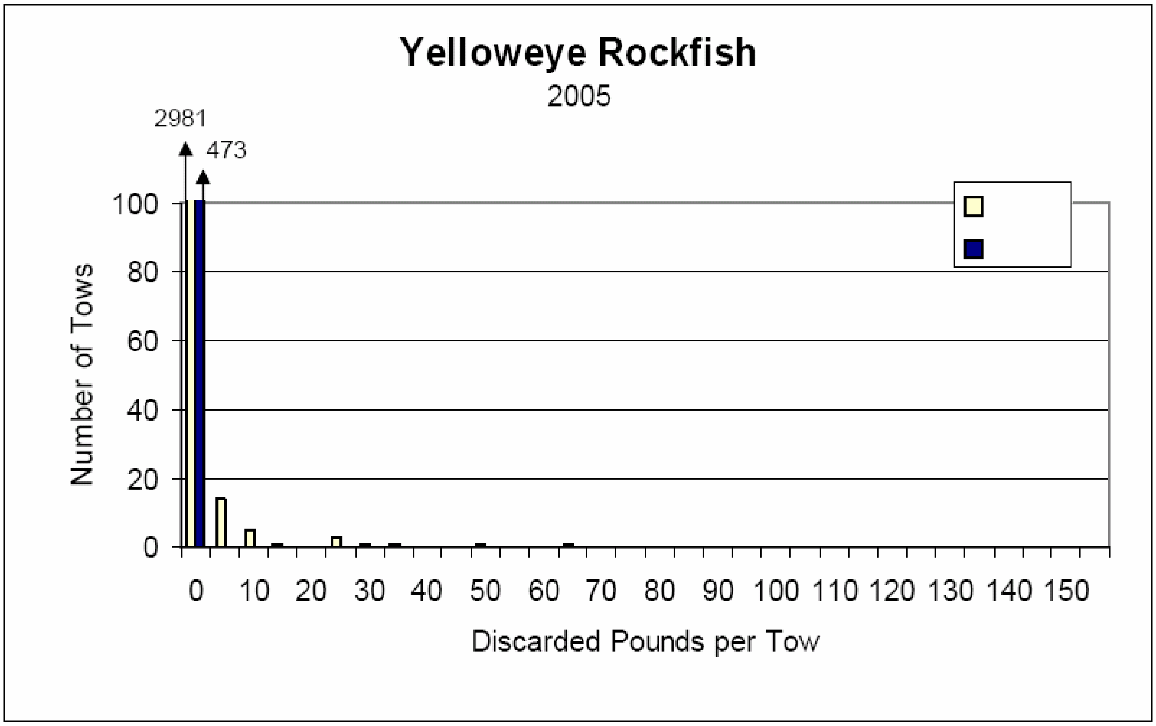


Figure 1 Observed Discard of Yelloweye Rockfish in the Non-whiting Trawl Fishery (note: at least one tow occurred in 2004 with > 100 lbs)

Background

Given the uncertainty surrounding potential catch of overfished species, a traditional IQ program may end up resulting in a case where individuals withhold quota from the market because they are not certain whether they will need that quota in the future or not. This is a method of hedging against uncertainty. This could be the case even though there is a greater probability of not catching rare overfished species than there is a probability of catching them because the cost of being wrong could be severe. In other words, the cost of catching overfished species and then having to purchase enough quota to cover that catch could be quite expensive, so vessels may be more inclined to hold on to quota instead of selling it.

Permit and vessel owners or operators may withhold quota pounds for several different reasons. We know that fishing is a relatively inexact method of extracting resources, so there is an unknown associated with fishing activities. In order to better guarantee future opportunities to fish, fishers may hold on to quota to cover unexpected catch events. In addition, the cost of covering a catch event of a rare species may be extremely costly if there is a limited supply of quota available. This could be particularly problematic for fishermen because it is likely that many fishermen are liquidity constrained (ie. have limited access to funds). Therefore, to avoid the scenario of having to purchase expensive quota without adequate funds, fishers may choose to hold quota instead of selling it if they are planning to fish in the future (ie. hedge against uncertainty). This creates a problem for vessels that need to cover a deficit because the supply available on the market would be diminished in this case.

To outline the magnitude of the problem, the following scenario was developed. This scenario assumes that the non-whiting trawl sector will be allocated 0.5 metric tons of yelloweye rockfish, and that the number of participants in that fishery consolidates to 60 vessels. This means that there would be approximately 3 yelloweye rockfish available to each vessel. If each of those vessels intends to hedge against uncertainty by holding on to only 1 fish, the effect is that approximately 40% of the sector allocation is not available for purchase on the market. This reduces the chance that vessels with deficits can cover their catch by purchasing quota pounds and increases the cost of purchasing quota pounds because the supply on the market is less.

Table 12 Yelloweye Available

	Available Quantity of Yelloweye under Initial Allocation	Quantity Available on the Market if Hedging Occurs
Lbs available to the sector	1,102	682
Lbs per vessel	18	11
No. of Fish per Vessel	3	2

Based on these ideas, a system that relies on a mechanism that allows for the distribution of rare overfished species quota on an as-needed basis may work more effectively – or result in more desirable outcomes – than making an initial distribution of quota shares at the start of the program. This is because quota holders would not have the option of withholding quota from the market, so there would be a greater certainty that the trawl allocation would be available to those that need to cover those overfished species catch events.

Proposed Option

An auction-based mechanism is one approach that would not make an initial allocation and could be set up to only allow participants to purchase quota on an as-needed basis. Making it available to vessels on an as needed basis eliminates the ability to withhold quota from the market and makes that amount available to those that need to access it. This system would be likely to continue providing incentives to avoid those stocks because there would be a cost associated with covering those catch events through a competitive auction. Further incentives would be created by requiring that those vessels tie up until the next auction takes place, which acts as an additional cost.

An auction-based management system designed for distribution of quota pounds on a periodic and as needed basis could be set up as follows:

- Vessels would not receive an initial distribution of QP for the species in question
- Vessels would be expected to fish without any quota pounds of those overfished species, but when they catch a specified amount of overfished species they would be required to stop fishing until they purchase enough quota pounds through the auction to cover their catch

- Participation in the auction would be limited to those that have deficits, and vessels would only be allowed to purchase enough quota to cover their deficit (ie. nobody could purchase more than they need)[2].
- A minimum performance standard and limit on accumulation would be set by setting a maximum quantity that could be purchased by a single vessel in the auction. If vessels catch more than the allowable purchase quantity, they remain tied up and are allowed to bid in subsequent auctions.

In this type of system, several things may tend to occur:

- A leveling of the playing field and a reduction in the ability of entities to control harvest activities by withholding quota shares.
- Because of the tie-up provision, vessels that have a tendency to encounter the overfished species managed under the program would be less active, thereby decreasing the potential for a disaster tow to occur.
- Make overfished species quota pounds more accessible to fishery participants that encounter relatively rare species (like yelloweye) and need to cover deficits because it would not be possible for individuals to withhold quota from the market.
- Reduction in the cost of purchasing quota pounds to cover deficits because there would be more quota pounds available on the market to purchase (an increase in supply should reduce cost)

Summary of Proposed Option for Consideration

The proposed auction-based mechanism for managing overfished species is to hold four auctions of overfished species quota pounds throughout the year in order to cover deficits of overfished species.

- Vessels would not receive an initial allocation of quota of rare overfished species.
- Vessels would be expected to fish with zero quota pounds of rare overfished species
- When a vessel has caught the overfished species managed by this program and incurs a deficit (or catches more than a specified amount), they would not be allowed to fish until that deficit is cleared[3].
- Catch deficits are only cleared through the auction process.

2 In this type of a system, it may be reasonable to expect a third party entity to develop an insurance-based program that charges vessels to be a part of the program and then purchases quota on the vessel's behalf. We would expect that vessels that are part of the program, and are repeat offenders, would be charged higher premiums and deductibles and eventually reduce the number of bycatch encounters, or leave the fishery altogether.

[3] Some catch could be allowed to occur between auctions depending on the likelihood of encountering those stocks. The system could allow vessels to fish during a period as long as they don't catch more than 20 lbs of canary. If that vessel caught 15 lbs of canary, they could continue fishing, but would be expected to cover that catch during the next auction. If they do not cover that catch in the next auction, they would be required to tie up until doing so in a subsequent auction.

- Only vessels with a deficit would be allowed to participate in the auction.
- Vessels would not be allowed to purchase an amount in excess of their deficit
- Vessels would not be allowed to purchase more than 10-25% of the quota pounds available in a single auction (this amount is species specific).
- The amount of quota available on the auction would be 25% of the allowable catch to be released 4 times per year[4].
- Vessels that have not cleared deficits in the auction would remain tied up and be allowed to bid in subsequent auctions

This type of a system may work effectively for rare overfished species like cowcod and yelloweye where it is more likely that a vessel will not encounter them than will. If this program were to be used for more abundant overfished species, this proposal would need to be modified to allow for some catch to occur between auctions; otherwise a substantial percentage of the fleet would likely be tied up at any given time. This is because overfished species such as darkblotched are more commonly encountered and more difficult to avoid, meaning that vessels would be required to tie up routinely if they must stop fishing upon catching those more abundant species and this outcome is probably not necessary to control the catch of that species.

For hypothetical purposes, the following table was developed to illustrate a series of rules for managing stocks in a periodic auction. This table shows a list of overfished species, the amount of catch of those species that a vessel could make between auctions before being required to tie up, the quantity of QP available at each auction, the amount of QP any single vessel can purchase in an auction, and the total QP auctioned in any given year.

Table 13 Auction Amounts by Species

Species	Allowable per-vessel catch between auctions before tying up	Quantity of QP available at each auction	Amount of QP any single vessel can purchase in an auction	Total QP auctioned in any year
Yelloweye	0 – 10 lbs	300 lbs	100 lbs	1,200 lbs
Cowcod	0 – 20 lbs	400 lbs	100 lbs	1,600 lbs
Canary	20 – 100 lbs	4,500 lbs	800 lbs	18,000 lbs
Darkblotched	600 – 1,200 lbs	150,000 lbs	4,000 lbs	600,000 lbs
POP	500 – 1,000 lbs	87,500 lbs	7,000 lbs	350,000 lbs
Bocaccio	400 – 1,000 lbs	25,000 lbs	6,000 lbs	100,000 lbs

[4] Auctioning 25% of the allowable catch would apply if there were 4 auctions during a year. If there were 5 auctions, then each auction would release 20%; if there were 3 auctions, each auction would release 33.33%, etc. Limiting the amount of quota pounds released during each auction is intended to insure a competitive bid process (ie. break down the ability for collusion to occur by limiting supply), and thereby reinforce incentives to avoid overfished species. Having auctions on a periodic basis are intended to provide further incentives to avoid those stocks because tying up for a period of time between auctions acts as a cost.

A Hypothetical Example of the Auction-Based Approach

The following is a hypothetical example of the auction-based mechanism being used for yelloweye rockfish. In this example, we start in the year 2012 (the first year of the IQ program) and examine the role of a fisherman and of NMFS in executing the auction.

In this example, the Pacific X begins fishing in January of 2012. That vessel then makes a second trip in February where there is a yelloweye rockfish encounter that requires the vessel to tie up. On the NMFS side, there is a scheduled auction that occurs every 3 months that has been described as part of the groundfish fishery regulations. NMFS begins accepting bids on March 1 for the first auction, which will be held at the end of March. Throughout this time period the Pacific X makes bids for yelloweye rockfish to cover the deficit. On April 1, NMFS issues yelloweye QP to vessels with the highest bid.

Table 14 Hypothetical Example of the Auction-Based Approach

Date	Actions taken by F/V Pacific X	Actions taken by NMFS that are related to the auction
Jan 1	Nothing	Regulations governing the 2012 fishery go into effect. These regulations state that 4 auctions are scheduled to occur throughout the year. Each releases 500 lbs of yelloweye.
Jan 17	The F/V Pacific X departs on a fishing trip where there are no encounters of yelloweye	Nothing
Jan 20	The F/V Pacific X returns to port	Nothing
Feb 5	The F/V Pacific X departs on a fishing trip	Nothing
Feb 6	The F/V Pacific X encounters 10lbs of yelloweye rockfish, stops fishing, and returns to port	Nothing
Mar 1	F/V Pacific X submits a bid of $1,000 for 10 lbs of yelloweye	NMFS begins accepting bids for yelloweye QP
Mar 15	F/V Pacific X realizes there are higher bids and that he will not receive yelloweye QP. Submits a bid for $10,000 for 10 lbs of yelloweye	Nothing
Apr 1	Pacific X receives 10 lbs of yelloweye QP	Auction closes and NMFS issues QP to vessels making the highest bid in the auction, including the Pacific X
April 7	Pacific X departs on a fishing tip	Nothing

Direct QS Reallocation After Initial Issuance (A-2.1.6)

With Changes in Management Areas

Fishery management areas provide spatial boundaries for fishery species assessments and harvest areas. Lines of latitude are used to define the regulatory boundaries of the fishery management areas. After implementation of an IFQ program, these regulatory boundaries could be subject to change if, among other reasons, stock distributions change, harvest patterns are altered, new information becomes available, a species is separated out from a species complex, or management philosophies change. Change may occur through subdivision of existing areas, recombination of areas, or movement of management lines.

The current IFQ alternative includes a provision only for the subdivision of an existing unit:

> if at any time after the initial allocation an IFQ management unit is further subdivided, those holding QS for the unit being subdivided would receive equal amounts of shares for each of the resulting IFQ management.

With respect to other changes of management lines, the current alternative states:

> "If a new management unit is established that is not a subset of an existing management unit, the Council will need to take action at that time to develop criteria for QS reapportionment."

The strawman options presented here, if incorporated, would reduce the need for future Council action on this matter. The basic idea behind both strawman options is that the quota holder would come out no better or worse, with respect to the total amount of QP, before the recombination, division, or alteration of a fishery management area.

Strawman Option for Recombination of Areas: When two areas are combined, the QS held by individuals in each area will be adjusted proportionally such that (1) the total QS for the area sums to 100%, and (2) a person holding QS in the newly created area will receive the same amount of total QP as they would if the areas had not been combined.

> Example: 50 mt (5%) of the trawl allocation is for the Conception area and 950 mt (95%) of the trawl allocation is for latitudinal line 40°10' to the Conception area. An individual who holds 50% of the allocation in the Conception area would get 25 mt. Should these areas be combined, that person would receive 2.5% of the new 1,000 mt south of 40°10' trawl allocation (50% multiplied by 5%, i.e. the individual's allocation for the conception area multiplied by the Conception area portion of the new south of 40°10' area)). Similarly the QS allocation for an individual to the north would be their percent of QS times 95%.

Strawman Option for Movement of a Management Line: When a management boundary line is moved, the QS held by individuals in each area will be adjusted proportionally such that they maintain the same share of the coastwide trawl allocation. In other words, the fishing area may expand or decrease, but the individual's QP for both areas combined wouldn't change because of the change in areas. In order to achieve this end, the holders of QS in the area being reduced will receive QS for the area being expanded, such that the total QP they would be issued for the year of the line movement will not be reduced. Those holding QS in the area being expanded will have their QS reduced such that the QP they receive in the year of the line movement will not increase as a result of the expansion (nor will it be reduced).

> For example (see following table), first assume that 50% of the trawl allocation for a species is for north of the $40^{o}10'$ line and 50% is for south (i.e. the coastwide trawl allocation is evenly distributed between these two areas). Now assume that a decision is made to move the management line to 38^{o} and that as a result of this movement 70% of the QP for the species would be for north of 38^{o} and 30% would be for south of $38^{o.}$ The QS holdings would be adjusted as follows:
>
>> Those persons holding QS for the southern area, would continue to hold QS for the new southern area (their QS which, in aggregate, previously represented 50% of the coastwide OY would be scaled back such that it represents only 30% of the coastwide OY).
>>
>> In addition those persons would be allocated QS for the new northern area representing 20% of the coastwide trawl allocation (they would receive 28.6% of the QS for the new northern area (20%/70%=28.6%)). Thus, those holding QS for the south would still hold 50% of the coastwide QS (all of the southern 30% and 20% represented in northern QS). The allocation of northern QS would be made in proportion to their holdings of southern area QS. Those with QS for the expanded northern area would each have their QS reduced by 28.6% such that their total QP remain unchanged.
>>
>> On an individual basis, if a person holds 1.5% of the coastwide trawl allocation through a 3% holding of the southern QS, when the adjustment in the latitude line is made, they continue to hold 3% of the southern area QS but it represents only 0.9% of the coastwide trawl allocation (3% times 30%). So they would receive an amount of the northern QS that is equivalent to 0.6% of the coast wide allocation. This would bring them back to a total of 1.5% of the coastwide allocation. The amount of northern area QS necessary to achieve this would be a little less than 0.9% of northern QS (0.9% times 70% equals about 0.6%).

Table 15 Example of adjustments in response to a hypothetical movement of a management line.

	Northern Area	Southern Area	Coastwide (Total MT or % of Coastwide Shares)	Northern as a Share of Coastwide	Southern as a Share of Coastwide
Existing Line at 41°10' N Lat					
Trawl Portion of OY	100 mt	100 mt	200 mt	50% CW MT	50% CW MT
Individual A					
Quota Shares	0% QS	3.00% QS	1.50% QS	0.00% CW QS	1.50% CW QS
Quota Pounds	0 mt	3 mt	3 mt		
Individual B					
Quota Shares	3.00% QS	0% QS	1.50% QS	1.50% CW QS	0.00% CW QS
Quota Pounds	3 mt	0 mt	3 mt		
A+B QS	3.00% QS	3.00% QS	3.00% QS	1.50% CW QS	1.50% CW QS
New Line at 38°0' N Lat					
The new line moves 40mt or 20% of the coast wide quota share out of the old southern area and into the new northern area.					
Trawl Portion of OY	140 mt	60 mt	200 mt	70% CW MT	30% CW MT
For holders of QS in the southern area provide an amount of northern area QS equal to 40 mt or 20% of the coastwide allocation, i.e. 28.6% of the northern QS (40mt/140mt or 20%/70%)					
Individual A					
Quota Shares	0.86% QS (3% x 28.6%)	3.00% QS	1.50% QS	0.60% CW QS	0.90% CW QS
Quota Pounds	1.2 mt	1.8 mt	3 mt		
For holders of QS in the northern area decreased their QS by 28.6% (40mt/140mt or 20%/70%)					
Individual B	2.14% QS	0% QS	1.50% QS	1.50% CW QS	0.00% CW QS
	3 mt	0 mt	3 mt		
A+B QS	3.00% QS	3.00% QS	3.00% QS	2.10% CW QS	0.90% CW QS

With Changes in Stock Status

As a species moves out of (or into) overfished status, the opportunities for targeting the species may change significantly. A number of overfished species are not currently targeted, but are caught incidentally in other trawl target strategies. When an overfished species is rebuilt, there will often be a sudden and substantial increase in the OY. As these opportunities change, it may be appropriate to consider reallocation of QS within a trawl sector to accommodate directed fishing on the rebuilt species. A uniform and known approach for such reallocation would provide desired regulatory consistency and predictability for industry and government.

The following options are for reallocation within a single given trawl sector and would not reallocate among trawl sectors, or between trawl and nontrawl sectors. Adjustments to the allocation among sectors would be handled in a separate process.

Reallocating QS for an Overfished Species that Becomes Rebuilt

The following options are proposed in anticipation of a future directed fishery on a rebuilt species.

Under the first strawman option, the QS for currently overfished species would be allocated with the designation "rebuilding QS." When the species is rebuilt, the rebuilding QS would be augmented by the issuance of additional QS, either

1. newly created when the species is rebuilt, or
2. established now but not fished until the species is rebuilt (allocated with the designation "shadow QS")

Alternatively, the Council could make no special provisions for reallocation upon rebuilding and the future increase could be absorbed by holders of the QS for that species.

The following table provides an example of how the reallocation situation would occur. In this example, in the last year of rebuilding, 100% of the available OY (40 mt) is allocated based on rebuilding QS. A person (Individual A) holding 3% of the rebuilding OY receives 1.2 mt. In the first year that the stock is declared rebuilt, the OY doubles. When this happens the shares of Individual A are scaled back such that he does not receive an increase in QP (alternatively the shares might be scaled back so he only receives a portion of the increase, e.g. 25%). In this example, where the OY doubles and individual A's QS are scaled back so that he receives no increase in QP, there are now QSs equaling 50% of the OY (40 mt) available for redistribution. The question then is how will the "new" QS be distributed. The alternative approaches for distribution of the new QS are the topic of Strawman Option 1. Strawman Option 2 there would be no direct redistribution, but rather redistribution would occur through market transactions.

Table 16 Example reallocation upon rebuilding

			Individual A's Holdings	
Type of QS	Amount of Total QS by Type of QS	OY	QS	QP Equivalent
Rebuilding OY		40 mt		
QS Rebuilding	100%		3%	1.2 mt
Rebuilt OY		80 mt		
QS Rebuilding (rebuilding designation to be removed after reallocation is completed)	50%		1.5% (rebuilding QS after being scaled back)	1.2 mt
QS (new)	50% (distribution method to be determined)			

The specific options are as follows.

Strawman Option 1: At the start of the program, for those overfished species for which there should not be significant targeting "rebuilding QS" will be issued. In the year in which a species is declared rebuilt and the OY is reset to correspond to the species rebuilt status, QS allocations will be adjusted as follows:

Strawman Option 1a: Additional new QS for the increase in harvest resulting from a species achieving rebuilt status will be distributed.

Amount Issued: The **amount** of new QS issued would be such that, after all adjustments are made, in the first year under rebuilt status those who held rebuilding QS will receive QPs equal to [OR 1.25 times (Council to decide)] what they received in the last year under overfished status. The "rebuilding" designation would be removed from the QS.

Allocation: The new QS will b **distributed** based on catch history, auction, or some other means. *[THE RULES FOR ALLOCATING NEEDS TO BE SPECIFIED. A challenge in specifying an allocation method based on the proposed catch history period is that there may be decades between the period of the history and the time the species is rebuilt. A challenge in using a more recent catch history would be determining an appropriate catch history for a target fishery not currently in existence.]*

Adjustment: After the new QS is issued, QS holdings will be **adjusted** proportionally such that the total QS sum to 100% and those previously holding rebuilding QS will receive the intended amount of QP in the first year (see "Amount Issued").

Strawman Option 1b: same as Option 1a, except that rather than issuing new QS when a species is rebuilt, shadow species QS will be issued at the start of the program and be activated when a species is rebuilt. Shadow QS will not be active (usable) until the overfished species is rebuilt. When a species is rebuilt, both types of QS would then be redesignated as regular QS (neither "rebuilding" nor "shadow"). When activated, the QS amounts will be adjusted as indicated in Option 1a.

Allocation: Shadow QS will be allocated based on a person's (permit and/or processor's) delivery history prior to the year the species was declared overfished (there will be no "drop years" option for the allocation of shadow QS) [OR ... based on the same allocation rules used for the QS of non-overfished species].

Strawman Option 2: When a species is rebuilt, no adjustments will be made to the QS distribution. Any needed QS redistribution will occur through private market transactions.

Reallocating QS for a Species that Becomes Overfished

If a species becomes overfished and QS for the species will be needed to cover incidental catch in some trawl targeting strategies, the Council may wish to specify that the QS should be redistributed in order to facilitate full harvest of the target species allocations.

Strawman Option 1: If a species becomes overfished, as part of the biennial specifications process the Council may allocate "rebuilding QS" to QS owners based on their holdings of QS for related targets species and fleet bycatch rates (the allocation formula may also take into account an owner's QS for the newly overfished species, prior to the reallocation). At that time, the previously allocated QS will become "shadow QS" and remain shadow QS until such time as the species is rebuilt. While the species is being rebuilt QP will be allocated to holders of rebuilding QS but not to holders of shadow QS.

Strawman Option 2: When a species becomes overfished, no adjustments will be made to the QS distribution. Any needed QS redistribution will occur through private market transactions.

Vessel QP Minimum Holding Requirement (A-2.2.1)

A minimum holding requirement would specify an amount of QP a vessel must hold in its account, or otherwise ensure it has access to, prior to fishing.

At the June Council meeting, the GMT recommended consideration of two mechanisms for implementing a minimum holding requirement. One mechanism would establish a minimum holding requirement to access a certain area. The second approach would allow vessels to enter into voluntary pooling agreements in order to reach a minimum holding requirement. The Council requested that the GMT continue to work on the issue. See GMT report for additional information.

Vessel QP Overage Resolution (A-2.2.1)

Even when a vessel fishes in a manner which may generally avoid the take of large amounts of a particular overfished species, such species are sometimes encountered unpredictably in single large tows (sometimes termed “disaster tows”). For an overfished species, the small amounts of QP available in a particular year, combined with the incentives that other vessels may have to hold overfished species QP in case they encounter such a tow, may make it very difficult for a vessel encountering a disaster tow to acquire enough QP to cover its catch. Section A-2.2.1 specifies that a vessel with catch in excess of its QP holdings may not leave on a fishing trip until it has complied with the program by coving its overage with QP (Option 1 below). Other options would provide alternative conditions through which vessels might continue to fish.

> Option 1: All catch taken on a trip must be covered with QP within 30 days of the landing for that trip unless the overage is within the limits of the carryover provision (Section A-2.2.2.b), in which case the vessel has 30 days or until a reasonable time (to be determined) after the QP are issued for the following year, whichever is greater. For any vessel with an overage (catch not covered by QP), fishing will be prohibited until the overage is covered regardless of the amount of the overage (extent of the prohibition to be determined). Vessels which have not adequately covered their overage within the time limits specified, must still cover the overage before resuming fishing, using QP from the following year(s), if necessary. If a vessel covers it overage, but coverage occurs outside the specified time limit, the vessel may still be cited for a program violation.
>
> Option 2: Same as Option 1 with subsequent year option(s): (For overfished species only) If a vessel enters a subsequent year with a deficit in its account which is more than twice the total amount of QP the vessel held for the species in the preceding year, the vessel may surrender QS for other species. The QS surrendered will then be (1) reallocated to remaining QS holders, or (2) placed in an account for community development etc. Upon this election the vessel holder will be allowed to resume fishing with a zero deficit for that overfished species. The amount of QS surrendered will be ....???
>
> Option 3: Same as Option 1 with the following subsequent year option: (For overfished species only) If a vessel enters a subsequent year with a deficit in its account which is more than twice the total amount of QP the vessel held for the species in the preceding year, the vessel may voluntarily post a performance bond in the amount of (percentage or $100K?), whereupon the vessel may continue to fish its IFQ holdings. The bond will remain in place for as long as the vessel holder carries a deficit in its QP account. COMMENT: This (and Option 2) may create an incentive to fish the overfished spp more heavily to establish enough of a deficit to qualify (e.g. once 150% over fisher more to reach twice the amount and qualify for the surrender or bond options).

The following two options may not be feasible if they are interpreted as not providing due process for those with an overage. THE GAC HAS RECOMMENDED THESE OPTIONS BE DROPPED.

OPTION 4: Same as Option 2 except that instead of surrendering an amount of target species QS equivalent to the amount of catch typically associated with the amount of the overage, the vessel will pay the average ex-vessel value equivalent to the amount of catch typically associated with the amount of the overage (as per Option 2). If a vessel chooses to make such a payment instead of acquiring the needed QP, upon this election the vessel holder will be allowed to resume fishing with a zero deficit for that overfished species.

OPTION 5: Same as Option 1 except that if a vessel exceeds its QP allocation and does not acquire sufficient QP to cover the overage by year's end, the vessel holder will be fined 1.5 times the value of <u>all fish aboard</u> the vessel when overage(s) occurred. After payment of the fine, it will be allowed to continue to fish.

Accumulation Limits (A-2.2.3.e)

Appendix 2 provides a number of tables that compare expected QS allocations to the proposed accumulation limits.

The following information shows the accumulation limits that were developed at the October meeting of the Groundfish Allocation Committee. This information is shown alongside an analysis of landings/catch made by individual permits during the period that will be used for assigning quota shares (currently specified as 1994-2003). In this analysis, landings data is used for the shorebased sector and total catch data is used for the at-sea sector. This analysis focuses on the maximum landings/catch made by permits, where the maximum number shown is the landings made by the permit with the largest landings during those years relative to other trawl permits. In other words, information in this document shows the maximum share of landings/catch made by permits historically against the accumulation limits proposed by the Groundfish Allocation Committee. In addition, the information shows the historic share of landings against the OY, the total trawl sector share of all non-tribal landings, the total trawl sector share of the OY, and all sectors landings as a percent of the OY. Each of these additional columns provides a frame of reference for the maximum share information. For example, in the case of shortbelly rockfish, the maximum share of landings made by a permit was 97% in 2003. This 97% figure is derived from a landings history that was less than 1 metric ton out of an OY of 13,900 metric tons in that same year. The information in this table primarily focuses on permits engaged in the non-whiting fishery, with the exception being those rows that are identified as a sector of the whiting fishery.

In addition to this information, Council staff has attempted to identify species where historical catch shares may be reduced by the proposed accumulation limits as well as cases where landed catch data may not be reflective of what has historically been caught in the fishery. Species that have been caught by individual permits in greater proportions than what is currently proposed for accumulation limits have been highlighted in bold and enlarged font. Species that have had historically high rates of discard– either for regulatory purposes in order to eliminate targeting, or because of market conditions – have been shaded. For these species, the Council may want to consider setting accumulation limits based on criteria different from historical landings data. Some examples of other criteria may include regional variation in species abundance, the geographic distribution of fishing effort, or some combination thereof.

Table 17 Proposed Accumulation Limits

	Option 1		Option 2		Option 3									
	Ctrl Cap (%)	Vsl Cap (%)	Ctrl Cap (%)	Vsl Cap (%)	Ctrl Cap (%)	Vsl Cap (%)	Year Maximum Landings Share Was Attained	Maximum Annual Permit Landings Share	Sector Landings in the Year Maximum Share was Attained (mt)	Maximum Annual Permit Landings Share Expressed in mt	OY (mt)	LE TWL share of non-tribal landings	LE TWL landings as share of OY	All sectors landings as share of OY
All nonwhiting groundfish (in aggregate)	1.5	3	2.2	4.4	3	6	2002	4%	20,416	853				
Lingcod - coastwide	5	10	7.5	15			2003	9%	61	6	651	5%	9%	211%
N. of 42° (OR & WA)	5	10	7.5	15			2000	12%	38	5		22%		
S. of 42° (CA)	5	10	7.5	15			2003	14%	12	2		1%		
Pacific Cod	5	10	7.5	15			2000	**23%**	274	62		99%		
Pacific Whiting (Coastwide)			0	0			2002	47%	39	19	129,600	100%	84%	101%
Non-whiting sector							2002	47.1%	39	19	129,600	99.8%	83.7%	100.7%
Shoreside Whiting Sector	10	7.5	15	11.3	25	12	1994	9.1%	68,338	6,223				
Mothership Sector	10	25	15	37.5	25	50	2002	18.5%	26,593	4,922	129,600	99.8%	83.7%	100.7%
Catcher-Processor Sector	50	65	75	97.5	60	75	2003	49.5%	41,214	20,401	148,200	100.0%	79.9%	95.8%
Alll Whiting Sectors Combined	15	25	22.5	37.5	40	50								
Sablefish (Coastwide)	1.9	3.8	2.9	5.7			2003	2%	2,324	54		48%		
N. of 36° (Monterey north)	2	6.2	3	9.3			2003	2%	2,246	54	6,500	49%	35%	82%
S. of 36° (Conception are	5	6.2	7.5	9.3			2001	**38%**	2,486	953	212	20%	13%	67%
PACIFIC OCEAN PERCH	5	6.2	7.5	9.3			2002	7%	147	11	350	99%	43%	44%
Shortbelly Rockfish	5	6.2	7.5	9.3			2003	**97%**	0	0	13,900	73%	0%	0%
WIDOW ROCKFISH	3.4	6.8	5.1	10.2			2003	**45%**	4	2	832	92%	3%	5%
CANARY ROCKFISH	5	10	7.5	15			2000	13%	36	5	200	24%	19%	80%
Chilipepper Rockfish	5	10	7.5	15			2003	**47%**	7	3	2,000	96%	18%	0%
BOCACCIO	5	10	7.5	15			2003	79%	0	0	20	1%	1%	57%
Splitnose Rockfish	5	10	7.5	15			2002	**20%**	56	11	461	95%	12%	13%
Yellowtail Rockfish	5	10	7.5	15			2003	14%	100	14	3,146	83%	5%	15%
Shortspine Thornyhead - coastwide	3.1	6.2	4.7	9.3			1994	4%	2,934	111				
N. of 34°27'	4.8	9.6	7.2	14.4			1994	5%	2,223	111				
S. of 34°27'	4.7	9.4	7.1	14.1			2001	7%	122	9		73%		
Longspine Thornyhead - coastwide	2	4	3	6			1995	2%	5,327	109		99%		
N. of 34°27'	2	4	3	6			1994	5%	2,223	111				
S. of 34°27'	5	10	7.5	15			2001	7%	122	9		73%		
COWCOD	5	10	7.5	15			2002	**100%**	0	0	5	1%	0%	13%
DARKBLOTCHED	5	10	7.5	15			1996	**16%**	715	114		99%		
YELLOWEYE	5	10	7.5	15			2003	**36%**	1	0	22	12%	4%	53%
Black Rockfish - coastwide	5	10	7.5	15			1996	**53%**	17	9		2%		
Black Rockfish (WA)	5	10	7.5	15			2002	**100%**	0	0		0%		
Black Rockfish (OR-CA)	5	10	7.5	15			1996	**53%**	17	9		2%		
Minor Rockfish North	5	10	7.5	15			2002	9%	124	12	3,115	51%	5%	10%
Nearshore Species	5	10	7.5	15			1994	**98%**	1	1				
Shelf Species	4	8	6	12			2002	15%	44	6		79%		
Slope Species	5	10	7.5	15			1994	12%	1,001	119				
Minor Rockfish South	5	10	7.5	15			2002	24%	392	93	2,015	29%	19%	67%
Nearshore Species	5	10	7.5	15			1994	**98%**	1	1				
Shelf Species	5	10	7.5	15			2002	15%	44	6		79%		
Slope Species	5	10	7.5	15			1994	12%	1,001	119				
California scorpionfish	5	10	7.5	15			2002	**100%**	0	0		0%		
Cabezon (off CA only)	5	10	7.5	15			2001	**100%**	0	0				
Dover Sole	1.8	3.6	2.7	5.4			1997	2%	10,113	199	11,050	99%	92%	92%
English Sole	10	20	15	30			1995	14%	1,108	154		99%		
Petrale Sole (coastwide)	2.9	5.8	4.4	8.7			1994	6%	1,262	78				
Arrowtooth Flounder	5	10	7.5	15			2002	**25%**	2,075	528		100%		
Starry Flounder	5	10	7.5	15			2000	**66%**	25	17		58%		
Other Flatfish	10	20	15	30			2000	16%	1,522	249		93%		
Kelp Greenling							2003	**100%**	0	0		0%		
Spiny Dogfish							1996	34%	195	67		83%		
Other Fish	5	10	7.5	15			2003	10%	224	23	14,700	48%	2%	3%

Tracking and Monitoring (See NMFS Report)

For Tracking and Monitoring Estimates of Administrative Costs and Fee Structures, see the NMFS Report (Agenda Item D.7.d).

Mandatory Data Collection Requirement for IFQ Alternative (A-2.3.2)

This section covers data that would be collected under the mandatory data collection requirement within the context of the scope of economic data collection and monitoring of the effects of a trawl IFQ program. This section was developed by Dr. Todd Lee, Northwest Fisheries Science Center, Seattle, WA, should be considered draft, and comments are welcome.

Background and Justification

The goal of the Council's rationalization alternatives involves several economic components.

The goal of the program is to:
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.[5]

The Council has also enumerated several objectives and constraints for the program that involve economic components and monitoring of the program. These include (see Trawl Rationalization Alternatives, November 2007 Agenda Item D.7.b, Attachment 2 for a complete listing of the objectives and constraints):

Objectives

- Provide for a viable, profitable, and efficient groundfish fishery.
- Increase operational flexibility.
- Minimize adverse effects from an IFQ program on fishing communities and other fisheries to the extent practical.
- Promote measurable economic and employment benefits through the seafood catching, processing, distribution elements, and support sectors of the industry.
- Provide quality product for the consumer.
- Increase safety in the fishery

Constraints and Guiding Principles

- Minimizing negative impacts resulting from localized concentrations of fishing effort.
- Avoiding provisions where the primary intent is a change in marketing power balance between harvesting and processing sectors.
- Avoiding excessive quota concentration.
- Providing efficient and effective monitoring and enforcement.
- Designing a responsive review evaluation and modification mechanism.

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[5] Trawl Rationalization Alternatives (REV 07/11/07), p. 2.

- Taking 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.

The Magnuson-Stevens Fishery Conservation and Management Act (as amended through January 2007) also places importance on social and economic outcomes resulting with a rationalization programs. Sec. 303A.(c)(1)(C) states that any limited access privilege program (LAPP) to harvest fish submitted by a Council or approved by the Secretary under this section shall promote social and economic benefits.

The Act also contains a monitoring requirement to determine whether a LAPP is meeting its goals. Sec. 303A.(c)(1)(G) states that any LAPP shall:

> *include provisions for the regular monitoring and review by the Council and the Secretary of the operations of the program, including determining progress in meeting the goals of the program and this Act, and any necessary modification of the program to meet those goals, with a formal review 5 years after the implementation of the program and thereafter to coincide with scheduled Council review of the relevant fishery management plan (but no less frequent than once every 7 years).*

In order to meet the monitoring requirements for the economic goals, improved and expanded economic data would be needed for the trawl IFQ fishery. One of the current trawl rationalization alternatives provides for a mandatory economic data collection provision. The mandatory economic data provision will be contrasted with the status quo alternative of voluntary economic data collection in the draft EIS (see Table 4, footnote y, of the November 2007 PFMC Agenda Item D.7.b, Attachment 2 for the current mandatory data alternative). Regardless of whether the economic data collection is mandatory or voluntary, the types of data necessary to monitor the effects of the program are the same. However, the choice of mandatory or voluntary data collection will likely have a large effect on the Council's and the NMFS' ability to consistently and systematically collect the necessary data.

Despite the NWFSC's recent progress in voluntary economic data collection, economic analysis of the limited entry trawl fishery has historically been severely constrained by a lack of economic data. Incomplete cost-earnings data on vessels and processors has been a particular problem. While PacFIN provides data on most, but not all, earnings sources for limited entry trawlers, little data on the cost of operating harvesting vessels has been available. Data on the costs and earnings of processing plants has not been available to NMFS or Council economists. This lack of economic data has hampered attempts to measure economic performance, build regional economic input-output models, assess overcapacity, and build models which predict economic behavior.

The first attempt to collect economic data from limited entry trawl vessel owners occurred in 1999 and 2000. This mail survey utilized a lengthy questionnaire asking for considerable fishery specific information, but obtained a response rate well below 20%. Because of the low response rate and non-respondent bias, data collected through this survey was of limited value. A processor survey conducted at about the same time obtained an even lower response rate.

A second voluntary economic survey of limited entry vessel owners was conducted in 2005-2007. In order to obtain higher response rates, this second survey utilized a much shorter questionnaire and collected data through in-person interviews. This survey obtained a fairly high response rate of over 70%, but at the cost of considerably less data collection from each respondent due to the shorter questionnaire. While this second survey provides much data of value for assessing industry economic performance and regional economic impacts, our ability to evaluate the contribution of individual fisheries (such as groundfish) to vessel economic performance is limited by the reduced questionnaire length. Collecting data through in-person interviews helped to substantially increase the response rate, but at considerably increased survey cost.

The NWFSC is attempting to build a time series database of cost-earnings data for the federally managed groundfish and salmon fisheries. To this end, the NWFSC is currently developing open access groundfish and directed salmon surveys, and a processor survey. These surveys should be implemented by the end of this year, pending OMB approval. Mandatory economic data collection offers the advantages of reduced non-response bias, the ability to collect more detailed fishery specific data, and reduced survey fielding costs. These advantages would apply to data collection from both the harvesting sector and the processing sector.

Measuring Economic Effects

Monitoring the economic effects of a rationalization program would require a variety of economic data. In general, the data requirements depend on the types of effects that need to be monitored and the economic models used to estimate them. The primary effects of a rationalization program can be captured in two broad areas of economic analysis: 1) economic performance measures; and, 2) regional economic impact analysis.

Economic Performance Measures

A primary motivation for rationalization programs is to increase the economic performance of the fishing industry, and provide increased net economic benefits to the nation. Economic performance measures include:

- Costs, earnings, and profitability
- Economic efficiency
- Capacity measures
- Economic stability
- Net benefits to society
- Distribution of economic net benefits
- Product quality
- Functioning of the quota market
- Incentives to reduce bycatch
- Market power
- Spillover effects in other fisheries

Estimation of economic performance measures requires information on the costs and earnings of harvesters and processors. Some of the above performance measures are derived through a tabulation of the data, while others require more sophisticated models such as cost function estimation, capacity models, and economic behavioral models.

Regional Economic Impact Analysis

One common concern associated with rationalization programs is their potential effects on regional economies. Some of these effects may be positive (e.g., increased harvest of under utilized target species), or mixed (e.g., fleet consolidation or shifting of the geographic location of fishing effort). A rationalization program will likely affect different regional economies in different ways. Regional economic modeling involves quantifying these changes by tracking the expenditures of all businesses, households, and institutions within a given geographic region. The formal study of these economic relationships is done through input-output analysis, which analyzes the direct, indirect and induced effects, and the resulting economic multipliers associated with each business sector in the regional economy. An input-output model estimates:

- Economic contribution of the fishery to regional economies
- Distributional effects between fishing sectors
- Distributional effects across regional economies
- Utilization of fishery resources
- Community fishery dependence

Input-out models require data on the cost and earnings of harvesters and processors. They also require information about the location of the expenditures so they can be properly assigned to particular regional economies.

Data Requirements

Under either a voluntary or a mandatory data collection program, all members of the West Coast groundfish industry harvesting or processing fish under the rationalization program would be asked to supply economic data. This would include:

- Catcher vessels
- Shoreside Processors
- Motherships
- Catcher/Processors

The most appropriate scale for the data collection is at the vessel or plant level, with possibly additional information about ownership of multiple vessels or plants in order to account for fixed costs that are not allocated to individual operating units (vessels or plants). In order to isolate the effects of the rationalization program on the groundfish fishery, it is necessary to collect data, to the extent possible, at the fishery level of resolution. For example, catcher vessel expenses likely vary by target species and gear. To capture this difference, some data would need to be collected at the trip level. Other expenses, such as fixed costs (e.g., general and administrative), that are not affected by the number or type of trips taken, would need to be collected as an annual total. The fixed costs would then need to be allocated across the fisheries in which a harvester participated through a formula (e.g., proportional to the revenues from each fishery).

For catcher vessels, changes in fishery participation are an important potential outcome of a rationalization program. In order to model and predict changes in fishery participation, fishery economists need to understand the costs incurred while operating in both the groundfish and other fisheries. Trip costs for trawl caught groundfish could be included under the mandatory data collection provision. Data from other fisheries would be collected voluntarily as they are not covered under the current mandatory data provision.

For at-sea and shoreside processors, variable costs need to be reported for West Coast caught groundfish. This is necessary for the estimation of the effect of a rationalization program. Data from other fisheries would be collected voluntarily as they are not covered under the current mandatory data provision.

Below is a list of the data necessary to monitor the effects of a rationalization program. A separate list is presented for catcher vessels, shoreside processors, motherships, catcher/processors. These lists are preliminary and are intended to illustrate the type and level of data that would be required. Consultation with industry is needed to further develop and refine the lists.

Catcher Vessels
Trip level expenses and data include:

- Crew (including number)
- Captain
- Fuel
- Ice
- Provisions
- Bait (for non- trawl fisheries)
- Observer fees
- Taxes: landings and buyback
- Other trip based expenses
- Length of trip

Annual expenses include:

- Vessel and on-board equipment repairs, maintenance, improvements and purchases
- Gear
- Moorage
- Permit purchases and leases
- Interest
- Insurance
- Utilities
- Taxes: property, payroll, income
- General and administrative
- Other annual expenses

Annual revenues for West Coast fisheries are available through PacFIN. Other revenues are necessary to allocate annual expenses and they include:

- Alaska landings
- Other non-West Coast landings by species
- Other sources of revenue (such as scientific surveys or leasing)

Vessel characteristics include:

- Home port, horsepower, fuel capacity
- Speed when steaming full, steaming empty, and trawling
- Fuel consumption when steaming full, steaming empty, and trawling
- Crew compensation method (share system calculation details) when participating in the West Coast groundfish fishery
- Vessel ownership information

Shoreside Processor plants
Annual expenses include:

- West Coast trawl caught groundfish
- Non-fish ingredients: West Coast groundfish trawl
- Processing line labor: West Coast groundfish trawl
- Packing materials, freight and storage: West Coast groundfish trawl
- Observer fees (if applicable): West Coast groundfish trawl
- Processing cost for all other fisheries
- Non-processing line labor
- Processing equipment repairs, maintenance, improvements and purchases
- Other plant related equipment repairs, maintenance, improvements and purchases
- Interest
- Insurance
- Utilities
- Taxes
- General and administrative
- Other annual expenses

Annual revenues include:

- Total revenue by species and product category for West Coast trawl groundfish
- Total revenue from other fish inputs (to allocate expenses)
- Other sources of revenue associated with the plant (to allocate expenses)

Plant characteristics include:

- Plant ID number
- Average number of processing and plant positions
- Plant ownership information

Mothership Vessels
Annual expenses include

- Crew and labor (including number): West Coast groundfish trawl
- West coast trawl caught groundfish
- Fuel: West Coast groundfish trawl
- Provisions: West Coast groundfish trawl
- Non-fish ingredients: West Coast groundfish trawl
- Packing materials, freight and storage: West Coast groundfish trawl
- Observer fees (if applicable): West Coast groundfish trawl
- Vessel and on-board equipment repairs, maintenance, improvements and purchases
- Processing equipment repair, maintenance, improvements and purchases
- Moorage
- Permits purchase and lease
- Interest
- Insurance
- Utilities
- Taxes
- General and administrative
- Other annual expenses

Annual revenue includes:

- Total revenue by species and product category for West Coast trawl groundfish
- Total revenue from other fish inputs (to allocate expenses)
- Other sources of revenue associated with the vessel (to allocate expenses)

Vessel characteristics include:

- Home port, horsepower, fuel capacity
- Fuel consumption when steaming full and steaming empty
- Crew compensation method (share system calculation details) when participating in the West Coast groundfish fishery
- Vessel ownership information

Catcher/Processor Vessels
Annual expenses include:

- Crew and labor (including number): West Coast groundfish trawl
- Fuel: West Coast groundfish trawl
- Provisions: West Coast groundfish trawl
- Non-fish ingredients: West Coast groundfish trawl
- Packing materials, freight and storage: West Coast groundfish trawl
- Observer fees: West Coast groundfish trawl
- Vessel and on-board equipment repairs, maintenance, improvements and purchases

- Processing equipment repair, maintenance, improvements and purchases
- Gear
- Permit purchases and leases
- Moorage
- Interest
- Insurance
- Utilities
- Insurance
- Taxes
- General and administrative
- Other annual expenses

Revenue revenues include:

- Total revenue by species and product category for West Coast trawl groundfish
- Total revenue from other fish inputs (to allocate expenses)
- Other sources of revenue associated with the vessel (to allocate expenses)

Vessel characteristics include:

- Home port, horsepower, fuel capacity
- Speed when steaming full, steaming empty, and trawling
- Fuel consumption when steaming full, steaming empty, and trawling
- Crew compensation method (share system calculation details) when participating in the West Coast groundfish fishery
- Vessel ownership information

Quota Ownership, leasing and prices

The mandatory data collection alternative provides for the collection of transaction value information in a centralized registry of ownership and leases. This information would be necessary to analyze the functioning of the quota market to determine its ability to allocate quota in an efficient manner, or whether particular constraints are adversely affecting quota allocation. This information would also enhance the ability of economists to estimate the distributional consequences of the rationalization program.

Other Sectors of the Fishing Industry (Spillover Effects)

Currently, the only provision to collect economic data from fisheries not directly covered by a rationalization program is through a voluntary survey. The extent to which any spillover effects from the rationalization program into non-rationalized fisheries can be captured would depend on the willingness of industry to cooperate with a voluntary data collection effort.

Time Period of Data Collection

In order to monitor and determine the effects of a rationalization program, it would be necessary to collect a consistent, annual time-series of data through the life of the program. Since many factors affect the fishery each year (regulatory, management, environmental, and economic), a consistent, annual time series is necessary to disentangles these effects, and isolate the effects attributed to the rationalization program. The data collection should begin before the rationalization program is implemented so that a baseline dataset is available.

Data Collection Mechanisms

A variety of mechanisms could be used to collect the data. Since the type of data collected may vary by the frequency of the reporting period, several different mechanisms, tailored to the particular data being collected, may provide the most flexibility. A great deal of coordination with industry would be necessary to determine the most practical and least burdensome methods. Some options are: annual surveys (mail or wed-based), and logbooks.

Additional Resources

Mandatory data collection (and expanded voluntary data collection) would require addition resources at the NWFSC and the NWR to implement, monitor and evaluate the program. The program should be designed to collect the necessary data, but do so at a low cost, both for industry, the Council and the NMFS. Estimates of the additional costs and funding sources would need to be identified.

Data Confidentiality

The mandatory economic data provisions would require the development of statutory and regulatory language to ensure the confidentiality of the data. Any voluntary data collection program should ensure data confidentiality as well.

Allocation of Halibut IBQ Using A Target Species as a Proxy and Applying Bycatch Rates (A-4)

Introduction

The catch of Pacific halibut may be regulated by way of Individual Bycatch Quota in the trawl fishery after a rationalization program goes into place. Allocating Pacific halibut to individual trawl permits may prove to be difficult because there are no permit-specific records available with which to make an allocation based on catch history (outside the whiting fishery). This is because regulations prohibit the retention of Pacific halibut with gears other than hook and line gear. An initial allocation can be made to permits if it is done based on a bycatch rate to target species that have been landed and by the area that was fished. This paper describes a method for allocating Pacific halibut based on a proxy, or a bycatch rate.

General Description

Pacific halibut are encountered incidentally in trawl fisheries. Pacific halibut are a prohibited species, meaning their retention is not allowed in fisheries using trawl gear so there are no permit-specific records of Pacific halibut catch. The incidental catch of Pacific halibut is documented through the West Coast Groundfish Observer Program which samples the non-whiting trawl fishery. This information is used to estimate the total catch of Pacific halibut in the non-whiting trawl fishery based on an encounter rate to a target species. The approach described here proposes a method that is similar to the approach used for estimating total trawl mortality, but includes additional stratifications based on INPFC area and whether a vessel was fishing seaward or shoreward of the trawl Rockfish Conservation Area. These additional stratifications are proposed to take into account the known spatial abundance and encounter rates of Pacific halibut that exist as well as the spatial fishing patterns exhibited by fishermen. In addition, this method relies on an equal distribution of buyback catch history to insure that each permit receives some amount of Pacific halibut IBQ[6].

Data Used in Application

Several sources of information exist for deriving permit-specific catch histories of Pacific halibut. These sources of information include logbook data, West Coast Groundfish Observer Program data, and fish ticket data. These sources of information can be used similarly to the approach described for allocating overfished species based on a bycatch rate, however the approach described here has a couple of differences. The first difference is that the approach for allocating Pacific halibut uses two species that have been shown to have positive correlations with Pacific halibut – arrowtooth flounder and Dover sole – while the method for allocating overfished species uses all target species.

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[6] The Council may not choose an equal distribution of buyback history which would make the aspect of the proposal that relies on that equal distribution null and void. In such a case, one could propose that permits operating in the north still receive a minimum share of Pacific halibut quota regardless of their historic landings of target species. However, minimum amounts of Pacific halibut quota are not likely to be as necessary as a minimum amount of overfished species because Pacific halibut are not expected to be as constraining to fishing activities as overfished species. In other words, making an initial distribution of Pacific halibut quota to permits and relying on the market to redistribute that quota in an acceptable fashion may be completely reasonable.

The second difference is that this approach uses an area stratification that is based on landings of target species that have occurred north of 40 degrees 10 minutes N lat, and stratifies that area into two sub areas. One sub area is a combination of the Eureka and Columbia INPFC areas, and the other area is the Vancouver INPFC area. These areas were chosen because available observer information shows a clear difference in encounters of Pacific halibut off northern Washington compared to areas to the south, and this INPFC area-based stratification can be readily accommodated with logbook data.

Limited entry trawl logbook data is used in the same fashion as the approach taken for allocating overfished species, albeit the number of target species is fewer because arrowtooth and Dover sole show positive correlations with Pacific halibut. Depth-based landings are used to distribute the fish ticket landings of individual permits between shoreward and seaward of the trawl Rockfish Conservation Area. In addition to using logbooks to determine depth of catch, logbook data is also used to determine latitudinal area of catch.

Table 18 Hypothetical Vessel Average Depth-Based Catch Proportion of Target Species that were caught by a Vessel Fishing in the Vancouver Area (2003-2006)

Area	TARGET SPECIES	Average Seaward Catch Percentage	Average Shoreward Catch Percentage
Vancouver INPFC Area	ARROWTOOTH FLOUNDER	48%	52%
	DOVER SOLE	11%	89%

In order to insure that each permit gets some Pacific halibut IBQ, this proposal relies on an equal distribution of buyback history. That equal distribution will insure that each permit receives some amount of arrowtooth and Dover sole, and therefore, some amount of Pacific halibut. This is intended because it is believed that some encounters of Pacific halibut will occur even for permits that do not target Dover sole and arrowtooth flounder. It is important to note however, that the Council may not wish to adopt an equal allocation of buyback history, and in this instance there would be cases where vessels will receive very minimal amounts of Pacific halibut if they have not landed much arrowtooth flounder and Dover sole in the past. If the intention is to insure that permits fishing in the northern areas have a minimal amount of Pacific halibut IBQ, then a minimum IBQ quota share could be established, and permits would receive amounts greater than that threshold depending on their catch history of Dover sole and arrowtooth flounder. In any event, Pacific halibut are not expected to constrain harvest activities to the same degree as overfished species, so relying on the market to apportion Pacific halibut quota in an effective manner after initial distribution may be completely reasonable.

Model Development and Application

The model for this approach uses fish ticket data during the qualifying period. Dover sole and arrowtooth flounder from these fish ticket records are split into shoreward and seaward amounts based on permit-specific catch depth from logbook data from 2003 – 2006 as shown in the above table, and by the Vancouver INPFC area and the combined Columbia and Eureka INPFC area based on logbook data. Where fish ticket records exist for a particular species, but logbook records do not, the fleet average depth or area distribution for harvests of that species is used. This information is matched against West Coast Groundfish Observer Program data that is stratified shoreward and seaward of the RCA for the years 2003 – 2006 and also stratified between the Vancouver and combined Columbia/Eureka INPFC areas. Quota shares for Dover sole and arrowtooth are then calculated for each permit and applied to the trawl allowable catch during the implementation year of IQs to estimate the implementation year quota pounds. These implementation year quota pounds are stratified by shoreward and seaward amounts and INPFC area based on catch history. Each of these quota pound estimates are matched up to a corresponding depth and area Pacific halibut bycatch rate and the result is summed. The result is a poundage estimate for Pacific halibut for each permit. That estimate is then divided by the fleet total to estimate each permit's quota share of Pacific halibut.

The following tables illustrate how the quota shares of arrowtooth and Dover sole are separated into shoreward, seaward, and latitudinal amounts. The table below uses the above table showing depth-based catch from logbooks. The first column of the table shows the species and the second column of the table shows the quota share that permit would receive of arrowtooth and Dover sole. The third, fourth, and fifth columns then show the source area and depth of catch. In this case the particular permit only has catch history from the Vancouver area. This hypothetical permit would receive 1% of the arrowtooth flounder share, of which 0.476% of it was caught seaward of the trawl RCA in the Vancouver area.

Table 19 Hypothetical Development of Area-Specific Seaward and Shoreward Quota Shares of Target Species

Permit XXLE Catch History				
Target Species	Quota Shares to Permit X	Area	Seaward Share	Shoreward Share
ARROWTOOTH FLOUNDER	1.00%	Vancouver	0.476%	0.524%
		Columbia/Eureka	0.0%	0.0%
DOVER SOLE	3.00%	Vancouver	0.317%	2.683%
		Columbia/Eureka	0.0%	0.0%

The next table uses the information from the previous to estimate the quota pounds a permit would get during the implementation period. This calculation uses the shoreward and seaward delineation of target species shares to estimate a shoreward and seaward quota poundage amount during the implementation year.

Table 20 Hypothetical Development of Shoreward and Seaward Implementation Year Quota Pounds

Target Species	Area	Seaward Share	Shoreward Share	Implementation Year Trawl Allocation (mt)	Seaward Pounds	Shoreward Pounds
ARROWTOOTH FLOUNDER	Vancouver	0.476%	0.524%	5,000	52,464	57,767
	Columbia/ Eureka	0%	0%			
DOVER SOLE	Vancouver	0.317%	2.683%	16,000	111,744	946,474
	Columbia/ Eureka	0%	0%			

The next table then proceeds to match the shoreward and seaward quota pounds with the corresponding bycatch rates of Pacific halibut. That amount is then summed and divided by the fleet total to derive each permits' quota shares of Pacific halibut, shown in the last column.

Table 21 Derivation of Pacific Halibut Quota Shares

Target Species	Area	Sea-ward lbs	Shore-ward lbs	Sea-ward Bycth Rate	Shore-ward Bycth Rate	Sea-ward Pacific Halibut LBS	Shore-ward Pacific Halibut LBS	Permit P. halibut Total	Fleet P. halibut Total	P. Halibut Share
ARROWTTH FLOUNDER	Vncvr	52,464	57,766	0.001	0.04	52	2,311			
	Colum/ Eureka	0	0	.00005	0	0	0			
DOVER SOLE	Vncvr	111,744	946,473	0.001	0.04	112	37,859			
	Colum/ Eureka	0	0	.00005	0	0	0			
								40,334	1,800,000	2.2%

<u>Bycatch Species Management in the Whiting Fishery (A-5 and B)</u>

Creation of a trawl rationalization program would likely include an allocation of incidental catch species to the whiting fishery, separate from the remainder of the non-whiting fishery (an exception would occur if the shoreside whiting and nonwhiting fisheries are managed as a single sector under the IFQ alternative). This separate whiting sector allocation of bycatch species is a change from status quo and would require the identification of a management approach to ensure that the intent of the allocations are met and Optimum Yields (OY) are not exceeded.

In the following, it is proposed that some species be identified for direct management through sector caps, co-op allocations, IFQs or other management tools, and that for other species, those for which whiting sector harvest is at *de minimis*[7] levels, an indirect approach be used. For those *de minimis* species, the Council would estimate an expected impact and deduct that impact from the OY prior to allocation among the sectors taking the species at more significant levels.

Strawman Proposal for Management of Bycatch Species:

> Direct control: Caps, IFQ, or other limits on the whiting fishery, individual whiting sectors, co-ops or vessels will be established only for those bycatch species that are
>
> (1) overfished and caught in the whiting fishery, or
> (2) taken in significant quantities in the whiting fishery.
>
> If a species that is not currently overfished becomes overfished, at that time all necessary allocations within the whiting sectors in aggregate will be established based on the distribution of individual whiting sector-allocations, *OR* QS, *OR* co-op-history (depending on the management regime). Under the current FMP, formal allocations among sectors are suspended when a stock becomes overfished.
>
> Indirect control. To account for *de minimis* harvest of all other species that are taken as bycatch in the whiting fishery, as appropriate, deductions will be made from the OY prior to determining the amount of the OY available for distribution among those sectors which take the species in more significant quantities.

This method for indirect control of *de minimis* species is similar to methods used under status quo management. For example, prior to allocating the whiting OY among the various directed sectors, a deduction is made for the amount of whiting expected to be taken as bycatch in non-whiting fisheries. These amounts are monitored and there are opportunities for adjustments to be made in subsequent management cycles if it is found that the amount of anticipated bycatch has been underestimated. Inseason monitoring of

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[7] *De minimis*: so small or minimal in difference that it does not matter; lacking significance or importance (<u>Webster's New Millennium Dictionary of English</u>, 2007; and <u>Merriam-Webster's Dictionary of Law</u>, 1996).

harvest relative to these set asides and management to create bycatch avoidance incentives is not warranted because the species is not overfished, the biological consequences of an overage would be small (likely un-measurable) and the monitoring and management costs would be relatively high.

The species most likely to be candidates for direct control at the time of implementation are:

Pacific Ocean Perch
Widow Rockfish
Canary Rockfish
Yellowtail Rockfish
Darkblotched Rockfish

Based on historic data, species that might be candidates for direct management initially or in the future, if they become overfished or other conservation concerns arise, include but are not necessarily limited to

Sablefish
Spiny Dogfish

There are a few species groups taken in the whiting fishery, members of which could potentially be subject to direct control, if they are split out from the group.

Minor Shelf Rockfish North
Minor Slope Rockfish North

<u>Trading IFQ With Limited Entry Fixed Gear Vessels</u>

Proposal for Consideration (Presented to the TIQC by Bob Alverson, Fishing Vessel Owners' Association)

Proposal: To allow any limited entry permit owner to harvest trawl individual quota pounds. Limited entry permit owners would be required to use the gear endorsed on their respective permits and to adhere to all current regulations in place for the type of gear used, as well as to any regulations enacted as part of the trawl IFQ program pertaining to the tracking and monitoring of catch and quotas (including observer coverage requirements and catch retention).

Rationale: The current suite of trawl rationalization alternatives would require that an individual own a trawl permit in order to harvest trawl individual quota pounds. Gear switching would be allowed whereby a trawl permit owner could use any directed legal commercial groundfish gear to harvest all or a portion of his quota pounds. However, non-trawl limited entry permit holders would need to purchase or lease both quota pounds <u>and</u> *a trawl permit* to participate in gear switching, even if they planned to fish the quota pounds with the gear endorsed by their license. This requirement is an extra cost for non-trawl limited entry permit holders that might reduce the level of gear switching.

The trawl permit requirement was proposed to control costs (e.g. cost of tracking quota pounds) by limiting the number of potential vessels in the fishery. By broadening the requirement to include holders of any limited entry groundfish permit, this proposal would be able to remove the barrier to gear switching caused by the trawl permit requirement with only a relatively modest increase in the number of potential vessels fishing for trawl quota pounds. Quota pounds could be readily tracked using the individual's limited entry permit. In addition, the number of non-trawl vessels attempting to obtain and fish for trawl quota pounds would likely be small because of the high costs associated with the additional tracking and monitoring requirements that would be part of the IFQ program (e.g., observer coverage).

Potential Issues to be Addressed:

- As the bycatch associated with the different gear types varies, a fixed gear harvester may need to acquire quota pounds for a different suite of species than a trawler (e.g., yelloweye rockfish), which may not be readily available.
- Although the universe of limited entry permits would be known, the larger number of vessels potentially involved and the different compliance issues associated with the additional gear types might create extra logistical burdens for enforcement, total catch accounting, and any at sea observer program set up as part of a TIQ program.
- There would have to be a declaration procedure or some other way for NMFS and the Council to determine when a vessel was fishing trawl quota pounds versus its fixed gear trip limits.

Bycatch Management in the Mothership and Shoreside Sector Co-op Programs (B-1 and B-2)

The current options for bycatch management specify that bycatch will be managed under a cap for all whiting sectors together or separate caps for each sector. There are no provisions for assigning bycatch caps to co-ops. If there is a sector bycatch allocation and there is more than one co-op in a sector, this could generate a race for fish among the co-ops. Alternatively, co-ops might work together by developing an inter-co-op agreement. An inter-co-op agreement would be needed if catch allocation is to be transferred from one co-op to another without involvement from NMFS. The mothership and shoreside co-op alternatives specify that catch allocation is to be transferable from one co-op to another, but currently the alternatives do not contain provisions for inter-co-op agreements.

DATA APPENDIX 1: IFQ RECENT PARTICIPATION AND CO-OP ENDORSEMENT/PERMIT QUALIFYING REQUIREMENTS

Tables in this appendix are to assist the Council in a preliminary evaluation of the effects of alternative recent participation and endorsement qualifying requirements.

Shoreside Whiting Processor IFQ Recent Participation and Co-op Permit Qualification

The following tables provide a summary of information about shoreside companies that received trawl-caught whiting from vessels that targeted whiting on fishing trips. Companies are shown at the highest level of known ownership, and includes fish businesses, buyers, and dealers under the control of a company. The receiver information is based on landings recorded by each state's identifier (PROCID in the PacFin database).

Table 1-1 provides a graphic illustration of the companies receiving directed whiting. There are a total of 26 companies that have received whiting during the period 1994 through 2006. Each row provides the receiver history for a company, and the grey shading within a year indicates that the company was "active" (received whiting) in that year. The row of numbers beneath the graphic presents a count of the number of active companies in each year.

The second half of Table 1-1 provides details on the quantities (in metric tons (MT)) and raw product costs for each year, including averages and the smallest quantity (and cost) received by a buyer in the year. Raw product costs are in nominal form; they have not been adjusted for inflation.

Table 1-2 presents the information for the 26 receivers of whiting in groupings that reflect the variety of time periods of interest to the GAC and TIQC. Grey shading indicates that the company was active during the time period.

The series of tables within Table 1-3 provide information about the number of companies that were active during different time periods, and the share or percentage of the historic period of 1994 to 2004 associated with those companies. In left side tables, the count of companies are shown that were active for a specific number of years within a time series. For example, within the column headed 1998-2003, the first row indicates that nine companies (of 26) had no participation within the selected time range. The column further indicates that eight had one year of participation, one company had three years, and so on. Each column sums to 26 in order to account for all receivers of whiting.

The right side tables are companions to the left side, and present the percentage of the historic period (1994 to 2004) associated with receipts by companies. To continue the example, 5.2 percent of 1994 to 2004 history is attributable to companies with no participation in the 1998 to 2003 time range. At the other extreme, 83.8 percent is attributable to the five companies with six or more years of participation.

Seven additional companion sets are included in Table 1-3. These are structured in the same fashion as described above, but reflect different threshold minimum levels of receipt. For example, the second table shows activity where at least 1 MT was received in a year. Within the range 1998-2003, eleven companies are shown with no participation. Comparing to the nine in the preceding table, this indicates that two additional companies did not meet the threshold of receiving 1 MT in any year.

Thresholds are presented for 1 MT, 100 MT, 200 MT, 300 MT, 500 MT, 1000 MT, and 5,000 MT in the remaining tables.

Table 1-4 provides information about a subset of the companies that received whiting from directed whiting trips: those that are still "active" in the fishery. The term "active" is applied to a company if it received at least one delivery in the period of January 1, 2004, and December 31,

2006. The total number that is currently active includes five that were also receiving whiting in 1994, up to the maximum of 11 companies that received whiting in 2006. Within the time ranges, a total of 13, or half of all 26 identified companies, were active in 2004 to 2006.

The count of companies by number of years of activity is presented in Table 1-5. The structure of the tables is similar to Table 1-3 described above, except that there is no row for “0 years of participation.” Thus, the table column sums to the number of companies that actually participated (within specified thresholds) in the time range.

Table 1-6 presents information on the participation of all companies within time ranges, organized by the volume of fish received. For example, within the period 1998-2003, nine companies had no receipts, while seven had receipts between 0 and 100 MT. The remaining companies are distributed elsewhere within the column.

Table 1-7 provides a comparison showing the intersection of companies participating in different time periods. Finally, Table 1-8 shows the first and last years of participation for companies that received whiting from vessels in the directed fishery. The table indicates that nine companies started participation in 1994, and that five of those nine also had whiting receipts in 2006 (i.e., remain in the fishery).

Shoreside Nonwhiting Processor Recent Participation Analysis

The following tables provide a summary of information about shoreside companies that received trawl-caught groundfish (whiting and nonwhiting) from vessels that targeted nonwhiting on fishing trips. The tables do not include receipts of whiting from the directed whiting fishery, presented above in Tables 1-1 through 1-7.

The first page of Table 1-9 provides a graphic illustration of the companies receiving groundfish from nonwhiting directed trips. There are a total of 208 companies that have received groundfish from the nonwhiting fleet during the period 1994 through 2006. Each row provides the receiver history for a company, and the grey shading within a year indicates that the company was “active” (received whiting) in that year. The row of numbers beneath the graphic presents a count of the number of active companies in each year.

The second page of Table 1-9 provides details on the quantities (in metric tons (MT)) and raw product costs for each year, including averages and the smallest quantity (and cost) received by a buyer in the year. Raw product costs are in nominal form; they have not been adjusted for inflation.

Table 1-10 presents the information for the 208 receivers of nonwhiting in groupings that reflect the variety of time periods of interest to the GAC and TIQC. Grey shading indicates that the company was active during the time period. (The data are presented in two columns in the interest of space. The “Total Number Active in the Period” accounts for both columns of data.)

The series of tables within Table 1-11 provide information about the number of companies that were active during different time periods, and the share or percentage of the historic period of 1994 to 2004 associated with those companies. The structural form of the tables is identical to that presented above in Table 1-3 for whiting. In left side tables, the count of companies are shown that were active for a specific number of years within a time series. For example, within the column headed 1998-2003, the first row indicates that 84 companies (of 208) had no participation within the selected time range. The column further indicates that 41 had one year of participation, 31 had two years, and so on. Each column sums to 208 in order to account for all receivers of groundfish from the nonwhiting fleet.

The right side tables are companions to the left side, and present the percentage of the historic period (1994 to 2004) associated with receipts by companies. To continue the example, 3.5 percent of 1994 to 2004 history is attributable to companies with no participation in the 1998 to 2003 time range. At the other extreme, 76.3 percent is attributable to the 21 companies with six or more years of participation.

Seven additional companion sets are included in Table 1-11. These are structured in the same fashion as described above, but reflect different threshold minimum levels of receipt. For example, the second table shows activity where at least 1 MT was received in a year. Within the range 1998-2003, eleven companies are shown with no participation. Comparing to the nine in the preceding table, this indicates that two additional companies did not meet the threshold of receiving 1 MT in any year.

Thresholds are presented for 1 MT, 100 MT, 200 MT, 300 MT, 500 MT, 1000 MT, and 5,000 MT in the remaining tables.

Table 1-12 provides information about the subset of the companies that that are still "active" in the fishery. The term "active" is applied to a company if it received at least one delivery in the period of January 1, 2004, and December 31, 2006. The total number that is currently active includes 24 that were also receiving groundfish in 1994, up to the maximum of 44 companies that received whiting in 2004. Within the time ranges, a total of 63, or about 30 percent of the 208 identified companies, were active in 2004 to 2006.

The count of companies by number of years of activity is presented in Table 1-13. The structure of the tables is similar to Table 1-11 described above, except that there is no row for "0 years of participation." Thus, the table column sums to the number of companies that actually participated (within specified thresholds) in the time range.

Table 1-14 presents information on the participation of all companies within time ranges, organized by the volume of fish received. For example, within the period 1998-2003, 84 companies had no receipts, while 80 had receipts between 0 and 100 MT. The remaining companies (of 208 in total) are distributed elsewhere within the column.

Table 1-15 provides a comparison showing the intersection of companies participating in different time periods. Finally, Table 1-16 shows the first and last years of participation for companies that received whiting from vessels in the directed fishery. The table indicates that 80 companies started participation in 1994, and that 19 of those 80 also had whiting receipts in 2006 (i.e., remain in the fishery).

Table 1-17 shows by state the number of whiting buying companies with activity sometime during 1994-2006. Table 1-18 shows those companies currently active (received some landings from 2004 through 2006) by whether or not they have any participation (top half) or 1 mt of participation in one or two ore more years for 1998 through 2003. These thresholds reflect proposed recent participation requirements for whiting processors. Table 1-19 provides information for similar thresholds for a greater variety of number of active years. And Table 1-20 shows some of this information broken out by state.

Table 1-21 shows by state the number of nonwhiting buying companies with activity sometime during 1994-2006. Table 1-22 shows those companies currently active (received some landings from 2004 through 2006) by whether or not they have any participation (top) 1 mt in a year (middle) or 6 mt in a year for 1998 through 2003. These thresholds reflect proposed recent participation requirements for whiting processors. Table 1-23 provides information for similar thresholds for a greater variety of number of active years. And Table 1-24 shows some of this information broken out by state.

Geographic and species breakouts are provided for companies with 1994-2003 history that would not meet three levels of 1998 through 2003 recent participation screens (one delivery, 1 mt in one year, 6 mt in three years) (Tables 1-25, 1-26 and 1-27). At the bottom of these tables, the totals for buyers not meeting the recent participation requirements are expressed as a percent of the total for the sector.

There are a total of 62 shoreside nonwhiting companies that received less than 1 mt of groundfish during the entire qualifying period (1994-2003). The total value landed by these 62 companies (31% of the buyers) is less than $35,000 (less than 1% of 1% of the total for the sector (on a metric ton basis their landings counted for less than one half of a percent of 1% of the total for the sector).

Mothership Company IFQ Recent Participation

Under the IFQ program, it is the company associated with the mothership processor that will receive a permit. Therefore, Tables 1-29 through 1- evaluate activity of the company rather than the vessel. Table 1-29 provides a schematic illustrating the years in which various mothership companies participated in the fishery.

Table 1-30 shows for each potential recent participation period the number of years a company had some activity in the mothership whiting fishery. This information can be used to provide an initial sense of the effect of a proposed requirement. For example, looking at the 1997-2004 column one can quickly see that no companies would be affected by any requirement for up to 4 years of participation and that a threshold amount of landings for the period would have to be at least 58,600 mt before it would screen out any additional participants.

Table 1-31 shows for a variety of time periods (columns) and thresholds (label at the top of each set of rows, eg. “>100 mt”) the number of companies that met that threshold for a certain number of years. To the right is a display of the total 1994-2003 history of for the corresponding number of vessels displayed to the left. From Table 1-31 one can determine the number of vessels and amount of catch history eliminated from the fishery if a recent participation threshold were set at a particular level.

Table 1-32 allows one to evaluate the initial effect of criteria based on a total amount of metric tons landed over the entire period, as compared to the individual years presentation in Table 1-31.

Mothership Vessel Co-op Permit Qualification

Tables 1-33 through 1-36 are similar to Tables 1-29 through 1-32, except they display activity for the individual vessels that will be qualifying for permits rather than for the mothership company.

Tables 1-37 and 1-38 provide information similar to that in Tables 1-29 and 1-30, except it is for the subset of vessels with some participation in 2004 through 2006.

Catcher Processor
Shoreside Whiting Catcher Vessel
Mothership Whiting Sector Catcher Vessel
IFQ Recent Participation and Whiting Endorsement Qualification

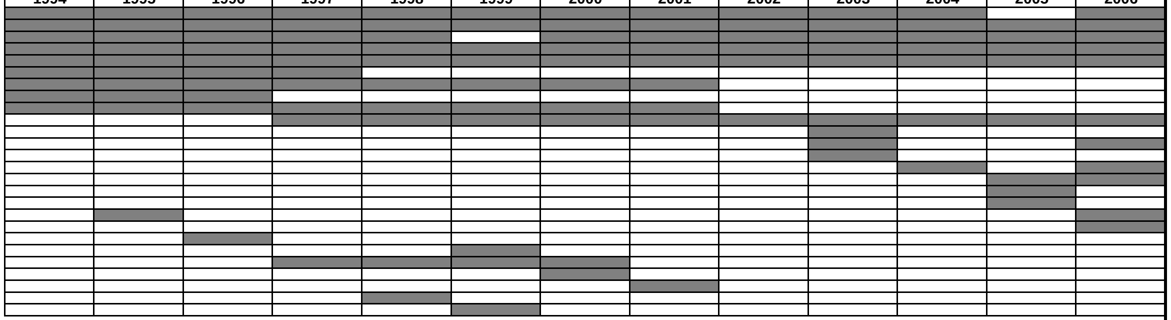
Tables similar to those previously described are provided for these other sectors with data pertaining to meeting the IFQ recent participation or whiting endorsement qualifying criteria.

Table-1-1. Round Weight Summed by Company for Receipts from Whiting Fleet (30SW), Whiting Catch Only

Grey shading indicates the company was active in that year (i.e., RWT>0).

Each row represents participation history for a single company. Number of separate companies: **26**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Number Active in the Year (count of above):	**9**	**10**	**10**	**10**	**10**	**10**	**10**	**9**	**6**	**9**	**7**	**8**	**11**

	Year												
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Minimum Annual MT Received by a Buyer (for year)	113.5	94.9	163.7	213.5	91.2	2.9	<1.0	<1.0	19.5	5.0	6.6	40.1	2.5
Average Annual MT Received by Buyers (for year)	8,167.8	7,489.1	8,501.6	8,728.7	8,770.8	8,339.2	8,580.7	8,154.0	7,583.9	5,686.9	13,268.5	12,194.7	8,842.4

	Year												
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Minimum Annual Raw Product Costs (year)	$12,506	$12,550	$21,321	$23,535	$10,142	<$1,000	<$1,000	<$1,000	$2,153	<$1,000	$1,013	$4,423	<$1,000
Average Annual Raw Product Costs (year)	$543,409	$780,942	$509,089	$813,766	$474,935	$683,096	$796,332	$637,606	$755,395	$565,226	$1,074,714	$1,418,771	$1,247,164

Table 1-2. Round Weight Summed by Business ID for Whiting Fleet (30SW), Whiting Catch Only - Specific Time Ranges

Grey shading indicates the permit was active in that year (i.e., RWT>0). Each row represents participation history for one company.

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Total Number Active in the Period (count of above):	**14**	**17**	**13**	**19**	**17**	**18**	**16**	**13**

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual MT Received by a Buyer (for period)	91.2	<1.0	2.5	<1.0	<1.0	<1.0	<1.0	2.5
Average Annual MT Received by Buyers (for period)	8,334.9	8,473.6	10,253.9	8,551.4	7,907.0	8,522.3	7,710.7	11,065.5

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual Raw Product Costs (period)	$10,142	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (period)	$626,082	$738,728	$1,319,420	$712,143	$646,324	$695,483	$685,276	$1,253,537

Table 1-3. Counts of companies by number of years of activity above a specified threshold for the indicated period (left side) and those companies' corresponding percent of total 1994-2003 history over that period (right side).

Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	9	13	7	9	8	10	13
1	3	8	7	10	8	9	7	5
2	2	1	6	0	0	0	1	3
3	1	2		0	1	1	2	5
4	1	0		1	2	2	1	
5	7	1		2	1	0	5	
6 or more		5		6	5	6		

Percentage of 1994-2003 History (MT) by Companies Active for Number of Years in Period (>0 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.2%	5.1%	11.5%	4.0%	5.2%	5.0%	5.3%	11.5%
1	0.8%	0.2%	11.6%	1.2%	0.0%	0.2%	0.0%	0.0%
2	14.0%	3.1%	76.9%	0.0%	0.0%	0.0%	3.1%	11.6%
3	3.2%	3.3%		0.0%	3.1%	3.1%	3.3%	76.9%
4	1.0%	0.0%		3.1%	3.3%	3.3%	4.5%	
5	80.8%	4.5%		3.3%	4.5%	0.0%	83.8%	
6 or more		83.8%		88.3%	83.8%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	11	13	9	11	10	12	13
1	3	6	7	8	6	7	5	5
2	2	1	6	0	0	0	1	3
3	1	2		0	1	1	2	5
4	1	0		1	2	2	1	
5	7	1		2	1	0	5	
6 or more		5		6	5	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.2%	5.1%	11.5%	4.0%	5.2%	5.0%	5.3%	11.5%
1	0.8%	0.2%	11.6%	1.2%	0.0%	0.2%	0.0%	0.0%
2	14.0%	3.1%	76.9%	0.0%	0.0%	0.0%	3.1%	11.6%
3	3.2%	3.3%		0.0%	3.1%	3.1%	3.3%	76.9%
4	1.0%	0.0%		3.1%	3.3%	3.3%	4.5%	
5	80.8%	4.5%		3.3%	4.5%	0.0%	83.8%	
6 or more		83.8%		88.3%	83.8%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 100 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	16	15	14	16	15	17	15
1	3	1	6	3	1	2	0	5
2	2	2	5	0	1	1	2	1
3	2	1		1	1	1	1	5
4	1	0		1	1	1	2	
5	6	3		1	2	0	4	
6 or more		3		6	4	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 100 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.2%	5.1%	22.9%	4.0%	5.2%	5.1%	5.3%	22.9%
1	0.8%	0.2%	0.2%	1.2%	0.0%	0.2%	0.0%	0.0%
2	14.0%	3.3%	76.9%	0.0%	0.2%	0.2%	3.3%	0.2%
3	3.4%	3.2%		0.2%	3.1%	3.1%	3.2%	76.9%
4	1.0%	0.0%		3.1%	3.2%	3.2%	8.3%	
5	80.6%	19.7%		3.2%	8.3%	0.0%	80.0%	
6 or more		68.6%		88.3%	80.0%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 200 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	14	16	15	15	17	16	17	15
1	2	2	6	2	1	2	1	5
2	2	1	5	1	0	0	1	1
3	1	1		0	1	1	1	5
4	1	0		1	1	1	2	
5	6	3		1	2	0	4	
6 or more		3		6	4	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 200 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.2%	5.1%	22.9%	4.1%	5.3%	5.1%	5.3%	22.9%
1	1.0%	0.4%	0.2%	1.2%	0.2%	0.4%	0.2%	0.0%
2	14.0%	3.1%	76.9%	0.2%	0.0%	0.0%	3.1%	0.2%
3	3.2%	3.2%		0.0%	3.1%	3.1%	3.2%	76.9%
4	1.0%	0.0%		3.1%	3.2%	3.2%	8.3%	
5	80.6%	19.7%		3.2%	8.3%	0.0%	80.0%	
6 or more		68.6%		88.3%	80.0%	88.3%		

Table 1-3. Continued.

Count of Companies by Number of Years of Activity During the Period (at Least 300 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	15	16	15	15	17	16	17	15
1	1	2	6	3	1	2	1	5
2	2	1	5	0	0	0	1	1
3	1	1		0	1	1	1	5
4	1	0		1	1	1	2	
5	6	3		1	2	0	4	
6 or more		3		6	4	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 300 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.4%	5.1%	22.9%	4.1%	5.3%	5.1%	5.3%	22.9%
1	0.8%	0.4%	0.2%	1.4%	0.2%	0.4%	0.2%	0.0%
2	14.0%	3.1%	76.9%	0.0%	0.0%	0.0%	3.1%	0.2%
3	3.2%	3.2%		0.0%	3.1%	3.1%	3.2%	76.9%
4	1.0%	0.0%		3.1%	3.2%	3.2%	8.3%	
5	80.6%	19.7%		3.2%	8.3%	0.0%	80.0%	
6 or more		68.6%		88.3%	80.0%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 500 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	15	16	15	15	17	16	17	15
1	1	2	6	3	1	2	1	5
2	2	1	5	0	0	0	1	1
3	1	1		0	1	1	1	5
4	1	0		1	1	1	2	
5	6	3		1	2	0	4	
6 or more		3		6	4	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 500 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.4%	5.1%	22.9%	4.1%	5.3%	5.1%	5.3%	22.9%
1	0.8%	0.4%	0.2%	1.4%	0.2%	0.4%	0.2%	0.0%
2	14.0%	3.1%	76.9%	0.0%	0.0%	0.0%	3.1%	0.2%
3	3.2%	3.2%		0.0%	3.1%	3.1%	3.2%	76.9%
4	1.0%	0.0%		3.1%	3.2%	3.2%	8.3%	
5	80.6%	19.7%		3.2%	8.3%	0.0%	80.0%	
6 or more		68.6%		88.3%	80.0%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	15	17	17	16	18	17	18	17
1	1	1	4	2	0	1	0	3
2	2	1	5	0	0	0	1	1
3	1	1		0	1	1	1	5
4	2	0		1	1	1	2	
5	5	3		1	2	0	4	
6 or more		3		6	4	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.4%	5.3%	22.9%	4.2%	5.4%	5.3%	5.4%	22.9%
1	0.8%	0.2%	0.2%	1.2%	0.0%	0.2%	0.0%	0.0%
2	14.0%	3.1%	76.9%	0.0%	0.0%	0.0%	3.1%	0.2%
3	3.2%	3.2%		0.0%	3.1%	3.1%	3.2%	76.9%
4	32.0%	0.0%		3.1%	3.2%	3.2%	8.3%	
5	49.6%	19.7%		3.2%	8.3%	0.0%	80.0%	
6 or more		68.6%		88.3%	80.0%	88.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	16	20	22	19	20	19	21	22
1	3	1	0	2	1	2	0	0
2	4	1	4	0	0	0	1	0
3	0	1		0	2	2	1	4
4	2	0		2	0	0	0	
5	1	0		0	0	0	3	
6 or more		3		3	3	3		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	1.4%	13.1%	27.6%	9.9%	13.7%	9.9%	16.9%	27.6%
1	9.0%	3.8%	0.0%	6.9%	3.2%	6.9%	0.0%	0.0%
2	20.3%	3.1%	72.4%	0.0%	0.0%	0.0%	3.1%	0.0%
3	0.0%	11.4%		0.0%	14.5%	14.5%	11.4%	72.4%
4	42.4%	0.0%		14.5%	0.0%	0.0%	0.0%	
5	26.8%	0.0%		0.0%	0.0%	0.0%	68.6%	
6 or more		68.6%		68.6%	68.6%	68.6%		

Table 1-4. Whiting Fleet (30SW), Whiting Catch Only - Firms Active in 2004-2006 (at least one year)

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Number Active (for year)	5	6	5	6	6	5	6	6	6	7	7	8	11

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual MT Received by a Buyer (for year)	628.5	185.6	4,592.4	1,836.8	1,277.2	2,242.5	2,054.9	1,696.2	19.5	5.0	6.6	40.1	2.5
Average Annual MT Received by Buyers (for year)	12,175.9	8,313.8	14,161.4	12,393.4	12,333.4	15,257.1	12,785.0	11,870.7	7,583.9	7,303.9	13,268.5	12,194.7	8,842.4

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual Raw Product Costs (for year)	$48,395	$18,413	$275,860	$159,758	$88,631	$197,756	$197,827	$149,585	$2,153	<$1,000	$1,013	$4,423	<$1,000
Average Annual Raw Product Costs (for year)	$797,108	$879,649	$836,664	$1,177,874	$623,347	$1,245,016	$1,139,046	$930,023	$755,395	$725,845	$1,074,714	$1,418,771	$1,247,164

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Total Number Active (for period)	7	8	13	8	7	8	7	13

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual MT Received by a Buyer (for period)	185.6	5.0	2.5	5.0	5.0	5.0	5.0	2.5
Average Annual MT Received by Buyers (for period)	11,783.2	11,181.9	10,253.9	11,471.2	10,968.1	11,342.6	10,695.0	11,065.5
Minimum Annual Raw Product Costs (for year)	$18,413	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (for year)	$866,217	$966,913	$1,319,420	$950,676	$888,691	$918,973	$941,759	$1,253,537

Table 1-5. Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	1	2	7	2	1	2	1	5
2	1	0	6	0	0	0	0	3
3	0	0		0	0	0	0	5
4	0	0		0	0	0	1	
5	5	1		0	1	0	5	
6 or more		5		6	5	6		

Count of Companies by Number of Years of Activity During the Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	1	2	7	2	1	2	1	5
2	1	0	6	0	0	0	0	3
3	0	0		0	0	0	0	5
4	0	0		0	0	0	1	
5	5	1		0	1	0	5	
6 or more		5		6	5	6		

Count of Companies by Number of Years of Activity During the Period (At Least 100 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	1	1	6	1	0	1	0	5
2	1	0	5	0	0	0	0	1
3	0	0		0	0	0	0	5
4	0	0		0	0	0	2	
5	5	3		0	2	0	4	
6 or more		3		6	4	6		

Count of Companies by Number of Years of Activity During the Period (At Least 200 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	0	1	6	1	0	1	0	5
2	1	0	5	0	0	0	0	1
3	0	0		0	0	0	0	5
4	0	0		0	0	0	2	
5	5	3		0	2	0	4	
6 or more		3		6	4	6		

Count of Companies by Number of Years of Activity During the Period (At Least 300 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	0	1	6	1	0	1	0	5
2	1	0	5	0	0	0	0	1
3	0	0		0	0	0	0	5
4	0	0		0	0	0	2	
5	5	3		0	2	0	4	
6 or more		3		6	4	6		

Table 1-5. Continued.

Count of Companies by Number of Years of Activity During the Period (At Least 500 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1	0	1	6	1	0	1	0	5
2	1	0	5	0	0	0	0	1
3	0	0		0	0	0	0	5
4	0	0		0	0	0	2	
5	5	3		0	2	0	4	
6 or more		3		6	4	6		

Count of Companies by Number of Years of Activity During the Period (At Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1	0	1	4	1	0	1	0	3
2	1	0	5	0	0	0	0	1
3	0	0		0	0	0	0	5
4	1	0		0	0	0	2	
5	4	3		0	2	0	4	
6 or more		3		6	4	6		

Count of Companies by Number of Years of Activity During the Period (At Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1	2	1	0	1	0	1	0	0
2	1	0	4	0	0	0	0	0
3	0	1		0	1	1	1	4
4	2	0		1	0	0	0	
5	1	0		0	0	0	3	
6 or more		3		3	3	3		

Table 1-6. Counts of Companies by Total MT During the Period

	Specific Time Ranges (Years)							
MT Range	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	9	13	7	9	8	10	13
>0 and <=100	0	7	2	7	7	7	7	2
>100 and <=200	2	0	0	1	1	1	0	0
>200 and <=1,000	1	1	2	0	1	1	1	2
>1,000 and <=5,000	0	1	4	3	0	1	0	4
>5,000 and <=10,000	2	1	1	0	1	0	2	0
>10,000 and <=20,000	3	3	1	2	3	4	2	1
>20,000 and <=30,000	3	0	0	2	0	0	0	1
>30,000	3	4	3	4	4	4	4	3

Table 1-7. Comparison showing companies active in both of various combinations of time ranges.

	Specific Time Ranges (Years)							
Counts for Those Active in:	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1994-1998	**14**	9	7	11	10	10	9	7
1999-2004	9	**17**	8	17	16	17	16	8
2005-2006	7	8	**13**	8	7	8	7	13
1997-2004	11	17	8	**19**	17	18	16	8
1998-2003	10	16	7	17	**17**	17	16	7
1998-2004	10	17	8	18	17	**18**	16	8
1999-2003	9	16	7	16	16	16	**16**	7
2004-2006	7	8	13	8	7	8	7	**13**

Table 1-8. Entry and exit years for companies receiving from the whiting fleet.

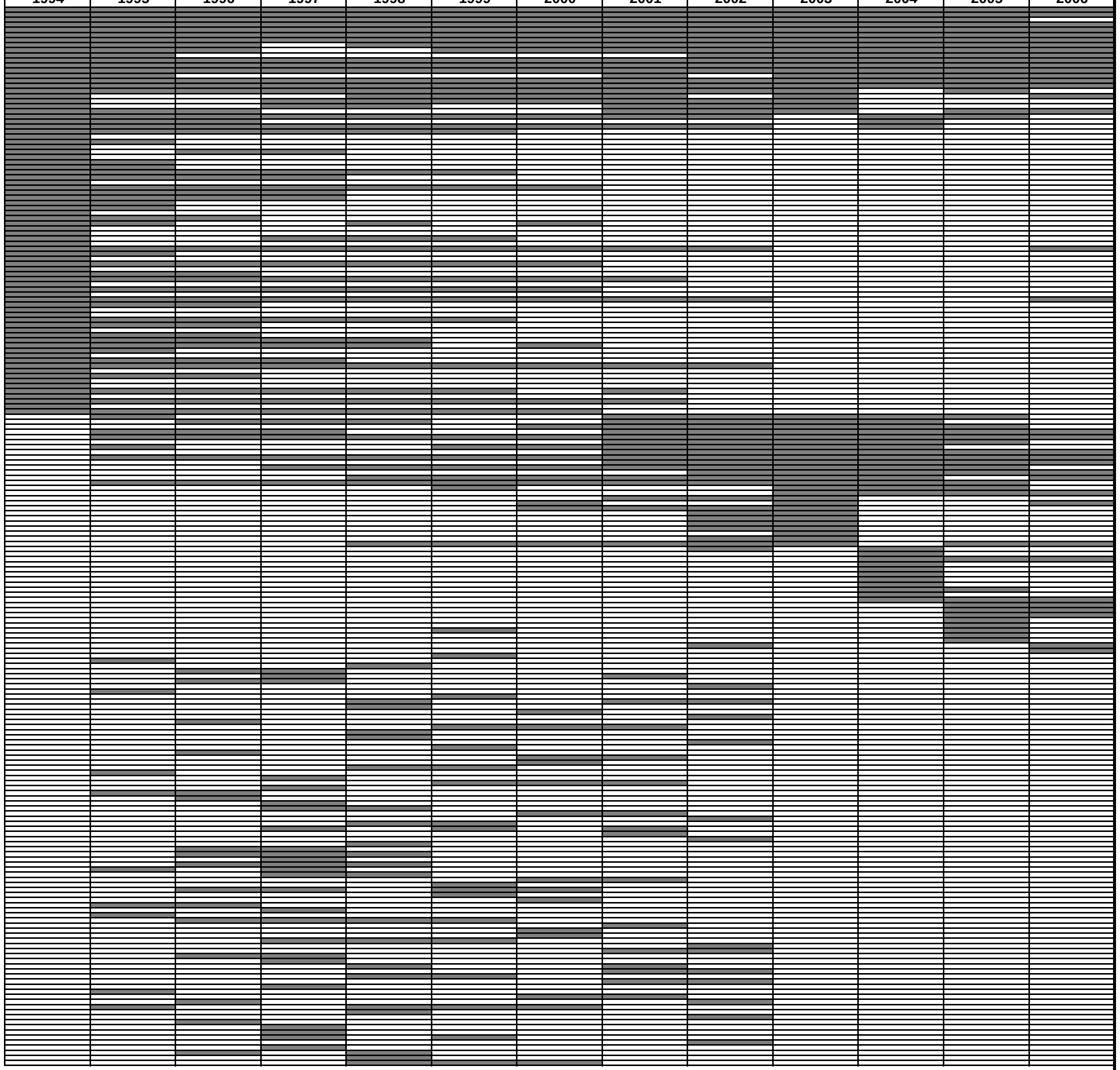
	Last Year of Participation													
First Year of Participation	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**TOTAL**
1994	0	0	1	1	0	0	0	2	0	0	0	0	5	**9**
1995		0	0	0	0	0	0	0	0	0	0	0	1	**1**
1996			1	0	0	0	0	0	0	0	0	0	0	**1**
1997				0	0	0	1	0	0	0	0	0	1	**2**
1998					1	0	0	0	0	0	0	0	0	**1**
1999						2	0	0	0	0	0	0	0	**2**
2000							1	0	0	0	0	0	0	**1**
2001								1	0	0	0	0	0	**1**
2002									0	0	0	0	0	**0**
2003										2	0	0	1	**3**
2004											0	0	1	**1**
2005												2	1	**3**
2006													1	**1**
Total	**0**	**0**	**2**	**1**	**1**	**2**	**2**	**3**	**0**	**2**	**0**	**2**	**11**	**26**

Table 1-9. Year of Activity and Round Weight Summed by Company for Receipts from Non-Whiting Fleet (40SN), Non-Whiting and Whiting Catch

Grey shading indicates the company was active in that year (i.e., RWT>0).

Each row represents paraticipation history for a single company. Number of separate companies: **208**

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Number Active in the Year (count of above):	80	69	66	69	64	59	54	59	61	47	46	44	36

Table 1-9. Continued. Summary by Year of Annual Quantities and Raw Product Costs, Nonwhiting Receivers

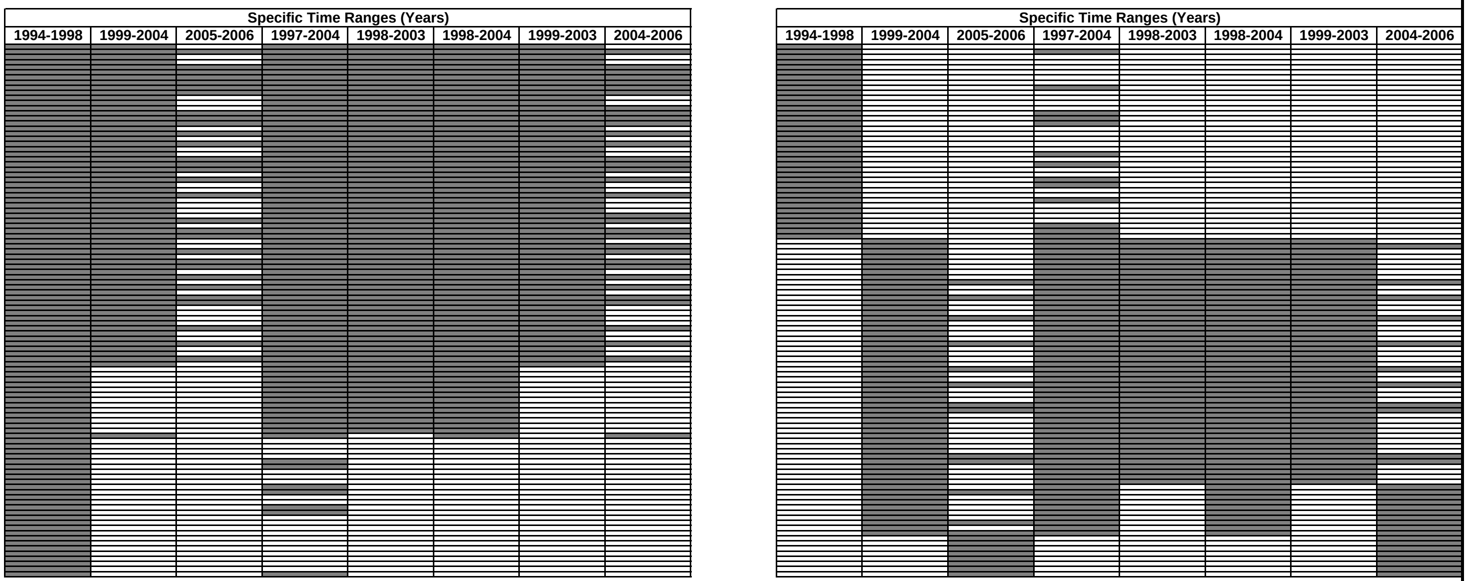
	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual MT Received by a Buyer (for year)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Average Annual MT Received by Buyers (for year)	615.2	709.9	745.5	637.8	547.1	581.5	552.0	394.1	335.3	447.4	435.1	428.6	487.4

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual Raw Product Costs (year)	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (year)	$546,347	$801,427	$783,576	$647,102	$520,922	$547,051	$624,364	$465,137	$388,068	$526,759	$490,503	$506,272	$658,653

Table 1-10. Round Weight Summed by Business ID for Non-Whiting Fleet (40SN), Non-Whiting and Whiting Catch - Specific Time Ranges

Grey shading indicates the permit was active in that year (i.e., RWT>0). Each row represents participation history for one company.

Specific Time Ranges (Years): 1994-1998 | 1999-2004 | 2005-2006 | 1997-2004 | 1998-2003 | 1998-2004 | 1999-2003 | 2004-2006



	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Total Number Active in the Period (count of above):	**142**	**122**	**51**	**155**	**124**	**135**	**111**	**63**

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual MT Received by a Buyer (for period)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Average Annual MT Received by Buyers (for period)	650.7	456.6	455.1	496.5	476.3	471.5	460.2	447.8

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual Raw Product Costs (period)	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (period)	$657,216	$504,380	$574,844	$528,141	$509,313	$507,094	$506,659	$544,053

Table 1-11. Counts of companies by number of years of activity above a specified threshold for the indicated period (left side) and those companies' corresponding percent of total 1994-2003 history over that period (right side)

Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	66	86	157	53	84	73	97	145
1	61	49	22	63	41	50	40	24
2	24	25	29	27	31	29	27	15
3	19	11		20	17	16	13	24
4	8	11		10	6	9	8	
5	30	6		6	8	6	23	
6 or more		20		29	21	25		

Percentage of 1994-2004 History (MT) by Companies Active for Number of Years in Period (>0 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.5%	7.0%	20.0%	1.7%	3.5%	2.7%	7.9%	18.9%
1	1.0%	3.1%	3.1%	2.0%	4.6%	5.4%	2.2%	2.5%
2	1.2%	6.4%	77.0%	4.9%	2.2%	2.2%	6.4%	1.9%
3	2.9%	3.3%		2.2%	6.4%	6.3%	3.6%	76.7%
4	2.6%	1.7%		5.9%	3.4%	3.5%	2.9%	
5	91.7%	1.8%		3.4%	3.6%	1.6%	77.0%	
6 or more		76.7%		79.9%	76.3%	78.4%		

Count of Companies by Number of Years of Activity During the Period (at Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	112	127	174	111	124	120	131	167
1	33	27	13	28	26	25	28	14
2	17	18	21	19	16	20	15	9
3	14	8		12	15	12	10	18
4	8	9		10	5	6	7	
5	24	5		7	7	9	17	
6 or more		14		21	15	16		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.5%	7.1%	20.1%	1.7%	3.5%	2.7%	8.0%	19.1%
1	1.1%	3.1%	3.1%	2.0%	4.7%	5.5%	2.3%	2.5%
2	1.3%	6.5%	76.9%	4.9%	2.2%	2.3%	7.8%	1.8%
3	2.9%	4.8%		2.2%	7.9%	6.4%	3.6%	76.6%
4	4.1%	1.6%		6.0%	3.4%	4.8%	1.4%	
5	90.1%	0.4%		4.8%	2.1%	1.6%	76.8%	
6 or more		76.5%		78.3%	76.2%	76.8%		

Count of Companies by Number of Years of Activity During the Period (at Least 100 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	162	180	197	172	176	176	180	197
1	15	10	4	11	10	10	11	2
2	6	5	7	5	6	4	5	2
3	7	3		4	4	6	2	7
4	4	1		5	3	3	1	
5	14	2		2	0	0	9	
6 or more		7		9	9	9		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 100 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	1.5%	12.0%	24.5%	3.7%	4.9%	4.9%	12.0%	24.5%
1	2.2%	2.6%	3.5%	3.2%	7.7%	7.7%	4.1%	1.4%
2	2.5%	6.9%	72.0%	6.0%	4.1%	1.9%	6.0%	2.1%
3	4.3%	4.6%		2.8%	5.3%	7.6%	3.9%	72.0%
4	3.2%	0.2%		6.7%	4.2%	4.2%	0.2%	
5	86.4%	1.9%		3.9%	0.0%	0.0%	73.7%	
6 or more		71.9%		73.7%	73.7%	73.7%		

Count of Companies by Number of Years of Activity During the Period (at Least 200 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	172	188	199	181	185	185	188	199
1	8	7	2	8	6	6	7	2
2	5	2	7	3	5	4	3	0
3	9	4		4	2	3	3	7
4	3	1		3	3	3	1	
5	11	0		2	1	1	6	
6 or more		6		7	6	6		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 200 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	2.8%	13.6%	26.6%	6.3%	12.5%	12.5%	13.6%	26.6%
1	2.5%	5.6%	1.4%	6.8%	1.6%	1.6%	5.6%	1.4%
2	1.6%	3.1%	72.0%	1.4%	5.8%	5.1%	3.8%	0.0%
3	6.3%	5.1%		5.4%	3.1%	3.8%	4.5%	72.0%
4	6.1%	1.2%		3.7%	4.5%	4.5%	1.2%	
5	80.7%	0.0%		3.9%	1.2%	1.2%	71.3%	
6 or more		71.3%		72.5%	71.3%	71.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 300 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	180	192	201	187	190	190	192	201
1	4	5	2	5	5	5	5	0
2	7	2	5	3	3	2	3	2
3	4	3		3	2	3	2	5
4	3	0		2	2	2	0	
5	10	0		2	1	0	6	
6 or more		6		6	5	6		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 300 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	5.9%	15.7%	28.0%	8.1%	14.0%	14.0%	15.7%	28.0%
1	0.7%	4.7%	5.3%	6.4%	3.0%	3.0%	4.7%	0.0%
2	3.2%	3.2%	66.7%	2.4%	4.1%	3.5%	3.9%	5.3%
3	4.0%	5.0%		4.1%	3.2%	3.9%	4.3%	66.7%
4	6.1%	0.0%		3.2%	4.3%	4.3%	0.0%	
5	80.2%	0.0%		4.3%	1.4%	0.0%	71.3%	
6 or more		71.3%		71.3%	69.9%	71.3%		

Table 1-11. Continued.

Count of Companies by Number of Years of Activity During the Period (at Least 500 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	184	194	201	189	191	191	194	201
1	7	4	3	6	6	6	4	1
2	2	4	4	3	2	2	4	2
3	3	0		1	3	3	0	4
4	5	0		3	0	0	0	
5	7	0		0	1	0	6	
6 or more		6		6	5	6		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 500 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	7.0%	18.0%	28.0%	9.4%	14.7%	14.7%	18.0%	28.0%
1	3.1%	3.3%	6.0%	7.1%	4.7%	4.7%	3.3%	0.7%
2	1.1%	7.4%	66.0%	3.5%	2.6%	2.6%	7.4%	5.3%
3	3.4%	0.0%		1.9%	6.8%	6.8%	0.0%	66.0%
4	12.3%	0.0%		6.8%	0.0%	0.0%	0.0%	
5	73.2%	0.0%		0.0%	1.4%	0.0%	71.3%	
6 or more		71.3%		71.3%	69.9%	71.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	192	198	204	193	196	196	198	203
1	2	4	0	7	6	6	4	1
2	4	1	4	2	0	0	1	0
3	3	0		0	1	1	0	4
4	2	0		1	0	0	0	
5	5	0		0	1	0	5	
6 or more		5		5	4	5		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	11.3%	22.0%	34.0%	13.1%	19.6%	19.6%	22.0%	30.1%
1	1.1%	5.0%	0.0%	9.5%	7.3%	7.3%	5.0%	3.9%
2	7.6%	3.1%	66.0%	4.3%	0.0%	0.0%	3.1%	0.0%
3	4.6%	0.0%		0.0%	3.1%	3.1%	0.0%	66.0%
4	6.3%	0.0%		3.1%	0.0%	0.0%	0.0%	
5	69.2%	0.0%		0.0%	3.9%	0.0%	69.9%	
6 or more		69.9%		69.9%	66.0%	69.9%		

Count of Companies by Number of Years of Activity During the Period (at Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	207	207	207	207	207	207	207	207
1	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	0	0
3	0	0		0	0	0	0	1
4	0	0		0	0	0	0	
5	1	0		0	0	0	1	
6 or more		1		1	1	1		

Percentage of 1994-2004 History (MT) by Companies Active for Years in Period (At Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	56.8%	56.8%	56.8%	56.8%	56.8%	56.8%	56.8%	56.8%
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	43.2%	0.0%	0.0%	0.0%	0.0%	0.0%
3	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	43.2%
4	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	
5	43.2%	0.0%		0.0%	0.0%	0.0%	43.2%	
6 or more		43.2%		43.2%	43.2%	43.2%		

Table 1-12. Non-Whiting Fleet (40SN), Whiting and Non-Whiting Catch - Firms Active in 2004-2006 (at least one year)

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Number Active (for year)	24	29	26	23	26	29	29	36	38	37	46	44	36

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual MT Received by a Buyer (for year)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Average Annual MT Received by Buyers (for year)	1,370.4	1,210.2	1,332.0	1,489.8	1,081.0	1,013.0	906.4	620.4	535.3	566.8	435.1	428.6	487.4

	Year												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual Raw Product Costs (for year)	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (for year)	$1,231,505	$1,385,476	$1,406,106	$1,506,972	$1,026,038	$939,712	$1,014,961	$730,554	$619,335	$666,544	$490,503	$506,272	$658,653

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Total Number Active (for period)	34	55	51	55	44	55	44	63

	Specific Time Ranges (Years)							
	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
Minimum Annual MT Received by a Buyer (for period)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Average Annual MT Received by Buyers (for period)	1,288.9	648.0	455.1	764.0	756.0	694.7	706.0	447.8
Minimum Annual Raw Product Costs (for year)	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000	<$1,000
Average Annual Raw Product Costs (for year)	$1,309,617	$715,095	$574,844	$814,708	$809,535	$748,641	$776,227	$544,053

Table 1-13. Count of Companies by Number of Years of Activity During the Specified Period

Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	4	13	22	13	4	13	4	24
2	4	3	29	3	5	3	5	15
3	5	5		5	6	5	7	24
4	4	9		4	2	5	6	
5	17	5		3	7	5	22	
6 or more		20		27	20	24		

Count of Companies by Number of Years of Activity During the Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	4	13	22	13	4	13	4	24
2	4	3	29	3	5	3	5	15
3	5	5		5	6	5	7	24
4	4	9		4	2	5	6	
5	17	5		3	7	5	22	
6 or more		20		27	20	24		

Count of Companies by Number of Years of Activity During the Period (At Least 100 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	5	4	4	2	3	3	5	2
2	1	2	7	2	4	2	2	2
3	3	2		2	1	3	1	7
4	2	1		3	2	2	1	
5	9	2		1	0	0	9	
6 or more		7		9	9	9		

Count of Companies by Number of Years of Activity During the Period (At Least 200 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	1	2	2	2	2	2	2	2
2	1	1	7	1	2	1	2	0
3	4	3		2	1	2	2	7
4	2	1		2	2	2	1	
5	7	0		1	1	1	6	
6 or more		6		7	6	6		

Count of Companies by Number of Years of Activity During the Period (At Least 300 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	0	2	2	2	1	1	2	0
2	2	1	5	1	2	1	2	2
3	2	2		2	1	2	1	5
4	2	0		1	1	1	0	
5	6	0		1	1	0	6	
6 or more		6		6	5	6		

Count of Companies by Number of Years of Activity During the Period (At Least 500 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
1	2	1	3	2	2	2	1	1
2	0	2	4	2	1	1	2	2
3	2	0		0	1	1	0	4
4	2	0		1	0	0	0	
5	5	0		0	1	0	6	
6 or more		6		6	5	6		

Table 1-13. Continued

Count of Companies by Number of Years of Activity During the Period (At Least 1,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1	0	2	0	3	2	2	2	1
2	3	0	4	0	0	0	0	0
3	1	0		0	0	0	0	4
4	0	0		0	0	0	0	
5	4	0		0	1	0	5	
6 or more		5		5	4	5		

Count of Companies by Number of Years of Activity During the Period (At Least 5,000 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	0	0
3	0	0		0	0	0	0	1
4	0	0		0	0	0	0	
5	1	0		0	0	0	1	
6 or more		1		1	1	1		

Table 1-14. Counts of Companies by Total MT During the Period

	Specific Time Ranges (Years)							
MT Range	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	66	86	157	53	84	73	97	145
>0 and <=50	88	82	32	104	80	89	74	44
>50 and <=100	4	9	6	10	10	11	7	2
>100 and <=200	8	4	3	6	5	4	4	6
>200 and <=1,000	18	13	6	15	11	13	12	4
>1,000 and <=5,000	14	9	2	13	13	12	9	5
>5,000 and <=10,000	6	2	1	2	1	1	2	1
>10,000 and <=20,000	2	1	1	3	2	3	2	0
>20,000 and <=30,000	1	1	0	1	1	1	0	1
>30,000	1	1	0	1	1	1	1	0

Table 1-15. Comparison showing companies active in both of various combinations of time ranges.

	Specific Time Ranges (Years)							
Counts for Those Active in:	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
1994-1998	142	64	30	97	76	77	63	34
1999-2004	64	122	43	122	111	122	111	55
2005-2006	30	43	51	43	40	43	40	51
1997-2004	97	122	43	155	124	135	111	55
1998-2003	76	111	40	124	124	124	111	44
1998-2004	77	122	43	135	124	135	111	55
1999-2003	63	111	40	111	111	111	111	44
2004-2006	34	55	51	55	44	55	44	63

Table 1-16. Entry and exit years for companies receiving from the nonwhiting fleet.

	Last Year of Participation													
First Year of Participation	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**TOTAL**
1994	21	7	6	5	1	4	6	3	1	2	2	3	19	**80**
1995		5	2	1	0	0	1	0	0	0	1	2	3	**15**
1996			4	4	3	1	1	0	1	0	1	0	0	**15**
1997				10	2	2	0	2	0	0	0	1	0	**17**
1998					7	3	1	1	1	0	0	0	2	**15**
1999						5	0	2	0	0	0	2	0	**9**
2000							5	4	0	1	0	1	1	**12**
2001								2	3	1	0	1	2	**9**
2002									8	5	1	0	2	**16**
2003										1	0	0	1	**2**
2004											7	1	2	**10**
2005												4	3	**7**
2006													1	**1**
	21	**12**	**12**	**20**	**13**	**15**	**14**	**14**	**14**	**10**	**12**	**15**	**36**	**208**

Table 1-17. Number of shoreside nonwhiting companies that received whiting during 1994-2006, by State(s):

California (Only)	9		
Oregon (Only)	8	Total Operating in California:	12
Washington (Only)	6		
California AND Oregon	2	Total Operating in Oregon:	11
California AND Washington	0		
Oregon AND Washington	0	Total Operating in Washington:	7
California AND Oregon AND Washington	1		
TOTAL	**26**		

Table 1-18. Active companies receiving shoreside whiting sector deliveries (those with 2004-1006 participation) and inactive companies, number of years above the indicated threshold and percent o total history.

Companies That Received Whiting (>0 MT) from Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

	Number	Percent	Within Allocation Period (1998-2003) Active 1 Year	Active 2+ Years	% of 1994-2003
Currently Active, with Recent Participation	7	92.5%	1	6	87.0%
Not Active, with Recent Participation	10	7.5%	7	3	7.3%
Currently Active, No Recent Participation	6	--	--	--	0.0%
Not Active, No Recent Participation	3	--	--	--	5.6%
TOTALS	**26**	**100.0%**			**100.0%**

Companies That Received Whiting (at Least 1 MT in a Year) from Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

	Number	Percent	Within Allocation Period (1998-2003) Active 1 Year	Active 2+ Years	% of 1994-2003
Currently Active, with Recent Participation	7	92.5%	1	6	87.0%
Not Active, with Recent Participation	8	7.5%	5	3	7.3%
Currently Active, No Recent Participation	6	--	--	--	0.0%
Not Active, No Recent Participation	5	--	--	--	5.6%
TOTALS	**26**	**100.0%**			**100.0%**

Note: An "active" company received whiting during the period January 1, 2004 to December 31, 2006.

Table 1-19. Counts of companies recieving shoreside whiting sector deliveries by number of years of activity above a specified threshold for the indicated period (left side) and those companies' corresponding percent of total 1994-2003 history over that period (right side).

Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	9	13	7	9	8	10	13
1	3	8	7	10	8	9	7	5
2	2	1	6	0	0	0	1	3
3	1	2		0	1	1	2	5
4	1	0		1	2	2	1	
5	7	1		2	1	0	5	
6 or more		5		6	5	6		

Percentage of 1994-2003 History (MT) by Companies Active for Number of Years in Period (>0 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.0%	5.7%	13.0%	4.5%	5.7%	5.7%	5.7%	13.0%
1	0.9%	0.0%	12.8%	1.2%	0.0%	0.0%	0.0%	0.0%
2	12.7%	3.5%	74.2%	0.0%	0.0%	0.0%	3.5%	12.8%
3	3.6%	3.8%		0.0%	3.5%	3.5%	3.8%	74.2%
4	1.2%	0.0%		3.5%	3.8%	3.8%	4.5%	
5	81.6%	4.5%		3.8%	4.5%	0.0%	82.5%	
6 or more		82.5%		87.0%	82.5%	87.0%		

Count of Companies by Number of Years of Activity During the Period (at Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	12	11	13	9	11	10	12	13
1	3	6	7	8	6	7	5	5
2	2	1	6	0	0	0	1	3
3	1	2		0	1	1	2	5
4	1	0		1	2	2	1	
5	7	1		2	1	0	5	
6 or more		5		6	5	6		

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	**1994-1998**	**1999-2004**	**2005-2006**	**1997-2004**	**1998-2003**	**1998-2004**	**1999-2003**	**2004-2006**
0	0.0%	5.7%	13.0%	4.5%	5.7%	5.7%	5.7%	13.0%
1	0.9%	0.0%	12.8%	1.2%	0.0%	0.0%	0.0%	0.0%
2	12.7%	3.5%	74.2%	0.0%	0.0%	0.0%	3.5%	12.8%
3	3.6%	3.8%		0.0%	3.5%	3.5%	3.8%	74.2%
4	1.2%	0.0%		3.5%	3.8%	3.8%	4.5%	
5	81.6%	4.5%		3.8%	4.5%	0.0%	82.5%	
6 or more		82.5%		87.0%	82.5%	87.0%		

Table 1-20. Geographic distribution of companies receiving shoreside whiting deliveries by possible recent participation levels.

Number of Companies Operating within Each State, by Years of Activity During the Period (Any Receipts >0 MT in the Year)

	California		Oregon		Washington	
Years:	**1994-2003**	**1998-2003**	**1994-2003**	**1998-2003**	**1994-2003**	**1998-2003**
0	4	5	2	5	0	2
1	4	4	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

Number of Companies Operating within Each State, by Years of Activity During the Period (at Least 1 MT in the Year)

	California		Oregon		Washington	
Years:	**1994-2003**	**1998-2003**	**1994-2003**	**1998-2003**	**1994-2003**	**1998-2003**
0	6	7	2	5	0	2
1	2	2	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

Table 1-21. Number of companies that received non-whiting sector deliveries during 1994-2006, by State(s):

California (Only)	136		
Oregon (Only)	36	Total Operating in California	144
Washington (Only)	26		
California AND Oregon	6	Total Operating in Oregon:	45
California AND Washington	1		
Oregon AND Washington	2	Total Operating in Washingt	30
California AND Oregon AND Washington	1		
TOTAL	**208**		

Table 1-22. Active companies receiving nonwhiting sector deliveries (those with 2004-1006 participation) and inactive companies, number of years above the indicated threshold and percent of total history.

Companies That Received Groundfish (>0 MT) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

	Number	Percent	Within Allocation Period (1998-2003) Active 1 Year	Active 2 Years	Active 3+ Years	% of 1994-2003
Currently Active, with Recent Participation	44	90.0%	4	5	35	79.1%
Not Active, with Recent Participation	80	10.0%	37	26	17	17.2%
Currently Active, No Recent Participation	19	--	--	--	--	0.9%
Not Active, No Recent Participation	65	--	--	--	--	2.8%
TOTALS	**208**	**100.0%**				**100.0%**

Companies That Received Groundfish (at Least 1 MT in a Year) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

	Number	Percent	Within Allocation Period (1998-2003) Active 1 Year	Active 2 Years	Active 3+ Years	% of 1993-2004
Currently Active, with Recent Participation	34	89.8%	5	1	28	79.0%
Not Active, with Recent Participation	50	10.2%	21	15	14	17.3%
Currently Active, No Recent Participation	7	--	--	--	--	0.9%
Not Active, No Recent Participation	117	--	--	--	--	2.8%
TOTALS	**208**	**100.0%**				**100.0%**

Companies That Received Groundfish (at Least 6 MT in a Year) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

	Number	Percent	Within Allocation Period (1998-2003) Active 1 Year	Active 2 Years	Active 3+ Years	% of 1993-2004
Currently Active, with Recent Participation	28	89.4%	5	2	21	78.3%
Not Active, with Recent Participation	41	10.6%	20	10	11	17.7%
Currently Active, No Recent Participation	3	--	--	--	--	0.0%
Not Active, No Recent Participation	136	--	--	--	--	4.0%
TOTALS	**208**	**100.0%**				**100.0%**

Note: An "active" company received whiting during the period January 1, 2004 to December 31, 2006.

Table 1-23 Counts of companies recieving nonwhiting sector deliveries by number of years of activity above a specified threshold for the indicated period (left side) and those companies' corresponding percent of total 1994-2003 history over that period (right side).

Count of Companies by Number of Years of Activity During the Period (Any Activity >0 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	66	86	157	53	84	73	97	145
1	61	49	22	63	41	50	40	24
2	24	25	29	27	31	29	27	15
3	19	11		20	17	16	13	24
4	8	11		10	6	9	8	
5	30	6		6	8	6	23	
6 or more		20		29	21	25		
Total	208	208	208	208	208	208	208	208

Percentage of 1994-2003 History (MT) by Companies Active for Number of Years in Period (>0 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.5%	7.4%	21.1%	1.8%	3.7%	2.8%	8.4%	20.0%
1	1.1%	3.2%	3.2%	2.1%	4.8%	5.7%	2.3%	2.6%
2	1.3%	6.7%	75.8%	5.1%	2.3%	2.3%	6.7%	1.9%
3	3.0%	3.5%		2.3%	6.8%	6.6%	3.8%	75.5%
4	2.6%	1.8%		6.2%	3.6%	3.6%	3.1%	
5	91.5%	1.9%		3.6%	3.6%	1.6%	75.8%	
6 or more		75.4%		78.9%	75.1%	77.3%		

Count of Companies by Number of Years of Activity During the Period (at Least 1 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	112	127	174	111	124	120	131	167
1	33	27	13	28	26	25	28	14
2	17	18	21	19	16	20	15	9
3	14	8		12	15	12	10	18
4	8	9		10	5	6	7	
5	24	5		7	7	9	17	
6 or more		14		21	15	16		
Total	208	208	208	208	208	208	208	208

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.5%	7.5%	21.2%	1.8%	3.7%	2.8%	8.4%	20.1%
1	1.1%	3.3%	3.2%	2.1%	4.9%	5.8%	2.4%	2.6%
2	1.4%	6.8%	75.6%	5.2%	2.3%	2.4%	8.3%	1.9%
3	2.9%	5.1%		2.4%	8.3%	6.7%	3.8%	75.4%
4	4.0%	1.7%		6.3%	3.6%	5.1%	1.5%	
5	90.1%	0.4%		5.0%	2.0%	1.6%	75.6%	
6 or more		75.3%		77.2%	75.0%	75.6%		

Count of Companies by Number of Years of Activity During the Period (at Least 6 MT in the Year)

	Specific Time Ranges (Years)							
Number of Years	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	140	144	180	129	139	138	145	177
1	15	22	9	24	25	22	26	9
2	18	17	19	18	12	15	12	6
3	5	7		10	12	12	9	16
4	6	3		7	5	4	2	
5	24	2		5	2	3	14	
6 or more		13		15	13	14		
Total	208	208	208	208	208	208	208	208

Percentage of 1994-2003 History (MT) by Companies Active for Years in Period (At Least 1 MT in the Year)

	Specific Time Ranges (Years)							
No. of Yrs	1994-1998	1999-2004	2005-2006	1997-2004	1998-2003	1998-2004	1999-2003	2004-2006
0	0.6%	8.7%	23.3%	3.0%	4.0%	4.0%	8.7%	21.7%
1	1.1%	2.3%	1.1%	1.3%	4.9%	4.9%	3.8%	2.6%
2	2.2%	8.2%	75.6%	5.0%	3.7%	2.2%	6.7%	0.4%
3	2.0%	4.2%		2.5%	6.8%	8.2%	4.4%	75.3%
4	3.9%	1.0%		7.7%	4.2%	4.1%	0.9%	
5	90.1%	0.3%		4.2%	1.4%	1.0%	75.6%	
6 or more		75.3%		76.4%	75.0%	75.6%		

Table 1-24. Geographic distribution of companies receiveing nonwhiting deliveries by possible recent participation levels.

Number of Companies Operating within Each State, by Years of Activity During the Period (Any Receipts >0 MT in the Year)

	California		Oregon		Washington		
Years:	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003	
0	10	59	7	18	2	10	
1	56	30	12	8	7	6	
2	25	20	7	6	6	5	
3	13	12	5	4	3	2	
4	12	4	1	2	2	0	
5	0	3	1	3	1	2	
6 or more	28	16	12	4	9	5	
Total	144	144	45	45	30	30	219

Number of Companies Operating within Each State, by Years of Activity During the Period (at Least 1 MT in the Year)

	California		Oregon		Washington		
Years:	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003	
0	65	88	19	27	5	13	
1	24	17	6	5	9	5	
2	15	11	3	3	2	3	
3	9	9	4	5	2	2	
4	5	4	2	1	2	0	
5	3	3	2	1	2	3	
6 or more	23	12	9	3	8	4	
Total	144	144	45	45	30	30	219

Number of Companies Operating within Each State, by Years of Activity During the Period (at Least 6 MT in the Year)

	California		Oregon		Washington		
Years:	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003	
0	80	80	19	19	8	8	
1	28	32	8	13	10	12	
2	10	15	9	8	3	3	
3	8	7	3	2	1	3	
4	2	10	2	3	1	4	
5	6	0	1	0	1	0	
6 or more	10	0	3	0	6	0	
Total	144	144	45	45	30	30	219

Table 1-25. Companies receiving nonwhiting sector landings with no activity during 1998-2003 (Quantity (in MT) and raw product cost (RPC) by species, 1994-2003 receipts).

	California			Oregon			Washington		
Species	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.
Lingcod - coastwide	86.6	84,532	27	116.0	95,259	7	101.2	103,425	7
N. of 42° (OR & WA)	0.0	0	0	116.0	95,259	7	101.2	103,425	7
S. of 42° (CA)	86.6	84,532	27	0.0	0	0	0.0	0	0
Pacific Cod	0.0	8	1	12.4	9,573	5	396.9	361,551	6
Pacific Whiting (Coastwide)	1.4	185	3	4.4	272	1	0.0	0	0
Sablefish (Coastwide)	624.3	1,283,898	21	391.4	780,749	5	42.1	118,210	8
N. of 36° (Monterey north)	370.4	927,524	17	391.4	780,749	5	42.1	118,210	8
S. of 36° (Conception area)	253.9	356,374	7	0.0	0	0	0.0	0	0
PACIFIC OCEAN PERCH	0.7	681	8	73.5	49,524	6	45.2	34,494	7
Shortbelly Rockfish	2.6	1,359	7	3.1	1,297	5	0.0	0	0
WIDOW ROCKFISH	378.4	281,352	17	1,022.8	718,385	6	108.4	76,377	7
CANARY ROCKFISH	46.0	44,261	21	97.4	71,755	6	18.6	14,818	7
Chilipepper Rockfish	432.9	421,333	22	0.0	0	0	0.0	0	0
BOCACCIO	338.3	256,186	18	0.0	0	0	0.0	0	0
Splitnose Rockfish	78.5	40,688	18	0.0	0	0	0.0	0	0
Yellowtail Rockfish	70.2	54,597	8	378.9	289,869	6	320.1	259,443	7
Shortspine Thornyhead - coastwide	406.7	760,499	15	201.8	349,166	5	19.7	30,698	7
N. of 34°27'	115.7	249,745	6	201.8	349,166	5	19.7	30,698	7
S. of 34°27'	291.0	510,754	9	0.0	0	0	0.0	0	0
Longspine Thornyhead - coastwide	790.2	1,489,833	14	379.1	642,180	6	9.6	17,130	2
N. of 34°27'	790.2	1,489,833	14	379.1	642,180	6	9.6	17,130	2
S. of 34°27'	0.0	0	0	0.0	0	0	0.0	0	0
Other thornyheads	19.7	29,846	5	7.3	10,622	3	0.0	0	0
COWCOD	0.0	11	1	0.0	0	0	0.0	0	0
DARKBLOTCHED	29.6	26,028	22	121.2	79,195	6	4.6	3,798	7
YELLOWEYE	3.0	2,848	14	20.2	14,878	6	1.8	1,457	6
Black Rockfish - coastwide	10.9	11,511	5	2.3	1,704	1	0.0	9	4
Black Rockfish (WA)	0.0	0	0	0.0	0	0	0.0	9	4
Black Rockfish (OR-CA)	10.9	11,511	5	2.3	1,704	1	0.0	0	0
Minor Rockfish North	44.3	32,392	24	255.1	164,348	8	55.5	45,448	7
Nearshore Species	0.2	377	1	0.0	0	0	0.0	0	0
Shelf Species	25.7	20,898	23	108.6	69,771	8	34.8	28,717	7
BOCACCIO: N. of Monterrey	0.6	531	6	20.8	14,810	6	10.6	8,578	7
Chilipepper Rockfish: Eureka	7.8	5,976	8	2.1	1,612	2	0.0	0	1
Redstripe Rockfish	0.6	379	5	36.9	20,943	6	8.2	6,963	7
Silvergrey Rockfish	0.0	0	0	17.6	12,996	5	11.6	9,622	7
Other Northern Shelf Rockfish	16.6	14,012	21	31.2	19,410	8	4.4	3,554	7
Slope Species	18.4	11,117	10	146.5	94,577	6	20.6	16,731	7
Bank Rockfish	0.5	499	4	3.0	2,012	5	0.0	0	0
Sharpchin Rockfish, north	6.7	3,682	6	27.8	16,121	6	4.5	3,808	6
Splitnose Rockfish: N. of Monterrey	6.2	3,660	8	20.7	13,247	6	1.2	914	7
Yellowmouth Rockfish	0.0	0	0	65.6	42,343	5	2.2	1,800	5
Other Northern Slope Rockfish	5.0	3,276	8	29.3	20,854	6	12.7	10,209	7
Minor Rockfish South	290.1	267,505	32	0.0	0	0	0.0	0	0
Nearshore Species	2.3	1,980	7	0.0	0	0	0.0	0	0
Shelf Species	61.0	71,905	32	0.0	0	0	0.0	0	0
Redstripe Rockfish	0.1	64	3	0.0	0	0	0.0	0	0
Yellowtail Rockfish	8.4	7,243	14	0.0	0	0	0.0	0	0
Other Southern Shelf Rockfish	52.5	64,598	30	0.0	0	0	0.0	0	0
Slope Species	226.8	193,620	20	0.0	0	0	0.0	0	0
Bank Rockfish	46.7	44,210	18	0.0	0	0	0.0	0	0
Blackgill Rockfish	128.2	123,720	18	0.0	0	0	0.0	0	0
Sharpchin Rockfish	0.5	392	11	0.0	0	0	0.0	0	0
Yellowmouth Rockfish	0.0	0	0	0.0	0	0	0.0	0	0
Other Southern Slope Rockfish	51.4	25,298	15	0.0	0	0	0.0	0	0
California scorpionfish	0.1	284	2	0.0	0	0	0.0	0	0
Cabezon (off CA only)	0.0	0	0	0.0	0	0	0.0	0	0
Dover Sole	2,396.7	1,662,289	16	881.7	588,311	5	239.5	191,227	6
Dover Sole (summer)	1,240.9	870,209	14	500.9	340,452	4	117.6	94,732	6
Dover Sole (winter)	1,155.8	792,080	11	380.8	247,859	5	121.9	96,495	4
English Sole	88.0	74,801	25	73.7	53,539	6	195.4	162,739	6

Table 1-25. Continued.

Species	California RWT	California RPC	California # of Co.	Oregon RWT	Oregon RPC	Oregon # of Co.	Washington RWT	Washington RPC	Washington # of Co.
Petrale Sole (coastwide)	168.2	369,101	32	147.4	280,353	7	62.8	134,999	7
N of 40°10' summer	46.1	91,898	7	68.8	135,132	5	30.1	64,089	5
N of 40°10' winter	31.4	60,821	6	78.7	145,221	6	32.7	70,910	7
S of 40°10' summer	34.6	80,867	18	0.0	0	0	0.0	0	0
S of 40°10' winter	56.0	135,515	20	0.0	0	0	0.0	0	0
Arrowtooth Flounder	28.2	6,496	4	160.5	39,910	5	131.2	27,396	4
Arrowtooth Flounder summer	24.2	5,521	3	116.4	30,006	4	92.3	19,071	4
Arrowtooth Flounder winter	4.0	975	2	44.0	9,904	5	38.9	8,325	2
Starry Flounder	0.0	0	0	3.4	2,438	2	11.5	7,349	4
Other Flatfish	546.2	461,595	35	120.2	90,565	7	18.5	18,274	6
Kelp Greenling	0.2	108	3	0.0	0	0	0.0	0	0
Spiny Dogfish	0.5	86	2	0.0	0	0	9.3	2,152	3
Other (Ground) Fish	72.8	22,033	14	33.0	9,619	4	0.0	0	0
Pink shrimp	0.0	0	0	0.0	0	0	0.0	0	0
Other shrimp	0.0	0	0	0.0	0	0	0.0	0	0
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	2.9	35,696	9	0.0	0	0	0.0	0	0
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.0	0	0
PACIFIC HALIBUT	0.0	0	0	0.0	192	1	0.0	0	0
CALIFORNIA HALIBUT	13.4	55,035	17	0.0	13	1	0.0	0	0
SALMON	0.0	0	0	0.0	0	0	0.0	0	0
UNSP. SEA CUCUMBERS	0.0	0	0	0.0	0	0	0.0	0	0
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.0	0	0	0.0	0	0	0.0	0	0
CA Gillnet complex	76.7	39,706	17	30.5	10,161	2	112.1	20,704	5
Squid	0.0	5	1	0.0	0	0	0.0	0	0
COASTAL PELAGIC SPP	0.1	17	1	0.8	51	1	0.0	0	0
Highly Migratory spp	0.4	598	3	0.0	0	0	0.0	0	0
Dungeness crab	1.0	4,316	3	0.0	0	0	0.0	0	0
Other crab	0.1	164	2	0.0	0	0	0.0	0	0
Clams & Mussels	0.0	29	2	0.0	0	0	0.0	0	0
Other Spp	12.9	10,904	21	0.2	210	3	0.3	297	3
Nearshore groundfish spp	100.4	98,792	30	121.7	99,401	7	112.7	110,783	7
Shelf groundfish spp	2,411.3	1,995,429	43	1,377.2	1,014,975	8	1,216.8	1,008,769	7
Slope groundfish spp	3,198.9	3,824,414	35	2,458.8	2,347,930	7	401.6	354,958	7
Dover sole, thornyheads, sablefish complex	4,237.5	5,226,365	25	1,861.4	2,371,028	6	310.9	357,265	8
Total (for all groundfish species)	**6,955.3**	**7,686,346**		**4,506.9**	**4,343,511**		**1,791.6**	**1,610,994**	
Total (for all species)	**7,062.9**	**7,832,957**	**48**	**4,538.4**	**4,354,138**	**10**	**1,904.0**	**1,631,995**	**8**
All Companies - Total (for all species)	**133,999**	**148,778,066**	**134**	**170,425**	**178,306,249**	**38**	**61,366**	**49,441,957**	**28**

Table 1-26. Companies receiving nonwhiting sector landings with no years greater than 1 mt during 1998-2003 (Quantity (in MT) and raw product cost (RPC) by species, 1994-2003 receipts).

	California			Oregon			Washington		
Species	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.
Lingcod - coastwide	86.9	85,244	35	117.7	99,550	15	101.2	103,478	9
N. of 42° (OR & WA)	0.0	0	0	117.7	99,550	15	101.2	103,478	9
S. of 42° (CA)	86.9	85,244	35	0.0	0	0	0.0	0	0
Pacific Cod	0.0	8	1	12.4	9,573	5	397.0	361,654	9
Pacific Whiting (Coastwide)	1.4	185	3	4.4	272	1	0.0	0	0
Sablefish (Coastwide)	625.4	1,285,925	29	391.5	780,762	7	42.4	119,176	9
N. of 36° (Monterey north)	371.0	928,344	24	391.5	780,762	7	42.4	119,176	9
S. of 36° (Conception area)	254.4	357,581	9	0.0	0	0	0.0	0	0
PACIFIC OCEAN PERCH	0.7	690	10	73.6	49,699	8	45.8	34,947	10
Shortbelly Rockfish	2.6	1,359	7	3.1	1,297	5	0.0	0	0
WIDOW ROCKFISH	378.6	281,790	19	1,022.8	718,390	8	108.7	76,556	9
CANARY ROCKFISH	46.1	44,414	27	97.5	72,038	10	18.9	15,011	9
Chilipepper Rockfish	433.4	422,143	29	0.0	0	0	0.0	0	0
BOCACCIO	338.4	256,281	21	0.0	0	0	0.0	0	0
Splitnose Rockfish	79.1	41,484	27	0.0	0	0	0.0	0	0
Yellowtail Rockfish	70.2	54,597	8	379.0	289,954	9	320.1	259,451	8
Shortspine Thornyhead - coastwide	406.7	760,503	18	201.9	349,171	7	19.9	31,174	9
N. of 34°27'	115.7	249,745	6	201.9	349,171	7	19.9	31,174	9
S. of 34°27'	291.0	510,758	12	0.0	0	0	0.0	0	0
Longspine Thornyhead - coastwide	790.2	1,489,834	15	379.1	642,180	6	10.1	17,971	3
N. of 34°27'	790.2	1,489,834	15	379.1	642,180	6	10.1	17,971	3
S. of 34°27'	0.0	0	0	0.0	0	0	0.0	0	0
Other thornyheads	20.5	31,470	7	7.3	10,622	3	0.0	0	0
COWCOD	0.0	11	1	0.0	0	0	0.0	0	0
DARKBLOTCHED	29.7	26,106	28	121.2	79,231	9	4.9	3,995	10
YELLOWEYE	3.0	2,915	17	20.2	14,878	6	1.8	1,479	8
Black Rockfish - coastwide	11.3	12,314	6	2.3	1,717	2	0.0	9	4
Black Rockfish (WA)	0.0	0	0	0.0	0	0	0.0	9	4
Black Rockfish (OR-CA)	11.3	12,314	6	2.3	1,717	2	0.0	0	0
Minor Rockfish North	44.7	33,132	31	255.4	164,898	14	57.7	47,024	10
Nearshore Species	0.2	377	1	0.0	0	0	0.0	0	0
Shelf Species	26.0	21,634	30	108.7	69,842	12	35.5	29,236	10
BOCACCIO: N. of Monterrey	0.6	531	7	20.9	14,812	7	10.7	8,631	9
Chilipepper Rockfish: Eureka	8.1	6,648	11	2.1	1,612	2	0.0	0	1
Redstripe Rockfish	0.6	379	5	36.9	20,944	8	8.2	7,011	10
Silvergrey Rockfish	0.0	0	0	17.6	12,997	6	11.9	9,857	9
Other Northern Shelf Rockfish	16.7	14,076	27	31.2	19,477	12	4.7	3,737	10
Slope Species	18.4	11,121	12	146.7	95,056	10	22.2	17,788	10
Bank Rockfish	0.5	500	6	3.0	2,012	5	0.0	0	0
Sharpchin Rockfish, north	6.7	3,682	8	27.8	16,126	8	5.8	4,628	9
Splitnose Rockfish: N. of Monterrey	6.2	3,660	9	20.7	13,271	8	1.3	979	10
Yellowmouth Rockfish	0.0	0	0	65.7	42,493	6	2.2	1,800	6
Other Northern Slope Rockfish	5.0	3,279	9	29.5	21,154	10	12.9	10,381	10
Minor Rockfish South	295.1	276,238	46	0.0	0	0	0.0	0	0
Nearshore Species	2.4	2,293	10	0.0	0	0	0.0	0	0
Shelf Species	63.4	75,870	44	0.0	0	0	0.0	0	0
Redstripe Rockfish	0.1	64	3	0.0	0	0	0.0	0	0
Yellowtail Rockfish	8.4	7,243	14	0.0	0	0	0.0	0	0
Other Southern Shelf Rockfish	54.9	68,563	42	0.0	0	0	0.0	0	0
Slope Species	229.3	198,075	30	0.0	0	0	0.0	0	0
Bank Rockfish	47.0	44,792	22	0.0	0	0	0.0	0	0
Blackgill Rockfish	130.3	127,441	27	0.0	0	0	0.0	0	0
Sharpchin Rockfish	0.5	392	11	0.0	0	0	0.0	0	0
Yellowmouth Rockfish	0.0	0	0	0.0	0	0	0.0	0	0
Other Southern Slope Rockfish	51.5	25,450	21	0.0	0	0	0.0	0	0
California scorpionfish	0.2	548	3	0.0	0	0	0.0	0	0
Cabezon (off CA only)	0.0	77	1	0.0	0	0	0.0	0	0
Dover Sole	2,397.8	1,662,866	19	882.0	588,481	8	239.8	191,455	7
Dover Sole (summer)	1,241.1	870,314	15	501.1	340,584	7	117.6	94,732	6
Dover Sole (winter)	1,156.7	792,552	14	380.9	247,897	6	122.2	96,723	5
English Sole	88.4	75,238	33	73.8	53,658	10	195.5	162,870	7

Table 1-26. Continued.

Species	California			Oregon			Washington		
	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.
Petrale Sole (coastwide)	169.1	371,411	45	147.8	280,866	14	63.2	135,843	9
N of 40°10' summer	46.1	92,022	8	69.0	135,425	11	30.2	64,353	6
N of 40°10' winter	31.6	61,239	8	78.8	145,441	9	33.0	71,490	8
S of 40°10' summer	34.8	81,263	23	0.0	0	0	0.0	0	0
S of 40°10' winter	56.6	136,887	28	0.0	0	0	0.0	0	0
Arrowtooth Flounder	28.2	6,496	4	160.5	39,939	6	131.2	27,396	4
Arrowtooth Flounder summer	24.2	5,521	3	116.5	30,035	5	92.3	19,071	4
Arrowtooth Flounder winter	4.0	975	2	44.0	9,904	5	38.9	8,325	2
Starry Flounder	0.0	10	1	3.4	2,462	5	11.5	7,349	4
Other Flatfish	549.7	466,084	47	120.9	91,352	13	18.6	18,366	7
Kelp Greenling	0.2	108	3	0.0	0	0	0.0	0	0
Spiny Dogfish	0.5	108	3	0.0	0	0	9.3	2,152	3
Other (Ground) Fish	72.8	22,075	18	33.2	9,944	6	0.0	0	0
Pink shrimp	0.0	0	0	0.0	0	0	0.0	0	0
Other shrimp	0.0	0	0	0.0	0	0	0.0	0	0
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	4.0	47,004	14	0.0	0	0	0.0	0	0
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.0	0	0
PACIFIC HALIBUT	0.0	0	0	0.0	192	1	0.0	0	0
CALIFORNIA HALIBUT	14.0	58,950	26	0.0	63	2	0.0	0	0
SALMON	0.0	0	0	0.0	0	0	0.0	0	0
UNSP. SEA CUCUMBERS	0.0	0	0	0.0	0	0	0.0	0	0
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.0	0	0	0.0	0	0	0.0	0	0
CA Gillnet complex	76.7	39,740	18	30.5	10,166	3	112.1	20,704	5
Squid	0.0	5	1	0.0	0	0	0.0	0	0
COASTAL PELAGIC SPP	0.1	17	1	0.8	51	1	0.0	0	0
Highly Migratory spp	0.4	598	3	0.0	0	0	0.0	0	0
Dungeness crab	1.0	4,345	4	0.0	0	0	0.0	0	0
Other crab	0.1	170	3	0.0	0	0	0.0	0	0
Clams & Mussels	0.0	29	2	0.0	0	0	0.0	0	0
Other Spp	13.2	11,131	26	0.2	252	4	0.3	297	3
Nearshore groundfish spp	101.2	100,971	42	123.5	103,729	15	112.7	110,836	9
Shelf groundfish spp	2,415.7	2,002,339	66	1,378.2	1,015,987	17	1,218.2	1,010,009	10
Slope groundfish spp	3,204.6	3,834,085	53	2,459.3	2,348,888	14	405.7	358,969	10
Dover sole, thornyheads, sablefish complex	4,240.6	5,230,598	36	1,861.7	2,371,216	11	312.2	359,776	10
Total (for all groundfish species)	**6,970.8**	**7,711,664**		**4,511.0**	**4,350,934**		**1,797.6**	**1,617,356**	
Total (for all species)	**7,080.5**	**7,873,794**	**77**	**4,542.6**	**4,361,658**	**19**	**1,910.0**	**1,638,357**	**11**
All Companies - Total (for all species)	**133,999**	**148,778,066**	**134**	**170,425**	**178,306,249**	**38**	**61,366**	**49,441,957**	**28**

Table 1-27. Companies receiving nonwhiting sector landings with fewer than 3 years greater than 6 mt during 1998-2003 (Quantity (in MT) and raw product cost (RPC) by species, 1994-2003 receipts).

	California			Oregon			Washington		
Species	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**
Lingcod - coastwide	220.2	225,222	67	644.8	548,480	22	349.0	319,621	15
N. of 42° (OR & WA)	0.0	0	0	644.8	548,480	22	349.0	319,621	15
S. of 42° (CA)	220.2	225,222	67	0.0	0	0	0.0	0	0
Pacific Cod	0.0	9	2	67.4	54,002	9	1,442.4	1,241,595	16
Pacific Whiting (Coastwide)	3.2	564	7	19.3	2,098	5	0.0	0	0
Sablefish (Coastwide)	1,312.7	2,530,848	60	1,320.6	2,995,574	15	458.3	1,218,123	15
N. of 36° (Monterey north)	561.9	1,271,181	54	1,320.6	2,995,574	15	458.3	1,218,123	15
S. of 36° (Conception area)	750.8	1,259,667	20	0.0	0	0	0.0	0	0
PACIFIC OCEAN PERCH	0.8	758	12	445.4	321,986	17	275.8	206,335	15
Shortbelly Rockfish	3.3	2,109	17	4.7	2,078	8	0.0	9	1
WIDOW ROCKFISH	630.8	500,902	45	3,574.8	2,501,447	13	1,088.7	755,840	15
CANARY ROCKFISH	85.5	94,465	52	506.3	382,308	17	150.9	113,374	15
Chilipepper Rockfish	1,356.6	1,341,844	61	0.0	0	0	0.0	0	0
BOCACCIO	496.1	387,053	51	0.0	0	0	0.0	0	0
Splitnose Rockfish	744.6	400,172	59	0.0	0	0	0.0	0	0
Yellowtail Rockfish	71.3	55,677	11	2,088.5	1,594,482	16	2,030.0	1,615,626	15
Shortspine Thornyhead - coastwide	1,002.2	1,828,060	46	597.6	1,159,101	14	226.7	386,703	14
N. of 34°27'	117.2	253,273	10	597.6	1,159,072	14	226.7	386,703	14
S. of 34°27'	885.0	1,574,787	39	0.0	29	1	0.0	0	0
Longspine Thornyhead - coastwide	1,694.8	3,093,440	38	1,242.3	2,079,273	12	136.1	223,436	8
N. of 34°27'	1,694.3	3,093,340	37	1,242.3	2,079,273	12	136.1	223,436	8
S. of 34°27'	0.5	100	1	0.0	0	0	0.0	0	0
Other thornyheads	31.0	53,758	17	43.1	61,994	5	0.0	0	0
COWCOD	0.0	20	2	0.0	0	0	0.0	0	0
DARKBLOTCHED	76.1	70,931	58	449.5	312,392	18	22.1	16,523	15
YELLOWEYE	8.5	8,619	35	104.4	76,572	12	6.2	4,564	12
Black Rockfish - coastwide	11.5	12,587	10	16.6	11,969	5	1.9	1,318	6
Black Rockfish (WA)	0.0	0	0	0.0	0	0	1.9	1,318	6
Black Rockfish (OR-CA)	11.5	12,587	10	16.6	11,969	5	0.0	0	0
Minor Rockfish North	58.1	49,063	57	1,175.2	779,846	23	324.2	245,954	15
Nearshore Species	0.2	385	2	0.0	0	0	0.0	6	1
Shelf Species	38.9	36,955	55	593.8	387,111	20	234.8	176,947	15
BOCACCIO: N. of Monterey	0.8	627	8	95.3	69,111	12	34.7	26,602	13
Chilipepper Rockfish: Eureka	8.7	7,407	15	3.1	2,262	6	0.0	0	2
Redstripe Rockfish	0.7	515	7	197.3	113,053	13	28.0	21,885	15
Silvergrey Rockfish	0.0	0	0	83.2	59,864	11	59.5	45,350	13
Other Northern Shelf Rockfish	28.6	28,406	52	214.8	142,821	20	112.6	83,110	15
Slope Species	19.0	11,723	16	581.4	392,735	19	89.3	69,001	15
Bank Rockfish	0.5	504	7	11.7	7,845	10	0.0	0	0
Sharpchin Rockfish, north	6.7	3,687	10	143.1	85,479	15	18.9	13,920	13
Splitnose Rockfish: N. of Monterrey	6.6	4,005	12	79.8	52,449	16	4.2	3,032	13
Yellowmouth Rockfish	0.0	0	0	207.5	144,918	11	14.3	10,650	10
Other Northern Slope Rockfish	5.2	3,527	13	139.4	102,044	19	51.9	41,399	15
Minor Rockfish South	1,272.7	1,203,201	81	0.2	166	3	0.0	0	0
Nearshore Species	8.4	8,970	22	0.0	0	0	0.0	0	0
Shelf Species	189.7	218,789	79	0.0	30	1	0.0	0	0
Redstripe Rockfish	0.1	64	3	0.0	0	0	0.0	0	0
Yellowtail Rockfish	37.2	34,178	32	0.0	30	1	0.0	0	0
Other Southern Shelf Rockfish	152.3	184,547	76	0.0	0	0	0.0	0	0
Slope Species	1,074.6	975,442	62	0.1	136	3	0.0	0	0
Bank Rockfish	531.7	514,136	52	0.0	0	0	0.0	0	0
Blackgill Rockfish	371.5	355,048	57	0.0	0	0	0.0	0	0
Sharpchin Rockfish	4.0	3,591	26	0.0	0	0	0.0	0	0
Yellowmouth Rockfish	0.1	116	1	0.0	0	0	0.0	0	0
Other Southern Slope Rockfish	167.2	102,551	52	0.1	136	3	0.0	0	0
California scorpionfish	0.2	548	3	0.0	0	0	0.0	0	0
Cabezon (off CA only)	2.7	1,885	2	0.0	0	0	0.0	0	0
Dover Sole	6,002.3	4,140,348	51	2,942.3	2,004,234	16	1,456.2	1,031,331	13
Dover Sole (summer)	3,129.5	2,158,529	43	1,639.4	1,118,449	12	710.8	499,623	12
Dover Sole (winter)	2,872.8	1,981,819	40	1,302.9	885,785	14	745.4	531,708	11
English Sole	362.6	313,779	64	291.4	211,884	18	725.9	534,135	13

Table 1-27. Continued.

Species	California RWT	California RPC	California # of Co.	Oregon RWT	Oregon RPC	Oregon # of Co.	Washington RWT	Washington RPC	Washington # of Co.
Petrale Sole (coastwide)	574.2	1,265,091	79	577.7	1,243,359	23	451.8	937,058	15
N of 40°10' summer	55.7	112,564	12	208.7	444,110	17	252.9	520,483	11
N of 40°10' winter	34.3	66,552	11	369.0	799,229	18	198.8	416,575	14
S of 40°10' summer	209.9	460,086	55	0.0	14	2	0.0	0	0
S of 40°10' winter	274.3	625,889	58	0.0	6	1	0.0	0	0
Arrowtooth Flounder	29.5	7,495	9	793.4	175,781	13	522.1	110,085	9
Arrowtooth Flounder summer	24.8	5,768	8	647.6	142,999	10	387.3	80,191	9
Arrowtooth Flounder winter	4.8	1,727	4	145.8	32,782	11	134.8	29,894	7
Starry Flounder	2.8	3,731	7	30.7	22,292	11	24.0	13,389	7
Other Flatfish	1,204.3	1,050,223	82	657.6	609,418	20	172.3	131,070	13
Kelp Greenling	0.2	282	6	0.0	5	1	0.0	0	0
Spiny Dogfish	3.5	1,786	7	1.0	275	1	56.1	14,522	6
Other (Ground) Fish	123.7	43,625	39	100.0	30,556	10	0.1	97	2
Pink shrimp	0.0	0	0	0.0	0	0	0.0	0	0
Other shrimp	0.1	684	1	0.0	0	0	0.0	0	0
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	12.0	151,132	29	0.0	0	0	0.0	0	0
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.0	0	0
PACIFIC HALIBUT	0.0	0	0	0.1	335	3	0.0	0	0
CALIFORNIA HALIBUT	89.9	459,010	51	0.2	708	6	0.0	0	0
SALMON	0.0	0	0	0.0	0	0	0.0	0	0
UNSP. SEA CUCUMBERS	0.0	0	0	0.0	0	0	0.0	0	0
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.0	18	1	0.0	0	0	0.0	0	0
CA Gillnet complex	125.3	68,696	41	186.2	70,826	9	301.6	51,582	11
Squid	0.0	35	5	0.0	0	0	0.0	0	0
COASTAL PELAGIC SPP	0.7	446	7	4.2	656	2	0.0	0	0
Highly Migratory spp	0.5	726	6	0.1	193	1	0.1	120	1
Dungeness crab	1.0	4,360	5	0.0	0	0	0.0	0	0
Other crab	0.1	170	3	0.0	0	0	0.0	0	0
Clams & Mussels	0.0	32	3	0.0	0	0	0.0	0	0
Other Spp	23.5	22,733	50	8.7	6,542	11	3.0	1,428	5
Nearshore groundfish spp	246.2	253,610	74	692.1	582,746	22	374.9	334,334	15
Shelf groundfish spp	6,032.5	5,195,943	103	6,148.5	4,412,236	26	5,997.4	4,801,060	18
Slope groundfish spp	8,463.4	9,613,282	88	8,756.9	8,548,944	23	2,917.8	2,636,024	17
Dover sole, thornyheads, sablefish complex	10,043.0	11,646,454	70	6,146.0	8,300,176	20	2,277.4	2,859,593	16
Total (for all groundfish species)	**17,386.0**	**18,688,095**		**17,695.1**	**17,181,572**		**9,920.9**	**9,120,708**	
Total (for all species)	**17,639.3**	**19,396,278**	**114**	**17,894.5**	**17,260,832**	**28**	**10,225.5**	**9,173,838**	**19**
All Companies - Total (for all species)	**133,999**	**148,778,066**	**134**	**170,425**	**178,306,249**	**38**	**61,366**	**49,441,957**	**28**

Table 1-28. Shoreside nonwhiting companies receiveing less than 1 mt of groundfish during 1994-2003 (Quantity (in MT) and Raw Product Cost (RPC) by Species, 1994-2003 Receipts).

	California			Oregon			Washington			COMBINED		
Species	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.
Lingcod - coastwide	0.2	483	10	1.2	3,141	8	1.5	11	1	1.5	3,635	19
N. of 42° (OR & WA)	0.0	0	0	1.2	3,141	8	1.2	11	1	1.2	3,152	9
S. of 42° (CA)	0.2	483	10	0.0	0	0	0.2	0	0	0.2	483	10
Pacific Cod	0.0	0	0	0.0	0	0	0.1	87	2	0.1	87	2
Pacific Whiting (Coastwide)	0.0	16	1	0.0	0	0	0.0	0	0	0.0	16	1
Sablefish (Coastwide)	0.5	967	8	0.0	13	2	0.6	187	1	0.6	1,167	11
N. of 36° (Monterey north)	0.4	915	7	0.0	13	2	0.6	187	1	0.6	1,115	10
S. of 36° (Conception area)	0.0	52	1	0.0	0	0	0.0	0	0	0.0	52	1
PACIFIC OCEAN PERCH	0.0	11	3	0.1	175	2	0.1	4	2	0.1	190	7
Shortbelly Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
WIDOW ROCKFISH	0.8	1,326	2	0.0	5	2	0.8	0	1	0.8	1,331	5
CANARY ROCKFISH	0.6	690	9	0.2	283	4	0.8	2	1	0.8	975	14
Chilipepper Rockfish	0.7	819	11	0.0	0	0	0.7	0	0	0.7	819	11
BOCACCIO	0.0	2	5	0.0	0	0	0.0	0	0	0.0	2	5
Splitnose Rockfish	0.3	484	11	0.0	0	0	0.3	0	0	0.3	484	11
Yellowtail Rockfish	0.1	94	1	0.1	85	3	0.2	8	1	0.2	187	5
Shortspine Thornyhead - coastwide	0.0	28	4	0.0	5	2	0.1	82	1	0.1	115	7
N. of 34°27'	0.0	24	1	0.0	5	2	0.1	82	1	0.1	111	4
S. of 34°27'	0.0	4	3	0.0	0	0	0.0	0	0	0.0	4	3
Longspine Thornyhead - coastwide	0.0	1	1	0.0	0	0	0.0	0	0	0.0	1	1
N. of 34°27'	0.0	1	1	0.0	0	0	0.0	0	0	0.0	1	1
S. of 34°27'	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other thornyheads	0.0	40	1	0.0	0	0	0.0	0	0	0.0	40	1
COWCOD	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
DARKBLOTCHED	0.2	166	9	0.0	36	3	0.2	10	2	0.2	212	14
YELLOWEYE	0.1	173	5	0.0	0	0	0.1	22	2	0.1	195	7
Black Rockfish - coastwide	0.4	803	1	0.0	13	1	0.4	0	0	0.4	816	2
Black Rockfish (WA)	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Black Rockfish (OR-CA)	0.4	803	1	0.0	13	1	0.4	0	0	0.4	816	2
Minor Rockfish North	1.0	1,301	11	0.4	562	7	2.1	578	2	2.1	2,441	20
Nearshore Species	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Shelf Species	0.6	964	10	0.1	83	5	1.2	450	2	1.2	1,497	17
BOCACCIO: N. of Monterey	0.0	23	3	0.0	2	1	0.1	53	2	0.1	78	6
Chilipepper Rockfish: Eureka	0.4	751	3	0.0	0	0	0.4	0	0	0.4	751	3
Redstripe Rockfish	0.0	5	1	0.0	1	2	0.0	23	2	0.0	29	5
Silvergrey Rockfish	0.0	0	0	0.0	1	1	0.3	235	2	0.3	236	3
Other Northern Shelf Rockfish	0.1	185	8	0.1	79	5	0.4	139	2	0.4	403	15
Slope Species	0.4	337	4	0.3	479	4	0.9	128	2	0.9	944	10
Bank Rockfish	0.0	2	2	0.0	0	0	0.0	0	0	0.0	2	2
Sharpchin Rockfish, north	0.0	15	2	0.0	5	2	0.0	4	2	0.0	24	6
Splitnose Rockfish: N. of Monterey	0.2	143	3	0.0	24	2	0.2	3	2	0.2	170	7
Yellowmouth Rockfish	0.0	0	0	0.1	150	1	0.1	0	1	0.1	150	2
Other Northern Slope Rockfish	0.2	177	4	0.2	300	4	0.6	121	2	0.6	598	10
Minor Rockfish South	1.5	2,062	24	0.0	0	0	1.5	0	0	1.5	2,062	24
Nearshore Species	0.0	13	2	0.0	0	0	0.0	0	0	0.0	13	2
Shelf Species	1.0	1,260	22	0.0	0	0	1.0	0	0	1.0	1,260	22
Redstripe Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Yellowtail Rockfish	0.3	324	4	0.0	0	0	0.3	0	0	0.3	324	4
Other Southern Shelf Rockfish	0.7	936	20	0.0	0	0	0.7	0	0	0.7	936	20
Slope Species	0.5	789	11	0.0	0	0	0.5	0	0	0.5	789	11
Bank Rockfish	0.2	214	6	0.0	0	0	0.2	0	0	0.2	214	6
Blackgill Rockfish	0.2	427	9	0.0	0	0	0.2	0	0	0.2	427	9
Sharpchin Rockfish	0.0	0	2	0.0	0	0	0.0	0	0	0.0	0	2
Yellowmouth Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other Southern Slope Rockfish	0.1	148	7	0.0	0	0	0.1	0	0	0.1	148	7
California scorpionfish	0.2	548	3	0.0	0	0	0.2	0	0	0.2	548	3
Cabezon (off CA only)	0.0	77	1	0.0	0	0	0.0	0	0	0.0	77	1
Dover Sole	0.0	0	0	0.1	91	2	0.1	0	0	0.1	91	2
Dover Sole (summer)	0.0	0	0	0.1	91	2	0.1	0	0	0.1	91	2
Dover Sole (winter)	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
English Sole	0.3	377	9	0.1	119	4	0.4	0	0	0.4	496	13

	California			Oregon			Washington			COMBINED		
Species	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**
Table 1-28. Continued.												
	California			**Oregon**			**Washington**			**COMBINED**		
Species	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**
Petrale Sole (coastwide)	1.1	2,925	19	0.3	430	6	1.5	264	1	1.5	3,619	26
N of 40°10' summer	0.1	124	1	0.2	292	5	0.4	264	1	0.4	680	7
N of 40°10' winter	0.4	940	2	0.1	138	2	0.5	0	0	0.5	1,078	4
S of 40°10' summer	0.2	405	6	0.0	0	0	0.2	0	0	0.2	405	6
S of 40°10' winter	0.5	1,456	12	0.0	0	0	0.5	0	0	0.5	1,456	12
Arrowtooth Flounder	0.0	0	0	0.0	29	1	0.0	0	0	0.0	29	1
Arrowtooth Flounder summer	0.0	0	0	0.0	29	1	0.0	0	0	0.0	29	1
Arrowtooth Flounder winter	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Starry Flounder	0.0	0	0	0.0	24	2	0.0	0	0	0.0	24	2
Other Flatfish	3.2	4,496	20	0.3	468	5	3.4	0	0	3.4	4,964	25
Kelp Greenling	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Spiny Dogfish	0.0	22	1	0.0	0	0	0.0	0	0	0.0	22	1
Other (Ground) Fish	0.0	47	5	0.0	124	1	0.1	0	0	0.1	171	6
Pink shrimp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other shrimp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	0.3	5,135	6	0.0	0	0	0.3	0	0	0.3	5,135	6
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.1	0	0	0.1	141	2
PACIFIC HALIBUT	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA HALIBUT	0.7	4,105	10	0.0	50	1	0.7	0	0	0.7	4,155	11
SALMON	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
UNSP. SEA CUCUMBERS	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CA Gillnet complex	0.0	16	2	0.0	0	0	0.0	0	0	0.0	16	2
Squid	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
COASTAL PELAGIC SPP	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Highly Migratory spp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Dungeness crab	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other crab	0.0	6	1	0.0	0	0	0.0	0	0	0.0	6	1
Clams & Mussels	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other Spp	0.1	150	6	0.0	42	1	0.1	0	0	0.1	192	7
Nearshore groundfish spp	0.9	1,924	16	1.2	3,178	8	2.1	11	1	2.1	5,113	25
Shelf groundfish spp	3.5	4,930	38	0.9	982	9	5.2	833	2	5.2	6,745	49
Slope groundfish spp	3.1	5,578	28	0.5	838	6	3.8	224	2	3.8	6,640	36
Dover sole, thornyheads, sablefish complex	0.5	1,036	12	0.1	109	4	0.8	269	2	0.8	1,414	18
Total (for all groundfish species)	**11.2**	**17,958.0**		**2.9**	**5,603.0**		**15.3**	**1,255.0**		**15.3**	**24,816.0**	
Total (for all species)	**12.4**	**27,511**	**49**	**2.9**	**5,695**	**10**	**1.2**	**1,255**	**3**	**16.5**	**34,461**	**62**
All Companies - Total (for all species)	**133,999**	**148,778,066**	**134**	**170,425**	**178,306,249**	**38**	**61,366**	**49,441,957**	**28**	**365,790**	**376,526,272**	**200**

Table 1-29. Mothership company IFQ recent participation analysis, years of activity.

MS Companies with Some Activity 1994-2006

■ = Active   □ = Not Active

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MS Co 01	■	■	■	■	■	■	■	■	■	■	■	■	■
MS Co 02	■	■	■	■	■	■	■	■	■	■	■	■	■
MS Co 03	■	■											
MS Co 04													■
MS Co 05	■	■	■	■	■	■	■	■				■	■
MS Co 06	■												
MS Co 07	■	■	■	■	■	■	■	■	■	■	■	■	■
Total number ac	6	5	4	4	4	4	4	4	3	3	3	4	5
Minimum annua	2,832	1,507	5,552	6,938	7,892	6,619	6,103	6,571	7,945	7,069	7,237	5,607	1,751
Average annual	9,534	6,196	11,749	12,313	12,593	12,032	10,772	8,939	8,875	8,676	8,052	12,150	11,106

MS Companies with Some Activity During 2004-2006

■ = Active   □ = Not Active

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MS Co 01	■	■	■	■	■	■	■	■	■	■	■	■	■
MS Co 02	■	■	■	■	■	■	■	■	■	■	■	■	■
MS Co 04													■
MS Co 05	■	■	■	■	■	■	■	■				■	■
MS Co 07	■	■	■	■	■	■	■	■	■	■	■	■	■
Total number ac	4	4	4	4	4	4	4	4	3	3	3	4	5
Minimum annua	8,843	1,507	5,552	6,938	7,892	6,619	6,103	6,571	7,945	7,069	7,237	5,607	1,751
Average annual	12,318	6,804	11,749	12,313	12,593	12,032	10,772	8,939	8,875	8,676	8,052	12,150	11,106

Table 1-30. Number of years of activity for each mothership company, during the indicated period.

All MS Companies

MS Activity: number of years with activity during the period

	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
MS Co 01	5	6	2	8	6	7	5	3
MS Co 02	5	6	2	8	6	7	5	3
MS Co 03	2	0	0	0	0	0	0	0
MS Co 04	0	0	1	0	0	0	0	1
MS Co 05	5	3	2	5	4	4	3	2
MS Co 06	1	0	0	0	0	0	0	0
MS Co 07	5	6	2	8	6	7	5	3
Total number active in the period	6	4	5	4	4	4	4	5
Minimum mt for the period	5,098	35,171	1,751	58,508	42,199	51,146	34,306	1,751
Average mt for the period	39,134	50,944	20,826	75,850	57,498	63,537	44,906	25,657

Table 1-31. Mothership company by number of years meeting the indicated criteria and percent of total by those companies.

Count of MS by number of years with whiting catch >0 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	3	2	3	3	3	3	2
1	1	0	1	0	0	0	0	1
2	1	0	4	0	0	0	0	1
3	0	1		0	0	0	1	3
4	0	0		0	1	1	0	
5	4	0		1	0	0	3	
≥6		3		3	3	3		
Total number active in the period	6	4	5	4	4	4	4	5

Percent of '94-'03 catch history by MS with the indicated number of years of activity.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0.0%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
1	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	1.5%	0.0%	97.3%	0.0%	0.0%	0.0%	0.0%	21.6%
3	0.0%	21.6%		0.0%	0.0%	0.0%	21.6%	75.7%
4	0.0%	0.0%		0.0%	21.6%	21.6%	0.0%	
5	97.3%	0.0%		21.6%	0.0%	0.0%	75.7%	
≥6		75.7%		75.7%	75.7%	75.7%		

Count of MS by number of years with whiting catch >1,000 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	3	2	3	3	3	3	2
1	1	0	1	0	0	0	0	1
2	1	0	4	0	0	0	0	1
3	0	1		0	0	0	1	3
4	0	0		0	1	1	0	
5	4	0		1	0	0	3	
≥6		3		3	3	3		
Total number active in the period	6	4	5	4	4	4	4	5

Percent of '94-'03 catch history represented by MS with at least 1,000 mt during each of the indicated number of years during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0.0%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
1	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	1.5%	0.0%	97.3%	0.0%	0.0%	0.0%	0.0%	21.6%
3	0.0%	21.6%		0.0%	0.0%	0.0%	21.6%	75.7%
4	0.0%	0.0%		0.0%	21.6%	21.6%	0.0%	
5	97.3%	0.0%		21.6%	0.0%	0.0%	75.7%	
≥6		75.7%		75.7%	75.7%	75.7%		

Table 1-31. Continued.

Number of Years	Count of MS by number of years with whiting catch >2,000 mt during the period								Percent of '94-'03 catch history represented by MS with at least 2,000 mt during each of the indicated number of years during the period							
	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	3	3	3	3	3	3	3	0.0%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
1	1	0	0	0	0	0	0	0	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	1	0	4	0	0	0	0	1	1.5%	0.0%	97.3%	0.0%	0.0%	0.0%	0.0%	21.6%
3	0	1		0	0	0	1	3	0.0%	21.6%		0.0%	0.0%	0.0%	21.6%	75.7%
4	1	0		0	1	1	0		17.2%	0.0%		0.0%	21.6%	21.6%	0.0%	
5	3	0		1	0	0	3		80.1%	0.0%		21.6%	0.0%	0.0%	75.7%	
≥6		3		3	3	3				75.7%		75.7%	75.7%	75.7%		
Total number with at least one year >2,000 mt.	6	4	4	4	4	4	4	4								

Number of Years	Count of MS by number of years with whiting catch >5,000 mt during the period								Percent of '94-'03 catch history represented by MS with at least 5,000 mt during each of the indicated number of years during the period							
	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	2	3	3	3	3	3	3	3	1.5%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
1	1	0	0	0	0	0	0	0	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0	0	4	0	0	0	0	1	0.0%	0.0%	97.3%	0.0%	0.0%	0.0%	0.0%	21.6%
3	0	1		0	0	0	1	3	0.0%	21.6%		0.0%	0.0%	0.0%	21.6%	75.7%
4	2	0		0	1	1	0		44.4%	0.0%		0.0%	21.6%	21.6%	0.0%	
5	2	0		1	0	0	3		52.9%	0.0%		21.6%	0.0%	0.0%	75.7%	
≥6		3		3	3	3				75.7%		75.7%	75.7%	75.7%		
Total number with at least one year >5,000 mt.	5	4	4	4	4	4	4	4								

Number of Years	Count of MS by number of years with whiting catch >10,000 mt during the period								Percent of '94-'03 catch history represented by MS with at least 10,000 mt during each of the indicated number of years during the period							
	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	4	4	3	4	4	4	4	3	19.9%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
1	0	0	2	0	0	0	0	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0	2	2	0	0	0	2	2	0.0%	0.0%	97.3%	0.0%	0.0%	0.0%	0.0%	21.6%
3	1	1		0	2	2	1		21.6%	21.6%		0.0%	0.0%	0.0%	21.6%	75.7%
4	1	0		2	1	1	0		27.3%	0.0%		0.0%	21.6%	21.6%	0.0%	
5	1	0		1	0	0	0		31.3%	0.0%		21.6%	0.0%	0.0%	75.7%	
≥6		0		0	0	0				75.7%		75.7%	75.7%	75.7%		
Total number with at least one year >10,000 mt.	3	3	4	3	3	3	3	4								

Table 1-32. Mothership company by total metric tons of deliveries received over the indicated period.

Count of MS by total MT category during the period

MT range	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	3	2	3	3	3	3	2
>0 and <=100	0	0	0	0	0	0	0	0
>100 and <=500	0	0	0	0	0	0	0	0
>500 and <=1,000	0	0	0	0	0	0	0	0
>1,000 and <=5,000	0	0	1	0	0	0	0	1
>5,000 and <=10,000	2	0	0	0	0	0	0	0
>10,000 and <=20,000	0	0	1	0	0	0	0	1
>20,000 and <=30,000	0	0	3	0	0	0	0	0
>30,000	4	4	0	4	4	4	4	3

Table 1-33. Mothership co-op permit qualification analysis, years of activity.

Mothership Co-op Recent Participation Analysis ■ = Active □ = Not Active

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MS01	X	X	X	X	X	X	X	X				X	X
MS02	X												
MS03	X												
MS04	X	X	X	X	X	X	X	X	X	X	X	X	X
MS05													X
MS06	X												
MS07			X										
MS08	X	X	X	X	X	X	X						
MS09	X	X	X	X	X	X	X	X	X	X	X	X	X
MS10	X	X	X	X	X	X	X	X	X	X	X	X	X
MS11		X											
MS12			X										
MS13	X	X											
MS14	X	X	X	X	X	X	X	X	X	X	X	X	X
Total number active in the period	10	8	8	6	6	6	6	5	4	4	4	5	6
Minimum annual mt for the period	66	464	98	5,271	4,257	4,560	4,548	489	805	1,023	264	4,708	1,749
Average annual mt for the period	5,680	3,787	5,797	8,152	8,278	7,928	7,104	7,117	6,648	6,505	6,025	9,695	9,226

Table 1-34. Number of years of activity for each mothership during the indicated period.

Count of MS by number of years with whiting catch >0 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	8	8	8	8	8	8	8
1	6	0	1	0	0	0	0	1
2	1	1	5	0	0	0	1	1
3	0	1		0	1	1	1	4
4	0	0		1	1	1	0	
5	6	0		1	0	0	4	
≥6		4		4	4	4		
Total number active in the period	13	6	6	6	6	6	6	6
Minimum mt for the period	66	10,610	1,749	21,991	16,720	16,720	10,610	1,749
Average mt for the period	17,850	33,749	17,305	50,178	38,009	42,026	29,732	21,322

Table 1-35. Counts of number of motherships and share of total history by number of years in which the vessel met the indicated criteria.

Percent of '94-'04 catch history by MS with the indicated number of years of activity.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0.0%	4.6%	13.6%	4.6%	4.6%	4.6%	4.6%	13.6%
1	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	1.4%	9.0%	86.4%	0.0%	0.0%	0.0%	9.0%	21.6%
3	0.0%	21.6%		0.0%	9.0%	9.0%	21.6%	64.8%
4	0.0%	0.0%		9.0%	21.6%	21.6%	0.0%	
5	95.4%	0.0%		21.6%	0.0%	0.0%	64.8%	
≥6		64.8%		64.8%	64.8%	64.8%		

Count of MS by number of years with whiting catch >500 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	5	8	8	8	8	8	8	8
1	2	0	1	0	0	0	0	1
2	1	1	5	0	0	0	1	2
3	0	1		0	1	1	1	3
4	0	1		1	1	1	1	
5	6	0		1	1	1	3	
≥6		3		4	3	3		
Total number with at least one year >500 mt.	9	6	6	6	6	6	6	6

Count of MS by number of years with whiting catch >1,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	5	8	8	8	8	8	8	8
1	2	0	1	0	0	0	0	1
2	1	1	5	0	0	0	1	2
3	0	2		0	1	1	2	3
4	0	0		1	2	2	0	
5	6	0		2	0	0	3	
≥6		3		3	3	3		
Total number with at least one year >1,000 mt.	9	6	6	6	6	6	6	6

Count of MS by number of years with whiting catch >1,500 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	5	8	8	8	8	8	8	8
1	2	0	1	0	0	0	0	1
2	1	2	5	0	0	0	2	2
3	0	1		0	2	2	1	3
4	0	0		2	1	1	0	
5	6	0		1	0	0	3	
≥6		3		3	3	3		
Total number with at least one year >1,500 mt.	9	6	6	6	6	6	6	6

Table 1-35. Continued.

Count of MS by number of years with whiting catch >2,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	5	8	9	8	8	8	8	9
1	2	0	0	0	0	0	0	0
2	1	2	5	0	0	0	2	2
3	1	1		0	2	2	1	3
4	0	0		2	1	1	0	
5	5	0		1	0	0	3	
>6		3		3	3	3		
Total number with at least one year >2,000 mt.	9	6	5	6	6	6	6	5

Count of MS by number of years with whiting catch >5,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	6	8	9	8	8	8	8	9
1	2	1	1	0	0	0	1	0
2	1	1	4	0	1	1	1	3
3	2	1		1	2	1	2	2
4	1	1		1	1	2	0	
5	2	0		2	0	0	2	
>6		2		2	2	2		
Total number with at least one year >5,000 mt.	8	6	5	6	6	6	6	5

Count of MS by number of years with whiting catch >10,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	12	12	11	12	12	12	12	11
1	1	1	2	1	1	1	1	2
2	0	1	1	0	0	0	1	1
3	1	0		0	1	1	0	
4	0	0		1	0	0	0	
5	0	0		0	0	0	0	
>6		0		0	0	0		
Total number with at least one year >10,000 mt.	2	2	3	2	2	2	2	3

Table 1-36. Count of motherships by total metric tons of deliveries received over the indicated period.

MT range	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	8	8	8	8	8	8	8
>0 and <=100	2	0	0	0	0	0	0	0
>100 and <=500	2	0	0	0	0	0	0	0
>500 and <=1,000	0	0	0	0	0	0	0	0
>1,000 and <=5,000	0	0	1	0	0	0	0	1
>5,000 and <=10,000	3	0	0	0	0	0	0	0
>10,000 and <=20,000	0	2	3	0	1	1	2	2
>20,000 and <=30,000	4	0	2	1	1	1	0	1
>30,000	2	4	0	5	4	4	4	2

Table 1-37. MS with some Activity in 2004, 2005 or 2006 ■ = Active □ = Not Active

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MS01	■	■	■	■	■	■	■	■				■	■
MS04	■	■	■	■	■	■	■	■	■	■	■	■	■
MS05													■
MS09	■	■	■	■	■	■	■	■	■	■	■	■	■
MS10	■	■	■	■	■	■	■	■	■	■	■	■	■
MS14	■	■	■	■	■	■	■	■	■	■	■	■	■
Total number active in the period	5	5	5	5	5	5	5	5	4	4	4	5	6
Minimum annual mt for the period	1,944	1,503	4,930	5,638	4,257	4,560	4,653	489	805	1,023	264	4,708	1,749
Average annual mt for the period	6,599	4,460	8,231	8,728	8,711	8,301	7,615	7,117	6,648	6,505	6,025	9,695	9,226

Table 1-38. MS Activity: number of years with activity during the period

	'94-'98	'99-'04	'05-06	'97-'04	'98-'03	'98-'04	'99-'03	'04-'06
MS01	5	3	2	5	4	4	3	2
MS04	5	6	2	8	6	7	5	3
MS05	0	0	1	0	0	0	0	1
MS09	5	6	2	8	6	7	5	3
MS10	5	6	2	8	6	7	5	3
MS14	5	6	2	8	6	7	5	3
Total number active in the period	5	5	6	5	5	5	5	6
Minimum mt for the period	23,054	18,113	1,749	33,051	27,149	27,413	17,849	1,749
Average mt for the period	36,729	38,376	17,305	55,816	42,267	47,088	33,556	21,322

Table 1-39. Catcher-processor (CP) IFQ recent participation analysis, years of activity.

CP with Some Activity During 1994-2006 (■ = Active, □ = Not Active)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CP01	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
CP02	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
CP03	Active	Active	Active	Active	Active	Active	Not Active	Not Active	Not Active	Not Active	Not Active	Not Active	Active
CP04	Active	Active	Active	Active	Not Active	Active	Not Active	Active	Not Active	Active	Active	Active	Active
CP05	Active	Active	Active	Active	Active	Not Active	Active	Active	Active	Active	Active	Active	Active
CP06	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
CP07	Active	Active	Active	Active	Active	Not Active	Active	Active	Active	Active	Active	Active	Active
CP08	Active	Active	Active	Active	Active	Active	Active	Not Active	Not Active	Not Active	Not Active	Not Active	Active
CP09	Active	Active	Active	Active	Not Active	Not Active	Active	Active	Not Active	Not Active	Not Active	Not Active	Active
CP10	Active	Active	Active	Active	Not Active	Not Active	Not Active	Not Active	Not Active	Not Active	Not Active	Not Active	Not Active
Total number active in the period	10	10	10	10	7	6	7	7	5	6	6	6	9
Minimum annual mt for the period	2,087	1,932	4,577	3,459	4,618	3,815	673	1,510	3,626	3,471	5,288	6,492	4,028
Average annual mt for the period	9,401	6,307	6,588	7,081	10,053	11,279	8,347	8,375	7,268	6,869	12,196	13,148	8,763

Table 1-40 Counts of number of CPs and share of total history by number of years in which the vessel met the indicated criteria.

Count of CPs by number of years with whiting catch >0 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0	1	1	0	1	1	1	1
1	0	1	3	1	0	0	1	3
2	0	2	6	0	2	2	2	0
3	0	0		2	2	1	1	6
4	3	1		1	0	1	2	
5	7	2		1	2	0	3	
>6		3		5	3	5		
Total number active in the period	10	9	9	10	9	9	9	9
Minimum mt for the period	12,891	8,834	4,028	3,459	8,834	8,834	8,834	4,028
Average mt for the period	36,414	37,273	17,528	47,664	36,962	45,092	29,142	25,659

Percent of '94-'04 catch history by CPs with this number of years of activity.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0.0%	3.7%	3.7%	0.0%	3.7%	3.7%	3.7%	3.7%
1	0.0%	11.3%	26.4%	3.7%	0.0%	0.0%	11.3%	26.4%
2	0.0%	15.1%	69.9%	0.0%	15.9%	15.9%	15.1%	0.0%
3	0.0%	0.0%		15.9%	15.7%	10.6%	5.1%	69.9%
4	13.3%	5.1%		10.6%	0.0%	5.1%	29.9%	
5	86.7%	29.9%		5.1%	29.9%	0.0%	35.0%	
>6		35.0%		64.8%	35.0%	64.8%		

Count of CPs by number of years with whiting catch >5,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	1	1	2	1	2	1	2	2
1	0	3	2	1	2	2	3	2
2	0	2	6	2	1	2	2	0
3	3	1		1	2	1	2	6
4	0	2		1	2	1	1	
5	6	1		1	1	2	0	
>6		0		3	0	1		
Total number with at least one year >5,000 mt.	9	9	8	9	8	9	8	8

Percent of '94-'04 catch history represented by CPs with at least 5,000 mt during each of a number of years during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	5.1%	3.7%	14.2%	3.7%	10.4%	3.7%	10.4%	14.2%
1	0.0%	22.6%	15.9%	4.5%	9.6%	11.3%	20.9%	15.9%
2	0.0%	15.7%	69.9%	11.8%	11.3%	16.4%	22.3%	0.0%
3	14.9%	11.7%		11.3%	22.3%	10.6%	23.3%	69.9%
4	0.0%	23.3%		10.6%	23.3%	11.7%	23.1%	
5	80.0%	23.1%		11.7%	23.1%	23.3%	0.0%	
>6		0.0%		46.4%	0.0%	23.1%		

Table 1-41. CP by total metric tons of deliveries received over the indicated period.

Count of CPs by total MT category during the period

MT range	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
0	0	1	1	0	1	1	1	1
>0 and <=100	0	0	0	0	0	0	0	0
>100 and <=500	0	0	0	0	0	0	0	0
>500 and <=1,000	0	0	0	0	0	0	0	0
>1,000 and <=5,000	0	0	1	1	0	0	0	1
>5,000 and <=10,000	0	1	1	0	1	1	1	1
>10,000 and <=20,000	1	2	6	1	2	0	3	2
>20,000 and <=30,000	3	2	0	1	0	2	3	4
>30,000	6	4	1	7	6	6	2	1

Table 1-42. CP with some Activity in 2004, 2005 or 2006

■ = Active □ = Not Active

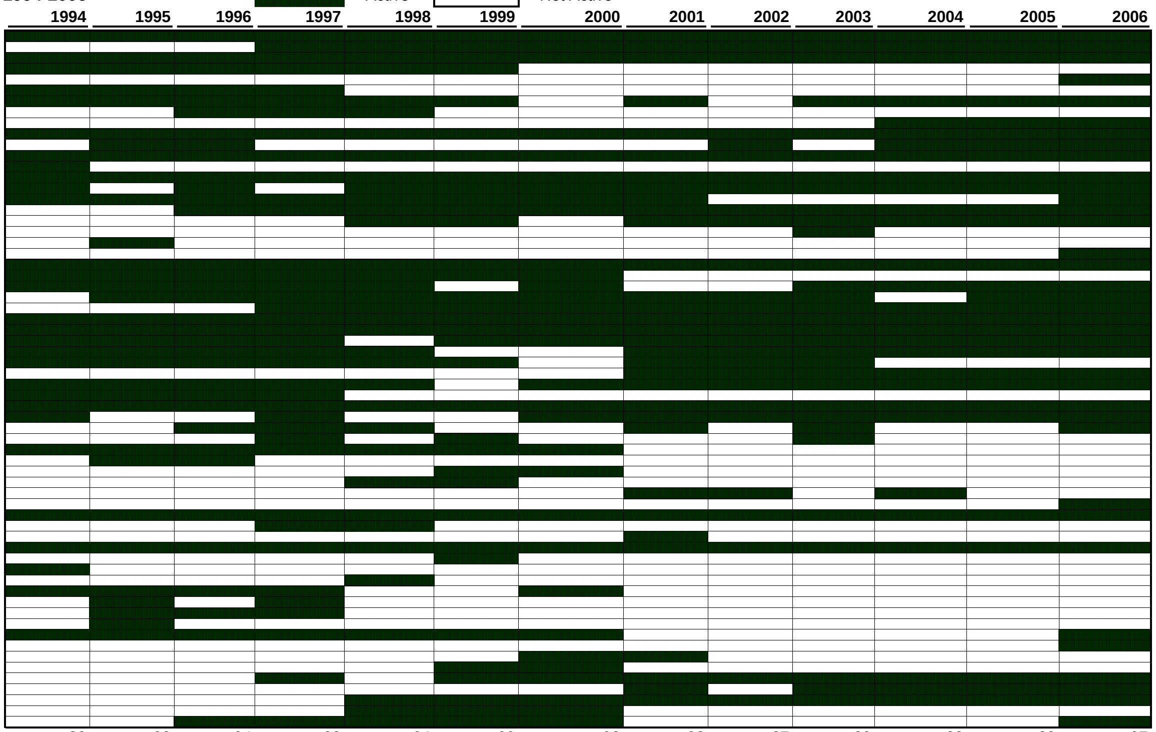
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CP01	■	■	■	■	■	■	■	■	■	■	■	■	■
CP02	■	■	■	■	■	■	■	■	■	■	■	■	■
CP03	■	■	■	■	■	■	□	□	□	□	□	□	■
CP04	■	■	■	■	□	■	□	■	□	■	■	■	■
CP05	■	■	■	■	■	□	■	■	■	■	■	■	■
CP06	■	■	■	■	■	■	■	■	■	■	■	■	■
CP07	■	■	■	■	■	□	■	■	■	■	■	■	■
CP08	■	■	■	■	■	■	■	□	□	□	□	□	■
CP09	■	■	■	■	□	□	■	■	□	□	□	□	■
CP10	□	□	□	□	□	□	□	□	□	□	□	□	□
Total number active in the period	9	9	9	9	7	6	7	7	5	6	6	6	9
Minimum annual mt for the period	2,087	1,932	4,577	3,503	4,618	3,815	673	1,510	3,626	3,471	5,288	6,492	4,028
Average annual mt for the period	9,389	6,209	6,713	7,483	10,053	11,279	8,347	8,375	7,268	6,869	12,196	13,148	8,763

Table 1-43. CP Activity: number of years with activity during the period

	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	'97-'04 (8)	'98-'03 (6)	'98-'04 (7)	'99-'03 (5)	'04-'06 (3)
CP01	5	6	2	8	6	7	5	3
CP02	5	6	2	8	6	7	5	3
CP03	5	1	1	3	2	2	1	1
CP04	4	4	2	5	3	4	3	3
CP05	5	5	2	7	5	6	4	3
CP06	5	6	2	8	6	7	5	3
CP07	5	5	2	7	5	6	4	3
CP08	5	2	1	4	3	3	2	1
CP09	4	2	1	3	2	2	2	1
CP10	0	0	0	0	0	0	0	0
Total number active in the period	9	9	9	9	9	9	9	9
Minimum mt for the period	12,891	8,834	4,028	12,337	8,834	8,834	8,834	4,028
Average mt for the period	37,614	37,273	17,528	52,576	36,962	45,092	29,142	25,659

Table 1-44 Shoreside sector whiting IFQ recent participation and co-op endorsement analysis, years of activity.

1. Permits with Some Activity 1994-2006 ■ = Active □ = Not Active



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total number active in the period	28	32	34	38	34	33	32	32	27	29	28	29	37
Minimum annual mt for the period	32.39288	3	5	12	1	2	0	0	8	5	5	631	7
Average annual mt for the period	2165.947	2,148	2,221	2,154	2,396	2,383	2,480	2,199	1,547	1,608	3,317	3,364	2,629

Table 1-45. Counts of number of shoreside whiting vessels and share of total history by number of years in which the vessel met the indicated criteria.

Count of SW Permits by number of years with whiting catch >0 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	14	17	27	5	4	14	13	28	26
1	11	6	8	9	10	9	9	7	9
2	7	11	29	8	6	8	7	6	2
3	6	5		6	6	8	7	23	27
4	7	3		2	4	4	4		
5	19	6		5	3	4	4		
≥6		16		29	31	17	20		
Total number active in the period	50	47	37	59	60	50	51	36	38
Minimum mt for the period	1	0	0	0	0	0	0	0	7
Average mt for the period	7,365	7,688	8,593	6,639	5,860	6,336	6,491	9,581	9,874

Percent of '94-'04 catch history by SW permits with this number of years of activity.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	5.0%	3.7%	14.0%	0.3%	0.0%	2.6%	2.4%	16.1%	14.0%
1	5.5%	2.3%	7.3%	0.1%	0.4%	3.2%	2.2%	6.2%	7.3%
2	7.6%	11.7%	78.7%	2.5%	1.2%	5.2%	5.3%	5.0%	6.0%
3	8.6%	6.2%		6.2%	3.6%	12.3%	9.2%	72.7%	72.6%
4	11.5%	7.1%		2.2%	6.1%	7.1%	7.5%		
5	61.8%	12.5%		4.5%	2.5%	7.4%	6.3%		
≥6		56.5%		84.3%	86.3%	62.1%	67.3%		

Count of SW Permits by number of years with whiting catch >100 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	23	22	28	16	15	21	20	32	28
1	8	4	7	4	5	5	5	5	7
2	5	10	29	5	4	7	6	6	3
3	4	4		5	3	8	7	21	26
4	6	4		4	5	4	5		
5	18	5		4	4	2	2		
≥6		15		26	28	17	19		
Total number with at least one year >100 mt.	41	42	36	48	49	43	44	32	36

Percent of '94-'04 catch history by SW permits with this number of years with at least 100 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	5.8%	3.7%	14.0%	0.3%	0.0%	2.6%	2.4%	16.1%	14.0%
1	6.0%	2.4%	7.3%	0.3%	0.5%	3.3%	2.3%	6.3%	7.3%
2	7.1%	13.3%	78.7%	2.6%	1.3%	5.4%	5.3%	7.6%	7.7%
3	8.4%	6.7%		6.4%	3.4%	13.2%	11.0%	70.0%	70.9%
4	11.0%	6.0%		3.1%	6.5%	8.6%	8.9%		
5	61.6%	11.9%		4.4%	3.3%	4.8%	3.4%		
≥6		56.0%		82.9%	84.9%	62.1%	66.8%		

Count of SW Permits by number of years with whiting catch >200 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	25	22	28	17	16	21	20	32	28
1	7	4	7	4	4	6	5	6	7
2	5	11	29	5	5	6	7	5	3
3	3	3		5	3	8	6	21	26
4	6	4		3	5	4	5		
5	18	5		4	3	2	2		
≥6		15		26	28	17	19		
Total number with at least one year >200 mt.	39	42	36	47	48	43	44	32	36

Percent of '94-'04 catch history by SW permits with this number of years with at least 200 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	6.0%	3.7%	14.0%	0.3%	0.1%	2.6%	2.4%	16.1%	14.0%
1	6.0%	2.4%	7.3%	0.4%	0.5%	3.5%	2.3%	6.5%	7.3%
2	10.0%	13.5%	78.7%	2.6%	1.5%	5.2%	5.5%	7.4%	7.7%
3	5.3%	6.5%		6.4%	3.4%	13.2%	10.7%	70.0%	70.9%
4	11.0%	6.0%		2.9%	6.5%	8.6%	8.9%		
5	61.6%	11.9%		4.4%	3.1%	4.8%	3.4%		
≥6		56.0%		82.9%	84.9%	62.1%	66.8%		

Count of SW Permits by number of years with whiting catch >300 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	26	23	28	18	16	23	21	33	28
1	7	4	7	3	5	4	5	6	7
2	4	11	29	6	4	6	6	4	3
3	4	2		4	4	9	7	21	26
4	5	4		5	5	4	4		
5	18	5		3	4	1	3		
≥6		15		25	26	17	18		
Total number with at least one year >300 mt.	38	41	36	46	48	41	43	31	36

Percent of '94-'04 catch history by SW permits with this number of years with at least 300 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	6.9%	4.3%	14.0%	0.5%	0.1%	3.4%	2.9%	16.3%	14.0%
1	6.4%	2.1%	7.3%	0.2%	0.7%	2.8%	1.9%	8.5%	7.3%
2	8.7%	15.5%	78.7%	3.9%	1.3%	5.2%	5.3%	5.1%	7.7%
3	6.7%	4.3%		5.1%	4.7%	15.4%	13.0%	70.0%	70.9%
4	9.6%	6.0%		4.3%	5.7%	7.3%	6.7%		
5	61.6%	11.9%		4.3%	4.8%	3.8%	4.3%		
≥6		56.0%		81.5%	82.6%	62.1%	65.9%		

Count of SW Permits by number of years with whiting catch >400 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	27	23	28	18	16	23	21	33	28
1	6	5	7	3	5	4	5	6	7
2	4	10	29	6	4	7	7	5	3
3	4	2		5	4	8	6	20	26
4	7	5		4	6	4	4		
5	16	5		3	3	3	4		
≥6		14		25	26	15	17		
Total number with at least one year >400 mt.	37	41	36	46	48	41	43	31	36

Percent of '94-'04 catch history by SW permits with this number of years with at least 400 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	7.6%	4.3%	14.0%	0.5%	0.1%	3.4%	2.9%	16.3%	14.0%
1	5.7%	3.8%	7.3%	0.2%	0.7%	2.8%	1.9%	8.5%	7.3%
2	8.7%	13.8%	78.7%	3.9%	1.3%	6.9%	7.0%	7.5%	7.7%
3	6.7%	4.3%		5.8%	4.7%	13.7%	11.3%	67.6%	70.9%
4	17.0%	7.5%		3.7%	6.4%	7.3%	6.7%		
5	54.3%	12.8%		4.3%	4.2%	7.7%	5.8%		
≥6		53.6%		81.5%	82.6%	58.2%	64.4%		

Count of SW Permits by number of years with whiting catch >500 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	28	23	28	19	17	23	21	33	28
1	5	6	8	3	5	5	6	6	7
2	5	9	28	6	3	7	6	6	4
3	3	4		4	5	7	7	19	25
4	9	3		5	6	5	4		
5	14	5		3	3	3	3		
≥6		14		24	25	14	17		
Total number with at least one year >500 mt.	36	41	36	45	47	41	43	31	36

Percent of '94-'04 catch history by SW permits with this number of years with at least 500 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	7.7%	4.3%	14.0%	0.6%	0.1%	3.4%	2.9%	16.3%	14.0%
1	5.7%	3.9%	7.8%	0.3%	0.8%	2.9%	2.1%	8.5%	7.3%
2	10.1%	13.6%	78.2%	4.3%	1.2%	7.3%	6.8%	9.0%	8.2%
3	5.3%	6.2%		5.3%	5.2%	13.2%	11.7%	66.2%	70.5%
4	21.0%	5.5%		5.0%	7.3%	8.8%	7.7%		
5	50.3%	12.8%		4.6%	4.5%	8.5%	4.3%		
≥6		53.6%		79.8%	80.9%	55.9%	64.4%		

Table 1-45. Continued..

Count of SW Permits by number of years with whiting catch >1,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	29	27	34	22	21	26	25	35	33
1	7	3	4	4	3	6	4	9	4
2	3	11	26	3	3	5	6	3	4
3	5	4		8	7	9	8	17	23
4	11	2		2	5	2	4		
5	9	4		2	2	4	1		
≥6		13		23	23	12	16		
Total number with at least one year >1,000 mt.	35	37	30	42	43	38	39	29	31

Percent of '94-'04 catch history by SW permits with this number of years with at least 1,000 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	7.7%	6.2%	18.4%	0.9%	0.6%	3.9%	3.6%	16.6%	17.3%
1	8.9%	2.3%	4.7%	1.7%	0.9%	5.4%	3.2%	14.3%	5.3%
2	9.2%	15.9%	76.9%	3.2%	1.8%	6.0%	6.2%	4.6%	8.2%
3	6.8%	7.7%		9.5%	7.6%	17.2%	13.8%	64.6%	69.2%
4	32.0%	3.5%		2.7%	7.2%	6.9%	8.8%		
5	35.5%	15.6%		3.6%	3.6%	13.4%	3.8%		
≥6		48.8%		78.3%	78.3%	47.2%	60.6%		

Count of SW Permits by number of years with whiting catch >1,500 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	33	30	35	25	24	29	28	39	34
1	6	5	4	4	3	8	5	9	4
2	4	10	25	7	7	5	8	2	5
3	4	1		5	5	5	4	14	21
4	9	3		2	3	4	3		
5	8	7		4	3	5	3		
≥6		8		17	19	8	13		
Total number with at least one year >1,500 mt.	31	34	29	39	40	35	36	25	30

Percent of '94-'04 catch history by SW permits with this number of years with at least 1,500 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	11.6%	9.8%	18.9%	2.2%	1.9%	6.9%	6.7%	22.5%	17.8%
1	11.0%	4.9%	8.1%	3.2%	1.3%	8.8%	4.4%	14.4%	5.3%
2	8.6%	15.3%	73.0%	7.9%	7.7%	7.9%	10.2%	6.6%	12.3%
3	5.5%	3.0%		7.9%	6.1%	10.6%	8.7%	56.5%	64.6%
4	30.1%	6.4%		3.9%	5.9%	11.3%	7.2%		
5	33.2%	26.1%		9.1%	6.6%	19.3%	8.3%		
≥6		34.5%		65.8%	70.5%	35.2%	54.5%		

Count of SW Permits by number of years with whiting catch >2,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	36	35	37	29	27	34	32	46	36
1	6	6	5	7	6	8	7	7	5
2	5	6	22	5	8	4	6	3	4
3	3	4		3	1	8	3	8	19
4	8	4		1	2	2	6		
5	6	4		5	5	2	2		
≥6		5		14	15	6	8		
Total number with at least one year >2,000 mt.	28	29	27	35	37	30	32	18	28

Percent of '94-'04 catch history by SW permits with this number of years with at least 2,000 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	16.7%	15.1%	20.5%	5.6%	4.4%	11.4%	10.2%	35.6%	19.6%
1	13.9%	8.4%	9.7%	9.2%	5.5%	12.1%	8.3%	21.5%	6.8%
2	8.4%	10.5%	69.8%	6.1%	11.1%	8.6%	11.2%	10.8%	11.6%
3	5.9%	14.3%		6.4%	1.7%	26.4%	7.2%	32.1%	62.0%
4	30.4%	15.2%		2.3%	4.7%	7.3%	21.6%		
5	24.7%	15.5%		11.4%	11.3%	8.5%	7.3%		
≥6		21.1%		58.9%	61.3%	25.6%	34.2%		

Count of SW Permits by number of years with whiting catch >5,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	56	55	61	53	49	58	54	63	57
1	8	7	2	8	11	5	8	1	5
2	0	2	1	3	4	1	2	0	2
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0		
5	0	0		0	0	0	0		
≥6		0		0	0	0	0		
Total number with at least one year >5,000 mt.	8	9	3	11	15	6	10	1	7

Percent of '94-'04 catch history by SW permits with this number of years with at least 5,000 mt during the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	66.2%	72.6%	88.1%	58.1%	48.8%	77.2%	67.8%	97.5%	78.8%
1	33.8%	20.8%	7.1%	27.7%	34.6%	18.7%	25.5%	2.5%	14.0%
2	0.0%	6.7%	4.7%	14.1%	16.7%	4.1%	6.7%	0.0%	7.3%
3	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%		
5	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		
≥6		0.0%		0.0%	0.0%	0.0%	0.0%		

Table 1-46. Shoreside whiting sector catcher vessels by total metric tons of deliveries received over the indicated period.

Count of Permits by total MT category during the period

MT range	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	14	17	27	5	4	14	13	28	26
>0 and <=100	8	3	1	9	7	5	4	4	2
>100 and <=500	6	3	3	2	3	2	1	0	0
>500 and <=1,000	1	1	1	1	1	2	2	2	3
>1,000 and <=5,000	10	7	2	12	12	15	16	5	7
>5,000 and <=10,000	8	8	6	9	12	8	6	7	8
>10,000 and <=20,000	14	15	14	16	13	14	16	17	17
>20,000 and <=30,000	3	3	3	3	1	0	0	1	1
>30,000	0	0	0	0	0	0	0	0	0

Table 1-47. Entry exit data for the shoreside whiting sector catcher vessels.

First year of participation	Last year of participation: 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Totals
1994	2	0	0	2	0	1	3	0	0	1	0	0	19	28
1995		2	1	2	0	0	0	0	0	0	0	0	3	8
1996			0	0	1	0	0	0	0	0	0	0	3	4
1997				0	1	0	0	0	0	1	0	0	3	5
1998					2	0	1	0	0	0	0	0	2	5
1999						1	2	0	0	0	0	0	0	3
2000							0	1	0	0	0	0	0	1
2001								1	0	0	1	0	2	4
2002									0	0	0	0	0	0
2003										1	0	0	0	1
2004											0	0	1	1
2005												0	0	0
2006													4	4
Totals	2	2	1	4	4	2	6	2	0	3	1	0	37	64

Table 1-48. Number of permits active in each period and with at least 500 mt of shoreside whiting in the period.

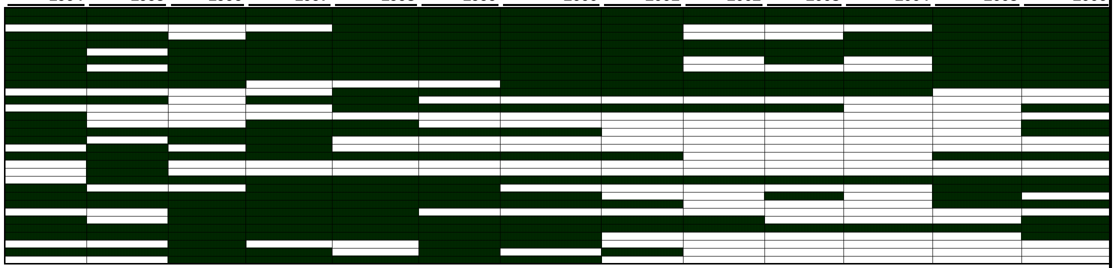
	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
'94-'98	36	30	25	36	36	32	32	24	25
'99-'04		41	33	40	41	39	41	31	33
'05-06			36	46	41	42	31	32	0
'94-'03				46	46	41	42	31	32
'94-'04					47	41	43	31	33
'98-'03						41	41	31	31
'98-'04							43	31	33
'01-'03								31	29
'04-06									36

Table 1-49. Number of with shoreside whiting activity before and after the period, but not during a qualifying period.

	Minimum activity level during: 0 mt	200 mt	500 mt
1999-2004:	0	0	0
1999-2003:	0	0	1
1998-2003:	0	0	1
1998-2004:	0	0	0

Table 1-50 Mothership sector catcher vessel whiting IFQ recent participation and co-op endorsement analysis, years of activity.

1. Permits with Some Activity 1994-2006 ■ = Active □ = Not Active



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total number active in the period	22	19	21	24	24	23	22	18	11	12	10	16	20
Minimum annual mt for the period	304	394	924	780	1,327	848	12	982	1,310	555	1,417	833	852
Average annual mt for the period	2,052	1,235	1,688	1,967	2,069	2,068	1,937	1,977	2,418	2,168	2,410	3,030	2,768

Table 1-51. Counts of number of mothership sector whiting vessels and share of total history by number of years in which the vessel met the indicated criteria.

Count of Permits by number of years with whiting catch >0 during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0	8	11	0	0	5	5	13	10
1	7	1	6	3	3	3	3	7	7
2	1	5	15	1	1	3	3	2	6
3	6	5		4	4	3	3	10	9
4	7	3		3	3	7	5		
5	11	2		1	1	2	4		
≥6		8		20	20	9	9		
Total number active in the period	32	24	21	32	32	27	27	19	22
Minimum mt for the period	304	999	833	304	304	1,327	1,327	982	833
Average mt for the period	6,279	8,437	4,944	11,853	12,606	8,447	9,339	4,642	5,815

Percent of '94-'04 catch history by permits with this number of years of activity.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0.0%	6.2%	14.5%	0.0%	0.0%	2.2%	2.2%	16.9%	10.3%
1	10.3%	1.3%	18.4%	0.3%	0.3%	3.9%	3.9%	22.3%	22.6%
2	0.7%	11.5%	67.1%	0.7%	0.7%	4.4%	4.4%	8.2%	18.4%
3	11.3%	17.1%		5.0%	5.0%	8.3%	8.3%	52.5%	48.7%
4	28.1%	11.4%		4.4%	4.4%	23.9%	17.1%		
5	49.6%	6.5%		2.5%	2.5%	8.2%	15.1%		
≥6		46.1%		87.1%	87.1%	48.9%	48.9%		

Count of Permits by number of years with whiting catch >100 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0	8	11	0	0	5	5	13	10
1	7	2	6	3	3	3	3	7	7
2	1	4	15	1	1	4	4	2	6
3	6	5		4	4	2	2	10	9
4	7	3		3	3	7	5		
5	11	2		1	1	2	4		
≥6		8		20	20	9	9		
Total number with at least one year >100 mt.	32	24	21	32	32	27	27	19	22

Percent of '94-'04 catch history by permits with this number of years with at least 100 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0.0%	6.2%	14.5%	0.0%	0.0%	2.2%	2.2%	16.9%	10.3%
1	10.3%	4.2%	18.4%	0.3%	0.3%	3.9%	3.9%	22.3%	22.6%
2	0.7%	8.5%	67.1%	0.7%	0.7%	7.4%	7.4%	8.2%	18.4%
3	11.3%	17.1%		5.0%	5.0%	5.4%	5.4%	52.5%	48.7%
4	28.1%	11.4%		4.4%	4.4%	23.9%	17.1%		
5	49.6%	6.5%		2.5%	2.5%	8.2%	15.1%		
≥6		46.1%		87.1%	87.1%	48.9%	48.9%		

Count of Permits by number of years with whiting catch >400 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	2	8	11	2	2	5	5	13	10
1	5	2	6	1	1	3	3	7	7
2	1	4	15	1	1	4	4	2	6
3	6	5		4	4	2	2	10	9
4	8	3		3	3	7	5		
5	10	2		1	1	2	4		
≥6		8		20	20	9	9		
Total number with at least one year >400 mt.	30	24	21	30	30	27	27	19	22

Percent of '94-'04 catch history by permits with this number of years with at least 400 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0.2%	6.2%	14.5%	0.2%	0.2%	2.2%	2.2%	16.9%	10.3%
1	10.1%	4.2%	18.4%	0.1%	0.1%	3.9%	3.9%	22.3%	22.6%
2	0.7%	8.5%	67.1%	0.7%	0.7%	7.4%	7.4%	8.2%	18.4%
3	11.3%	17.1%		5.0%	5.0%	5.4%	5.4%	52.5%	48.7%
4	31.0%	11.4%		4.4%	4.4%	23.9%	17.1%		
5	46.8%	6.5%		2.5%	2.5%	8.2%	15.1%		
≥6		46.1%		87.1%	87.1%	48.9%	48.9%		

Count of Permits by number of years with whiting catch >1,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	3	9	13	3	3	5	5	14	12
1	5	2	4	1	1	5	5	6	5
2	3	5	15	2	2	2	2	3	6
3	6	3		6	6	4	4	9	9
4	8	4		0	0	5	3		
5	7	1		3	3	3	5		
≥6		8		17	17	8	8		
Total number with at least one year >1,000 mt.	29	23	19	29	29	27	27	18	20

Percent of '94-'04 catch history by permits with this number of years with at least 1,000 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0.3%	7.4%	21.3%	0.3%	0.3%	2.2%	2.2%	18.7%	17.1%
1	10.7%	5.0%	11.6%	0.7%	0.7%	7.2%	7.2%	20.5%	15.8%
2	4.6%	12.3%	67.1%	2.6%	2.6%	4.1%	4.1%	11.0%	18.4%
3	13.2%	11.3%		8.8%	8.8%	11.2%	11.2%	49.7%	48.7%
4	37.8%	14.2%		0.0%	0.0%	18.1%	11.3%		
5	33.4%	3.6%		8.3%	8.3%	11.0%	17.9%		
≥6		46.1%		79.3%	79.3%	46.1%	46.1%		

Table 1-51. Continued.

Count of Permits by number of years with whiting catch >1,500 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	5	10	15	4	4	8	8	20	14
1	5	2	5	2	2	2	2	2	5
2	7	8	12	5	5	3	3	2	6
3	5	2		2	2	8	7	8	7
4	8	1		2	2	2	2		
5	2	3		4	3	2	2		
≥6		6		13	14	7	8		
Total number with at least one year >1,500 mt.	27	22	17	28	28	24	24	12	18

Percent of '94-'04 catch history by permits with this number of years with at least 1,500 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	2.8%	9.4%	25.9%	1.6%	1.6%	6.8%	6.8%	38.0%	21.7%
1	10.8%	6.5%	17.3%	2.0%	2.0%	2.6%	2.6%	8.0%	18.3%
2	15.0%	22.9%	56.8%	7.0%	7.0%	7.7%	7.7%	10.0%	19.2%
3	19.0%	7.2%		4.6%	4.6%	24.9%	21.7%	44.0%	40.8%
4	42.3%	4.2%		5.5%	5.5%	7.7%	7.2%		
5	10.1%	14.1%		12.6%	9.4%	10.0%	7.9%		
≥6		35.6%		66.7%	69.9%	40.3%	46.1%		

Count of Permits by number of years with whiting catch >2,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	12	14	16	9	9	12	12	22	15
1	12	5	6	6	6	7	7	3	7
2	3	5	10	4	4	2	2	3	6
3	3	2		2	2	6	4	4	4
4	2	3		4	3	2	4		
5	0	1		2	2	1	0		
≥6		2		5	6	2	3		
Total number with at least one year >2,000 mt.	20	18	16	23	23	20	20	10	17

Percent of '94-'04 catch history by permits with this number of years with at least 2,000 mt durng the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	16.4%	19.2%	28.9%	7.1%	7.1%	14.2%	14.2%	46.7%	24.7%
1	40.1%	16.5%	19.6%	15.4%	15.4%	21.5%	21.5%	15.0%	23.8%
2	13.6%	19.3%	51.5%	12.0%	12.0%	7.1%	7.1%	15.3%	27.0%
3	19.4%	11.0%		7.0%	7.0%	26.5%	17.2%	23.0%	24.5%
4	10.5%	14.7%		17.3%	13.6%	11.4%	20.7%		
5	0.0%	5.7%		11.1%	9.0%	5.7%	0.0%		
≥6		13.6%		30.1%	35.8%	13.6%	19.3%		

Count of Permits by number of years with whiting catch >5,000 mt during the period

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	31	31	29	31	31	31	31	32	29
1	1	1	3	1	0	1	0	0	2
2	0	0	0	0	1	0	1	0	1
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0		
5	0	0		0	0	0	0		
≥6		0		0	0	0	0		
Total number with at least one year >5,000 mt.	1	1	3	1	1	1	1	0	3

Percent of '94-'04 catch history by permits with this number of years with at least 5,000 mt during the period.

Number of Years	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	90.6%	90.6%	79.2%	90.6%	90.6%	90.6%	90.6%	100.0%	79.2%
1	9.4%	9.4%	20.8%	9.4%	0.0%	9.4%	0.0%	0.0%	11.4%
2	0.0%	0.0%	0.0%	0.0%	9.4%	0.0%	9.4%	0.0%	9.4%
3	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%		
5	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		
≥6		0.0%		0.0%	0.0%	0.0%	0.0%		

Table 1-52. Mothership whiting sector catcher vessels by total metric tons of deliveries received over the indicated period.

Count of Permits by total MT category during the period

MT range	'94-'98 (5)	'99-'04 (6)	'05-'06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
0	0	8	11	0	0	5	5	13	10
>0 and <=100	0	0	0	0	0	0	0	0	0
>100 and <=500	2	0	0	2	2	0	0	0	0
>500 and <=1,000	1	1	2	1	1	0	0	1	2
>1,000 and <=5,000	9	8	10	5	5	7	7	8	10
>5,000 and <=10,000	15	6	8	5	5	10	9	9	7
>10,000 and <=20,000	5	8	1	14	13	9	10	1	2
>20,000 and <=30,000	0	1	0	4	5	1	0	0	1
>30,000	0	0	0	1	1	0	1	0	0

Table 1-53. Entry exit data for the mothership whiting sector catcher vessels.

Number of Permits active in each year period

First year of participation	Last year of participation 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Totals
1994	1	0	0	1	1	0	0	1	0	0	0	1	17	22
1995		2	0	1	0	0	0	0	0	0	0	0	1	4
1996			0	0	1	0	2	0	0	0	0	0	0	3
1997				0	0	0	0	0	0	0	0	0	0	0
1998					0	0	0	0	0	0	1	0	2	3
1999						0	0	0	0	0	0	0	0	0
2000							0	0	0	0	0	0	0	0
2001								0	0	0	0	0	0	0
2002									0	0	0	0	0	0
2003										0	0	0	0	0
2004											0	0	0	0
2005												0	0	0
2006													0	0
Totals	1	2	0	2	2	0	2	1	0	0	1	1	20	32

Table 1-54. Number of permits active in each period and with at least 500 mt of mothership whiting sector in the period.

	'94-'98 (5)	'99-'04 (6)	'05-06 (2)	94-'03 (10)	94-'04 (11)	'98-'03 (6)	'98-'04 (7)	'01-'03 (3)	'04-'06 (3)
'94-'98	30	24	21	30	30	27	27	19	22
'99-'04		24	20	24	24	24	24	19	21
'05-06			21	30	27	27	19	22	0
'94-'03				30	30	27	27	19	22
'94-'04					30	27	27	19	22
'98-'03						27	27	19	22
'98-'04							27	19	22
'01-'03								19	18
'04-06									22

Table 1-55. Number of permits with mothership whiting sector activity before and after the period, but not during a qualifying period.

	Minimum activity level during		
	0 mt	200 mt	500 mt
1999-2004:	1	1	1
1999-2003:	1	1	1
1998-2003:	0	0	0
1998-2004:	0	0	0

DATA APPENDIX 2: ACCUMULATION LIMITS

Tables in this appendix compare proposed accumulation limit options against amounts of QS that would be issued to

- permits based on landings,
- permit owners based on landings (aggregating permits at the ownership level)
- buyers based on purchases (excluding buyers that also own permits)
- buyers based on purchases (including buyers that also own permits)
- buyers/harvesters based on their combination of landings and purchases
-

for a variety of allocation formulas. Following the table of contents are three pages that briefly describe each table.

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Description of the Tables

Table 2-1a: Compares **permit-level** initial harvester **quota share (QS)** allocations against vessel accumulation limit options for the **non-whiting sector**. Vessel limit options are "Option 1" and "Option 2". Two permit allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each permit allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the vessel limits.

Table 2-1b: Compares **permit-level** initial harvester **quota share (QS)** allocations against vessel accumulation limit options for the **whiting sectors**. Vessel limit options are "Option 1" and "Option 2". Two permit allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each permit allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the vessel limits.

Table 2-2a: Compares the maximum **non-whiting permit** harvester QS allocation amounts calculated under the **equal-sharing** allocation formula against **vessel limit Option 1**, and for permits exceeding the limit option, indicates the **state** in which the permits' principal port was located, and the amount of QS above the limit.

Table 2-2b: Compares the maximum **non-whiting permit** harvester QS allocation amounts calculated under the **all catch history-based** allocation formula against **vessel limit Option 1**, and for permits exceeding the limit option, indicates the **state** in which the permits' principal port was located, and the amount of QS above the limit.

Table 2-2c: Compares the maximum **non-whiting permit** harvester QS allocation amounts calculated under the **equal-sharing** allocation formula against **vessel limit Option 2**, and for permits exceeding the limit option, indicates the **state** in which the permits' principal port was located, and the amount of QS above the limit.

Table 2-2d: Compares the maximum **non-whiting permit** harvester QS allocation amounts calculated under the **all catch history-based** allocation formula against **vessel limit Option 2**, and for permits exceeding the limit option, indicates the **state** in which the permits' principal port was located, and the amount of QS above the limit.

Table 2-3a: Compares **entity-level** initial quota share (QS) allocations against QS control limit options for **non-whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Control limit options are "Option 1" and "Option 2". Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the control limits.

Table 2-3b: Compares **entity-level** initial quota share (QS) allocations against QS control limit options for **whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Control limit options are "Option 1" and "Option 2". Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the control limits.

Table 2-4a: Compares **entity-level** initial quota share (QS) allocations against QS control limit options for **non-whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Control limit options are "Option 1" and "Option 2". Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the control limits.

Table 2-4b: Compares **entity-level** initial quota share (QS) allocations against QS control limit options for **whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Control limit options are "Option 1" and "Option 2". Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the **maximum QS allocation** calculated under each formula and scenario, and by how much, if any, the maximum allocation amounts exceed the control limits.

Table 2-5a: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 1** for **non-whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-5b: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 1** for **whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option**, and the amount of QS allocated in excess of the control limits.

Table 2-6a: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 1** for **non-whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-6b: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 1** for **whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-7a: Compares entity-level initial quota share (QS) allocations against QS control limit **Option 2** for **non-whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-7b: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 2** for **whiting** sector **harvesters**, **including harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-8a: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 2** for **non-whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 75% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with **QS allocations exceeding the control limit option,** and the amount of QS allocated in excess of the control limits.

Table 2-8b: Compares **entity-level** initial quota share (QS) allocations against QS control limit **Option 2** for **whiting** sector **harvesters**, **excluding harvesting entities owned by buyers**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("History + ="), and (2) 100% catch history-based allocation ("100% History"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocation to harvesters, and 50% allocation to harvesters. The columns indicate the number, if any, of harvesting entities with QS allocations exceeding the control limit option, and the amount of QS allocated in excess of the control limits.

Table 2-9a: Compares **buyer initial quota share (QS) allocations** against control limit options for the **non-whiting sector**. Control limit options are "Option 1" and "Option 2". The allocation scenario assumes 25% of QS is allocated to buyers based on purchasing history. The columns indicate the **maximum QS** allocation calculated, and by how much, if any, the maximum allocation amount exceeds the control limits.

Table 2-9b: Compares **buyer initial quota share (QS) allocations** against control limit options for the **whiting sector**. Control limit options are "Option 1" and "Option 2". The allocation scenario assumes 50% of QS is allocated to buyers based on purchasing history. The columns indicate the **maximum QS** allocation calculated, and by how much, if any, the maximum allocation amount exceeds the control limits.

Table 2-10: Compares **combined harvester and buyer entity-level initial quota share (QS)** allocations against **QS control limit Option 1**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("Equal Sharing"), and (2) 100% catch history-based allocation ("Proportional"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocated to harvesters, and 75% allocated to harvesters - 25% allocated to buyers (50% - 50% for whiting sectors). The columns indicate for each scenario the total number of entities receiving initial allocations, the number of combined entities with **QS allocations exceeding the control limit option,** the maximum QS allocation, and the amount of QS that would be allocated in excess of the control limit.

Table 2-11: Compares **combined harvester and buyer entity-level initial quota share (QS)** allocations against **QS control limit Option 2**. Two allocation formulas are compared: (1) catch history-based allocation plus equal sharing of buyback catch hstory ("Equal Sharing"), and (2) 100% catch history-based allocation ("Proportional"). Two quota share allocation scenarios are applied to each allocation formula: (1) 100% allocated to harvesters, and 75% allocated to harvesters - 25% allocated to buyers (50% - 50% for whiting sectors). The columns indicate for each scenario the total number of entities receiving initial allocations, the number of combined entities with **QS allocations exceeding the control limit option**, the maximum QS allocation, and the amount of QS that would be allocated in excess of the control limit.

Table 2-1a. Evaluation of Vessel Limit Options Compared with <u>Maximum</u> QS Allocations to Permits

Non-whiting Sector	Vessel Limits		Maximum QS Allocated to a Permit by Allocation Formula				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species Group	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
All nonwhiting groundfish (in aggregate)	3.0%	4.4%	1.6%	2.5%	1.2%	1.9%	-	-	-	-	-	-	-	-
Lingcod - coastwide	10.0%	15.0%	2.2%	3.5%	1.6%	2.6%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	10.0%	15.0%	2.6%	4.4%	2.0%	3.3%	-	-	-	-	-	-	-	-
S. of 42° (CA)	10.0%	15.0%	4.4%	6.9%	3.3%	5.2%	-	-	-	-	-	-	-	-
Pacific Cod	10.0%	15.0%	10.0%	20.4%	7.5%	15.3%	0.0%	10.4%	-	5.3%	-	5.4%	-	0.3%
Pacific Whiting							-	-	-	-	-	-	-	-
Shoreside non-whiting Sector	7.5%	11.3%	8.7%	14.7%	6.5%	11.1%	1.2%	7.2%	-	3.6%	-	3.4%	-	-
Shoreside Whiting Sector	7.5%	11.3%												
Mothership Sector	25.0%	37.5%												
Catcher Processors	65.0%	97.5%												
All Whiting Sectors Combined	25.0%	37.5%												
Sablefish (Coastwide)	3.8%	5.7%	1.4%	2.0%	1.0%	1.5%	-	-	-	-	-	-	-	-
N. of 36° (Monterey north)	6.2%	9.3%	1.4%	2.1%	1.0%	1.6%	-	-	-	-	-	-	-	-
S. of 36° (Conception area)	6.2%	9.3%	15.0%	23.4%	11.3%	17.5%	8.8%	17.2%	5.1%	11.3%	5.7%	14.1%	2.0%	8.2%
PACIFIC OCEAN PERCH	6.2%	9.3%	3.0%	5.0%	2.2%	3.7%	-	-	-	-	-	-	-	-
Shortbelly Rockfish	6.2%	9.3%	19.5%	35.5%	14.6%	26.7%	13.3%	29.3%	8.4%	20.5%	10.2%	26.2%	5.3%	17.4%
WIDOW ROCKFISH	6.8%	10.2%	5.4%	8.1%	4.0%	6.1%	-	1.3%	-	-	-	-	-	-
CANARY ROCKFISH	10.0%	15.0%	2.8%	4.7%	2.1%	3.5%	-	-	-	-	-	-	-	-
Chilipepper Rockfish	10.0%	15.0%	9.6%	11.8%	7.2%	8.9%	-	1.8%	-	-	-	-	-	-
BOCACCIO	10.0%	15.0%	12.4%	15.1%	9.3%	11.3%	2.4%	5.1%	-	1.3%	-	0.1%	-	-
Splitnose Rockfish	10.0%	15.0%	9.2%	12.0%	6.9%	9.0%	-	2.0%	-	-	-	-	-	-
Yellowtail Rockfish	10.0%	15.0%	3.7%	6.2%	2.8%	4.7%	-	-	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	6.2%	9.3%	1.4%	2.1%	1.0%	1.6%	-	-	-	-	-	-	-	-
N. of 34°27'	9.6%	14.4%	1.9%	3.2%	1.4%	2.4%	-	-	-	-	-	-	-	-
S. of 34°27'	9.4%	14.1%	3.3%	4.7%	2.5%	3.5%	-	-	-	-	-	-	-	-
Longspine Thornyhead - coastwide	4.0%	6.0%	1.3%	1.8%	0.9%	1.4%	-	-	-	-	-	-	-	-
N. of 34°27'	4.0%	6.0%	1.3%	1.8%	0.9%	1.4%	-	-	-	-	-	-	-	-
S. of 34°27'	10.0%	15.0%	64.6%	100.0%	48.4%	75.0%	54.6%	90.0%	38.4%	65.0%	49.6%	85.0%	33.4%	60.0%
COWCOD	10.0%	15.0%	44.4%	100.0%	33.3%	75.0%	34.4%	90.0%	23.3%	65.0%	29.4%	85.0%	18.3%	60.0%
DARKBLOTCHED	10.0%	15.0%	4.4%	7.9%	3.3%	5.9%	-	-	-	-	-	-	-	-
YELLOWEYE	10.0%	15.0%	6.0%	8.9%	4.5%	6.7%	-	-	-	-	-	-	-	-
Black Rockfish - coastwide	10.0%	15.0%	11.7%	15.1%	8.8%	11.3%	1.7%	5.1%	-	1.3%	-	0.1%	-	-
Black Rockfish (WA)	10.0%	15.0%	13.5%	40.3%	10.1%	30.2%	3.5%	30.3%	0.1%	20.2%	-	25.3%	-	15.2%
Black Rockfish (OR-CA)	10.0%	15.0%	13.9%	16.7%	10.4%	12.5%	3.9%	6.7%	0.4%	2.5%	-	1.7%	-	-

Table 2-1a. Continued.

Non-whiting Sector	Vessel Limits		Maximum QS Allocated to a Permit by Allocation Formula				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species Group	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Minor Rockfish North	10.0%	15.0%	2.0%	3.2%	1.5%	2.4%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	15.0%	12.8%	30.8%	9.6%	23.1%	2.8%	20.8%	-	13.1%	-	15.8%	-	8.1%
Shelf Species	8.0%	12.0%	2.6%	4.4%	2.0%	3.3%	-	-	-	-	-	-	-	-
Slope Species	10.0%	15.0%	2.4%	3.8%	1.8%	2.9%	-	-	-	-	-	-	-	-
Minor Rockfish South	10.0%	15.0%	5.9%	8.3%	4.4%	6.2%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	15.0%	10.9%	15.0%	8.2%	11.3%	0.9%	5.0%	-	1.3%	-	0.0%	-	-
Shelf Species	10.0%	15.0%	7.5%	9.8%	5.6%	7.3%	-	-	-	-	-	-	-	-
Slope Species	10.0%	15.0%	6.4%	9.4%	4.8%	7.0%	-	-	-	-	-	-	-	-
California scorpionfish	10.0%	15.0%	63.2%	67.3%	47.4%	50.5%	53.2%	57.3%	37.4%	40.5%	48.2%	52.3%	32.4%	35.5%
Cabezon (off CA only)	10.0%	15.0%	59.5%	62.0%	44.6%	46.5%	49.5%	52.0%	34.6%	36.5%	44.5%	47.0%	29.6%	31.5%
Dover Sole	3.6%	5.4%	1.3%	1.8%	0.9%	1.4%	-	-	-	-	-	-	-	-
English Sole	20.0%	30.0%	3.5%	5.4%	2.6%	4.0%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	5.8%	8.7%	1.7%	2.8%	1.3%	2.1%	-	-	-	-	-	-	-	-
Arrowtooth Flounder	10.0%	15.0%	6.2%	13.0%	4.7%	9.7%	-	3.0%	-	-	-	-	-	-
Starry Flounder	10.0%	15.0%	30.5%	34.6%	22.9%	26.0%	20.5%	24.6%	12.9%	16.0%	15.5%	19.6%	7.9%	11.0%
Other Flatfish	20.0%	30.0%	9.2%	13.5%	6.9%	10.2%	-	-	-	-	-	-	-	-
Other Fish	10.0%	15.0%	3.9%	6.2%	2.9%	4.7%	-	-	-	-	-	-	-	-
Kelp Greenling			14.7%	16.2%	11.0%	12.2%								
Spiny Dogfish			10.9%	39.0%	8.1%	29.2%								
Nearshore spp			5.1%	8.4%	3.9%	6.3%								
Shelf spp			3.0%	5.0%	2.3%	3.8%								
Slope spp			1.4%	2.0%	1.0%	1.5%								
DTS			1.2%	1.8%	0.9%	1.3%								
Total Thornyheads			1.2%	1.7%	0.9%	1.3%								

Table 2-1b. Evaluation of Vessel Limit Options Compared with <u>Maximum</u> QS Allocations to Permits

			Maximum QS Allocated to a Permit by Allocation Formula				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
Whiting Sectors	Vessel Limits		100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting														
Shoreside non-whiting Sector														
Shoreside Whiting Sector	7.5%	11.3%	4.7%	5.0%	2.3%	2.5%	-	-	-	-	-	-	-	-
Mothership Sector	25.0%	37.5%	9.6%	10.2%	4.8%	5.1%	-	-	-	-	-	-	-	-
Catcher Processors	65.0%	97.5%	-	23.6%	-	-		-				-		
All Whiting Sectors Combined	25.0%	37.5%					-	-	-	-	-	-	-	-

Table 2-2a. Evaluation of Vessel Limit Option 1 Compared with Maximum QS Allocations to Permits under Equal Sharing Formula

100% Allocation to Harvesters

Non-whiting Sector Species Group	Vessel Limit Option 1	Maximum QS Allocated to a Permit	Number of Permits (and Associated QS) with Initial Allocations Exceeding the Limit: Coastwide Number	Coastwide QS	Washington Number	Washington QS	Oregon Number	Oregon QS	California Number	California QS
All nonwhiting groundfish (in aggregate)	3.0%	1.65%	-	-	-	-	-	-	-	-
Lingcod - coastwide	10.0%	2.17%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	10.0%	2.65%	-	-	-	-	-	-	-	-
S. of 42° (CA)	10.0%	4.37%	-	-	-	-	-	-	-	-
Pacific Cod	10.0%	10.04%	1	10.04%	1	10.04%	-	-	-	-
Pacific Whiting										
Shoreside non-whiting Sector	7.5%	8.67%	1	8.67%	-	-	1	8.67%	-	-
Shoreside Whiting Sector	7.5%									
Mothership Sector	25.0%									
Catcher Processors	65.0%									
All Whiting Sectors Combined	25.0%									
Sablefish (Coastwide)	3.8%	1.36%	-	-	-	-	-	-	-	-
N. of 36° (Monterey north)	6.2%	1.40%	-	-	-	-	-	-	-	-
S. of 36° (Conception area)	6.2%	15.00%	4	41.10%	-	-	1	9.82%	3	31.28%
PACIFIC OCEAN PERCH	6.2%	2.97%	-	-	-	-	-	-	-	-
Shortbelly Rockfish	6.2%	19.53%	1	19.53%	-	-	-	-	1	19.53%
WIDOW ROCKFISH	6.8%	5.38%	-	-	-	-	-	-	-	-
CANARY ROCKFISH	10.0%	2.83%	-	-	-	-	-	-	-	-
Chilipepper Rockfish	10.0%	9.56%	-	-	-	-	-	-	-	-
BOCACCIO	10.0%	12.39%	1	12.39%	-	-	-	-	1	12.39%
Splitnose Rockfish	10.0%	9.17%	-	-	-	-	-	-	-	-
Yellowtail Rockfish	10.0%	3.74%	-	-	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	6.2%	1.40%	-	-	-	-	-	-	-	-
N. of 34°27'	9.6%	1.86%	-	-	-	-	-	-	-	-
S. of 34°27'	9.4%	3.32%	-	-	-	-	-	-	-	-
Longspine Thornyhead - coastwide	4.0%	1.25%	-	-	-	-	-	-	-	-
N. of 34°27'	4.0%	1.25%	-	-	-	-	-	-	-	-
S. of 34°27'	10.0%	64.58%	1	64.58%	-	-	1	64.58%	-	-
COWCOD	10.0%	44.45%	1	44.45%	-	-	-	-	1	44.45%
DARKBLOTCHED	10.0%	4.36%	-	-	-	-	-	-	-	-
YELLOWEYE	10.0%	6.03%	-	-	-	-	-	-	-	-
Black Rockfish - coastwide	10.0%	11.71%	1	11.71%	-	-	1	11.71%	-	-
Black Rockfish (WA)	10.0%	13.49%	2	26.15%	1	12.66%	1	13.49%	-	-
Black Rockfish (OR-CA)	10.0%	13.92%	1	13.92%	-	-	1	13.92%	-	-
Minor Rockfish North	10.0%	2.03%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	12.79%	1	12.79%	1	12.79%	-	-	-	-
Shelf Species	8.0%	2.64%	-	-	-	-	-	-	-	-
Slope Species	10.0%	2.37%	-	-	-	-	-	-	-	-
Minor Rockfish South	10.0%	5.85%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	10.89%	1	10.89%	-	-	-	-	1	10.89%
Shelf Species	10.0%	7.46%	-	-	-	-	-	-	-	-
Slope Species	10.0%	6.44%	-	-	-	-	-	-	-	-
California scorpionfish	10.0%	63.15%	2	93.87%	1	30.71%	-	-	1	63.15%
Cabezon (off CA only)	10.0%	59.50%	2	95.94%	-	-	-	-	2	95.94%
Dover Sole	3.6%	1.27%	-	-	-	-	-	-	-	-
English Sole	20.0%	3.48%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	5.8%	1.72%	-	-	-	-	-	-	-	-
Arrowtooth Flounder	10.0%	6.23%	-	-	-	-	-	-	-	-
Starry Flounder	10.0%	30.48%	1	30.48%	-	-	1	30.48%	-	-
Other Flatfish	20.0%	9.19%	-	-	-	-	-	-	-	-
Other Fish	10.0%	3.91%	-	-	-	-	-	-	-	-
Kelp Greenling		-	-	-	-	-	-	-	-	-
Spiny Dogfish		-	-	-	-	-	-	-	-	-
Nearshore spp		-	-	-	-	-	-	-	-	-
Shelf spp		-	-	-	-	-	-	-	-	-
Slope spp		-	-	-	-	-	-	-	-	-
DTS		-	-	-	-	-	-	-	-	-
Total Thornyheads		-	-	-	-	-	-	-	-	-

Table 2-2b. Evaluation of Vessel Limit Option 1 Compared with <u>Maximum</u> QS Allocations to Permits under the All Catch History Formu

100% Allocation to Harvesters			Number of Permits (and Associated QS) with Initial Allocations Exceeding the Limit							
Non-whiting Sector	Vessel Limit	Maximum QS Allocated to a	Coastwide		Washington		Oregon		California	
Species Group	Option 1	Permit	Number	QS	Number	QS	Number	QS	Number	QS
All nonwhiting groundfish (in aggregate)	3.0%	2.48%	-	-	-	-	-	-	-	-
Lingcod - coastwide	10.0%	3.46%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	10.0%	4.45%	-	-	-	-	-	-	-	-
S. of 42° (CA)	10.0%	6.91%	-	-	-	-	-	-	-	-
Pacific Cod	10.0%	20.44%	2	31.38%	2	31.38%	-	-	-	-
Pacific Whiting										
Shoreside non-whiting Sector	7.5%	14.74%	3	32.17%	1	8.08%	2	24.09%	-	-
Shoreside Whiting Sector	7.5%									
Mothership Sector	25.0%									
Catcher Processors	65.0%									
All Whiting Sectors Combined	25.0%									
Sablefish (Coastwide)	3.8%	2.02%	-	-	-	-	-	-	-	-
N. of 36° (Monterey north)	6.2%	2.11%	-	-	-	-	-	-	-	-
S. of 36° (Conception area)	6.2%	23.39%	6	78.59%	-	-	1	15.19%	5	63.40%
PACIFIC OCEAN PERCH	6.2%	4.97%	-	-	-	-	-	-	-	-
Shortbelly Rockfish	6.2%	35.54%	2	43.29%	-	-	-	-	2	43.29%
WIDOW ROCKFISH	6.8%	8.13%	1	8.13%	-	-	-	-	1	8.13%
CANARY ROCKFISH	10.0%	4.67%	-	-	-	-	-	-	-	-
Chilipepper Rockfish	10.0%	11.80%	2	22.22%	-	-	-	-	2	22.22%
BOCACCIO	10.0%	15.05%	1	15.05%	-	-	-	-	1	15.05%
Splitnose Rockfish	10.0%	12.03%	1	12.03%	-	-	-	-	1	12.03%
Yellowtail Rockfish	10.0%	6.22%	-	-	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	6.2%	2.08%	-	-	-	-	-	-	-	-
N. of 34°27'	9.6%	3.16%	-	-	-	-	-	-	-	-
S. of 34°27'	9.4%	4.73%	-	-	-	-	-	-	-	-
Longspine Thornyhead - coastwide	4.0%	1.82%	-	-	-	-	-	-	-	-
N. of 34°27'	4.0%	1.82%	-	-	-	-	-	-	-	-
S. of 34°27'	10.0%	100.00%	1	100.00%	-	-	1	100.00%	-	-
COWCOD	10.0%	100.00%	1	100.00%	-	-	-	-	1	100.00%
DARKBLOTCHED	10.0%	7.92%	-	-	-	-	-	-	-	-
YELLOWEYE	10.0%	8.87%	-	-	-	-	-	-	-	-
Black Rockfish - coastwide	10.0%	15.10%	1	15.10%	-	-	1	15.10%	-	-
Black Rockfish (WA)	10.0%	40.29%	2	78.05%	1	37.75%	1	40.29%	-	-
Black Rockfish (OR-CA)	10.0%	16.70%	1	16.70%	-	-	1	16.70%	-	-
Minor Rockfish North	10.0%	3.24%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	30.77%	1	30.77%	1	30.77%	-	-	-	-
Shelf Species	8.0%	4.37%	-	-	-	-	-	-	-	-
Slope Species	10.0%	3.85%	-	-	-	-	-	-	-	-
Minor Rockfish South	10.0%	8.26%	-	-	-	-	-	-	-	-
Nearshore Species	10.0%	15.03%	4	47.48%	1	10.57%	1	10.79%	2	26.11%
Shelf Species	10.0%	9.78%	-	-	-	-	-	-	-	-
Slope Species	10.0%	9.36%	-	-	-	-	-	-	-	-
California scorpionfish	10.0%	67.30%	2	100.00%	1	32.70%	-	-	1	67.30%
Cabezon (off CA only)	10.0%	62.03%	2	100.00%	-	-	-	-	2	100.00%
Dover Sole	3.6%	1.85%	-	-	-	-	-	-	-	-
English Sole	20.0%	5.35%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	5.8%	2.76%	-	-	-	-	-	-	-	-
Arrowtooth Flounder	10.0%	13.00%	2	23.97%	2	23.97%	-	-	-	-
Starry Flounder	10.0%	34.64%	1	34.64%	-	-	1	34.64%	-	-
Other Flatfish	20.0%	13.54%	-	-	-	-	-	-	-	-
Other Fish	10.0%	6.20%	-	-	-	-	-	-	-	-
Kelp Greenling		-	-	-	-	-	-	-	-	-
Spiny Dogfish		-	-	-	-	-	-	-	-	-
Nearshore spp		-	-	-	-	-	-	-	-	-
Shelf spp		-	-	-	-	-	-	-	-	-
Slope spp		-	-	-	-	-	-	-	-	-
DTS		-	-	-	-	-	-	-	-	-
Total Thornyheads		-	-	-	-	-	-	-	-	-

Table 2-2c. Evaluation of Vessel Limit Option 2 Compared with Maximum QS Allocations to Permits under Equal Sharing Formula

100% Allocation to Harvesters			Number of Permits (and Associated QS) with Initial Allocations Exceeding the Limit							
Non-whiting Sector	Vessel Limit	Maximum QS Allocated to a	Coastwide		Washington		Oregon		California	
Species Group	Option 2	Permit	Number	QS	Number	QS	Number	QS	Number	QS
All nonwhiting groundfish (in aggregate)	4.4%	1.65%	-	-	-	-	-	-	-	-
Lingcod - coastwide	15.0%	2.17%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	15.0%	2.65%	-	-	-	-	-	-	-	-
S. of 42° (CA)	15.0%	4.37%	-	-	-	-	-	-	-	-
Pacific Cod	15.0%	10.04%	-	-	-	-	-	-	-	-
Pacific Whiting										
Shoreside non-whiting Sector	11.3%	8.67%	-	-	-	-	-	-	-	-
Shoreside Whiting Sector	11.3%									
Mothership Sector	37.5%									
Catcher Processors	97.5%									
All Whiting Sectors Combined	37.5%									
Sablefish (Coastwide)	5.7%	1.36%	-	-	-	-	-	-	-	-
N. of 36° (Monterey north)	9.3%	1.40%	-	-	-	-	-	-	-	-
S. of 36° (Conception area)	9.3%	15.00%	3	34.22%	-	-	1	9.82%	2	24.40%
PACIFIC OCEAN PERCH	9.3%	2.97%	-	-	-	-	-	-	-	-
Shortbelly Rockfish	9.3%	19.53%	1	19.53%	-	-	-	-	1	19.53%
WIDOW ROCKFISH	10.2%	5.38%	-	-	-	-	-	-	-	-
CANARY ROCKFISH	15.0%	2.83%	-	-	-	-	-	-	-	-
Chilipepper Rockfish	15.0%	9.56%	-	-	-	-	-	-	-	-
BOCACCIO	15.0%	12.39%	-	-	-	-	-	-	-	-
Splitnose Rockfish	15.0%	9.17%	-	-	-	-	-	-	-	-
Yellowtail Rockfish	15.0%	3.74%	-	-	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	9.3%	1.40%	-	-	-	-	-	-	-	-
N. of 34°27'	14.4%	1.86%	-	-	-	-	-	-	-	-
S. of 34°27'	14.1%	3.32%	-	-	-	-	-	-	-	-
Longspine Thornyhead - coastwide	6.0%	1.25%	-	-	-	-	-	-	-	-
N. of 34°27'	6.0%	1.25%	-	-	-	-	-	-	-	-
S. of 34°27'	15.0%	64.58%	1	64.58%	-	-	1	64.58%	-	-
COWCOD	15.0%	44.45%	1	44.45%	-	-	-	-	1	44.45%
DARKBLOTCHED	15.0%	4.36%	-	-	-	-	-	-	-	-
YELLOWEYE	15.0%	6.03%	-	-	-	-	-	-	-	-
Black Rockfish - coastwide	15.0%	11.71%	-	-	-	-	-	-	-	-
Black Rockfish (WA)	15.0%	13.49%	-	-	-	-	-	-	-	-
Black Rockfish (OR-CA)	15.0%	13.92%	-	-	-	-	-	-	-	-
Minor Rockfish North	15.0%	2.03%	-	-	-	-	-	-	-	-
Nearshore Species	15.0%	12.79%	-	-	-	-	-	-	-	-
Shelf Species	12.0%	2.64%	-	-	-	-	-	-	-	-
Slope Species	15.0%	2.37%	-	-	-	-	-	-	-	-
Minor Rockfish South	15.0%	5.85%	-	-	-	-	-	-	-	-
Nearshore Species	15.0%	10.89%	-	-	-	-	-	-	-	-
Shelf Species	15.0%	7.46%	-	-	-	-	-	-	-	-
Slope Species	15.0%	6.44%	-	-	-	-	-	-	-	-
California scorpionfish	15.0%	63.15%	2	93.87%	1	30.71%	-	-	1	63.15%
Cabezon (off CA only)	15.0%	59.50%	2	95.94%	-	-	-	-	2	95.94%
Dover Sole	5.4%	1.27%	-	-	-	-	-	-	-	-
English Sole	30.0%	3.48%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	8.7%	1.72%	-	-	-	-	-	-	-	-
Arrowtooth Flounder	15.0%	6.23%	-	-	-	-	-	-	-	-
Starry Flounder	15.0%	30.48%	1	30.48%	-	-	1	30.48%	-	-
Other Flatfish	30.0%	9.19%	-	-	-	-	-	-	-	-
Other Fish	15.0%	3.91%	-	-	-	-	-	-	-	-
Kelp Greenling		-	-	-	-	-	-	-	-	-
Spiny Dogfish		-	-	-	-	-	-	-	-	-
Nearshore spp		-	-	-	-	-	-	-	-	-
Shelf spp		-	-	-	-	-	-	-	-	-
Slope spp		-	-	-	-	-	-	-	-	-
DTS		-	-	-	-	-	-	-	-	-
Total Thornyheads		-	-	-	-	-	-	-	-	-

Table 2-2d. Evaluation of Vessel Limit Option 2 Compared with Maximum QS Allocations to Permits under the All Catch History Formula

100% Allocation to Harvesters

Non-whiting Sector Species Group	Vessel Limit Option 2	Maximum QS Allocated to a Permit	Coastwide Number	Coastwide QS	Washington Number	Washington QS	Oregon Number	Oregon QS	California Number	California QS
			Number of Permits (and Associated QS) with Initial Allocations Exceeding the Limit							
All nonwhiting groundfish (in aggregate)	4.4%	2.48%	-	-	-	-	-	-	-	-
Lingcod - coastwide	15.0%	3.46%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	15.0%	4.45%	-	-	-	-	-	-	-	-
S. of 42° (CA)	15.0%	6.91%	-	-	-	-	-	-	-	-
Pacific Cod	15.0%	20.44%	1	20.44%	1	20.44%	-	-	-	-
Pacific Whiting										
Shoreside non-whiting Sector	11.3%	14.74%	1	14.74%	-	-	1	14.74%	-	-
Shoreside Whiting Sector	11.3%									
Mothership Sector	37.5%									
Catcher Processors	97.5%									
All Whiting Sectors Combined	37.5%									
Sablefish (Coastwide)	5.7%	2.02%	-	-	-	-	-	-	-	-
N. of 36° (Monterey north)	9.3%	2.11%	-	-	-	-	-	-	-	-
S. of 36° (Conception area)	9.3%	23.39%	4	63.64%	-	-	1	15.19%	3	48.45%
PACIFIC OCEAN PERCH	9.3%	4.97%	-	-	-	-	-	-	-	-
Shortbelly Rockfish	9.3%	35.54%	1	35.54%	-	-	-	-	1	35.54%
WIDOW ROCKFISH	10.2%	8.13%	-	-	-	-	-	-	-	-
CANARY ROCKFISH	15.0%	4.67%	-	-	-	-	-	-	-	-
Chilipepper Rockfish	15.0%	11.80%	-	-	-	-	-	-	-	-
BOCACCIO	15.0%	15.05%	1	15.05%	-	-	-	-	1	15.05%
Splitnose Rockfish	15.0%	12.03%	-	-	-	-	-	-	-	-
Yellowtail Rockfish	15.0%	6.22%	-	-	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	9.3%	2.08%	-	-	-	-	-	-	-	-
N. of 34°27'	14.4%	3.16%	-	-	-	-	-	-	-	-
S. of 34°27'	14.1%	4.73%	-	-	-	-	-	-	-	-
Longspine Thornyhead - coastwide	6.0%	1.82%	-	-	-	-	-	-	-	-
N. of 34°27'	6.0%	1.82%	-	-	-	-	-	-	-	-
S. of 34°27'	15.0%	100.00%	1	100.00%	-	-	1	100.00%	-	-
COWCOD	15.0%	100.00%	1	100.00%	-	-	-	-	1	100.00%
DARKBLOTCHED	15.0%	7.92%	-	-	-	-	-	-	-	-
YELLOWEYE	15.0%	8.87%	-	-	-	-	-	-	-	-
Black Rockfish - coastwide	15.0%	15.10%	1	15.10%	-	-	1	15.10%	-	-
Black Rockfish (WA)	15.0%	40.29%	2	78.05%	1	37.75%	1	40.29%	-	-
Black Rockfish (OR-CA)	15.0%	16.70%	1	16.70%	-	-	1	16.70%	-	-
Minor Rockfish North	15.0%	3.24%	-	-	-	-	-	-	-	-
Nearshore Species	15.0%	30.77%	1	30.77%	1	30.77%	-	-	-	-
Shelf Species	12.0%	4.37%	-	-	-	-	-	-	-	-
Slope Species	15.0%	3.85%	-	-	-	-	-	-	-	-
Minor Rockfish South	15.0%	8.26%	-	-	-	-	-	-	-	-
Nearshore Species	15.0%	15.03%	1	15.03%	-	-	-	-	1	15.03%
Shelf Species	15.0%	9.78%	-	-	-	-	-	-	-	-
Slope Species	15.0%	9.36%	-	-	-	-	-	-	-	-
California scorpionfish	15.0%	67.30%	2	100.00%	1	32.70%	-	-	1	67.30%
Cabezon (off CA only)	15.0%	62.03%	2	100.00%	-	-	-	-	2	100.00%
Dover Sole	5.4%	1.85%	-	-	-	-	-	-	-	-
English Sole	30.0%	5.35%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	8.7%	2.76%	-	-	-	-	-	-	-	-
Arrowtooth Flounder	15.0%	13.00%	-	-	-	-	-	-	-	-
Starry Flounder	15.0%	34.64%	1	34.64%	-	-	1	34.64%	-	-
Other Flatfish	30.0%	13.54%	-	-	-	-	-	-	-	-
Other Fish	15.0%	6.20%	-	-	-	-	-	-	-	-
Kelp Greenling		-	-	-	-	-	-	-	-	-
Spiny Dogfish		-	-	-	-	-	-	-	-	-
Nearshore spp		-	-	-	-	-	-	-	-	-
Shelf spp		-	-	-	-	-	-	-	-	-
Slope spp		-	-	-	-	-	-	-	-	-
DTS		-	-	-	-	-	-	-	-	-
Total Thornyheads		-	-	-	-	-	-	-	-	-

Table 2-3a. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Including Permits owned by Buyers)

			Maximum QS Allocated to an Entity by QS Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
Nonwhiting Sector	Control Limits		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
All nonwhiting groundfish (in aggregate)	1.5%	2.2%	4.9%	5.1%	3.7%	3.8%	3.4%	3.6%	2.2%	2.3%	2.7%	2.9%	1.5%	1.6%
Lingcod - coastwide	5.0%	7.5%	5.3%	5.8%	4.0%	4.3%	0.3%	0.8%	-	-	-	-	-	-
N. of 42° (OR & WA)	5.0%	7.5%	4.7%	4.7%	3.5%	3.5%	-	-	-	-	-	-	-	-
S. of 42° (CA)	5.0%	7.5%	6.8%	8.3%	5.1%	6.2%	1.8%	3.3%	0.1%	1.2%	-	0.8%	-	-
Pacific Cod	5.0%	7.5%	11.4%	20.4%	8.5%	15.3%	6.4%	15.4%	3.5%	10.3%	3.9%	12.9%	1.0%	7.8%
Pacific Whiting							-	-	-	-	-	-	-	-
Shoreside non-whiting Sector	10.0%	15.0%	8.7%	14.7%	6.5%	11.1%	-	4.7%	-	1.1%	-	-	-	-
Shoreside Whiting Sector	10.0%	15.0%												
Mothership Sector	10.0%	15.0%												
Catcher Processors	50.0%	75.0%												
All Whiting Sectors Combined	15.0%	22.5%					-	-	-	-	-	-	-	-
Sablefish (Coastwide)	1.9%	2.9%	4.7%	4.7%	3.5%	3.5%	2.8%	2.8%	1.6%	1.6%	1.8%	1.8%	0.6%	0.6%
N. of 36° (Monterey north)	2.0%	3.0%	4.8%	4.8%	3.6%	3.6%	2.8%	2.8%	1.6%	1.6%	1.8%	1.8%	0.6%	0.6%
S. of 36° (Conception area)	5.0%	7.5%	32.1%	48.8%	24.1%	36.6%	27.1%	43.8%	19.1%	31.6%	24.6%	41.3%	16.6%	29.1%
PACIFIC OCEAN PERCH	5.0%	7.5%	5.8%	6.8%	4.4%	5.1%	0.8%	1.8%	-	0.1%	-	-	-	-
Shortbelly Rockfish	5.0%	7.5%	20.6%	36.5%	15.4%	27.4%	15.6%	31.5%	10.4%	22.4%	13.1%	29.0%	7.9%	19.9%
WIDOW ROCKFISH	3.4%	5.1%	5.4%	8.1%	4.0%	6.1%	2.0%	4.7%	0.6%	2.7%	0.3%	3.0%	-	1.0%
CANARY ROCKFISH	5.0%	7.5%	4.6%	6.1%	3.5%	4.6%	-	1.1%	-	-	-	-	-	-
Chilipepper Rockfish	5.0%	7.5%	9.7%	11.8%	7.3%	8.9%	4.7%	6.8%	2.3%	3.9%	2.2%	4.3%	-	1.4%
BOCACCIO	5.0%	7.5%	14.8%	17.8%	11.1%	13.3%	9.8%	12.8%	6.1%	8.3%	7.3%	10.3%	3.6%	5.8%
Splitnose Rockfish	5.0%	7.5%	10.4%	13.3%	7.8%	10.0%	5.4%	8.3%	2.8%	5.0%	2.9%	5.8%	0.3%	2.5%
Yellowtail Rockfish	5.0%	7.5%	6.9%	8.6%	5.2%	6.5%	1.9%	3.6%	0.2%	1.5%	-	1.1%	-	-
Shortspine Thornyhead - coastwide	3.1%	4.7%	5.5%	7.2%	4.1%	5.4%	2.4%	4.1%	1.0%	2.3%	0.8%	2.5%	-	0.7%
N. of 34°27'	4.8%	7.2%	4.5%	5.6%	3.4%	4.2%	-	0.8%	-	-	-	-	-	-
S. of 34°27'	4.7%	7.1%	14.3%	19.8%	10.7%	14.9%	9.6%	15.1%	6.0%	10.2%	7.2%	12.7%	3.6%	7.8%
Longspine Thornyhead - coastwide	2.0%	3.0%	4.6%	5.6%	3.5%	4.2%	2.6%	3.6%	1.5%	2.2%	1.6%	2.6%	0.5%	1.2%
N. of 34°27'	2.0%	3.0%	4.6%	5.6%	3.5%	4.2%	2.6%	3.6%	1.5%	2.2%	1.6%	2.6%	0.5%	1.2%
S. of 34°27'	5.0%	7.5%	64.6%	100.0%	48.4%	75.0%	59.6%	95.0%	43.4%	70.0%	57.1%	92.5%	40.9%	67.5%
COWCOD	5.0%	7.5%	44.8%	100.0%	33.6%	75.0%	39.8%	95.0%	28.6%	70.0%	37.3%	92.5%	26.1%	67.5%
DARKBLOTCHED	5.0%	7.5%	5.6%	9.2%	4.2%	6.9%	0.6%	4.2%	-	1.9%	-	1.7%	-	-
YELLOWEYE	5.0%	7.5%	6.0%	8.9%	4.5%	6.7%	1.0%	3.9%	-	1.7%	-	1.4%	-	-
Black Rockfish - coastwide	5.0%	7.5%	11.7%	15.1%	8.8%	11.3%	6.7%	10.1%	3.8%	6.3%	4.2%	7.6%	1.3%	3.8%
Black Rockfish (WA)	5.0%	7.5%	13.5%	40.3%	10.1%	30.2%	8.5%	35.3%	5.1%	25.2%	6.0%	32.8%	2.6%	22.7%
Black Rockfish (OR-CA)	5.0%	7.5%	13.9%	16.7%	10.4%	12.5%	8.9%	11.7%	5.4%	7.5%	6.4%	9.2%	2.9%	5.0%

Table 2-3a. Continued.

Nonwhiting Sector	Control Limits		Maximum QS Allocated to an Entity by QS Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Minor Rockfish North	5.0%	7.5%	4.4%	6.4%	3.3%	4.8%	-	1.4%	-	-	-	-	-	-
Nearshore Species	5.0%	7.5%	12.8%	30.8%	9.6%	23.1%	7.8%	25.8%	4.6%	18.1%	5.3%	23.3%	2.1%	15.6%
Shelf Species	4.0%	6.0%	4.7%	6.7%	3.5%	5.0%	0.7%	2.7%	-	1.0%	-	0.7%	-	-
Slope Species	5.0%	7.5%	4.1%	6.0%	3.1%	4.5%	-	1.0%	-	-	-	-	-	-
Minor Rockfish South	5.0%	7.5%	11.9%	15.7%	8.9%	11.7%	6.9%	10.7%	3.9%	6.7%	4.4%	8.2%	1.4%	4.2%
Nearshore Species	5.0%	7.5%	13.6%	17.6%	10.2%	13.2%	8.6%	12.6%	5.2%	8.2%	6.1%	10.1%	2.7%	5.7%
Shelf Species	5.0%	7.5%	8.3%	9.9%	6.2%	7.4%	3.3%	4.9%	1.2%	2.4%	0.8%	2.4%	-	-
Slope Species	5.0%	7.5%	13.3%	18.2%	10.0%	13.6%	8.3%	13.2%	5.0%	8.6%	5.8%	10.7%	2.5%	6.1%
California scorpionfish	5.0%	7.5%	63.3%	67.3%	47.5%	50.5%	58.3%	62.3%	42.5%	45.5%	55.8%	59.8%	40.0%	43.0%
Cabezon (off CA only)	5.0%	7.5%	59.5%	62.0%	44.6%	46.5%	54.5%	57.0%	39.6%	41.5%	52.0%	54.5%	37.1%	39.0%
Dover Sole	1.8%	2.7%	5.0%	6.2%	3.7%	4.6%	3.2%	4.4%	1.9%	2.8%	2.3%	3.5%	1.0%	1.9%
English Sole	10.0%	15.0%	7.5%	9.4%	5.7%	7.0%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	2.9%	4.4%	4.9%	5.6%	3.7%	4.2%	2.0%	2.7%	0.8%	1.3%	0.5%	1.2%	-	-
Arrowtooth Flounder	5.0%	7.5%	6.2%	13.0%	4.7%	9.7%	1.2%	8.0%	-	4.7%	-	5.5%	-	2.2%
Starry Flounder	5.0%	7.5%	30.5%	34.6%	22.9%	26.0%	25.5%	29.6%	17.9%	21.0%	23.0%	27.1%	15.4%	18.5%
Other Flatfish	10.0%	15.0%	9.2%	13.5%	6.9%	10.2%	-	3.5%	-	0.2%	-	-	-	-
Other Fish	5.0%	7.5%	7.1%	10.8%	5.4%	8.1%	2.1%	5.8%	0.4%	3.1%	-	3.3%	-	0.6%
Kelp Greenling			14.7%	16.2%	11.0%	12.2%								
Spiny Dogfish			10.9%	39.0%	8.1%	29.2%								
Nearshore spp			5.7%	8.4%	4.3%	6.3%								
Shelf spp			5.7%	6.5%	4.3%	4.9%								
Slope spp			4.5%	4.8%	3.4%	3.6%								
DTS			4.7%	5.5%	3.5%	4.1%								
Total Thornyheads			4.9%	6.0%	3.7%	4.5%								

Table 2-3b. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Including Permits owned by Buyers)

			Maximum QS Allocated to an Entity by QS Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
Whiting Sectors	Control Limits		100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting														
Shoreside non-whiting Sector														
Shoreside Whiting Sector	10.0%	15.0%	10.7%	11.5%	5.4%	5.7%	0.7%	1.5%	-	-	-	-	-	-
Mothership Sector	10.0%	15.0%	9.6%	10.2%	4.8%	5.1%	-	0.2%	-	-	-	-	-	-
Catcher Processors	50.0%	75.0%	-	53.5%	-	-		3.5%				-		
All Whiting Sectors Combined	15.0%	22.5%					-	-	-	-	-	-	-	-

Table 2-4a. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Excluding Permits owned by Buyers)

Nonwhiting Sector	Control Limits		Maximum QS Allocated to an Entity by Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
All nonwhiting groundfish (in aggregate)	1.5%	2.2%	3.7%	3.8%	2.7%	2.8%	2.2%	2.3%	1.2%	1.3%	1.5%	1.6%	0.5%	0.6%
Lingcod - coastwide	5.0%	7.5%	2.9%	3.5%	2.2%	2.6%	-	-	-	-	-	-	-	-
N. of 42° (OR & WA)	5.0%	7.5%	3.3%	4.7%	2.5%	3.5%	-	-	-	-	-	-	-	-
S. of 42° (CA)	5.0%	7.5%	5.2%	6.6%	3.9%	4.9%	0.2%	1.6%	-	-	-	-	-	-
Pacific Cod	5.0%	7.5%	10.0%	20.4%	7.5%	15.3%	5.0%	15.4%	2.5%	10.3%	2.5%	12.9%	0.0%	7.8%
Pacific Whiting							-	-	-	-	-	-	-	-
Shoreside non-whiting Sector	10.0%	15.0%	8.7%	14.7%	6.5%	11.1%	-	4.7%	-	1.1%	-	-	-	-
Shoreside Whiting Sector	10.0%	15.0%												
Mothership Sector	10.0%	15.0%												
Catcher Processors	50.0%	75.0%												
All Whiting Sectors Combined	15.0%	22.5%					-	-	-	-	-	-	-	-
Sablefish (Coastwide)	1.9%	2.9%	3.5%	3.9%	2.6%	2.9%	1.6%	2.0%	0.7%	1.0%	0.6%	1.0%	-	0.0%
N. of 36° (Monterey north)	2.0%	3.0%	3.0%	4.1%	2.3%	3.1%	1.0%	2.1%	0.3%	1.1%	0.0%	1.1%	-	0.1%
S. of 36° (Conception area)	5.0%	7.5%	32.1%	48.8%	24.1%	36.6%	27.1%	43.8%	19.1%	31.6%	24.6%	41.3%	16.6%	29.1%
PACIFIC OCEAN PERCH	5.0%	7.5%	3.6%	5.4%	2.7%	4.0%	-	0.4%	-	-	-	-	-	-
Shortbelly Rockfish	5.0%	7.5%	6.8%	11.1%	5.1%	8.3%	1.8%	6.1%	0.1%	3.3%	-	3.6%	-	0.8%
WIDOW ROCKFISH	3.4%	5.1%	5.4%	8.1%	4.0%	6.1%	2.0%	4.7%	0.6%	2.7%	0.3%	3.0%	-	1.0%
CANARY ROCKFISH	5.0%	7.5%	4.2%	6.1%	3.1%	4.6%	-	1.1%	-	-	-	-	-	-
Chilipepper Rockfish	5.0%	7.5%	8.5%	10.4%	6.3%	7.8%	3.5%	5.4%	1.3%	2.8%	1.0%	2.9%	-	0.3%
BOCACCIO	5.0%	7.5%	12.0%	13.9%	9.0%	10.5%	7.0%	8.9%	4.0%	5.5%	4.5%	6.4%	1.5%	3.0%
Splitnose Rockfish	5.0%	7.5%	9.6%	12.2%	7.2%	9.1%	4.6%	7.2%	2.2%	4.1%	2.1%	4.7%	-	1.6%
Yellowtail Rockfish	5.0%	7.5%	3.7%	6.2%	2.8%	4.7%	-	1.2%	-	-	-	-	-	-
Shortspine Thornyhead - coastwide	3.1%	4.7%	5.5%	7.2%	4.1%	5.4%	2.4%	4.1%	1.0%	2.3%	0.8%	2.5%	-	0.7%
N. of 34°27'	4.8%	7.2%	3.7%	5.6%	2.7%	4.2%	-	0.8%	-	-	-	-	-	-
S. of 34°27'	4.7%	7.1%	14.3%	19.8%	10.7%	14.9%	9.6%	15.1%	6.0%	10.2%	7.2%	12.7%	3.6%	7.8%
Longspine Thornyhead - coastwide	2.0%	3.0%	4.6%	5.6%	3.5%	4.2%	2.6%	3.6%	1.5%	2.2%	1.6%	2.6%	0.5%	1.2%
N. of 34°27'	2.0%	3.0%	4.6%	5.6%	3.5%	4.2%	2.6%	3.6%	1.5%	2.2%	1.6%	2.6%	0.5%	1.2%
S. of 34°27'	5.0%	7.5%	64.6%	100.0%	48.4%	75.0%	59.6%	95.0%	43.4%	70.0%	57.1%	92.5%	40.9%	67.5%
COWCOD	5.0%	7.5%	44.8%	100.0%	33.6%	75.0%	39.8%	95.0%	28.6%	70.0%	37.3%	92.5%	26.1%	67.5%
DARKBLOTCHED	5.0%	7.5%	5.6%	9.2%	4.2%	6.9%	0.6%	4.2%	-	1.9%	-	1.7%	-	-
YELLOWEYE	5.0%	7.5%	6.0%	8.9%	4.5%	6.7%	1.0%	3.9%	-	1.7%	-	1.4%	-	-
Black Rockfish - coastwide	5.0%	7.5%	11.7%	15.1%	8.8%	11.3%	6.7%	10.1%	3.8%	6.3%	4.2%	7.6%	1.3%	3.8%
Black Rockfish (WA)	5.0%	7.5%	13.5%	40.3%	10.1%	30.2%	8.5%	35.3%	5.1%	25.2%	6.0%	32.8%	2.6%	22.7%
Black Rockfish (OR-CA)	5.0%	7.5%	13.9%	16.7%	10.4%	12.5%	8.9%	11.7%	5.4%	7.5%	6.4%	9.2%	2.9%	5.0%

Table 2-4a. Continued.

Nonwhiting Sector	Control Limits		Maximum QS Allocated to an Entity by Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Minor Rockfish North	5.0%	7.5%	4.3%	6.4%	3.2%	4.8%	-	1.4%	-	-	-	-	-	-
Nearshore Species	5.0%	7.5%	4.3%	9.8%	3.2%	7.4%	-	4.8%	-	2.4%	-	2.3%	-	-
Shelf Species	4.0%	6.0%	4.4%	6.7%	3.3%	5.0%	0.4%	2.7%	-	1.0%	-	0.7%	-	-
Slope Species	5.0%	7.5%	4.1%	6.0%	3.1%	4.5%	-	1.0%	-	-	-	-	-	-
Minor Rockfish South	5.0%	7.5%	11.9%	15.7%	8.9%	11.7%	6.9%	10.7%	3.9%	6.7%	4.4%	8.2%	1.4%	4.2%
Nearshore Species	5.0%	7.5%	13.6%	17.6%	10.2%	13.2%	8.6%	12.6%	5.2%	8.2%	6.1%	10.1%	2.7%	5.7%
Shelf Species	5.0%	7.5%	8.3%	9.9%	6.2%	7.4%	3.3%	4.9%	1.2%	2.4%	0.8%	2.4%	-	-
Slope Species	5.0%	7.5%	13.3%	18.2%	10.0%	13.6%	8.3%	13.2%	5.0%	8.6%	5.8%	10.7%	2.5%	6.1%
California scorpionfish	5.0%	7.5%	63.3%	67.3%	47.5%	50.5%	58.3%	62.3%	42.5%	45.5%	55.8%	59.8%	40.0%	43.0%
Cabezon (off CA only)	5.0%	7.5%	59.5%	62.0%	44.6%	46.5%	54.5%	57.0%	39.6%	41.5%	52.0%	54.5%	37.1%	39.0%
Dover Sole	1.8%	2.7%	5.0%	6.2%	3.7%	4.6%	3.2%	4.4%	1.9%	2.8%	2.3%	3.5%	1.0%	1.9%
English Sole	10.0%	15.0%	3.5%	5.4%	2.6%	4.0%	-	-	-	-	-	-	-	-
Petrale Sole (coastwide)	2.9%	4.4%	3.8%	5.6%	2.8%	4.2%	0.9%	2.7%	-	1.3%	-	1.2%	-	-
Arrowtooth Flounder	5.0%	7.5%	6.2%	13.0%	4.7%	9.7%	1.2%	8.0%	-	4.7%	-	5.5%	-	2.2%
Starry Flounder	5.0%	7.5%	30.5%	34.6%	22.9%	26.0%	25.5%	29.6%	17.9%	21.0%	23.0%	27.1%	15.4%	18.5%
Other Flatfish	10.0%	15.0%	4.6%	5.2%	3.5%	3.9%	-	-	-	-	-	-	-	-
Other Fish	5.0%	7.5%	7.1%	10.8%	5.4%	8.1%	2.1%	5.8%	0.4%	3.1%	-	3.3%	-	0.6%
Kelp Greenling			14.7%	16.2%	11.0%	12.2%								
Spiny Dogfish			10.9%	39.0%	8.1%	29.2%								
Nearshore spp			5.1%	8.4%	3.9%	6.3%								
Shelf spp			3.5%	5.0%	2.6%	3.8%								
Slope spp			3.9%	4.8%	2.9%	3.6%								
DTS			4.6%	5.5%	3.4%	4.1%								
Total Thornyheads			4.9%	6.0%	3.7%	4.5%								

Table 2-4b. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Excluding Permits owned by Buyers)

Whiting Sectors	Control Limits		Maximum QS Allocated to an Entity by Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting														
Shoreside non-whiting Sector														
Shoreside Whiting Sector	10.0%	15.0%	10.7%	11.5%	5.4%	5.7%	0.7%	1.5%	-	-	-	-	-	-
Mothership Sector	10.0%	15.0%	9.6%	10.2%	4.8%	5.1%	-	0.2%	-	-	-	-	-	-
Catcher Processors	50.0%	75.0%	-	53.5%	-	-		3.5%				-		
All Whiting Sectors Combined	15.0%	22.5%					-	-	-	-	-	-	-	-

Table 2-5a. Evaluation of Control Limit <u>Option 1</u> Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
Non-whiting Sector			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
All nonwhiting groundfish (in aggregate)	1.5%	116	14	20	6	12	31.7%	47.5%	13.5%	24.9%
Lingcod - coastwide	5.0%	112	1	1	0	0	5.3%	5.8%	0.0%	0.0%
N. of 42° (OR & WA)	5.0%	85	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 42° (CA)	5.0%	68	2	8	1	2	12.0%	49.8%	5.1%	11.4%
Pacific Cod	5.0%	87	3	6	2	6	27.2%	72.6%	16.1%	54.5%
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*	59	0	2	0	1	0.0%	26.5%	0.0%	11.1%
Shoreside Whiting Sector	10.0%									
Mothership Sector	10.0%									
Catcher Processors	50.0%									
All Whiting Sectors Combined	15.0%									
Sablefish (Coastwide)	1.9%	112	6	13	4	4	18.1%	35.1%	10.5%	11.9%
N. of 36° (Monterey north)	2.0%	112	6	10	3	3	17.4%	28.8%	8.1%	9.7%
S. of 36° (Conception area)	5.0%	24	3	3	3	3	54.0%	82.7%	40.5%	62.0%
PACIFIC OCEAN PERCH	5.0%	96	1	3	0	1	5.8%	17.3%	0.0%	5.1%
Shortbelly Rockfish	5.0%	92	2	3	2	3	27.4%	55.4%	20.6%	41.5%
WIDOW ROCKFISH	3.4%	115	3	4	2	2	14.0%	23.4%	7.6%	11.0%
CANARY ROCKFISH	5.0%	113	0	1	0	0	0.0%	6.1%	0.0%	0.0%
Chilipepper Rockfish	5.0%	63	7	8	5	5	54.5%	70.6%	32.5%	39.0%
BOCACCIO	5.0%	54	5	6	2	3	43.9%	56.6%	20.1%	29.0%
Splitnose Rockfish	5.0%	57	5	6	5	5	44.1%	61.5%	33.0%	42.0%
Yellowtail Rockfish	5.0%	99	1	2	1	1	6.9%	14.9%	5.2%	6.5%
Shortspine Thornyhead - coastwide	3.1%	110	2	4	2	2	10.0%	19.1%	7.5%	8.5%
N. of 34°27'	4.8%	97	0	1	0	0	0.0%	5.6%	0.0%	0.0%
S. of 34°27'	4.7%	73	3	4	2	3	27.6%	43.0%	16.3%	28.7%
Longspine Thornyhead - coastwide	2.0%	109	9	13	4	7	26.9%	42.7%	12.0%	21.4%
N. of 34°27'	2.0%	109	9	13	4	7	26.9%	42.7%	12.0%	21.4%
S. of 34°27'	5.0%	1	1	1	1	1	64.6%	100.0%	48.4%	75.0%
COWCOD	5.0%	1	1	1	1	1	44.8%	100.0%	33.6%	75.0%
DARKBLOTCHED	5.0%	112	2	3	0	2	11.0%	23.3%	0.0%	13.6%
YELLOWEYE	5.0%	108	1	5	0	1	6.0%	32.3%	0.0%	6.7%
Black Rockfish - coastwide	5.0%	69	4	5	3	4	32.1%	46.0%	19.6%	30.0%
Black Rockfish (WA)	5.0%	17	2	4	2	4	26.2%	96.9%	19.6%	72.7%
Black Rockfish (OR-CA)	5.0%	61	18	18	15	18	76.2%	88.3%	53.0%	66.3%
Minor Rockfish North	5.0%	113	0	2	0	0	0.0%	11.5%	0.0%	0.0%
Nearshore Species	5.0%	44	1	4	1	4	12.8%	56.4%	9.6%	42.3%
Shelf Species	4.0%	113	2	4	0	1	9.2%	20.9%	0.0%	5.0%
Slope Species	5.0%	98	0	4	0	0	0.0%	21.2%	0.0%	0.0%
Minor Rockfish South	5.0%	79	4	7	2	3	30.8%	56.1%	14.4%	25.7%
Nearshore Species	5.0%	39	5	7	4	4	45.4%	73.1%	30.3%	40.5%
Shelf Species	5.0%	74	5	8	4	4	36.2%	61.1%	23.2%	29.2%
Slope Species	5.0%	73	4	5	3	3	32.8%	48.8%	20.8%	28.8%
California scorpionfish	5.0%	2	2	2	2	2	94.1%	100.0%	70.6%	75.0%
Cabezon (off CA only)	5.0%	2	2	2	2	2	96.0%	100.0%	72.0%	75.0%
Dover Sole	1.8%	113	8	13	4	6	23.0%	37.7%	11.6%	17.7%
English Sole	10.0%	112	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	2.9%	113	3	5	1	2	12.1%	20.7%	3.7%	8.0%
Arrowtooth Flounder	5.0%	98	3	6	0	5	17.2%	51.9%	0.0%	34.9%
Starry Flounder	5.0%	64	4	4	3	3	52.1%	59.0%	34.7%	39.3%
Other Flatfish	10.0%	113	0	1	0	1	0.0%	13.5%	0.0%	10.2%
Other Fish	5.0%	101	2	4	1	2	13.7%	32.6%	5.4%	15.6%
Kelp Greenling										
Spiny Dogfish										
Nearshore spp										
Shelf spp										
Slope spp										
DTS										
Total Thornyheads										

Table 2-5b. Evaluation of Control Limit Option 1 Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*									
Shoreside Whiting Sector	10.0%	121	1	1	0	0	10.7%	11.5%	0.0%	0.0%
Mothership Sector	10.0%	121	0	1	0	0	0.0%	10.2%	0.0%	0.0%
Catcher Processors	50.0%	4		1				53.5%		
All Whiting Sectors Combined	15.0%									

Table 2-6a. Evaluation of Control Limit Option 1 Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers

Nonwhiting Sector			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
All nonwhiting groundfish (in aggregate)	1.5%	107	11	16	4	9	23.0%	36.3%	8.3%	17.9%
Lingcod - coastwide	5.0%	103	0	0	0	0	0.0%	0.0%	0.0%	0.0%
N. of 42° (OR & WA)	5.0%	82	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 42° (CA)	5.0%	59	1	4	0	0	5.2%	24.1%	0.0%	0.0%
Pacific Cod	5.0%	83	2	5	1	5	15.9%	53.9%	7.5%	40.4%
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*	53	0	2	0	1	0.0%	26.5%	0.0%	11.1%
Shoreside Whiting Sector	10.0%									
Mothership Sector	10.0%									
Catcher Processors	50.0%									
All Whiting Sectors Combined	15.0%									
Sablefish (Coastwide)	1.9%	103	5	11	3	3	13.4%	28.4%	7.0%	8.4%
N. of 36° (Monterey north)	2.0%	103	5	8	2	2	12.6%	21.9%	4.5%	6.1%
S. of 36° (Conception area)	5.0%	19	3	3	3	3	54.0%	82.7%	40.5%	62.0%
PACIFIC OCEAN PERCH	5.0%	92	0	2	0	0	0.0%	10.6%	0.0%	0.0%
Shortbelly Rockfish	5.0%	83	1	2	1	2	6.8%	18.9%	5.1%	14.2%
WIDOW ROCKFISH	3.4%	106	2	4	2	2	10.1%	23.4%	7.6%	11.0%
CANARY ROCKFISH	5.0%	104	0	1	0	0	0.0%	6.1%	0.0%	0.0%
Chilipepper Rockfish	5.0%	55	4	5	3	3	29.4%	40.9%	18.0%	21.4%
BOCACCIO	5.0%	46	3	3	1	2	23.2%	27.2%	9.0%	15.7%
Splitnose Rockfish	5.0%	49	3	4	3	3	26.6%	39.0%	19.9%	25.1%
Yellowtail Rockfish	5.0%	95	0	1	0	0	0.0%	6.2%	0.0%	0.0%
Shortspine Thornyhead - coastwide	3.1%	103	1	3	1	1	5.5%	14.9%	4.1%	5.4%
N. of 34°27'	4.8%	94	0	1	0	0	0.0%	5.6%	0.0%	0.0%
S. of 34°27'	4.7%	67	2	3	2	2	21.8%	35.0%	16.3%	22.7%
Longspine Thornyhead - coastwide	2.0%	102	7	10	3	6	20.2%	33.4%	8.6%	18.1%
N. of 34°27'	2.0%	102	7	10	3	6	20.2%	33.4%	8.6%	18.1%
S. of 34°27'	5.0%	1	1	1	1	1	64.6%	100.0%	48.4%	75.0%
COWCOD	5.0%	1	1	1	1	1	44.8%	100.0%	33.6%	75.0%
DARKBLOTCHED	5.0%	103	2	3	0	2	11.0%	23.3%	0.0%	13.6%
YELLOWEYE	5.0%	99	1	5	0	1	6.0%	32.3%	0.0%	6.7%
Black Rockfish - coastwide	5.0%	64	1	2	1	1	11.7%	21.2%	8.8%	11.3%
Black Rockfish (WA)	5.0%	16	2	4	2	4	26.2%	96.9%	19.6%	72.7%
Black Rockfish (OR-CA)	5.0%	56	14	14	11	14	50.3%	58.4%	33.5%	43.8%
Minor Rockfish North	5.0%	104	0	2	0	0	0.0%	11.5%	0.0%	0.0%
Nearshore Species	5.0%	41	0	3	0	3	0.0%	25.6%	0.0%	19.2%
Shelf Species	4.0%	104	1	3	0	1	4.4%	16.2%	0.0%	5.0%
Slope Species	5.0%	94	0	4	0	0	0.0%	21.2%	0.0%	0.0%
Minor Rockfish South	5.0%	71	3	3	2	3	25.6%	34.3%	14.4%	25.7%
Nearshore Species	5.0%	32	4	6	3	3	34.5%	58.0%	22.1%	29.2%
Shelf Species	5.0%	66	1	3	1	1	8.3%	21.0%	6.2%	7.4%
Slope Species	5.0%	65	3	4	3	3	27.8%	43.6%	20.8%	28.8%
California scorpionfish	5.0%	2	2	2	2	2	94.1%	100.0%	70.6%	75.0%
Cabezon (off CA only)	5.0%	2	2	2	2	2	96.0%	100.0%	72.0%	75.0%
Dover Sole	1.8%	104	6	10	3	5	16.4%	29.1%	8.1%	14.1%
English Sole	10.0%	103	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	2.9%	104	2	3	0	1	7.2%	12.4%	0.0%	4.2%
Arrowtooth Flounder	5.0%	92	2	5	0	4	11.5%	45.0%	0.0%	29.8%
Starry Flounder	5.0%	59	4	4	3	3	52.1%	59.0%	34.7%	39.3%
Other Flatfish	10.0%	104	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other Fish	5.0%	92	2	4	1	2	13.7%	32.6%	5.4%	15.6%
Kelp Greenling										
Spiny Dogfish										
Nearshore spp										
Shelf spp										
Slope spp										
DTS										
Total Thornyheads										

Table 2-6b. Evaluation of Control Limit Option 1 Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*									
Shoreside Whiting Sector	10.0%	112	1	1	0	0	10.7%	11.5%	0.0%	0.0%
Mothership Sector	10.0%	119	0	1	0	0	0.0%	10.2%	0.0%	0.0%
Catcher Processors	50.0%	3		1				53.5%		
All Whiting Sectors Combined	15.0%									

Table 2-7a. Evaluation of Control Limit <u>Option 2</u> Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

Nonwhiting Sector			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
All nonwhiting groundfish (in aggregate)	2.2%	116	4	7	2	4	13.9%	22.9%	6.5%	11.7%
Lingcod - coastwide	7.5%	112	0	0	0	0	0.0%	0.0%	0.0%	0.0%
N. of 42° (OR & WA)	7.5%	85	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 42° (CA)	7.5%	68	0	1	0	0	0.0%	8.3%	0.0%	0.0%
Pacific Cod	7.5%	87	2	4	2	3	21.4%	59.0%	16.1%	37.6%
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*	59	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Shoreside Whiting Sector	15.0%									
Mothership Sector	15.0%									
Catcher Processors	75.0%									
All Whiting Sectors Combined	22.5%									
Sablefish (Coastwide)	2.9%	112	3	4	1	2	11.1%	15.9%	3.5%	6.5%
N. of 36° (Monterey north)	3.0%	112	2	3	1	2	7.8%	12.9%	3.6%	6.7%
S. of 36° (Conception area)	7.5%	24	2	3	2	3	47.1%	82.7%	35.3%	62.0%
PACIFIC OCEAN PERCH	7.5%	96	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Shortbelly Rockfish	7.5%	92	1	3	1	2	20.6%	55.4%	15.4%	35.7%
WIDOW ROCKFISH	5.1%	115	1	2	0	1	5.4%	14.6%	0.0%	6.1%
CANARY ROCKFISH	7.5%	113	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Chilipepper Rockfish	7.5%	63	4	5	0	3	36.0%	52.0%	0.0%	25.5%
BOCACCIO	7.5%	54	2	2	2	2	26.8%	31.7%	20.1%	23.8%
Splitnose Rockfish	7.5%	57	4	5	1	3	37.0%	56.0%	7.8%	28.1%
Yellowtail Rockfish	7.5%	99	0	1	0	0	0.0%	8.6%	0.0%	0.0%
Shortspine Thornyhead - coastwide	4.7%	110	1	1	0	1	5.5%	7.2%	0.0%	5.4%
N. of 34°27'	7.2%	97	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 34°27'	7.1%	73	2	3	1	2	21.8%	38.2%	10.7%	22.7%
Longspine Thornyhead - coastwide	3.0%	109	4	5	2	4	16.0%	22.8%	6.9%	14.7%
N. of 34°27'	3.0%	109	4	5	2	4	16.0%	22.8%	6.9%	14.7%
S. of 34°27'	7.5%	1	1	1	1	1	64.6%	100.0%	48.4%	75.0%
COWCOD	7.5%	1	1	1	1	1	44.8%	100.0%	33.6%	75.0%
DARKBLOTCHED	7.5%	112	0	2	0	0	0.0%	18.1%	0.0%	0.0%
YELLOWEYE	7.5%	108	0	1	0	0	0.0%	8.9%	0.0%	0.0%
Black Rockfish - coastwide	7.5%	69	2	4	1	1	19.5%	40.0%	8.8%	11.3%
Black Rockfish (WA)	7.5%	17	2	4	2	2	26.2%	96.9%	19.6%	58.5%
Black Rockfish (OR-CA)	7.5%	61	14	16	9	12	68.5%	84.2%	41.5%	55.3%
Minor Rockfish North	7.5%	113	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Nearshore Species	7.5%	44	1	3	1	1	12.8%	49.1%	9.6%	23.1%
Shelf Species	6.0%	113	0	1	0	0	0.0%	6.7%	0.0%	0.0%
Slope Species	7.5%	98	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Minor Rockfish South	7.5%	79	1	3	1	1	11.9%	34.3%	8.9%	11.7%
Nearshore Species	7.5%	39	4	4	2	4	40.4%	54.0%	18.4%	40.5%
Shelf Species	7.5%	74	2	4	0	0	16.1%	39.0%	0.0%	0.0%
Slope Species	7.5%	73	2	3	1	2	21.0%	38.4%	10.0%	21.6%
California scorpionfish	7.5%	2	2	2	2	2	94.1%	100.0%	70.6%	75.0%
Cabezon (off CA only)	7.5%	2	2	2	2	2	96.0%	100.0%	72.0%	75.0%
Dover Sole	2.7%	113	4	4	2	4	15.5%	18.7%	7.3%	14.0%
English Sole	15.0%	112	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	4.4%	113	1	2	0	0	4.9%	10.7%	0.0%	0.0%
Arrowtooth Flounder	7.5%	98	0	3	0	2	0.0%	32.5%	0.0%	18.0%
Starry Flounder	7.5%	64	3	3	1	1	46.3%	52.4%	22.9%	26.0%
Other Flatfish	15.0%	113	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other Fish	7.5%	101	0	2	0	1	0.0%	20.8%	0.0%	8.1%
Kelp Greenling										
Spiny Dogfish										
Nearshore spp										
Shelf spp										
Slope spp										
DTS										
Total Thornyheads										

Table 2-7b. Evaluation of Control Limit Option 2 Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*									
Shoreside Whiting Sector	15.0%	121	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Mothership Sector	15.0%	121	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Catcher Processors	75.0%	4		0				0.0%		
All Whiting Sectors Combined	22.5%									

Table 2-8a. Evaluation of Control Limit <u>Option 2</u> Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers

Nonwhiting Sector			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
All nonwhiting groundfish (in aggregate)	2.2%	107	3	5	1	3	9.0%	15.6%	2.7%	7.9%
Lingcod - coastwide	7.5%	103	0	0	0	0	0.0%	0.0%	0.0%	0.0%
N. of 42° (OR & WA)	7.5%	82	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 42° (CA)	7.5%	59	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Pacific Cod	7.5%	83	1	3	1	2	10.0%	40.3%	7.5%	23.5%
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*	53	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Shoreside Whiting Sector	15.0%									
Mothership Sector	15.0%									
Catcher Processors	75.0%									
All Whiting Sectors Combined	22.5%									
Sablefish (Coastwide)	2.9%	103	2	3	0	1	6.4%	11.2%	0.0%	2.9%
N. of 36° (Monterey north)	3.0%	103	1	2	0	1	3.0%	8.1%	0.0%	3.1%
S. of 36° (Conception area)	7.5%	19	2	3	2	3	47.1%	82.7%	35.3%	62.0%
PACIFIC OCEAN PERCH	7.5%	92	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Shortbelly Rockfish	7.5%	83	0	2	0	1	0.0%	18.9%	0.0%	8.3%
WIDOW ROCKFISH	5.1%	106	1	2	0	1	5.4%	14.6%	0.0%	6.1%
CANARY ROCKFISH	7.5%	104	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Chilipepper Rockfish	7.5%	55	2	3	0	1	16.7%	28.5%	0.0%	7.8%
BOCACCIO	7.5%	46	1	1	1	1	12.0%	13.9%	9.0%	10.5%
Splitnose Rockfish	7.5%	49	3	3	0	2	26.6%	33.4%	0.0%	18.2%
Yellowtail Rockfish	7.5%	95	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Shortspine Thornyhead - coastwide	4.7%	103	1	1	0	1	5.5%	7.2%	0.0%	5.4%
N. of 34°27'	7.2%	94	0	0	0	0	0.0%	0.0%	0.0%	0.0%
S. of 34°27'	7.1%	67	2	2	1	2	21.8%	30.3%	10.7%	22.7%
Longspine Thornyhead - coastwide	3.0%	102	3	4	1	3	11.5%	18.3%	3.5%	11.4%
N. of 34°27'	3.0%	102	3	4	1	3	11.5%	18.3%	3.5%	11.4%
S. of 34°27'	7.5%	1	1	1	1	1	64.6%	100.0%	48.4%	75.0%
COWCOD	7.5%	1	1	1	1	1	44.8%	100.0%	33.6%	75.0%
DARKBLOTCHED	7.5%	103	0	2	0	0	0.0%	18.1%	0.0%	0.0%
YELLOWEYE	7.5%	99	0	1	0	0	0.0%	8.9%	0.0%	0.0%
Black Rockfish - coastwide	7.5%	64	1	1	1	1	11.7%	15.1%	8.8%	11.3%
Black Rockfish (WA)	7.5%	16	2	4	2	2	26.2%	96.9%	19.6%	58.5%
Black Rockfish (OR-CA)	7.5%	56	10	12	5	8	42.6%	54.2%	22.1%	32.8%
Minor Rockfish North	7.5%	104	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Nearshore Species	7.5%	41	0	2	0	0	0.0%	18.3%	0.0%	0.0%
Shelf Species	6.0%	104	0	1	0	0	0.0%	6.7%	0.0%	0.0%
Slope Species	7.5%	94	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Minor Rockfish South	7.5%	71	1	3	1	1	11.9%	34.3%	8.9%	11.7%
Nearshore Species	7.5%	32	3	3	1	3	29.5%	39.0%	10.2%	29.2%
Shelf Species	7.5%	66	1	1	0	0	8.3%	9.9%	0.0%	0.0%
Slope Species	7.5%	65	2	3	1	2	21.0%	38.4%	10.0%	21.6%
California scorpionfish	7.5%	2	2	2	2	2	94.1%	100.0%	70.6%	75.0%
Cabezon (off CA only)	7.5%	2	2	2	2	2	96.0%	100.0%	72.0%	75.0%
Dover Sole	2.7%	104	3	3	1	3	10.7%	13.9%	3.7%	10.4%
English Sole	15.0%	103	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Petrale Sole (coastwide)	4.4%	104	0	1	0	0	0.0%	5.6%	0.0%	0.0%
Arrowtooth Flounder	7.5%	92	0	3	0	2	0.0%	32.5%	0.0%	18.0%
Starry Flounder	7.5%	59	3	3	1	1	46.3%	52.4%	22.9%	26.0%
Other Flatfish	15.0%	104	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other Fish	7.5%	92	0	2	0	1	0.0%	20.8%	0.0%	8.1%
Kelp Greenling										
Spiny Dogfish										
Nearshore spp										
Shelf spp										
Slope spp										
DTS										
Total Thornyheads										

Table 2-8b. Evaluation of Control Limit Option 2 Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*									
Shoreside Whiting Sector	15.0%	112	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Mothership Sector	15.0%	119	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Catcher Processors	75.0%	3		0				0.0%		
All Whiting Sectors Combined	22.5%									

Table 2-9a. Evaluation of Control Limit Options Compared with Maximum QS Allocations to Buyers Based on Buying History Only (Assuming 25% of Allocation to Buyers)

Non-whiting Sector

Species Group	Control Limits: Option 1	Control Limits: Option 2	Maximum QS Allocated Based on Buying History Allocation Formula (25%)	Max QS Exeeds Option 1 Limit by Indicated Percent	Max QS Exeeds Option 2 Limit by Indicated Percent
All nonwhiting groundfish (in aggregate)	1.5%	2.2%	10.2%	8.7%	8.0%
Lingcod - coastwide	5.0%	7.5%	10.2%	5.2%	2.7%
N. of 42° (OR & WA)	5.0%	7.5%	10.5%	5.5%	3.0%
S. of 42° (CA)	5.0%	7.5%	9.2%	4.2%	1.7%
Pacific Cod	5.0%	7.5%	5.8%	0.8%	-
Pacific Whiting				-	-
Shoreside non-whiting Sector	10.0%	15.0%	7.8%	-	-
Shoreside Whiting Sector	10.0%	15.0%			
Mothership Sector	10.0%	15.0%			
Catcher Processors	50.0%	75.0%			
All Whiting Sectors Combined	15.0%	22.5%			
Sablefish (Coastwide)	1.9%	2.9%	12.1%	10.2%	9.2%
N. of 36° (Monterey north)	2.0%	3.0%	12.6%	10.6%	9.6%
S. of 36° (Conception area)	5.0%	7.5%	13.3%	8.3%	5.8%
PACIFIC OCEAN PERCH	5.0%	7.5%	11.7%	6.7%	4.2%
Shortbelly Rockfish	5.0%	7.5%	11.3%	6.3%	3.8%
WIDOW ROCKFISH	3.4%	5.1%	10.9%	7.5%	5.8%
CANARY ROCKFISH	5.0%	7.5%	10.0%	5.0%	2.5%
Chilipepper Rockfish	5.0%	7.5%	4.4%	-	-
BOCACCIO	5.0%	7.5%	2.7%	-	-
Splitnose Rockfish	5.0%	7.5%	6.2%	1.2%	-
Yellowtail Rockfish	5.0%	7.5%	10.8%	5.8%	3.3%
Shortspine Thornyhead - coastwide	3.1%	4.7%	11.1%	8.0%	6.4%
N. of 34°27'	4.8%	7.2%	14.3%	9.5%	7.1%
S. of 34°27'	4.7%	7.1%	7.0%	2.3%	-
Longspine Thornyhead - coastwide	2.0%	3.0%	12.2%	10.2%	9.2%
N. of 34°27'	2.0%	3.0%	12.2%	10.2%	9.2%
S. of 34°27'	5.0%	7.5%	25.0%	20.0%	17.5%
COWCOD	5.0%	7.5%	12.5%	7.5%	5.0%
DARKBLOTCHED	5.0%	7.5%	12.4%	7.4%	4.9%
YELLOWEYE	5.0%	7.5%	9.7%	4.7%	2.2%
Black Rockfish - coastwide	5.0%	7.5%	12.2%	7.2%	4.7%
Black Rockfish (WA)	5.0%	7.5%	12.5%	7.5%	5.0%
Black Rockfish (OR-CA)	5.0%	7.5%	13.1%	8.1%	5.6%
Minor Rockfish North	5.0%	7.5%	12.3%	7.3%	4.8%
Nearshore Species	5.0%	7.5%	12.2%	7.2%	4.7%
Shelf Species	4.0%	6.0%	11.0%	7.0%	5.0%
Slope Species	5.0%	7.5%	12.8%	7.8%	5.3%
Minor Rockfish South	5.0%	7.5%	6.4%	1.4%	-
Nearshore Species	5.0%	7.5%	2.9%	-	-
Shelf Species	5.0%	7.5%	4.1%	-	-
Slope Species	5.0%	7.5%	6.6%	1.6%	-
California scorpionfish	5.0%	7.5%	6.3%	1.3%	-
Cabezon (off CA only)	5.0%	7.5%	8.3%	3.3%	0.8%
Dover Sole	1.8%	2.7%	11.3%	9.5%	8.6%
English Sole	10.0%	15.0%	9.6%	-	-
Petrale Sole (coastwide)	2.9%	4.4%	10.4%	7.5%	6.0%
Arrowtooth Flounder	5.0%	7.5%	10.0%	5.0%	2.5%
Starry Flounder	5.0%	7.5%	15.9%	10.9%	8.4%
Other Flatfish	10.0%	15.0%	8.0%	-	-
Other Fish	5.0%	7.5%	14.0%	9.0%	6.5%

Table 2-9b. Evaluation of Control Limit Options Compared with Maximum QS Allocations to Buyers Based on Buying History Only (Assuming 50% of Allocation to Buyers)

Whiting Sectors

Species Group	Control Limits: Option 1	Control Limits: Option 2	Maximum QS Allocated Based on Buying History Allocation Formulas (50%)	Max QS Exeeds Option 1 Limit by Indicated Percent	Max QS Exeeds Option 2 Limit by Indicated Percent
Pacific Whiting					
Shoreside non-whiting Sector					
Shoreside Whiting Sector	10.0%	15.0%	15.7%	5.7%	0.7%
Mothership Sector	10.0%	15.0%	15.02%	5.02%	0.02%
Catcher Processors	50.0%	75.0%			
All Whiting Sectors Combined	15.0%	22.5%			

Table 2-10. Evaluation of Control Limit Option 1 Compared with Combined Harvesting and Buying Entity Quota Shares

		Number of Harvesting Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	Option 1 Control Limits	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
All nonwhiting groundfish (in aggregate)	1.5%	121	14	116	20	302	9	297	14	4.9%	31.7%	5.1%	47.5%	13.9%	32.0%	14.0%	42.6%
Lingcod - coastwide	5.0%	121	1	112	1	244	1	235	1	5.3%	5.3%	5.8%	5.8%	14.2%	14.2%	14.5%	14.5%
N. of 42° (OR & WA)	5.0%	121	-	85	-	168	1	134	1	4.7%	-	4.7%	-	14.1%	14.1%	14.0%	14.0%
S. of 42° (CA)	5.0%	121	2	68	8	200	1	147	2	6.8%	12.0%	8.3%	49.8%	14.4%	14.4%	15.4%	20.6%
Pacific Cod	5.0%	121	3	87	6	164	2	131	6	11.4%	27.2%	20.4%	72.6%	14.4%	21.9%	19.9%	60.3%
Pacific Whiting																	
Shoreside non-whiting Sector	10.0%	121	-	59	2	145	1	85	2	8.7%	-	14.7%	26.5%	10.4%	10.4%	12.3%	23.4%
Shoreside Whiting Sector	10.0%	121	1	47	1	139	2	67	2	10.7%	10.7%	11.5%	11.5%	15.8%	28.0%	15.7%	27.8%
Mothership Sector	10.0%	121	-	28	1	124	3	31	3	9.6%	-	10.2%	10.2%	18.4%	43.0%	18.5%	43.3%
Catcher Processors	50.0%	4	1	4	1	4	1	4	1	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%
All Whiting Sectors Combined																	
Sablefish (Coastwide)	1.9%	121	6	112	13	233	6	224	6	4.7%	18.1%	4.7%	35.1%	15.6%	28.3%	15.6%	30.1%
N. of 36° (Monterey north)	2.0%	121	6	112	10	226	5	217	5	4.8%	17.4%	4.8%	28.8%	16.1%	26.5%	16.2%	28.6%
S. of 36° (Conception area)	5.0%	121	3	24	3	148	5	51	5	32.1%	54.0%	48.8%	82.7%	24.1%	59.5%	36.6%	80.8%
PACIFIC OCEAN PERCH	5.0%	121	1	96	3	180	2	156	2	5.8%	5.8%	6.8%	17.3%	16.1%	22.5%	16.8%	23.0%
Shortbelly Rockfish	5.0%	121	2	92	3	162	3	133	4	20.6%	27.4%	36.5%	55.4%	15.4%	34.4%	27.4%	54.5%
WIDOW ROCKFISH	3.4%	121	3	115	4	217	4	211	4	5.4%	14.0%	8.1%	23.4%	13.8%	25.3%	13.4%	28.7%
CANARY ROCKFISH	5.0%	121	-	113	1	226	1	218	1	4.6%	-	6.1%	6.1%	13.5%	13.5%	13.5%	13.5%
Chilipepper Rockfish	5.0%	121	7	63	8	193	6	135	6	9.7%	54.5%	11.8%	70.6%	10.0%	42.8%	11.7%	49.6%
BOCACCIO	5.0%	121	5	54	6	185	4	118	5	14.8%	43.9%	17.8%	56.6%	11.1%	32.2%	13.3%	42.0%
Splitnose Rockfish	5.0%	121	5	57	6	191	6	127	5	10.4%	44.1%	13.3%	61.5%	11.5%	44.2%	13.1%	48.2%
Yellowtail Rockfish	5.0%	121	1	99	2	180	2	159	1	6.9%	6.9%	8.6%	14.9%	16.0%	21.2%	17.3%	17.3%
Shortspine Thornyhead - coastwide	3.1%	121	2	110	4	218	3	207	4	5.5%	10.0%	7.2%	19.1%	14.4%	21.8%	14.2%	26.5%
N. of 34°27'	4.8%	121	-	97	1	173	1	150	1	4.5%	-	5.6%	5.6%	17.7%	17.7%	17.5%	17.5%
S. of 34°27'	4.7%	121	3	73	4	178	4	131	5	14.3%	27.6%	19.8%	43.0%	10.7%	33.2%	14.9%	46.3%
Longspine Thornyhead - coastwide	2.0%	121	9	109	13	202	7	190	10	4.6%	26.9%	5.6%	42.7%	15.6%	32.4%	15.5%	42.7%
N. of 34°27'	2.0%	121	9	109	13	201	7	189	10	4.6%	26.9%	5.6%	42.7%	15.6%	32.4%	15.5%	42.7%
S. of 34°27'	5.0%	121	1	1	1	122	2	2	2	64.6%	64.6%	100.0%	100.0%	48.4%	73.4%	75.0%	100.0%
COWCOD	5.0%	121	1	1	1	123	3	3	3	44.8%	44.8%	100.0%	100.0%	33.6%	58.6%	75.0%	100.0%
DARKBLOTCHED	5.0%	121	2	112	3	233	1	224	3	5.6%	11.0%	9.2%	23.3%	15.6%	15.6%	15.4%	29.0%
YELLOWEYE	5.0%	121	1	108	5	199	1	186	2	6.0%	6.0%	8.9%	32.3%	11.8%	11.8%	11.1%	17.7%
Black Rockfish - coastwide	5.0%	121	4	69	5	153	3	101	5	11.7%	32.1%	15.1%	46.0%	18.0%	33.4%	18.7%	49.0%
Black Rockfish (WA)	5.0%	121	2	17	4	129	4	26	6	13.5%	26.2%	40.3%	96.9%	12.5%	42.6%	30.2%	93.3%
Black Rockfish (OR-CA)	5.0%	121	5	61	5	146	3	86	5	13.9%	41.5%	16.7%	48.7%	19.7%	37.2%	20.3%	51.9%

Table 2-10. Continued.

		Number of Harvesting Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	**Option 1 Control Limits**	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
Minor Rockfish North	5.0%	121	-	113	2	236	1	228	1	4.4%	-	6.4%	11.5%	15.6%	15.6%	15.4%	15.4%
Nearshore Species	5.0%	121	1	44	4	133	2	56	5	12.8%	12.8%	30.8%	56.4%	14.3%	23.9%	23.1%	54.6%
Shelf Species	4.0%	121	2	113	4	231	2	223	3	4.7%	9.2%	6.7%	20.9%	14.5%	19.6%	14.5%	24.5%
Slope Species	5.0%	121	-	98	4	187	1	165	1	4.1%	-	6.0%	21.2%	15.8%	15.8%	15.4%	15.4%
Minor Rockfish South	5.0%	121	4	79	7	217	4	176	6	11.9%	30.8%	15.7%	56.1%	9.3%	30.5%	11.7%	48.5%
Nearshore Species	5.0%	121	5	39	7	157	5	75	5	13.6%	45.4%	17.6%	73.1%	11.0%	38.4%	14.1%	48.6%
Shelf Species	5.0%	121	5	74	8	213	5	167	5	8.3%	36.2%	9.9%	61.1%	9.7%	37.8%	11.4%	44.0%
Slope Species	5.0%	121	4	73	5	199	5	151	5	13.3%	32.8%	18.2%	48.8%	10.0%	35.8%	13.6%	44.7%
California scorpionfish	5.0%	121	2	2	2	128	5	9	5	63.3%	94.1%	67.3%	100.0%	47.5%	89.1%	50.5%	93.6%
Cabezon (off CA only)	5.0%	121	2	2	2	126	3	8	3	59.5%	96.0%	62.0%	100.0%	44.6%	80.4%	46.5%	83.3%
Dover Sole	1.8%	121	8	113	13	223	7	215	9	5.0%	23.0%	6.2%	37.7%	14.9%	30.6%	14.9%	37.2%
English Sole	10.0%	121	-	112	-	235	1	226	1	7.5%	-	9.4%	-	15.3%	15.3%	16.6%	16.6%
Petrale Sole (coastwide)	2.9%	121	3	113	5	256	3	248	4	4.9%	12.1%	5.6%	20.7%	14.1%	21.3%	14.2%	26.5%
Arrowtooth Flounder	5.0%	121	3	98	6	168	2	146	6	6.2%	17.2%	13.0%	51.9%	13.2%	23.4%	14.0%	53.8%
Starry Flounder	5.0%	121	4	64	4	162	4	107	4	30.5%	52.1%	34.6%	59.0%	22.9%	53.4%	26.0%	57.9%
Other Flatfish	10.0%	121	-	113	1	255	1	247	2	9.2%	-	13.5%	13.5%	10.7%	10.7%	12.5%	22.8%
Other Fish	5.0%	121	2	101	4	192	2	172	3	7.1%	13.7%	10.8%	32.6%	16.6%	21.9%	15.9%	31.5%

Table 2-11. Evaluation of Control Limit Option 2 Compared with Combined Harvesting and Buying Entity Quota Shares

		Number of Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	Option 2 Control Limits	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
All nonwhiting groundfish (in aggregate)	4.4%	121	4	116	7	302	4	297	7	4.9%	13.9%	5.1%	22.9%	13.9%	22.9%	14.0%	30.9%
Lingcod - coastwide	15.0%	121	-	112	-	244	1	235	1	5.3%	-	5.8%	-	14.2%	14.2%	14.5%	14.5%
N. of 42° (OR & WA)	15.0%	121	-	85	-	168	1	134	1	4.7%	-	4.7%	-	14.1%	14.1%	14.0%	14.0%
S. of 42° (CA)	15.0%	121	-	68	1	200	1	147	1	6.8%	-	8.3%	8.3%	14.4%	14.4%	15.4%	15.4%
Pacific Cod	15.0%	121	2	87	4	164	2	131	3	11.4%	21.4%	20.4%	59.0%	14.4%	21.9%	19.9%	43.4%
Pacific Whiting																	
Shoreside non-whiting Sector	11.3%	121	-	59	-	145	-	85	-	8.7%	-	14.7%	-	10.4%	-	12.3%	-
Shoreside Whiting Sector	11.3%	121	-	47	-	139	1	67	1	10.7%	-	11.5%	-	15.8%	15.8%	15.7%	15.7%
Mothership Sector	37.5%	121	-	28	-	124	1	31	1	9.6%	-	10.2%	-	18.4%	18.4%	18.5%	18.5%
Catcher Processors	97.5%	4	-	4	-	4	-	4	-	53.5%	-	53.5%	-	53.5%	-	53.5%	-
All Whiting Sectors Combined																	
Sablefish (Coastwide)	5.7%	121	3	112	4	233	2	224	3	4.7%	11.1%	4.7%	15.9%	15.6%	19.0%	15.6%	22.2%
N. of 36° (Monterey north)	9.3%	121	2	112	3	226	2	217	3	4.8%	7.8%	4.8%	12.9%	16.1%	19.6%	16.2%	23.0%
S. of 36° (Conception area)	9.3%	121	2	24	3	148	3	51	4	32.1%	47.1%	48.8%	82.7%	24.1%	48.9%	36.6%	75.4%
PACIFIC OCEAN PERCH	9.3%	121	-	96	-	180	1	156	1	5.8%	-	6.8%	-	16.1%	16.1%	16.8%	16.8%
Shortbelly Rockfish	9.3%	121	1	92	3	162	2	133	3	20.6%	20.6%	36.5%	55.4%	15.4%	29.3%	27.4%	48.6%
WIDOW ROCKFISH	10.2%	121	1	115	2	217	1	211	2	5.4%	5.4%	8.1%	14.6%	13.8%	13.8%	13.4%	19.5%
CANARY ROCKFISH	15.0%	121	-	113	-	226	1	218	1	4.6%	-	6.1%	-	13.5%	13.5%	13.5%	13.5%
Chilipepper Rockfish	15.0%	121	4	63	5	193	2	135	4	9.7%	36.0%	11.8%	52.0%	10.0%	17.6%	11.7%	36.1%
BOCACCIO	15.0%	121	2	54	2	185	2	118	2	14.8%	26.8%	17.8%	31.7%	11.1%	20.1%	13.3%	23.8%
Splitnose Rockfish	15.0%	121	4	57	5	191	2	127	4	10.4%	37.0%	13.3%	56.0%	11.5%	19.3%	13.1%	41.2%
Yellowtail Rockfish	15.0%	121	-	99	1	180	1	159	1	6.9%	-	8.6%	8.6%	16.0%	16.0%	17.3%	17.3%
Shortspine Thornyhead - coastwide	9.3%	121	1	110	1	218	1	207	2	5.5%	5.5%	7.2%	7.2%	14.4%	14.4%	14.2%	19.6%
N. of 34°27'	14.4%	121	-	97	-	173	1	150	1	4.5%	-	5.6%	-	17.7%	17.7%	17.5%	17.5%
S. of 34°27'	14.1%	121	2	73	3	178	3	131	4	14.3%	21.8%	19.8%	38.2%	10.7%	27.6%	14.9%	40.3%
Longspine Thornyhead - coastwide	6.0%	121	4	109	5	202	3	190	5	4.6%	16.0%	5.6%	22.8%	15.6%	22.5%	15.5%	30.8%
N. of 34°27'	6.0%	121	4	109	5	201	3	189	5	4.6%	16.0%	5.6%	22.8%	15.6%	22.5%	15.5%	30.8%
S. of 34°27'	15.0%	121	1	1	1	122	2	2	2	64.6%	64.6%	100.0%	100.0%	48.4%	73.4%	75.0%	100.0%
COWCOD	15.0%	121	1	1	1	123	3	3	3	44.8%	44.8%	100.0%	100.0%	33.6%	58.6%	75.0%	100.0%
DARKBLOTCHED	15.0%	121	-	112	2	233	1	224	1	5.6%	-	9.2%	18.1%	15.6%	15.6%	15.4%	15.4%
YELLOWEYE	15.0%	121	-	108	1	199	1	186	1	6.0%	-	8.9%	8.9%	11.8%	11.8%	11.1%	11.1%
Black Rockfish - coastwide	15.0%	121	2	69	4	153	2	101	3	11.7%	19.5%	15.1%	40.0%	18.0%	26.8%	18.7%	38.0%
Black Rockfish (WA)	15.0%	121	2	17	4	129	4	26	4	13.5%	26.2%	40.3%	96.9%	12.5%	42.6%	30.2%	79.2%
Black Rockfish (OR-CA)	15.0%	121	2	61	3	146	2	86	3	13.9%	22.8%	16.7%	34.9%	19.7%	30.1%	20.3%	41.0%

Table 2-11. Continued.

Species	Option 2 Control Limits	Number of Entities Over the Limit: 100% to Harvesters: Equal Sharing: Total Number of Entities	Number over the Limit	Proportional: Total Number of Entities	Number over the Limit	75% to Harvesters (50% for whiting sectors): Equal Sharing: Total Number of Entities	Number over the Limit	Proportional: Total Number of Entities	Number over the Limit	Total QS Allocated to Entities Over the Limit: 100% to Harvesters: Equal Sharing: MAX QS	QS Over the Limit	Proportional: MAX QS	QS Over the Limit	75% to Harvesters (50% for whiting sectors): Equal Sharing: MAX QS	QS Over the Limit	Proportional: MAX QS	QS Over the Limit
Minor Rockfish North	15.0%	121	-	113	-	236	1	228	1	4.4%	-	6.4%	-	15.6%	15.6%	15.4%	15.4%
Nearshore Species	15.0%	121	1	44	3	133	2	56	2	12.8%	12.8%	30.8%	49.1%	14.3%	23.9%	23.1%	35.4%
Shelf Species	12.0%	121	-	113	1	231	1	223	1	4.7%	-	6.7%	6.7%	14.5%	14.5%	14.5%	14.5%
Slope Species	15.0%	121	-	98	-	187	1	165	1	4.1%	-	6.0%	-	15.8%	15.8%	15.4%	15.4%
Minor Rockfish South	15.0%	121	1	79	3	217	2	176	2	11.9%	11.9%	15.7%	34.3%	9.3%	18.2%	11.7%	22.1%
Nearshore Species	15.0%	121	4	39	4	157	2	75	4	13.6%	40.4%	17.6%	54.0%	11.0%	21.2%	14.1%	43.4%
Shelf Species	15.0%	121	2	74	4	213	2	167	3	8.3%	16.1%	9.9%	39.0%	9.7%	18.3%	11.4%	29.2%
Slope Species	15.0%	121	2	73	3	199	2	151	3	13.3%	21.0%	18.2%	38.4%	10.0%	18.5%	13.6%	31.0%
California scorpionfish	15.0%	121	2	2	2	128	2	9	2	63.3%	94.1%	67.3%	100.0%	47.5%	70.6%	50.5%	75.0%
Cabezon (off CA only)	15.0%	121	2	2	2	126	3	8	3	59.5%	96.0%	62.0%	100.0%	44.6%	80.4%	46.5%	83.3%
Dover Sole	5.4%	121	4	113	4	223	3	215	6	5.0%	15.5%	6.2%	18.7%	14.9%	21.5%	14.9%	31.3%
English Sole	30.0%	121	-	112	-	235	1	226	1	7.5%	-	9.4%	-	15.3%	15.3%	16.6%	16.6%
Petrale Sole (coastwide)	8.7%	121	1	113	2	256	1	248	2	4.9%	4.9%	5.6%	10.7%	14.1%	14.1%	14.2%	19.0%
Arrowtooth Flounder	15.0%	121	-	98	3	168	2	146	4	6.2%	-	13.0%	32.5%	13.2%	23.4%	14.0%	42.0%
Starry Flounder	15.0%	121	3	64	3	162	2	107	2	30.5%	46.3%	34.6%	52.4%	22.9%	41.6%	26.0%	44.6%
Other Flatfish	30.0%	121	-	113	-	255	-	247	-	9.2%	-	13.5%	-	10.7%	-	12.5%	-
Other Fish	15.0%	121	-	101	2	192	1	172	2	7.1%	-	10.8%	20.8%	16.6%	16.6%	15.9%	24.1%

Trawl Rationalization Alternatives (REV 09/17/07)

Trawl Rationalization Alternatives

Status Quo Management Regime

If this alternative is chosen, **status quo** will continue, including vessel cumulative landing limits for nonwhiting and season management for whiting.

Individual Fishing Quota (IFQ) Alternative

If this alternative is chosen, **IFQs** will be used to manage the catch of groundfish caught by trawl vessels operating under a limited entry (LE) trawl permit with the following exceptions. IFQs will **not** be required for catch by an LE trawl vessel operating in fisheries (such as shrimp) in which groundfish is harvested incidentally, nor for catch by an LE trawl vessel when operating as part of LE fixed gear fishery (for vessels with LE permit(s) endorsed for both trawl and fixed gears).

Whiting Sector -- Cooperative Alternative

If this alternative is chosen, **co-ops** will be established for one or more of the three whiting sectors. Options are provided for the possible rollover of excess whiting from one sector to another and the possible allocation and rollover of bycatch species among sectors.

Mothership Sector Co-ops	Catcher vessel co-ops for the mothership fishery and limited entry for motherships.
Shoreside Sector Co-ops	Catcher vessel co-ops for the whiting shoreside fishery (option development pending).
Catcher-Processor Sector Co-ops	Vessel co-ops for the catcher-processor sector and endorsement to close the class of catcher processor permits.

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IFQ = Individual Fishing Quota, in general (encompasses both QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Goals and Objectives

The Pacific Fishery Management Council (Council) is currently considering alternatives that would rationalize the West Coast trawl fishery and provide incentive to reduce bycatch, either through an IFQ program for all trawl sectors and/or through co-ops for the whiting sectors. Under either alternative, allocations would be made to eligible fishery participants as a privilege to harvest a portion of fish, and not as a property right. Though structurally different, both the IFQ and co-op alternatives have been designed by the Council to fulfill the goal of the program:

> *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.* [1]

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 IFQ program 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:

1. Taking into account the biological structure of the stocks including, but not limited to, populations and genetics.
2. Taking into account the need to ensure that the total OYs and Allowable Biological Catch (ABC) are not exceeded.
3. Minimizing negative impacts resulting from localized concentrations of fishing effort.
4. Accounting for total groundfish mortality.

[1] "Bycatch" is defined in the Magnuson-Stevens Act as: "species of fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program."

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5. Avoiding provisions where the primary intent is a change in marketing power balance between harvesting and processing sectors.
6. Avoiding excessive quota concentration.
7. Providing efficient and effective monitoring and enforcement.
8. Designing a responsive mechanism for program review, evaluation, and modification.
9. Taking 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.

Brief Overview of the Alternatives

Two key components of the program, individual catch accountability and flexible vessel limits, are expected to achieve most elements of the program goal. In comparison, under status quo, management vessels are individually accountable only for landings (not discards), and fishing is restricted by cumulative trip limits or season closures that are the same for all vessels.

The co-op alternative includes a separate co-op program for each whiting sector. Table 1 provides an overview of major elements differentiating the IFQ alternative from the co-op alternative and, within the co-op alternative, differentiating the sector specific co-op programs from one another.

Neither the IFQ alternative nor the co-op alternative will change allocation among sectors. Allocation among sectors is needed to implement the IFQ program but is being handled in a separate process outside of this EIS. The IFQ alternative provides freely transferable and highly divisible individual quota which a vessel would need to acquire to cover its catch. NMFS would track the transfers of individual quota and check it against vessel catch. Processors may be given an initial allocation of quota or an adaptive management provision may provide processor compensation.

Under the catcher vessel co-op programs (both the mothership and shoreside programs), catcher vessels with permits that meet minimum qualifying requirements would receive a whiting endorsement. The whiting endorsements would be specific for each whiting sector. An option is provided under which the whiting endorsements could be permanently transferred from one limited entry trawl permit to another, through NMFS. Another option would prohibit such transfers. When the endorsements are first issued, the permit's history would be used to associate an amount of whiting catch history with each endorsement. The endorsement catch history might be thought of as a permit or endorsement share. However, the endorsement shares are not divisible and the permit's exclusive access to the share is limited. Each year the permit would choose between participating in a co-op or the non-co-op fishery. NMFS would allocate to the co-op or the non-co-op fishery based on the catch history associated with each endorsement. Each co-op would be responsible for managing the fishing of its members through private agreements. It is only through these private agreements that the shares a vessel brings to the co-op could be transferred to a different vessel. The vessels participating in the non-co-op fishery do not have individual exclusive claims to the allocation they contribute to the non-co-op fishery, and therefore no opportunity to transfer permit shares from one vessel to another. NMFS

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monitors catch at aggregate levels, closing individual co-ops, the non-co-op fishery, and the sector as needed to keep catch within the allocation.

The **mothership co-op program** provides a limited entry system for mothership processors. Catcher vessel permits opting to participate in a co-op are tied to their initial mothership until the permit participates for a year in the non-co-op fishery. After the year in the non-co-op fishery ends, whiting endorsed catcher vessel permits may move to a different processor but are then tied to that new processor until they once again participate for a year in the non-co-op fishery.

During its first two years, the **shoreside co-op program** would prevent shoreside processors that are not "co-op eligible" from receiving whiting from co-ops of catcher vessels endorsed to deliver to shoreside processors. Co-op eligibility would be based on processing history. However, during those two years, any shoreside processor could still receive whiting from vessels fishing in the shoreside non-co-op fishery. Permits opting to participate in a co-op would be tied to processors until the permit participates for a given time (possibly a year or more) in the non-co-op fishery. There are two options for permit-processor ties after the initial years of the program. Under one option, after the first two years, permits that move into a co-op would not be tied to a processor. Under the other option, ties would be established with a processor any time a permit moves into a co-op (similar to the mothership program).

The **catcher-processor (CP) sector** is already organized as a co-op through a voluntary private agreement. The co-op alternative would provide some additional stability to the co-op by capping the number of permits eligible to participate in the CP sector. Currently, new permits may be moved into the CP sector though the combination of smaller trawl permits into a permit large enough for a catcher-processor vessel.

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Table 1. Comparison of the action alternatives.

	IFQ Alternative for Nonwhiting & Whiting	Co-op Alternative for Whiting		
		Mothership Program	Shoreside Program	Catcher-Processor (CP) Program
Sector Allocation	Set in separate but linked process			
Vessel LE Permit Requirement	LE permit (Trawl) required (no change)	New mothership whiting endorsement required for mothership deliveries.	New shoreside whiting endorsement required for shoreside deliveries.	New CP endorsement required for CP deliveries.
		The new endorsements may or may not be transferable among limited entry trawl endorsed permits.		No endorsement transferability option.
Harvest Allocation Among Participants **Whiting**	QS issued initially to permits, and possibly processors, based on whiting history. Each year QP will be issued to holders of QS.	At the time of initial implementation, whiting harvest history (endorsement shares) are associated with each whiting endorsement. The shares for a particular endorsement never change. NMFS assigns the endorsement's shares to a co-op or the non-co-op fishery, depending on which system the permit holder chooses to fish.		None (Allocation among participants currently achieved through private co-op agreement among participants)
Nonwhiting	Same as for whiting but initial allocation based on nonwhiting species or on a proxy. (Option: No IFQ for whiting deliveries, bycatch managed as a pool with caps)	Same as above but bycatch species allocation based on an endorsement's whiting history.		Same as above.
Monitoring, Transfers, and Catch Control	NMFS monitors at the vessel level, including at-sea catch (restricting the fishery as needed) & monitors QS/QP transfers to a wide class of persons, including anyone eligible to own a US fishing vessel.	NMFS monitors harvest at the sector and co-op level, closing segments as needed, but does not monitor inseason transfers of catch opportunities. If endorsement transfer is allowed, NMFS would record and track those transfers. Co-ops control inseason transfers and the catch of their members. Non endorsed permits may join co-op and fish the allocation of endorsed permits (upon mutual agreement).		NMFS monitors and closes the sector as needed. Distribution of harvest among vessels is currently managed under a private co-op agreement.
Processor Participation Restriction	None	Limited entry for motherships	Two-year restriction on those eligible to receive from co-ops ("co-op eligible" processors)	New endorsement for participation as a CP
Other Processor Provisions	Example Options: Allocation of QS/QP to processors; possible adaptive management compensation.	Processor tie (Permits opting to participate in a co-op are tied to the mothership until the permit participates for a year in the non-co-op fishery).	Processor tie (Permits opting to participate in a co-op are tied to processors until the permit participates the required time in the non co-op fishery. Option: Permits that move into a co-op after the first two years are not tied to a processor.	None

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IFQ Alternative

The IFQ alternative is described in the following summary text and four tables. Table 2 provides an overview of the sections of the alternative. Table 3 provides a summary of the provisions in each section. Table 4 provides a full description of the IFQ alternative and Table 5 displays the accumulation limit options for the IFQ alternatives.

SUMMARY

Under the alternative, an IFQ will grant an entity the privilege to catch a specified portion of the trawl sector's allocation. Within the IFQ program, vessels will be allowed to use any directed groundfish commercial gear, which will thus allow for "gear switching." For the **shoreside non-whiting sector**, IFQs will be created for all species of groundfish under the Groundfish Fishery Management Plan (although some will still be managed collectively at the complex level). For the **whiting sectors**, IFQ will either be created for all species of groundfish, or IFQ might be created only for the target species, Pacific whiting. Under the second option, the allocation of bycatch to the whiting fishery (or to specific whiting sectors) will be managed as fleet catch caps. Reaching the bycatch limit will trigger closure of the whiting fishery (or specific whiting sector).

Halibut individual bycatch quota (IBQ) may be created and required to cover the incidental catch of Pacific halibut in the groundfish trawl fishery. Under an IBQ program, retention would not be allowed.

Initial Allocation

The program will initially allocate IFQ as quota shares (QS) to fishery participants based mainly on their historical involvement in the fishery. Following the initial allocation, transfers (described below) will allow for others to also participate in the fishery as quota holders. The initial allocation is best understood in two segments:

> First, the Council is considering what groups should be included in the initial allocation, and what proportional split should be made among groups. Options specified are (1) to allocate 100 percent of QS to permit owners, or (2) for the nonwhiting groundfish sector to allocate 75 percent to permit owners and 25 percent to processors, and for the whiting sector to allocate 50 percent to permit owners and 50 percent to processors.
>
> Second, the Council is considering specific allocation formulas that will determine the amount of QS each eligible entity will receive. These calculations are based on the delivery history associated with a vessel permit or processing company, summed over a set number of years. There is an option that would base the allocation to vessel permit owners entirely on permit delivery history and another that would associate a portion of the available QS with the buyback permits and then equally divide that pool of QS among the qualified permits. For catcher vessels and shoreside processors, a special calculation is being considered for overfished species to allocate these species based on a QS recipient's need to cover incidental catch under current fishing practices. As explained above, fleet catch caps may be used instead of IFQs to manage bycatch species in the whiting fishery. For this scenario, only whiting QS will be allocated.

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Management Structure

In designing the management regime for the IFQ program, the Council is balancing the benefits of flexibility and individual accountability with program costs and the constraints of the very low allowable catch levels of overfished species. Prior to the start of each fishing year, NMFS will issue quota pounds (QP) to entities based on the amount of QS they hold, and in proportion to the trawl allocation of each species. When a vessel goes fishing under the IFQ program, all catch must be recorded and must be matched by an equal amount of QP from the vessel's QP account. If there is not enough QP to cover the catch from a trip, there is a 30 day grace period during which adequate QP must be transferred into the vessel's account. That vessel cannot be used to fish, and its permit cannot be sold, until the overage is covered. A carryover provision will allow for an overage in one year to be covered by up to 10 percent of the following year's QP; likewise, the provision also will allow QP that were not used in one year to be carried over into the following year, up to 10 percent. There may or may not be some minimum amount of QP a vessel must hold before fishing.

Bycatch reduction and greater efficiency are expected to occur in the groundfish fishery under the IFQ program because of the transferability of QS and QP. As these units are transferred (bought and sold, and "leased" through private contract), it is anticipated that those best able to avoid catching overfished species, and those who are most efficient, will increase the amount registered to them, while those who regularly incur high bycatch rates or operate less efficiently might choose to sell their QS and leave the fishery. Generally, anyone eligible to own a US-documented fishing vessel could also acquire QS and QP, and the QS and QP could be acquired in very small increments. These provisions will allow for new entrants into the fishery; for example, a crew member could slowly purchase amounts of quota.

Rewarding bycatch avoidance and efficiency are desired outcomes from the program. In order to protect against unintended consequences, however, two provisions limit transferability. The Council is considering whether to divide the trawl fishery into three or four sectors within the IFQ alternative (under three sectors, the fishery will divide into catcher-processor whiting, mothership whiting, and shoreside; while under four sectors the shoreside sector will divide additionally into shoreside whiting and shoreside non-whiting). QS or QP could not be transferred between the different sectors, so there will be stability in the relative amount of fish caught within each sector. The second provision is to establish accumulation limits on the amount of QS or QP that can be controlled by an entity, and accumulation limits on the amount of QP registered to a vessel. The Council is still considering the percentages that will be established for each species. The intent of these limits is to prevent excessive control of quota by a participant. A grandfather clause may allow a person initially allocated QS in amounts in excess of the cap to maintain ownership of those QS.

An option for an adaptive management provision would allow the Council to use up to 10% of the trawl allocation to provide incentives or support other compensation to offset adverse impacts of the program.

Monitoring and Tracking

The monitoring and tracking program necessary and feasible to assure that all catch (including discards) is documented and matched against QP is under development. Currently, 100 percent coverage by at-sea compliance monitors/observers is prescribed in the

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IFQ alternative (though it may be possible in certain situations to use cameras to assure compliance). Compared to status quo monitoring, this will be a significant increase for a large portion of the trawl fleet, particularly non-whiting shoreside vessels. Discarding may be allowed, though all fish discarded will also have to be covered by QP. A number of other elements of the monitoring program are being considered, including the level of shoreside monitoring, whether to limit landing ports or landing hours, the expansion of the state fish ticket system into an electronic Federal system to track trawl landings, and a small vessel exception, if feasible.

Costs and Fee Structure

Program costs are of concern and are under assessment. Fee structures will be proposed to recover program costs and consideration will be made to align the fee structure with usage level. Another issue under consideration is the extent to which privatization of management system elements will take place under the program. Work on the cost and fee structure is proceeding.

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Table 2 Overview the IFQ alternative.

IFQ Alternative	
A-1	***Trawl Sector Management Under IFQs***
A-1.1	Scope for IFQ Management (includes gear switching) **(Also see Section A-5)**
A-1.2	IFQ Management Units (includes latitudinal area management)
A-1.3	General Management and Trawl Sectors"
A-1.4	Management of Nonwhiting Trips
A-1.5	Management of Whiting Trips
A-2	***IFQ System Details***
A-2.1	Initial Allocation and Direct Reallocation
A-2.2	Permit/IFQ Holding Requirements and Acquisition (Includes Annual Issuance and Transfer Rules)
A-2.3	Program Administration (Includes Tracking, Data Collection, Costs, Duration)
A-2.4	Additional Measures for Processors
A-3	***Adaptive Management***
A-4	***Pacific Halibut Individual Bycatch Quota (IBQ) – non-retention***
A-5	***Alternative Scope for IFQ Management***

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Table 3. Summary of the IFQ Alternatives

	Element	SubElement	IFQ Alternative
A. ***Trawl Sector Management Under IFQs***			**Same for All Alternatives**
A-1.1	Scope for IFQ Management, Including Gear Switching		Catch based system. QP required to cover: all groundfish species catch (including all discards). *This implies gear switching is allowed (vessels with limited entry trawl permits can use directed groundfish gears (including open access, longline and fishpot) to harvest their QP.* ***See Section A-5 for an alternative specification of the scope for whiting trips.***
A-1.2	IFQ Management Units, Including Latitudinal Area Management		QS/QP will be species/species group, area and trawl sector specific. QP will not be used in a trawl sector other than that for which it was issued, unless specifically allowed, and will not be used in a nontrawl sector.[a] QP will not be transferred between areas. Species, species group and areas will be as specified in the ABC/OY table. The Council may subdivide QS after initial allocation. Section A-2.1.6 provides methods for reallocating QS if area management lines are created, moved, or eliminated after initial implementation of the program, or if species groups are subdivided. *Hereafter, all references to species include species and species group, unless otherwise indicated.*
A-1.3	General Management and Trawl Sectors "		Unless otherwise specified, status quo regulations, other than trip limits, will remain in place, including season closures and area restrictions, as necessary. There will be **Option 1:** three trawl sectors: shoreside, mothership, and catcher-processors. **Option 2**: four trawl sectors: shoreside nonwhiting, shoreside whiting, mothership, and catcher-processors. *Allocation among trawl sectors to be determined in the intersector allocation process.*
A-1.4	Management of Nonwhiting Trips		Nonwhiting trips are those with less than 50% whiting. No changes to existing management measures other than those specified in Section A-1.3, have been identified at this time.[b]
A-1.5	Management of Whiting Trips		Whiting seasons will not be changed under the TIQ program. When the primary whiting season is closed • If 3 sectors: for shoreside deliveries, sector specific QP required plus cumulative whiting catch limits apply. Deliveries prohibited for at-sea sectors. • If 4 sectors: whiting sectors prohibited from delivering.

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Table 3. Summary of IFQ alternatives (continued)

	Element	SubElement	IFQ Alternative
A-2. ***IFQ System Details***			
A-2.1	**Initial Allocation and Direct Reallocation**		
A-2.1.1	Eligible Groups	a. Groups and Initial Split of QS	**Option 1:** 100% to permit owners **Option 2:** 75% to permit owners and 25% to processors for the shoreside nonwhiting sector. 50% to permit owners and 50% to processors for whiting sectors.
		b. Permit History	Landings history goes with the permit.
		c. Processing Definition	For the purpose of applying the initial allocation formula, only the first processing counts as processing. A special definition of processors and processing is provided to meet this intent; fish "receivers" may be used as a proxy for "processors".
		d. Attributing and Accruing Processing History	For the processor allocation, attribute history to the first receiver, but for shoreside **Option 1:** attribute history to the receiver reported on the landing receipt. **Option 2:** attribute history to the receiver if that entity meets the definition of processor with respect to trawl caught ground fish. **Option 3:** Same as Option 1, except history may be reassigned to an entity not on the landings receipt, if parties agree or through a non-agency adjudication process.
A-2.1.2	Recent Participation	a. Permits	Recent participation is not required in order for a permit to qualify for an initial allocation of QS.
		b. Processors (motherships)	Recent participation is required to qualify for an initial allocation of QS: 1,000 mt of ground fish in each of any two years from 1998-2004.
		c. Processors (shoreside)	Recent participation is required to qualify for an initial allocation of QS: [level of activity to be determined] from 1999-2004

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Table 3. Summary of IFQ alternatives (continued)

	Element	SubElement	IFQ Alternative
A-2.1.3	Allocation Formula	a. Permits with catcher vessel history	For all fish management units: **Option 1:** All QS allocated based on permit history (see following formulas). **Option 2**: An equal division of the buy-back permits' pool of QS among all qualifying permits plus allocation of the remaining QS based on each permit's history (see following formulas). **Permit history based allocation suboptions** **For non-whiting trips,** permit history used for QS allocation will be calculated as follows. **For non-overfished species**: use an allocation period of 1994-2003. Within that period use relative history and drop the three worst years. **For overfished species <u>taken incidentally:</u>** **Overfished Species Option 1:** as it is calculated for non-overfished species. **Overfished Species Option 2:** apply a bycatch rate to target species QS. **For whiting trips,** permit history used for QS allocation will be calculated as follows. **For whiting**, using an allocation period of 1994-2003. Within that period, use relative history and drop the two worst years. **For bycatch species**: **Bycatch Option 1:** using history for that species, as it is calculated for whiting **Bycatch Option 2:** using the whiting history as a proxy. **Area Assignments:** Landings history will be assigned to catch areas based on port of landing. **Relative history (%).** For each sector, the permit history for each year is measured as a percent of the sector's total for the year.
		b. Permits with catcher-processor history	Owner's of catcher-processor permits will be allocated QS based on permit history for 1994-2003 (no option to drop years) and using relative history as defined for catcher vessel permits.
		c. Processors (motherships)	Calculate QS based on the entity's history for the allocation period of 1998-2003 (no option to drop years), and use relative history as defined for catcher vessel permits.
		d. Processors (shoreside)	**For all species other than incidental species**, calculate QS based on the entity's history for the allocation period of 1994-2004 (drop two worst years) and use relative history. **For incidental species** (overfished species taken incidentally on nonwhiting trips and bycatch species taken on whiting trips) consider the same allocation options identified for permits in Section A-2.1.3.a
A-2.1.4	History for Combined Permits and Other Exceptional Situations		Permit history for combined permits includes the history for all the permits that have been combined. For history occurring when trawl permits were stacked, split the history evenly between the stacked permits. Illegal landings don't count. Nonwhiting EFPs landings in excess of cumulative limits for the non-EFP fishery will not count toward an allocation of QS. Compensation fish will not count toward an allocation of QS.
A-2.1.5	Initial Issuance Appeals		No Council appeals process. NMFS will develop a proposal for an internal appeals process. Accepted revisions to fish tickets are those approved by the state.

IFQ = Individual Fishing Quota, in general (encompasses QS and QP)
QS = Quota Shares, a share of the total trawl allocation (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 3. Summary of IFQ alternatives (continued)

	Element	SubElement	IFQ Alternative
A-2.1.6	Direct Reallocation After Initial Issuance		Reallocation With Changes in Overfished Status. When an overfished species is rebuilt or a species becomes overfished: **Option 1:** there will be no change in the QS allocation. **Option 2:** the following methods will be used to reallocate QS **(TO BE DEVELOPED)** Reallocation With Changes in Area Management Area Subdivision: If at any time after the initial allocation an IFQ management unit is geographically subdivided, those holding QS for the unit being subdivided will receive equal amounts of shares for each of the newly created IFQ management units. Area Recombination: **(TO BE DEVELOPED)** Area Line Movement: **(TO BE DEVELOPED)** Reallocation With Subdivision of a Species Group: If at any time after the initial allocation an IFQ management unit for a species group is subdivided, those holding QS for the unit being subdivided will receive equal amounts of shares for each of the newly created IFQ management units. For example, if a person holds 1% of a species group before the subdivision, that person will hold 1% of the QS for each of the groups resulting from the subdivision.
A-2.2	**Permit/IFQ Holding Requirements and Acquisition**		
A-2.2.1	Permit/IFQ Holding Requirement		1. Limited entry trawl permit required. 2. 30 days to cover catch with QP unless the overage is within the limits of the carryover provision, in which case the vessel has 30 days or a reasonable time to cover the overage after the following year QP are issued, whichever is greater. 3. For a vessel to use QP, the QP must be in the vessel's QP account. 4. For a vessel that does not have QP to cover its catch, no fishing until the overage is covered. 5. A vessel with a deficit may not transfer its LE permit. 6. **Option:** A certain amount of QP must be held prior to departure from port. **(OPTION TO BE DEVELOPED)** [If this option is not selected there will be no minimum holding requirement]. 7. **Option:** In certain limited circumstances, a vessel may clear a QP deficit for overfished species by means other than acquiring additional QP. **(OPTION TO BE DEVELOPED)**
A-2.2.2	IFQ Annual Issuance	a. Annual QP Issuance	QP will be issued annually to QS holders.
		b. Carryover (Surplus or Deficit)	**Non-overfished Species:** 10% carryover for each species **Overfished Species:** 10% carryover for each species Surplus QP may not be carried over for more than one year.
		c. Quota Share Use-or-Lose Provisions	None. The need for this provision will be evaluated as part of program review process, and the provision could be added later, if necessary.
		d. Entry Level Opportunities	No special provisions. QS are infinitely divisible, new entrants may buy-in through small increments over time.
A-2.2.3	IFQ Transfer Rules	a. Eligible to Own or Hold	Those eligible to own QS/QP will be restricted to those eligible to own and control a US fishing vessel and any person or entity eligible to own or control a US fishing vessel pursuant to sections 203(g) and 213(g) of the AFA (see Table 4 for additional language).

IFQ = Individual Fishing Quota, in general (encompasses QS and QP)
QS = Quota Shares, a share of the total trawl allocation (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 3. Summary of IFQ alternatives (continued)

	Element	SubElement	IFQ Alternative
		b. Transfers and Leasing	QS/QP will be transferable and transfers must be registered with NMFS. QS leasing will not be facilitated by NMFS.
		c. Temporary Transfer Prohibition	Temporary prohibitions on QS transfers, as necessary for program administration (to be determined by NMFS).
		d. Divisibility	QS will be highly divisible. QP will be in whole pound units.
		e. Accumulation Limits (Vessel or Control)	There will be a limit on the amount of QP that may be used with a vessel and a limit on the amount of QS or QP a person may control. The control limit will be based on the individual and collective rule. A grandfather clause will apply to vessel and control accumulation limits. Note: The Council might limit accumulation of total groundfish QS/QP or QS/QP for a complex, in addition to the species/species group limits.
A-2.3	**Program Administration**		
A-2.3.1	Tracking and Monitoring NMFS will explore the possibility of less than 100% at-sea monitoring and report back on the possibility.		**Option 1:** 100% at-sea compliance monitors/observers (small vessel exception, if feasible). Discarding will be allowed. VMS will be required. Electronic landings tracking, advance notice of landings, unlimited landing hours. Some shoreside monitoring. Site licenses will be required. Any landing not made at a licensed site will be illegal. QP account information for vessels will be available in the field. A central lien registry system will be created with limited ownership information. **Option 2:** Same as Option 1 except as follows. No small vessel exception. There will be full retention and 100% shoreside monitoring. The site licensing program will be replaced by a limitation on the ports to which deliveries can be made. Landing hours will be limited. A central lien registry system will contain expanded ownership information. **Option 3:** Same as Option 1 except as follows. No small vessel exception. Cameras might be provided as an option for vessels to use in place of compliance observers (feasibility to be determined). Discards will be allowed (except when cameras are used). A Federal system will be created to track trawl landings. A central lien registry system will contain expanded ownership information. In addition to the above, the Council will pursue a process to consider the creation of an electronic logbook system and allowing vessels to split loads between different delivery locations.
A-2.3.2	Socio-Economic Data Collection		Expanded data collection, mandatory compliance of harvesters and processors. Include transaction prices in a central QS ownership registry.
A-2.3.3	Program Costs Options to be Refined.	a. Cost Transfer and Recovery	**Option 1:** Recover IFQ program costs but not enforcement or science costs A maximum of 3% of ex-vessel value. **Option 2:** Full cost recovery through landing fees plus privatization of certain elements of the management system.
		b. Fee Structure	To be determined. TIQC recommends a fee structure that reflects usage. Option (to be developed) that allows for equitable sharing of observer costs for smaller vessels.
A-2.3.4	Program Duration and Modification		Four-year review process to start four years after implementation. Community advisory committee to review IFQ program performance.

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Table 3. Summary of IFQ alternatives (continued)

	Element	SubElement	IFQ Alternative
A-2.4	Additional Measures for Processors		**Option 1**. Any QS received for processing history as part of the initial allocation will expire after a certain period of time (to be determined prior to final Council action).. **Option 2**. The accumulation limit grandfather clause of Section A-2.2.3.e will not apply for processing history. Processors will not be allowed to use history receiving groundfish to qualify for QS in excess of accumulation limits. **Option 3**. The Adaptive Management allocation and process (Section A-3) will be used to compensate processors for demonstrated harm by: auctioning QP to generate funds to provide financial compensation, or providing QP to be directed in a fashion that increases benefits for affected processors.
A-3	***Adaptive Management***		For each year of the program, up to 10% of the year's trawl allocation (whiting and nonwhiting) may be distributed as quota pounds (QP) to create incentives or to compensate in response to unforeseen outcomes from implementing the IFQ program. Criteria to be established, if the Council decides to take action under this provision. *Designation of the amounts and methods for distribution may be done for more than one year at a time, e.g. for two years as part of the biennial specifications process.* *Note: This approach does not change the option for splits of quota share (QS) that will go to eligible groups.*
A-4	***Pacific Halibut Individual Bycatch Quota (IBQ) – non-retention***		**Option:** IBQ for Pacific halibut bycatch in the trawl fishery will be established. Such IBQ will be issued on the basis of a bycatch rate applied to the target species quota shares an entity receives. IBQ will not be geographically subdivided.
A-5	***Alternative Scope for IFQ Management***		**Option:** IFQ will be required to cover all groundfish catch except for bycatch species taken on whiting trips. ***If this option is adopted a number of sections above would be amended to conform with the option (see Table 4, A-5).***

[a] Not withstanding this provision, a vessel with a limited entry trawl permit may catch the trawl QP with a nontrawl gear, as per Section A-1.1.

[b] For the nonwhiting fishery there is a potential that a vessel might make a targeted whiting trip by accumulating whiting QPs provided to cover whiting bycatch in the nonwhiting fishery. This could create a problem if it occurred during a time when the whiting fishery is closed to control for impacts on ESA listed salmon. Other than that whiting targeted trips using whiting QP intended for whiting bycatch in the nonwhiting fishery might not create a problem. Restrictions might be imposed on whiting catch in the nonwhiting fishery as needed to address concerns ESA concerns.

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Table 4. Full description of the IFQ Alternatives

	Element	SubElement	
A. *Trawl Sector Management*			
A-1.1	Scope for IFQ Management, Including Gear Switching		QP will be required to cover catch of all groundfish (including all discards) by limited entry trawl vessels using any directed commercial groundfish gear, EXCEPT when such vessels also have a limited entry permit endorsed for fixed gear (longline or fishpot) AND have declared that they are fishing in the limited entry fixed gear fishery. ***See Section A-5 for an alternative specification of the scope for whiting trips.*** For the purpose of the trawl rationalization alternatives, "directed commercial groundfish gear" is defined as all legal commercial groundfish gear including limited entry gear and commercial vertical hook and line, troll and dinglebar gear. *This definition of the scope allows a limited entry trawl vessel to switch to nontrawl groundfish gears, including fixed gear, for the purpose of catching their QP. It also allows a nontrawl vessel to acquire a trawl permit, and thereby use trawl QP to catch the LE trawl allocation using nontrawl gear*.
A-1.2	IFQ Management Units, Including Latitudinal Area Management		QS will carry designations for the species/species group, area and trawl sector to which it applies (see A-1.3 for the list of trawl sectors). The QP will have the same species/species group, area and sector designations as the QS on the basis of which the QP was issued. QP will not be used in a trawl sector other than that for which it was issued, unless specifically allowed, and will not be used in a nontrawl sector.[a] QP will not be used in a catch area or for a species/species group other than that for which it is designated. The species, species groupings and area subdivisions will be those that are specified in ABC/OY table that is generated through the groundfish biennial specifications process. QS for remaining minor rockfish will be aggregated for the nearshore, shelf, and slope depth strata, as per Table 5. Changing the management units. After initial QS allocation the Council may alter the management units by changing the management areas or subdividing species groups. Section A-2.1.6 provides methods for reallocating QS when such changes are made after initial implementation of the program.[b] *Hereafter, all references to species include species and species group, unless otherwise indicated.*
A-1.3	General Management and Trawl Sectors		Unless otherwise specified, status quo regulations, other than trip limits, will remain in place. If individual vessel overages (catch not covered by QP) make it necessary, area restrictions, season closures or other measures will be used to prevent the trawl sector (in aggregate or the individual trawl sectors listed here) from going over allocations.[c] The IFQ fishery may also be restricted or closed as a result of overages in other sectors. There will be: **Option 1:** three trawl sectors: shoreside, mothership, and catcher-processors. **Option 2**: four trawl sectors: shoreside nonwhiting, shoreside whiting, mothership, and catcher-processors. *Allocation among trawl sectors to be determined in the intersector allocation process..[d]* *Trawl vessels fishing IFQ with nontrawl gear will be required to comply with the RCA lines applicable for that gear. Such restrictions, as necessary, will be determined in a separate process.*

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Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-1.4	Management of NonWhiting Trips		Nonwhiting trips are those with less than 50% whiting. No changes to management measures, other than those identified in Section A-1.3, have been identified at this time.[e]
A-1.5	Management of Whiting Trips[f]		Whiting seasons will not be changed under the TIQ program, and so the current spring openings will be maintained to control impacts on ESA-listed salmon. [g] When the primary whiting season for a sector is closed (see section A-1.3 for options on the number of trawl sectors) • If there are 3 sectors: for shoreside deliveries, sector specific QP will be required plus cumulative whiting catch limits apply. Deliveries will be prohibited for at-sea sectors. • If there are 4 sectors: whiting sectors will be prohibited from delivering.
A-2. *IFQ System Details*			
A-2.1	**Initial Allocation and Direct Reallocation**		
A-2.1.1	Eligible Groups	a Groups and Initial Split of Quota Share	***Eligible Groups*** The initial allocation of QS will be made either only to permit owners or to permit owners and processors. The following are options for the distribution of the initial QS allocation among the eligible groups. **Option 1:** 100% to permit owners **Option 2:** 75% to permit owners and 25% to processors for shoreside nonwhiting sector QS. 50% to permit owners and 50% to processors for whiting sector QS. *The Council may select other distributions within this range.* *Due to limitations on available documentation, fish "receivers" may be used as a proxy for "processors" (see A-2.1.1.d) After initial allocation, trading will likely result in changes in the distribution of shares among permit owners and processors. Additionally, entities that are neither permit owners nor processors may acquire quota shares. (see below: "IFQ/Permit Holding Requirements and IFQ Acquisition").*
		b Permit History	Landing[h] history will accrue to the permit under which the landing was made. The owner of a permit at the time of initial allocation will receive the QS issued based on the permit. (See section A-2.1.4 on permit combinations and other exceptional situations.)
		c Processing Definition	A special definition of "processor" and "processing" will be used for initial QS allocation. A main intent of the definition is to specify that, if QS is issued for processing, only the first processor of the fish receives an initial allocation of QS. See footnote for definition.[i] *However, due to limitations on available documentation, fish "receivers" may be used as a proxy for "processors, as per the following section.*

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Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
		d Attributing and Accruing Processing History	For an allocation for deliveries to at-sea processors: use at-sea fishery observer data and weekly processing reports to document processing history. For an allocation for shoreside processors: **Option 1:** attribute history to the receiver reported on the landing receipt (i.e. the entity responsible for filling out the state fish ticket). *The fish receiver would serve as a proxy for processor because of limited availability of official documentation on actual processing history.* **Option 2:** attribute history to the receiver reported on the landing receipt, if that entity meets the definition of a processor with respect to trawl caught groundfish. *The option is similar to Option 1 except that the fish receiver would have to demonstrate at least some processing of trawl caught groundfish.* **Option 3:** same as Option 1, except history may be reassigned to an entity not on the landings receipt, if parties agree or through *a non-agency* adjudication process. *The intent of this option is to provide an opportunity for catch history to be assigned to the entity that actually processed the fish.*
A-2.1.2	Recent Participation	a Permits (including catcher-processor[j] permits)	Recent participation is not required in order for a permit to qualify for an initial allocation of QS.
		b Processors (motherships)	Recent participation is required to qualify for QS: 1,000 mt of groundfish in each of any two years from 1998-2004.
		c Processors (shoreside)	Recent participation is required to qualify for an initial allocation of QS: [level of activity to be determined] from 1999-2004.

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QP = Quota Pounds (issued each year based on quota shares held)

Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-2.1.3	Allocation Formula	a Permits with catcher vessel history	For all fish management units, as specified in section A-1.2: **Option 1:** All QS allocated based on permit history (see following formulas). **Option 2**: An equal division of the buy-back permits' pool of QS among all qualifying permits plus allocation of the remaining QS based on each permit's history (see following formulas). (The QS pool associated with the buyback permits will be the buyback permit history as a percent of the total fleet history for the allocation period. The calculation will be based on total absolute pounds with no other adjustments and no dropped years.) **Permit history based allocation suboptions** For **non-whiting** trips, permit history used for QS allocation will be calculated: **For non-overfished species**: using an allocation period of 1994-2003. Within that period use relative history and drop the three worst years.[k] **For overfished species taken incidentally:**[l]: **Overfished Species Option 1:** as it is calculated for non-overfished species. **Overfished Species Option 2:** use target species QS as a proxy based on the following approach: Apply fleet average bycatch rates and depth and seasonal distributions to each permit's target species QS allocations. Fleet average bycatch rates for the areas shoreward and seaward of the RCA will be developed from West Coast Observer Program data for 2003-2006. For the purposes of the allocation, it will be assumed that a permit's QS for each target species will be distributed shoreward and seaward of the RCA based on the fleet average for that species derived from logbook information for 2003-2006. Both the fleet bycatch rates and the distribution of fleet target catch will be stratified by latitudinal area. For **whiting** trips, permit history used for QS allocation will be calculated as follows: **For whiting**, using an allocation period of 1994-2003. Within that period, use relative history and drop the two worst years.[m] **For bycatch species** (if IFQ is used for bycatch species): **Bycatch Option 1:** using history for that species, as it is calculated for whiting **Bycatch Option 2:** using the whiting history as a proxy (i.e. allocation will be pro rata based on the whiting allocation). **Area Assignments:** Landings history will be assigned to catch areas based on port of landing.[n] **Relative history (%).** For each sector, the permit history for each year is measured as a percent of the sector's total for the year.
.		b Permits with catcher-processor history	Owners of catcher-processor permits will be allocated QS based on permit history[o] for 1994-2003 (no option to drop years), and using relative history as defined for catcher vessel permits. *Bycatch species should be addressed.*
		c Processors (motherships)	Calculate processing history based on allocation period of 1998-2003 (no option to drop years) and use relative history as defined for catcher vessel permits. *Bycatch species should be addressed.*

IFQ = Individual Fishing Quota, in general (encompasses QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
		d Processors (shoreside)	**For all species other than incidental species**, calculate QS based on the entity's history for the allocation period of 1994-2004 (drop two worst years) and use relative history (as defined in Section A-2.1.3.a).. **For incidental species** (overfished species taken incidentally on nonwhiting trips and bycatch species taken on whiting trips) consider the same allocation options identified for permits in Section A-2.1.3.a
A-2.1.4	History for Combined Permits and Other Exceptional Situations		Permit history for combined permits will include the history for all the permits that have been combined. For history occurring when two or more trawl permits were stacked, split the history evenly between the stacked permits. History for illegal landings will not count toward an allocation of QS. Landings made under nonwhiting EFPs that are in excess of the cumulative limits in place for the non-EFP fishery will not count toward an allocation of QS. Compensation fish will not count toward an allocation of QS.
A-2.1.5	Initial Issuance Appeals		There will be no Council appeals process on the initial issuance of IFQ. NMFS will develop a proposal for an internal appeals process and bring it to the Council for consideration. Only revisions to fish tickets accepted will be those approved by the state. Any proposed revisions to fishtickets should undergo review by state enforcement personnel prior to finalization of the revisions.
A-2.1.6	Direct Reallocation After Initial Issuance		Reallocation With Change in Overfished Status. When an overfished species is rebuilt or a species becomes overfished: **Option 1:** there will be no change in the QS allocation. **Option 2:** the following methods will be used to reallocate QS **(TO BE DEVELOPED)** Reallocation With Changes in Area Management Area Subdivision: If at any time after the initial allocation an IFQ management unit is geographically subdivided, those holding QS for the unit being subdivided will receive equal amounts of shares for each of the newly created IFQ management units. Area Recombination: **(TO BE DEVELOPED)** Area Line Movement: **(TO BE DEVELOPED)** Reallocation With Subdivision of a Species Group: If at any time after the initial allocation an IFQ management unit for a species group is subdivided, those holding QS for the unit being subdivided will receive equal amounts of shares for each of the newly created IFQ management units. For example, if a person holds 1% of a species group before the subdivision, that person will hold 1% of the QS for each of the groups resulting from the subdivision.

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Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-2.2	**Permit/IFQ Holding Requirements and Acquisition** **(after initial allocation)**		
A-2.2.1	Permit/IFQ Holding Requirement		1. Only vessels with limited entry trawl permits are allowed to fish in the trawl IFQ fishery. 2. All catch taken on a trip must be covered with QP within 30 days of the landing for that trip unless the overage is within the limits of the carryover provision (Section A-2.2.2.b), in which case the vessel has 30 days or a reasonable time (to be determined) after the QP are issued for the following year, whichever is greater. [p] 3. For a vessel to use QP, the QP must be in the vessel's QP account. 4. For any vessel with an overage (catch not covered by QP), fishing will be prohibited until the overage is covered regardless of the amount of the overage (extent of the prohibition to be determined).[q] Vessels which have not adequately covered their overage within the time limits specified in paragraph 2, must still cover the overage before resuming fishing, using QP from the following year(s), if necessary. If a vessel covers it overage, but coverage occurs outside the specified time limit (paragraph 2), the vessel may still be cited for a program violation. 5. For vessels with an overage, the limited entry permit may not be sold or transferred until the deficit is cleared. 6. **Option:** A certain amount of QP must be held prior to departure from port. **(OPTION TO BE DEVELOPED)** [If this option is <u>not</u> selected there will be no minimum holding requirement]. 7. **Option:** In certain limited circumstances, a vessel may clear a QP deficit for overfished species by means other than acquiring additional QP. **(OPTION TO BE DEVELOPED)**
A-2.2.2	IFQ Annual Issuance	a Annual Quota Pound Issuance	QP will be issued annually to QS holders based on the amount of QS held. *As specified above, QS holders will have to transfer their QP to a vessel account in order for those QP to be used.*

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QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
		b Carryover (Surplus or Deficit)	A carryover allowance will allow surplus QP in a vessel's QP account to be carried over from one year to the next or allow a deficit in a vessel's QP account for one year to be carried over and covered with QP from a subsequent year. Surplus QP may not be carried over for more than one year. A vessel with a QP **surplus** at the end of the current year will be able to use that QP in the immediately following year, up to the limit of the carryover allowance (see below). A vessel with a QP **deficit** in the current year will be able to cover that deficit with QP from the following year without incurring a violation if (1) the amount of QP it needs from the following year is within the carryover allowance (see below), and (2) the QP are acquired within the time limits specified in A-2.2.1.[r] **Carryover Allowance**: Limit of up to 10 percent carryover for each species. This applies to both non-overfished species and overfished species. The percentage is calculated based on the total pounds (used and unused) in a vessel's QP account for the current year.[s] *Note: This provision relates only to carry-over of what is in the vessel's account. Should consideration be given to carryover of QP that are not transferred to a vessel account?*
		c Quota Share Use-or-Lose Provisions	None. The need for this provision will be evaluated as part of program review process, and the provision could be added later, if necessary.
		d Entry Level Opportunities	Under the MSFCMA, the Council is required to consider entry level fishermen, small vessel owners, and crew members, and in particular the possible allocation of a portion of the annual harvest to individuals falling in those categories. No special provisions have been identified for analysis, given that new entry is addressed indirectly by allowing crew, captains and others to acquire QS in small increments.
A-2.2.3	IFQ Transfer Rules	a Eligible to Own or Hold	Those eligible to own QS/QP will be restricted to (i) any person or entity eligible to own and control a US fishing vessel with a fishery endorsement pursuant to 46 USC 12108 (general fishery endorsement requirements) and 12102(c) (75% citizenship requirement for entities) and (ii) any person or entity eligible to own or control a US fishing vessel with a fishery endorsement pursuant to sections 203(g) and 213(g) of the AFA.
		b Transfers and Leasing	QS/QP will be transferable and transfers must be registered with NMFS. NMFS will not differentiate between a transfer for a lease and a permanent transfer.[t]
		c Temporary Transfer Prohibition	NMFS may establish temporary prohibitions on the transfer of QS, as necessary to facilitate program administration.
		d Divisibility	QS will be highly divisible and the QP will be transferred in whole pound units (i.e. fractions of a pound could not be transferred)

IFQ = Individual Fishing Quota, in general (encompasses QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
		e Accumulation Limits (Vessel and Control)	Limits[u] may vary by species/species group, areas, and sector. See options for each sector listed in Table 5. **Vessel Use Limit:** A limit on the QP that may be registered for a single vessel during the year. This element will mean that a vessel could not have more used and unused quota pounds registered for the vessel than a predetermined percentage of the QP pool. **Own or Control Accumulation Limit:** A person, individually or collectively, may not control QS or QP in excess of the specified limit (unless exempted by the grandfather clause). QS or QP 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. The calculation of QS or QP controlled by a person will follow the "individual and collective" rule. "Individual and collective" rule: The amount of QS or QP that is computed as applying to a person is equal to the sum of the QS or QP registered to that person and an amount equal to the percentage of holdings by that person in any entity in which that person has an interest. PROPOSED REWORDING TO CLARIFY Individual and Collective Rule: The QS or QP 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 or QP 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 or QP that counts toward the person's limit.[v] A grandfather clause will apply to (1) vessel accumulation limits and (2) control accumulation limits. This clause allows a person, if initially allocated QS in amounts in excess of the cap, to maintain ownership of the QS. The grandfather clause will expire with a change in ownership[w] of the QS. If the owner divests some of the QS, the owner may not reacquire QS or QP until the owner is under the cap. Once under the cap, the grandfather clause expires and additional QS or QP may be acquired but not in excess of the control caps. *Note: The Council might limit accumulation of total groundfish QS/QP or QS/QP for a complex, in addition to the species/species group limits.*

Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-2.3	**Program Administration**		
A-2.3.1	Tracking, Monitoring and Enforcement NMFS will explore the possibility of less than 100% at-sea monitoring and report back on the possibility.		For all tracking, monitoring and enforcement options: VMS and advance notice of landings will be required; there will be an electronic landings tracking system; QP account information for vessels will be tracked electronically and available in the field; and there will be a central QS/QP transaction system that will include a QS lien registry. **Option 1:**100% at-sea compliance monitors/observers (small vessel exception, if feasible). Discarding will be allowed. Allowing discarding will require that the timeliness of discard reporting be improved to match that for landings reporting. Such timeliness will be necessary to track QP usage. Electronic landings tracking (state landings system), advance notice of landings, unlimited landing hours. Some shoreside monitoring. Some costs will be controlled through a requirement that delivery sites be licensed. Site licenses (license criteria to be specified) will ensure that certain standards will be met that will facilitate monitoring and will aid work force planning. Any landing not made at a licensed site will be illegal. The lien registry system will include only essential ownership information. **Option 2:** Same as Option 1 except as follows. No small vessel exception. There will be full retention and 100% shoreside monitoring, so the discard reporting system will not need to be upgraded. The site licensing program will be replaced by a limitation on the ports (ports to be specified) to which deliveries could be made. Costs will be further controlled by limiting landing hours (to be specified). A lien registry system will contain expanded ownership information. **Option 3:** Same as Option 1 except as follows. No small vessel exception. Cameras might be provided as an option for vessels to use in place of compliance observers (feasibility to be determined). Discards will be allowed (except when cameras are used, in which case full retention will be required). Instead of creating an electronic state fish ticket system, a Federal system will be created to track trawl landings. A lien registry system will contain expanded ownership information. In addition to the above options, the Council has indicated it will pursue a process to consider the creation of an electronic logbook system and allowing vessels to split loads between different delivery locations.
A-2.3.2	Socio-Economic Data Collection[x]		The data collection program will be expanded and submission of economic data by harvesters and processors will be mandatory. See footnote for a full description[y] Information on QS transaction prices, will be included in a central QS ownership registry. *NOTE: No mention of social data. Data collection may need to start before first year of implementation in order to have a baseline for comparison.*

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Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-2.3.3	Program Costs Options to be Refined.	a Cost Recovery	**Option 1:** Fees will be used to recover costs associated with management of the IFQ program but not for enforcement or science. The limit on fees will be 3% of ex-vessel value, as specified in the MSFCMA. **Option 2:** There will be full cost recovery. Cost recovery will be achieved through landing fees plus privatization of elements of the management system. In particular, privatization for monitoring of IFQ catch (e.g., industry pays for their own compliance monitors). Stock assessments will not be privatized and the electronic fish ticket system will not be privatized.
		b Fee Structure	To be determined. TIQC recommends a fee structure that reflects usage. Option (to be developed) that allows for equitable sharing of observer costs for smaller vessels.
A-2.3.4	Program Duration and Modification		Four-year review process to start four years after implementation. Community advisory committee to review IFQ program performance.
A-2.4	Additional Measures for Processors		**Option 1:** Any QS received for processing history as part of the initial allocation will expire after a certain period of time (to be determined prior to final Council action). At that time all remaining QS will be adjusted proportionally so that the total is 100%. **Option 2:** The accumulation limit grandfather clause of Section A-2.2.3.e will not apply for processing history. Regardless of the percent of the total QS designated for processors, processing history will not entitle a person to receive QS in excess of the accumulation limits. **Option 3:** The Adaptive Management allocation and process (Section A-3) will be used to compensate processors for demonstrated harm by: auctioning QP to generate funds to provide financial compensation, or providing QP to be directed in a fashion that increases benefits for affected processors.
A-3	***<u>Adaptive Management</u>***		For each year of the program, up to 10% of the year's trawl allocation may be distributed as quota pounds (QP) to create incentives or to compensate in response to unforeseen outcomes from implementing the IFQ program. Examples of unforeseen outcomes include, but are not limited to, unexpected geographic shifts in the distribution of catch or landings, unexpected effects on certain segments of the industry (e.g. processors), or an unexpected barrier to new entry into the fishery. This provision will apply to the overall trawl sector (whiting and non-whiting). If the Council decides to take action under this provision, it will establish criteria for the distribution of up to 10% of the QP in a manner that will encourage those receiving the QP to undertake the desired activities or otherwise compensate for unexpected effects. *Designation of the amounts and methods for distribution may be done for more than one year at a time, e.g. for two years as part of the biennial specifications process.* *Note: This approach does not change the option for splits of quota share (QS) that will be initially allocated to eligible groups.*

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Table 4. Full description of the IFQ Alternatives (continued)

	Element	SubElement	
A-4	***Pacific Halibut Individual Bycatch Quota (IBQ) – non-retention***		Option: IBQ for Pacific halibut bycatch in the trawl fishery will be established. Such IBQ will be issued on the basis of a bycatch rate applied to the target species quota shares an entity receives. Area specific bycatch rates may be used for allocation but halibut IBQ will not be geographically subdivided.
A-5	***Alternative Scope for IFQ Management***		**Option:** IFQ will be required to cover all groundfish catch except for bycatch species taken on whiting sector trips. **If this option is selected sections above would be modified as follows.** **Section A-1**. Replace "QP will be required to cover catch of all groundfish (including all discards" with "for non-whiting trips, QP will be required to cover catch of all groundfish (including all discards), for whiting trips, QP will be required to cover catch of all whiting (including all whiting discards but not incidental catch of nonwhiting groundfish species)." If the three sector option is selected in Section A-1.3, then in the previous sentence replace "non-whiting trips" with "shoreside trips" and replace "whiting trips" with "trips delivered at sea." **Section A-1.3** Under the three sector option (shoreside, mothership, and catcher-processors) this alternative scope does not apply to the shoreside sector. For all catch destined for shoreside delivery QP would be required, including catch on trips targeted on whiting. For catch destined for at-sea delivery, QP would be required for whiting but not bycatch species. Under the four sector option, shoreside whiting trips would be included among those for which QP is required to cover whiting and not required for bycatch species. **Section A-1.5.** Whiting trip bycatch species will not be managed with IFQ but will be pooled and managed with bycatch caps. Select one of the following options for incorporation in Section A-1.5: **Bycatch Management Option 1: A single bycatch caps covering all whiting sectors.** All sectors and co-ops will close as soon as the whiting fishery bycatch cap is reached for one species; a controlled pace may be established if the sectors choose to work together cooperatively, potentially forming an intersector/interco-op cooperative. **Bycatch Management Option 2: A single bycatch caps covering all whiting sectors and seasonal releases.** Same as Option 1, including the potential for forming co-ops, except there will be seasonal releases of bycatch allocation.[z] **Bycatch Management Option 3: A separate bycatch caps for each sector.** Each sector closes when its bycatch cap is reached. **Bycatch Management Option 4: A separate bycatch cap for each sector and a roll-over.** Each sector closes when its bycatch cap is reached. Unused bycatch may be rolled over from one sector to another if the sector with unused bycatch has used its full allocation of whiting or participants in the sector do not intend to harvest the remaining sector allocation.

[a] Not withstanding this provision, a vessel with a limited entry trawl permit may catch the trawl QP with a nontrawl gear, as per Section A-1.1.

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Table 4. Full description of the IFQ Alternatives (continued)

[b] Such changes in latitudinal area management may occur as a result of changes in the management areas for species/species complexes in the ABC/OY table or as a result of separate Council action to change the trawl QS by area. In either case, specific Council action will be required to change the management areas and such action will be accompanied by appropriate supporting analysis and public comment opportunity.

[c] The Council authority to establish or modify RCAs will not be changed by this alterantive.

[d] The allocation among trawl sectors will be determined as part of the intersector allocation process. The TIQC recommended a number of options for determining the allocation among trawl sectors. One of these would have based the allocation on fleet history but not have included in the fleet history the history of any vessel not meeting the recent participation requirement. The Council rejected this application of a recent participation requirement to a determination of fleet history. The remaining TIQC options recommend that the division of allocation among trawl sectors be based on the fleet history over the same time periods used to allocate QS. The TIQC further recommends that if different periods are used for different trawl sectors, either (1) calculate the share for each sector based on its IFQ allocation period, then adjust all percentages proportionately such that they sum to 100%; OR (2) use the shortest period common to the allocation formula for all sectors.

If bycatch in the whiting sectors is not managed with IFQs and is pooled at the overall whiting fishery or sector level, allocations of bycatch will be determined through the intersector allocation process. The TIQC recommends allocation among the whiting sectors based on: Option 1: pro rata in proportion to the whiting allocation, or Option 2: weighted historical catch formula (for example, in projecting bycatch in the whiting fisheries prior to the start of the season, the GMT uses a four-year weighted average starting with the most recent year: 40%, 30%, 20%, 10%).

[e] For the nonwhiting fishery there is a potential that a vessel might make a targeted whiting trip by accumulating whiting QPs provided to cover whiting bycatch in the nonwhiting fishery. This could create a problem if it occurred during a time when the whiting fishery is closed to control for impacts on ESA listed salmon. Other than that whiting targeted trips using whiting QP intended for whiting bycatch in the nonwhiting fishery might not create a problem. Restrictions might be imposed on whiting catch in the nonwhiting fishery as needed to address concerns ESA concerns.

[f] A whiting QP rollover provision was considered but rejected from further analysis. This provision would have allowed unused QP to be reclassified so that they could be used in any whiting sector.

[g] The current process for changing the whiting fishery opening dates involves a regulatory amendment developed under the FMP through a framework process. Implementation of an IFQ program should not change this process

[h] The term "landing," as defined in the regulations, includes both shoreside and at-sea deliveries.

[i] "**Processors**"

At-sea processors are those vessels that operate as motherships in the at-sea whiting fishery and those permitted vessels operating as catcher-processors in the at-sea whiting fishery.

A shoreside processor is an operation, working on US soil, that takes delivery of trawl-caught groundfish that has not been "processed at-sea" and that has not been "processed shoreside"; and that thereafter engages that particular fish in "shoreside processing." Entities that received fish that have not

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undergone "at-sea processing" or "shoreside processing" (as defined in this paragraph) and sell that fish directly to consumers shall not be considered a "processor" for purposes of QS allocations.

"Shoreside Processing" is defined as either of the following:

1. Any activity that takes place shoreside; and that involves:
   - cutting groundfish into smaller portions; OR
   - freezing, cooking, smoking, drying groundfish; OR
   - packaging that groundfish for resale into 100 pound units or smaller for sale or distribution into a wholesale or retail market.
2. The purchase and redistribution into a wholesale or retail market of live groundfish from a harvesting vessel.

[j] If a catcher-processor consensus formula is used, recent participation will not be applied.

[k] State landings receipts (fish tickets) will be used to assess landings history for shoreside deliveries and observer data will be used for deliveries to motherships.

[l] The intent is to consider an alternative allocation method QS for overfished species which, at reduced harvest levels, are needed primarily to cover incidental catch in fisheries that target healthy stocks. The alternative method (Option 2) would attempt to allocate the species to those who will be receiving QS for related target species. By allocating overfished species QS to those most in need of it, such an allocation would be expected to reduce transition costs. Currently, the list of overfished species that fall into this category is as follows: canary rockfish, darkblotched rockfish, Pacific Ocean perch, widow rockfish, yelloweye rockfish. This list may change by the time the program is ready to be implemented. If a major target species became overfished, it would not be intended that such a species would be allocated via an alternative method (for example species such as Dover sole, sablefish, or Pacific whiting).

[m] State landings receipts (fish tickets) will be used to assess landings history for shoreside deliveries and observer data will be used for deliveries to motherships.

[n] Catch area data on fish tickets are not considered reliable. It is often filled out by fish receivers that assume the vessel has been fishing in nearby ocean areas. Therefore it will be assumed that all catch comes from ocean areas near the port of landing.

[o] Permit history from observer data

[p] QP from a subsequent year may not be accessed not until such QP have been issued by NMFS.

[q] The extent of the prohibition (e.g. whether it includes state fisheries or fisheries in Alaska) and its duration are to be determined.

[r] Carryover of deficits provides some flexibility to use pounds from a year to cover a deficit from a previous year. Without a carryover provision, a vessel would still need to use pounds in a subsequent year to cover an overage but would incur a violation.

[s] There has been some GMT discussion of a possible need for the QP surpluses carried over to a following year be adjusted proportionally in the following year if the trawl allocation for the following year changes.

[t] QS may be transferred on a temporary basis through private contract (leased) but NMFS will not track lease transfers differently than any other transfer.

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Table 4. Full description of the IFQ Alternatives (continued)

[u] In this section, the term "permit" was changed to "vessel" to be consistent with Section A-2.1.3 which indicates that QP go into vessel accounts, not permit accounts. The term "own or control" was shortened to "control" for simplicity. Control includes ownership and therefore.

[v] For example, if a person has a 50% ownership interest in that entity then 50% of the QS owned by that entity will count against the individual's accumulation limit.

[w] **Change in Ownership definition:** For the purpose of the grandfather clause, ownership of a legal entity is defined to change with the addition of a new member to the corporation, partnership or other legal entity. Members may leave without causing the grandfather clause to expire for that entity.

[x] **Data collection, status quo.**

- Voluntary submission of economic data for LE trawl industry (status quo efforts)
- Voluntary submission of economic data for other sectors of the fishing industry.
- Ad hoc assessment of government costs.

Voluntary Provisions: NMFS will continue to support the PSMFC EFIN project attempts to collect economic and social data useful in evaluating the impacts of fishing and fishing regulations.

Central Registry: The program will include no new central registries for QS owners/lessees or limited entry permit owners/lessees other than that necessary to directly support the IFQ tracking and monitoring system, as maintained by the NMFS Permit Office.

Government Costs: Data on the monitoring, administration, and enforcement costs related to governance of the IFQ program will be collected and summarized on an ad hoc basis.

[y] **Data collection:** Expanded **mandatory** submission of economic data:

- Mandatory submission of economic data for LE trawl industry (harvesters and processors).
- Voluntary submission of economic data for other sectors of the fishing industry.
- Include transaction value information in a centralized registry of ownership.
- Formal monitoring of government costs.

Mandatory Provisions: The Pacific Fishery Management Council and the National Marine Fisheries Service shall have the authority to implement a data collection program for cost, revenue, ownership, and employment data, compliance with which will be mandatory for members of the West Coast groundfish industry harvesting or processing fish under the Council's authority. Data collected under this authority will be treated as confidential in accordance with Section 402 of the MSA.

A mandatory data collection program shall be developed and implemented as part of the groundfish trawl IFQ program and continued through the life of the program. Cost, revenue, ownership, employment and other information will be collected on a periodic basis (based on scientific requirements) to provide the information necessary to study the impacts of the IFQ program. This data could also be used to analyze the economic and social impacts of future FMP amendments on industry, regions, and localities. This data collection effort is also required to evaluate achievement of goals and objectives associated with the IFQ program. ~~Both statutory and regulatory language shall be developed to ensure the confidentiality of these data.~~ Data collected under this authority will be treated as confidential in accordance with Section 402 of the MSA. Additional funding (as compared to status quo) will be needed to support the collection of these data. *The data collected would include data needed to meet MSA requirements (including antirust). Preceding strikeouts and deletions are changed recommended by Council/agency staff after review over the summer.*

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The development of the program shall include: A comprehensive discussion of the enforcement of such a program, including discussion of the type of enforcement actions that will be taken if inaccuracies are found in mandatory data submissions. The intent of this action will be to ensure that accurate data are collected without being overly burdensome on industry in the event of unintended errors.

Voluntary Provisions: A voluntary data collection program will be used to collect information needed to assess spillover impacts on non-trawl fisheries.

Central Registry: Information on transaction prices will be included in a central registry of QS owners. Such information will also be included for LE permit owners/lessees.

Government Costs: Data will be collected and maintained on the monitoring, administration, and enforcement costs related to governance of the IFQ program.

[z] At the outset, it is envisioned that the seasonal approach will be used to manage widow rockfish bycatch; for canary rockfish and darkblotched rockfish, status quo management will be maintained (i.e., no sector allocation and no seasonal apportionment).

A seasonal release bycatch management program will be implemented through regulation. For reference, a similar program is used to manage halibut bycatch in NPFMC-managed flatfish and Pacific cod fisheries, see 50CFR679.21(d).

In practice, seasonal releases protect the next sector entering the fishery. For example, a May 15-June 15 release will be used by the catcher-processors and motherships, but it protects the shoreside fishery; the June15-September release will be used by shoreside and whatever catcher-processors and motherships are still fishing whiting, and to protect a fall at-sea season after September 15; the final release in September will again be shared by the catcher-processors and motherships, assuming shoreside is done.

For example:

1. No sector bycatch allocations.
2. Status quo for canary and darkblotched rockfish; i.e., no seasonal or sector allocation.
3. May 15 - June 15; 40% of widow hard cap released.
4. June 15 - August 31; an additional 45% of widow hard cap released.
5. Sept. 1 - Dec. 31; final 15% of widow hard cap released.
6. Once a seasonal release of widow rockfish is reached, the whiting fishery is closed to all three sectors for that period. The fishery re-opens to all three sectors upon release of the next seasonal release of widow rockfish.
7. Unused amounts from one seasonal release rollover into subsequent release periods.

(Note: percentages are for illustration purposes only, actual release percentages will be developed through the PFMC process).

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Table 5. Control cap, and vessel cap options to define QS/QP accumulation limits in IFQ Program Alternatives.

Stock	Option 1			Option 2			Option 3	
	Control Cap (%)	Vessel Cap (%)		Control Cap (%)	Vessel Cap (%)		Control Cap (%)	Vessel Cap (%)
All nonwhiting groundfish (in aggregate)	1.5	3.0		2.1	4.2		3 or 5	6 or 10
Lingcod - coastwide c/								
N. of 42 (OR & WA)								
S. of 42 (CA)								
Pacific Cod								
Pacific Whiting								
Shoreside Sector	10	7.5		15	10		25	12
Mothership Sector	10	25		15	30		25	50
Catcher Processors	50	65		55	70		60	75
Alll Whiting Sectors Combined	15	25		25	40		40	50
Sablefish (Coastwide)	1.7	3.4						
N. of 36 (Monterey north)								
S. of 36 (Conception area)								
PACIFIC OCEAN PERCH								
Shortbelly Rockfish								
WIDOW ROCKFISH	3.6	7.2						
CANARY ROCKFISH	6.0	12.0						
Chilipepper Rockfish								
BOCACCIO								
Splitnose Rockfish								
Yellowtail Rockfish	3.5	7.0						
Shortspine Thornyhead - coastwide	2.0	4.0						
Shortspine Thornyhead - N. of 34deg27'								
Shortspine Thornyhead - S. of 34deg27'								
Longspine Thornyhead - coastwide	2.1	4.2						
Longspine Thornyhead - N. of 34deg27'								
Longspine Thornyhead - S. of 34deg27'								
COWCOD - S. of 36 (Conception area)								
COWCOD - Monterey area								
DARKBLOTCHED								
YELLOWEYE g/								
Black Rockfish								
Black Rockfish (WA)								
Black Rockfish (OR-CA)								
Minor Rockfish North								
Nearshore Species								
Shelf Species								
Slope Species								
Minor Rockfish South								
Nearshore Species								
Shelf Species								
Slope Species								
California scorpionfish								
Cabezon (off CA only)								
Dover Sole	1.95	3.9						
English Sole	7.0	14.0						
Petrale Sole (coastwide) c/	3.0	6.0						
Arrowtooth Flounder								
Starry Flounder								
Other Flatfish	9.1	18.2						
Other Fish								

The following categories are not included in this table. Control Limits: Sanddabs 27.6%, Other sebastes: 6.6%. Permit Limits = 2x control limits.

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Whiting Sector Cooperative Alternative

This alternative considers co-ops, another form of dedicated access privilege, for the whiting fishery. If the co-op alternative is adopted, the Council could still consider adopting the IFQ alternative for the non-whiting shoreside sector only, or maintaining the non-whiting shoreside sector under status quo. Similarly, the Council could adopt co-ops for all or any combination of the three whiting sectors (shoreside, mothership and catcher processor).

As described below, all qualified catcher vessels (vessels with whiting endorsements for shoreside or mothership deliveries) will have a choice whether to participate in a co-op or in the non-co-op portion of the fishery. The co-op alternative would limit participation by motherships and put some constraints on participation by shoreside processors. Other provisions would obligate particular permits to deliver their catch to particular processors and provide rules for modifying those obligations. For catcher processors (CPs), no formal co-op fishery will be established; instead, participation in the CP sector will be capped by granting CP permits only to participants meeting specified qualification criteria, thus protecting the existing voluntary co-op. Individual CPs will be able to choose between participation in the voluntary co-op or competing with the co-op in an Olympic style fishery.

The whiting sector co-op alternative is described generally in the following summary. Table 6 provides an overview of the sections of the alternative. Following this summary and overview table are the sections which provide a full description of the alternative and its various co-op programs. The whiting sector co-op alternative includes a section on general management of the whiting fishery followed by separate sections on the co-op programs that would apply to each sector of the whiting fishery.

Summary

Whiting Sector Management under Co-ops
The existing allocation of whiting between the shoreside whiting, mothership, and CP sectors will not change under this alternative (42%, 24%, and 34%, respectively). Whiting from one sector could not be transferred to another sector, except possibly through a rollover of excess whiting from a sector, that does not have the intent or ability to use it, to another sector.

Provisions also address bycatch in the whiting fishery (particularly that of certain overfished species and Endangered Species Act-listed salmon). The Council is considering whether or not to create incidental groundfish species caps for each whiting sector or for all whiting sectors combined. If fleet caps are sector specific, an allocation among sectors will be made as part of the intersector allocation environmental impact statement. NMFS will close the whiting fishery, or particular sectors, if a bycatch limit is reached.

Given the high level of monitoring already in place in the whiting fishery, only moderate changes are expected to be needed to implement this alternative for the at-sea whiting fishery. For the at-sea fishery, 100 percent coverage aboard mothership and CPs will continue. For the shoreside whiting fishery, at-sea monitoring will be increased to 100 percent to enforce catch accounting requirements. For some coverage, it may be possible for cameras to be used in place of monitors.

Co-ops for Catcher Vessels Delivering to Motherships

Under this program, catcher vessels with a whiting endorsement for the mothership sector will make the choice each year whether to be part of a co-op or to register to fish in the non-co-op portion of the fishery. Each co-op will be made up of permits with mothership whiting endorsements. Based on its catch history, each permit that qualifies for a mothership whiting endorsement will be designated a share of the mothership sector allocation. There is an option which would allow the endorsements, together with the associated shares, to be transferred as a unit from one LE trawl permit to another. Each year, NMFS will distribute a catch allocation to a catcher vessel co-op based on the sum of the endorsement shares for the permits registered to that co-op. NMFS will also distribute a catch allocation each year to the non-co-op portion of the fishery, based on the collective catch history of the permits opting to participate in the non-co-op fishery.

The co-op organization will coordinate harvest by its members. Although co-op agreements will include a mandatory clause that the catch allocation made to a member must equal the amount that the member brings into the co-op ("The Golden Rule"), co-op members may transfer catch allocations among themselves. Similarly, if there are multiple co-ops in the sector, one co-op will be allowed to transfer catch allocation to another co-op, though that catch must still be delivered to the original mothership unless a mutual exception is made. NMFS will not track these transfers between co-ops**??** or those among co-op members. [Currently there are no provisions pertaining to the creation of inter-co-op agreements. These provisions need to be added in order to specify opportunities for transfers among co-ops.]

The class of motherships will be closed by creating an LE permit for mothership vessels. Each catcher vessel permit's endorsement share will be designated for delivery to the mothership that the permit delivered the majority of its catch to in the year prior to implementation of the program. A catcher vessel permit owner may join a different co-op or deliver to a different mothership than the one to which it is first assigned. However, the permit owner would first be required to enter into the non-co-op portion of the fishery for one year.

Like in the IFQ alternative, accumulation limits will be imposed to prevent excessive concentration of catch allocations. They will cap the proportion of whiting that an individual or entity could process and will cap the proportion of whiting an individual or entity could accumulate via ownership of catcher vessel permit(s).

Co-ops for Catcher Vessels Delivering Shoreside

Similar to the mothership co-op program, permits with a shoreside whiting endorsement will make the choice each year whether to be part of a co-op or to fish independently in the non-co-op portion of the fishery. Based on their catch history, each permit that qualifies for a shoreside whiting endorsement will be designated a share of the shoreside sector allocation. There is an option which would allow the endorsements together with the associated shares to be transferred as a unit from one LE trawl permit to another. Allocation will be distributed each year by NMFS to the co-op to which the permits are registered. NMFS will also distribute a catch allocation each year to the non-co-op portion of the fishery based on the collective catch history of the permits opting to participate in the non-co-op mode.

The co-op organization will coordinate harvest by its members. Although co-op agreements must stipulate that the catch allocation made to a member equal the amount that the member brings into the co-op, transfers could be made among co-op members ("The Golden Rule"). Transfers could also occur between co-ops. NMFS will not track transfers either between co-ops**??** or among members of a single co-op. [Currently there are no provisions pertaining to the creation of inter-co-op agreements. These provisions need to be added in order to specify opportunities for transfers among co-ops.]

For the first two years of the program, only processors that have qualified for a shoreside processor permit will be eligible to receive fish from a co-op. Qualification will be based on having processed a specified amount of whiting during certain qualifying years. A permit that is in the non-co-op portion may deliver to any processor but a permit in a co-op will be required to deliver whiting to the co-op-qualified processors that were the basis of its catch history. If a permit wants to deliver to a processor different than the one(s) it is assigned to, it will have to enter the non-co-op portion of the fishery for a given number of years, after which it will be released from obligations and may deliver to any shoreside processor. There are two options for processor ties. Under one, after the first two years of a program, once a permit breaks its processor tie it can rejoin a co-op, deliver to any processor and is not obligated to deliver to that same processor in subsequent years. Under the other option, the permit will be obligated to the processor(s) to which it chooses to deliver in its first year upon rejoining the co-op and in order to break that obligation must again return to the non-co-op fishery for a period of time.

Like in the IFQ alternative, accumulation limits will be imposed to prevent excessive concentration. These limits will cap the proportion of whiting an individual or entity could accumulate via ownership of catcher vessel permit(s).

Co-ops for Catcher-Processors

Under this alternative, the main change from the current CP sector management will be the creation of a CP endorsement to close the CP fishery to new entrants. This endorsement will be granted to limited entry permits registered to CP vessels if they meet specified qualification criteria. Only vessels with a CP limited entry permit will be allowed to harvest fish from the sector's allocation. Limited entry permits with CP endorsements will continue to be transferable.

Catch by the CP sector will be controlled primarily by closing the fishery when a constraining allocation is reached. As under status quo, co-op(s) may continue to be formed voluntarily by CP permit holders. If a co-op is formed, the sector will be managed as a private voluntary cooperative and governed by a private contract that will likely include division of the sector allocation among eligible vessels according to an agreed harvest schedule. NMFS will not establish an allocation of catch or catch history among permits. Therefore, if any permit holder decides not to join the cooperative, a race for fish could ensue. Similarly, if more than one co-op is formed, a race for fish could ensue absent an inter co-op agreement.

Table 6. Overview of the co-op alternative.

Co-op Alternative	
B.1	***Whiting Sector Management Under Co-ops***
B-1.1	Whiting Management
B-1.2	Annual Rollovers
B-1.3	Bycatch Species Management
B-1.4	Bycatch Subdivision by Sector
B-1.5	At-sea Observers/Monitoring
B-1.6	Sector Allocations
B-2	***Co-ops for Catcher Vessels Delivering to Motherships (CV(MS))***
B-2.1	Catcher Vessel (MS) Endorsement and Catch History Calculation
B-2.2	Mothership (MS) Permits
B-2.3	Annual Registration
B-2.4	Co-op Formation
B-2.5	Co-op Allocation
B-2.6	Non-co-op Allocation
B-2.7	Movement between Motherships
B-2.8	Mutual Agreement Exception
B-2.9	Temporary Transfer of Allocation to CV(MS) and nonCV(MS) Endorsed Permits
B-2.10	CV(MS) Permit Combination to Achieve a Larger Size Endorsement
B-2.11	Accumulation Limits
B-2.12	MS Permit Ownership
B-2.13	Mothership Permit Transfer
B-2.14	Mothership Withdrawal
B-3	***Co-ops for Catcher Vessels Delivering to Shoreside Processors***
B-2.1	Catcher Vessel (SS) Endorsement and Catch History Calculation
B-2.2	Shoreside Processor (SSP) Permits
B-2.3	Annual Registration
B-2.4	Co-op Formation and Structure
B-2.5	Co-op Allocation
B-2.6	Non-co-op Allocation

IFQ = Individual Fishing Quota, in general (encompasses both QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Table 6. Overview of the co-op alternative (continued).

Co-op Alternative	
B-2.7	Movement between Motherships
B-2.8	Mutual Agreement Exception
B-2.9	Temporary Transfer of Allocation to CV(SS) and nonCV(SS) Endorsed Permits
B-2.10	CV(SS) Permit Combination to Achieve a Larger Size Endorsement
B-2.11	Accumulation Limits
B-2.12	SS Permit Transfer
B-2.13	Shoreside Processor Withdrawal
B-2.14	Permit Qualification for a Catcher Vessel Shoreside [CV(SS)] Endorsement
B-4	***Co-ops for Catcher-Processors***
B-4.1	Catcher-Processor (CP) Endorsement
B-4.2	Annual Registration
B-4.3	Co-op Formation
B-4.4	Co-op Allocation
B-4.5	CP Permit Combination to Achieve a Larger Size Endorsement

IFQ = Individual Fishing Quota, in general (encompasses QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Whiting Sector Management Under Co-ops

Whiting Management

Under the co-op options for the mothership and shoreside sectors, catcher vessel permits will be endorsed for deliveries to these sectors and amounts of history assigned.

The whiting catch history calculation for each mothership endorsed catcher vessel permit [CV(MS)] and shoreside endorsed catcher vessel permit [CV(MS)] will be assigned to a pool for the co-op in which the permit will participate or a pool for the mothership or shoreside non-co-op fishery. Co-ops are responsible for monitoring and enforcing the catch limits of co-op members. NMFS will monitor the catch in the non-co-op fishery, the co-op fisheries and the overall catch of all three sectors. NMFS will close these fisheries when their catch limits have been achieved.

Annual Whiting Rollovers

- **Whiting Rollover Option 1.** There **will not** be a **rollover** of unused whiting from one whiting sector to another.
- **Whiting Rollover Option 2.** Each year rollovers to other sectors may occur if sector participants are surveyed by NMFS and no participants intend to harvest remaining sector allocations in that year. Current provisions for NMFS to re-allocate unused sector allocations of whiting (from sectors no longer active in the fishery) to other sectors still active in the fishery will be maintained (see 50CFR660.323(c) – Reapportionments).

Bycatch Species Management

For the foreseeable future, the whiting fishery will be managed under bycatch limits (hard caps) for widow, canary, and darkblotched rockfish. The ESA-listed salmon bycatch management measures, that is, the 11,000 Chinook threshold, 0.05 rate threshold, and triggered 100 fathom closure, will also continue to be in place. The goal of bycatch management is to control the rate and amounts of rockfish and salmon bycatch to ensure each sector is provided an opportunity to harvest its whiting allocation.

Bycatch Subdivision by Sector

- **Subdivision Option A:** Do not subdivide bycatch species.
- **Subdivision Option B:** Subdivide bycatch species allocation among each of the whiting sectors as specified in the section below on allocation.

For Subdivision Option A (No Bycatch Subdivision) if bycatch species are not allocated among the sectors, then

- **Bycatch Management Option 1:** all sectors and co-ops will close as soon as the whiting fishery bycatch cap is reached for one species; a controlled pace may be established if the sectors choose to work together cooperatively, potentially forming an intersector/interco-op cooperative.
- **Bycatch Management Option 2:** Same as Option 1, including the potential for forming co-ops, except there will be seasonal releases of bycatch allocation.

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At the outset, it is envisioned that the seasonal approach will be used to manage widow rockfish bycatch; for canary rockfish and darkblotched rockfish, status quo management will be maintained (i.e., no sector allocation and no seasonal apportionment).

A seasonal release bycatch management program will be implemented through regulation. For reference, a similar program is used to manage halibut bycatch in NPFMC-managed flatfish and Pacific cod fisheries, see 50CFR679.21(d).

In practice, seasonal releases protect the next sector entering the fishery. For example, a May 15-June 15 release will be used by the catcher-processors and motherships, but it protects the shoreside fishery; the June15-September release will be used by shoreside and whatever catcher-processors and motherships are still fishing whiting, and to protect a fall at-sea season after September 15; the final release in September will again be shared by the catcher-processors and motherships, assuming shoreside is done.

For example:

1. No sector bycatch allocations.
2. Status quo for canary and darkblotched rockfish; i.e., no seasonal or sector allocation.
3. May 15 - June 15; 40% of widow hard cap released.
4. June 15 - August 31; an additional 45% of widow hard cap released.
5. Sept. 1 - Dec. 31; final 15% of widow hard cap released.
6. Once a seasonal release of widow rockfish is reached, the whiting fishery is closed to all three sectors for that period. The fishery re-opens to all three sectors upon release of the next seasonal release of widow rockfish.
7. Unused amounts from one seasonal release rollover into subsequent release periods.

(Note: percentages are for illustration purposes only, actual release percentages will be developed through the PFMC process).

For Subdivision Option B (Bycatch Subdivision).

- **Rollover Option 1**: If each sector has its own allocation of bycatch, unused bycatch may be rolled over from one sector to another if the sector's full allocation of whiting has been harvested or participants in the sector do not intend to harvest the remaining sector allocation.
- **Rollover Option 2**: **<u>Rollovers are not allowed.</u>**

At-sea Observers/ Monitoring

- **Shoreside Whiting Fishery:** Increase to 100% to enforce catch accounting requirements.
- **At-sea Whiting Fishery:** 100% coverage aboard mothership and catcher-processors will continue.

For some coverage, cameras may be used in place of observers (feasibility to be determined).

Co-ops for Catcher Vessels Delivering to Motherships

The following is a description of the co-op alternative for catcher vessels delivering to motherships.

The mothership whiting fishery will be managed in two modes:

1. Co-op Fishery: Catcher vessels in co-op(s) delivering to motherships (CV(MS))
2. Non-co-op Fishery: Seasonal management (closure on attainment of the allocation) for those not participating in co-ops

Catcher vessels with a CV(MS) whiting endorsement will **annually** choose, **by a set date**, the mode in which they will fish during a fishing year and commit to that mode for the entire fishing year.

CV(MS) Whiting Endorsement. Permits with a qualifying history will be designated as CV(MS) permits through the addition of an endorsement to their limited entry groundfish permit.

Qualifying for a CV(MS) Whiting Endorsement. A limited entry permit will qualify for a CV(MS) whiting endorsement if it has a total of more than 500 mt of whiting deliveries to motherships from

Qualification Option 1: 1998 through 2004
Qualification Option 2: 1994 through 2003

Identification of Endorsement Related Catch History. The following are options for the initial calculation to be used in determining NMFS distribution to co-op and non-co-op fishery pools. A CV(MS) whiting endorsement calculated catch history will be based on

Allocation Option 1: its best 6 out of 7 years from 1998 through 2004
Allocation Option 2: its best 9 out of 11 years from 1994 through 2004
Allocation Option 3: its best **5** out of **6** years from 1998 through 2003
Allocation Option 4: its best 8 out of **10** years from 1994 through 2003

For the purpose of the endorsement and initial calculation, catch history associated with the permit includes that of permits that were combined to generate the current permit.

Transfer Option 1: The CV(MS) whiting endorsement together with the associated catch history may not be transferred separate from the permit.

Transfer Option 2: The CV(MS) whiting endorsement together with the associated catch history may be transferred to a different limited entry trawl permit. Catch history may not be subdivided or transferred separately.

Mothership (MS) Permits. The vessel owners of qualifying motherships will be issued MS permits. In the case of bareboat charters, the charterer of the bareboat will be issued the permit. Only vessels for which such permits are held may receive at-sea deliveries from catcher vessels. A qualifying mothership is one which processed at least 1,000 mt of whiting in each of any two years from 1998 through 2004.

MS permits will be transferable and there will be no size endorsements associated with the permit. A vessel may not harvest whiting and operate as a mothership in the same year. MS permits may only be used for processing by one vessel per year. Exclusionary language will be

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added to indicate that a vessel that has left US fisheries to participate in foreign fisheries will not be allowed to return. [Need rationale]

Annual Registration. Each year MS and CV(MS) permit holders planning to participate in the mothership sector must register with NMFS. At that time they must identify which co-op they will participate in or if they plan to participate in the non-co-op fishery.

Co-op Formation. Co-ops will be formed among CV(MS) permit owners.

Co-op Formation Option 1 (Multiple Coops): In the first year of the program, permit owners choosing to participate in a co-op must form those co-ops based on the mothership where the CV(MS) permit holders delivered the majority of their most recent years' catch. A separate co-op must be formed for each mothership to which deliveries were made. There can be only one catcher vessel co-op for each mothership. Co-op agreements will be submitted to NMFS. In subsequent years, multiple coops are required to be formed based on the processor where CV permit holder delivered the majority of their most recent year's catch.

Co-op Formation Option 2: Multiple coops are not required. Catcher vessels may organize a single coop or multiple coops of like-minded catcher vessels. Vessels within the coop(s) will have separate contracts with the processor to whom they are delivering. Permit owners choosing to participate in a coop must register annually with NMFS and express their intent to be a member of the coop at a date certain prior to the start of the fishery. In the first year of the program, permit holders are required to deliver their percentage of the coop allocation to the mothership where they delivered the majority of the most recent years' catch.

Coop agreements must stipulate that catch allocations to members of the coop be based on their catch history calculation distribution to the coop by NMFS ("The Golden Rule")

Annual Allocation to Co-ops and the Non-co-op Fishery.

Co-op Allocation. Each year NMFS will determine the percent of the mothership sector's harvest allocation to be given to each co-op based on the catch history calculation of CV(MS) permits registered to participate in the co-op that year. NMFS does not allocate to the individual permit holder, rather, allocates an aggregate amount of harvest tonnage annually to the co-op, based on the catch histories associated with the members of the co-ops.

Non-co-op Allocation. Each year NMFS will determine the distribution to be given to the non-co-op fishery based on the catch history calculation of permit holders registered to participate in that fishery.

Movement between Motherships.

Each year, CV(MS) permit owners will choose between fishing in the non-co-op fishery or delivering to the same mothership that they most recently delivered the majority of their whiting catch in the last calendar year in which they participated. However, if a CV(MS) permit participated in the non-co-op fishery in the previous year, or did not participate in the mothership whiting fishery, it is released from its obligation and may deliver to any mothership in a subsequent year. In the first year of the program, the CV(MS) permit owner's choice will be between delivering in the non-co-op fishery and making co-op deliveries to the licensed mothership to which the permit made a majority of its whiting deliveries in the last calendar year in which it participated.

Mutual Agreement Exception. By mutual agreement of the CV(MS) permit owner and mothership to which the permit is obligated, and on a year-to-year basis, a permit may deliver to a licensed mothership other than that to which it is obligated. Such an agreement will not change the permit's future year obligation to the mothership (i.e., the vessel will still need to participate in the non-co-op fishery for one year in order to move from one mothership to another).

Temporary Transfer of Allocation to CV(MS) and nonCV(MS) Endorsed Permits. CV(MS) permit owners are permitted to transfer co-op allocations amongst other coop members. Such inter- or intra- co-op transfers must deliver co-op shares to the mothership to which allocation is obligated unless released by mutual agreement. Also, a co-op allocation may be harvested by any catcher vessel holding a valid limited entry trawl permit (including one that does not have a CV(MS) endorsement). Whiting allocations are not permanently separable from a CV(MS) endorsement. Allocations may not be transferred from the mothership sector to another sector.

CV(MS) Permit Combination to Achieve a Larger Size Endorsement. In general, when a CV(MS) endorsed permit is combined with another permit, the resulting permit will be CV(MS) endorsed, except when the CV(MS) permit is combined with a CP permit. Specifically, a CV(MS) endorsed permit that is combined with a limited entry trawl permit that is not CV(MS) endorsed or one that is CV(Shoreside) [CV(SS)] endorsed will be reissued with the CV(MS) endorsement. If the other permit is CV(SS) endorsed, the CV(SS) endorsement will also be maintained on the resulting permit. However, CV(MS) and CV(SS) catch histories will be maintained separately on the resulting permit and be specific to participation in the sectors for which the catch histories were originally determined. If a CV(MS) permit is combined with a CP permit, the CV(MS) endorsement and history will not be reissued on the combined permit. The size endorsement resulting from permit combinations will be determined based on the existing permit combination formula.

Accumulation Limits.

MS Permit Ownership: No individual or entity owning a MS permit(s) may process more than . . . **Option 1** 20%, **Optoin 2,** 30% or **Option 3** 50% **. . .** of the total mothership sector whiting allocation.

CV(MS) Permit Ownership: No individual or entity may own CV(MS) permits for which the allocation totals greater than 10%, 15%, or 25% of the total mothership sector whiting allocation.

Mothership Permit Transfer. If a mothership transfers its MS permit to a different mothership or different owner, the CV(MS) permit obligation remains in place and transfers with the MS permit to the replacement mothership unless the obligation is changed by mutual agreement or participation in the non-co-op fishery.

Mothership Withdrawal. If a mothership does not participate in the fishery and does not transfer its permit to another mothership or mutually agree to transfer delivery to another mothership, the CV(MS) permit holders obligated to that mothership may participate in the non-co-op fishery.

If a mothership does not qualify for an MS permit in the first year of the program, the vessels which delivered to that mothership in the previous year may deliver to the qualified mothership to which it last delivered its majority of catch or participate in the non-co-op fishery.

Co-ops for Catcher Vessels Delivering to Shoreside Processors

Management

The shoreside whiting fishery will be managed in two modes:

1. Co-op Fishery: Catcher vessels in co-ops delivering to shoreside processors [CV(SS)]
2. Non-co-op Fishery: Seasonal management (close on attainment of allocation) for those not participating in co-ops. Vessels in the non-co-op fishery will be prohibited from forming a separate co-op but may deliver to any processor. Quota attached to vessels in the non-co-op fishery will not be available to vessels in any co-op but will be pooled – i.e., will be available to any non-co-op vessel.
3. Incidental Harvest: Whiting harvested incidentally in the nonwhiting shoreside fishery may be processed by any shoreside processor.

Catcher vessels with a CV(SS) whiting endorsement will choose the mode in which they will fish during a fishing year and commit to that mode for the entire fishing year.

CV(SS) Endorsement

Permits with a qualifying history will be designated as CV(SS) permits through the addition of an endorsement to their limited entry groundfish permit.

Qualifying for a CV(SS) Endorsement. A limited entry permit will qualify for a CV(SS) endorsement if it has a total of more than 500 mt of whiting deliveries to shoreside processors from:

Qualification Option 1: 1998 through 2004
Qualification Option 2: 1998 through 2003
Qualification Option 3: 1994 through 2004
Qualification Option 4: 1994 through 2003
Qualification Option 5: 2001 through 2003

Identification of Endorsement Related Catch History. The following are options for the initial calculation to be used in determining NMFS distribution to co-op and non-co-op fishery pools. A CV(SS) permit calculated landings history will be based on

Allocation Option 1: its best 6 out of 7 years from 1998 through 2004
Allocation Option 2: its best 9 out of 11 years from 1994 through 2004
Allocation Option 3: its best 5 out of 6 years from 1998 through 2003
Allocation Option 4: it's best 9 out of 10 years from 1994 through 2003

For the purpose of the endorsement and initial calculation, landing history associated with the permit includes that of permits that were combined to generate the current permit.

Transfer Option 1: The CV(SS) Endorsement may not be transferred separate from the permit.
Transfer Option 2: The CV(SS) Endorsement may be transferred to a different limited entry trawl permit.

IFQ = Individual Fishing Quota, in general (encompasses both QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

Shoreside Processor (SSP) Permits.

An initial co-op qualified shoreside processing entity is one that processed at least 1,000 mt of whiting in each of any two years from 1998 through 2004. Only these processor entities are eligible to receive fish from whiting cooperatives in the first two years of the program. Thereafter, any processing corporation could be eligible to receive fish from vessels in a whiting cooperative, subject to the other provisions of this plan. Processors without SSPs may receive whiting from participants in the non-co-op fishery and whiting harvested incidentally in the nonwhiting fishery at any time, including within the first two years of the program.

A shoreside processor is an operation, working on US soil, that takes landings of trawl-caught groundfish that has not been processed at-sea or previously processed shoreside; and that thereafter subjects those groundfish to shoreside processing. Entities that received fish that have not undergone at-sea processing or shoreside processing (as defined in this paragraph) and sell that fish directly to consumers shall not be considered a processor for purposes of the shoreside co-op program.

"Shoreside Processing" is defined as any activity that takes place shoreside; and that involves:

a) cutting groundfish into smaller portions; OR
b) freezing, cooking, smoking, drying groundfish; OR
c) packaging that groundfish for resale into 100 pound units or smaller for sale or distribution into a wholesale or retail market.

Annual Registration.

Each year SSP and CV(SS) permit holders planning to participate in the shoreside sector must register with NMFS. At that time CV(SS) permit holders must identify which co-op they will participate in or if they plan to participate in the non-co-op fishery so that NMFS can make appropriate distributions to co-op(s) and the non-co-op fishery.

Co-op Formation and Structure.

Co-ops will be formed among CV(SS) permit owners. Multiple co-ops may be formed and new co-ops may be formed each year, prior to annual registration. Two or more vessels may form a co-op.

Co-op agreements will be submitted to NMFS. Co-op agreements must distribute catch allocations to members based on the permit specific history calculation that NMFS used to distribute allocation to the co-op.

During the first two years of co-op formation, permit owners that join a co-op shall be required to deliver their whiting catches to the co-op qualified processors that were the basis of their landing history during the period . . . **Years Option 1**, **2001; Years Option 2**, **2000; Years Option 3**, **2000-2003** . .. .on a pro rata basis. Determination of the processor(s) to which a permit owner is obligated will take into account any successors in interest (see following paragraph). Transfers may take place within the co-op between permit holders to allow a permit holder to make deliveries exclusively to one processor so long as the total allocation received by the co-op, based on the permit holders that are members thereof, is distributed between the various co-op qualified processors on a pro rata basis based on the landing history of the members of the co-op during the period ***[SAME YEAR(S) AS SELECTED IN THE FIRST SENTENCE]***.

Option 1: Thereafter, once a CV(SS) permit has participated in the non-co-op fishery for ***[Options: 1 to 5 consecutive years]***, it is released from its delivery obligations to the processor(s) that were the basis of its history, and may join any of the various co-ops, or join with other permit holders who have also been released from delivery obligations to form a new co-op, and deliver to any shoreside processor in the subsequent years after the SSPs have expired.

Option 2: Thereafter any CV(SS) permit participating in a co-op is linked indefinitely to the processor they are delivering to under the initial linkage requirements. The permit can sever that linkage by participating in the non-co-op fishery for a period of ***[Options: 1 to 5 years]*** years. After completing their non-co-op obligation, the permit is then free to reenter the co-op system and deliver to a processor of their choosing. Once the vessel reenters the co-op system and elects to deliver their fish to a processor, a new linkage is then established with that processor. Should the permit later choose to break that new linkage, the non-co-op participation requirements again apply.

Should a permit elect to enter the non-co-op fishery within the first two years of this program, that permit must participate in the non-co-op fishery for a minimum of ***[Options: 2 to 5 years]***, regardless of other non-co-op participation requirements applying elsewhere in this document. Once the permit meets that obligation and later elects to enter a co-op, all provisions of co-op participation, including the processor linkage provisions, apply.

Processor Successor In Interest. In determining the processor to whom a permit owner that participates in a co-op is required to deliver in the first two years of the program, a processor's successor in interest will be taken into account. If a processor's assets were purchased and the landing history expressly identified as an asset in the purchase agreement, then any permit owner obligation based on those landings will accrue to the processor making the purchase. For landings history associated with a defunct or non-qualifying processor, that portion of a permit's allocation will be linked to the permit's initially assigned landing history on a pro-rata basis.

Co-op Allocation

Each year NMFS will determine the distribution to be given to each co-op based on the landing history calculation of CV(SS) permits registered to participate in the co-op that year. In addition, NMFS will determine the landing history linking each co-op to each processor, if any.

Non-co-op Allocation

Each year NMFS will determine the distribution to be given to the non-co-op fishery based on the landing history calculation of permit holders registered to participate in that fishery. The whiting allocation for the non-co-op segment shall be in proportion to the permit history of non-co-op participants, relative to the co-op participants. That allocation shall be available to all CV(SS) endorsed permit holders who have registered to participate in the non-co-op fishery that year.

Mutual Agreement Exception

By mutual agreement of the CV(SS) permit owner and shoreside processor to which the permit's catch is obligated, a CV(SS) vessel may deliver to a shoreside processor other than that to which it is obligated. The transfer may be temporary or permanent. In either case the vessel's catch taken under that permit will continue to be obligated to the same processor (which is the transferor processor if the transfer is temporary or the transferee processor if the transfer is permanent) subject to the terms of the transfer agreement. To make an additional change from its processor link (a change that is not by mutual agreement) the permit will need to be used in the non-co-op fishery for the prescribed time.

Temporary Transfer of Quota Shares to CV(SS) and non-CV(SS) Endorsed Permits

Owners of valid limited entry permits that are members of co-ops are permitted to transfer co-op allocation amongst members of other co-ops or their own co-op. Such inter- or intra co-op transfers must deliver co-op allocation (shares) to the shoreside processor to which the shares are obligated unless released by mutual agreement. Co-op shares may be harvested by any catcher vessel holding a valid trawl limited entry permit (including one that does not have a CV(SS) endorsement, provided it has become a member of a co-op and has acquired the right to harvest co-op shares via lease or other contract with a CV(SS)co-op member.). Whiting co-op shares are not permanently separable from the CV(SS) endorsement. Transfers of co-op shares from the shoreside sector to other sectors in any form are prohibited.

CV(SS) Permit Combination to Achieve a Larger Size Endorsement

In general, when a CV(SS) endorsed permit is combined with another permit, the resulting permit will be CV(SS) endorsed, except when the CV(SS) permit is combined with a CP permit. Specifically, a CV(SS) endorsed permit that is combined with a limited entry trawl permit that is not CV(SS) endorsed or one that is CV(MS) endorsed will be reissued with the CV(SS) endorsement. If the other permit is CV(MS) endorsed, the CV(MS) endorsement will also be maintained on the resulting permit. However, CV(SS) and CV(MS) histories will be maintained separately on the resulting permit and be specific to participation in the sectors for which the histories were originally determined. If a CV(SS) permit is combined with a CP permit, the CV(SS) endorsement and history will not be reissued on the combined permit. The size endorsement resulting from permit combinations will be determined based on the existing permit combination formula.

Accumulation Limits

CV(SS) Permit Ownership: No individual or entity may own CV(SS) permits for which the allocation totals greater than 15% of the total whiting shoreside allocation.

SSP Permit Transfer.

If a shoreside processor transfers its SSP permit to a different shoreside processor or different owner, the CV(SS) permit's obligation remains in place unless changed by mutual agreement or participation in the non-co-op fishery. (Since SSP permits are only in effect for the first two years of the program, this section is also in effect only for the first two years of the program.)

Shoreside Processor Withdrawal.

If a qualified shoreside processor does not participate in the whiting fishery in any year in which the co-op fishery is in operation, the CV(SS) permit holders that will otherwise be obligated to deliver to that shoreside processor shall be free to deliver to any other shoreside processor that year.

Co-ops for Catcher-Processors

Catch by the catcher-processor sector will be controlled primarily by closing the fishery when a constraining allocation is reached. As under status quo, vessels may form co-ops to achieve benefits that result from a slower paced more controlled harvest. The main change from status quo is the creation of a limited number of catcher-processor endorsements. A new entrant will have to acquire a permit with a catcher processor endorsement in order to enter the fishery.

Catcher-Processor (CP) Endorsement. The class of CP endorsed permits (CP permits) will be limited by an endorsement placed on a limited entry permit. Limited entry permits registered to qualified catcher-processor vessels will be endorsed as CP permits. A qualified permit is one that harvested and processed in the catcher-processor sector of the Pacific whiting fishery sometime from 1997 through 2004. Only vessels catcher-processor vessels with a CP endorsed limited entry permit will be allowed to process whiting at-sea. Limited entry permits with CP endorsements will continue to be transferable.

CP Permit Combination to Achieve a Larger Size Endorsement. A CP permit that is combined with a limited entry trawl permit that is not CP endorsed will result in a single CP permit with a larger size endorsement (a CV(MS) or CV(SS) endorsement on one of the permits being combined will not be reissued on the resulting permit). The resulting size endorsement will be determined based on the existing permit combination formula.

Co-op Formation. As under status quo, co-op(s) will be formed among holders of permits for catcher-processors. Participation in the co-op will be at the discretion of those permit holders. If eligible participants choose to form a co-op, the catcher-processor sector will be managed as a private voluntary cooperative and governed by a private contract that specifies, *inter alia*, allocation of whiting among CP permits, catch/bycatch management, and enforcement and compliance provisions. Since NMFS will not establish an allocation of catch or catch history among permits, if any permit holder decides not to participate, the potential co-op benefits will diminish and a race for fish is likely to ensue. Similarly, if more than one co-op forms, a race for fish could likely ensue, absent an inter co-op agreement.

Annual Registration. No annual registrations or declarations are required.

Co-op Allocation. There will be no government directed subdivision of the catcher-processor sector quota among participants. The catcher-processor sector allocation may be divided among eligible catcher-processor vessels (i.e., those catcher-processor vessels for which a CP permit is held) according to an agreed catcher-processor cooperative harvest schedule as specified by private contract.

Annual Reporting Requirements: The CP cooperative will submit an annual report to the Pacific Fishery Management Council at their November meeting. The report will contain information about the current year's CP fishery, including the CP sector's annual allocation of Pacific whiting; the CP cooperative's actual retained and discarded catch of Pacific whiting, salmon, rockfish, groundfish, and other species on a vessel-by-vessel basis; a description of the method used by the CP cooperative to monitor performance of cooperative vessels that participated in the CP sector of the fishery; and a description of any actions taken by the CP cooperative in response to any vessels that exceed their allowed catch and bycatch. The report will also identify plans for the

IFQ = Individual Fishing Quota, in general (encompasses both QS and QP)
QS = Quota Shares (issued at the start of the program)
QP = Quota Pounds (issued each year based on quota shares held)

next year's CP fishery, including the companies participating in the cooperative, the harvest agreement, and catch monitoring and reporting requirements.

RESTATEMENT OF MOTHERSHIP AND SHORESIDE CO-OP ALTERNATIVES

Over the summer, Council staff worked with NMFS staff and NOAA General Counsel to review the alternatives and identify areas needing clarification. During that process, issues arose regarding completeness of some aspects of the co-op alternatives (e.g. explicit identification of provisions pertaining to co-ops joining together to for inter-co-ops) and the need to identify those elements that would require Council/NMFS action as distinct from those that the industry would undertake independently. For discussion purposes, a reorganization of the alternatives has been developed. The reorganization contains sections addressing each of the following central questions.

1. Who can participate in the co-op fishery and who can participate in the non-co-op fishery?
2. What licenses would be issued and what are their characteristics?
3. How would co-ops form?
4. How would processor ties be established and maintained?
5. What would be the NMFS Role and how would the fishery be managed?

Additionally, for the mothership program this document contains a list of potential required elements to co-op agreements, as suggested by an industry representative (B-1.3.3.e and f). For Council consideration, a parallel section has been added to the shoreside co-op alternative (B-2.3.3.e and f).

NOTE: These programs do not reflect the most recent recommendations made by the Groundfish Allocation Committee or the Ad Hoc Groundfish Trawl Individual Quota Committee at their fall meetings.

WHITING MOTHERSHIP SECTOR CO-OP PROGRAM

Overview: Qualified permits will be endorsed for MS co-op participation. Each year the holders of those permits will choose whether their vessels will fish in the co-op fishery, in which individual co-ops will direct harvest, or fish in a non-co-op fishery that will be managed by NMFS as an Olympic style fishery. The co-op will be obligated to deliver its fish to specific mothership processors based on the obligations of each permit in the co-op. Limited entry permits will be issued for motherships and required for a mothership to receive whiting from catcher vessels.

B-1.1 Participation in the Mothership Sector

a. Catcher Vessels: Vessels with CV(MS) endorsed permits may participate in either the co-op or non-co-op portion of the mothership fishery. They will choose annually which fishery they will participate in for the coming year. Additionally, any groundfish limited entry trawl permitted vessels may participate in the co-op portion of the fishery if they join a co-op (as described in Section B-1.3.3).[1] No other catcher vessels may participate in the mothership fishery.

b. Processors. Only motherships with a mothership limited entry permit may receive deliveries from catcher vessels participating in the co-op or non-co-op portions of the mothership sector whiting fishery. (Note: Motherships may acquire such permits by transfer, see Section B-1.2.2.)

c. Vessels Excluded:

- ~~A vessel that has been under foreign registry after the date of the AFA and that has participated in fisheries in the territorial waters or exclusive economic zones of other countries will not be eligible to participate as a mothership in the mothership sector of the Pacific whiting fishery. [Confirm language in previous sentence. Need rationale]~~
- A vessel may not harvest whiting and operate as a mothership in the same year.

B-1.2 Permits/Endorsement Qualification and Characteristics

B-1.2.1 Catcher Vessel Mothership Whiting Endorsement (CV(MS) Whiting Endorsement)

a. Endorsement Qualification and History Assignment

Permits with a qualifying history will be designated as CV(MS) permits through the addition of an endorsement to their limited entry groundfish permit. At the time of endorsement qualification, each permit will also be assigned a catch history that will determine the share of the mothership whiting allocation associated with that permit.

Qualifying for a CV(MS) Whiting Endorsement. A limited entry permit will qualify for a CV(MS) whiting endorsement if it has a total of more than 500 mt of whiting deliveries to motherships from

Qualification Option 1: 1998 through 2004
Qualification Option 2: 1994 through 2003

Catch History Assignment (Identification of Endorsement Related Catch History) The following are options for the initial calculation to be used in determining NMFS distribution to co-op and non-co-op fishery pools. A CV(MS) whiting endorsement calculated catch history will be based on whiting history during the related permit's

[1] When such permits participate in a co-op the co-op will not be allocated any additional fish based on participation by such a vessel.

Allocation Option 1: best 6 out of 7 years from 1998 through 2004
Allocation Option 2: best 9 out of 11 years from 1994 through 2004
Allocation Option 3: best 5 out of 6 years from 1998 through 2003
Allocation Option 4: best 8 out of 10 years from 1994 through 2003

For the purpose of the endorsement and initial calculation, catch history associated with the permit includes that of permits that were combined to generate the current permit.

b. Whiting Endorsement Transferability and Endorsement Severability

Transfer Option 1: The CV(MS) whiting endorsement (together with the associated catch history) may not be severed from the groundfish limited entry trawl permit.

Transfer Option 2: The CV(MS) whiting endorsement (together with the associated catch history) may be severed from the groundfish limited entry trawl permit and transferred to a different limited entry trawl permit. Catch history associated with the whiting endorsement may not be subdivided.

d. Accumulation Limit

CV(MS) Permit Ownership: No individual or entity may own CV(MS) permits for which the allocation totals greater than 10%, 15%, or 25% of the total mothership sector whiting allocation.

e. Combination

CV(MS) Permit Combination to Achieve a Larger Size Endorsement. When a CV(MS) endorsed permit is combined with another permit, the resulting permit will be CV(MS) endorsed, except when the CV(MS) permit is combined with a CP permit in which case the CV(MS) endorsement will not survive on the resulting permit.[2]

B-1.2.2 Mothership Processor Permit

a. Qualifying Entities

The vessel owners of qualifying motherships will be issued MS permits. In the case of bareboat charters, the charterer of the bareboat will be issued the permit.

b. Qualification Requirements

A qualifying mothership is one which processed at least 1,000 mt of whiting in each of any two years from 1998 through 2004.

c. Transferability

(1) MS permits will be transferable and
(2) MS permits may be transferred to a vessel of any size (there will be no size endorsements associated with the permit.)
(3) MS permits may not be transferred to a vessel engaged in the harvest of whiting in the year of the transfer.
(4) MS permits may only be used for processing by one vessel per year.

d. Usage Limit

No individual or entity owning a MS permit(s) may process more than . . . **Option 1** 20%, **Option 2,** 30% or **Option 3** 50% **. . .** of the total mothership sector whiting allocation.

[2] Specifically, a CV(MS) endorsed permit that is combined with a limited entry trawl permit that is not CV(MS) endorsed or one that is CV(Shoreside) [CV(SS)] endorsed will be reissued with the CV(MS) endorsement. If the other permit is CV(SS) endorsed, the CV(SS) endorsement will also be maintained on the resulting permit. However, CV(MS) and CV(SS) catch histories will be maintained separately on the resulting permit and be specific to participation in the sectors for which the catch histories were originally determined. If a CV(MS) permit is combined with a CP permit, the CV(MS) endorsement and history will not be reissued on the combined permit. The size endorsement resulting from permit combinations will be determined based on the existing permit combination formula.

B-1.3 Co-op Formation and Operation Rules.

B-1.3.1 Who and Number of Co-ops

Co-ops will be formed among CV(MS) permit owners.

Co-op Formation Option 1 (Multiple Co-ops): Multiple co-ops would be organized around motherships. Permit owners choosing to participate in the co-op fishery must form a separate co-op based on the mothership where the CV(MS) permit holders delivered the majority of their most recent years' catch.

Co-op Formation Option 2: Multiple co-ops are not required. Catcher vessels may organize a single co-op or multiple co-ops but are obligated to deliver to the processors as proscribed in B-1.4.

B-1.3.2 When

Each year at a date certain prior to the start of the fishery, MS and CV(MS) permit holders planning to participate in the mothership sector must register with NMFS. At that time CV(MS) permit holders must identify which co-op they will participate in or if they plan to participate in the non-co-op fishery.

B-1.3.3 Co-op Agreement Standards

a. Submission to NMFS

Co-op agreements will be submitted to NMFS for approval.

b. Number of Participants in Each Co-op (Including Inter-co-ops)

Two or more permits may form a co-op but participation must conform to the requirements of Section B-1.3.1. Co-ops may form co-ops with other co-ops.

c. Catch History Distributions Among Permits

Co-op agreements must stipulate that catch allocations to members of the co-op be based on their catch history calculation distribution to the co-op by NMFS.

d. Participation by Non-CV (MS) Endorsed Permits

Through temporary arrangements a co-op allocation may be harvested by any catcher vessel holding a valid limited entry trawl permit which has joined the co-op (including one that does not have a CV(MS) endorsement).[3]

e. Other Required Co-op Agreement Provisions (PROPOSED INSERTION)

1) a list of all vessels and permit holders participating in the coop and their share of allocated catch which must match the amount distributed to individual permit holders by NMFS,
2) signature by all permit holder owners participating in the coop
3) a plan to adequately monitor catch and bycatch,
4) adequate enforcement and penalty provisions to ensure that catch and bycatch overages to not occur,
5) measures designed to reduce bycatch of overfished species
6) obligation to manage inseason transfers of catch history,
7) a requirement that at least a majority of the members are required to dissolve a coop,
8) an obligation to produce an annual report to the Council documenting the coop's catch and bycatch data and inseason transfers,
9) identification of coop manager to serve as the contact person with the agency and Council and other coops and to be responsible for annual distribution of catch and bycatch, oversight of

[3] As a member of the co-op, such a vessel would be subject to paragraph B-1.4 and the indicated processor obligations.

transfers, preparation of annual reports and is authorized to receive or respond to any legal process against the coop.

10) provisions that prohibit coop membership by permit holders that have incurred legal sanctions that prevent it from fishing groundfish in the pacific Fishery region,

f. Additional Provisions for Inter-co-op Agreements (PROPOSED INSERTION)

1) In the case of two or more cooperatives entering into an inter-cooperative agreement , provisions must include a adequate monitoring, enforcement and penalty provisions to ensure that aggregate coop catch and bycatch overages do not occur,
2) Each fishery cooperative must file a signed copy of a cooperative contract with NMFS that is available for public review before it is authorized to engage in fishing activities.
3) Any material changes or amendments to the contract, including change in membership must be filed annually with NMFS by ________.
4) Each coop must prepare and file an annual report with NMFS by ________. The report will document the catch, bycatch and transfer of coop's annual distribution of fish during that year. The annual report will be available to the public.
5) Each coop must file with NMFS a copy of a letter from the coop requesting a business review letter on the fishery cooperative from the Department of Justice and any response to such request.

B-1.3.4 Annual Allocation Transferability

a. The annual allocations received by a co-op based on catch history of the whiting endorsements held by its members may be transferred among co-op members and from one co-op to another so long as obligations to processors are met (as per Section B-1.4). Additionally, in order to transfer annual allocation from one co-op to another there must be a NMFS approved inter-co-op agreement.

b. Allocations may not be transferred from the mothership sector to another sector.

B-1.4 Processor Ties

B-1.4.1 Formation and Modification of Processor Tie Obligations

In the first year of the program, the CV(MS) permit owner's choice will be between delivering in the non-co-op fishery and making co-op deliveries to the licensed mothership to which the permit made a majority of its whiting deliveries in the last calendar year in which it participated. If a mothership does not qualify for an MS permit in the first year of the program, the vessels which delivered to that mothership in the previous year may deliver to the qualified mothership to which it last delivered its majority of catch or participate in the non-co-op fishery.

Thereafter, each year, CV(MS) permit owners choosing to participate in a co-op will deliver to the same mothership that they most recently delivered the majority of their whiting catch. (on a calendar year basis), However, if the CV(MS) permit owners chose to participate in the non-co-op fishery in the previous year, or did not participate in the mothership whiting fishery it is released from its obligation and may deliver to any mothership with an MS permit

Mothership Permit Transfer. If a mothership transfers its MS permit to a different mothership or different owner, the CV(MS) permit obligation remains in place and transfers with the MS permit to the replacement mothership unless the obligation is changed by mutual agreement or participation in the non-co-op fishery.

B-1.4.2 Flexibility in Meeting Processor Tie Obligations

a. Temporary Transfer of the Annual Allocation Within the Co-op or From One Co-op To Another

When CV(MS) permit owners transfer co-op allocations from one co-op member to another within the co-op or from one co-op to another within an inter-co-op, such transfers must deliver co-op shares to the mothership to which the allocation is obligated, unless released by mutual agreement.

b. Mutual Agreement Exception.

By mutual agreement of the CV(MS) permit owner and mothership to which the permit is obligated, and on a year-to-year basis, a permit may deliver to a licensed mothership other than that to which it is obligated. Such an agreement will not change the permit's future year obligation to the mothership (i.e., the permit will still need to participate in the non-co-op fishery for one year in order to move from one mothership to another).

B-1.4.3 Mothership Processor Withdrawal

Mothership Withdrawal. If a mothership does not participate in the fishery and does not transfer its permit to another mothership or mutually agree to transfer delivery to another mothership, the CV(MS) permit holders obligated to that mothership may participate in the non-co-op fishery.

B-1.5 NMFS Role

B-1.5.1 Permit and Endorsement Issuance

NMFS will issue all necessary permits and endorsements under the rules specified under this program. Appeals processes will be provided as appropriate and necessary.

B-1.5.2 Fishery Registration and Co-op Approval

NMSF will announce a deadline before which all co-op agreements must be received for the coming year. NMFS will review and approve or reject co-op agreements based on standards provided here and other standards which it deems necessary to achieve the policy intent of the Council's actions.

B-1.5.3 Annual Allocation to Co-ops and the Non-co-op Fishery

a. Co-op Allocation. Each year NMFS will determine the percent of the mothership sector's harvest allocation to be given to each co-op based on the catch history calculation of CV(MS) permits registered to participate in the co-op that year. NMFS does not allocate to the individual permit holder, rather, allocates an aggregate amount of harvest tonnage annually to the co-op, based on the catch histories associated with the members of the co-ops.

b. Non-co-op Allocation. Each year NMFS will determine the distribution to be given to the non-co-op fishery based on the catch history calculation of permit holders registered to participate in that fishery.

B-1.5.4 Fishery Management and Co-op Monitoring

a. NMFS will track all permit and endorsement transfers (if endorsement transfers are allowed) and the invocation of mutual agreement exceptions. Permit and endorsement transfers will not be valid until registered and acknowledged by NMFS.

b. NMFS will monitor catch and close segments of the fishery as necessary to ensure catch limits are not exceeded for:

1. the whiting mothership co-op fishery
2. the whiting mothership non-co-op fishery
3. the mothership whiting sector as a whole

c. NMFS will not necessarily monitor but will investigate and enforce as it deems necessary the permit and co-op obligations to processors

d. NMFS will not necessarily monitor or enforce (except as it deems necessary)

1. an individual permit's progress towards its catch allocations (permit level catch control will be at the co-op level and enforced through execution of the private contract)
2. a co-op's progress toward its catch allocation[4]
3. actual performance on the co-op agreement (the parties to the contract will resolve through private contract and remedies any deviation from provisions such as "the golden rule.")

e. NMFS will monitor other program provisions as needed. For example, ensuring that a vessel operating as a mothership does not also harvest whiting in the same year.

[4] This assumes that there is an inter-co-op agreement in place that covers the entire co-op fishery. If such an agreement is not in place covering both catch and bycatch, NMFS may need to monitor catch by each individual co-op (but not by the individual vessels in the co-op).

WHITING SHORESIDE SECTOR CO-OP PROGRAM

Overview: Qualified permits will be endorsed for shoreside co-op participation. Each year the holders of those permits will choose whether their vessels will fish in the co-op fishery, in which individual co-ops will direct harvest, or fish in a non-co-op fishery that will be managed by NMFS as an Olympic style fishery. The co-op will be obligated to deliver it's fish to specific processors based on the obligations of each permit in the co-op. For the first two years, only certain qualified processors will be eligible to receive deliveries from co-op vessels. Over time, these obligations may change or end (depending on options selected).

B-2.1 Participation in the Shoreside Whiting Sector

a. **Catcher Vessels:** Vessels with CV(SS) endorsed permits may participate in either the co-op or non-co-op portion of the shoreside fishery. They will choose annually which portion of the fishery they will participate in for the coming year. Additionally, any groundfish limited entry trawl permitted vessels may participate in the co-op portion of the fishery if they join a co-op (as described in Section B-2.3.3).[5] No other catcher vessels may participate in the shoreside whiting sector.

b. **Processors.** Any processor may receive fish from vessels participating in the shoreside non-co-op fishery. In the first two years, only co-op qualified shoreside processors[6] that have declared their intent to participate [7] may receive deliveries from catcher vessels in a shoreside co-op (Section B-2.3). Thereafter any shoreside processor may receive deliveries from co-ops.

c. **Catcher Vessels and Processors in the Nonwhiting Fishery.** This program does not affect vessels or processors receiving whiting taken incidentally in the nonwhiting fishery.

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[5] When such permits participate in a co-op the co-op will not be allocated any additional fish based on participation by such a vessel.

[6] **A shoreside processor** is an operation, working on US soil, that takes landings of trawl-caught groundfish that has not been processed at-sea or previously processed shoreside; and that thereafter subjects those groundfish to shoreside processing. Entities that received fish that have not undergone at-sea processing or shoreside processing (as defined in this paragraph) and sell that fish directly to consumers shall not be considered a processor for purposes of the shoreside co-op program.

"Shoreside Processing" is defined as any activity that takes place shoreside; and that involves:

a) cutting groundfish into smaller portions; OR
b) freezing, cooking, smoking, drying groundfish; OR
c) packaging that groundfish for resale into 100 pound units or smaller for sale or distribution into a wholesale or retail market.

[7] **A shoreside processor** is an operation, working on US soil, that takes landings of trawl-caught groundfish that has not been processed at-sea or previously processed shoreside; and that thereafter subjects those groundfish to shoreside processing. Entities that received fish that have not undergone at-sea processing or shoreside processing (as defined in this paragraph) and sell that fish directly to consumers shall not be considered a processor for purposes of the shoreside co-op program.

"Shoreside Processing" is defined as any activity that takes place shoreside; and that involves:

a) cutting groundfish into smaller portions; OR
b) freezing, cooking, smoking, drying groundfish; OR
c) packaging that groundfish for resale into 100 pound units or smaller for sale or distribution into a wholesale or retail market.

B-2.2. Permits/Endorsement Qualification and Characteristics

B-2.2.1 Catcher Vessel Shoreside Whiting Endorsement (CV(SS) Endorsement)

a. Endorsement Qualification and History Assignment

Permits with a qualifying history will be designated as CV(SS) permits through the addition of a CV(SS) endorsement to their limited entry groundfish permit. At the time of endorsement qualification, each permit will also be assigned a catch history that will determine the share of the shoreside whiting allocation associated with that permit.

Qualifying for a CV(SS) Endorsement. A limited entry permit will qualify for a CV(SS) endorsement if it has a total of more than 500 mt of whiting deliveries to shoreside processors from:

Qualification Option 1: 1998 through 2004
Qualification Option 2: 1998 through 2003
Qualification Option 3: 1994 through 2004
Qualification Option 4: 1994 through 2003
Qualification Option 5: 2001 through 2003

Catch History Assignment. Initial calculation to be used in determining NMFS distribution to co-op and non-co-op fishery pools. A CV(SS) permit calculated landings history will be based on whiting history during the related permit's

Allocation Option 1: best 6 out of 7 years from 1998 through 2004
Allocation Option 2: best 9 out of 11 years from 1994 through 2004
Allocation Option 3: best 5 out of 6 years from 1998 through 2003
Allocation Option 4: best **9?** out of 10 years from 1994 through 2003

For the purpose of the endorsement and initial calculation, landing history associated with the permit includes that of permits that were combined to generate the current permit.

c. Transferability and Endorsement Severability

Transfer Option 1: The CV(SS) Endorsement(together with the associated catch history) may not be severed from the groundfish limited entry trawl permit.

Transfer Option 2: The CV(SS) Endorsement (together with the associated catch history)may be severed from the groundfish limited entry trawl permit and transferred to a different limited entry trawl permit. Catch history associated with the whiting endorsement may not be subdivided.

Whiting harvest history (i.e. co-op shares) are not permanently separable from the CV(SS) endorsement.

d. Accumulation Limits

CV(SS) Permit Ownership: No individual or entity may own CV(SS) permits for which the allocation totals greater than 15% of the total whiting shoreside allocation.

e. Combination

CV(SS) Permit Combination to Achieve a Larger Size Endorsement

When a CV(SS) endorsed permit is combined with another permit, the resulting permit will be CV(SS) endorsed, except when the CV(SS) permit is combined with a CP permit, in which case the CV(SS) endorsement will not survive on the resulting permit.[8]

[8] Specifically, a CV(SS) endorsed permit that is combined with a limited entry trawl permit that is not CV(SS) endorsed or one that is CV(MS) endorsed will be reissued with the CV(SS) endorsement. If the other permit is CV(MS) endorsed, the CV(MS) endorsement will also be maintained on the resulting permit. However, CV(SS) and CV(MS) histories will be maintained separately on the resulting permit and be specific to participation in the sectors for which the histories were originally determined. If a CV(SS) permit is combined with a CP permit, the CV(SS)

B-2.2.2 Shoreside Co-op Eligible Processor Permit

a. Activities Requiring this Permit

Only processing entities with a shoreside co-op processor permit (SSP) are eligible to receive whiting fish from whiting cooperatives in the first two years of the program. Thereafter, any processing corporation could be eligible to receive whiting from participants in a whiting cooperative, subject to the other provisions of this plan. Processors without SSPs may receive whiting from participants in the non-co-op fishery and whiting harvested incidentally in the nonwhiting fishery at any time, including within the first two years of the program.

b. Qualification Requirements

An initial co-op qualified shoreside processing entity is one that processed at least 1,000 mt of whiting in each of any two years from 1998 through 2004.

c. Transferability

SSP permits will be transferable. If a shoreside processor transfers its SSP permit to a different shoreside processor or different owner, the CV(SS) permit's obligation remains in place unless changed by mutual agreement (as per Section 2.4.3.b) or participation in the non-co-op fishery, (as per Section 2.4.2).

d. Since SSP permits are only in effect for the first two years of the program, this section is also in effect only for the first two years of the program.

B-2.3. Co-op Formation and Operation Rules

B-2.3.1 Who

Co-ops will be formed among CV(SS) permit owners. Multiple co-ops may be formed and new co-ops may be formed each year, prior to annual registration. Owners of LE trawl permits that are not CV(SS) endorsed may join a co-op but their participation in the co-op will not add to the co-op's allocation. Vessels fishing in the non-co-op fishery may not form co-ops to coordinate harvest in the non-co-op fishery. [9]

B-2.3.2 When

Each year CV(SS) permit holders planning to participate in the shoreside sector must register with NMFS and express their intent to be a member of the co-op at a date certain prior to the start of the fishery. At that time CV(SS) permit holders must identify which co-op they will participate in or if they plan to participate in the non-co-op fishery..

B-2.3.3 Co-op Agreement: Standards and Permissible Provisions

a. Co-op agreements will be submitted to NMFS for approval.

b. Number of Participants

Two or more CV(SS) permit owners may form a co-op for harvesters. Co-ops may also form co-ops with other co-ops.

c. Golden Rule

Co-op agreements must distribute catch allocations to members based on the permit specific history calculation that NMFS used to distribute allocation to the co-op.

d. Participation by Non-CV(SS) Endorsed Permits

Through temporary arrangements co-op shares may be harvested by any catcher vessel holding a valid trawl limited entry permit (including one that does not have a CV(SS) endorsement,

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endorsement and history will not be reissued on the combined permit. The size endorsement resulting from permit combinations will be determined based on the existing permit combination formula.

[9] This provision does not cover cooperative behavior that is not governed by formally memorialized covenants (written contracts).

provided it has become a member of a co-op and has acquired the right to harvest co-op shares via lease or other contract with a CV(SS)co-op member.).[10]

e. Other Required Co-op Agreement Provisions (PROPOSED INSERTION)

11) a list of all vessels and permit holders participating in the coop and their share of allocated catch which must match the amount distributed to individual permit holders by NMFS,
12) signature by all permit holder owners participating in the coop
13) a plan to adequately monitor catch and bycatch,
14) adequate enforcement and penalty provisions to ensure that catch and bycatch overages to not occur,
15) measures designed to reduce bycatch of overfished species
16) obligation to manage inseason transfers of catch history,
17) a requirement that at least a majority of the members are required to dissolve a coop,
18) an obligation to produce an annual report to the Council documenting the coop's catch and bycatch data and inseason transfers,
19) identification of coop manager to serve as the contact person with the agency and Council and other coops and to be responsible for annual distribution of catch and bycatch, oversight of transfers, preparation of annual reports and is authorized to receive or respond to any legal process against the coop.
20) provisions that prohibit coop membership by permit holders that have incurred legal sanctions that prevent it from fishing groundfish in the pacific Fishery region,

f. Additional Provisions for Inter-co-op Agreements (PROPOSED INSERTION)

6) In the case of two or more cooperatives entering into an inter-cooperative agreement , provisions must include a adequate monitoring, enforcement and penalty provisions to ensure that aggregate coop catch and bycatch overages do not occur,
7) Each fishery cooperative must file a signed copy of a cooperative contract with NMFS that is available for public review before it is authorized to engage in fishing activities.
8) Any material changes or amendments to the contract, including change in membership must be filed annually with NMFS by ________.
9) Each coop must prepare and file an annual report with NMFS by ________. The report will document the catch, bycatch and transfer of coop's annual distribution of fish during that year. The annual report will be available to the public.
10) Each coop must file with NMFS a copy of a letter from the coop requesting a business review letter on the fishery cooperative from the Department of Justice and any response to such request.

B-2.3.4 Annual Allocation Transferability

a. Temporary Transfer of Quota Shares Within the Co-op

Temporary transfers of harvest allocation may take place within the co-op between permit holders..[11] Temporary transfers may also be made from one co-op to another so long as both co-ops are part of an inter-co-op agreement. Such inter- or intra-co-op transfers must deliver co-op allocation (shares) to the shoreside processor to which the shares are obligated unless released by mutual agreement. (See Section B-2.4)

b. Transfer of shares from the shoreside sector to other sectors in any form are prohibited.

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[10] As a member of the co-op, such a vessel would be subject to paragraph B-2.4 and the indicated processor obligations.

[11] Such transfers may be used to allow a permit holder to make deliveries exclusively to one processor.

B-2.4. Processor Ties

B-2.4.1 Initial Formation of Ties

During the first two years of co-op formation, permit owners that join a co-op shall be required to deliver their whiting catches to the co-op qualified processors that were the basis of their landing history during the period . . . **Years Option 1**, **2001; Years Option 2**, **2000; Years Option 3**, **2000-2003** . .. .on a pro rata basis. Determination of the processor(s) to which a permit owner is obligated will take into account any of the processor's(s') successors in interest.

Processor Successor In Interest. In determining the processor to whom a permit owner that participates in a co-op is required to deliver in the first two years of the program, a processor's successor in interest will be taken into account. If a processor's assets were purchased and the landing history expressly identified as an asset in the purchase agreement, then any permit owner obligation based on those landings will accrue to the processor making the purchase. For landings history associated with a defunct or non-qualifying processor, that portion of a permit's allocation will be linked to the permit's initially assigned landing history on a pro-rata basis.

B-2.4.2 Duration and Modification of Processor Ties (Options 1 and 2)

A permit's obligation to a processor will remain in place from one year to the next unless modified through the following process.

Option 1: Once a CV(SS) permit has participated in the non-co-op fishery for ***[Options: 1 to 5 consecutive years]***, it is released from its delivery obligations to the processor(s) that were the basis of its history, and may join any of the various co-ops, or join with other permit holders who have also been released from delivery obligations to form a new co-op, and deliver to any shoreside processor in the subsequent years after the SSPs have expired.

Option 2: Any CV(SS) permit participating in a co-op is linked indefinitely to the processor they are delivering to under the initial linkage requirements. The permit can sever that linkage by participating in the non-co-op fishery for a period of ***[Options: 1 to 5 years]*** years. After completing their non-co-op obligation, the permit is then free to reenter the co-op system and deliver to a processor of their choosing. Once the permit reenters the co-op system and elects to deliver their fish to a processor, a new linkage is then established with that processor. Should the permit later choose to break that new linkage, the non-co-op participation requirements again apply.

Should a permit elect to enter the non-co-op fishery within the first two years of this program, that permit must participate in the non-co-op fishery for a minimum of ***[Options: 2 to 5 years]***, regardless of other non-co-op participation requirements applying elsewhere in this document. Once the permit meets that obligation and later elects to enter a co-op, all provisions of co-op participation, including the processor linkage provisions, apply.

B-2.4.3 Flexibility in Meeting Processor Tie Obligations

a. Temporary Transfer of the Annual Allocation Within the Co-op or From One Co-op To Another

When a co-op or inter-co-op transfers catch among its members it must ensure that the total co-op allocation received by the co-op, based on the permit holders that are members thereof, is distributed between the various co-op qualified processors on a pro rata basis based on the landing history of the members of the co-op during the initial formation period specified in Section B-2.4.1 or the ties established through subsequent obligations, as per Section B-2.4.2.

b. Mutual Agreement Exception

By mutual agreement of the CV(SS) permit owner and shoreside processor to which the permit's catch is obligated, the vessel with the CV(SS) endorsed permit may deliver to a shoreside processor other than that to which it is obligated. The transfer may be temporary or permanent. In either case the vessel's catch taken under that permit will continue to be obligated to the same processor (which, in future years, is the transfering processor if the transfer is temporary or the processor receiving the transfer if the transfer is permanent) subject to the terms of the transfer agreement. To make an additional change from its processor link (a change that is not by mutual agreement) the permit will need to be used in the non-co-op fishery for the prescribed time (as per Section B-2.4.2).

B-2.4.4 Shoreside Processor Annual Declaration and Withdrawal

a. Each year SSP permit holders planning to participate in the shoreside sector must register with NMFS.

b. If a qualified shoreside processor does not participate in the whiting fishery in any year in which the co-op fishery is in operation, the CV(SS) permit holders that will otherwise be obligated to deliver to that shoreside processor shall be free to deliver to any other shoreside processor that year.

B-2.5. NMFS Role

B.2.5.1 Permit and Endorsement Issuance

NMFS will issue all necessary permits and endorsements under the rules specified under this program. Appeals processes will be provided as appropriate and necessary.

B-2.5.2 Fishery Registration and Co-op Approval

a. NMFS will announce a date certain before which all co-op agreements must be received for the coming year. NMFS will review and approve or reject co-op agreements based on standards provided here and other standards which it deems necessary to achieve the policy intent of the Council's actions.

b. For the first two years of the program NMFS will announce a date certain before which processors with SSPs must declare their intent to participate in the fishery.

B-2.5.3 Annual Allocation

a. Co-op Allocation

Each year NMFS will determine the distribution to be given to each co-op based on the landing history calculation of CV(SS) permits registered to participate in the co-op that year. In addition, NMFS will determine the landing history linking each co-op to each processor, if any.

b. Non-co-op Allocation

Each year NMFS will determine the distribution to be given to the non-co-op fishery based on the landing history calculation of permit holders registered to participate in that fishery. The whiting allocation for the non-co-op segment shall be in proportion to the permit history of non-co-op participants, relative to the co-op participants. That allocation shall be available to all CV(SS) endorsed permit holders who have registered to participate in the non-co-op fishery that year.

B-2.5.4 Fishery and Co-op Monitoring

a. NMFS will track all permit and endorsement transfers (if endorsement transfers are allowed) and the invocation of mutual agreement exceptions. Permit and endorsement transfers will not be valid until registered and acknowledged by NMFS.

b. NMFS will monitor catch and close segments of the fishery as necessary to ensure catch limits are not exceeded for:

    1. individual co-ops[12]
    2. the whiting shoreside co-op fishery
    3. the whiting shoreside non-co-op fishery
    4. the shoreside whiting sector as a whole

c. NMFS will not necessarily monitor but will investigate and enforce as it deems necessary the permit and co-op obligations to processors.

d. NMFS will not necessarily monitor or enforce (except as it deems necessary)

    1. an individual permit's progress towards its catch allocations (permit level catch control will be at the co-op level and enforced through execution of the private contract)
    2. actual performance on the co-op agreement (the parties to the contract will resolve through private contract and remedies any deviation from provisions such as "the golden rule.")

e. NMFS will monitor other program provisions as needed.

[12] If a co-op of co-ops (inter-co-op) is formed NMFS will only monitor catch at the highest co-op level that meets the co-op agreement standards. If an inter-co-op covers the entire shoreside sector's whiting harvest then NMFS will monitor the sector as a whole.

APPROACH AND METHODS FOR ANALYSIS

This document includes selected text from draft sections of the trawl rationalization EIS that describe the approach and analytical tools that will be used in assessing the impacts of rationalizing the West Coast trawl fishery. In this document we describe the analytical framework, which includes a description of an additive approach for estimating cumulative effects, the timeline that is assumed for the process and implementation of a trawl IQ program, and the analytical scenarios that are used to determine impacts of rationalizing the West Coast trawl fishery.

The analytical scenarios will serve as the basis for determining the effect of a rationalization program as a whole, and as such, members of the Council family are encouraged to pay particular attention to this section. These scenarios are intended to illustrate the effect of key decision points and trade-offs that exist in the suite of alternatives and to illustrate a more programmatic-level effect of rationalization. In other words, the perspective taken in constructing the analytical scenarios is to create a handful of example rationalization programs. These example rationalization programs concentrate on the key decision points and the elements of the program that are under consideration which can have a “big picture” impact on the affected environment. Individuals are encouraged to consider whether there are other elements that exist within the alternatives that should be considered “key elements” or that otherwise may have a “big picture” impact that are not included within the analytical scenarios.

Following the section describing the analytical framework is a section describing the principal models and methods that are being developed and that will be used to illustrate the impact of rationalization. This section describes assessment tools that are generally predictive in nature. Aspects of the alternatives that do not principally rely on a predictive assessment tool or are still undergoing research (such as program costs) are not included here. The Council family is encouraged to review these models and their outputs and consider whether there are other aspects of the program that deserve more focus and should be assessed by the construction of an assessment tool. In particular, individuals are encouraged to consider whether there are additional factors that should be measured, and tools that should be developed, that would facilitate a more informed decision on the part of the Council.

4.1 Analytical Framework

4.1.1 Additive Model for Analyzing Effects, Including Cumulative Effects

CEQ regulations at 40 CFR 1508.25 identify three types of impacts that must be considered in an environmental impact statement: direct, indirect, and cumulative effects. Direct and indirect effects are causally related to the proposed action: they are directly related to the action (occurring at the same time and place) or are indirect in that there is some intermediate cause-and-effect between the proposed action and the actual effect being evaluated in the analysis (occurring at a distance in time and/or place). The regulations also define a cumulative impact as “the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions.” Although the regulations and guidance identify cumulative effects as a separate, third class of impacts, all effects can be viewed as cumulative to the extent they are part of some causal chain that results in an ultimate effect on an environmental component. Using this concept of cumulative effects, this EIS frames the analysis in terms of an additive model. To arrive at the final, cumulative effect on an environmental component, the effects in a causal chain are traced out and measured qualitatively or quantitatively, in terms of the metrics that have been identified in this EIS. The components in this additive model include baseline conditions, reasonably foreseeable future actions, the effect of the proposed action, and any mitigation that is proposed separately from the alternatives. Baseline conditions describe the past and present status of environmental components as well as the future status of those environmental components under status quo regulations; reasonably foreseeable future actions are actions that are anticipated to occur in the future and generally include proposals that are in the planning and development stage; the effect of the alternatives is the predicted impact of the alternatives being considered; and mitigation includes proposals that are separate from the alternatives that are designed to mitigate the effects of the alternatives.

Table 1 Components included within the Additive Model for Determining Cumulative Effects

Components of Additive Model	Description
Baseline Conditions	The past and present status of environmental components and the future status of those components under status quo management measures
Reasonably Foreseeable Future Actions	Actions that are anticipated to occur in the future and generally include proposals that are in the planning and development stage
Effect of the Alternatives	The predicted impact of the alternatives being considered
Mitigation	Proposals separate from the alternatives that are designed to mitigate the effects of the alternatives. These are added to – or subtracted from – the baseline to arrive at the cumulative effect

Based on this evaluation a determination of whether the proposed action will result in significant impacts to the human environment will be made by the responsible program manager (Regional Administrator, NWR) and described in the record of decision (ROD), based on the information provided in this EIS. To determine the potential for significant effects, the impacts described in this EIS may be compared to a threshold, if one exists in Federal, State, or local law (1508.27(b)(10)); or in land use plans, policies or controls for the area (1502.16(c)); or can be defined in terms of an inconsistency with such laws, policies or plans (1506.2(d)). If no such threshold can be identified, then the alternatives are evaluated comparatively to identify which one has the least effect, in terms of the metric concerned. (Although this is an additive model, it should be noted that component effects can be "subtractive" to the degree that they are in fact mitigative; conceptually this can be likened to adding a negative number.)

This additive model is applied within the framework of the EIS by describing in Chapter 3 actions other than those of the alternatives under consideration and their effects; this serves as the description of the "affected environment." The affected environment is thus a summary of current conditions, which results from the interaction between past and present actions and underlying natural phenomena, and is described in terms of the same metrics used in Chapter 4.

In addition, Chapter 4.1.3 catalogues those factors likely to alter the condition of evaluated environmental components in the future—reasonably foreseeable future actions—in terms of the metrics. This projects the affected environment, or environmental baseline, forward in time by considering the interaction of these foreseeable actions with the natural phenomena.

Chapter 4 evaluates the impacts of the alternatives. This includes a description of how these alternatives affect the evaluated environmental components, in terms of the metrics, and a summation of these effects in combination with projected environmental conditions; this represents the cumulative impact assessment. The alternatives are also compared to the no action alternative, which represents baseline conditions if the current management program remains in place. The following sections describe the components of the additive model that are not discussed in chapter 3. These components include the baseline conditions, reasonably foreseeable future actions, and the effect of the alternatives. Also discussed is the analytical timeline which shows the assumed timeline for various aspects of groundfish fishery management and policy implementation from the present date through 2016.

4.1.1.1 Baseline Conditions

4.1.1.2 Catalogue of Reasonably Foreseeable Future Actions

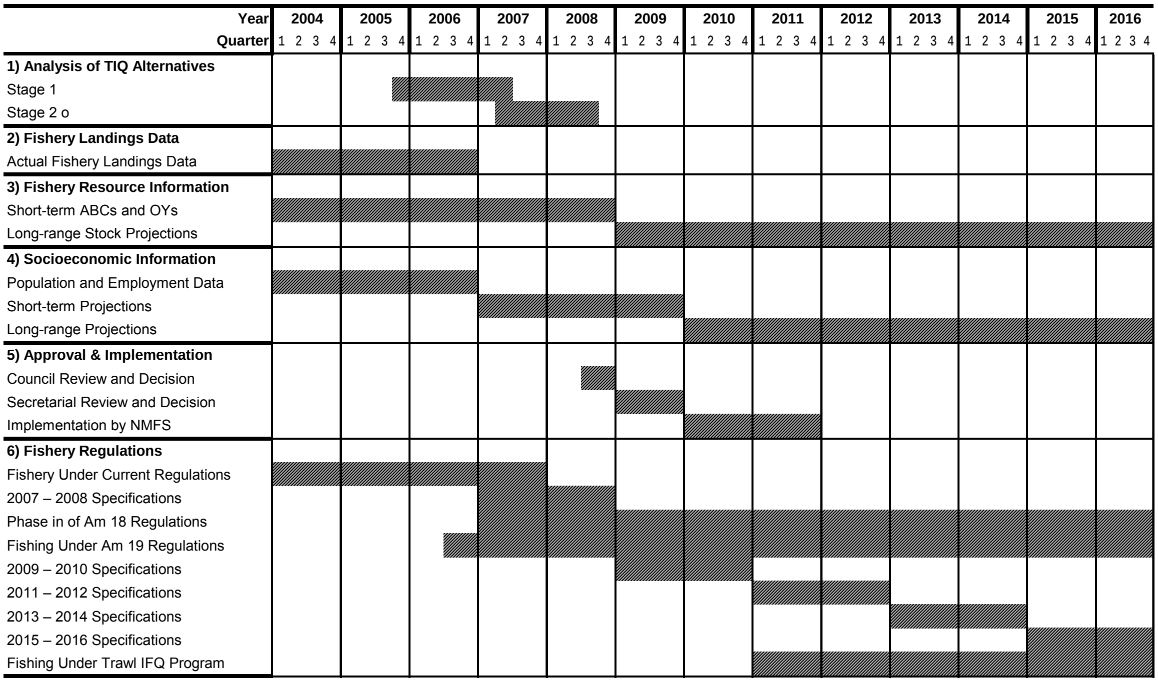
4.1.1.3 Analytical Timeline

As in any analysis that tries to predict the effects of future actions, it is critical to examine the time periods covered by the available historic and current data, the period in which the analysis will occur, and the period over which the analysts must make projections. In general, there is a substantial time lag between the period during which the analysis is undertaken and the period in which the effects of a proposed action will occur. Specifically, the DEIS is scheduled to be released in the fall of 2008.[1] The effects of the proposed action are not expect to occur until 2012 because of the time needed for Secretarial approval and the development of necessary infrastructure and personnel. Those effect will most likely will not be fully realized until some years later because of the time necessary for the fishery participants to adjust and adapt to the new regime.

Figure 1 provides a quarterly timeline for analysis and implementation of the trawl IFQ program from 2004 through 2016. The first section of the figure, labeled “Analysis of TIQ Alternatives,” indicates the time frame over which the analysis of the trawl IFQ program takes place. Sections 2 through 4 show the availability of key data sets that will be necessary for the analysis. Section 5, Approval & Implementation, shows the timeframe for the Council and Secretarial decision process and implementation of the approved program by NMFS. The last section of the figure, Fishery Regulations, indicates the timing of regulatory changes that are projected to occur during the first years of fishing under the program.

[1] The reauthorized Magnuson-Stevens Fishery Conservation and Management Act states that the Council shall submit a plan for rationalization of the West Coast groundfish trawl fishery within two years of reenactment of the act. The release of the DEIS in the fall of 2008 is scheduled to facilitate the development of that rationalization plan by the end of 2008, which will meet the congressionally mandated deadline.

Figure 1 Trawl IFQ Program Analytical and Implementation Timeline



Note: The fact that the timeline begins in 2004 does not mean that data from earlier periods will not be used in the analysis.

As seen in the first section of Figure 1, Stage 1 of the analysis (development of the analytical framework and outline) runs approximately one and a half years. The second stage of the trawl IFQ program analysis begins in the second quarter of 2007 and run through the third quarter of 2008.

Section 2 of the figure shows the period over which actual fishery landings data will be available. By the time the Stage 2 analysis is underway, fishery data for 2006 should be available. Information for earlier years will also be available and used to describe historical conditions of potentially affected resource and stakeholder groups, but it is not shown in the figure.

The figure’s third section describes the availability of stock assessment information. Under the current management regime, the groundfish stock specifications cover two-year periods, and Council recommendations are made at the end of the second quarter each even-numbered year. Therefore, actual ABC and OY specifications for the 2009 and 2010 fishery will not be available early enough to inform the trawl rationalization analysis. Harvest specifications for 2007 and 2008 provide an indication of the stock levels and OYs for the near term and also provide longer range projections. As indicated in the figure, these long-range projections of stock sizes are likely to be generally available through 2016 for most species.

The fourth section of the figure deals with available socioeconomic information. In general, population and employment estimates through 2006 will be available at the community or county level by the time Stage 2 of the analysis is underway. Reliable population and employment projections through 2009 should also be available, but projections beyond 2009 are likely to be less certain, primarily because population estimates are recalibrated every 10 years to the decennial US census.

Assuming that the analysis of the trawl IFQ program proceeds as currently scheduled, the Council should receive a preliminary draft analysis at the end of the second quarter in 2008 (June Council meeting), and is presumed to make its final recommendations by the end of that year (November Council meeting). Following the Council decision, it is presumed that development of a draft analysis for Secretarial review will be required. Drafting of plan amendment language, implementation plans, proposed changes to the regulation, and the Secretarial review and decision process will require at least a full year (2009). Assuming the Secretary approves the program, it is anticipated that implementation of the program by NMFS will require an additional two years (2010 and 2011).

The sixth and final section of the figure shows the major regulatory regimes under which the fishery will operate between 2004 and 2016. The current regulations are expected to remain in effect through 2008. By then it is anticipated that new groundfish stock and harvest specifications would be in place, and that some additional regulations such as Amendment 10 will have been put into place. It is assumed that fishing would continue under those regulations through 2011. In 2012, it is anticipated that fishing under the trawl IFQ program would begin.

The end of 2016 is used as the "end point" for the analysis. The time horizon of the analysis is more than a few years after implementation of an alternative management regime in order to include fleet consolidation and other possible effects.

4.1.1.4 Analytical Scenarios

The existing suite of alternatives specify two alternatives in addition to status quo. Within each of these alternatives are several sub-options that may have different impacts on the affected environment when examined in whole or in part. Each of the sub-options may have noticeable impacts on the affected environment if one is chosen over the other, but equally important is the combined suite of a series of sub-options that are potentially chosen and the overall impact of the combined suite of sub-options. Given the number of sub-options that exist in the suite of alternatives, there are a large number of potential combinations of sub-options that would make the analysis of the alternatives unfeasible if every potential combination was analyzed. Since the potential number of sub-option combinations is large, a suite of "analytical scenarios" were developed that serve as the focal point of the analysis. These analytical scenarios strategically combine a series of potential sub-options with the intention of illustrating the trade-offs that exist within the alternatives while keeping the analysis and consideration of options within a refined and feasible set.

One objective of the concept of analytical scenarios is the illustration of how different decision points can impact the outcome of a trawl rationalization program. These scenarios were developed so that each suite of sub-options making up the analytical scenario results in noticeable differences in the impact on the affected environment. Some sub-options are not illustrated in the analytical scenarios because the decision to choose one option or the other is not expected to have a noticeable impact on the program or the environment as a whole. It should be noted however that such options are considered in the components analyses that are included as appendices.

Four analytical scenarios are illustrated below and these scenarios are referred to throughout chapter 4 in illustrating the impact of a trawl rationalization program on the affected environment. It should be noted that status quo is not shown in the table but is considered in the analysis and referred to as Scenario 1.

ELEMENT	ANALYTICAL SCENARIOS FOR ILLUSTRATING IMPACTS			
	Scenario 2.a	Scenario 2.b	Scenario 3	Scenario 4
Catch Control Tool	• IFQ for all Trawl Sectors	• IFQ for all trawl sectors	• IFQ for Non-Whiting Trawl • Coops for Whiting Trawl	• IFQ for Shorebased Trawl • Coops for At-Sea Trawl
Initial Allocation	• Based on catch history (no buyback sharing)		• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• None	• 25% of groundfish • 50% whiting to shoreside and motherships	• Processor affiliations in mothership and SB whiting sectors. • 25% SB processor ownership of SB groundfish	• Processor affiliation in Mothership sector • 50% SB processor ownership of SB whiting • No processor ownership of SB groundfish
Species Covered	• All grndfish and Pacific halibut	• All grndfish and Pacific halibut	• All groundfish in non-whiting sector • Whiting in whiting sectors with bycatch pools that are common across all whiting sectors	• All groundfish in shorebased sector • Whiting is covered at sea. At sea sector bycatch is covered through sector-specific pools
Number of Trawl Sectors	• Three	• Four	• Four	• Three
Adaptive Management[1]	• No adaptive mgmt	• No adaptive mgmt	• Adaptive mgmt for non-whiting	• Adaptive mgmt for shorebased
Roll-over	• Roll-over exists	• Roll-over exists	• No roll-over	• Roll-over exists
Overfished Species Provisions	• none	• none	• placeholder	• placeholder
Accumulation Limits	• SB non-whiting grnd: 5% • SB whiting: 25% ctrl & 12% per vessel • Mothership: 25% ctrl & 50% per vessel • CP: 60% ctrl & 75% per vessel		• SB grnd: 1.5% • SB whiting: 15% • Mothershp: 20% • CV(MS): 10% • CP: none	• SB grnd: 3% • SB whiting: 10% • Mothershp: 30% • CV(MS): 15% • CP: none
Tracking and Monitoring Options	• Placehol der	• Placeholder	• Placeholder	• Placeholder

Note: Adaptive management provisions are assumed to be used to A) provide protection to communities and processors that may be adversely affected by rationalization by directing QP to LE permits based in particular communities, and B) to encourage bycatch reduction measures and/or gear conversion by directing QP to particular vessels

The above analytical scenarios serve as the basis for analyzing impacts to the affected environment. These scenarios were constructed to illustrate the trade-offs that exist in the existing suite of alternatives and to focus on elements of the alternatives that may have a significant impact, and therefore should be considered under NEPA. Some elements of the alternatives are not considered in these analytical scenarios for several reasons. Some of the elements or sub-options not included are simply specified as part of the program if a rationalization program is implemented so there is no contrast available. Other elements or sub-options are not considered because they are not expected to have a noticeable impact.

The approach for specifying the analytical alternatives was to construct alternatives in addition to status quo that show outcomes based on a range of market flexibility in the program and a range of processor influence over harvest privileges or harvest activities:

- Scenario 1 is Status Quo

- Scenario 2.a is constructed with the intention of being market-centric with a high level of individuality, individual accountability, and a focus on vessel-ownership of harvest privileges. The individuality perspective is accomplished by issuing IFQ (versus coops) for all sectors of the fishery. This creates a more individualistic perspective based on the notion that IQ tends to make participants focus on their personal perspective, whereas participants in a harvest cooperative acts within a type of community and take into account the perspective of other participants in that cooperative as well as their own perspective. The focus on vessel-ownership of harvest privileges is accomplished by not making an initial allocation of quota to processors. A focus on market outcomes is achieved by issuing IFQ, but also by requiring that all groundfish species and Pacific halibut be covered with IQ, that three trawl sectors be established (versus four), that no adaptive management exists which may otherwise skew the outcome driven by a market, allowing for a roll-over to occur, and not building in any specific requirements for managing overfished species.

- Scenario 2.b is constructed with the intention of being market-centric, with a high level of individuality and individual accountability, but with an initial distribution of quota shares being made to processors. This scenario is the same as 2.a, except that there is an initial allocation of IQ to processors, and the fishery is separated into four trawl sectors in order to support the processor allocation rules specified in the scenario.

- Scenario 3 imposes harvest cooperatives for the whiting sectors of the fishery and places constraints and controls on market outcomes through sector divisions, adaptive management mechanisms, and overfished species provisions. This scenario also has a relatively large degree of processor influence or ownership of harvest privileges. Imposing harvest cooperatives on three sectors of the fishery is expected to result in some different outcomes than IQ for all sectors. This is because the perspective of individual harvesters in a system of harvest cooperatives includes the perspective of other participants in the cooperative as well as the perspective of the individual. A limitation on market outcomes is achieved through a limitation in the species covered in the whiting fishery, the establishment of four trawl sectors, establishing an adaptive management mechanism, not allowing roll-overs to occur, and establishing special provisions to manage overfished species. Market outcomes are also restricted by establishing relatively small accumulation limits.

- Scenario 4 is intended to be moderate to scenarios 2 and 3 by allowing for more market-driven outcomes than scenario 3 through roll-over provisions, allowing for three trawl sectors, and higher accumulation limits than scenario 3. This scenario imposes harvest coops for the at-sea portion of the trawl fishery and also imposes special overfished species management provisions.

4.1.1.5 Uncertainty in Predicting Outcomes

4.2 Analytical Tools for Assessing the Impacts of Trawl

Rationalization

The rationalization of the West Coast trawl fishery is expected to result in impacts to the social and economic status of fishery participants, processors, and West Coast fishing communities. In addition, shifts in the location of fishing effort and changes in the amount of fishing-induced groundfish mortality is expected that will have impacts to the status of West Coast groundfish stocks and the marine ecosystem. In this section we describe the principal analytical approaches that are being proposed to address the impacts of trawl rationalization.

Preliminary analysis and public scoping has indicated that the rationalization of the West Coast trawl fishery could result in economic impacts to various aspects of the socioeconomic environment. Substantial impacts may be realized on the harvesting side via changes to economic status of trawl catcher vessels, permit holders, captains, and crewmembers. Substantial impacts may also be realized on the processing side via changes in the utilization of processing plants, processor access to groundfish landings, changes in the demand for processing labor, and impacts to the processing companies as a whole. These changes occur as a result of changes in the quantity of catch, the type and quality of fish retained, and negotiations that occur between harvesters and processors amongst other things. Impacts to harvesters and processors have a secondary effect to West Coast fishing communities because of changes in the economic status of harvesters and processors, as well as the level, type, and location of employment in both sectors.

The individual accountability and market-based trading aspects of rationalization are expected to result in shifts in harvesting activity that will alter the quantity of fish caught and the location of fishing effort. These changes could impact the status of fish stocks as harvest rates change and there is a resulting change in the removals of some species. Changes in fishing effort and fishing-induced mortality may also alter the ecosystem because of trophic interactions and the location and intensity of fishing effort that occurs on marine habitat.

Several efforts are being undertaken in order to address the impacts of trawl rationalization. These efforts can be categorized as A) economic theory, B) data and information collection, and C) model development. Economic theoretical approaches are being utilized to describe the outcomes of negotiation that occur between harvesters and processors and the outcomes that occur as a result of potential changes in the negotiating power of the two groups. Information collection is occurring in order to support model development, but also to provide analytical support for tracing impacts through aspects of the socioeconomic environment and to document lessons that have been learned from other rationalization programs. Model development is occurring to support the analysis of several issues. These issues include;

1) The impact of the initial allocation of IFQ,

2) The amount of fleet consolidation expected to occur,

3) The potential for shifts in the location of fishing effort,

4) The potential for changes in revenue and catch as a result of changes in bycatch rates,

5) The comparative advantage of ports and regions in a rationalized fishery,

6) The effect on the California current ecosystem resulting from changes in trawl activity,

7) The regional economic impacts of trawl fishing activity

4.2.1 Tools for Estimating Impacts

4.2.1.1 Theory for Illustrating Negotiation Outcomes

Game theoretical approaches for illustrating the concept of negotiation and bargaining power will be utilized to illustrate the negotiation that takes place between harvesters and processors. This information is useful for showing how the negotiation stance of each player changes as the initial allocation of quota is divided between harvesters and processors. This concept shows the linearity/non-linearity of bargaining power between two players engaged in a negotiation.

4.2.1.2 Information Collection

4.2.1.2.1 Lessons Learned from Other Rationalization Programs

The rationalization of the West Coast Trawl fishery can benefit from experience in other rationalization programs around the world. An in-depth literature review has been ongoing since 2004 in an attempt at documenting some of the intended and unintended consequences of rationalization programs that have been put in place. This information has demonstrated impacts to communities, catcher vessels, fishery resources, and processors and can be used to show an empirical example of how various policies have impacted portions of the affected environment.

4.2.1.2.2 Identification of Community Vulnerability and Resilience

As part of the 2007/2008 Annual Specifications and Amendment 16-4 Groundfish Rebuilding Plan Environmental Impact Statement, an analysis of community vulnerability and resilience was conducted. This information was created by estimating dependence of West Coast fishing communities on fishing activity and the relative resilience those communities have to dealing with change. This information is useful for considering impacts to communities in cases where changes in fishing activity have a different degree of impact to a community. In such cases, a moderate change in fishing activity occurring in a vulnerable community may be considered a substantial impact, while a moderate change in fishing activity in a less vulnerable community may be considered relatively inconsequential.

4.2.1.2.3 NWFSC cost-earnings survey

4.2.1.2.4 Documentation of processor ownership, plant location, and port-to-plant product flow

This data collection exercise is intended to document the location of trawl groundfish processing plants, the company of ownership, and the ports that those plants receive their groundfish from. This information will display the number of trawl groundfish plants owned by seafood processing companies, the regional location of those plants, whether those plants process whiting and/or non-whiting groundfish, and the port or ports that those plants derive their fish inputs from. The method for collecting this information is through data available in the PacFIN database, information provided by state port samplers and fisheries information specialists, and information provided by members of industry. This information can be used to show the geographic location of plants and product flow which is useful for illustrating impacts on processors from a change in the location of landing for example. This information also has repercussions for regions and communities.

The following table illustrates a hypothetical example of the information being collected in this exercise. This table shows the name of a plant, the city of that hypothetical plant, the company that owns that plant, the ports of landing that plant derives its catch from, and whether that plant processes whiting and/or non-whiting groundfish.

Table 2 Hypothetical Example of Processor Plant Information Being Collected

Plant name	Location	Company	Source ports	Whiting port	Groundfish port
A groundfish plant	Astoria, OR	A groundfish company	Astoria	Yes	Yes
			Westport	Yes	Yes
			Neah Bay	No	Yes

By documenting this information, it is possible to illustrate the relationships between processing plants and regional patterns of landings; between processing plants and individual seafood companies; and between whiting and non-whiting harvest levels and individual processing plants. By documenting this information, second and third order effects can be further developed and described that illustrate the effect on regions and communities that result from an impact on processing plants.

4.2.1.2.5 Documentation of Fishing Infrastructure and Support Business

The Northwest Fisheries Science Center is updating the community profiles that were published in 2006. As part of this update, information that is being collected will show the presence of fishing infrastructure and the presence of fishing support business, such as net manufacturing and vessel fabrication. This information is useful for showing the level of involvement the various fishing communities have in West Coast fisheries. Documenting the amount of infrastructure and support business is also useful for analysis that relies on the concept of “agglomeration economies” where a greater presence of similar business creates economic efficiencies through information sharing and a decrease in the amount of “transfer costs” or the cost of conducting day to day operations. In this case, a greater presence of fishing business would tend to illustrate the presence of agglomeration and provide an indicator of economic efficiencies that are present or not present in fishing communities along the West Coast.

4.2.1.2.6 Tracking and Monitoring Program and Cost Development

As part of this EIS development, NMFS is constructing options for a tracking and monitoring system that would meet the needs of a rationalized fishery. As part of this information development, options are being researched to determine the level of costs that can be borne by industry and the level of costs that need to be borne by agencies. This information has implications for the profitability of participants in the rationalized fishery and implications for management agencies that currently lack adequate resources for enhanced management systems.

4.2.1.3 Models

This subsection provides an overview of models being developed for predicting how portions of the affected environment will respond under each alternative. The choice of models depends upon the amount and quality of information available. The following bullets describe some of the data issues complicating model development for this analysis:

- Cost and earnings data for individual harvesters are available only for a single year.
- Cost and earnings data for individual processors are unavailable
- Comprehensive primary data on processed products and product prices are unavailable.
- Final market demand for groundfish products is not well known.
- Data showing the total catch (landings plus discard) of groundfish by individual vessels are unavailable.

Given these data shortcomings a comprehensive predictive model would not be feasible for development and use in the effects analysis. Instead, a set of models designed to focus on specific issues can be developed. These include:

- A model showing the effects of the initial allocation of IFQs in a trawl IFQ program.
- A model assessing the expected amount of fleet consolidation.
- A model illustrating the potential for geographic shifts in fishery patterns.
- A model illustrating the potential to reduce the catch rate of overfished species and the associated potential for increased target species catch and revenue.
- A qualitative comparative advantage model illustrating the potential for regions to be negatively or positively impacted by rationalization
- An ecosystem-based model describing the impact on the biological and ecosystem components of the environment resulting from changes in fishing behaviour and catch
- A regional input-output model that measures the regional economic impact of changes in catch and revenue occurring in a rationalized fishery

In addition to these models, available literature and theory is useful for articulating additional impacts that may not be able to be predicted, but can be assessed in a qualitative fashion. Such issues include impacts on fishing safety, and changes in bargaining power. Issues like these that cannot be readily assessed via the construction of a model are assessed in a qualitative fashion that is based on the expertise of analysts and a review of available literature.

4.2.1.3.1 Model to Assist in Assessing the Effects of the Initial Allocation of IFQ

The initial allocation of IFQs may have a large impact on the way in which trawl groundfish harvesters and processors prosecute the fishery, especially in the first few years under an IFQ program. An examination of how quota recipients fare under the initial allocation options relative to current participation levels will provide an indication of socioeconomic impacts resulting from the initial allocations. The initial allocation model will be designed to calculate allocations under alternative formula options, and to compare the value of those allocations with recent experience of both permits and processors. Key components of the model include:

- PacFIN fish ticket-level data on LE trawl landings by permit, year and species from 1994 - 2006. The model will also include data indicating the ex-vessel purchase of trawl groundfish by buyers or processors. Each trip will be categorized as to in which IFQ "sector" it belongs.

Compared with the original PacFIN file, the data is also "transposed" so that each species category is represented by two numeric data fields, one for round weight of the landing and one for ex-vessel revenue.

- Specific allocation rules included in the alternatives (e.g., relative lbs. calculated annually for years 1994-2003, dropping a certain number of years, and recent participation requirements). Allocation options currently on the table for permits include: no recent participation requirement, dropping the three worst years from the calculation for non-whiting fishery permits' quota shares, and dropping two years from the whiting fisheries permits' quota share calculation.

- Rules on alternative treatment of the buyback vessels' portion of total quota share. Current options include allocating the buyback portion equally among all permits receiving quota share, or allocating it in the same proportion as the permits' catch history-based quota share.

Results will be generated for each permit and processor who is eligible to receive quota share under each allocation option. Results will be rolled up to the business entity level in cases where owners control multiple buyer/processor codes and/or LE trawl permits. It will also be possible to combine processor and permit allocations to show total quota share amounts that would be allocated to entities with eligible history from both buying/processing activities and landings.

These results will be used to assess quota share concentration implications of the initial allocation, and to compare the annual catch value of allocated quota shares with the value of harvest and/or buying activity exhibited in recent years. Average ex-vessel revenue during 2004-2006 will most likely be used for this comparison.

4.2.1.3.2 Model to Assist in Assessing the Expected Amount of Fleet Consolidation

Consolidation under the alternatives will be a key impact mechanism. A model is being developed that provides projections of consolidation in the fishery and the effects of that consolidation. This model is based on work published by Weninger and Waters in the Journal of Environmental Economics and Management 46 (2003) 207-230.

Ex ante benefit estimates will be obtained using a two-step methodology. The first step predicts the harvesting practices expected to prevail under an ITQ system. This first step will predict post-ITQ equilibrium harvesting practices including:

- Groundfish harvest per vessel
- Number of vessels needed to harvest limited entry trawl groundfish catch
- Which vessels remain in the groundfish fishery and which vessels exit
- Non-groundfish harvest per vessel

A directional distance function model of a multiple output harvest technology is being used for analysis. The directional distance function is well-suited for characterizing fishing practices under alternative regulatory systems. The model is being estimated using data collected in the recently completed West Coast Limited Entry Cost Earnings Survey.

In the second step, estimates of potential economic benefits are generated conditional on the predicted harvesting practices from the first step analysis. Because the West Coast groundfish fishery is not a derby fishery, it is expected that economic benefits will come through cost reductions and increased access to target species that arise from modifications in fishing behavior (overfished species avoidance). The key output of the second step analysis is an estimate of post-ITQ equilibrium harvesting cost.

Changes in harvesting costs can arise from three sources. First, the total fixed costs incurred by the groundfish trawl fleet change as the size of the fleet changes. Since many limited entry trawlers incur annual fixed costs of at least $100,000, reductions in fleet size can result in substantial cost savings. Second, costs may change as vessels change decisions regarding fishery participation, and no longer incur diseconomies of scope (such as the costs of frequently switching gear for participating in multiple fisheries). Third, costs may change as vessels are able to buy and sell quota to take advantage of economies of scale and operate at the minimum point on their long run average cost curve.

Using the model developed through this project, it will be possible to compare:

- Harvesting costs under the current regulatory system
- Harvesting costs under an "unconstrained" ITQ system
- Harvesting costs under an ITQ system where fleet rationalization is constrained through program design features such as quota accumulation caps.

This information can be used to help determine community impacts, revenue associated with fishing opportunities under a rationalization program, and the number of boats engaged in the fishery. A prediction of the number of vessels engaged in the fishery has repercussions for estimating the cost of monitoring the fishery.

4.2.1.3.3 A Model Illustrating the Potential for Geographic Shifts in Fishery Patterns

Individual accountability in a rationalization program is likely to result in cleaner fishing practices. In particular, the individual accountability associated with constraining overfished species will encourage vessels to modify gears as well as fish in areas where overfished species are less abundant. In addition, the rationalization program will tend to slow the pace of Olympic style fisheries that exist in the shorebased and mothership sectors of the whiting fishery. Both of these measures will tend to adjust fishing patterns at a geographic level. Cleaner fishing practices are likely to result in some pressure to move away from areas where there are relatively high encounters of constraining species like canary, yelloweye, and cowcod. A rationalized whiting fishery will tend to slow the pace of harvesting and given that the whiting stock tends to migrate north over the course of the year, this is likely to result in more midwater trawl effort occurring further to the north than under an Olympic style fishery.

The model indicating geographic shifts in fishing effort in the non-whiting trawl fishery will be constructed to show areas and regions that are more likely to see less fishing effort and areas that are likely to see more fishing effort. This index will be based on a regional analysis of bycatch rates of constraining overfished species with the hypothesis being that areas with high bycatch rates will tend to see less trawl effort. This ranking of bycatch rates by area is intended to be illustrative of the type of effect that may occur in a rationalized fishery and should not be considered predictive.

The geographic shift in fishing effort in the mothership and shorebased sectors of the whiting fishery will be informed by catch patterns that have been exhibited in the catcher-processor sector of the whiting fishery. The catcher-processor sector of the whiting fishery voluntarily formed the Pacific Whiting Conservation Cooperative. This association acts like a rationalized fishery, and clear differences in fishing patterns occurred after the cooperative was formed. It is anticipated that similar fishing practices will occur in the mothership and shorebased sectors of the whiting fishery.

The outputs created by this model will show areas of the coast that are likely to see decreases or increases in trawl effort. The coast will be broken into ?9? distinct areas and increases or decreases in trawl effort will be identified based on the relative bycatch rate of overfished species that exist in each of those areas.

4.2.1.3.4 A Model Illustrating the Potential to Reduce the Catch Rate of Overfished Species and the Associated Potential for Increased Target Species Catch and Revenue

The reduction in the bycatch rate of overfished species is envisioned as one of the principal outcomes of a trawl rationalization plan. One large implication of reductions in the bycatch rate of overfished species is the ability to access more target species and generate higher levels of revenue than under status quo. Under status quo management, fishing opportunities have been reduced to protect overfished species. In some cases, opportunities to catch species that have historically been large targets of the trawl sector have been eliminated because of their relatively high degree of correlation with overfished species (yellowtail and chilipepper rockfish for example). In many cases, those species that are not highly correlated with overfished species have also seen target opportunities reduced. For example, the catch of sablefish (one of the primary targets for the trawl sector) has been less than the total trawl allocation by several hundred tons in recent years and this represents a substantial economic loss in exvessel revenue. It is envisioned that a rationalization program will encourage fishers to operate in a manner that avoids overfished species better than under the command and control type of management that exists in the status quo regime. This expected change in behavior is directly related to the individual accountability aspect of a rationalization program.

Several sources of information exist that can be used to show how the bycatch rate of overfished species can change in a rationalized fishery and the implications of that bycatch rate reduction. This information can be used to modify the NMFS/GMT trawl bycatch model[2] which predicts overfished species catch, target species catch, and exvessel revenue given an estimated overfished species bycatch rate and a set of assumed exvessel prices. By modifying the bycatch rate the model can be used to simulate potential changes in harvest outcomes that will occur in a rationalized fishery.

Information that exists to estimate changes in the bycatch rate of overfished species in a rationalized fishery include EFP fisheries have been conducted with requirements that are nearly identical to what would likely be required under a rationalized fishery. In addition, bycatch performance in the catcher-processor sector after that sector formed a voluntary harvest

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[2] The Trawl Bycatch Model was originally developed by staff at the Northwest Fisheries Science Center for use in setting regulations that manage the non-whiting trawl fishery. This model was reviewed and endorsed by the SSC in 2003.

cooperative is illustrative of the potential bycatch reductions that exist in a rationalized West Coast trawl fishery.

The Washington Arrowtooth Flounder EFP was a project that occurred over 4 years with requirements nearly identical to what would be expected under a rationalized fishery. In this EFP, vessels carried observers and were given an overall cap on the amount of overfished species. Vessels were also given individual vessel limits on overfished species. Vessels that could avoid overfished species and stay within their limits had access to arrowtooth flounder and petrale sole in excess of the normal two-month limits that were in place as well as access to areas within the trawl Rockfish Conservation Area. When a vessel reached or exceeded the individual cap, that vessel was no longer allowed to participate in the EFP and was required to fish under normal two-month limits and RCA restrictions while still carrying an EFP observer. In other words, observations were collected while fishing under the EFP and while the vessel was fishing under status quo regulations (the latter serves as the control on the experiment). In addition to information collected on overfished species and target species catch, information on non-marketable discards was collected during the first year of the program. This information can be used to show order of magnitude estimates regarding the amount of regulatory discard occurring under stats quo management and the increased amount of revenue that can be attributed to the fishery via an elimination of regulatory discards.

The information collected when vessels fished outside the EFP is directly comparable to bycatch information collected from the West Coast Groundfish Observer Program in a fishery that is not rationalized, while information collected in the EFP is illustrative of the bycatch rates that would be expected in a rationalized fishery. While the actual bycatch rates collected in this area cannot be used on a coastwide basis (the EFP occurred off northern Washington which has different overfished species interactions than other areas of the coast), the percentage difference between EFP-based observations, and non-EFP observations using the same observers can be used to show the reduction in bycatch rates that can be expected, and to estimate how coastwide bycatch rates collected through the WCGOP should be modified to reflect bycatch under a rationalized fishery.

The figure below illustrates the recorded canary bycatch rates for vessels participating in the EFP by year. The information below shows the bycatch rate when those vessels were participating in the EFP and the bycatch rate when those vessels were fishing under normal (non-EFP) fishing conditions. As is shown from the figure, in 2001 and 2002 the difference in EFP and non-EFP bycatch rates was substantial, while in 2003 and 2004 the difference was less, though still very noticeable. The explanation for this change is indicated in the figure. In 2003 gear modifications were required of vessels participating in the EFP and those gears (which had demonstrably lower bycatch rates) were used outside the EFP as well. In 2004 those vessels became more accustomed to using those gears and only gears that had demonstrated “satisfactory” results were used (which further reduced bycatch rates). In 2003 and 2004 the Rockfish Conservation Areas were in place during the months when observations were recorded, thus the bycatch rate for non-EFP observations fell because vessels were no longer fishing in areas with high canary bycatch.

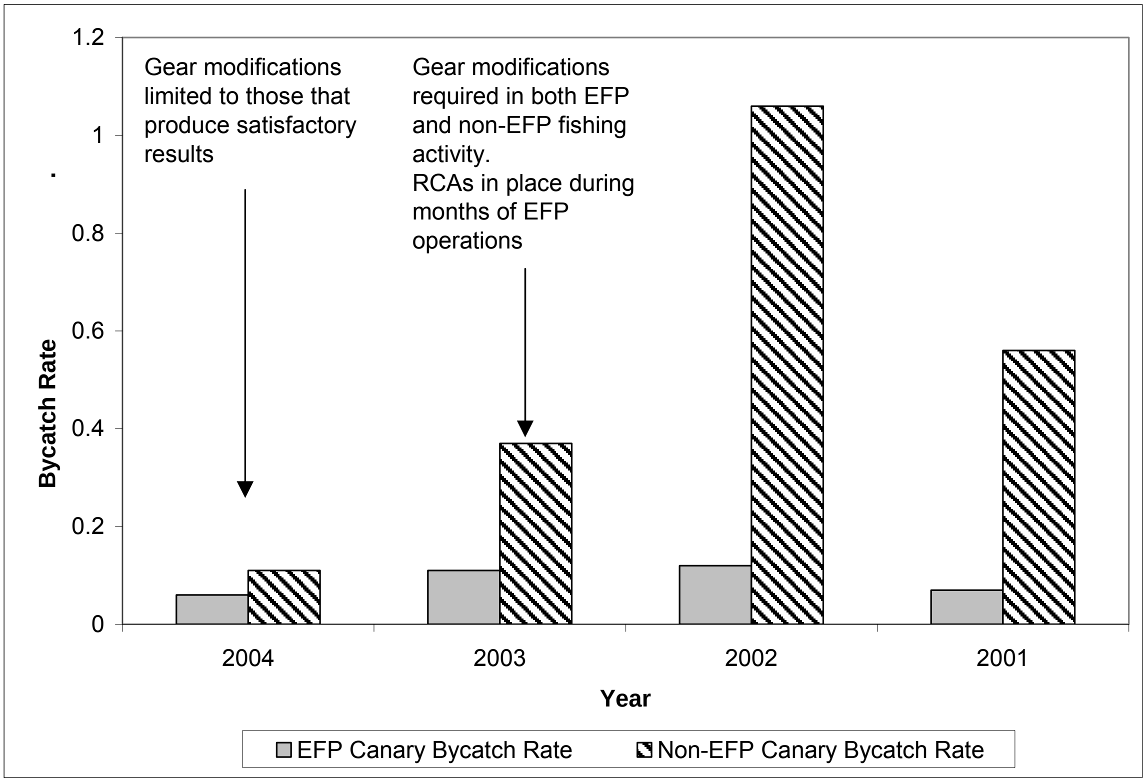
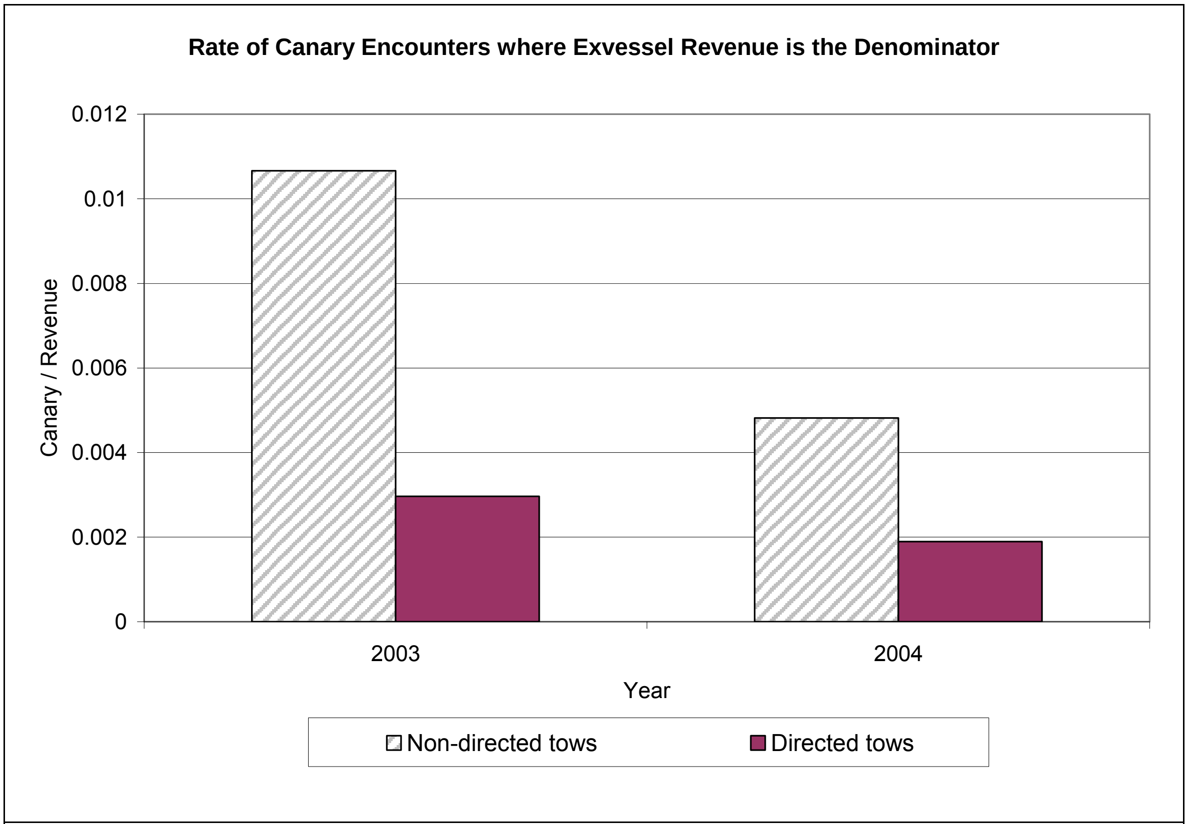
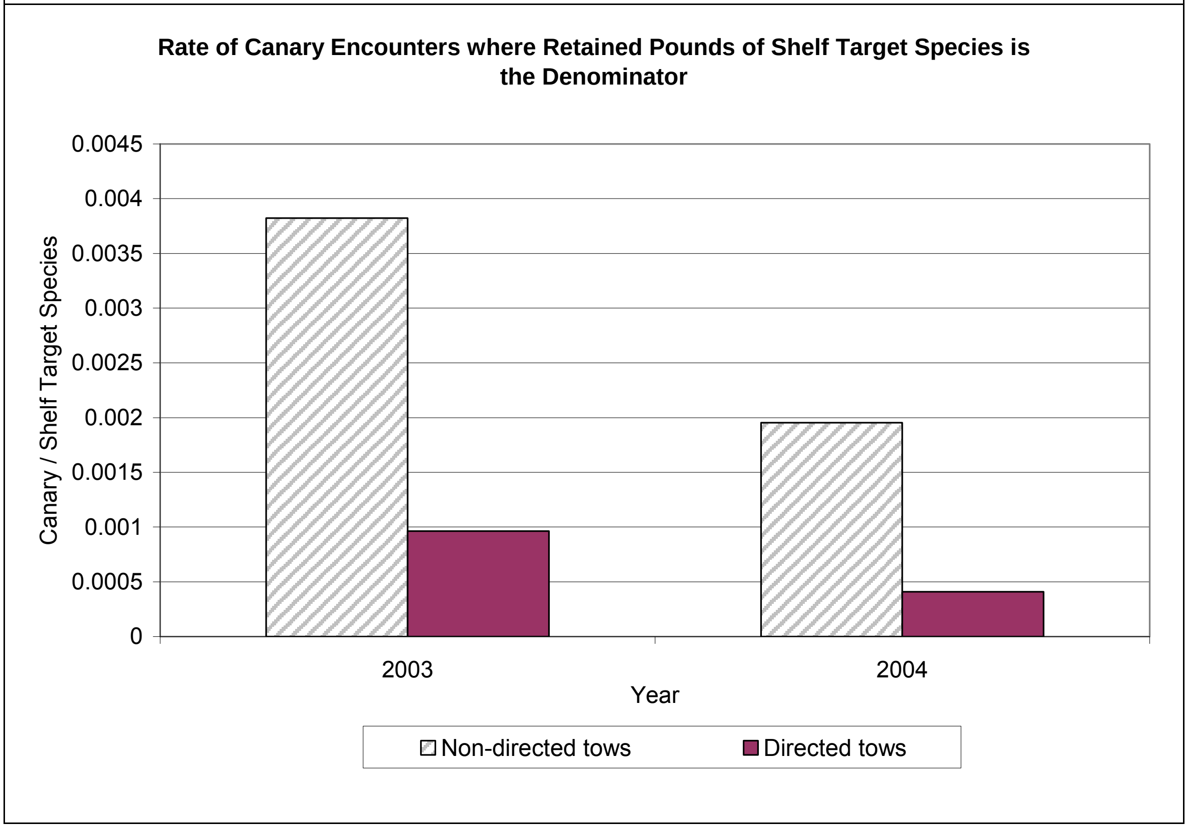
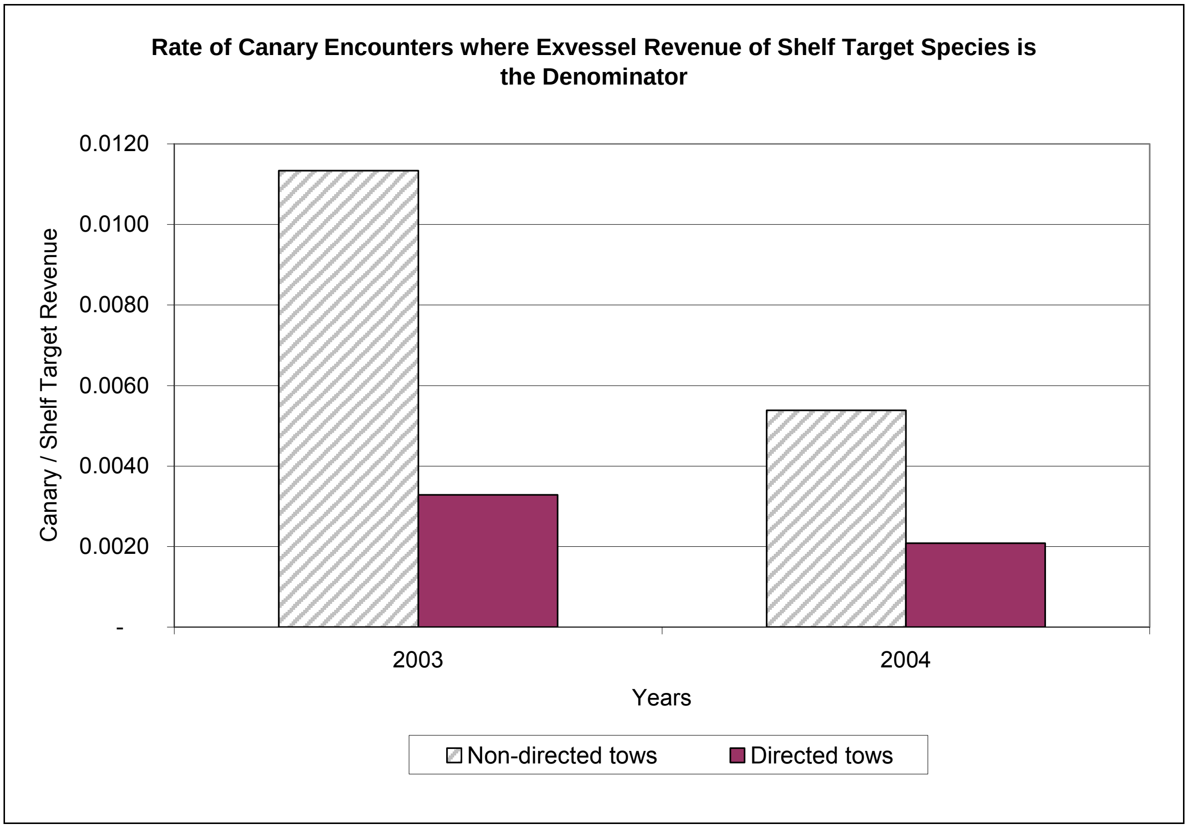


Figure 2 Observed Canary Bycatch Rates in the Washington Arrowtooth EFP

Comments received during the review of proposed methodology questioned whether the bycatch rates in the arrowtooth EFP changed because overfished species were being avoided, or whether they were changing because the denominator, or set of target species, were changing between EFP and non-EFP fishing activity. If the denominator, or set of target species, differs between EFP and non-EFP activity, then the results shown above may not be indicative of what could occur under a rationalization program. To examine this question, bycatch rates were estimated in several additional ways: the first method examined canary bycatch relative to the amount of revenue generated by fishing activity; the second method examined canary bycatch relative to the amount of shelf target species; and the third method examined canary relative to the amount of shelf target revenue. All three additional approaches show substantial differences in the bycatch of canary rockfish in directed EFP activity compared to non-EFP activity. Canary rockfish is examined in this case because it was the most constraining species to target fishing activity during the 4 years of the EFP (because of the individual accountability measures of the program). Along other portions of the coast other species such as darkblotched rockfish would likely to be more constraining, and therefore substantial reductions in darkblotched would be expected instead.


Rate of Canary Encounters where Exvessel Revenue is the Denominator
0.012
0.01
0.008
0.006
0.004
0.002
0
Canary / Revenue
2003
2004
Year
Non-directed tows
Directed tows


Rate of Canary Encounters where Retained Pounds of Shelf Target Species is the Denominator
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Canary / Shelf Target Species
2003
2004
Year
Non-directed tows
Directed tows



The data used from the Arrowtooth EFP project will be a comparison of observed bycatch rates that occurred in depths that are outside (deeper or shallower than) the trawl Rockfish Conservation Area. Including observations outside the RCA is consistent with the expectation that RCAs will remain in place under a rationalization program and also provides a more direct comparison between a rationalized fishery and status quo management (which relies on RCAs). This involves eliminating observations from 2001 – 2004 that occurred in depths within the trawl RCA. After this filtering exercise is completed, the percentage difference between EFP and non-EFP rates will be applied to coastwide bycatch rates estimated from the West Coast Groundfish Observer Program. These modified rates will be used in the NMFS/GMT bycatch model for estimating the change in target species catch and exvessel revenue that would be expected in a rationalized fishery given the expected reduction in the encounters of constraining overfished species.

It is likely that overfished species bycatch rates will also decrease in the mothership and shorebased sectors of the whiting fishery because those fisheries are operating as an Olympic fishery under status quo management. The whiting fishery operates under sector-wide bycatch limits that can close all sectors of the fishery if reached. Each sector has demonstrated a reduction in bycatch rates since bycatch limits were put in place, however the catcher-processor sector has demonstrated a lower rate of canary rockfish bycatch (the species that was most constraining from 2004-2006). By examining the bycatch rates in the catcher-processor sector, we can infer changes in the bycatch rates in the mothership and shorebased sectors of the whiting fishery if those sectors of the fishery are rationalized, however it is not appropriate to assume the mothership and shorebased sectors of the whiting fishery would have the same bycatch rates as the catcher processor sector.

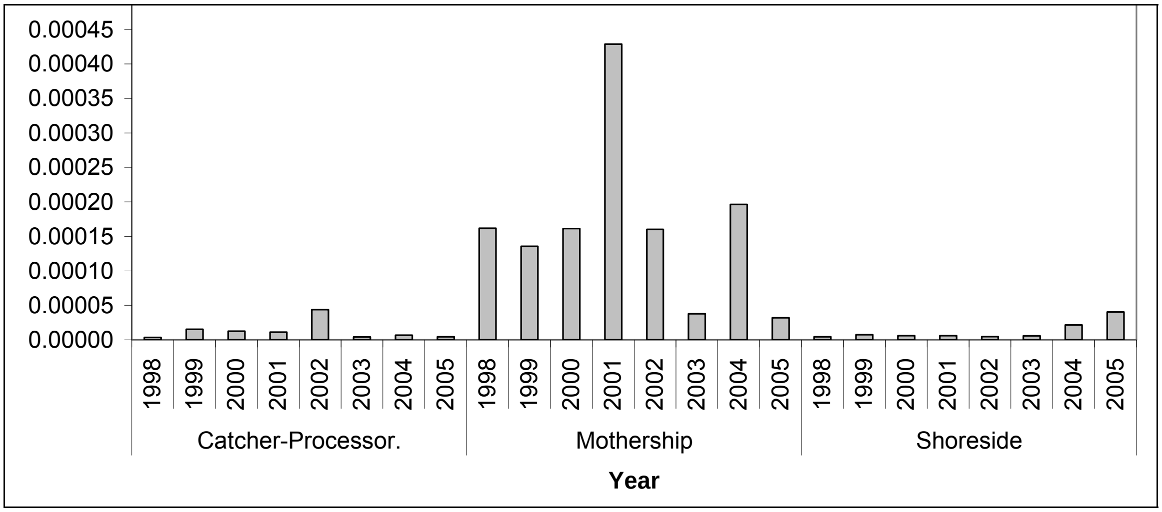


Figure 3 Canary Bycatch Rate by Year and Whiting Sector

The outputs created by this model will be a range of likely results of changes in catch and exvessel revenue that occur under a rationalized fishery. One bound can be described as being optimistic and the other bound can be described as being relatively pessimistic. This information will show the total exvessel revenue that can potentially be created by a rationalized trawl fleet and the associated quantity of retained catch.

4.2.1.3.5 A Comparative Advantage Model Illustrating the Potential for Regions to be Made Better or Worse Off by Rationalization

Several variables determine the amount of fishing activity occurring in different ports, including access to fishing grounds, port infrastructure, and fish purchasing and processing amongst other things. In a rationalized fishery, the incentives created by market-based management may impose additional forces that will alter the decision that vessel operators make regarding the location of fishing activity, the delivery location, and home-port location for a given vessel. Assuming profit is the motivating factor for fishers engaged in commercial fisheries then the decision framework created by a rationalized fishery will tend to shift the location of fishing and delivery activity.

Under status quo management vessels are not held individually responsible for the amount of fish they catch, provided their landings are within their cumulative landing limit. In addition, operators cannot choose to grant their cumulative limit to another, potentially more profitable, operator. Under a rationalized fishery, both scenarios change and fishers are held individually accountable and can transfer their fishing privilege to another vessel. The aspect of individual accountability will tend to put pressure on operators to fish in areas with lower encounter rates of overfished species and the ability for transferring catch privileges allows the fleet to consolidate to fewer, but more profitable vessels as the market directs quota in a manner that is more economically efficient.

In a rationalization program, more economically efficient vessels are expected to remain in the fishery, while less efficient vessels are expected to drop out of the fishery. Economic efficiency is determined by several variables including the ability of the operator to generate gross revenues and the vessels cost structure. Cost structure is determined by variable costs such as fuel, by fixed costs and also by “transfer costs” and the cost of doing day to day operations. Ports that have a higher degree of fishing support business (agglomeration) tend to make it easier and more efficient for operators to conduct day-to-day activities and this makes the cost of running a fishing business, acquiring parts, and negotiating work relationships lower than other ports.

Given these arguments, it is reasonable to expect ports with vessels that have a relatively long travel time to fishing grounds, have relatively unsuccessful operators, relatively costly vessels, and are in ports with relatively few support businesses to be at a disadvantage when compared to other regions. In addition, ports that are adjacent to fishing grounds with high constraining overfished species abundance would also tend to be at a disadvantage as the presence of overfished species would encourage operators to move to areas with lower abundance. Given enough disadvantaging (or advantaging) factors in a port, that port may find itself losing (or gaining) trawl groundfish activity after rationalization, absent some mitigation tool that the Council may wish to implement as part of the program.

Information is available to illustrate these relationships and provide information indicating which ports or areas may be at a relative advantage or disadvantage. Available information includes:

- Logbook data can be used to show the preferred fishing grounds of trawl vessels categorized by home port (e.g. we can identify the preferred grounds for Astoria-based trawlers). This information can be combined with West Coast groundfish observer program data to show whether preferred fishing grounds of some ports are in areas with relatively high bycatch rates of constraining overfished species. Those ports with vessels fishing in areas with relatively lower bycatch rates may be at an advantage in a rationalized fishery.

- West Coast fishing community profiles provide information about community business and infrastructure. In addition, industry members, extension agents, and extension publications are sources of this information. Using the theory of agglomeration, those communities with larger amounts of support business and infrastructure may be at an advantage in a rationalized fishery.

- The fleet consolidation model can be used to identify the geographic effects of consolidation based on the most likely vessels to drop out of the fishery and the most likely vessels to stay in the fishery.

- The initial distribution of quota can be used to show which ports will receive more or less quota relative to status quo and relative to the initial distribution made to other ports.

The output created by this model will illustrate 4 variables and the relative advantage or disadvantage each port has with respect to each of those variables. These variables include 1) bycatch rates in preferred fishing grounds of various ports, 2) relative economic efficiency of vessels in that port, 3) the relative amount of fishing business that exists in that port, and 4) the initial distribution of quota shares to those ports relative to status quo and relative to the distribution made to other ports.

Table 3 Hypothetical Example of Relative Comparative Advantage Information

Hypothetical Port	Relative Bycatch Rate	Fishing Infrastructure	Economic Efficiency of Local Fleet	Initial Distribution of Quota shares
Hypothetical Washington port	–	–	+	+
Hypothetical Oregon port	+	–	+	–
Hypothetical California port	+	–	–	+

4.2.1.3.6 An Model Describing the Impact on the California Current Ecosystem Resulting from Changes in Fishing Behaviour and Catch

Certain behavioural changes on the part of fishers can be anticipated after a rationalization program goes into place. These behavioural changes can have biological and ecosystem effects and these effects can be identified based on known relationships in the ecosystem. In a rationalized fishery it is anticipated that there will be geographic shifts in effort and greater utilization of currently under-utilized species will occur. Geographic shifts in effort have the potential to alter impacts on habitat and greater removals of some groundfish can have secondary impacts on other groundfish depending on the trophic level of that species. For example, if arrowtooth flounder is a predator of a certain rockfish and arrowtooth removals increase under rationalization, we would expect the abundance of that prey rockfish species to increase.

This model identifies the anticipated changes in fishing behaviour that will occur after a rationalized fishery goes into place. These changes are traced through known trophic and habitat relationships to identify the type of impacts that occur in the California ecosystem.

4.2.1.3.7 A Regional Input-Output Model that Measures the Regional Economic Impact of Changes in Catch and Revenue Occurring in a Rationalized Fishery

Attachment

4.2.2 Utilization of Analytical Methods in Assessing the Effects of the Analytical Scenarios

Each of the proposed methods is used to illustrate the impact of the analytical scenarios on portions of the affected environment. In some instances these methods can provide quantitative outputs that differ between each of the analytical scenarios, while at other times the proposed models may provide a range of likely outputs that are not necessarily tied to a specific analytical scenario. In this case, the relationship of the outputs to the analytical scenarios is characterized based on a qualitative likelihood of where each scenario may fall within that range.

Several analytical methods described are closely related to one another. Some of these analytical methods are related because one measures the direct effect of trawl rationalization while another measures the indirect effect and therefore relies on the outputs of the model estimating the direct effect. One example of where this occurs is when rationalization changes the way catcher vessels prosecute the fishery and this has a indirect, or second-order impact, on the biological status of fish stocks and on the state of the California current ecosystem.

The following table illustrates the relationship of the proposed analytical methods to the analytical scenarios and their utilization in determining their respective impact on each of the environmental components.

Data Collection / Model	Env Component Informed by Data/Model	Utilization of Information in the Assessment of Analytical Scenarios
4.2.1.2.4 Processor Plant and Company Info	• Processors • Communities	This data collection is primarily used as descriptive information and as supporting information within various analyses.
4.2.1.2.5 Community Infrastructure	• Communities • Catcher vessels	This data collection is primarily used as descriptive information and as information within various analyses.
4.2.1.2.1 Lessons Learned	• All environmental components	This information is used to show empirical examples of impacts where alternatives under consideration have been implemented in other areas
4.2.1.2.2 Community Vulnerability	• Communities	This information identifies communities that are vulnerable and dependent on fishing. Analytical scenarios are assessed based on the likelihood of impacting communities and whether those communities are vulnerable or not vulnerable.
4.2.1.2.3 NWFSC Cost-Earnings Survey	• Catcher-vessels	This information is primarily used as descriptive information and as inputs to the fleet consolidation model
4.2.1.2.6 Tracking and monitoring program and cost	• Agencies • Catcher Vessels	Analytical scenarios are assessed based on the amount of consolidation allowed or expected to occur and the associated cost of monitoring that fleet size
4.2.1.3.1 Initial Allocation of IQ	• Communities • Processors • Catcher Vessels	This information illustrates the distribution of initial allocation and the implications of doing so at the vessel, processor, and community level. Analytical scenarios are assessed based on the initial allocation rules specified in those scenarios.
4.2.1.3.2 Fleet Consolidation	• Communities • Processors • Catcher Vessels • Agencies • Captain & Crew • Input Suppliers	Fleet consolidation is illustrated based on model projections and the amount of accumulation limits that are specified as part of each scenario.
4.2.1.3.3 Geographic Fishing Patterns	• Groundfish resources • Non-trawl harvesters • Ecosystem • Groundfish	Identification of geographic shifts in fishing patterns is assessed based on the incentives within each analytical scenario for doing so.
4.2.1.3.4Change in Bycatch Rate, Catch, and Revenue	• Catcher Vessels • Processors & labor • Captain and Crew • Groundfish resources • California Current Ecosystem	Changes in catch and revenue are portrayed as a likely range. Analytical scenarios are analyzed based on the likelihood of whether each scenario would tend toward the lower or upper bound. The impact on components of the environment are estimated through the impact of the upper and lower bound.
4.2.1.3.5 Regional Comparative Advantage	• Communities • Processors • Ecosystem	Elements within the alternatives may mitigate the comparative advantage of some regions. The amount of mitigating factors in each analytical scenario are used to characterize the outputs of this model in terms of the likelihood that comparative advantage will make a region better or worse off under rationalization.
4.2.1.3.7 NWFSC Input-Output Model	• Communities	Outputs from the change in catch and revenue model will be used as inputs in this model. The output of the I-O model will be used to show the regional economic impact of the scenarios.

4.3 General Effects of Trawl Rationalization

4.3.1 Overview

4.3.1.1 A Review of Impacts in Other Rationalization Programs

4.3.1.2 Expected Effects in the West Coast Trawl Fishery

4.3.1.3 General Effects on West Coast Fisheries

4.3.1.4 General Effects on West Coast Communities, Including Processors

4.3.1.5 General Effects on Biological Resources

4.3.2 General Effects on Environmental Components Where There is a Low Potential for Significant Impacts

4.3.2.1 Buyers and Processors That Do Not Purchase Trawl Groundfish

4.3.2.2 Recreational Harvesters

4.3.2.3 Consumers of Groundfish Products

4.3.2.4 General Public

4.3.2.5 Other Fish Resources

4.3.2.6 Protected Species Other than ESA-Listed Salmon (includes seabirds, marine mammals, other ESA-listed species)

4.4 Limited Entry Trawl Groundfish Catcher Vessels and Permit Owners

4.5 Non-Trawl Commercial Harvesters

4.6 Captain and Crew

4.7 Trawl Catcher Processors

4.8 Processors of Trawl Groundfish

4.8.1 Information Collection

4.8.2 Potential Impacts, Mechanisms, and Metrics

4.9 Processor and Other Labor

4.10 Wholesalers and Retailers

4.11 Input Suppliers

4.12 Communities

4.13 Tribes

4.14 Management Agencies

4.15 Groundfish Resources

4.16 ESA Listed Salmon

4.17 California Current Ecosystem (incl. Habitat and Trophic Relationships)

SUPPLEMENTAL ANALYSIS AND ERRATA

Contents Page

Other Errata: In D.7.b, Attachment 1 Table 17, the row labeled “Pacific Whiting – coastwide” should not contain any data (i.e., row should be blank).

Organization of D.7.b, Attachment 1, Appendix Tables (page 1 of 3)

Sector to Which Tables Apply	Allocation Issue	Tables	Errata and Notes
Appendix 1			
Shoreside Processors (Buyers)			
Whiting	Recent Participation Analysis and Co-op Eligible Processor Analysis	1-1 thru 1-8	**Errata:** All tables should indicate that they apply to shoreside buyers of whiting targeted trips. Table 1-3. Percent of 1994-2003 should read percent of 1994-2004. Table 1-5 should indicate that it includes only those permits with activity from 2004-2006. **Note:** Tables 1-4 and 1-5 contain information similar to Tables 1-1 thru 1-3, except that Tables 1-4 and 1-5 include only those buyers with some activity from 2004-2006.
		1-17 thru 1-20	**Errata:** Table 1-17 should be titled: "Number of shoreside whiting companies that received whiting during 1994-2006"? **Note:** Tables 1-17 provides some geographic distribution information for the population of whiting buyers. Tables 1-18 thru 1-20 provides additional information specific to the TIQC recommended requirements for recent participation.
NonWhiting	Recent Participation Analysis	1-9 thru 1-16	**Errata:** All tables should indicate that they apply to buyers of trips targeted on non-whiting species. Table 1-13 should indicate that it includes only those permits with activity from 2004-2006. **Note:** Tables 1-12 and 1-13 contain information similar to Tables 1-10 thru 1-11, except that Tables 1-12 and 1-13 include only those buyers with some activity from 2004-2006.

Organization of D.7.b, Attachment 1, Appendix Tables (page 2 of 3)

Sector to Which Tables Apply	Allocation Issue	Tables	Errata and Notes
		1-21 thru 1-24	**Note:** Tables 1-21 provides some geographic distribution information for the population of non-whiting buyers. Tables 1-22 thru 1-24 provides additional information specific to the TIQC recommended requirements for recent participation plus a 1 mt per year option.
		1-25 thru 1-28	**Note:** Tables 1-25 thru 1-27 show the species composition by state of the companies that would be eliminated by the indicated screen. Table 1-28 combines entities for all states that would be eliminated by a 1 mt screen. Totals at the bottom include only companies with some trawl groundfish landings. **Errata**: In Table 1-28 "RWT" under the Washington RWT column shows the "Combined" RWT values. However the "RPC" and "# of Co." columns do show the Washington totals.
Mothership			
Company	Recent Participation Analysis (IFQ Alt)	1-29 thru 1-32	**Note:** Similar to shoreside processor tables, data aggregated at the company level for consideration of recent participation requirement for the IFQ alternative.
Vessel	Mothership Processing Permits (Co-op Alt)	1-33 thru 1-38	**Note:** Similar to shoreside processor tables, data aggregated at the mothershp vessel level for consideration of qualification requirement for a mothership processing permit.
Catcher Processor	Catcher-Processor Endorsements (Co-op Alt)	1-39 thru 1-43	**Errata:** Title should indicate the catcher-processor endorsements instead of IFQ recent participation. **Note:** Similar to shoreside processor tables, data aggregated at the catcher-processor vessel level for consideration of qualification requirement for a catcher-processor endorsement.

Organization of D.7.b, Attachment 1, Appendix Tables (page 3 of 3)

Sector to Which Tables Apply	Allocation Issue	Tables	Errata and Notes
Catcher Vessels			
Shoreside Whiting	Recent Participation (Whtg Endorsement, Co-op Alt)	1-44 thru 1-49	**Note:** Similar to shoreside processor tables, data aggregated at the catcher vessel level for consideration of qualification requirement for shoreside sector catcher vessel endorsements.
At-Sea Mothership	Recent Participation (Whtg Endorsement, Co-op Alt)	1-50 thru 1-55	**Note:** Similar to shoreside processor tables, data aggregated at the catcher vessel level for consideration of qualification requirement for mothership sector catcher vessel endorsements.
<u>**Appendix 2**</u>			
Harvesters (Individual Permits)	Vessel Accumulation Limits	2-1a thru 2-2d	**Note:** Maximum amounts allocated to **permits** compared with **vessel** limit options, and number of permits that would receive QS in excess of **vessel** limit options. Some also include geographic information.
Harvesters (Multiple Permits Under a Single Owner Are Aggregated)	Control Accumulation Limits (i.e. evaluates ownership of more than 1 permit)	2-3a thru 2-8b	**Note:** Maximum amounts allocated to an **entity that owns permits** compared with **control** limit options, and number of permit owners that would receive QS in excess of **control** limits. Some tables exclude permits owned by buyers.
Buyers (Excludes Permit History)	Control Accumulation Limits (Control) (QS Associated W/Buying)	2-9a thru 2-9b	**Note:** Maximum amounts to **buyers** compared with **control** limit options.
Harvesters and Buyers (Combined)	Control Accumulation Limits (Control)	2-10 thru 2-11	**Note:** Maximum amounts for **buyers and harvesters** combined compared with **control** limit options.

Table 1-21. Number of companies that received non-whiting sector deliveries during 1994-2006, by State(s):

California (Only)	136		
Oregon (Only)	36	Total Operating in California	144
Washington (Only)	26		
California AND Oregon	6	Total Operating in Oregon:	45
California AND Washington	1		
Oregon AND Washington	2	Total Operating in Washingt	30
California AND Oregon AND Washington	1		
TOTAL	**208**		

Table 1-22. Active companies receiving nonwhiting sector deliveries (those with 2004-1006 participation) and inactive companies, number of years above the indicated threshold and percent of total history.

Companies That Received Groundfish (>0 MT) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

		Within Allocation Period (1998-2003)				
	Number	Percent	Active 1 Year	Active 2 Years	Active 3+ Years	% of 1994-2003
Currently Active, with Recent Participation	44	90.0%	4	5	35	79.1%
Not Active, with Recent Participation	80	10.0%	37	26	17	17.2%
Currently Active, No Recent Participation	19	--	--	--	--	0.9%
Not Active, No Recent Participation	65	--	--	--	--	2.8%
TOTALS	**208**	**100.0%**				**100.0%**

Companies That Received Groundfish (at Least 1 MT in a Year) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

		Within Allocation Period (1998-2003)				
	Number	Percent	Active 1 Year	Active 2 Years	Active 3+ Years	% of 1993-2004
Currently Active, with Recent Participation	34	89.8%	5	1	28	79.0%
Not Active, with Recent Participation	50	10.2%	21	15	14	17.3%
Currently Active, No Recent Participation	7	--	--	--	--	0.9%
Not Active, No Recent Participation	117	--	--	--	--	2.8%
TOTALS	**208**	**100.0%**				**100.0%**

Companies That Received Groundfish (at Least 6 MT in a Year) from Non-Whiting Targeted Trips, With and Without Recent Participation (1998-2003)

		Within Allocation Period (1998-2003)				
	Number	Percent	Active 1 Year	Active 2 Years	Active 3+ Years	% of 1993-2004
Currently Active, with Recent Participation	28	89.4%	5	2	21	78.3%
Not Active, with Recent Participation	41	10.6%	20	10	11	17.7%
Currently Active, No Recent Participation	3	--	--	--	--	0.0%
Not Active, No Recent Participation	136	--	--	--	--	4.0%
TOTALS	**208**	**100.0%**				**100.0%**

Note: An "active" company received whiting during the period January 1, 2004 to December 31, 2006.

Shoreside Non-Whiting Companies that Received Less than 1 MT of Groundfish During 1994-2003

The information in this table displays the quantities by species associated with companies that would be excluded from an allocation of QS, should a 1 MT minimum threshold be established.

Table 1-28. Shoreside Non-Whiting Companies that Received Less than 1 MT of Groundfish (Quantity (in MT) and Raw Product Cost (RPC) by Species, 1994-2003 Receipts)

	California			Oregon			Washington			COMBINED		
Species	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.	RWT	RPC	# of Co.
Lingcod - coastwide	0.2	483	10	1.2	3,141	8	0.0	11	1	1.5	3,635	19
N. of 42° (OR & WA)	0.0	0	0	1.2	3,141	8	0.0	11	1	1.2	3,152	9
S. of 42° (CA)	0.2	483	10	0.0	0	0	0.0	0	0	0.2	483	10
Pacific Cod	0.0	0	0	0.0	0	0	0.1	87	2	0.1	87	2
Pacific Whiting (Coastwide)	0.0	16	1	0.0	0	0	0.0	0	0	0.0	16	1
Sablefish (Coastwide)	0.5	967	8	0.0	13	2	0.2	187	1	0.6	1,167	11
N. of 36° (Monterey north)	0.4	915	7	0.0	13	2	0.2	187	1	0.6	1,115	10
S. of 36° (Conception area)	0.0	52	1	0.0	0	0	0.0	0	0	0.0	52	1
PACIFIC OCEAN PERCH	0.0	11	3	0.1	175	2	0.0	4	2	0.1	190	7
Shortbelly Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
WIDOW ROCKFISH	0.8	1,326	2	0.0	5	2	0.0	0	1	0.8	1,331	5
CANARY ROCKFISH	0.6	690	9	0.2	283	4	0.0	2	1	0.8	975	14
Chilipepper Rockfish	0.7	819	11	0.0	0	0	0.0	0	0	0.7	819	11
BOCACCIO	0.0	2	5	0.0	0	0	0.0	0	0	0.0	2	5
Splitnose Rockfish	0.3	484	11	0.0	0	0	0.0	0	0	0.3	484	11
Yellowtail Rockfish	0.1	94	1	0.1	85	3	0.0	8	1	0.2	187	5
Shortspine Thornyhead - coastwide	0.0	28	4	0.0	5	2	0.0	82	1	0.1	115	7
N. of 34°27'	0.0	24	1	0.0	5	2	0.0	82	1	0.1	111	4
S. of 34°27'	0.0	4	3	0.0	0	0	0.0	0	0	0.0	4	3
Longspine Thornyhead - coastwide	0.0	1	1	0.0	0	0	0.0	0	0	0.0	1	1
N. of 34°27'	0.0	1	1	0.0	0	0	0.0	0	0	0.0	1	1
S. of 34°27'	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other thornyheads	0.0	40	1	0.0	0	0	0.0	0	0	0.0	40	1
COWCOD	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
DARKBLOTCHED	0.2	166	9	0.0	36	3	0.0	10	2	0.2	212	14
YELLOWEYE	0.1	173	5	0.0	0	0	0.0	22	2	0.1	195	7
Black Rockfish - coastwide	0.4	803	1	0.0	13	1	0.0	0	0	0.4	816	2
Black Rockfish (WA)	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Black Rockfish (OR-CA)	0.4	803	1	0.0	13	1	0.0	0	0	0.4	816	2
Minor Rockfish North	1.0	1,301	11	0.4	562	7	0.7	578	2	2.1	2,441	20
Nearshore Species	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Shelf Species	0.6	964	10	0.1	83	5	0.6	450	2	1.2	1,497	17
BOCACCIO: N. of Monterrey	0.0	23	3	0.0	2	1	0.1	53	2	0.1	78	6
Chilipepper Rockfish: Eureka	0.4	751	3	0.0	0	0	0.0	0	0	0.4	751	3
Redstripe Rockfish	0.0	5	1	0.0	1	2	0.0	23	2	0.0	29	5
Silvergrey Rockfish	0.0	0	0	0.0	1	1	0.3	235	2	0.3	236	3
Other Northern Shelf Rockfish	0.1	185	8	0.1	79	5	0.2	139	2	0.4	403	15
Slope Species	0.4	337	4	0.3	479	4	0.2	128	2	0.9	944	10
Bank Rockfish	0.0	2	2	0.0	0	0	0.0	0	0	0.0	2	2
Sharpchin Rockfish, north	0.0	15	2	0.0	5	2	0.0	4	2	0.0	24	6
Splitnose Rockfish: N. of Monterrey	0.2	143	3	0.0	24	2	0.0	3	2	0.2	170	7
Yellowmouth Rockfish	0.0	0	0	0.1	150	1	0.0	0	1	0.1	150	2
Other Northern Slope Rockfish	0.2	177	4	0.2	300	4	0.2	121	2	0.6	598	10
Minor Rockfish South	1.5	2,062	24	0.0	0	0	0.0	0	0	1.5	2,062	24
Nearshore Species	0.0	13	2	0.0	0	0	0.0	0	0	0.0	13	2
Shelf Species	1.0	1,260	22	0.0	0	0	0.0	0	0	1.0	1,260	22
Redstripe Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Yellowtail Rockfish	0.3	324	4	0.0	0	0	0.0	0	0	0.3	324	4
Other Southern Shelf Rockfish	0.7	936	20	0.0	0	0	0.0	0	0	0.7	936	20
Slope Species	0.5	789	11	0.0	0	0	0.0	0	0	0.5	789	11
Bank Rockfish	0.2	214	6	0.0	0	0	0.0	0	0	0.2	214	6
Blackgill Rockfish	0.2	427	9	0.0	0	0	0.0	0	0	0.2	427	9
Sharpchin Rockfish	0.0	0	2	0.0	0	0	0.0	0	0	0.0	0	2
Yellowmouth Rockfish	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other Southern Slope Rockfish	0.1	148	7	0.0	0	0	0.0	0	0	0.1	148	7
California scorpionfish	0.2	548	3	0.0	0	0	0.0	0	0	0.2	548	3
Cabezon (off CA only)	0.0	77	1	0.0	0	0	0.0	0	0	0.0	77	1
Dover Sole	0.0	0	0	0.1	91	2	0.0	0	0	0.1	91	2
Dover Sole (summer)	0.0	0	0	0.1	91	2	0.0	0	0	0.1	91	2
Dover Sole (winter)	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
English Sole	0.3	377	9	0.1	119	4	0.0	0	0	0.4	496	13
Petrale Sole (coastwide)	1.1	2,925	19	0.3	430	6	0.1	264	1	1.5	3,619	26
N of 40°10' summer	0.1	124	1	0.2	292	5	0.1	264	1	0.4	680	7
N of 40°10' winter	0.4	940	2	0.1	138	2	0.0	0	0	0.5	1,078	4
S of 40°10' summer	0.2	405	6	0.0	0	0	0.0	0	0	0.2	405	6
S of 40°10' winter	0.5	1,456	12	0.0	0	0	0.0	0	0	0.5	1,456	12
Arrowtooth Flounder	0.0	0	0	0.0	29	1	0.0	0	0	0.0	29	1
Arrowtooth Flounder summer	0.0	0	0	0.0	29	1	0.0	0	0	0.0	29	1
Arrowtooth Flounder winter	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Starry Flounder	0.0	0	0	0.0	24	2	0.0	0	0	0.0	24	2
Other Flatfish	3.2	4,496	20	0.3	468	5	0.0	0	0	3.4	4,964	25
Kelp Greenling	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Spiny Dogfish	0.0	22	1	0.0	0	0	0.0	0	0	0.0	22	1
Other (Ground) Fish	0.0	47	5	0.0	124	1	0.0	0	0	0.1	171	6
Pink shrimp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other shrimp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	0.3	5,135	6	0.0	0	0	0.0	0	0	0.3	5,135	6
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.0	0	0	0.1	141	2
PACIFIC HALIBUT	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA HALIBUT	0.7	4,105	10	0.0	50	1	0.0	0	0	0.7	4,155	11
SALMON	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
UNSP. SEA CUCUMBERS	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CA Gillnet complex	0.0	16	2	0.0	0	0	0.0	0	0	0.0	16	2
Squid	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
COASTAL PELAGIC SPP	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Highly Migratory spp	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Dungeness crab	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other crab	0.0	6	1	0.0	0	0	0.0	0	0	0.0	6	1
Clams & Mussels	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Other Spp	0.1	150	6	0.0	42	1	0.0	0	0	0.1	192	7
Nearshore groundfish spp	0.9	1,924	16	1.2	3,178	8	0.0	11	1	2.1	5,113	25
Shelf groundfish spp	3.5	4,930	38	0.9	982	9	0.8	833	2	5.2	6,745	49
Slope groundfish spp	3.1	5,578	28	0.5	838	6	0.2	224	2	3.8	6,640	36
Dover sole, thornyheads, sablefish complex	0.5	1,036	12	0.1	109	4	0.2	269	2	0.8	1,414	18
Subtotal (all groundfish species)	**11.2**	**17,958**	**49**	**2.9**	**5,603**	**10**	**1.2**	**1,255**	**3**	**15.3**	**24,816**	**62**
Total (for all species)	**12.4**	**27,511**	**49**	**2.9**	**5,695**	**10**	**1.2**	**1,255**	**3**	**16.5**	**34,461**	**62**
All Companies - Total (all groundfish species)	**129,532**	**145,087,590**	**134**	**165,595**	**176,494,331**	**38**	**60,149**	**48,994,004**	**28**	**355,276**	**370,575,925**	**190**
All Companies - Total (all species)	**133,999**	**148,778,066**	**134**	**170,425**	**178,306,249**	**38**	**61,366**	**49,441,957**	**28**	**365,790**	**376,526,272**	**190**

Table 2-1b. Evaluation of Vessel Limit Options Compared with Maximum QS Allocations to Permits

				Maximum QS Allocated to a Permit by Allocation Formula				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent				Max QS Exeeds Option 3 Limit By Indicated Percent			
Whiting Sectors	Vessel Limits			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1	Option 2	Option 3	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting																			
Shoreside non-whiting Sector																			
Shoreside Whiting Sector	7.5%	11.3%	12.0%	4.7%	5.0%	2.3%	2.5%	-	-	-	-	-	-	-	-	-	-	-	-
Mothership Sector	25.0%	37.5%	50.0%	9.6%	10.2%	4.8%	5.1%	-	-	-	-	-	-	-	-	-	-	-	-
Catcher Processors	65.0%	97.5%	75.0%	-	23.6%	-	-		-				-				-		
All Whiting Sectors Combined	25.0%	37.5%	50.0%	18.2%	18.2%	9.1%	9.1%	-	-	-	-	-	-	-	-	-	-	-	-

Table 2-3b. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Including Permits owned by Buyers)

Whiting Sectors	Control Limits			Maximum QS Allocated to an Entity by QS Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent				Max QS Exeeds Option 3 Limit By Indicated Percent			
				100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	Option 3	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting																-	-	-	-
Shoreside non-whiting Sector																			
Shoreside Whiting Sector	10.0%	15.0%	25.0%	10.7%	11.5%	5.4%	5.7%	0.7%	1.5%	-	-	-	-	-	-	-	-	-	-
Mothership Sector	10.0%	15.0%	25.0%	9.6%	10.2%	4.8%	5.1%	-	0.2%	-	-	-	-	-	-	-	-	-	-
Catcher Processors	50.0%	75.0%	60.0%	-	53.5%	-	-		3.5%				-			-	-	-	-
All Whiting Sectors Combined	15.0%	22.5%	40.0%	18.2%	18.2%	9.1%	9.1%	3.2%	3.2%	-	-	-	-	-	-	-	-	-	-

Table 2-4b. Evaluation of Control Limit Options Compared with Maximum Harvester QS Allocations (Excluding Permits owned by Buyers)

				Maximum QS Allocated to an Entity by Allocation Formulas				Max QS Exeeds Option 1 Limit By Indicated Percent				Max QS Exeeds Option 2 Limit By Indicated Percent				Max QS Exeeds Option 3 Limit By Indicated Percent			
Whiting Sectors	Control Limits			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters		100% to Harvesters		75% to Harvesters		100% to Harvesters		75% to Harvesters	
Species	Option 1	Option 2	Option 3	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Pacific Whiting																-	-	-	-
Shoreside non-whiting Sector																			
Shoreside Whiting Sector	10.0%	15.0%	25.0%	10.7%	11.5%	5.4%	5.7%	0.7%	1.5%	-	-	-	-	-	-	-	-	-	-
Mothership Sector	10.0%	15.0%	25.0%	9.6%	10.2%	4.8%	5.1%	-	0.2%	-	-	-	-	-	-	-	-	-	-
Catcher Processors	50.0%	75.0%	60.0%	-	53.5%	-	-		3.5%				-			-	-	-	-
All Whiting Sectors Combined	15.0%	22.5%	40.0%	18.2%	18.2%	9.1%	9.1%	3.2%	3.2%	-	-	-	-	-	-	-	-	-	-

Table 2-5b. Evaluation of Control Limit Option 1 Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*									
Shoreside Whiting Sector	10.0%	121	1	1	0	0	10.7%	11.5%	0.0%	0.0%
Mothership Sector	10.0%	121	0	1	0	0	0.0%	10.2%	0.0%	0.0%
Catcher Processors	50.0%	4		1				53.5%		
All Whiting Sectors Combined	15.0%	125	1	1	0	0	18.2%	18.2%	0.0%	0.0%

Table 2-6b. Evaluation of Control Limit Option 1 Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers)

			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
Whiting Sectors			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 1 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
Pacific Whiting										
Shoreside non-whiting Sector	*10.0%*									
Shoreside Whiting Sector	10.0%	112	1	1	0	0	10.7%	11.5%	0.0%	0.0%
Mothership Sector	10.0%	119	0	1	0	0	0.0%	10.2%	0.0%	0.0%
Catcher Processors	50.0%	3		1				53.5%		
All Whiting Sectors Combined	15.0%	124	1	1	0	0	18.2%	18.2%	0.0%	0.0%

Table 2-7b. Evaluation of Control Limit <u>Option 2</u> Compared with Harvesting Entity Quota Shares (Including Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***121***								
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*									
Shoreside Whiting Sector	15.0%	121	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Mothership Sector	15.0%	121	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Catcher Processors	75.0%	4		0				0.0%		
All Whiting Sectors Combined	22.5%	125	0	0	0	0	0.0%	0.0%	0.0%	0.0%

Table 2-8b. Evaluation of Control Limit Option 2 Compared with Harvesting Entity Quota Shares (Excluding Permits owned by Buyers)

Whiting Sectors			Number of Harvesting Entities Over the Limit				Total QS Allocated to Entities Over the Limit			
			100% to Harvesters		50% to Harvesters		100% to Harvesters		50% to Harvesters	
Species	Option 2 Control Limits	Number of Entities	History + =	100% History	History + =	100% History	History + =	100% History	History + =	100% History
Total Entities Receiving Initial Allocation		***112***								
Pacific Whiting										
Shoreside non-whiting Sector	*15.0%*									
Shoreside Whiting Sector	15.0%	112	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Mothership Sector	15.0%	119	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Catcher Processors	75.0%	3		0				0.0%		
All Whiting Sectors Combined	22.5%	124	0	0	0	0	0.0%	0.0%	0.0%	0.0%

Table 2-9b. Evaluation of Control Limit Options Compared with Maximum QS Allocations to Buyers Based on Buying History Only (Assuming 50% of Allocation to Buyers)

Whiting Sectors

Species Group	Control Limits: Option 1	Option 2	Option 3	Maximum QS Allocated Based on Buying History Allocation Formulas (50%)	Max QS Exeeds Option 1 Limit by Indicated Percent	Max QS Exeeds Option 2 Limit by Indicated Percent	Max QS Exeeds Option 3 Limit by Indicated Percent
Pacific Whiting							
Shoreside non-whiting Sector							
Shoreside Whiting Sector	10.0%	15.0%	25.0%	15.7%	5.7%	0.7%	-
Mothership Sector	10.0%	15.0%	25.0%	15.02%	5.02%	0.02%	-
Catcher Processors	50.0%	75.0%	60.0%	26.8%	-	-	-
All Whiting Sectors Combined	15.0%	22.5%	40.0%	11.4%	-	-	-

Table 2-10. Evaluation of Control Limit Option 1 Compared with Combined Harvesting and Buying Entity Quota Shares

		Number of Harvesting Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	Option 1 Control Limits	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
All nonwhiting groundfish (in aggregate)	1.5%	121	14	116	20	302	9	297	14	4.9%	31.7%	5.1%	47.5%	13.9%	32.0%	14.0%	42.6%
Lingcod - coastwide	5.0%	121	1	112	1	244	1	235	1	5.3%	5.3%	5.8%	5.8%	14.2%	14.2%	14.5%	14.5%
N. of 42° (OR & WA)	5.0%	121	-	85	-	168	1	134	1	4.7%	-	4.7%	-	14.1%	14.1%	14.0%	14.0%
S. of 42° (CA)	5.0%	121	2	68	8	200	1	147	2	6.8%	12.0%	8.3%	49.8%	14.4%	14.4%	15.4%	20.6%
Pacific Cod	5.0%	121	3	87	6	164	2	131	6	11.4%	27.2%	20.4%	72.6%	14.4%	21.9%	19.9%	60.3%
Pacific Whiting																	
Shoreside non-whiting Sector	10.0%	121	-	59	2	145	1	85	2	8.7%	-	14.7%	26.5%	10.4%	10.4%	12.3%	23.4%
Shoreside Whiting Sector	10.0%	121	1	47	1	139	2	67	2	10.7%	10.7%	11.5%	11.5%	15.8%	28.0%	15.7%	27.8%
Mothership Sector	10.0%	121	-	28	1	124	3	31	3	9.6%	-	10.2%	10.2%	18.4%	43.0%	18.5%	43.3%
Catcher Processors	50.0%	4	1	4	1	4	1	4	1	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%	53.5%
All Whiting Sectors Combined	15.0%	125	1	55	1	144	1	76	1	18.2%	18.2%	18.2%	18.2%	20.5%	20.5%	20.5%	20.5%
Sablefish (Coastwide)	1.9%	121	6	112	13	233	6	224	6	4.7%	18.1%	4.7%	35.1%	15.6%	28.3%	15.6%	30.1%
N. of 36° (Monterey north)	2.0%	121	6	112	10	226	5	217	5	4.8%	17.4%	4.8%	28.8%	16.1%	26.5%	16.2%	28.6%
S. of 36° (Conception area)	5.0%	121	3	24	3	148	5	51	5	32.1%	54.0%	48.8%	82.7%	24.1%	59.5%	36.6%	80.8%
PACIFIC OCEAN PERCH	5.0%	121	1	96	3	180	2	156	2	5.8%	5.8%	6.8%	17.3%	16.1%	22.5%	16.8%	23.0%
Shortbelly Rockfish	5.0%	121	2	92	3	162	3	133	4	20.6%	27.4%	36.5%	55.4%	15.4%	34.4%	27.4%	54.5%
WIDOW ROCKFISH	3.4%	121	3	115	4	217	4	211	4	5.4%	14.0%	8.1%	23.4%	13.8%	25.3%	13.4%	28.7%
CANARY ROCKFISH	5.0%	121	-	113	1	226	1	218	1	4.6%	-	6.1%	6.1%	13.5%	13.5%	13.5%	13.5%
Chilipepper Rockfish	5.0%	121	7	63	8	193	6	135	6	9.7%	54.5%	11.8%	70.6%	10.0%	42.8%	11.7%	49.6%
BOCACCIO	5.0%	121	5	54	6	185	4	118	5	14.8%	43.9%	17.8%	56.6%	11.1%	32.2%	13.3%	42.0%
Splitnose Rockfish	5.0%	121	5	57	6	191	6	127	5	10.4%	44.1%	13.3%	61.5%	11.5%	44.2%	13.1%	48.2%
Yellowtail Rockfish	5.0%	121	1	99	2	180	2	159	1	6.9%	6.9%	8.6%	14.9%	16.0%	21.2%	17.3%	17.3%
Shortspine Thornyhead - coastwide	3.1%	121	2	110	4	218	3	207	4	5.5%	10.0%	7.2%	19.1%	14.4%	21.8%	14.2%	26.5%
N. of 34°27'	4.8%	121	-	97	1	173	1	150	1	4.5%	-	5.6%	5.6%	17.7%	17.7%	17.5%	17.5%
S. of 34°27'	4.7%	121	3	73	4	178	4	131	5	14.3%	27.6%	19.8%	43.0%	10.7%	33.2%	14.9%	46.3%
Longspine Thornyhead - coastwide	2.0%	121	9	109	13	202	7	190	10	4.6%	26.9%	5.6%	42.7%	15.6%	32.4%	15.5%	42.7%
N. of 34°27'	2.0%	121	9	109	13	201	7	189	10	4.6%	26.9%	5.6%	42.7%	15.6%	32.4%	15.5%	42.7%
S. of 34°27'	5.0%	121	1	1	1	122	2	2	2	64.6%	64.6%	100.0%	100.0%	48.4%	73.4%	75.0%	100.0%
COWCOD	5.0%	121	1	1	1	123	3	3	3	44.8%	44.8%	100.0%	100.0%	33.6%	58.6%	75.0%	100.0%
DARKBLOTCHED	5.0%	121	2	112	3	233	1	224	3	5.6%	11.0%	9.2%	23.3%	15.6%	15.6%	15.4%	29.0%
YELLOWEYE	5.0%	121	1	108	5	199	1	186	2	6.0%	6.0%	8.9%	32.3%	11.8%	11.8%	11.1%	17.7%
Black Rockfish - coastwide	5.0%	121	4	69	5	153	3	101	5	11.7%	32.1%	15.1%	46.0%	18.0%	33.4%	18.7%	49.0%
Black Rockfish (WA)	5.0%	121	2	17	4	129	4	26	6	13.5%	26.2%	40.3%	96.9%	12.5%	42.6%	30.2%	93.3%
Black Rockfish (OR-CA)	5.0%	121	5	61	5	146	3	86	5	13.9%	41.5%	16.7%	48.7%	19.7%	37.2%	20.3%	51.9%

Table 2-11. Evaluation of Control Limit <u>Option 2</u> Compared with Combined Harvesting and Buying Entity Quota Shares

		Number of Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	Option 2 Control Limits	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
All nonwhiting groundfish (in aggregate)	4.4%	121	4	116	7	302	4	297	7	4.9%	13.9%	5.1%	22.9%	13.9%	22.9%	14.0%	30.9%
Lingcod - coastwide	15.0%	121	-	112	-	244	1	235	1	5.3%	-	5.8%	-	14.2%	14.2%	14.5%	14.5%
N. of 42° (OR & WA)	15.0%	121	-	85	-	168	1	134	1	4.7%	-	4.7%	-	14.1%	14.1%	14.0%	14.0%
S. of 42° (CA)	15.0%	121	-	68	1	200	1	147	1	6.8%	-	8.3%	8.3%	14.4%	14.4%	15.4%	15.4%
Pacific Cod	15.0%	121	2	87	4	164	2	131	3	11.4%	21.4%	20.4%	59.0%	14.4%	21.9%	19.9%	43.4%
Pacific Whiting																	
Shoreside non-whiting Sector	11.3%	121	-	59	-	145	-	85	-	8.7%	-	14.7%	-	10.4%	-	12.3%	-
Shoreside Whiting Sector	11.3%	121	-	47	-	139	1	67	1	10.7%	-	11.5%	-	15.8%	15.8%	15.7%	15.7%
Mothership Sector	37.5%	121	-	28	-	124	1	31	1	9.6%	-	10.2%	-	18.4%	18.4%	18.5%	18.5%
Catcher Processors	97.5%	4	-	4	-	4	-	4	-	53.5%	-	53.5%	-	53.5%	-	53.5%	-
All Whiting Sectors Combined	22.5%	125	-	55	-	144	-	76	-	18.2%	-	18.2%	-	20.5%	-	20.5%	-
Sablefish (Coastwide)	5.7%	121	3	112	4	233	2	224	3	4.7%	11.1%	4.7%	15.9%	15.6%	19.0%	15.6%	22.2%
N. of 36° (Monterey north)	9.3%	121	2	112	3	226	2	217	3	4.8%	7.8%	4.8%	12.9%	16.1%	19.6%	16.2%	23.0%
S. of 36° (Conception area)	9.3%	121	2	24	3	148	3	51	4	32.1%	47.1%	48.8%	82.7%	24.1%	48.9%	36.6%	75.4%
PACIFIC OCEAN PERCH	9.3%	121	-	96	-	180	1	156	1	5.8%	-	6.8%	-	16.1%	16.1%	16.8%	16.8%
Shortbelly Rockfish	9.3%	121	1	92	3	162	2	133	3	20.6%	20.6%	36.5%	55.4%	15.4%	29.3%	27.4%	48.6%
WIDOW ROCKFISH	10.2%	121	1	115	2	217	1	211	2	5.4%	5.4%	8.1%	14.6%	13.8%	13.8%	13.4%	19.5%
CANARY ROCKFISH	15.0%	121	-	113	-	226	1	218	1	4.6%	-	6.1%	-	13.5%	13.5%	13.5%	13.5%
Chilipepper Rockfish	15.0%	121	4	63	5	193	2	135	4	9.7%	36.0%	11.8%	52.0%	10.0%	17.6%	11.7%	36.1%
BOCACCIO	15.0%	121	2	54	2	185	2	118	2	14.8%	26.8%	17.8%	31.7%	11.1%	20.1%	13.3%	23.8%
Splitnose Rockfish	15.0%	121	4	57	5	191	2	127	4	10.4%	37.0%	13.3%	56.0%	11.5%	19.3%	13.1%	41.2%
Yellowtail Rockfish	15.0%	121	-	99	1	180	1	159	1	6.9%	-	8.6%	8.6%	16.0%	16.0%	17.3%	17.3%
Shortspine Thornyhead - coastwide	9.3%	121	1	110	1	218	1	207	2	5.5%	5.5%	7.2%	7.2%	14.4%	14.4%	14.2%	19.6%
N. of 34°27'	14.4%	121	-	97	-	173	1	150	1	4.5%	-	5.6%	-	17.7%	17.7%	17.5%	17.5%
S. of 34°27'	14.1%	121	2	73	3	178	3	131	4	14.3%	21.8%	19.8%	38.2%	10.7%	27.6%	14.9%	40.3%
Longspine Thornyhead - coastwide	6.0%	121	4	109	5	202	3	190	5	4.6%	16.0%	5.6%	22.8%	15.6%	22.5%	15.5%	30.8%
N. of 34°27'	6.0%	121	4	109	5	201	3	189	5	4.6%	16.0%	5.6%	22.8%	15.6%	22.5%	15.5%	30.8%
S. of 34°27'	15.0%	121	1	1	1	122	2	2	2	64.6%	64.6%	100.0%	100.0%	48.4%	73.4%	75.0%	100.0%
COWCOD	15.0%	121	1	1	1	123	3	3	3	44.8%	44.8%	100.0%	100.0%	33.6%	58.6%	75.0%	100.0%
DARKBLOTCHED	15.0%	121	-	112	2	233	1	224	1	5.6%	-	9.2%	18.1%	15.6%	15.6%	15.4%	15.4%
YELLOWEYE	15.0%	121	-	108	1	199	1	186	1	6.0%	-	8.9%	8.9%	11.8%	11.8%	11.1%	11.1%
Black Rockfish - coastwide	15.0%	121	2	69	4	153	2	101	3	11.7%	19.5%	15.1%	40.0%	18.0%	26.8%	18.7%	38.0%
Black Rockfish (WA)	15.0%	121	2	17	4	129	4	26	4	13.5%	26.2%	40.3%	96.9%	12.5%	42.6%	30.2%	79.2%
Black Rockfish (OR-CA)	15.0%	121	2	61	3	146	2	86	3	13.9%	22.8%	16.7%	34.9%	19.7%	30.1%	20.3%	41.0%

Table 2-12. Evaluation of Control Limit <u>Option 3</u> Compared with Combined Harvesting and Buying Entity Quota Shares

		Number of Entities Over the Limit								Total QS Allocated to Entities Over the Limit							
		100% to Harvesters				75% to Harvesters (50% for whiting sectors)				100% to Harvesters				75% to Harvesters (50% for whiting sectors)			
		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional		Equal Sharing		Proportional	
Species	Option 3 Control Limits	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	Total Number of Entities	Number over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit	MAX QS	QS Over the Limit
All nonwhiting groundfish (in aggregate)	3.0%	121	2	116	4	302	2	297	3	4.9%	8.6%	5.1%	15.6%	13.9%	17.2%	14.0%	20.5%
Lingcod - coastwide																	
N. of 42° (OR & WA)																	
S. of 42° (CA)																	
Pacific Cod																	
Pacific Whiting																	
Shoreside non-whiting Sector	25.0%	121	-	59	-	145	-	85	-	8.7%	-	14.7%	-	10.4%	-	12.3%	-
Shoreside Whiting Sector	25.0%	121	-	47	-	139	-	67	-	10.7%	-	11.5%	-	15.8%	-	15.7%	-
Mothership Sector	25.0%	121	-	28	-	124	-	31	-	9.6%	-	10.2%	-	18.4%	-	18.5%	-
Catcher Processors	60.0%	4	-	4	-	4	-	4	-	53.5%	-	53.5%	-	53.5%	-	53.5%	-
All Whiting Sectors Combined	40.0%	125	-	55	-	144	-	76	-	18.2%	-	18.2%	-	20.5%	-	20.5%	-
Sablefish (Coastwide)																	
N. of 36° (Monterey north)																	
S. of 36° (Conception area)																	
PACIFIC OCEAN PERCH																	
Shortbelly Rockfish																	
WIDOW ROCKFISH																	
CANARY ROCKFISH																	
Chilipepper Rockfish																	
BOCACCIO																	
Splitnose Rockfish																	
Yellowtail Rockfish																	
Shortspine Thornyhead - coastwide																	
N. of 34°27'																	
S. of 34°27'																	
Longspine Thornyhead - coastwide																	
N. of 34°27'																	
S. of 34°27'																	
COWCOD																	
DARKBLOTCHED																	
YELLOWEYE																	
Black Rockfish - coastwide																	
Black Rockfish (WA)																	
Black Rockfish (OR-CA)																	

Shoreside Non-Whiting Companies that Received Groundfish During 1994-2003

The information in this table displays the quantities by species associated with all companies.

Supplemental Table 1. **Shoreside Non-Whiting Companies that Received Groundfish (Quantity (in MT) and Raw Product Cost (RPC) by Species, 1994-2003 Receipts)**

	California			Oregon			Washington			COMBINED		
Species	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**	**RWT**	**RPC**	**# of Co.**
Lingcod - coastwide	1,472.4	1,564,129	87	2,826.6	2,673,928	32	1,256.4	1,131,013	22	5,555.4	5,369,070	132
N. of 42° (OR & WA)	0.0	0	0	2,826.6	2,673,928	32	1,256.4	1,131,013	22	4,083.0	3,804,941	51
S. of 42° (CA)	1,472.4	1,564,129	87	0.0	0	0	0.0	0	0	1,472.4	1,564,129	87
Pacific Cod	0.7	894	10	858.3	911,239	19	4,483.4	4,267,192	24	5,342.4	5,179,325	47
Pacific Whiting (Coastwide)	157.5	23,111	18	342.1	48,384	13	100.8	15,859	5	600.4	87,354	30
Sablefish (Coastwide)	11,681.8	26,053,791	80	15,105.5	38,058,917	25	2,601.7	7,140,450	23	29,389.0	71,253,158	120
N. of 36° (Monterey north)	10,566.2	24,063,141	73	15,105.5	38,058,917	25	2,601.7	7,140,450	23	28,273.4	69,262,508	113
S. of 36° (Conception area)	1,115.6	1,990,650	30	0.0	0	0	0.0	0	0	1,115.6	1,990,650	30
PACIFIC OCEAN PERCH	74.2	59,406	22	3,390.8	2,656,714	26	1,494.9	1,197,457	22	4,959.9	3,913,577	63
Shortbelly Rockfish	137.6	59,953	33	90.4	39,048	17	0.0	18	2	228.1	99,019	47
WIDOW ROCKFISH	7,317.5	5,922,145	64	23,669.3	18,389,719	22	5,511.0	4,148,668	23	36,497.8	28,460,532	102
CANARY ROCKFISH	779.4	813,797	71	3,123.2	2,615,250	27	918.3	763,171	22	4,820.9	4,192,218	112
Chilipepper Rockfish	8,181.3	7,374,538	81	6.8	6,016	2	0.0	0	0	8,188.1	7,380,554	81
BOCACCIO	1,428.0	1,186,119	70	0.0	0	0	0.0	0	0	1,428.0	1,186,119	70
Splitnose Rockfish	3,286.2	1,939,836	79	0.0	5	1	0.0	0	0	3,286.3	1,939,841	79
Yellowtail Rockfish	542.2	453,449	22	14,547.4	12,171,480	26	6,889.0	5,759,436	23	21,978.7	18,384,365	63
Shortspine Thornyhead - coastwide	5,577.9	11,490,111	65	5,427.9	10,438,145	24	1,273.3	2,111,727	20	12,279.1	24,039,983	101
N. of 34°27'	1,999.0	4,333,821	20	5,425.7	10,434,417	24	1,273.3	2,111,727	20	8,698.0	16,879,965	56
S. of 34°27'	3,578.9	7,156,290	58	2.2	3,728	6	0.0	0	0	3,581.1	7,160,018	61
Longspine Thornyhead - coastwide	13,894.0	25,110,694	57	13,118.4	22,762,867	22	1,071.2	1,858,717	14	28,083.7	49,732,278	85
N. of 34°27'	13,893.6	25,110,594	56	13,118.4	22,762,867	22	1,071.2	1,858,717	14	28,083.2	49,732,178	84
S. of 34°27'	0.5	100	1	0.0	0	0	0.0	0	0	0.5	100	1
Other thornyheads	319.2	588,603	35	246.0	384,149	13	0.0	0	0	565.2	972,752	44
COWCOD	0.0	20	2	0.0	0	0	0.0	0	0	0.0	20	2
DARKBLOTCHED	2,294.2	1,896,538	78	2,441.5	1,844,024	28	129.9	104,768	22	4,865.6	3,845,330	120
YELLOWEYE	42.5	42,624	52	372.8	282,838	21	45.9	35,873	19	461.1	361,335	85
Black Rockfish - coastwide	30.8	32,119	21	133.9	116,031	14	23.1	19,619	10	187.8	167,769	38
Black Rockfish (WA)	0.0	0	0	0.0	0	0	23.1	19,619	10	23.1	19,619	10
Black Rockfish (OR-CA)	30.8	32,119	21	133.9	116,031	14	0.0	0	0	164.7	148,150	31
Minor Rockfish North	1,826.3	1,268,369	75	6,921.6	4,848,259	33	1,623.5	1,283,179	23	10,371.4	7,399,807	123
Nearshore Species	2.9	4,006	8	5.3	4,245	4	0.1	96	4	8.2	8,347	14
Shelf Species	1,008.6	737,364	73	3,882.4	2,668,682	30	1,014.6	787,960	23	5,905.7	4,194,006	118
BOCACCIO: N. of Monterrey	111.1	91,303	16	436.5	334,959	21	260.0	204,386	20	807.6	630,648	50
Chilipepper Rockfish: Eureka	436.7	305,895	25	195.3	174,478	12	0.7	676	6	632.6	481,049	39
Redstripe Rockfish	22.4	14,089	14	957.4	549,256	22	135.3	104,767	22	1,115.1	668,112	52
Silvergrey Rockfish	0.7	647	3	405.4	314,101	21	369.1	287,843	20	775.2	602,591	40
Other Northern Shelf Rockfish	437.7	325,430	70	1,887.9	1,295,888	30	249.6	190,288	23	2,575.1	1,811,606	115
Slope Species	814.8	526,999	27	3,033.9	2,175,332	29	608.8	495,123	22	4,457.4	3,197,454	70
Bank Rockfish	86.9	68,938	15	37.8	27,119	19	0.0	0	0	124.7	96,057	30
Sharpchin Rockfish, north	325.7	192,365	20	813.5	474,340	24	82.6	63,594	20	1,221.8	730,299	57
Splitnose Rockfish: N. of Monterrey	243.9	149,333	23	450.6	301,954	26	34.4	26,962	20	728.8	478,249	61
Yellowmouth Rockfish	5.5	4,465	4	553.4	404,638	20	64.8	49,616	17	623.7	458,719	36
Other Northern Slope Rockfish	152.8	111,898	24	1,178.6	967,281	29	427.0	354,951	22	1,758.4	1,434,130	67
Minor Rockfish South	5,110.6	4,677,538	101	12.4	8,972	7	0.0	0	0	5,123.0	4,686,510	106
Nearshore Species	60.5	56,811	40	0.0	0	0	0.0	0	0	60.5	56,811	40
Shelf Species	1,180.0	1,088,258	99	6.7	5,763	5	0.0	0	0	1,186.7	1,094,021	102
Redstripe Rockfish	6.8	4,695	12	0.0	0	0	0.0	0	0	6.8	4,695	12
Yellowtail Rockfish	532.3	469,493	51	1.7	1,455	3	0.0	0	0	534.1	470,948	52
Other Southern Shelf Rockfish	640.8	614,070	96	5.0	4,308	4	0.0	0	0	645.8	618,378	98
Slope Species	3,870.1	3,532,469	82	5.7	3,209	6	0.0	0	0	3,875.8	3,535,678	86
Bank Rockfish	2,394.9	2,279,032	72	0.0	2	1	0.0	0	0	2,394.9	2,279,034	72
Blackgill Rockfish	923.1	893,668	76	0.0	0	0	0.0	0	0	923.1	893,668	76
Sharpchin Rockfish	152.7	89,525	41	0.0	0	0	0.0	0	0	152.7	89,525	41
Yellowmouth Rockfish	5.5	4,383	8	0.0	0	1	0.0	0	0	5.5	4,383	8
Other Southern Slope Rockfish	394.0	265,861	72	5.7	3,207	6	0.0	0	0	399.7	269,068	76
California scorpionfish	6.1	4,499	7	0.0	0	0	0.0	0	0	6.1	4,499	7
Cabezon (off CA only)	2.9	1,980	6	0.0	0	0	0.0	0	0	2.9	1,980	6
Dover Sole	41,574.9	29,549,685	71	39,126.8	29,227,553	26	7,377.0	5,336,081	19	88,078.7	64,113,319	108
Dover Sole (summer)	22,724.1	16,329,201	63	19,049.0	14,165,025	22	3,269.0	2,354,136	18	45,042.1	32,848,362	95
Dover Sole (winter)	18,850.8	13,220,484	59	20,077.8	15,062,528	24	4,108.0	2,981,945	17	43,036.6	31,264,957	92
English Sole	4,092.4	3,308,869	84	3,829.5	2,844,976	27	2,520.4	1,872,734	20	10,442.4	8,026,579	123
Petrale Sole (coastwide)	5,686.8	11,630,957	99	8,016.8	16,881,157	33	3,178.8	6,678,674	21	16,882.4	35,190,788	144
N of 40°10' summer	874.9	1,582,062	23	2,405.2	5,158,056	27	1,698.3	3,657,296	17	4,978.4	10,397,414	59
N of 40°10' winter	1,791.4	3,401,700	20	5,601.0	11,702,235	28	1,480.5	3,021,378	20	8,872.9	18,125,313	59
S of 40°10' summer	1,172.0	2,638,823	75	0.6	1,315	6	0.0	0	0	1,172.6	2,640,138	79
S of 40°10' winter	1,848.5	4,008,372	77	10.0	19,551	6	0.0	0	0	1,858.5	4,027,923	80
Arrowtooth Flounder	465.6	124,456	21	12,731.0	2,967,840	22	15,343.5	3,538,906	16	28,540.0	6,631,202	51
Arrowtooth Flounder summer	334.9	87,315	19	10,030.9	2,312,360	19	13,596.5	3,123,894	15	23,962.3	5,523,569	45
Arrowtooth Flounder winter	130.7	37,141	13	2,700.1	655,480	19	1,747.0	415,012	14	4,577.7	1,107,633	39
Starry Flounder	10.8	12,540	18	313.4	247,256	20	38.9	22,514	13	363.1	282,310	45
Other Flatfish	11,018.8	9,088,079	102	6,206.3	5,309,442	29	651.7	519,843	21	17,876.9	14,917,364	143
Kelp Greenling	1.7	1,176	13	0.0	174	3	0.0	0	0	1.8	1,350	15
Spiny Dogfish	45.9	22,658	14	339.1	86,250	8	3,613.5	1,185,265	15	3,998.5	1,294,173	33
Other (Ground) Fish	2,471.5	784,907	58	2,396.9	673,698	18	3.0	2,840	8	4,871.3	1,461,445	77
Pink shrimp	0.0	0	0	0.0	0	0	221.7	208,480	1	221.7	208,480	1
Other shrimp	0.1	699	2	0.4	2,483	4	1.4	9,482	1	1.9	12,664	6
GOLDEN PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
SPOTTED PRAWN	20.2	239,685	38	0.0	0	0	0.0	0	0	20.2	239,685	38
SPOTTED PRAWN	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
RIDGEBACK PRAWN	0.1	141	2	0.0	0	0	0.0	0	0	0.1	141	2
PACIFIC HALIBUT	0.0	94	1	0.2	903	6	0.0	72	2	0.2	1,069	8
CALIFORNIA HALIBUT	310.3	1,583,070	71	0.4	1,357	11	0.0	0	0	310.7	1,584,427	78
SALMON	0.0	9	1	0.0	0	0	0.0	0	0	0.0	9	1
UNSP. SEA CUCUMBERS	0.0	42	1	0.0	0	0	0.0	0	0	0.0	42	1
ALL ECHINODERMS	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
CALIFORNIA SHEEPHEAD	0.2	185	4	0.0	0	0	0.0	0	0	0.2	185	4
CA Gillnet complex	3,867.8	1,631,319	61	4,674.1	1,722,165	18	950.5	203,189	18	9,492.5	3,556,673	88
Squid	1.8	1,401	11	0.8	445	2	0.0	0	0	2.6	1,846	11
COASTAL PELAGIC SPP	21.4	10,123	20	57.7	7,375	7	0.0	0	0	79.1	17,498	25
Highly Migratory spp	3.0	2,724	18	1.0	2,220	5	0.4	595	4	4.5	5,539	21
Dungeness crab	3.6	13,493	11	0.0	0	0	0.0	0	0	3.6	13,493	11
Other crab	6.7	12,582	10	0.0	3	1	0.0	0	0	6.7	12,585	10
Clams & Mussels	1.6	1,244	7	0.0	0	0	0.0	0	0	1.6	1,244	7
Other Spp	230.0	193,665	70	95.4	74,967	21	42.6	26,135	11	368.0	294,767	94
Nearshore groundfish spp	1,588.1	1,677,260	94	3,279.2	3,041,634	32	1,318.5	1,173,242	22	6,185.8	5,892,136	139
Shelf groundfish spp	42,406.9	35,665,991	123	58,451.8	43,229,250	36	38,049.0	23,806,957	27	138,907.8	102,702,198	176
Slope groundfish spp	60,207.2	71,794,451	108	79,812.9	86,133,006	33	17,424.7	16,334,813	25	157,444.8	174,262,270	157
Dover sole, thornyheads, sablefish complex	73,047.9	92,792,884	90	73,024.7	100,871,631	30	12,323.2	16,446,975	24	158,395.7	210,111,490	136
Subtotal (all groundfish species)	**129,531.8**	**145,087,590**		**165,594.8**	**176,494,331**		**60,149.4**	**48,994,004**		**355,276.0**	**370,575,925**	**190**
Total (for all species)	**133,998.6**	**148,778,066**	**134**	**170,424.8**	**178,306,249**	**38**	**61,366.1**	**49,441,957**	**28**	**365,789.5**	**376,526,272**	**190**

Supplemental Table 2. Illustration of Relative lb "weights" (Sector Catch in Year 2003 Divided by Annual Catch): 1994 to 2004

Stock or Complex	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Lingcod - coastwide	0.04	0.06	0.05	0.05	0.28	0.28	0.91	1.04	0.59	1.00	1.04
N. of 42° (OR & WA)	0.05	0.06	0.05	0.06	0.34	0.36	1.26	1.54	0.73	1.00	1.14
S. of 42° (CA)	0.04	0.04	0.04	0.04	0.16	0.15	0.43	0.46	0.33	1.00	0.78
Pacific Cod	1.26	2.12	2.40	1.77	2.57	3.76	3.80	3.30	1.51	1.00	0.94
Pacific Whiting											
Shoreside Non-whiting	0.60	0.43	0.46	0.26	0.27	1.17	0.84	1.20	0.77	1.00	2.06
Shoreside Whiting	0.70	0.68	0.62	0.59	0.58	0.61	0.60	0.70	1.12	1.00	0.55
At-Sea Whiting (MS)	0.46	0.79	0.58	0.53	0.52	0.55	0.61	0.73	0.98	1.00	1.08
At-Sea Whiting (CP)	0.48	0.67	0.63	0.58	0.59	0.61	0.61	0.70	1.13	1.00	0.56
Sablefish (Coastwide)	0.66	0.63	0.56	0.63	1.08	0.74	0.86	0.92	1.61	1.00	0.95
N. of 36° (Monterey north)	0.67	0.64	0.57	0.63	1.11	0.73	0.85	0.90	1.61	1.00	0.95
S. of 36° (Conception area)	0.51	0.38	0.36	0.51	0.68	0.94	2.15	2.74	1.59	1.00	0.97
PACIFIC OCEAN PERCH	0.15	0.16	0.16	0.20	0.22	0.25	0.97	0.70	0.89	1.00	1.01
Shortbelly Rockfish	0.01	0.01	0.01	0.00	0.01	0.10	0.01	0.05	3.08	1.00	2.65
WIDOW ROCKFISH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.00	0.46
CANARY ROCKFISH	0.01	0.01	0.01	0.01	0.01	0.01	0.21	0.32	0.18	1.00	1.17
Chilipepper Rockfish	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.02	0.05	1.00	0.19
BOCACCIO	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	1.00	0.02
Splitnose Rockfish	0.52	0.55	0.37	0.35	0.12	0.73	1.80	1.67	2.70	1.00	0.92
Yellowtail Rockfish	0.02	0.03	0.02	0.08	0.06	0.06	0.04	0.07	0.14	1.00	1.08
Shortspine Thornyhead - coastwide	0.22	0.36	0.44	0.48	0.56	0.93	0.87	1.41	1.00	1.00	1.00
N. of 34°27'	0.21	0.38	0.43	0.46	0.54	0.88	0.96	1.32	1.08	1.00	1.06
S. of 34°27'	0.27	0.32	0.47	0.50	0.62	1.09	0.72	1.67	0.85	1.00	0.90
Longspine Thornyhead - coastwide	0.38	0.29	0.33	0.40	0.70	0.88	1.09	1.37	0.82	1.00	2.15
N. of 34°27'	0.38	0.29	0.33	0.40	0.70	0.88	1.09	1.37	0.82	1.00	2.15
S. of 34°27'	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	E	0.00	0.00
COWCOD	0.00	0.00	E	0.00	0.00	0.00	0.00	0.00	E	0.00	0.00
DARKBLOTCHED	0.10	0.11	0.11	0.10	0.09	0.23	0.33	0.52	0.74	1.00	0.42
YELLOWEYE	0.01	0.01	0.01	0.01	0.03	0.04	0.79	0.49	1.02	1.00	2.93
Black Rockfish - coastwide	0.02	0.10	0.05	0.04	0.01	0.19	0.48	0.93	0.27	1.00	0.37
Black Rockfish (WA)	E	E	0.00	E	E	0.00	0.00	0.00	E	0.00	0.00
Black Rockfish (OR-CA)	0.02	0.15	0.05	0.04	0.01	0.19	0.48	0.93	0.30	1.00	0.37
Minor Rockfish North	0.07	0.09	0.09	0.10	0.10	0.20	0.43	0.45	1.20	1.00	0.69
Nearshore Species	0.40	0.30	12.02	0.94	0.05	1.73	0.76	0.47	0.36	1.00	0.20
Shelf Species	0.02	0.02	0.02	0.02	0.02	0.05	0.36	0.10	0.43	1.00	1.61
Slope Species	0.13	0.18	0.20	0.19	0.29	0.41	0.44	0.94	1.63	1.00	0.64
Minor Rockfish South	0.29	0.27	0.20	0.21	0.23	1.54	1.08	0.88	0.48	1.00	0.79
Nearshore Species	0.11	0.05	0.02	0.03	0.54	0.03	0.98	1.54	0.54	1.00	3.26
Shelf Species	0.02	0.01	0.01	0.01	0.01	0.08	0.09	0.12	0.19	1.00	1.52
Slope Species	0.41	0.37	0.26	0.29	0.33	2.49	1.28	0.97	0.50	1.00	0.78
California scorpionfish	E	0.00	0.00	E	0.00	0.00	0.00	E	E	0.00	0.00
Cabezon (off CA only)	E	0.00	E	0.00	0.00	E	E	E	E	0.00	0.00
Dover Sole	0.86	0.72	0.61	0.74	0.93	0.82	0.85	1.09	1.18	1.00	1.05
English Sole	0.79	0.77	0.76	0.60	0.76	0.96	1.15	0.89	0.76	1.00	0.96
Petrale Sole (coastwide)	1.49	1.22	1.08	1.04	1.33	1.32	1.05	1.09	1.09	1.00	1.02
Arrowtooth Flounder	0.74	1.00	1.06	0.99	0.72	0.43	0.70	0.94	1.11	1.00	0.97
Starry Flounder	0.40	0.58	1.04	0.49	0.55	1.31	1.15	3.96	1.58	1.00	0.24
Other Flatfish	0.68	0.62	0.79	0.81	0.96	0.78	0.97	0.92	0.91	1.00	1.16
Kelp Greenling	0.13	0.01	0.33	0.00	0.35	0.00	0.00	0.85	34.00	1.00	0.00
Spiny Dogfish	0.19	0.55	1.01	0.59	0.49	0.46	0.72	0.59	0.44	1.00	1.65
Other Fish	0.26	0.26	0.30	0.40	0.36	0.70	0.95	0.96	1.22	1.00	2.04

Table 3a. Example of Quota Share (QS) Allocations for a Selected Shoreside Non-whiting Vessel Permit (catch in lbs) with a Relatively Early Catch History.

Permit	Species Group	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL Actual lbs	Actual lbs QS (1)	TOTAL Relative lbs	Relative lbs QS (2)	Difference in QS (2) - (1)	Percent Difference in QS*
SNW1	Lingcod - coastwide	2,162	2,969	31,230	72,004	3,143	1,810	715	38				114,070	0.93%	7,612	0.52%	-0.41%	- 44%
	N. of 42° (OR & WA)	2,162	2,969	25,681	47,400	3,143	1,810	715	38				83,917	0.93%	6,982	0.60%	-0.33%	- 36%
	S. of 42° (CA)	0	0	5,549	24,604	0	0	0	0				30,153	0.92%	1,182	0.40%	-0.52%	- 56%
	Pacific Cod	178	11	236	293	558	74	14	275				1,639	0.01%	4,002	0.02%	0.00%	+ 37%
	Pacific Whiting (Coastwide)	1,391	0	46	0	0	0	0	0				1,437	0.11%	861	0.12%	0.01%	+ 5%
	Sablefish (Coastwide)	24,065	41,773	60,763	49,192	35,528	56,317	43,925	32,718				344,280	0.49%	255,295	0.45%	-0.04%	- 8%
	N. of 36° (Monterey north)	24,065	41,773	60,763	49,192	35,528	56,317	43,925	32,718				344,280	0.51%	256,058	0.47%	-0.04%	- 8%
	S. of 36° (Conception area)	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	PACIFIC OCEAN PERCH	10,683	27,419	16,565	19,623	13,205	7,175	7,062	3,600				105,331	0.94%	26,549	0.83%	-0.11%	- 12%
	Shortbelly Rockfish	0	1	267	10	0	0	108	0				386	0.08%	3	0.06%	-0.02%	- 27%
	WIDOW ROCKFISH	264,370	293,456	295,570	279,832	141,522	187,317	143,919	21,673				1,627,660	2.04%	1,359	1.39%	-0.64%	- 32%
	CANARY ROCKFISH	12,542	10,277	82,980	31,806	33,781	18,020	0	61				189,467	1.79%	1,760	0.95%	-0.83%	- 47%
	Chilipepper Rockfish	0	0	24,252	49,763	0	0	0	0				74,015	0.41%	368	0.21%	-0.20%	- 50%
	BOCACCIO	0	0	17,439	10,100	0	0	0	0				27,539	0.87%	12	0.45%	-0.42%	- 48%
	Splitnose Rockfish	0	0	9,896	289	0	0	0	0				10,184	0.13%	3,810	0.10%	-0.03%	- 22%
	Yellowtail Rockfish	54,934	15,965	129,421	28,765	44,741	54,764	75,440	18,337				422,367	0.87%	17,152	0.70%	-0.17%	- 19%
	Shortspine Thornyhead - coastwide	10,407	16,161	19,546	16,306	12,290	11,857	8,841	7,524				102,931	0.36%	60,735	0.38%	0.01%	+ 4%
	N. of 34°27'	10,407	16,161	15,014	13,647	12,290	11,857	8,841	7,524				95,741	0.48%	56,514	0.50%	0.03%	+ 5%
	S. of 34°27'	0	0	4,531	2,659	0	0	0	0				7,190	0.09%	3,476	0.07%	-0.02%	- 18%
	Longspine Thornyhead - coastwide	20,578	40,458	83,410	51,451	6,493	15,680	35,705	16,861				270,634	0.43%	147,893	0.39%	-0.03%	- 8%
	N. of 34°27'	20,578	40,458	83,410	51,451	6,493	15,680	35,705	16,861				270,634	0.43%	147,893	0.39%	-0.03%	- 8%
	S. of 34°27'	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	COWCOD	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	DARKBLOTCHED	16,357	25,059	12,492	17,685	31,525	5,105	3,502	757				112,482	1.01%	13,054	0.68%	-0.33%	- 33%
	YELLOWEYE	2,456	1,307	12,899	5,929	156	350	0	0				23,097	2.26%	249	1.06%	-1.20%	- 53%
	Black Rockfish - coastwide	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Black Rockfish (WA)	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Black Rockfish (OR-CA)	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Minor Rockfish North	13,740	33,271	41,492	27,093	28,319	14,105	9,698	3,939				171,657	0.74%	21,812	0.60%	-0.14%	- 19%
	Nearshore Species	0	0	0	0	565	0	0	0				565	2.71%	30	0.50%	-2.20%	- 81%
	Shelf Species	3,792	11,305	27,646	12,575	10,657	7,486	327	4				73,793	0.57%	1,696	0.37%	-0.20%	- 35%
	Slope Species	9,947	21,966	13,846	14,519	17,096	6,619	9,371	3,935				97,299	0.96%	26,401	0.84%	-0.12%	- 12%
	Minor Rockfish South	0	0	18,197	38,167	0	0	0	0				56,364	0.48%	11,522	0.25%	-0.23%	- 47%
	Nearshore Species	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Shelf Species	0	0	6,259	1,599	0	0	0	0				7,857	0.30%	98	0.15%	-0.15%	- 50%
	Slope Species	0	0	11,938	36,568	0	0	0	0				48,506	0.53%	13,704	0.30%	-0.23%	- 43%
	California scorpionfish	0	0	0	12,408	0	0	0	0				12,408	92.92%	0	0.00%	-92.92%	- 100%
	Cabezon (off CA only)	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Dover sole (total)	42,546	51,907	54,125	83,543	58,628	109,660	64,990	105,333				570,733	0.27%	482,491	0.27%	-0.01%	- 2%
	English Sole	2,150	847	2,046	3,697	2,176	1,589	0	101				12,606	0.05%	9,384	0.05%	-0.01%	- 10%
	Petrale Sole (coastwide)	3,171	12,073	7,051	5,615	7,336	2,857	5,782	6,599				50,484	0.12%	59,704	0.13%	0.00%	+ 4%
	Arrowtooth Flounder (total)	3,146	33	832	898	2,044	10,387	2,952	16,785				37,078	0.05%	27,973	0.05%	0.00%	- 8%
	Starry Flounder	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Other Flatfish	1,144	343	1,139	5,431	2,260	4,025	2,064	2,352				18,758	0.04%	15,757	0.04%	0.00%	- 1%
	Kelp Greenling	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Spiny Dogfish	0	0	0	0	0	0	0	0				0	0.00%	0	0.00%	0.00%	-
	Other Fish	106	0	0	1,238	0	0	0	110				1,454	0.01%	622	0.01%	0.00%	- 14%
	Total Groundfish	487,136	573,329	921,893	811,138	423,704	501,091	404,717	237,063				4,360,069	0.53%	2,299,754	0.45%	-0.08%	- 15%

Table 3b. Example of Quota Share (QS) Allocations for a Selected Shoreside Non-whiting Vessel Permit (catch in lbs) with a Relatively Late Catch History.

Permit	Species Group	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL Actual lbs	Actual lbs QS (1)	TOTAL Relative lbs	Relative lbs QS (2)	Difference in QS (2) - (1)	Percent Difference in QS*
SNW2	Lingcod - coastwide	109	146	102	94	85	129	134	386	466	2,152	3,263	7,066	0.06%	6,429	0.44%	0.38%	+ 666%
	N. of 42° (OR & WA)	109	146	102	94	85	129	134	386	466	2,152	3,263	7,066	0.08%	7,069	0.60%	0.53%	+ 675%
	S. of 42° (CA)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Pacific Cod	290	75	179	260	74	102	158	84	1,703	21,823	35,305	60,053	0.42%	60,594	0.24%	-0.18%	- 43%
	Pacific Whiting (Coastwide)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Sablefish (Coastwide)	0	0	0	30	0	1,318	1,872	20,897	15,124	18,694	11,184	69,119	0.10%	75,578	0.13%	0.04%	+ 36%
	N. of 36° (Monterey north)	0	0	0	30	0	1,318	1,872	20,897	15,124	18,694	11,184	69,119	0.10%	75,111	0.14%	0.04%	+ 34%
	S. of 36° (Conception area)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	PACIFIC OCEAN PERCH	2	0	0	0	0	34	2	0	0	0	0	38	0.00%	11	0.00%	0.00%	- 0%
	Shortbelly Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	WIDOW ROCKFISH	0	0	0	0	0	2	2,816	101	0	0	5	2,924	0.00%	6	0.01%	0.00%	+ 56%
	CANARY ROCKFISH	21	0	0	4	54	164	402	106	398	11	57	1,217	0.01%	272	0.15%	0.14%	+ 1,182%
	Chilipepper Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	BOCACCIO	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Splitnose Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Yellowtail Rockfish	0	52	14	0	313	491	32,850	10,301	3,825	2,184	2,907	52,937	0.11%	7,886	0.32%	0.21%	+ 196%
	Shortspine Thornyhead - coastwide	0	0	0	0	0	131	177	1,531	112	1,207	3	3,160	0.01%	3,757	0.02%	0.01%	+ 110%
	N. of 34°27'	0	0	0	0	0	131	177	1,531	112	1,207	3	3,160	0.02%	3,639	0.03%	0.02%	+ 106%
	S. of 34°27'	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Longspine Thornyhead - coastwide	0	0	0	0	0	1	1	142	2	0	0	145	0.00%	198	0.00%	0.00%	+ 129%
	N. of 34°27'	0	0	0	0	0	1	1	142	2	0	0	145	0.00%	198	0.00%	0.00%	+ 129%
	S. of 34°27'	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	COWCOD	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	DARKBLOTCHED	15	0	0	1	0	59	32	29	28	4	0	169	0.00%	66	0.00%	0.00%	+ 126%
	YELLOWEYE	1	0	0	0	0	1	0	4	69	0	0	75	0.01%	72	0.31%	0.30%	+ 4,109%
	Black Rockfish - coastwide	1,119	584	1,060	71	1,062	72	216	0	0	7	307	4,498	1.07%	382	1.80%	0.73%	+ 68%
	Black Rockfish (WA)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Black Rockfish (OR-CA)	1,119	584	1,060	71	1,062	72	216	0	0	7	307	4,498	1.22%	416	1.96%	0.74%	+ 61%
	Minor Rockfish North	87	1	0	4	11	212	494	185	436	243	29	1,702	0.01%	1,132	0.03%	0.02%	+ 325%
	Nearshore Species	0	0	0	0	0	0	0	0	0	1	25	26	0.12%	6	0.10%	-0.02%	- 19%
	Shelf Species	51	1	0	3	11	102	181	121	384	105	2	961	0.01%	356	0.08%	0.07%	+ 943%
	Slope Species	36	0	0	1	0	110	314	64	52	137	2	716	0.01%	471	0.01%	0.01%	+ 113%
	Minor Rockfish South	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Nearshore Species	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Shelf Species	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Slope Species	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	California scorpionfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Cabezon (off CA only)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Dover sole (total)	1,723	11,937	20,387	30,256	42,804	45,137	56,592	77,677	62,350	96,197	64,059	509,119	0.24%	490,890	0.27%	0.03%	+ 12%
	English Sole	7,625	4,839	6,791	2,925	852	9,688	26,200	15,606	29,294	25,371	27,947	157,136	0.63%	145,131	0.70%	0.07%	+ 11%
	Petrale Sole (coastwide)	1,709	1,816	3,271	2,807	6,308	5,613	15,090	7,473	12,539	24,520	42,459	123,606	0.30%	132,416	0.28%	-0.02%	- 6%
	Arrowtooth Flounder (total)	41	0	0	0	0	7,445	10,744	18,051	799	730	19	37,828	0.06%	29,415	0.05%	0.00%	- 5%
	Starry Flounder	3,132	7,258	7,411	1,984	2,311	622	1,042	1,666	5,728	17,540	7,494	56,188	5.30%	52,420	7.47%	2.18%	+ 41%
	Other Flatfish	31,080	26,590	21,399	10,340	10,547	8,791	7,233	22,517	47,133	46,636	39,267	271,532	0.64%	242,470	0.68%	0.04%	+ 5%
	Kelp Greenling	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Spiny Dogfish	0	0	0	0	0	0	122	0	0	0	0	122	0.00%	88	0.00%	0.00%	+ 36%
	Other Fish	0	20	0	0	24	0	38	0	0	0	0	82	0.00%	50	0.00%	0.00%	+ 22%
	Total Groundfish	46,954	53,320	60,616	48,775	64,444	80,009	156,214	176,756	180,003	257,319	234,304	1,358,714	0.16%	1,138,045	0.22%	0.06%	+ 36%

Table 3c. Example of Quota Share (QS) Allocations for a Selected Shoreside Non-whiting Vessel Permit (catch in lbs) with a Relatively Constant Catch History.

Permit	Species Group	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL Actual lbs	Actual lbs QS (1)	TOTAL Relative lbs	Relative lbs QS (2)	Difference in QS (2) - (1)	Percent Difference in QS*
SNW3	Lingcod - coastwide	5,020	2,789	2,195	3,029	2,321	2,817	1,332	1,011	1,128	2,234	2,586	26,460	0.21%	9,934	0.68%	0.46%	+ 216%
	N. of 42° (OR & WA)	5,020	2,789	2,195	3,029	2,321	2,817	1,332	1,011	1,128	2,234	2,586	26,460	0.29%	11,722	1.00%	0.71%	+ 243%
	S. of 42° (CA)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Pacific Cod	8,599	830	1,245	4,732	24,488	4,612	1,012	1,074	13,115	55,591	90,774	206,071	1.45%	272,579	1.08%	-0.37%	- 26%
	Pacific Whiting (Coastwide)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Sablefish (Coastwide)	2,992	2,344	9,913	8,631	12,169	15,392	7,997	33,450	16,335	19,848	14,136	143,207	0.20%	136,348	0.24%	0.04%	+ 18%
	N. of 36° (Monterey north)	2,992	2,344	9,913	8,631	12,169	15,392	7,997	33,450	16,335	19,848	14,136	143,207	0.21%	135,922	0.25%	0.04%	+ 17%
	S. of 36° (Conception area)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	PACIFIC OCEAN PERCH	288	34	268	21	1,245	2,606	478	217	515	1	0	5,673	0.05%	2,101	0.07%	0.02%	+ 30%
	Shortbelly Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	- 36%
	WIDOW ROCKFISH	44	77	2	10	416	1,257	16	2,939	0	0	4	4,765	0.01%	11	0.01%	0.00%	+ 82%
	CANARY ROCKFISH	2,077	2,104	1,957	1,639	3,296	3,659	903	771	479	299	0	17,184	0.16%	980	0.53%	0.37%	+ 228%
	Chilipepper Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	BOCACCIO	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Splitnose Rockfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Yellowtail Rockfish	3,497	1,418	2,207	2,737	17,180	49,853	2,938	1,901	15,906	3,079	1,920	102,637	0.21%	12,147	0.50%	0.29%	+ 135%
	Shortspine Thornyhead - coastwide	13	69	94	328	259	1,222	377	794	213	730	480	4,578	0.02%	4,382	0.03%	0.01%	+ 69%
	N. of 34°27'	13	69	94	328	255	1,222	377	794	213	730	480	4,574	0.02%	4,309	0.04%	0.02%	+ 68%
	S. of 34°27'	0	0	0	0	4	0	0	0	0	0	0	4	0.00%	2	0.00%	0.00%	+ 5%
	Longspine Thornyhead - coastwide	0	79	101	178	8	13	412	138	874	0	1	1,805	0.00%	1,500	0.00%	0.00%	+ 40%
	N. of 34°27'	0	79	101	178	8	13	412	138	874	0	1	1,805	0.00%	1,501	0.00%	0.00%	+ 40%
	S. of 34°27'	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	COWCOD	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	DARKBLOTCHED	1,372	92	123	81	113	602	388	69	960	12	3	3,814	0.03%	1,208	0.06%	0.03%	+ 83%
	YELLOWEYE	106	4	10	5	39	3	0	33	0	4	0	202	0.02%	23	0.10%	0.08%	+ 390%
	Black Rockfish - coastwide	7,616	3,728	5,903	20,314	9,552	359	399	5	356	20	114	48,366	11.54%	2,074	9.78%	-1.76%	- 15%
	Black Rockfish (WA)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Black Rockfish (OR-CA)	7,616	3,728	5,903	20,314	9,552	359	399	5	356	20	114	48,366	13.13%	2,339	11.03%	-2.10%	- 16%
	Minor Rockfish North	7,809	277	521	298	438	1,207	1,426	725	1,081	96	109	13,986	0.06%	3,325	0.09%	0.03%	+ 52%
	Nearshore Species	0	0	0	0	0	0	0	15	84	13	6	118	0.57%	51	0.87%	0.30%	+ 53%
	Shelf Species	4,682	172	316	208	323	585	143	161	764	17	88	7,457	0.06%	672	0.15%	0.09%	+ 154%
	Slope Species	3,127	106	204	90	115	622	1,283	550	233	66	16	6,411	0.06%	2,314	0.07%	0.01%	+ 17%
	Minor Rockfish South	0	0	0	0	1	0	0	0	0	0	0	1	0.00%	0	0.00%	0.00%	- 40%
	Nearshore Species	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Shelf Species	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Slope Species	0	0	0	0	1	0	0	0	0	0	0	1	0.00%	0	0.00%	0.00%	- 34%
	California scorpionfish	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Cabezon (off CA only)	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0	0.00%	0.00%	-
	Dover sole (total)	26,976	73,153	135,963	85,605	84,875	80,744	89,472	84,550	86,597	106,408	84,778	939,120	0.45%	832,131	0.46%	0.01%	+ 3%
	English Sole	103,035	78,142	91,788	104,506	106,866	85,202	72,028	73,208	84,369	92,620	50,600	942,364	3.78%	790,220	3.82%	0.04%	+ 1%
	Petrale Sole (coastwide)	19,075	29,765	27,273	21,273	31,578	38,102	80,061	43,886	37,926	62,384	55,579	446,902	1.08%	500,708	1.06%	-0.02%	- 2%
	Arrowtooth Flounder (total)	3,354	1,521	0	13	0	17,696	29,815	29,025	7,046	678	13	89,161	0.13%	68,455	0.12%	-0.01%	- 6%
	Starry Flounder	41,478	42,383	19,723	21,303	58,756	19,173	36,421	3,560	10,382	7,607	19,644	280,429	26.43%	214,234	30.54%	4.10%	+ 16%
	Other Flatfish	139,182	119,999	65,424	49,835	34,276	62,048	46,593	49,312	86,045	88,354	70,359	811,425	1.93%	680,795	1.91%	-0.02%	- 1%
	Kelp Greenling	0	0	0	0	0	0	0	0	1	0	0	1	0.03%	34	9.09%	9.07%	+ 35,240%
	Spiny Dogfish	1,782	0	0	96	659	1,220	3,070	12	0	0	0	6,839	0.08%	3,490	0.07%	0.00%	- 3%
	Other Fish	381	333	1,772	307	341	2	63	0	71	26	0	3,296	0.03%	1,135	0.02%	-0.01%	- 31%
	Total Groundfish	374,693	359,140	366,482	324,940	388,872	387,789	375,201	326,680	363,398	439,990	391,100	4,098,285	0.50%	2,882,789	0.57%	0.07%	+ 14%

Table 3d. Annual Fleetwide Landings (catch in lbs) by Species and Complex for Permitted Shoreside Non-whiting Vessels, 1994-2004.

Permit	Species Group	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL Actual lbs	TOTAL Relative lbs
TOTAL	Lingcod - coastwide	3,020,438	2,358,361	2,654,569	2,579,931	479,010	477,484	145,636	127,761	225,578	133,057	127,858	12,329,683	1,463,631
	N. of 42° (OR & WA)	2,335,726	1,708,671	2,008,422	1,887,121	315,666	295,567	84,013	69,208	145,056	106,256	93,345	9,049,051	1,168,820
	S. of 42° (CA)	684,712	649,690	646,147	692,810	163,344	181,918	61,623	58,553	80,522	26,801	34,513	3,280,633	294,811
	Pacific Cod	1,819,661	1,081,740	954,705	1,299,346	894,446	610,311	603,968	694,791	1,521,904	2,294,415	2,429,669	14,204,955	25,238,560
	Pacific Whiting (Coastwide)	110,170	155,791	143,582	253,703	245,087	56,877	78,964	55,339	86,813	66,529	32,228	1,285,083	731,820
	Sablefish (Coastwide)	7,738,353	8,168,976	9,110,963	8,164,662	4,727,566	6,962,904	5,932,166	5,542,225	3,184,970	5,123,456	5,389,323	70,045,564	56,358,012
	N. of 36° (Monterey north)	7,401,728	7,714,061	8,638,994	7,826,238	4,475,134	6,779,663	5,852,344	5,479,686	3,076,850	4,952,052	5,212,575	67,409,324	54,472,567
	S. of 36° (Conception area)	336,625	454,915	471,969	338,424	252,432	183,242	79,822	62,539	108,120	171,404	176,749	2,636,240	1,885,445
	PACIFIC OCEAN PERCH	1,978,949	1,818,255	1,807,121	1,461,653	1,344,840	1,146,888	298,577	412,828	324,724	290,100	286,986	11,170,920	3,191,096
	Shortbelly Rockfish	77,291	65,842	79,151	172,471	41,528	4,910	37,766	9,651	167	515	194	489,487	5,668
	WIDOW ROCKFISH	12,649,045	13,592,034	11,912,070	13,698,015	7,378,195	8,137,526	8,197,828	3,813,161	562,052	8,872	19,421	79,968,218	97,591
	CANARY ROCKFISH	1,862,487	1,489,081	2,131,040	1,749,339	1,989,807	1,132,678	79,486	52,104	93,286	16,791	14,359	10,610,458	184,699
	Chilipepper Rockfish	2,525,030	3,251,471	3,076,853	3,384,429	2,284,329	1,726,385	792,491	655,499	338,969	16,280	86,386	18,138,123	179,079
	BOCACCIO	1,036,340	719,072	607,853	486,031	123,283	68,998	37,939	29,405	39,002	247	13,377	3,161,547	2,717
	Splitnose Rockfish	639,507	605,243	885,606	946,722	2,876,570	453,398	184,059	199,117	122,807	331,951	360,875	7,605,853	3,651,456
	Yellowtail Rockfish	9,157,232	8,833,764	9,166,615	2,951,318	3,727,930	3,618,554	5,780,232	3,271,926	1,530,670	221,425	204,818	48,464,485	2,435,676
	Shortspine Thornyhead - coastwide	6,617,329	4,089,619	3,333,441	3,082,871	2,610,476	1,571,878	1,681,095	1,039,179	1,467,341	1,466,058	1,462,347	28,421,632	16,126,633
	N. of 34°27'	4,969,238	2,673,313	2,384,462	2,196,357	1,886,581	1,160,941	1,062,361	770,788	941,386	1,018,986	965,687	20,030,101	11,208,843
	S. of 34°27'	1,648,091	1,416,306	948,979	886,514	723,895	410,937	618,734	268,391	525,955	447,072	496,660	8,391,531	4,917,790
	Longspine Thornyhead - coastwide	8,990,903	11,709,713	10,474,398	8,490,633	4,902,221	3,902,456	3,144,596	2,494,923	4,181,552	3,421,745	1,592,168	63,305,308	37,639,196
	N. of 34°27'	8,990,903	11,709,713	10,474,398	8,490,633	4,902,221	3,902,456	3,144,596	2,494,923	4,180,553	3,421,745	1,592,168	63,304,309	37,639,196
	S. of 34°27'	0	0	0	0	0	0	0	0	999	0	0	999	0
	COWCOD	0	0	15	0	0	0	0	0	19	0	0	34	0
	DARKBLOTCHED	1,720,411	1,565,119	1,590,772	1,786,656	1,988,113	762,122	526,867	336,233	235,869	174,699	411,417	11,098,277	1,921,690
	YELLOWEYE	184,074	297,780	221,805	183,777	64,887	56,275	2,686	4,351	2,090	2,129	726	1,020,578	23,419
	Black Rockfish - coastwide	98,750	20,283	38,586	52,392	178,816	10,164	3,980	2,072	7,035	1,928	5,257	419,261	21,209
	Black Rockfish (WA)	2,204	7,148	0	2,123	38,806	0	0	0	611	0	0	50,891	0
	Black Rockfish (OR-CA)	96,546	13,134	38,586	50,269	140,010	10,164	3,980	2,072	6,424	1,928	5,257	368,370	21,209
	Minor Rockfish North	4,839,357	3,688,381	3,771,895	3,371,877	3,243,175	1,618,169	765,613	722,307	273,799	328,174	475,962	23,098,710	3,609,918
	Nearshore Species	1,361	1,787	45	573	10,202	312	713	1,148	1,505	541	2,705	20,890	5,946
	Shelf Species	2,658,851	2,123,851	2,364,607	1,903,236	2,232,923	922,193	116,276	416,064	96,988	41,616	25,864	12,902,468	457,771
	Slope Species	2,179,146	1,562,743	1,407,243	1,468,069	1,000,050	695,664	648,625	305,096	175,306	286,018	447,393	10,175,353	3,146,202
	Minor Rockfish South	1,419,581	1,545,496	2,097,575	2,020,673	1,795,666	272,318	387,332	473,836	863,790	418,032	528,832	11,823,131	4,598,349
	Nearshore Species	8,704	19,738	40,997	29,197	1,785	28,583	987	630	1,805	968	297	133,691	10,646
	Shelf Species	397,397	410,689	459,830	577,477	538,048	78,892	65,149	50,477	32,211	6,004	3,942	2,620,116	66,043
	Slope Species	1,013,480	1,115,068	1,596,748	1,414,000	1,255,834	164,843	321,197	422,728	829,774	411,060	524,593	9,069,324	4,521,660
	California scorpionfish	471	0	0	12,766	0	0	0	20	96	0	0	13,353	0
	Cabezon (off CA only)	6,026	0	16	0	0	170	9	28	98	0	0	6,347	0
	Dover sole (total)	19,146,564	22,877,170	26,809,497	22,298,567	17,766,530	20,126,174	19,430,381	15,058,347	13,928,099	16,442,111	15,714,372	209,597,813	180,863,225
	English Sole	2,380,278	2,439,999	2,489,217	3,149,848	2,475,116	1,957,615	1,639,275	2,113,243	2,479,825	1,882,578	1,954,548	24,961,542	20,708,355
	Petrale Sole (coastwide)	2,866,722	3,501,931	3,976,221	4,106,947	3,216,408	3,247,886	4,077,288	3,915,019	3,931,119	4,277,381	4,197,683	41,314,605	47,051,190
	Arrowtooth Flounder (total)	6,828,200	5,081,202	4,790,398	5,125,890	7,036,822	11,765,673	7,225,865	5,401,761	4,575,241	5,081,114	5,260,848	68,173,014	55,892,251
	Starry Flounder	157,542	109,762	61,502	129,931	116,798	48,859	55,424	16,091	40,473	63,779	260,697	1,060,858	701,565
	Other Flatfish	4,770,487	5,211,566	4,119,057	4,002,941	3,383,055	4,150,923	3,354,898	3,519,564	3,575,281	3,242,295	2,798,244	42,128,310	35,665,249
	Kelp Greenling	266	3,347	102	0	97	0	0	40	1	34	0	3,887	374
	Spiny Dogfish	2,268,701	783,324	430,238	739,918	886,912	947,059	605,116	733,965	985,525	434,351	262,681	9,077,791	4,777,864
	Other Fish	1,912,383	1,870,639	1,646,158	1,247,822	1,372,185	702,746	521,477	516,085	403,207	493,193	241,580	10,927,475	5,425,121
	Total Groundfish	107,395,946	106,945,378	108,477,976	97,025,298	77,186,483	75,616,985	65,720,086	51,258,368	45,096,410	46,315,187	44,134,600	825,172,717	509,467,061

ELEMENT	ANALYTICAL SCENARIOS FOR ILLUSTRATING IMPACTS			
	Scenario 2.a	Scenario 2.b	Scenario 3	Scenario 4
Catch Control Tool	• IFQ for all Trawl Sectors	• IFQ for all trawl sectors	• IFQ for Non-Whiting Trawl • Coops for Whiting Trawl	• IFQ for Shorebased Trawl • Coops for At-Sea Trawl
Initial Allocation	• Based on catch history (no buyback sharing)		• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• None	• 25% of groundfish • 50% whiting to shoreside and motherships	• Processor affiliations in mothership and SB whiting sectors. • 25% SB processor ownership of SB groundfish	• Processor affiliation in Mothership sector • 50% SB processor ownership of SB whiting • No processor ownership of SB groundfish
Species Covered	• All grndfish and Pacific halibut	• All grndfish and Pacific halibut	• All groundfish in non-whiting sector • Whiting in whiting sectors with bycatch pools that are common across all whiting sectors	• All groundfish in shorebased sector • Whiting is covered at sea. At sea sector bycatch is covered through sector-specific pools
Number of Trawl Sectors	• Three	• Four	• Four	• Three
Adaptive Management[1]	• No adaptive mgmt	• No adaptive mgmt	• Adaptive mgmt for non-whiting	• Adaptive mgmt for shorebased
Roll-over	• Roll-over exists	• Roll-over exists	• No roll-over	• Roll-over exists
Overfished Species Provisions	• none	• none	• placeholder	• placeholder
Accumulation Limits	• SB non-whiting grnd: 5% • SB whiting: 25% ctrl & 12% per vessel • Mothership: 25% ctrl & 50% per vessel • CP: 60% ctrl & 75% per vessel		• SB grnd: 1.5% • SB whiting: 15% • Mothershp: 20% • CV(MS): 10% • CP: none	• SB grnd: 3% • SB whiting: 10% • Mothershp: 30% • CV(MS): 15% • CP: none
Tracking and Monitoring Options	• Placehol der	• Placeholder	• Placeholder	• Placeholder

Note: Adaptive management provisions are assumed to be used to A) provide protection to communities and processors that may be adversely affected by rationalization by directing QP to LE permits based in particular communities, and B) to encourage bycatch reduction measures and/or gear conversion by dir

TRAWL RATIONALIZATION ALTERNATIVES
EVENING OF MONDAY, NOVEMBER 5, 2007
POWERPOINT PRESENTATIONS

Evening Presentation

- Opening — Donald McIsaac
- Review and Outstanding Issues — Jim Seger
  - Merrick Burden
  - Todd Lee
  - Mike Taylor
  - Ed Waters
- Approach to Analysis — Merrick Burden

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Work Planning Schematic for Upcoming Groundfish FMP Amendments and Biennial Specifications

Council Meeting	Amendment 20 Trawl Ratnlzation EIS	Amendment 21 Intersector Allocation EIS	2009-10 Biennial Specifications
Nov, 2007	Adopt EISAlternatives	Prelim. DEIS; AdoptPreferred Alternative	Adopt remaining Stock Assessments, Prelim ABC/OYs, and Mgmt Measures
Mar, 2008	(place holder)		
April, 2008		Final Council	Adopt ABC/OYs and Refined Mgmt. Measures
June, 2008	Prelim. DEIS; Adopt Preferred Alternative		Adopt Final ABC/OYs & Mgmt Measures
Sept, 2008			
Nov, 2008	Final Council Action		

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Objectives for Monday Evening

- Council Member and Advisory Body Orientation on the Issues
- Review Analysis
- Review Approach to Analysis

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Thursday

- Summarize the Outstanding Issues
- Review the Alternatives in More Detail
- Discuss General Preliminary Results

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Quick Review of Alternatives

- IFQs
- Co-ops
  - Mothership Whiting Sector
  - Shoreside Whiting Sector
  - Catcher-Processor Sector

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IFQ Alternative

- IFQ Scope
    - All Groundfish Species
    - Caught With Directed Commercial Gear
    - By Vessels with LE Trawl Permits
  - Alternative Scope (same but no IFQ for bycatch in the whiting fishery)
- QS Issued Once At Start (To Permits &/or Processors)
- After Initial Issuance, QS Widely Transferable
- QP Issued Annually
- Vessels Required to Have QP
- Accumulation Limits (Vessel and Control)
- Tracking, Monitoring, Data Collection
- Adaptive Management Option
- Halibut IBQ Option

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Co-ops

- Mothership and Shoreside
  - Catcher Vessels
    - Qualify for whiting endorsements and an allocation
    - Each year join a catcher vessel co-op or fish in the non-co-op fishery
    - Tied to processors
    - Must participate in non-co-op fishery to permanently change processors
  - Processors
    - Mothership limited entry
    - Shoreside co-op qualified processors (1st 2 years)
- Catcher Processors
  - Qualify for a catcher-processor endorsement
  - Voluntary co-ops (no non-co-op fishery)

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Time Periods for Qualifying and Allocation (IFQ & Co-ops) (D.7.b, Att 1, pgs 1 thru 3)

- Qualifying Period – one criteria that may be used to determine who is entitled to an initial allocation
  - Recent participation under the IFQ alternative
  - Whiting endorsement under the co-op alternative
  - Processor permits
- Allocation Period – period of time used to determine the amount allocated to a particular entity.

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Time Periods for Qualifying and Allocation (IFQ & Co-ops)

	Qualifying for Participation		Allocation	
	IFQ Recent Participation	Co-op Alt Endorsement/ Permit	IFQ Allocation	Co-op Catch History
Permit Owners				
Nonwhtg SS Catcher Ves	None	N/A	*'94-'03 (drop 3)*	N/A
Whtg SS Catcher Ves	None	'98-'04 (>500 mt) '98-'03 " '94-'04 " '94-'03 " '01-'03 " *'97-'03* (>500 mt)	*'94-'03 (drop 2)*	'98-'04 (drop 1) '94-'04 (drop 2) '98-'03 (drop 1) '94-'03 (drop 1?) *97-'03 (drop 1)*
Whtg MS Catcher Ves	None	'98-'04 (>500 mt) '94-'03 (>500 mt) *97-'03* (>500 mt)	*'94-'03 (drop 2)*	'98-'04 (drop 1) '94-'04 (drop 2) '98-'03 (drop 1) '94-'03 (drop 2) *97-'03 (drop 1)*
Cather-Processor	None	'97-'04 (>0 in at least 1 yr) *97-'03 (>0 in at least 1 yr)*	*'94-'03 (drop 0)*	N/A
Mothership	'98-'04 (>1K mt in 2 yrs) *'97-'03 (>1K mt in 2 yrs)*	'98-'04(>1K mt in 2 yrs) *97-'03 (>1K mt in 2 yrs)*	'98-'03 (drop 0) *97-'03 (drop 0)*	N/A
Shoreside Processing Companies	'99-'04 (TBD) *'98-'03 (pending)*	98-'04 (>1K mt in 2 yrs) *98-'03 (>1K mt in 2 yrs)*	'94-'04 (drop 2) *94-'03 (drop 2)*	N/A

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Time Periods for Qualifying and Allocation

	Qualifying for Participation		Allocation	
	IFQ Recent Participation	Co-op Alt Endorsement/ Permit	IFQ Allocation	Co-op Catch History
LE Permit Owners				
Nonwhtg Shoreside CV	None	N/A	'94-'03 (drop 3)	N/A
Whiting Shoreside CV	None	'97-'03 (>500 mt)	'94-'03 (drop 2)	97-'03 (drop 1)
Whiting Mothership CV	None	97-'03 (>500 mt)	'94-'03 (drop 2)	97-'03 (drop 1)
Cather-Processor	None	97-'03 (>0 in at least 1 yr)	'94-'03 (drop 0)	N/A
Mothership	'97-'03 (>1K mt in 2 yrs)	97-'03 (>1K mt in 2 yrs)	97-'03 (drop 0)	N/A
Shoreside Processing Companies	'98-'03 (pending)	98-'03 (>1K mt in 2 yrs)	94-'03 (drop 2)	N/A

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Partial Rationale for Periods (D.7.b, Att1, pgs 1 thru 3)

- 1994 – start of license limitation
- 1997 – start of 3 whiting sectors
- 1998 – 1st year of "full" observer coverage
- 1999 – last year prior to footrope restrictions
- 2000 – disaster declaration and foot rope restrictions
- 2003 – control date and end of pre-buyback period
- 2004 – last year prior to development of co-op proposal

- Other reasons for year choices –
  - balance between more recent and historic participation & practices
  - stability in participation

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Qualifying and Allocation Periods Impact Summary

- Recent participation for shoreside whiting and nonwhiting receivers (processors/buyers) (Including both the period and participation level)
- Orientation on Tables in D.7.b, Attachment 1 (Appendix 1)

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Recent Participation for Shoreside Buyers (Whiting and Nonwhiting)

- GAC Recommended Qualifying Period
  - 1998-2003
- TIQC Recommended Qualifying Levels
  - Options for Whiting: 1 delivery; 1 mt in 2 yrs
  - Options for Non-Whiting: 1 delivery; 6 mt in 3 yrs
- GAC Recommended Allocation Period:
  - 1994-2003 (drop 2 years)

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Shoreside Whiting
(recent participation or co-op processor license)

1994-2006 26 companies buying
1994-2003 21 companies buying
1998-2003 17 companies buying
1998-2003 9 companies buying (>1 mt in 2 yrs)

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Shoreside Whiting Buyer – Qualifying Period Choice

	Of 21 Companies With Some Activity From 1994-2003			
	Number of Companies Excluded		Percent of '94-'03 History Excluded	
	1 delivery	>1 mt in 2 years	1 delivery	>1 mt in 2 years
'97-'03	3	12	4.6%	5.7%
'98-'03	4	12	5.7%	5.7%
'99-'03	5	12	5.7%	5.7%
'94-'03	0	10	0.0%	0.9%
'99-'04	5	12	5.1%	5.1%

>1 mt has same effect as >100 mt

* '99-'04 Percent of History calculated using '94-'04 history for 21 companies

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Shoreside Whiting Buyer – Level of Activity (1998-2003)

	Number of Companies by Number of Years at the Indicated Level of Activity		
# of Years	1 delivery	>1 mt	>100 mt
0	4	6	11
1	8	6	1
2	0	0	1
3	1	1	1
4	2	2	1
5	1	1	2
>6	5	5	4

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Shoreside Whiting Buyer – Geographic Distribution

	Companies With The Indicated Deliveries*			
	CA	OR	WA	ALL
1 delivery				
1994-2003	8	9	7	21
1998-2003	7	6	5	17
>1 mt in 2 yrs				
1998-2003	3	5	2	9

*Some companies operate in more than one state.

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Shoreside Non-Whiting Buyer
(recent participation or co-op system license)

1994-2006 208 companies buying
1994-2003 190 companies buying
1998-2003 124 companies buying
1998-2003 84 companies buying
> 1 mt in 1 year
1998-2003 32 companies buying
> 6 mt in 3 years

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Shoreside Non-Whiting Buyer – Qualifying Period Choice

	Of 190 Companies With Some Activity From 1994-2003					
	Number of Companies Excluded			Percent of History Excluded		
	1 delivery	>1 mt	>6 mt in 3 years	1 delivery	>1 mt	>6 mt in 3 years
'97-'03	46	97	153	2.7%	2.7%	9.3%
'98-'03	66	106	158	3.7%	3.7%	12.7%
'99-'03	79	113	165	8.4%	8.4%	19.2%
'94-'03	0	68	141	0.0%	0.0%	2.2%
'99-'04	78	112	165	7.0%	7.1%	18.2%

* '99-'04 Percent of History calculated using '94-'04 history for 190 companies

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Shoreside Non-Whiting Buyer – Level of Activity (1998-2003)

	Number of Companies by Number of Years at the Indicated Level of Activity		
# of Years	1 delivery	>1 mt	>6 mt
0	66	106	121
1	41	26	25
2	31	16	12
3	17	15	12
4	6	5	5
5	8	7	2
6	21	15	13

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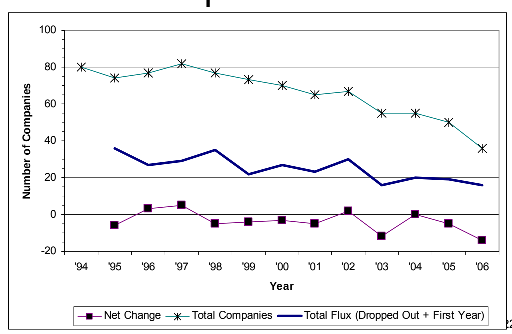
Shoreside Non-Whiting Buyer – Geographic Distribution

	Companies With The Indicated Deliveries*			
	CA	OR	WA	ALL
1 delivery				
1994-2003	134	38	28	190
1998-2003	85	27	20	124
>1 mt				
1994-2003	79	26	25	122
1998-2003	56	18	17	84
>6 mt in 3 yrs				
1994-2003	26	9	9	49
1998-2003	17	5	7	32

*Some companies operate in more than one state.

21

Shoreside Non-Whiting – Buyer Participation Trend



22

Nonwhiting < 1 mt total from 1994-2003

	Number of Buyers	Percent of Total Companies	Percent of Total 1994-2003 RWT	1994-2003 RPC
California	49	37%	0.0096%	0.0190%
Oregon	10	26%	0.0018%	0.0032%
Washington	3	11%	0.0020%	0.0026%
Coastwide	62	31%	0.0047%	0.0093%

The 1994-2003 RPC percent (0.0093%) times the 2006 RPC value of ($23.7 mil) equals $2,203, for an average of $36 per company.

23

Orientation on Appendix 1 Tables

24

Table 1-1
(D.7.b Att 1, Appdx 1, Page 1-8)

Table-1-1. Round Weight Summed by Company for Receipts from Whiting Fleet (30SW), Whiting Catch Only
Grey shading indicates the company was active in that year (i.e., RWT>0).
Each row represents participation history for a single company. Number of separate companies: 26

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Number Active in the Year (count of above):	9	10	10	10	10	10	10	9	6	9	7	8	11

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual MT Received by a Buyer (for year)	113.5	94.9	163.7	213.5	91.2	2.9	<1.0	<1.0	19.5	5.0	6.6	40.1	2.5
Average Annual MT Received by Buyers (for year)	8,167.8	7,489.1	8,501.6	8,728.7	8,770.8	8,339.2	8,580.7	8,154.0	7,583.9	5,686.9	13,268.5	12,194.7	8,842.4

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Minimum Annual Raw Product Costs (year)	$12,506	$12,550	$21,321	$23,535	$10,142	<$1,000	<$1,000	<$1,000	$2,153	<$1,000	$1,013	$4,423	<$1,000
Average Annual Raw Product Costs (year)	$543,409	$780,942	$509,089	$813,766	$474,935	$683,096	$796,332	$637,606	$755,395	$565,226	$1,074,714	$1,418,771	$1,247,164

Table 1-3
(D.7.b Att 1, Appdx 1, Page 1-10)

Tables 1-6 thru 1-8
(D.7.b Att 1, Appdx 1, Page 1-21)

27

Table 1-19
(D.7.b Att 1, Appdx 1, Page 1-23)

28

Table 1-20
(D.7.b Att 1, Appdx 1, Page 1-24)

Table 1-20. Geographic distribution of companies receiving shoreside whiting deliveries by possible recent participation levels.

Number of Companies Operating within Each State, by Years of Activity During the Period (Any Receipts >0 MT in the Year)

	California		Oregon		Washington	
Years:	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003
0	4	5	2	5	0	2
1	4	4	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

Number of Companies Operating within Each State, by Years of Activity During the Period (at Least 1 MT in the Year)

	California		Oregon		Washington	
Years:	1994-2003	1998-2003	1994-2003	1998-2003	1994-2003	1998-2003
0	6	7	2	5	0	2
1	2	2	2	1	5	3
2	0	0	0	0	0	0
3	0	0	2	1	0	0
4	1	2	1	0	0	0
5	0	0	0	1	0	0
6 or more	3	1	4	3	2	2

29

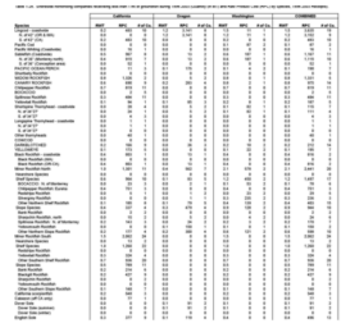
Table 1-23
(D.7.b Att 1, Appdx 1, Page 1-26)

30

Table 1-24
(D.7.b Att 1, Appdx 1, Page 1-27)

31

Table 1-28
(D.7.b Att 1, Appdx 1, Page 1-34)



32

Entities Qualifying for an Initial Allocation (A-2.1.1) (#1)

- Shoreside Processing, Successor in Interest (D.7.b, Att 1, pgs 4-5)
  - No permits or vessels to track
  - Should successor in interest be recognized?
    - Situations:
      - All assets of a company are bought and the purchaser maintains the companies operations. (Ownership of XYZ changes, XYZ stays in business)
      - Some but not all assets of a company are purchased. For example
        - » only the trade name is purchased.
        - » company operations are discontinued and physical assets purchased.
        - » trade name and assets are split between different buyers.

33

Entities Qualifying for an Initial Allocation (A-2.1.1) (#2)

- “Mothership Processor” (D.7.b, Att 1, pgs 5-6)
  - Under one option, QS will go to “processors”
  - QS is to be assigned based on “processing history”
  - “At-sea processors are those vessels that operate as motherships. ..”
  - What entity associated with the vessel would receive the processor QS?
    - Should owners of the vessel receive the initial allocation or should the company operating the processing venture receive the allocation?
      - For the co-op alternative, it is the vessel owner that receives the mothership permit unless there is a bareboat charter, in which case it goes to the charterer. *The GAC has recommended this be approach be extended to the IFQ alternative.*
  - The definition of who is eligible to own QS, after initial issuance, was developed to allow current participants to continue in the fishery (incorporates AFA exceptions on US ownership requirements).

34

Recent Participation (A-2.1.2)

- Shoreside Processors (D.7.b, Att 1, pgs 7-10).
  - Covered above when we discussed time periods.

35

QS Allocation Formula (A-2.1.3)

- Quota Shares to Each Sector
- Equal Allocation Component
- Drop Years
  - Tends to benefit those with variable history at the expense of consistent participants, leveling out the distribution.
- Relative Pounds
  - Benefits those catching more when trawl history is lower (see Supplemental D.7.b, Attachment 4)
- Method for Allocating Overfished Species

36

Allocation of Overfished Species

- Method: Historic harvest/equal allocation (i.e. same as all other species)
- Method: Target Species QS, Bycatch Rates and Logbooks
  - (E.7.b, Att 1, pgs 11-17)
- Method: Auction
  - (E.7.b, Att 1, pgs 17-22)

SEE POWERPOINTS 1 AND 2 (ATTACHED)

37

Direct QS Reallocation After Initial Issuance (A-2.6.1)

- With Changes in Management Areas
- With Changes in Stock Status

38

Direct Reallocation With Changes in Latitudinal Management Areas (E.7.b, Att 1, pgs 23-25)

- Method Established for Splitting Areas
  - e.g. Coastwide QS split N & S.
    - A person holding 1% coastwide, will receive 1% for north and 1% for south.
    - Trading will then ensue as needed.
- Need a Method for Moving Management Lines

39

Reallocation With Line Movement

- Principle: Same total pounds after the line movement as before.
- Example:
  - an existing line is shifted from north to south
  - the OY for the new northern area is larger
  - and the OY for the southern area smaller.
    - Those holding QS for the southern area will receive some QS for the northern area.
    - Those holding QS for the northern area will see their QS decline but because the OY has increased their annual QP allocation will not change.
- Greatest adjustment for those in the transition area (the portion of the old southern that is now north of the line).
- To stay in that area they will have to trade all of their southern QS for northern.
- Folks in southern area that remains southern will have northern QS to southern.

40

Direct Reallocation With Changes in Stock Status (E.7.b, Att 1, pgs 25-28)

1. When a currently overfished stock is rebuilt
2. If a healthy stock becomes overfished

NOTE: These options pertain <u>only</u> to reallocation of QS within a sector (e.g. within the shoreside nonwhiting sector) <u>not</u> among trawl sectors or between trawl and nontrawl sectors.

41

Reallocation Upon Rebuilding

- Why might this be considered?
  - There will likely be a sudden and dramatic rise in the OY and trawl allocation in the year rebuilt status is achieved.
  - Those holding the QS for bycatch may not need the increase to harvest their target species.
  - Those who previously targeted on the overfished species gave up their directed fishing opportunity to facilitate rebuilding.
- Alternatively, allow markets to reallocate QS.

42

Rebuilt Species Method (Step 1)

	Amount of Total QS by Type of QS	OY	Individual A's Holdings QS	QP Equivalent
Rebuilding OY		40 mt		
Rebuilding QS	100%		3%	1.2 mt
Rebuilt OY		80 mt		
Rebuilding QS (rebuilding designation to be removed after reallocation is completed)	50%		1.5% (rebuilding QS after being scaled back)	1.2 mt
QS (new)	50% **(distribution method to be determined)**			

43

Rebuilt Species Method (Step 2)

- Distribution of "New" QS
  - Determine Distribution Method When Rebuilding Is About to Occur
    - Timely development of an allocation formula.
    - Rely on future harvest patterns (which will not likely relate to those who targeted in the past).
    - Rely on past harvest patterns reflected in the permit history and give to who holds the permit at that time.
  - Determine a Method Now
    - Rely on past harvest patterns reflected in the permit history and give to whom ever holds the permit at that time.
    - Issue shadow QS now to allow industry to complete the implementation adjustment period (administrative costs).
      - » "Shadow QS" (inactive, no QP issued)

44

Newly-Overfished Species Method

- Declare previously held QS to be "shadow QS" (inactive, no QP issued)
- Issue rebuilding QS based on
  - target species QS held
  - with possible consideration for amount of overfished species QS held
- When the stock is rebuilt, the rebuilding QS becomes inactive and shadow QS are reactivated.

45

Vessel QP Minimum Holding Requirement

- An amount of QP that would need to be in the vessel account prior to fishing.
  - On one hand, concern that it is permissible for a vessel to go fishing without QP.
  - On the other hand, fairly stringent monitoring and compliance requirements and "tie-up" requirement for any vessel with an uncovered deficit.
  - Difficult in identifying the species mix and amounts that a vessel would be required to hold.
- GMT Report: Options for Minimum Holding Requirement for Overfished Species
  1. Depth based requirement
  2. Requirement for fishing in "hot spots"

46

Vessel Catch Overage Resolution

- Current Option
  - All catch taken on a trip must be covered with QP within 30 days (unless within carryover limits)
  - Until overage is covered
    - Fishing prohibited (groundfish catch, all Federally managed fisheries (extent of prohibition to be determined))
    - Permit may not be transferred (QP may be transferred)
  - If necessary QP may be used from following year(s)
  - Creates potential for multiyear tie-up in case of a rare overfished species.
- A Number of Alternative Compliance Options Have Been Developed

47

Alternative Compliance Options

- If the overage is sufficienlty large there would be a one time exception:
  - Option: Vessel surrenders an amount of QS for other species.
    - Amount might be in some proportion to its overage species.
  - Option: Vessel posts a bond to guarantee future compliance.
    - Amount might be determined based on what would be required to purchase the needed shares.
- Vessel would be able to resume fishing with a zero deficit after meeting the alternative compliance measure.
- Two other options proposed have been deemed to have due process problems.

48

Accumulation Limits (A-2.2.3.e)

- Vessel Limits
- Control Limits

"Individual and collective" rule: The amount of QS or QP that is computed as applying to a person is equal to the sum of the QS or QP registered to that person and an amount equal to the percentage of holdings by that person in any entity in which that person has an interest.

PROPOSED REWORDING TO CLARIFY Individual and Collective Rule: The QS or QP 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 or QP 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 or QP that counts toward the person's limit.

D.7.b, Attachment 2 (pg 23)

49

Table 17
(D.7.b Att 1, Page 1-33)

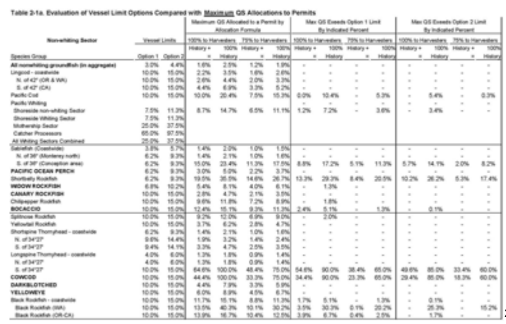
50

Accumulation Limits (A-2.2.3.e)

- Some limits may not allow past levels of concentration (bold large).
- Limits are based on landed catch and for some species there may have been significant unlanded bycatch.

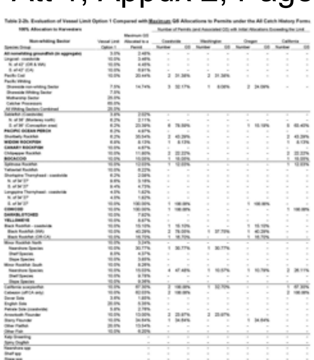
51

Table 2-1a
(D.7.b Att 1, Appdx 2, Page 2-6)



2

Table 2-2b
(D.7.b Att 1, Appdx 2, Page 2-10)



53

Tracking and Monitoring

- Issues such as
  - at-sea compliance monitors (100% coverage)
  - use of cameras
  - compliance monitory skill level and who pays
  - full retention/discards
  - shoreside monitoring
  - data turn around time
  - limited ports or landing hours
  - small vessel exceptions
- Presentation from NMFS on Thursday

54

Mandatory Data Collection

- Todd Lee, NWFSC

SEE POWERPOINT 3 (ATTACHED)

55

Allocation of Halibut IBQ

- Covered above when discussing overfished species allocation.

56

Bycatch Species Management In the Whiting Sectors

- IFQs: Option to have no IFQ for bycatch species in the whiting fishery.
- Co-ops in the whiting sector

General Policy:

- Direct control: Caps, IFQ, or other limits on the whiting fishery, individual whiting sectors, co-ops or vessels will be established only for those bycatch species that are
  (1) overfished and caught in the whiting fishery, or
  (2) taken in significant quantities in the whiting fishery.

57

Likely Candidates For Direct Control in the Whiting Fishery

The species most likely to be candidates for direct control at the time of implementation are:

- Pacific Ocean Perch
- Widow Rockfish
- Canary Rockfish
- Yellowtail Rockfish
- Darkblotched Rockfish

58

Trading IFQ With Limited Entry Fixed Gear Vessels

Main Parts of Proposal:

- Allow any limited entry permit owner to harvest trawl individual quota pounds.
- Limited entry permit owners would be required to use the gear endorsed on their respective permits
- Participating vessels, adhere to regulations enacted as part of the trawl IFQ program pertaining to the tracking and monitoring of catch and quotas (including observer coverage requirements and catch retention).

59

Bycatch Management In the Mothership and Shoreside Sector Co-op Programs

- There are no provisions for assigning bycatch caps to co-ops.

SEE POWERPOINT 4 (ATTACHED)

60

Some Other Issues in GAC and TIQC Reports

- TIQC: Change the maximum amount of QS to processors in the whiting sector from 50% to 25%.
- TIQC: Eliminate the vessel size endorsement.
- GAC and TIQC: Limit trading of overfished species QS in the first year.
- GAC and TIQC: Assign bycatch to co-ops.
- GAC: Eliminate shoreside co-op alt, TIQC Move ahead with shoreside co-op alt.
- TIQC: Add options to allow vessel to operate as MS and CP in same year, and allow MS permit transfers once during the year.
- GAC and TIQC: Extend mandatory data collection to co-ops.
- TIQC Guidance: on MS processor tie provisions.

61

Allocation of Overfished Species IFQ and Pacific Halibut IBQ Based on a Bycatch Rate

Objective of the Bycatch Rate Allocation Formula

Allocating based on a bycatch rate is intended to:

- Be more equitable than a catch history-based allocation
- Allocate stocks in a way that takes into account spatial fishing patterns and spatial abundance of overfished stocks
  - Permits with catch history in a relatively high canary area would receive relatively more canary
  - Permits with catch history in a relatively high bocaccio area would receive relatively more bocaccio

2

A Quick Review

- Overfished species abundance can differ substantially across different areas
- Fishermen will fish in different areas depending on several factors including their home-port and the type of quota that is allocated to them.
- Allocating overfished stocks on a bycatch rate attempts to allocate IQ of overfished stocks based on:
  - the presence of overfished stocks on an area-basis,
  - the area that fishermen are likely to fish in when the fishery is rationalized, and
  - the amount of target species IQ each permit will receive

3

The GAC and TIQC are recommending slightly different approaches.

The principal difference between the GAC and TIQC recommendation is based on the following question:

"What is the best way to predict where fishermen will go fishing when the fishery is rationalized?"

- Both recommendations use logbook data to estimate where each vessel/permit will fish, the question is, which years of logbook data are the best estimator for the future?

4

Differences between GAC and TIQC

GAC

- Use logbooks from 2003-2006 as the estimator for fishing location

rationale is that status quo fishing location preferences are a good estimator for fishing location preferences under rationalization

TIQC

- Use logbooks from 1994-2003 as the estimator for fishing location

rationale is that fishing location preferences will be more similar to 1994-2003 period because permits will be allocated IQ based on that period

5

An Auction-Based Approach for Managing Relatively Rare Species in an IFQ Program

What is the problem?

- The trawl sector allocation of some species may be less than a single ton
- When yelloweye is divided amongst non-whiting permits, each permit may receive an equivalent of 1 – 4 fish for a year
- Available information shows that, while catch events of relatively rare species are infrequent, they can be relatively large
  - This can have dramatic repercussions to individual vessels if they are required to find quota on an open market to cover deficits

2

Problem continued

- There is uncertainty about what and how much will be caught when a net is deployed.
- Empirical evidence shows that society tends to "hedge" against uncertainty
- In an IFQ program, hedging would mean that vessels would tend to withhold quota from the market in order to protect themselves from future catch uncertainty

3

Illustration of the problem and the implications of "hedging" behavior

- In the case of yelloweye we assume that the fleet consolidates to 60 vessels and that approximately 0.5 mt is allocated to the sector
- We assume that each vessel hedges against uncertainty by holding on to enough quota to cover a single fish (~6 lbs)

4

Illustration of the problem and implications (continued)

	Available Quantity of Yelloweye under Initial Allocation	Quantity Available on the Market if Hedging Occurs
Lbs available to the sector	1,102	682
Lbs per vessel	18	11
No. of Fish per Vessel	3	2

Above table shows that if hedging occurs, ~40% of the sector allocation is unavailable for trading on the market

- This is likely to have a substantial impact on the price
- Price and quota unavailability may make it problematic for vessels to cover deficits

5

Objective of the Auction-based program

Overall objectives are to:

- Decrease the price of purchasing rare species quota
- Increase the likelihood that vessels can cover deficits
  - Price is influenced by reducing demand and increasing the supply available to those that need it
  - The ability to cover deficits is increased by only making QP available to those with deficits, and limiting purchases to quantities necessary to cover overages

6

Description of the Auction-Based Concept

- The auction would occur several times throughout the year
- Vessels would not receive an initial distribution of quota for relatively rare species
- Vessels would be expected to fish with zero QP of those species
- When vessels catch a set amount of these rare species they would need to tie up and cannot fish again until covering that catch by purchasing QP in the auction.
- If vessels do not cover their deficit in the initial auction, they remain tied up and compete in subsequent auctions

7

Implications of the Auction-Based concept

- Maintains incentives to avoid rebuilding stocks by A) requiring that vessels tie up between auctions if they encounter those species, and B) requiring vessels to purchase QP through the auction
  - Both aspects impose a cost, and therefore an incentive to avoid those stocks
- Intended to reduce the cost of acquiring QP for those vessels
  - Increases the supply of QP available to those that need it (because vessels do not have the opportunity to withhold those quota pounds from the market)
  - Reduces the demand for QP (because only vessels with deficits can participate)
    - Both effects should reduce the price of purchasing QP

8

Preliminary Implementation Concept for the Auction-Based Approach

- As part of implementing regulations, NMFS publishes the intent to issue QP through periodic auctions
  - Adjustments to auction frequency listed as a "routine measure"
  - Adjustments to catch amount allowed before being required to tie up is listed as a "routine measure"

9

Implementation concept in practice

- Vessels go fishing at start of year
- Vessels encountering more than 0-10 lbs of yelloweye must stop fishing and tie up.
- On March 1, NMFS begins accepting bids from vessels with deficits.
- 1^{st} auction closes on March 31 and QP is given to the highest bidders
- Those vessels that have won enough QP to cover deficits can go fishing. Others remain tied up.

10

Other details of the auction-based approach

- As part of this management tool, vessels would not be allowed to purchase more than 10-25% of the QP available at any auction
  - This acts as a minimum performance standard and prevents the "deepest pockets" from controlling the fishery
- Vessels would not be allowed to purchase more than their deficit
  - Maintains the objective of giving QP to those that need it

11

Final thoughts

- This approach would probably not be appropriate for more abundant overfished species like Darkblotched rockfish or Pacific Ocean perch.
  - This idea rests on the notion that it is far more likely a vessel will catch zero pounds of those relatively rare species than they will catch any of them

12

Economic Data Collection for Monitoring the Effects of Trawl Rationalization

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1

MSA Requirement

- Need to monitor limited access privilege program (LAPP) to determine if attaining goals
- The Council's stated goal includes several economic aspects
- Economics is also a large part of the Council's objectives, and constraints and guiding principles

2

Economic Effects

- Economic Performance Measures
  - Cost, earnings and profitability
  - Economic efficiency and stability
  - Capacity measures
  - Net benefits to society
  - Distribution of net benefits
  - Product quality
  - Functioning of quota market
  - Incentives to reduce bycatch
  - Market power
  - Spillover effects into other fisheries
- Regional Economic Impact Analysis
  - Contribution to regional economies
  - Distributional effects

3

Data Requirements

- Need data to isolate the effects of the LAPP
  - More data than we are currently collecting through voluntary surveys
  - In general, this means data at the species or fishery level
- A mandatory data collection provision is a current alternative
- Data for spillover effects collected through voluntary surveys of non-LAPP fisheries
- Need data for several years prior to LAPP enactment

4

Other issues

- Data confidentiality
- Costs
  - Additional resources
  - Cost to industry
- PRA required to justify questions and assess burden
- Data collection mechanisms
- Data verification
- Social data

5

Bycatch Management in Coop Alternatives

Inter-coop agreements as a bycatch management tool

1

Existing Options for Bycatch Management in Whiting Coops

- The existing suite of alternatives specify provisions for bycatch management that include:
  - Allocation of bycatch to either:
    - The whiting fishery as a whole
    - To individual whiting sectors
    - GAC and TIQC are recommending an additional option to allocate bycatch (overfished stocks) to coops, and
    - To allow for the formation of inter-coop agreements to manage bycatch (overfished stocks with bycatch caps) between coops

2

Inter-coop agreements as a bycatch management tool

- An inter-coop agreement can increase the successful management of bycatch by:
  - Spreading the risk across a wider spectrum of participants
  - Fostering wider communication about bycatch across the fishery
- Provisions within the inter-coop agreements may specify:
  - Arrangements for sharing bycatch caps between coops and/or sectors
  - Management measures for minimizing bycatch (area closures)
  - Penalties for not meeting specified provisions

3

Inter-coop agreements as a way to spread risk

- Inter-coop agreements increase the number of fishery participants collectively managing the catch of overfished stocks
- An increased number of participants will tend to spread the risk of bycatch management
  - This acts as a form of insurance

4

Inter-coop agreements as a means of increasing communication

- Inter-coop agreements link additional fishery participants to a common constraint/objective (successful management of a common bycatch cap)
- Provisions within the inter-coop agreement require participants to act rationally and collectively to achieve that mutual objective
- Successful management of that limit requires a common and shared knowledge of successful bycatch avoidance techniques
  - Identification of hotspot areas for example
- This will tend to increase communication – and therefore knowledge transfer – between fishery participants
- Increased knowledge tends to increase the likelihood of successfully managing bycatch

5

Specifics of Envisioned Inter-coop agreement Structure

Inter-coop agreements can be used to:

A. Manage bycatch within sectors
B. Manage bycatch across sectors
   - If bycatch is allocated at the coop level and/or there is more than one coop in a sector:
     - Individual coops within a sector may form inter-coop agreements to share bycatch caps within that sector
   - If bycatch is allocated at the sector level and/or there is one coop per sector:
     - Coops may form inter-coop agreements to manage bycatch across sectors

6

Methods and Approach for Analysis

1

Overview

Impacts of the alternatives will be assessed to a large degree based on developing models and analytical tools

These tools will be used to analyze the impact of “analytical scenarios”

- Analytical scenarios combine the existing alternatives and sub-options into several rationalization “programs”
- Scenarios are also constructed with the intention of illustrating the key trade-offs that exist within the alternatives

2

A Categorization of Analytical Tools

Analytical tools can be categorized as:

- Theoretical approaches designed to illustrate concepts and trade-offs
- Information collection to describe the existing environment in a way that better sets the stage for rationalization impacts
- Development of models used to quantitatively assess the effects of rationalization

3

Issues Addressed by Analytical Tools

1) The impact of the initial allocation of IFQ,
2) The amount of fleet consolidation and harvesting cost savings expected to occur,
3) The potential for shifts in the location of fishing effort,
4) The potential for changes in revenue and catch as a result of changes in bycatch rates,
5) The comparative advantage of ports and regions in a rationalized fishery,
6) Negotiation and bargaining power between harvesters and processors,
7) The regional economic impacts of trawl fishing activity,
8) The effect on the California current ecosystem resulting from changes in trawl activity

4

Analytical Scenarios

- Analytical scenarios are constructed with the intention of showing the impact of rationalization programs (as opposed to the effect of individual sub-options)
- From a broad perspective, the scenarios are intended to show the effect of a range of market flexibility and individual accountability in the program
  - Within those scenarios, other key sub-options are ranged to show their impact on the program as a whole

5

Description of Analytical Scenarios

- Scenario 1 is status quo
- Scenario 2a and 2b are intended to be market-centric with a high level of individual accountability of catch. This is largely achieved by issuing IFQ to all sectors and covering all species with IQ.
  - 2.b adds an initial allocation of IFQ to processors while 2.a does not
- Scenario 3 imposes harvest coops on the whiting sectors, IFQ for the non-whiting sector, and imposes sub-options to mitigate against a purely market-driven program
- Scenario 4 is intended to be moderate to scenario 2 and 3 by imposing harvest coops on the at-sea portion of the fishery and fewer, or less restrictive, sub-options to mitigate against a purely market-driven program

6

ELEMENT	Scenario 2.a	Scenario 2.b
Catch Control Tool	• IFQ for all Trawl Sectors	• IFQ for all trawl sectors
Initial Allocation	• Based on catch history (no buyback sharing)	
Processor Initial Ownership / Coop Affiliations	• None	• 25% of groundfish • 50% whiting to shoreside and motherships
Species Covered	• All grndfish and Pacific halibut	• All grndfish and Pacific halibut
Number of Trawl Sectors	• Three	• Four
Adaptive Management	• No adaptive mgmt	• No adaptive mgmt
Roll-over	• Roll-over exists	• Roll-over exists
Overfished Species Provisions	• none	• none
Accumulation Limits	• SB non-whiting grnd: 5% • SB whiting: 25% ctrl & 12% per vessel • Mothership: 25% ctrl & 50% per vessel • CP: 60% ctrl & 75% per vessel	

7

ELEMENT	Scenario 3
Catch Control Tool	• IFQ for Non-Whiting Trawl • Coops for Whiting Trawl
Initial Allocation	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• Processor affiliations in mothership and SB whiting sectors. • 25% SB processor ownership of SB groundfish
Species Covered	• All groundfish in non-whiting sector • Whiting in whiting sectors with bycatch pools that are common across all whiting sectors
Number of Trawl Sectors	• Four
Adaptive Management	• Adaptive mgmt for non-whiting
Roll-over	• No roll-over
Overfished Species Provisions	• placeholder
Accumulation Limits	• SB grnd: 1.5% • SB whiting: 15% • Mothershp: 20% • CV(MS): 10% • CP: none

8

ELEMENT	Scenario 4
Catch Control Tool	• IFQ for Shorebased Trawl (whiting & non-whiting) • Coops for At-Sea Trawl
Initial Allocation	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• Processor affiliation in Mothership sector • 50% SB processor ownership of SB whiting • No processor ownership of SB groundfish
Species Covered	• All groundfish in shorebased sector • Whiting is covered at sea. At sea sector bycatch is covered through sector-specific pools
Number of Trawl Sectors	• Three
Adaptive Management	• Adaptive mgmt for shorebased
Roll-over	• Roll-over exists
Overfished Species Provisions	• placeholder
Accumulation Limits	• SB grnd: 3% • SB whiting: 10% • Mothershp: 30% • CV(MS): 15% • CP: none

9

Trawl Rationalization Alternatives

- Review IFQ Alternative Basics
- Review Co-op Alternative Basics

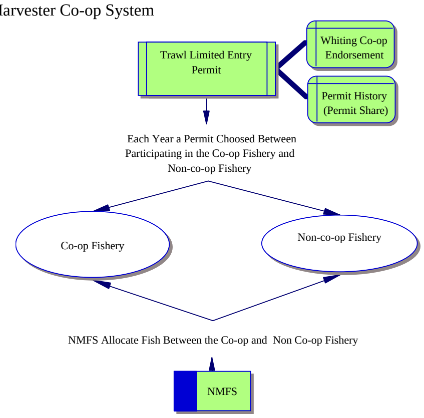
1

IFQ Alternative

- IFQ Scope
  - All Groundfish Species
  - Caught With Directed Commercial Gear
  - By Vessels with LE Trawl Permits
  - – Alternative Scope (same but no IFQ for bycatch in the whiting fishery)
- QS Issued Once At Start (To Permits and Possibly Processors)
- After Initial Issuance, QS Widely Transferable
- QP Issued Annually
- Vessels Required to Have QP
- Accumulation Limits (Vessel and Control)
- Tracking, Monitoring, Data Collection
- Adaptive Management Provision
- Halibut IBQ Option

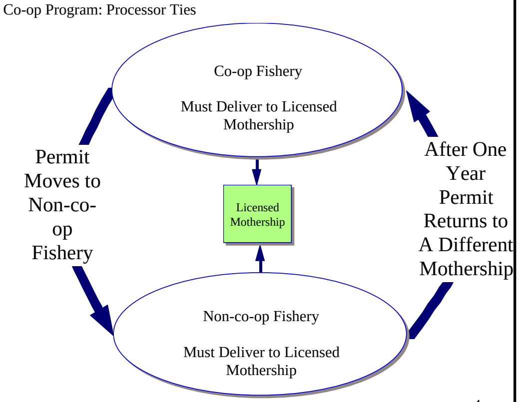
2

The Harvester Co-op System



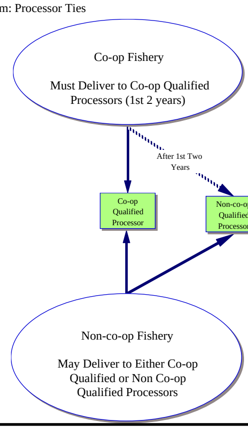
3

Mothership Co-op Program: Processor Ties



4

Shoreside Co-op Program: Processor Ties

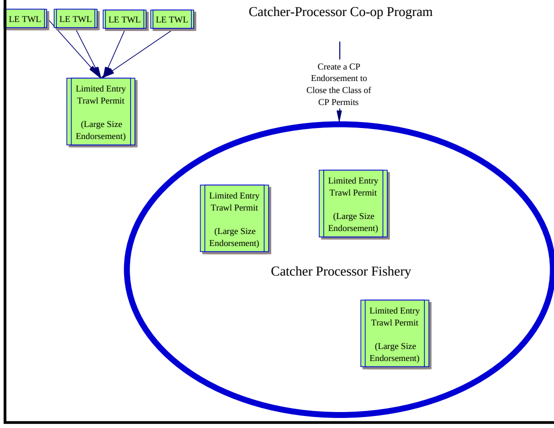


5

- Ties with shoreside processors are broken similar to the means described for motherships (1 year in the non-co-op fishery)

6

Catcher-Processor Co-op Program



7

Whiting Sector Bycatch Management

- IFQ Program Option: IFQ for all bycatch species
  - Option: No IFQ for bycatch species
    - Allocation to all sectors combined (option for seasonal releases)
    - Allocation to each whiting sector (option for rollovers)
- Co-ops
    - Allocation to all sectors combined (option for seasonal releases)
    - Allocation to each whiting sector (option for rollovers)

8

- Review details of alternatives.
  - D.7.b, Attachment 2 – Trawl Rationalization Alt
    - Table 4 on (Page 16)
    - Whiting Sector Management Under Co-ops (Page 38)
  - D.7.b, Attachment 3 – Restatement of Mothership and Shoreside Co-op Alt
  - D.7.b, Attachment 2 – Trawl Rationalization Alt
    - Co-ops for Catcher-Processors (Page 47)

9

Quota Share Allocation Formula and Accumulation Limits

- These two factors will significantly affect the quantitative analysis to be conducted over the next six months.
- For the QS allocation formula in particular, changes made down the road will be costly in terms of time and effort for reanalysis.

10

QS Allocation Formula (A-2.1.3)

- Drop Years
  - Takes into account exigencies that may reduce a permit's ability to participate for a period of time (e.g. hardships)
  - Tends to benefit those with variable history at the expense of consistent participants, leveling out the distribution.
- Relative Pounds
  - Takes into account relative intensity of a fisherman's effort and commitment to the fishery in the face of more constraining regulations.
  - Benefits those catching more when trawl history is lower
  - Because of the recent downward trend, this gives more credit to more recent entrants
    - (see Supplemental D.7.b, Attachment 4, pages 19-23)
- Method for Allocating Overfished Species

11

Relative Shares

- There may be some larger differences in credit given for equivalent amounts of landing in two different years.
- For target species, the range is relative narrow.
- For overfished species, species rarely caught in trawl gear, and shelf species the range may be wide.
- Effects will be greatest on those who have history of short duration.

12

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	QS Abs	QS Rel	% Chng
Sablefish	**.66**	**.63**	**.56**	**.63**	**1.08**	**.74**	**.86**	**.92**	**1.61**	**1.00**			
Relative Credit - 2002 vs. 1995									**2.44**				
Str Early	24,065	41,773	60,763	49,192	35,528	56,317	43,925	32,718	0	0	.49	.45	-8
Str Late	0	0	0	30	0	1,318	1,872	20,897	15,124	18,694	.10	.13	+36
Consistent	2,992	2,344	9,913	8,631	12,169	15,392	7,997	33,450	16,335	19,848	.20	.24	+18
Lingcod	**.04**	**.06**	**.05**	**.05**	**.28**	**.28**	**.91**	**1.04**	**.05**	**1.00**			
Relative Credit - 2001 vs. 1994								**26**					
Str Early	2,162	2,969	31,230	72,004	3,143	1,810	715	38	0	0	.93	.52	-44
Str Late	109	146	102	94	85	129	134	386	466	2,152	.06	.44	+666
Consistent	5,020	2,789	2,195	3,029	2,321	2,817	1,332	1,011	1,128	2,234	.21	.68	+216
Canary	**.01**	**.01**	**.01**	**.01**	**.01**	**.01**	**.21**	**.32**	**.18**	**1.00**			
Relative Credit - 2003 vs. 1994										**100**			
Str Early	12,542	10,277	82,980	31,806	33,781	18,020	0	61	-	-	1.79	.95	-47
Str Late	21	0	0	4	54	164	402	106	398	11	.01	.15	+1182
Consistent	2,077	2,104	1,957	1,639	3296	3,659	903	771	479	299	.16	.53	+228
Kelp Grnling	**.13**	**.01**	**.33**	**.00**	**.35**	**.00**	**.00**	**.85**	**34.00**	**1.00**			
Relative Credit - 2002 vs. 1995									**261.5**				
Consistent	.00	.00	.00	.00	.00	.00	.00	.00	1.00	.00	0.03	9.09	+35240

13

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03
NShelf Rock	**.02**	**.02**	**.02**	**.02**	**.02**	**.05**	**.36**	**.10**	**.43**	**1.00**
Relative Credit - 2002 vs. 1995									**2.44**	
Str Erly	3,792	11,305	27,646	12,575	10,657	7,486	327	4	-	-
Str Late	51	1	0	3	11	102	181	121	384	105
Const	4,682	172	315	208	323	585	143	161	764	17

	Total Catch History	QS Abs	QS Rel	%Chng
Str Erly	73,793	.57	.37	-35
Str Late	961	.01	.08	+36
Const	7,457	.06	.15	+18

14

For More Info On Previous Slides See

Agenda Item D.7.b
Supplemental Attachment 5
Pages 19-23

15

Proposed Accumulation Limits

Agenda Item D.7.b
Supplemental Attachment 1
Components Discussion Paper
Table 17, Pages 33

16

Methods and Approach for Analysis

Overview

- A description of issues addressed by developing models and other analytical tools
- Preliminary results of 3 analytical tools
- A description of the "analytical scenarios" that will serve as the basis for the analysis
  - Analytical scenarios combine the existing alternatives and sub-options into several rationalization "programs"
  - Scenarios are also constructed with the intention of illustrating the key trade-offs that exist within the alternatives

Issues Assessed with Analytical Tools

- The impact of the initial allocation of IFQ,
- The amount of fleet consolidation expected to occur
- The amount of harvesting cost savings expected to occur,
- The potential for shifts in the location of fishing effort,
- The potential for changes in revenue and catch as a result of changes in bycatch rates,
- The comparative advantage of ports and regions in a rationalized fishery,
- Negotiation and bargaining power between harvesters and processors,
- The regional economic impacts of trawl fishing activity,
- The effect on the California current ecosystem resulting from changes in trawl activity

Preliminary Results of 3 Developing Analytical Tools

- Exvessel revenue estimates in the non-whiting trawl sector
- Fleet consolidation and harvester cost savings in the non-whiting trawl sector
- Distributional effects of trawl rationalization on West Coast trawl communities

Initial Exvessel Revenue Estimates in the Non-whiting Trawl Sector

Assessment is based on the following key assumptions

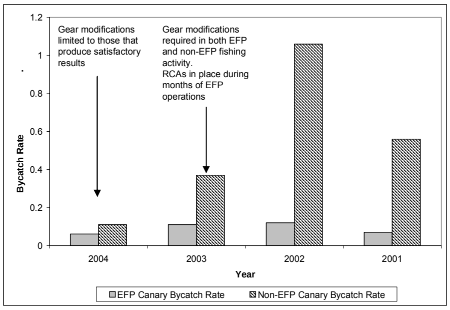
- Exvessel prices remain constant
- Overfished species bycatch rates may change substantially as fishermen find creative ways to avoid overfished stocks
- Overfished stocks are assumed to be as constraining to SQ management in the future as they are currently

  - For more detail, see Agenda Item D.7.b Attachment 4

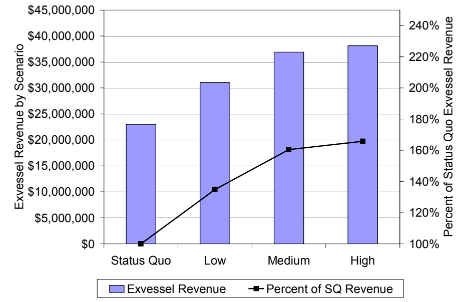
Effects Underlying Exvessel Revenue Projections

- Several under-utilized species will be increasingly accessible as the bycatch of constraining stocks is reduced
- Some species with large OYs will not be fully utilized (Dover sole, arrowtooth, other flatfish)
- Species that are more highly associated with overfished stocks will not be fully utilized (eg. yellowtail and chilipepper rockfish)

Major Assumption for Predicted Changes in Non-whiting Trawl Revenue



Preliminary Estimates of Potential Exvessel Revenue in the Non-Whiting Trawl Fishery

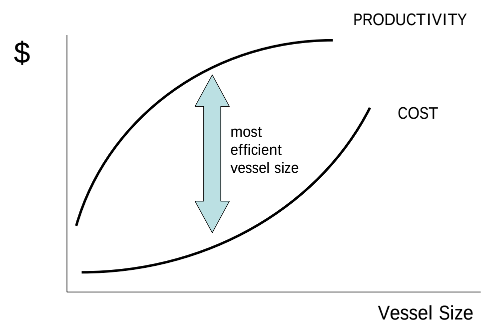


Potential Cost Savings and Fleet Consolidation in the Non-Whiting Trawl Fishery

This ongoing assessment uses the NWFSC cost-earnings survey and basic economic theory to estimate

- The most "efficient" vessel size,
- The amount of fleet consolidation that could be expected and,
- Fleet-wide cost savings

Theory behind vessel efficiency estimate



Preliminary Outcomes of Efficiency and Cost Savings Model

- Initial analysis shows non-whiting trawl fishery participants are making zero economic profit under status quo
- Fleet consolidation should be expected to occur, but to a point (ie. the fleet won't consolidate down to a single vessel)
- Substantial reductions in harvesting costs can occur because of fleet consolidation
- Substantial cost savings can occur by allowing consolidation to occur toward the most efficient vessel size
  - Maintaining vessel/permit size restrictions will restrict cost savings
  - Limiting consolidation will restrict cost savings

Preliminary Community Assessment

In this assessment we examine the relative comparative advantage of various trawl communities in a rationalized fishery

- This preliminary assessment indexes communities based on several factors including:
  - Local fleet productivity
  - Whether the local fleet is dependent on fishing grounds in a relatively high constraining species bycatch area
  - Whether there is the presence of other fishery services in those communities (the presence of other business creates efficiencies)
  - The initial allocation of IFQ made to each community

Fishing Grounds of Select Ports and Location of Relatively High Overfished Species Bycatch Area

Port	Fleet Production Score	Bycatch Dependent Area Score	Shoreside Support Business	Initial Allocation of Grndfish	Preliminary Score
ASTORIA	+	+	+	--	+
BELLINGHAM BAY	+	--	+	--	
BROOKINGS	+	+	--	+	+
CHARLESTON (COOS BAY)	+	+	+	+	+
CRESCENT CITY	--	+	+	--	
EUREKA	--	+	+	--	
FORT BRAGG	--	+	+	?	
MORRO BAY	?	+	--	--	
MOSS LANDING	--	+	+	+	
NEAH BAY	--	--	--	?	--
NEWPORT	+	--	+	?	
PRINCETON / HALF MOON BAY	--	--	+	+	
SAN FRANCISCO	--	+	+	+	+
WESTPORT	--	+	+	?	

Analytical Scenarios

- Analytical scenarios will serve as the basis for the analysis
- Analytical scenarios are constructed with the intention of showing the impact of rationalization programs (as opposed to the effect of individual sub-options)
- These scenarios were constructed with the intention of showing the effect of a range of market flexibility and individual accountability in the program
  - Within those scenarios, other key sub-options are ranged to show their impact on the program as a whole

Description of Analytical Scenarios

- Scenario 1 is status quo
- Scenario 2a and 2b are intended to be market-centric with a high level of individual accountability of catch. This is largely achieved by issuing IFQ to all sectors and covering all species with IQ.
  - 2.b adds an initial allocation of IFQ to processors while 2.a does not
- Scenario 3 imposes harvest coops on the whiting sectors, IFQ for the non-whiting sector, and imposes sub-options to mitigate against a purely market-driven program
- Scenario 4 is intended to be moderate to scenario 2 and 3 by imposing harvest coops on the at-sea portion of the fishery and fewer, or less restrictive, sub-options to mitigate against a purely market-driven program

ELEMENT	Scenario 2.a	Scenario 2.b
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Number of Trawl Sectors	• Three	• Four
Adaptive Management	• No adaptive mgmt	• No adaptive mgmt
Roll-over	• Roll-over exists	• Roll-over exists
Overfished Species Provisions	• none	• none
Accumulation Limits	• SB non-whiting grnd: 5% • SB whiting: 25% ctrl & 12% per vessel • Mothership: 25% ctrl & 50% per vessel • CP: 60% ctrl & 75% per vessel	

ELEMENT	Scenario 3
Catch Control Tool	• IFQ for Non-Whiting Trawl • Coops for Whiting Trawl
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Adaptive Management	• Adaptive mgmt for non-whiting
Roll-over	• No roll-over
Overfished Species Provisions	• placeholder
Accumulation Limits	• SB grnd: 1.5% • SB whiting: 15% • Mothership: 20% • CV(MS): 10% • CP: none

ELEMENT	Scenario 4
Catch Control Tool	• IFQ for Shorebased Trawl (whiting & non-whiting) • Coops for At-Sea Trawl
Initial Allocation	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• Processor affiliation in Mothership sector • 50% SB processor ownership of SB whiting • No processor ownership of SB groundfish
Species Covered	• All groundfish in shorebased sector • Whiting is covered at sea. At sea sector bycatch is covered through sector-specific pools
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Adaptive Management	• Adaptive mgmt for shorebased
Roll-over	• Roll-over exists
Overfished Species Provisions	• placeholder
Accumulation Limits	• SB grnd: 3% • SB whiting: 10% • Mothershp: 30% • CV(MS): 15% • CP: none

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of General Counsel, GCNW
7600 Sand Point Way N.E.,
Seattle, Washington 98115-6349

October 30, 2007

Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

Dear Mr. Hansen:

This letter is in response to the Council's request for legal review of the Trawl Individual Quota alternatives that have been preliminarily adopted for analysis. We have not concluded our review of the entire program, which will continue during the development and consideration of the program. We do, however, have several comments at this stage of development.

First, we stress that a proper written record, including a detailed explanation and justification for the various alternatives and their major components, is required for agency decision making. NMFS needs a clear record of the rationale in order to make (and defend if necessary) a reasoned decision on approval and implementation. We will continue working with Jim Seger and Merrick Burden to ensure that the rationale and justification are sufficiently documented as part of the Environmental Impact Statement and associated documents.

Next, we have determined that several provisions of the shoreside cooperative proposal are not consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C. §§1801 et seq. As you will recall, GCNW's letter of June 10, 2005, which is enclosed, stated our opinion that "under the MSA, no program that amounts to an allocation of shorebased processing privileges can be implemented (except for one recent exception for specific Alaska fisheries)." Additionally, we stated that "a limit could not be placed on the number of processing sites if the purpose were to allocate shoreside processing privileges." We also stated that "requiring that fishermen sell their fish only to specific processors that hold IFQ is the equivalent of allocating on-shore processing privileges and thus is not authorized by the MSA."

The following provision of the alternative entitled "Co-ops for Catcher Vessels Delivering to Shoreside Processors" adopted by the Council at its June 2007 meeting limits the number of processing sites in order to provide those sites with processing privileges and therefore is beyond the agency's authority under the MSA:[1]

--In the first two years of the program, the only shoreside processors that are eligible to get Shoreside Processor (SSP) Permits and receive fish from whiting harvesting cooperatives are those that processed at least 1,000 mt of whiting in each of any two years from 1998 through 2004.

The following provisions of the June 2007 shoreside co-operative alternative obligates catcher vessel deliveries to a specific processor and thus establish a specific amount of whiting that must be delivered to specific shoreside processors. These provisions have the effect of allocating shoreside processing privileges and therefore are beyond the agency's authority under the MSA.

--During the first two years of co-op formation, permit owners that join a co-op shall be required to deliver their whiting catches to the co-op qualified processors that were the basis of their landing history during the period **Years Option 1, 2001; Years Option 2, 2000; Years Option 3, 2000-2003.** Determination of the processor(s) to which a permit holder is obligated will take into account any successors in interest (see following paragraph). Transfers may take place within the co-op between permit holders to allow a permit holder to make deliveries exclusively to one processor so long as the total allocation received by the co-op, based on the permit holders that are members therof, is distributed between the various co-op qualified processors on a pro rata basis based on the landing history of the members of the co-op during the period **[SAME YEAR(S) SELECTED IN THE FIRST SENTENCE].**

--After the first two years: (Option 1: catcher vessels are "released from delivery obligations to the processor(s) that were the basis of its history.") **Option 2**: Thereafter any catcher vessels participating in a co-op is linked indefinitely to the processor they are delivering to under the initial linkage requirement. The permit can sever that linkage by participating in the non-co-op fishery for a period of **[Options: 1 to 5 years]**. After completing their non co-op obligation, the permit is then free to reenter the co-op system and deliver to a processor of their choosing. Once the vessel reenters the co-op system and elects to deliver their fish to a processor, a new linkage is then established with that processor. Should the permit later choose to break the new linkage, the non-co-op participation requirements again apply.

--Co-op allocation: Each year NMFS will determine the distribution to be given to each co-op based on the landing history calculation of catcher vessel permits

[1]We are working from a draft prepared by the Council following the Council meeting, dated July 11, 2007, which incorporates revisions by the Council to earlier drafts.

registered to participate in the co-op that year. In addition, NMFS will determine the landing history linking each co-op to each processor, if any.

–Mutual agreement exception: By mutual agreement of the catcher vessel permit owner and shoreside processor to which the permit's catch is obligated, a catcher vessel may deliver to a shoreside processor other than that to which it is obligated. The transfer may be temporary or permanent. In either case the vessel's catch taken under that permit will continue to be obligated to its permanent processor (which is the transferor processor if the transfer is temporary or the transferee processor if the transfer is permanent) subject to the terms of the transfer agreement. To make an additional change from its processor link (a change that is not by mutual agreement) the permit will need to be used in the non-co-op fishery for the prescribed time.

–Inter- or intra- co-op transfers by limited entry permit owners must deliver co-op allocation (shares) to the shoreside processor to which the shares are obligated unless released by mutual agreement.

–If a shoreside processor transfers its SSP permit to a different shoreside processor or different owner, the catcher vessel's obligation remains in place unless changed by mutual agreement for participation in the non-co-op fishery.

We are aware that the alternative contains provisions that proponents may suggest eliminate the allocation of processing privileges: the shoreside processor limitation is for only the first two years of the program; the catcher vessel- processor linkage or obligation is for only the first two years of the program under one of the options; catcher vessels are not obligated to join a co-op and thus be obligated to a processor (instead they would fish in the non-co-op fishery where the quota is available to all catcher-vessels in the non-co-op fishery); and the obligation can be extinguished by mutual agreement of the processor and the catcher vessel. These provisions do not, however, eliminate the allocation, under certain circumstances, of the shoreside processing privilege. In general, the portions of the shoreside proposal that are not just a continuation of an existing management system include one or more of the elements that are beyond the MSA authority.

As we noted in our June 10, 2005, letter, it is "NOAA's longstanding opinion that the MSA does not provide the legal authority to establish a 'processor quota' system for shorebased processors," because shorebased processing is not "fishing" as that term is defined in the statute. The legal basis for this opinion is detailed in the enclosed Memorandum for North Pacific Fishery Management Council from Lisa Lindeman, NOAA Regional Counsel, Alaska Region, Magnuson Act authority to allocate fishing and processing privileges to processors, September 20, 1993. Nothing in any subsequent legislation changes our legal analysis. In recognition of this legal opinion, Congress specifically passed legislation to authorize processor quotas in the American Fisheries Act, Div. C, Title II, Subtitle II, Pub. L. 105-277, and in the Consolidated Appropriations Act of 2004 , Pub.L. 108-199, section 801, which amended section 313(j) of the Magnuson-Stevens Act (the crab rationalization program). The recent Magnuson-

Stevens Fishery Conservation and Management Reauthorization Act (MSRA) does not change our 1993 legal analysis. While section 303A of MSRA adds specific consideration of processors among other sectors or participants in several sections, it does not make any modifications to the basis for NOAA's 1993 opinion. Significantly, section 303A specifically establishes the requirements for a "limited access privilege program to *harvest* fish". 16 U.S.C. §1853a (emphasis added).

We are available to work with the staff, the TIQC and the GAC to modify the alternative such that it is consistent with the MSA and, to the extent possible, meets the goals of the original language.

We are aware that the Council has asked specific questions about any potential anti-competitiveness implications of the alternatives, including the processor linkage in the mothership coop and the issue of excessive shares. We have initiated informal discussions on the alternatives with the Department of Justice, with the intent of notifying the Council of any issues in a timely manner.

We look forward to continuing to work with you as you move forward on this important rationalization program.

Sincerely,

Eileen M. Cooney
NW Regional Counsel

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of General Counsel, GCNW
7600 Sand Point Way N.E.,
Seattle, Washington 98115-6349

June 10, 2005

Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE. Ambassador Place, Suite 200
Portland, Oregon 97220-1384

Dear Mr. Hansen:

This letter is in response to your letter, dated January 27, 2005, in which you requested a NOAA General Counsel opinion on any legal issues or constraints posed by several alternatives under consideration during the ongoing development of a possible individual fishing quota (IFQ) program for the West Coast limited entry trawl groundfish fishery. Mariam McCall, representing NOAA General Counsel, provided oral responses to the letter at the February 23-24, 2005, meeting of the Ad Hoc Groundfish Trawl Individual Quota Committee. Her responses have been incorporated in the Draft Summary Minutes of that meeting and are summarized below.

Questions 1 and 2: What are the legal issues or constraints posed by "allowing IFQ to be held (owned) by fish processors, at any time," and "issuing IFQ to fish processors at the time of initial allocation of shares?"

Response: The Council has considerable leeway in making the decision about who may be issued or hold IFQ; processors as well as other groups or persons could be issued or hold IFQs. Any allocation decision must have a record developed to support it. As part of the record, the requirements of Magnuson-Stevens Fishery Conservation and Management Act (MSA) National Standard 4 and section 303(b)(6), among other provisions, must be considered.

Question 3: What are the legal issues posed by requiring fishermen to sell their fish to particular processors by establishing a license limitation system for processors or an individual processing quota (IPQ)? The Council also requests information on other legal issues that might be associated with limiting the processors to whom a harvester might sell fish.

Response: As you are aware, it is NOAA's longstanding opinion that the MSA does not provide the legal authority to establish a "processor quota" system for shorebased processors. See Memorandum for North Pacific Fishery Management Council from Lisa Lindeman, NOAA General Counsel, Alaska Region, Magnuson Act authority to allocate fishing and processing privileges to processors, September 20, 1993 (enclosed). Thus, under the MSA, no program that amounts to an allocation of shorebased processing privileges can be implemented (except for one recent exception for specific Alaska fisheries). As for any potential legal issues, providing a legal opinion on a hypothetical program that assumes new authority to establish limited entry systems for processors is difficult because the parameters of the hypothetical program have not been developed. I understand you are interested in having the antitrust questions referred to the Department of Justice, however, it is unlikely that DOJ could provide meaningful advice at this point in the process. As you are aware, DOJ provided comments on a proposed Alaska crab IPQ program in August of 2003. At that time, the crab program had been developed in detail by the Council, and legislation authorizing it was anticipated shortly. Enclosed is a copy of that letter from DOJ to the NOAA General Counsel.

Question 4: What are the legal issues posed by requiring that fishermen sell their fish to processors that hold IFQ? The primary difference between this and an IPQ program would be that the processors and fishers would purchase their individual quota from a single IFQ pool rather than pools split into IPQ and IFQ.

Response: Requiring that fishermen sell their fish only to specific processors that hold IFQ is the equivalent of allocating on-shore processing privileges and thus is not authorized by the MSA.

Question 5: What are the legal issues posed by limiting or restricting in any way the number of fish processors that may purchase fish from fishermen?

Response: In general, a limit could not be placed on the number of processing sites if the purpose were to allocate shoreside processing privileges. However, the licensing or permitting of processor sites could be allowed for enforcement or monitoring purposes, as long as the requirements were necessary for the conservation and management of the fishery and not a disguised limited entry program. Incidental allocation consequences could be permissible depending on the record. Provisions that have the practical effect of limiting the number of ports or sites to which deliveries could be made could be defensible if the record is clear that they are designed for biological, conservation or management purposes.

Question 6: What are the legal issues posed by accumulation caps, including whether there are legal issues to be considered in developing options with different caps for different types of entities and how the legal considerations may change on whether caps are applied to amounts used on a vessel, amounts owned and amounts controlled (leased or owned).

Response: The response will depend on the record and the rationale developed to support proposed caps, and the justification to support the measures as necessary conservation and management measures. Once the Council has identified the accumulation caps to be considered, and adequate analysis and background information is available, it may be possible to request a Department of Justice opinion on antitrust or related issues. In general, while it is possible to ascertain and monitor the ownership of quota as recorded with NOAA Fisheries, it would be very difficult to ascertain and monitor the control of quota.

You also forwarded some questions that the IQ Committee included in the report of its October 2004 meeting. The report included two basic questions. First, if a rebuilding OY is exceeded, would the IQ fishery need to be shut down? And second, could quota overages or underages be rolled over to the next year?

Response: There is not a legal prohibition on doing this if the overall plan is structured such that this makes biological sense. For example, the rebuilding plans, and the FMP itself, would need to be structured to ensure that a variable OY (as a result of overages and underages) would meet the rebuilding targets and the OY requirements. You would also have to deal with how this affected the rest of the groundfish fishery. Finally, there would need to be a conclusion that it would not be so complex that in reality it couldn't be tracked.

As always, Mariam McCall and I are available to discuss these issues further.

Sincerely,

Eileen M. Cooney
NW Regional Counsel

Enclosures

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September 20, 1993

MEMORANDUM FOR: North Pacific Fishery Management Council

FROM: Lisa L. Lindeman
NOAA General Counsel--Alaska Region

SUBJECT: Magnuson Act authority to allocate fishing and processing privileges to processors

BACKGROUND

The North Pacific Fishery Management Council (NPFMC) is currently reviewing potential elements and options for the Comprehensive Rationalization Plan (CRP) in the North Pacific groundfish and crab fisheries. One of the elements, initial assignment of quota share, currently contains five options for consideration by the NPFMC.[1] One option is described as initially allocating a portion of the harvesting quota share to processors under a limited access system. Another option, known as the two-pie system, is described as allocating Individual Processor Quota (IPQ) to processors, creating a limited access system for processing <u>in addition to</u> a limited access system for harvesting. Proponents of an initial allocation to processors contend that allocations of fishing privileges must be fair and equitable and must consider past and current participation in the fisheries. They argue that allocating fishing privileges only to the harvesting fleet fails to recognize the participation and capital investments made by the processing sector of the fishing industry.

You have requested a legal opinion from NOAA General Counsel as to whether the NPFMC and the Secretary of Commerce (Secretary)

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[1]As of June 28, 1993, there are five recommended options for the initial assignment of quota share:
- (A) to vessels or vessel owners at the time IFQ is issued;
- (B) to vessel owners at time of landings activities, considering two general types of recipients: (1) those still in the fisheries and (2) those who have exited the fisheries;
- (C) assign harvesting quota share to other fisheries investors including processors, skippers, and crew;
- (D) coastal communities; and
- (E) assign separate processor quota share (the two-pie system).

have the statutory authority under the Magnuson Fishery Conservation and Management Act (Magnuson Act or the Act) to implement either of these two options. This memorandum answers these questions first by analyzing what types of allocations are authorized under the Act and then analyzing whether the Act requires that all allocations be allocated among harvesters. The third section of the memorandum presents a summary of issues that may arise when a Council considers making allocations to persons other than harvesters.[2]

SUMMARY OF FINDINGS

1. There is authority under the Magnuson Act to allocate fishing privileges. The Magnuson Act requires the Councils and the Secretary to implement measures regulating fishing that are necessary and appropriate for the conservation and management of the fishery. The Councils and the Secretary also have the authority to limit access to one or more fisheries. Access to these fisheries is limited by the allocation of fishing privileges.

2. The Magnuson Act defines "fishery" as one or more stocks of fish and any fishing for such stocks. The term "fishing" under the Magnuson Act includes harvesting activities and operations at-sea in support of or in preparation for harvesting activities. At-sea processing is an operation at-sea in support of harvesting. On-shore[3] processing is not "fishing."

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[2]In a memorandum from Chris Oliver dated August 13, 1993, a third question was also asked: If there is authority under the Magnuson Act to allocate harvesting or processing privileges to processors, are there any legal obstacles to allocating those privileges to foreign-owned processors? The answer to this question will require more legal analysis than time permits before the September Council meeting. However, a memorandum addressing this question can be prepared and presented at the December Council meeting if the Council is still interested in the answer to this question. Mr. Oliver's memorandum is attached to this memorandum.

[3]For purposes of this memorandum, "on-shore processor" means processors that are located landward of the baseline of the United States and "on-shore processing" means processing activities conducted at facilities located landward of the baseline. It is important to note that the definition of "on-shore" for purposes of this memorandum differs from the definition of "inshore" used in 50 CFR 672.2 and 675.2. The definition of inshore includes more than on-shore processors.

3. Because the Councils and the Secretary have the authority to allocate fishing privileges, an IPQ system that allocates Individual At-Sea Processing privileges is authorized under the Act. Allocations of other fishing privileges, such as at-sea transshipping privileges and at-sea supplying privileges are also authorized. However, an IPQ system that purports to create and allocate individual on-shore processing privileges is not authorized under the Magnuson Act.

4. There is authority under the Magnuson Act to allocate fishing privileges to harvesters, processors and to other persons or groups as long as such allocations are consistent with the national standards, including national standard 4, other provisions of the Magnuson Act and other applicable law.

5. Any allocation scheme considered by the Councils and the Secretary that allocates fishing privileges to persons other than harvesters will encounter fairness and equity questions that must be addressed in the administrative record.

CAVEAT

The reader should keep in mind that this memorandum does not address the adequacy of any record developed by any Council to support the creation and allocation of at-sea processing privileges or to support an allocation of fishing privileges to on-shore processors. The analysis is completely theoretical; Secretarial approval and legal defense of any measure that establishes at-sea processing privileges or that initially allocates fishing privileges to on-shore processors would depend on the existence of a record justifying the measure and demonstrating the net benefits to be derived from implementation.

DISCUSSION

When Congress charges an agency with the responsibility of carrying out a statute, such as the Magnuson Act, questions concerning Congressional delegations of authority to that agency may arise. Judicial review of an agency's interpretation of statutory authority is governed by the test set forth in[4] <u>Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.</u>. The first part of the <u>Chevron</u> test requires a determination of "whether Congress has directly spoken to the precise question at issue" and "whether the intent of Congress is clear." If not,

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[4]467 U.S. 837 (1984). In this case, the Environmental Protection Agency issued regulations based on its interpretation of the Clean Air Act's statutory language concerning treatment of pollution sources within a single plant.

the second prong of the Chevron test is applied and a reviewing court must decide whether the agency's interpretation is based on a reasonable construction of the statute.[5] In applying this deferential standard of review, the court should uphold an agency's interpretation of a statute it administers as long as the interpretation is permissible.[6] If Congress was not "clearly averse" to the agency's interpretation, and if the interpretation is "not manifestly contrary to the statute," it should be upheld.[7] Finally, courts should be most deferential in cases involving complex regulatory schemes.[8] Since a reviewing court would apply the Chevron test to determine whether the Secretary has the authority to develop and implement an IPQ system, the Chevron test will be used in responding to the NPFMC's questions.

There is no explicit language in the Magnuson Act authorizing the Councils and the Secretary to establish an IPQ limited access system for processors or to allocate harvesting privileges to processors. Moreover, Congress' intent concerning the Councils' and the Secretary's authority, or lack thereof, to establish either of these two systems is not clearly stated. Failing to resolve the issue using the first prong of the Chevron test, an examination of the statutory language and the legislative history of the Magnuson Act, past legal opinions and case law is necessary to determine whether the Act contains implicit authority to establish such systems.

I. Allocations that are authorized under the Magnuson Act.

Fundamental to answering the question of whether the Councils and the Secretary have the authority to allocate processing privileges are the answers to the questions of what types of allocations are authorized by the Magnuson Act and whether the Act requires that all allocations be allocated among harvesters.

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[5] 467 U.S. at 842-43.

[6] National Fisheries Institute v. Mosbacher, 732 F. Supp. 210, 217 (D.D.C. 1990).

[7] Stinson Canning Co., v. Mosbacher, 731 F. Supp. 32, 37 (D. Me. 1990).

[8] Washington Crab Producers, Inc. v. Mosbacher, 924 F.2d 1438, 1447 (9th Cir. 1990).

a. The Councils and the Secretary have the authority to allocate fishing privileges.

The only specific reference in the Magnuson Act for allocating privileges appears in subsection 301(a)(4), or national standard 4.[9] National Standard 4 states:

> Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this subchapter shall be consistent with the following national standards for fishery conservation and management:
>
> > . . . (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 a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

(Emphasis added.) Although national standard 4 contains the only specific reference to allocating fishing privileges, many other sections of the Magnuson Act focus on the Councils' and the Secretary's authority to regulate fishing and the fishery. Subsections 303(a) and (b) authorize the Councils and the Secretary to prepare fishery management plans (FMPs) for "fisheries."[10] Additionally, subsection 303(a) contains a list of those provisions Congress, through the Magnuson Act, requires the Councils and the Secretary to include in each FMP. Subsection 303(a)(1)(A) states that any FMP prepared must "contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States which are (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and to protect, restore, and promote the long-term health and stability of the fishery." (Emphasis added.) Subsection 303(a)(2) requires a description of the fishery including all vessels involved, fishing gear used, actual and potential revenues from the fishery, recreational interest in the fishery, and nature and extent of foreign fishing and native American treaty fishing

[9] 16 U.S.C. 1851(a)(4).

[10] "Fishery" is defined by the Act as "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks." 16 U.S.C. 1802(8) (Emphasis added.)

rights. The remaining subsections of 303(a) continue to focus on other aspects of the "fishery" or "fishing."

Other support can be found in subsection 303(b), and specifically subsection 303(b)(6). Subsection 303(b)(6) authorizes the Councils and the Secretary to establish systems for limiting access to the fishery in order to achieve optimum yield. Factors that need to be considered by the Councils and the Secretary all focus on the fishery to which limited access would apply: present participation in the fishery; historical fishing practices in and dependence on the fishery; the economics of the fishery; the capability of fishing vessels used in the fishery to engage in other fisheries; and the cultural and social framework relevant to the fishery.[11]

Given the Magnuson Act's emphasis on the Councils' and the Secretary's authority to regulate "fishing," it logically follows that, in order to limit access, the Councils and the Secretary would allocate fishing privileges to fish for one or more stocks of fish.

b. "Fishing" does not include on-shore processing.

Although it is clear that the Councils and the Secretary have the authority to allocate fishing privileges, the next question is what constitutes "fishing." "Fishing" is defined in the Magnuson Act at subsection 3(10) as:

> (A) the catching, taking or harvesting of fish; (B) the attempted catching, taking, or harvesting of fish; (C) any other activity that can reasonably be expected to result in the catching, taking or harvesting of fish; or (D) any operations at-sea in support of, or in preparation for, any activity described in subparagraphs (A) through (C). Such term does not include any scientific research activity which is conducted by a scientific research vessel.[12]

In 1978, NOAA General Counsel prepared a legal opinion analyzing the Secretary's statutory authority to deny applications for permits that would authorize foreign vessels to operate in the EEZ. The Secretary wanted to know whether she had the authority to deny those permits on the basis that U.S. fish

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[11]Some other sections of the Act are 2(b)(1) and (3) (purposes of the Act are to conserve and manage the fishery resources off the coasts of the United States and to promote domestic commercial and recreational fishing.) 16 U.S.C. 1801(b)(1) and (3).

[12]16 U.S.C. 1802(10).

processors had the capacity or intent to receive and process the fish concerned. Although the 1978 legal opinion addresses a different question than the ones before the NPFMC now, its analysis of the term "fishing" and conclusion that the term "fishing" included processing conducted at-sea but did not include processing conducted on-shore are relevant to this discussion.[13]

First, the 1978 opinion interpreted subsection 3(10)(D) as including processing as a support or preparation activity described in subparagraphs (A) through (C) <u>but only if</u> the processing is "at-sea." Second, it interpreted subsection 3(10)(C) as not including on-shore processing as "fishing:"

> In our view, the logical interpretation of section 3(10)(C) would restrict its application to activities at-sea which directly result in the catching of fish. An activity on land which merely provides an incentive to catch fish is insufficiently related to the catching of fish to constitute "fishing" under section 3(10)(C). This conclusion is consistent with the legislative history of the FCMA which at no point indicates that the term "fishing" was intended to include on-shore processing. It is also consistent with section 2(b)(1) which refers to the need to manage the fishery resources off the coasts of the U.S.[14]

The 1978 opinion concluded that the Secretary did not have sufficient authority under the Magnuson Act to disapprove the applications on the basis that U.S. fish processors had the capacity or the intent to receive and process fish harvested from the EEZ. This conclusion led Congress to amend the Magnuson Act later that same year to provide the Secretary with the necessary statutory authority. That amendment[15] became known as the processor preference amendment.

Most relevant to the immediate question of whether "fishing" includes on-shore processing are the changes that were <u>not made</u> to the Magnuson Act by the processor preference amendment. Congress contemplated amending the definition of "fishing" by deleting subsection (D) in order to separate "processing" from the harvesting aspects of "fishing."[16] The term "processing" would have been defined, thus clearly separating the two

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[13]General Counsel Opinion No. 61, at 12 (1978).

[14]<u>Id.</u>, at 10 (1978).

[15]Authorization, Appropriations--Fishery Conservation and Management Act of 1976, Pub. L. No. 95-354, 92 Stat. 519 (1978).

[16]S. Rep. No. 935, 95th Cong., 2d Sess. 2-3.

activities. As finally passed, however, the amendment did not change the definition of "fishing" or define "processing." Representative Murphy provided the following explanation for the decision to leave the definitions unchanged:

> In the end, we decided to leave the [Magnuson Act] definitions unchanged on this point while, at the same time, making clear the act was intended to benefit the entire fishing industry. I want to emphasize that, even though the final bill does not include the House clarification, it is the understanding of the House that "fishing" in section 3 of the [Magnuson Act] does include "processing" and that, for that reason, the proposed clarification is unnecessary.

124 Cong. Rec. H8265-66 (August 10, 1978) (statement of Rep. Murphy). Although Representative Murphy stated that the definition of "fishing" includes "processing," he did not clarify whether his use of the term "processing" included only at-sea processing or both at-sea and on-shore processing.

Despite Representative Murphy's lack of clarification, the definition of "fishing" in the Magnuson Act continues to exclude on-shore processing. The 1978 legal opinion concluded that subsection (C) did not include any processing activities, and that subsection (D) included processing activities but only those conducted at-sea. Congress' contemplated changes would only have deleted subsection (D) from the fishing definition in order to keep the entire definition of "fishing" related to catching, taking, or harvesting, and not to processing. When Congress chose not to amend the definition, but clarified that the definition included processing, it had to be referring only to subsection (D). Even with the knowledge that NOAA General Counsel interpreted subsection (D) as applicable only to at-sea processing, Congress did not delete the phrase "at-sea" from the definition. Therefore, only processing at-sea is considered fishing under the Magnuson Act. On-shore processing does not constitute "fishing" as that term is defined by the Magnuson Act.

c. <u>The Councils and the Secretary do not have the authority to create and allocate on-shore processing privileges</u>.

If "fishing" does not include on-shore processing, then can the Councils and the Secretary establish an IPQ limited access system that creates and allocates on-shore processing privileges? Based on the preceding discussion, the Councils and the Secretary do not have the authority to allocate on-shore processing privileges or establish a system that contained such allocations. Assuming that the two-pie system is one that includes allocations of on-shore processing privileges, it would most likely fail under the <u>Chevron</u> test as an unreasonable agency interpretation of statutory authority. Therefore, this memorandum concludes that the portion of the IPQ option that allocates individual on-shore processing quota would be an invalid extension of the Councils' and the Secretary's statutory authority.

The NPFMC may be presented with the argument that subsection 303(b)(10) of the Act would provide the Councils and the Secretary with the authority to allocate on-shore processing quota. Subsection 303(b)(10) states:

> Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, may--(10) prescribe such other measures, requirements, or conditions and restrictions as are determined to be necessary and appropriate for the conservation and management of the fishery.

Proponents of the two-pie system may argue that an IPQ system is necessary and appropriate for the conservation and management of the fishery because conservation and management measures include the promotion of economic and social goals included in the Magnuson Act. Establishing an IPQ system would achieve the Magnuson Act's economic and social goals because on-shore processors would not be at a competitive disadvantage and possibly driven out of business as the at-sea processing sector drove up the price of fish.[17] An IPQ system would balance the playing field so that on-shore processors and the communities that benefit economically, socially and culturally from the existence of an on-shore processor would be protected.[18]

This argument fails to withstand scrutiny on two grounds. First, subsection 303(b)(10) was not included by Congress as a means for the Councils and the Secretary to circumvent any limits on their statutory authority contained in other sections of the Magnuson Act. Subsection 303(b)(10) provides the Councils and the Secretary with the discretionary ability to develop necessary and appropriate conservation and management measures not enumerated in subsections 303(a) or (b). To interpret 303(b)(10) in such a sweeping manner would swallow up the other provisions of the Act. Second, there is nothing within the subsection to expand the definition of fishing.

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[17] See Attachment (memorandum from Chris Oliver dated August 13, 1993).

[18] Id.

d. The Councils and the Secretary have the authority to allocate fishing privileges which include harvesting privileges, at-sea processing privileges, or privileges to conduct operations in support of or in preparation for harvesting.

Using the same statutory analysis presented earlier, the Councils and the Secretary have the authority to allocate fishing privileges. Since "fishing" includes at-sea processing, a system that allocates at-sea processing privileges would most likely be deemed a reasonable interpretation of statutory authority. Therefore, that portion of the two-pie system that allocates Individual At-Sea Processor Quota, or that allocates at-sea processing privileges, is authorized. Although the two-pie system currently envisioned by the NPFMC would be beyond the Councils' and the Secretary's authority to implement, a system that allocates at-sea processing privileges based on at-sea processing history would indirectly allocate a portion of the total allowable catch for on-shore processing. Such indirect allocation to on-shore processors has been recognized as a legitimate exercise of statutory authority.[19] It must be stressed that such a system would have to be supported by an adequate record and a Secretarial finding that the system is consistent with the Magnuson Act and other applicable law.

It is important to note that, in addition to the Councils' and the Secretary's authority to allocate at-sea processing privileges, it is also within the Councils' and the Secretary's authority to allocate privileges for activities conducted at-sea that are in support of, or in preparation for, the catching, taking or harvesting of fish. Such at-sea activities could include transshipping, fueling, or crew provisioning to list just a few examples. To repeat, the Councils and the Secretary would have to provide a record that justify such an allocation under the Magnuson Act and other applicable law.

II. Does the Magnuson Act require that all fishing privileges be allocated among harvesters?

Although it is within the Councils' and the Secretary's discretionary authority to allocate fishing privileges among only harvesters, does the Magnuson Act actually limit the Councils' and the Secretary's authority to making allocations only to persons that have a harvesting history or are currently

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[19] See Memorandum dated December 1, 1989, for the North Pacific Fishery Management Council from Margaret H. Frailey and Craig R. O'Connor re: Limitations on Roe Stripping (concluding that on-shore processors could only be regulated indirectly as an incidence of managing "fishing."

harvesting fishery resources? Statutory language and past allocations demonstrate that the Magnuson Act authorizes the Councils and the Secretary to allocate fishing privileges to a wide range of individuals or groups, and does not limit those allocations to only harvesters.

The Act authorizes the Councils and the Secretary to establish FMPs that contain measures applicable to fishing that are necessary and appropriate for the conservation and management of the fishery and that promote the long-term health and stability of the fishery.[20] Drawing from the previous discussion, harvesters, along with at-sea processors, transshippers, suppliers, and other persons involved in at-sea support activities, are all fishing. Because the Councils and the Secretary are authorized to regulate fishing by making allocations of fishing privileges, these "fishermen" are all examples of persons to whom the Councils and Secretary can allocate fishing privileges. This analysis alone demonstrates that authority to allocate fishing privileges under the Magnuson Act extends beyond the harvester.

Previous allocations made by the Secretary also support the interpretation that the Magnuson Act authorizes the Councils and the Secretary to allocate fishing privileges to various persons and groups and not solely to harvesters. One of the most well-known allocations is the surf clam and ocean quahog ITQ system. In this plan, the Mid-Atlantic Council chose to allocate surf clam and ocean quahog quota initially to vessel owners. Initial allocations of harvesting privileges were made to vessel owners based on the vessel's reported landings between January 1, 1979, and December 31, 1988.[21] The regulations also provide for the transfer of allocation percentage or cage tags to "any person eligible to own a documented vessel under the terms of 46 U.S.C. 12102(a)."[22] By selecting vessel owners for initial allocation and anyone who can document a vessel under 46 U.S.C. 12102(a) for transfers of allocation percentage or cage tags, the Mid-Atlantic Council clearly chose to allocate ITQ to persons that may or may not have ever harvested fish.[23] While the specific question of

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[20] 16 U.S.C. 1853(a)(1)(A).

[21] 50 CFR 652.20(a) (1992).

[22] 50 CFR 652.20(f)(1) (1992).

[23] This allocation decision was raised in Sea Watch International v. Mosbacher. Plaintiffs claimed that the allocation to vessel owners was unfair and inequitable because it "ignored the high rate of vessel turnover in the industry, excluding individuals with a substantial catch history who recently sold a vessel, and award[ed] a "windfall" to individuals

whether the Councils and the Secretary had the authority to allocate fishing privileges to vessel owners was not raised, a reviewing court found that the Secretary had the authority to establish an ITQ system and that the surf clam and ocean quahog ITQ system was supported by an administrative record that justified the Secretary's decision to approve it.[24]

Another example is the Community Development Quota (CDQ) allocation made by Amendment 18 to the FMP for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (BSAI). As stated in the regulations, "one half of the pollock TAC placed in the reserve for each subarea will be assigned to a Western Alaska CDQ for each subarea. ...Portions of the CDQ for each area may be allocated for use by specific western Alaska communities in accordance with the community fishery development plans . . . ."[25] The purpose behind the allocation was "to help develop commercial fisheries in western Alaska communities" and one of the eligibility requirements was that a community not have previously developed harvesting or processing capability sufficient to support substantial fisheries participation in the BSAI.[26]

An argument that the language in national standard 4 limits the Councils and the Secretary to allocating fishing privileges to U.S. fishermen has not been supported by a reviewing court. In AFTA v. Baker, Intervenor-Plaintiff American Independent Fishermen (AIF) challenged the Secretary's allocation of pollock and Gulf of Alaska Pacific cod to the inshore component, claiming that such allocations were outside of the Secretary's statutory authority. Arguing that because the inshore component included on-shore processors and national standard 4 authorizes allocations only to U.S. fishermen, which does not include on-shore processors, AIF asked the court to find the allocation invalid. The judge disagreed with AIF, finding that "national standard 4 does not express 'clear Congressional intent' to

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with little or no [catch] history who recently purchased a vessel." Ruling on whether the allocation was fair and equitable under national standard 4, rather than an unauthorized extension of the Secretary's authority, the court did not agree with plaintiffs' claim and found that the record supported the Mid-Atlantic Council's use of vessel, rather than individual, catch data. Sea Watch Int'l v. Mosbacher, 762 F. Supp. 370, 377 (D.D.C. 1991).

[24] Id., at 375-76.

[25] 50 CFR 675.20(a)(3)(i) (1992).

[26] 57 FR 46139, 46139, 46140 (1992) (codified at 50 CFR part 675) (proposed October 7, 1992).

prohibit the allocation which AIF challenges" and found that the challenged regulations allocated fishing privileges among fishermen.[27] Judge Rothstein continued by stating that "[the regulations] in effect regulate offshore catcher-processors, which would otherwise preempt the coastal sector of the fishing industry."[28]

Based on this analysis, there is no explicit or implicit statutory requirement that the Councils and the Secretary allocate, either initially or by subsequent transfer, fishing privileges only to harvesters. To the contrary, the Magnuson Act has been construed as authorizing the Councils and the Secretary to make allocations of fishing privileges to harvesters as well as other persons or groups. Relying on the authority established by this interpretation, the Councils and the Secretary have allocated fishing privileges among various "fishermen," harvesters as well as others. And as long as an allocation is consistent with the Magnuson Act and other applicable law, a reviewing court is not likely to determine that such an interpretation is "manifestly contrary" to Congressional intent.

III. Allocations of fishing privileges must be consistent with national standard 4.

It is important to keep in mind that any allocation of fishing privileges must be consistent with national standard 4. National standard 4 requires that allocations be fair and equitable, reasonably calculated to promote conservation and carried out such that no particular individual, corporation or other entity acquires an excessive share of fishing privileges. Any allocation scheme that a Council selects must demonstrate how it complies with these three requirements.

Recognition of capital investment and past participation of processors, specifically on-shore processors, in the initial allocation of quota share raises several fairness and equity difficulties. First and foremost is the fact that allocations of fishing privileges that benefit one group to the exclusion or detriment of another must be justified in the administrative record developed by the Councils and the Secretary. If a Council adopts an allocation scheme that allocates fishing privileges to vessel owners, leaseholders and on-shore processors, for example, it will have to explain why other participants, such as skippers and crewmembers, were excluded from receiving an allocation.

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[27]American Factory Trawler Ass'n v. Baker, Civ. No. 92-870R, Order at 17 (W.D. Wash. July 24, 1992).

[28]Id., at 18.

Compounding the difficulties in developing such a justification is determining how much quota to allocate to persons that do not have a documented catch history. Can on-shore processor investment in buildings and equipment be equated to catch histories and investments in vessels for harvesters such that the allocations would result in a fair and equitable distribution of fishing privileges? If a Council can devise a method of determining the appropriate allocation of quota shares for on-shore processors, would it be able to devise a method for determining the appropriate allocation of quota shares for skippers and crewmembers. It is a question whether the Councils and the Secretary would be able to adequately justify an allocation scheme that allocates fishing privileges to some participants that cannot document a catch history but excludes other participants that cannot document a catch history. It must be remembered that the Councils and the Secretary clearly have the authority to allocate fishing privileges among those persons dependent on the fishery. However, the Councils and the Secretary must be able to justify the allocation scheme as fair and equitable and not arbitrary and capricious.

A third problem is that any initial allocations of fishing privileges to persons other than harvesters may represent a reduction to quota available for harvesters. The allocation "pie" is a finite resource; an allocation of fishing privilege to one person represents a loss of fishing privileges to another. Finally, an initial allocation of fishing privileges to vessel owners or skippers results in an allocation of fishing privileges to U.S. citizens due to U.S. Coast Guard documentation laws and manning requirements. Allocations to some crewmembers or on-shore processors may result in allocations to alien crewmembers or foreign owners.

Because of the implications of each allocation scheme, it is important for a Council to examine the goals and objectives to be attained by allocations of fishing privileges and determine which allocation scheme will achieve the desired results.

CONCLUSION

In conclusion, an allocation scheme that allocates at-sea processing privileges is permissible under the Magnuson Act. As long as the Councils and the Secretary allocate fishing privileges to achieve a purpose recognized under the Act and that furthers the achievement of optimum yield and is consistent with the national standards, other provisions of the Magnuson Act and other applicable law, NOAA General Counsel concludes that such an allocation scheme is authorized under the Act. However, it must be stressed that the more complex the allocations and the basis used for dividing those allocations among participants, the more difficult it could be to defend under an arbitrary and capricious standard and the more costly it would be for the National Marine Fisheries Service to implement.

cc: Meredith J. Jones
Jay S. Johnson
Margaret F. Hayes

Attachment

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MEMORANDUM

TO: Lisa Lindeman
NOAA General Counsel

FROM: Chris Oliver
Deputy Director

DATE: August 13, 1993

SUBJECT: Processor Quota Shares

Per your request of this morning, I will try to summarize the intent of the Council's proposal to consider Individual Processor Quotas (IPQs) as part of the comprehensive limited entry plan. I will also try to summarize the Council's concerns regarding the legalities of this proposal.

First, there has been discussion of allocating processors a portion of the harvesting QS, based on the argument that they have an equal investment in the fisheries. Though it is no secret that this proposal has little or no chance of happening, the Council does want to know if there is a legal basis for doing so. Is there anything in the Magnuson Act or National Standards which would preclude them from doing so? What kind of justification would be necessary for such a proposal to be approved? Would allocation of harvesting privileges to foreign owned processing entities be a problem?

Secondly, there has been proposed the 'two-pie' system whereby separate processor shares (IPQs) would be created which would mirror the harvesting shares. Under this system harvest shares would not be diluted but it would, theoretically at least, balance the playing field so that the processing sector would not be unfairly disadvantaged as they would (again, theoretically) under the original proposal. The theory is that they would be at a competitive disadvantage and would eventually be driven out of business as the at sea processing sector drove the price of fish up. The way the program would work is still fairly unclear. For example, whether the IPQs would be species-specific has not been discussed. The mechanism for initial allocation to processors of those shares has not been discussed very fully, though it would likely be based on relative processing activities during some specified period of time in the past. What is sure is that each processor would have a specific amount, and harvesters could only deliver their fish to a processor if that processor had adequate IPQ to cover that delivery. The harvesting sector is not completely enamored with this idea as it could dictate, to some extent, where they deliver their fish.

I guess the fundamental question to be answered is whether the Magnuson Act allows the Council the authority to create IPQs. The Act specifically addresses <u>fishing</u> activities and mandates, for example, consideration of past participation, current participation, and dependence on the fishery of the participants in the fisheries. Does this include processors? To the extent that the inshore/offshore amendment mandates a set percentage of fish be delivered onshore, would this be an extension of that logic? Would the Council (i.e., analysts) be required to quantify net benefits related to the IPQ proposal?

I believe the Council is concerned that we not go down a road of pursuing this proposal and then find out down the line that it is something they cannot do for legal reasons. Finally, there is considerable concern that even if IPQs themselves are legal, would it be a problem to allocate them to foreign owned entities? I think this about covers it Lisa, though I realize it may seem a bit vague at this point. Please call me after you review this memo.

Monitoring and Cost Issues

- Review of August Workshop
- Development of Analytical Alternatives
- Cost and Cost Recovery Issues
- Next Steps

August Workshop

- A gathering of state, commission, and NMFS folks involved in data collection, data quality, policy, regulation, enforcement, and modeling aspects of groundfish fishery
- Emphasis was on understanding the current trawl logbook, port sampler, and fish ticket systems but VMS, Camera, and Observer systems discussed as well as bycatch modeling inseason management, and ITQ needs and issues discussed.

Trawl Rationalization

- IFQ and Co-op Alternatives
- Track catch (landings and discards) against catch management unit—OY,species species group, gear, area, time, sector and subsector, bycatch cap.
- Track catch against ITQ holder, co-op group, vessel, permit, and processor
- Do so in a “Timely” manner

Scope: What Needs to Be Monitored

Catch (landings plus discard)

by trawl permitted vessels

with any directed groundfish gear.

(may or may not be required for bycatch in the whiting fishery)

Monitoring Decisions: Big Three

- 100% at-sea monitoring (catch monitors and/or cameras)
- Full retention (or not)
- 100% shoreside monitoring (or less)

Trade-offs (I)

- 100% at-sea monitoring
  - Human or Camera
    - effectiveness
    - cost
    - cameras (if feasible) require full retention
- Retention
  - Full
    - retention monitoring at-sea (camera or less skilled monitors)
    - retention cost and disposal
  - Discards Allowed
    - accurate species and weights at-sea (more highly skilled catch monitors)
    - timely discard reporting (on a par with landings)

Trade-offs (II)

- Shoreside Observation
  - Full
    - complete and accurate speciation and weights for retained catch
    - cost
  - Partial
    - possible need for secondary systems to ensure proper accounting of landings
      - e.g. increased plant audits and monitoring of shipments from processors.

"Givens" (all Council alternatives include)

- VMS
- Advance notice of landing
- Electronic landings reporting (state or Fed)
- Electronic tracking of vessel IFQ accounts (balances available in the field)

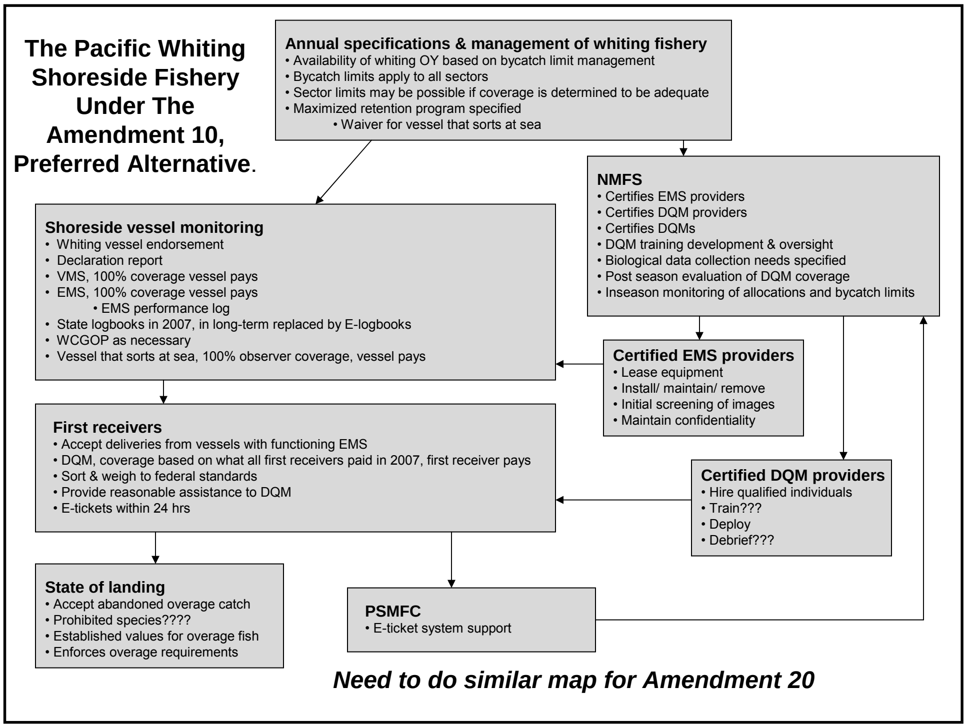
Analytical Alternatives

- Status Quo
- Status Quo "Electronic"
- 100 % At-Sea Monitoring (Human vs Camera), VMS, DQM, Electronic Logbooks.
- "Full", "Maximized" or "limited" Discards?
- Discussion of issues of "monitoring" at less than 100%; 24/7; institutional arrangements including 3rd party contracting, integration of state and fed systems, state vs fed

Background Analysis

Side by Side Comparison of:

- Status quo
- Council Alternatives
- BC Groundfish Trawl Fisheries
- Other Relevant world fisheries
- Amendment 10
- Bering Sea Co-ops (Pollock-other?)



Sources of Cost Estimates

- Bycatch EIS
- Amendment 10
- PSMFC PacFIN Program Estimates
- Fed and State interviews including Enforcement (dust of Enforcement Gap Analysis)
- Informal Interviews of Industry
  - “Sea State”
  - Industry—what monitoring costs are they currently paying –whiting, pollock, other fisheries.

What Costs?

- Have to attributable to the LAP Program
- Incremental to routine data collection, stock assessment, and other pre-existing management costs.
- Cost categories—management, data collection and analysis, and enforcement—terms are “fuzzy” in definition—only good guidance is use Alaska Experience

Deterrmining Costs-Use NMFS Alaska Model

- **cost information gathered annually from:**
  - **International Pacific Halibut Commission (IPHC)**
  - **NMFS Office of Law Enforcement**
  - **NMFS Sustainable Fisheries Division**
  - **NMFS Restricted Access Management**
  - **NMFS Office of Management and Information**
  - **NMFS Office of Administrative Appeals**
- **Costs are independently identified by each management and enforcement agency unit making a claim for cost recovery funds. Not all costs can be computed with precision, nevertheless, estimates are based on documented information and all costs are subject to audit.**
- **Beginning fall of 2005,**
  - **all Alaska Region employee time sheets are coded (in not less than 15 minute increments) to identify any time spent on halibut/sablefish IFQ program or BSAI crab rationalization program management.**
  - **All requisitions, travel, and training are given appropriate budget code(s) necessary to allocate percentage of cost related to the halibut/sablefish IFQ program or BSAI crab rationalization program**
  - **Alaska Region OMI use this data to determine recoverable management costs for the Alaska region**
- **IPHC and NMFS OLE provide management and enforcement costs with guidance from OMI**

Determining Costs (con't)

- AKR OMI collates all identified management and enforcement costs to determine total recoverable costs. Costs are identified for nine budget categories:
  - Personnel compensation
  - Personnel benefits
  - Travel
  - Transportation
  - Rent
  - Printing
  - Other contractual services
  - Supplies
  - Equipment

Limited Access Privilege Program
Management and Enforcement Cost Recovery

- Authorized under the Magnuson-Stevens Fishery Conservation and Management Act (MSA):
  - Secretary of Commerce is authorized to collect a fee to recover the actual costs directly related to the management, data collection, and enforcement of any limited access privilege program (LAPP).
  - Such fees may not exceed 3% of the ex-vessel value of the fish harvested under the LAPP.
  - Shall be collected:
    - At time of landing
    - Filing of landing report
    - Sale of fish during the fishing season; or
    - In the last quarter of the calendar year in which the fish is harvested
  - Fees collected are
    - in addition to any other fees charged under the MSA; and
    - deposited in the Limited Access System Administration Fund (LASAF)
    - Available, without appropriation or fiscal year limitation, only to the Secretary for the purpose of administering and implementing the MSA in the fishery in which the fees were collected

General Information on How NMFS Alaska Collects Fees

- Fees may not exceed 3% of the ex-vessel value of IFQ halibut or sablefish. Fees have never reached 3%.

- Fees collected are used to
  - recover costs of management and enforcement (75%)
  - make funds available for Congress to appropriate to support the North Pacific (IFQ) Loan Program (25%)

- Never recover 100% of costs because of the 25% allocation to the North Pacific IFQ Loan Program

- IFQ Permit Holders responsible for payment (approximately 2,500)
  - self-collect at time of landing
  - "billed" during last quarter of calendar year
  - Permit Holder has a choice:
    - s/he may pay based on "Standard" value as set out on the statement; or,
    - s/he may pay based on "actual" value of IFQ sales (if s/he so chooses, actual value must be proven)

- Payment due January 31st of the following year. May make payment with:
  - Pay.gov
  - Credit card
  - Money order
  - Personal check

- Failure to pay results in non-transferability restriction placed on quota; assessment of penalties and interest; and eventually referral to Treasury for collection
  - Compliance is approximately 99%

What Happens to the Money

- Deposited in the Limited Access System Administration Fund (LASAF)

- Available, without appropriation or fiscal year limitation, only to the Secretary for the purpose of administering and implementing the MSA in the fishery in which the fees were collected

- Flagged by NOAA Finance as to which fishery it belongs to: Crab, IFQ, SER's Snapper.

- NOAA Budget Office acknowledges the available funds and allocates them to NMFS HQ Budget.
  - NMFS Budget Office then allots the owning region the funds.
  - At that point they are available for expenditures.

- Getting the funds to our cooperating management partners:
  - AKR partners: IPHC and State of Alaska
    - » IPHC -- (For Halibut) They apply for and are awarded a grant to reimburse them for their previous year's IFQ expenses.
    - » State of Alaska – (For Crab) We are attempting to enter into a cooperative agreement; however, may have use grant mechanism.
    - » Looking for alternative ways to get cost recovery funds to cooperative management partners

Still Pondering

- Central QS/QP tracking
- Small Boat Exception
- ITQ/Co-op Permit/endorsement/declaration, allocation processes
- Industry Involvement in Designing Cost Reductions (limited ports, time, etc)
- Auction Issues and “Royalties”

GAC Recommendations and Public Comment

- Identify 3 sequential and additive levels of costs—Status quo, current shortfalls in existing programs, incremental costs of TIQ and Co-op programs.
- Show the benefits of increased monitoring in terms of increased access to fish and associated ex-vessel revenues.

Next Steps

- Creation of “Monitoring” Committee and first meeting November 30th
- PSMFC/NWR Presentation of Status of Electronic Fish Ticket and Logbook Projects
- Development of Monitoring and Analysis Analytical Document
- Late Spring GAC/TIQC meetings
- Draft June NEPA Document

GROUNDFISH ALLOCATION COMMITTEE REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION

The GAC met September 25-27 and developed the recommendations contained in this report. The next GAC meeting has been scheduled for Feb 20-22, 2008.

IFQs and Co-ops: Qualifying and Allocation Periods

The GAC discussed whether to narrow down the range of years now, or whether to wait for further Council instruction to do so.

> ***Recommendation:*** *Adopt dates for the qualifying and allocation periods, as displayed in Table 1, at the end of this report. If industry believes that other dates are more appropriate, they should bring those dates forward for consideration along with a supporting rationale.*

Following is rationale pertaining to various ranges of dates recommended by the GAC. These ranges emphasize 2003 for various reasons, however, one of the main ones is the maintenance of the integrity of the current control date and future control dates that the Council may wish to establish. Adherence to these control dates is important so that announcement of a control date does not act as a starting gun for harvesters to race for catch history, exacerbating management problems.

IFQ Allocation for Permits (Including Catcher Processors) and Shoreside Processors (1994-2003):

> These dates start with the inception of the groundfish limited entry program and end with the control date, which is also coincident with the buyback program. The span includes time before and after the disaster declaration period and by including earlier dates does not punish those who left the fishery when it was prudent to do so.

IFQ Recent Participation for Shoreside Processors (Non-whiting and Whiting)
IFQ Allocation for Shoreside Processors (Non-whiting and Whiting)
Co-op Permits for Shoreside Whiting Processors (1998-2003):

> For the shoreside processors the industry stabilized somewhat in about 1998 (as represented by number of buyers): there was a larger than average exodus from the fishery in 1997 and after 1998 the average number of new entrants per year declined. This period then reflects the core of participants in the fishery. This was also the most stable period for whiting (after 2004 whiting prices increased dramatically).

IFQ Recent Participation for Mothership Processors
IFQ Allocation for Motherships
Co-op Alternative Whiting Endorsements and
Co-op Alternative Mothership Permits (1997-2003):[1]

> These dates start with the first year in which there was a three way split of the whiting allocation among the three whiting sectors and conclude with the 2003 control date. A common date is recommended for the shoreside whiting and mothership whiting vessels for parity (so that a vessel moving between the fisheries during this period is equitably affected). A recent participation requirement would be included for motherships for the same reason provided for shoreside processors.

It was also noted that a wider range of years is more inclusive, awarding quota to a wider variety of participants; and that an allocation based on these periods might reflect a better period of coast wide distribution, particularly with respect to fishing communities. However, regardless of the initial allocation the market will tend to redistribute QS to more efficient participants. The quantitative analysis provides an assessment of the effects of the allocation period but not the rationale for choosing different periods.

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[1] It was been rumored that there were data problems with 1997 in the at-sea fishery (flaws or lack of completeness). If this is correct, 1998 should replace 1997.

IFQs: Entities Qualifying for An Initial Allocation (A-2.1.1)

Successor In Interest for Shoreside Processors

The GAC reviewed the rules for assigning history for "shoreside processing"[2] activities. The question asked was whether or not successor in interest should be recognized. If there is reason to give processors an initial allocation of QS, to not recognize successor in interest would disadvantage processing businesses sold during or since the allocation period as compared to those processing businesses that had not been sold over that period.

> ***Recommendation:*** *In allocating IFQ to processors, recognize successor in interest.*

Identification of the successor in interest was also discussed. For example, if a processing company is sold, would the processing history go with the company name, company customer base, company real estate and equipment, or as specified in a contract at the time of sale?

Guidance: Transfer of physical assets alone should not be considered a basis for successor in interest. Business relationships such as transfer of the company name and customer base might be reasonable evidence of successor in interest.

Every issue surrounding the successor in interest cannot be anticipated. As part of the implementation process NMFS should establish standards and criteria to be used in evaluating successor in interest and companies will need to come forward to present evidence relevant to those standards. For the purpose of the analysis, it will be assumed that the successor in interest is the entity which maintains the name of the company.

Identification of the "Mothership Entity"

The task before the GAC was to clarify who would receive the initial allocation that might be given to "motherships," because it could be construed in different ways (owner, charterer, operator).

There is only one known case where the owner of the mothership is different from the entity that operates the mothership. It was noted that no company has an inherent right to the allocation, rationale needs to be provided. In general, qualification and allocation criteria have been developed under a philosophy that the allocation should facilitate continued participation by those who have been participating in the West Coast

[2] Under the option that would allocate QS to shoreside processors, the allocation will go to the first processors of trawl caught groundfish only to the extent that the first receivers (buyers) and first processors are the same entity (under a suboption the allocation could go to a subsequent receiver if a determination is made that the subsequent receiver was the actual first processor.)

groundfish fishery. With respect to the issuance of the IFQ, the question comes down to which entities are in some sense more a part of the West Coast fishery than others.

> ***Recommendation:*** *In the IFQ Alternative, the initial allocation to motherships will go to the owner of the vessel, unless a bareboat charter, in which case it will go to the charterer.*

The GAC noted that a definition of "bareboat charterer" should be developed.

IFQs: Recent Participation Requirements (A-2.1.2)

The GAC discussed recent participation requirements for initial allocation of QS to shoreside processors, and indicated that the bar for qualifying should attempt to include fish processing entities and exclude entities that do not commercially process, such as restaurants. For processors, each additional year of the allocation period (1994-2003) expands the number of potential businesses that might apply for an initial allocation of QS (absent a recent participation requirement businesses that are no longer active in the fishery but still in existence may apply for QS). Thus the aggregate number of shoreside processors with some history has accumulated over the years as companies have entered and exited the business. For vessel permits, the number of qualifying entities has not changed, because each new entrant requires the displacement of a previous participant. The GAC included in its recommendations a time period for recent participation (1998-2003, as identified above) but left open the amount of landings that would be required during that period.

Guidance: The GAC requested information on the following with respect to shoreside processing entities that have purchased less than 1 mt during the allocation period (1994-2003): what are the entities, what are they buying, what are they doing with the fish, and where on the coast are they located?

IFQs: Allocating Overfished Species Using Target Species QS & Applying Bycatch Rates (A-2.1.3)

In June, the Council approved a method by which bycatch rates and fleet average tow depth distributions would be applied to the target species QS received by an individual. The fleet average bycatch rates would be adjusted based on the time of year and latitude over which the catch history generating the QS occurred. While it was believed that use of 2003-2006 permit specific harvest distribution information from logbooks would provide a more appropriate amount of overfished species QS for each permit, it was also thought that the logbook records were often incomplete. Since that time, it has been determined that the records are more complete than previously believed. Therefore, it was proposed that fleet averages for the depth distribution of harvest be replaced by permit specific logbook information. This would also allow a finer scale assessment by area of the appropriate bycatch (e.g. more areas than just north and south of 40 10' N Lat).

The GAC generally supported this proxy calculation and acknowledged that time is running low for investigating new options.

> ***Recommendation:*** *Revise the formula for allocating overfished species such that depth and latitudinal strata used for allocation of overfished species based on bycatch rates will be based on the logbooks associated with each permit rather than fleet wide average logbook information.*

The GAC also noted an interaction between the assignment of overfished species QS based on bycatch rates applied target species quota shares and the equal allocation of buyback pool quota shares (e.g., vessels without catch history in the north would receive arrowtooth QS).

IFQs: Allocation of Rare Overfished Species Using and Auction Approach (A-2.1.3)

The GAC noted that under the proposed auction approach the "price" paid would be not only the auction price but also the loss occurring from time off the water awaiting the next auction. Interest was expressed in flexibility such that if a person just needed a few pounds to cover a deficit he could continue fishing until the auction.

> ***Recommendation:*** *Further explore the allocation of rare overfished species by auction.*

IFQs: QS Reallocation (A-2.1.6)

With Changes in Management Areas

The GAC reviewed a formula for moving management lines and combining areas designed to ensure that the management area changes do not result in a reduction or increase in the annual QP a person receives.

> ***Recommendation:*** *Move ahead with the alternative for geographic reallocation, however, indicate that such area changes are expected to be rare.*

With Changes in Stock Status

When overfished target fisheries rebuild, there should be a way to allocate and catch those species, as bycatch, as a directed fishery, or as incidental catch in another directed fishery. There are several proposed ways to do this including auctions. Basing a future allocation on catch history might be difficult as there would not be recent catch history available which takes into account the new targeting opportunity that may suddenly become available when a stock achieved rebuilt status. However, the GAC thought it may be best to deal with allocation when rebuilding is achieved.

> ***Recommendation:*** *Drop options for reallocation when a stock is rebuilt. Acknowledge in the alternatives that some change in the quota share allocations*

could occur when a species status moves from overfished to not overfished, and mention ways that allocation could happen. Also, when a species becomes overfished, the QS may be reallocated to facilitate harvest of as many target species as possible.

IFQ: Vessel Quota Pound (QP) Minimum Holding Requirement (A-2.2.1)

During the GAC discussion of a minimum QP holding requirement for vessels it was noted that with appropriate disincentives, the minimum holding requirement would not be needed. If minimum holding requirements were to be implemented, more monitoring would be required and the system would be more complex.

> ***Recommendation:*** *Drop the option that would require a vessel to hold some minimum amount of QP before departing from port.*

IFQ: Vessel QP Overage Resolution (A-2.2.1)

Concern had been expressed that a disaster tow on a rare overfished species could result in a vessel being tied up (Option 1) for years trying to cover the overage. This might be considered victimization of the fisherman. On this basis, an attempt had been made to develop alternative means of compliance. Option 4 recommended a payment based on the average amount of target catch typically associated with the overage species and Option 5 recommended payment of a fine based on the value of fish onboard the vessel. It appeared that both of these approaches might not provide adequate due process. The viability of Options 2 and 3 were also uncertain. Option 3 needs to be clarified to indicate how the performance bond might be forfeited.

> ***Recommendation:*** *Drop Options 4 and 5, retain Option 1, and request that NOAA General Counsel provide input on Options 2 and 3.*

It was also noted that, as compared to a single species system, more flexibility might be required in the trawl multispecies fishery.

IFQ: Temporary Transfer Prohibitions (A-2.2.3.c)

During discussion of transfer of overfished species QS, the industry challenges in managing their portfolios of QS particularly given the degree of uncertainty regarding the implications of the IFQ program for overfished species. One of the lessons learned from the New Zealand system was that there may be utility in preventing the permanent transfer of QS during the first years of the program in order to allow fishermen to gain a better understanding of how the system will function and the value of the QS. Markets function best when there is good information.

> ***Recommendation:*** *Include in the alternatives a cooling off period for trading QS during the first 2-3 years of the TIQ program.*

This would not prevent the trading of the QP issued to those holding QS.

IFQ: Accumulation Limits (A-2.2.3.e)

The GAC reviewed available data tables and developed Option 1 based on the maximum landings history shares of nonbuyback permits (the 1994-2003 average of each non-buyback permit's annual landings divided by the annual landings of all non-buyback permits). The accumulation limits will determine the maximum fleet consolidation level. Focusing on the non-buyback permits is intended to preserve the more recent fleet profile. The period used was the same as the qualifying period. The intent of the option is to develop caps that are generally above the amounts of QS that will be allocated to permits based on their history during the qualifying period.

> ***Recommendation:*** *Change the Option 1 control cap to the percentages in the Table2 below with none higher than 5%, except English sole and other flatfish; Option 2 control cap to be 1.5 times the percentages from Option 1; and Option 3 control cap for all nonwhiting groundfish to be a 3% accumulation cap. For all options, the vessel cap would be double the control cap amount, except whiting. Decimal points should be rounded to the tenth. For species left blank use the values from page three of GAC Meeting, Agenda Item I, E Historic and Recent Total Shares, GAC September 2007 (as now reflected in Table 2).*

Guidance: Provide the geographic distribution and number of vessels that achieve the maximum limits.

Guidance: With respect to consolidation issues, evaluate control of the limited liability corporations that own the at-sea processors.

The GAC discussed the grandfather clause (clause allowing those who initially qualify for QS in excess of an accumulation). It was suggested that a limit on the grandfather clause might be a way to limit changes in market power that could result from the initial allocation. It would also reduce the maximum possible disparity among initial recipients (those not receiving amounts in excess of the accumulation limits may be at a disadvantage compared to those utilizing the grandfather exception).

> ***Recommendation:*** *Add a sub-option for analysis that would limit the grandfather clause to 2 times the accumulation limit amount that is finally adopted for Section A-2.2.3.e.*

QS not allocated as a result of the cap on the grandfather clause would effectively increase the amount received by all other initial recipients.

IFQ: Tracking and Monitoring, Estimates of Administrative Costs and Fees (A-2.3.1 and A-2.3.3)

Dr. Steve Freese made a presentation on tracking and monitoring issues and the assessment of program costs for the purpose of determining fees. This issue will be reviewed again by the GAC and TIQC in late spring.

Guidance: Deficits in implementing current fishery management should be documented so that they are not falsely attributed to ITQ implementation.

IFQ: Mandatory Data Collection Requirement (A-2.3.2)

Dr. Todd Lee reported to the GAC that current voluntary surveys are inadequate for managing and assessing an IQ fishery. Mandatory surveys would provide 100% response rate, be more detailed, and should be started a couple of years before implementation to capture a baseline for monitoring the effects of a TIQ program. Concern was expressed that data collected on a mandatory basis might not be accurate.

> ***Recommendation:*** *Add provisions that would allow audits to validate data submitted in response to a mandatory data collection requirement.*

It was noted that: data collected on a mandatory basis could be used to analyze other policies; and confidential data collected under the MSA is protected from divulgence through FOIA requests.

IFQs: Allocating of Halibut IBQ Using A Target Species QS and Applying Bycatch Rates (A-4)

The International Pacific Halibut Commission is proposing a new stock assessment that would dramatically reduce what the West Coast gets. The trawl portion of the halibut catch comes off the top of the areas total halibut quota, and thus limits other halibut fishery opportunities. A mechanism to allocate halibut to the trawl fishery might help save some halibut for the other sectors.

The formula for allocating halibut IBQ is similar to the formula for allocating overfished species QS.

> ***Recommendation****: Move ahead with the formula for allocating halibut bycatch quota based on bycatch rates.*

IFQ: Trading IFQ with Limited Entry Fixed Gear Vessels and Eliminating Size Endorsement (New)

The GAC received a proposal from Mr. Robert Alverson to allow trawl IFQ for some species to be used by fixed gear vessels without trawl permits.

***Recommendation**: If time allows, the TIQC should address a proposal to allow trawl IFQ for some species to be used with LE fixed gear permits. The proposal would also consider elimination of the length endorsement and would address the observation requirement that would go along with the harvest of trawl IFQ species on fixed gear vessels. Ms. Culver and Mr. Alverson will develop a proposal for consideration by the TIQC.*

There was no mention in the proposal of any effect on transferability of the IFQ (i.e. IFQ could be transferred to and from vessels with trawl limited entry permits).

Guidance: Clarify that gear switching (ability to move back and forth between gears) is different from gear conversion (permanent transition from one gear to another). The IFQ program covers only gear switching.

Co-ops: Bycatch Management in the Mothership and Shoreside Co-op Programs (B-1 and B-2)

The GAC expressed concern about the possibility that the co-op fishery could become a race for fish among co-ops. Adding an option for analysis that would allocate bycatch species to co-ops might reduce this as a possible occurrence. Bycatch would be allocated pro rata in proportion to the co-ops allocation of whiting. A provision was also added to allow co-ops to form inter-co-cops (co-ops of co-ops). Even if there is not an allocation of bycatch to co-ops the inter-co-ops might form to prevent a race for fish from developing. There might also be incentive to form the inter-co-ops if the bycatch allocations to single co-ops are not sufficient to cover "disaster" type tows of bycatch species. The concept of the inter-co-op agreement is not currently in the suite of options.

Other incentives for vessels to take part in a co-operative might include providing co-ops with an earlier start date than the non-co-op fishery, and/or a bycatch cap for the non-co-op vessels.

***Recommendation:** Add an option for co-op bycatch caps and inter-co-op agreements.*

Co-ops: Continuation of the Shoreside Co-op Alternative (B-2)

The GAC heard from the processor representative on its advisory panel that industry support for the shoreside co-op alternative is waning. Additionally, NOAA GC expressed concern as to whether the processor license program and processor ties that are part of the vessel co-op program would be permissible under the Magnuson-Stevens Act.

***Recommendation:** Drop from the analysis the co-op alternative for the whiting shoreside, due to waning industry support and questionable legality of the option.*

Co-ops: Mandatory Data Collection (New)

After hearing the report from Dr. Todd Lee on mandatory data collection for the IFQ program, the GAC decided that similar provisions should be included as part of the co-op alternatives.

> ***Recommendation:*** *Include the mandatory data collection option as part of the co-op alternative.*

Other Guidance

Guidance: Provide a list of efforts that have been made to reach out to communities.

Table 1. GAC recommended qualifying and allocation criteria.

	Qualifying for Participation		Allocation	
	IFQ Recent Participation	Co-op Alt Endorsement/ Permit	IFQ Allocation	Co-op Catch History
Permit Owners				
Nonwhtg SS Catcher Ves	None	N/A	’94-’03 (drop 3)	N/A
Whtg SS Catcher Ves	None	’97*-‘03 (>500 mt)	’94-’03 (drop 2)	97-‘03 (drop 1)
Whtg MS Catcher Ves	None	’97*-‘03 (>500 mt)	’94-’03 (drop 2)	’97*-‘03 (drop 1)
Cather-Processor Permit Owners	None	’97*-’03 (>0 in at least 1 yr)	’94-’03 (drop 0)	N/A
Mothership (Operators or Owners?)	’97*-’03 (>1K mt in in each of 2 yrs)	’97*-‘03 (>1K mt in each of 2 yrs)	’97*-’03 (drop 0)	N/A
Shoreside Processing Companies	’98-’03 (amount to be required pending data review)	’98-’03 (>200 mt in at least one year)	’94-’03 (drop 2)	N/A

N/A = Not Applicable

‘97* = Data in 1997 may have a fatal flaw which renders them useless. In which case, the starting year will be 1998.

Table 2. Control cap, and vessel cap options to define QS/QP accumulation limits in IFQ Program Alternatives.

Stock	Option 1		Option 2		Option 3	
	Control Cap (%)	Vessel Cap (%)	Control Cap (%)	Vessel Cap (%)	Control Cap (%)	Vessel Cap (%)
All nonwhiting groundfish (in aggregate)	1.5	3.0	2.2	4.4	3.0	6.0
Lingcod - coastwide c/	5	10	7.5	15		
N. of 42 (OR & WA)	5	10	7.5	15		
S. of 42 (CA)	5	10	7.5	15		
Pacific Cod	5	10	7.5	15		
Pacific Whiting			0	0		
Shoreside Sector	10	7.5	15	11.3	25	12
Mothership Sector	10	25	15	37.5	25	50
Catcher Processors	50	65	75	97.5	60	75
Alll Whiting Sectors Combined	15	25	22.5	37.5	40	50
Sablefish (Coastwide)	1.9	3.8	2.9	5.7		
N. of 36 (Monterey north)	2	6.2	3	9.3		
S. of 36 (Conception area)	5	6.2	7.5	9.3		
PACIFIC OCEAN PERCH	5	6.2	7.5	9.3		
Shortbelly Rockfish	5	6.2	7.5	9.3		
WIDOW ROCKFISH	3.4	6.8	5.1	10.2		
CANARY ROCKFISH	5	10	7.5	15		
Chilipepper Rockfish	5	10	7.5	15		
BOCACCIO	5	10	7.5	15		
Splitnose Rockfish	5	10	7.5	15		
Yellowtail Rockfish	5	10	7.5	15		
Shortspine Thornyhead - coastwide	3.1	6.2	4.7	9.3		
Shortspine Thornyhead - N. of 34deg27'	4.8	9.6	7.2	14.4		
Shortspine Thornyhead - S. of 34deg27'	4.7	9.4	7.1	14.1		
Longspine Thornyhead - coastwide	2	4	3	6		
Longspine Thornyhead - N. of 34deg27'	2	4	3	6		
Longspine Thornyhead - S. of 34deg27'	5	10	7.5	15		
COWCOD - Conception and Monterey	5	10	7.5	15		
DARKBLOTCHED	5	10	7.5	15		
YELLOWEYE g/	5	10	7.5	15		
Black Rockfish	5	10	7.5	15		
Black Rockfish (WA)	5	10	7.5	15		
Black Rockfish (OR-CA)	5	10	7.5	15		
Minor Rockfish North	5	10	7.5	15		
Nearshore Species	5	10	7.5	15		
Shelf Species	4	8	6	12		
Slope Species	5	10	7.5	15		
Minor Rockfish South	5	10	7.5	15		
Nearshore Species	5	10	7.5	15		
Shelf Species	5	10	7.5	15		
Slope Species	5	10	7.5	15		
California scorpionfish	5	10	7.5	15		
Cabezon (off CA only)	5	10	7.5	15		
Dover Sole	1.8	3.6	2.7	5.4		
English Sole	10	20	15	30		
Petrale Sole (coastwide) c/	2.9	5.8	4.4	8.7		
Arrowtooth Flounder	5	10	7.5	15		
Starry Flounder	5	10	7.5	15		
Other Flatfish	10	20	15	30		
Other Fish	5	10	7.5	15		

ENFORCEMENT CONSULTANTS REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION ALTERNATIVES (TRAWL INDIVIDUAL QUOTAS AND COOPERATIVES)

The Enforcement Consultants (EC) have reviewed Trawl Rationalization Alternatives Attachment D.7.b, Attachment 2 and Agenda Item D.7.a, Attachment 1 and have the following comments.

The EC would like to express its appreciation to the Trawl Individual Quota Committee (TIQC), Groundfish Allocation Committee (GAC), Groundfish Advisory Subpanel (GAP), and Groundfish Management Team (GMT) for their continued support of the suite of monitoring and compliance alternatives contained in the documents, and believe this suite of proposed alternatives adequately covers the range of monitoring issues pertinent to successful implementation of a trawl rationalization program.

Vessel Minimum Holding Requirement (A-2.2.1)
We concur with the GAC and TIQC recommendation that a minimum holding requirement be eliminated. We believe the requirements listed in Table 3, A-2.2.1, page 13 of Attachment 2 is adequate and appropriate.

Vessel Quota Pound Overage Resolution (A-2.2.1)
We concur with the TIQC and recommend retaining Options 1 and 2 for analysis.

Trading Individual Fishing Quotas (IFQs) with Limited Entry Fixed Gear Vessels
The EC does not believe this option has overwhelming monitoring and compliance issues that would preclude this option for analysis, but does believe that this option adds a layer of complexity the could negatively impact initial implementation, and recommends this option be tables and reconsidered as a trailing amendment after initial implementation of the TIQ program.

Vessel Size Endorsements
The EC believes vessel size endorsements are an obsolete, unnecessary management measure within the TIQ program and recommends this licensing endorsement requirement be dropped with implementation of the TIQ program.

Shoreside Sector Co-op Program (B2)
The EC has grave concerns regarding the Shoreside Sector Co-op as currently proposed. We find the processor linkage option confusing and therefore struggle in trying to anticipate how regulations would be prorogated to support this management objective, and once prorogated, how those regulations would be effectively enforced. The EC does not believe this proposal should be moved forward for analysis until the processor linkage option is given more clarity and specificity.

PFMC
11/07/07

GROUNDFISH ADVISORY SUBPANEL REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION ALTERNATIVES (TRAWL INDIVIDUAL QUOTAS AND COOPERATIVES)

The Groundfish Advisory Subpanel (GAP) heard a presentation from Mr. Jim Seger on the status of the Trawl Rationalization Program as well as outstanding issues that need to be resolved. The GAP has the following comments and recommendations.

In general, the GAP supports moving forward with the current suite of alternatives for analysis with the additions (not omissions) recommended by the Trawl Individual Quota Committee (TIQC), Groundfish Allocation Committee (GAC), and the GAP.

The GAP believes it would be premature to remove reasonable alternatives prior to analysis, potentially in violation of National Environmental Policy Act (NEPA) and other administrative procedures.

The GAP recommends the following additional alternatives be analyzed:

1. Transferability

   The GAP supports the TIQC recommendation to add an alternative for mothership permits to allow one transfer per year. This is recommended to provide flexibility in the case of breakdowns. Additionally, the GAP recommends looking at an alternative that would provide for no restrictions on annual transfers.

2. Operating Restrictions for Motherships

   The GAP supports the TIQC recommendation to include an alternative that will allow a vessel to operate in the capacity of a catcher processor and mothership sector within the same calendar year. The current draft provides that mothership permits may not be transferred to a vessel engaged in the harvest of whiting in the year of transfer.

3. Initial Linkage

   The GAP request that the Council add an alternative to base initial mothership processor-catcher vessel linkages on processing history from 1997 to 2004 and linkages from 1994 to 2003. Currently the only option for catcher vessels is a linkage to the mothership where deliveries were made to the year preceeding implementation of the individual fishing quota program.

4. Percent Linkages

   The current draft would require a catcher vessel to be linked with 100 percent of the vessels historical catches to a mothership. The GAP recommends that the Council analyze options at zero, 50%, 75% and 100%. The different percentages of linkage will allow the catcher vessels some leverage in negotiating prices.

5. Mothership Processor Withdrawal

   The GAP supports the TIQC option if a mothership chooses to not participate in the fishery, its linked catcher vessels should be free to join any mothership co-op. The catcher vessels should not be forced into the open access harvest if their market chooses to not participate. They should be able to take their quota to another market without penalty.

6. Length Overall

   The GAP supports looking at an alternative that removes the length overall limitations on a trawl permit once the IFQ program is adopted.

7. Rarely Occurring Overfished Species

   The GAP supports the GAC and TIQC recommendations relatative to auction options.

8. Jim Seger gave the GAP a presentation on relative poundage currently used in the rationalization options for distributing historical catches. The GAP supports this procedure and thanks Jim for the presentation.

9. The GAP supports including for analysis two sets of years of historical landings to determine qualification to participate in the Mothership Co-op Program. The GAP supports including the years of 1994-2003 as well as the period 1997-2003 for analysis. We note the following:
   a. The catch of vessels in the 1994- 1996 period helped to establish the whiting sector allocation of 1997.
   b. Preliminary analysis presented to the TIQC indicated there may be as few as three (3) vessels affected.
   c. Any catch derived from eliminating these vessels will contribute little to other participants in the sector.
   d. It is reasonable to analyze the same periods for qualification under both the individual quota option as well as the mothership co-op option.

PFMC
11/07/07

Agenda Item D.7.g
GMT Report
November 2007

GROUNDFISH MANAGEMENT TEAM REPORT ON TRAWL IQ ALTERNATIVES FOR INITIAL ALLOCATION O F OVERFISHED SPECIES, INITIAL ALLOATION OF HALIBUT BYCATCH QUOTA, AND AREA SPECIFIC MINIMUM HOLDING REQUIREMENTS

The Groundfish Management Team (GMT) reviewed discussion papers on allocating overfished species on a bycatch rate, allocating Pacific halibut to limited entry trawl permits in the non-whiting trawl fishery based on a bycatch rate, and minimum holding requirements.

Allocating Overfished Species on a Bycatch Rate

The GMT concurs with the concept of allocating overfished species (OFS) based on a bycatch rate because it would arguably provide more fishing opportunity for more individuals in the trawl fishery than allocating based on landings history. If OFS are allocated based on landings, a relatively small number of individuals would receive a relatively large share of quota.

The GMT reviewed the proposed methodology for assigning OFS quota to vessels based on the target species catch history, depth shoreward or seaward of the rockfish conservation area (RCA), and a bycatch rate. The methodology uses the available data sources in the following manner:

- Fish ticket data from 2003-2006 would provide the record of target species landed catch made by a permit. The target species catch would be used to estimate quota shares of target species.
- Quota shares of target species would be applied to the target species OYs that would go into effect during the implementation of the TIQ program (est. 2011).
- Depth data from logbooks (2003-2006) would be used to stratify each permits quota pounds into shoreward or seaward RCA locations. A fleet average depth distribution would be used for permits with no corresponding logbook.
- West Coast Groundfish Observer Program (WCGOP) data from 2003-2006 would be used for estimating shoreward and seaward bycatch rates of OFS.

The GMT concurs with using the projected OY for target species. The method is intended to more accurately reflect the status quo at the time of TIQ implementation, which would reduce the need for market adjustments after the initial allocation. The GMT also supports the use of logbooks in stratifying the landed catch and observer data to estimate bycatch rates.

Allocating Pacific Halibut Bycatch Quota on a Bycatch Rate

The GMT discussed the concept of managing catch of Pacific halibut in the trawl fishery through the use of an individual bycatch quota. Currently, bycatch of Pacific halibut is not a limiting factor for the trawl fishery. However, fluctuations in the total allowable catch (TAC), either due to natural causes or changes in stock assessment methodologies, could change the proportion of the 2A halibut TAC in the trawl fisheries. Further, catches of Pacific halibut could increase or decrease under the TIQ program, depending on the target strategies and areas fished. Therefore, the GMT supports the use of an IBQ as a tool to directly manage Pacific halibut catch in the trawl fisheries.

The GMT reviewed the proposed method for the initial allocation of Pacific halibut IBQ. There are no permit-specific records for trawl landings of Pacific halibut since regulations prohibit the retention of halibut with gears other than hook and line. The proposed methodology, which is similar to that used to allocate OFS, is based on a bycatch rate to target species stratified by area and depth. The target species used to calculate Pacific halibut IBQ are Dover sole and arrowtooth flounder, two species that have been shown to have a positive correlation with Pacific halibut bycatch. This is different from the methodology for OFS where a total of 26 target species are used. For permits with no Dover sole or arrowtooth flounder records, Pacific halibut IBQ could be obtained through equal allocation of the buyback permit history, if an alternative that with equal allocation of the buyback permits is selected. Under the buyback scenario, all permits would obtain some initial allocation halibut IBQ. Depth and area stratifications would be determined using logbook data. Depth-based stratification would occur shallower or deeper than 100 fathoms. Area stratifications would be either the Vancouver or the Columbia/Eureka INPFC areas based on differential bycatch rates reported from the WCGOP.

The GMT discussed the target species used to generate IBQ. There were concerns that generating the IBQ based on such few species (e.g., arrowtooth and Dover sole) may result in too few permits receiving IBQ. One solution may be an alternative where every permit would get some minimum amount of halibut IBQ (e.g., 1%) and those with arrowtooth and Dover sole history would receive an additional amount based on the bycatch rate. The proposal recommends that for permits with no Dover sole or arrowtooth flounder records, Pacific halibut IBQ would be obtained through equal allocation of the buyback permit history. The GMT notes that equal allocation of the buyback permit history is a proposed alternative, but is not guaranteed for implementation. Both alternatives could minimize the potential mismatch between initial IBQ allocation and current fishing practices.

Area Based Minimum Holding Requirements for Overfished Species

The GMT discussed two options for area based minimum holding requirements for OFS 1) depth based and 2) hot spot based. Depth based minimum holding requirements would be determined based on the target and OFS depth distribution. For example, if trawlers intend to target species in depths less than 200 fathoms, a minimum holding requirement for canary and yelloweye rockfish could be required. Vessels could fish deeper without meeting the minimum holding requirement for canary and yelloweye rockfish, but would need to meet those minimum holding requirement provisions if they desire to fish shallower than 200 fathoms. Depth based holding requirements would cover the entire coast, meaning that all fishers would be required to have OFS reserves. This may not be practical given the few OFS shares available. Additionally, as the year progresses fewer and fewer OFS quota pounds would be available thus fishers would be prevented from fishing at all. Assuming that current management measures are still available under the TIQ regime, inseason action could be taken to implement a depth restriction if few OFS quota pounds were remaining. For example, if nearly all the canary quota pounds were used early in the season then a 150 fm depth restriction could be implemented to reduce the probability of a catch that is larger than the remaining quota pounds on the market.

Hot spot minimum holding requirements were also discussed. Hot spot areas would be identified based on the presence of OFS and the probability that a trawler would encounter them. Access to the hot spot areas would then require a minimum holding requirement of the OFS common to the area. The hot spot minimum holding requirement would provide some insurance that some amount of OFS catch can be covered. Contrary to the depth based minimum holding requirement, at the end of the year, if few OFS quota pounds were available one could still conceivably fish in areas with low/no OFS impacts. As such, the hot spot minimum holding requirement might be a more feasible alternative.

At the very minimum, the area based holding requirement would discourage fishing in areas with high OFS with no IFQ to cover. While OFS quota pounds will be scarce, the holding requirement would encourage the development of risk pools or cooperatives to ensure that catch could be covered. Vessels could elect to enter into voluntary pooling agreements in order to reach that minimum holding requirement. This would require that trawlers forming voluntary risk pools register with, or notify the National Marine Fisheries Service (NMFS) that they are in a voluntary quota sharing pool for a year. This would provide verification that vessels in those pools collectively meet the minimum holding requirement of a given OFS. The declaration process could be handled through the current vessel monitoring system. The GMT supports an alternative/mechanism that encourages development of risk pools or cooperatives.

Generally, the team agreed that a mechanism is needed to prevent fishing in areas with high OFS bycatch while holding no OFS quota. Given the OFS constraints, market solutions may be few and a management tool may be necessary to prevent individual behavior that could negatively affect the fleet. To the extent that a minimum holding requirement could act as insurance, the concept is supported. The GMT, however, was unable to conceive of a minimum holding requirement mechanism, either depth based or hot spot based, that would provide insurance against a very large tow (e.g., a disaster tow) due to the scarcity of OFS quota.

GMT Recommendations

1. Initial allocation of OFS should be based on the target species catch history, depth shoreward or seaward of the RCA, and a bycatch rate as described in Agenda Item E.2.

2. Create a Pacific halibut IBQ which would provide a management tool to directly manage Pacific halibut catch in the trawl fishery. Explore alternatives that initially allocate Pacific halibut based on arrowtooth flounder and Dover sole catch history stratified by area and depth as described in Agenda Item L. Further explore an alternative that provides some minimum amount of halibut IBQ (e.g., 1%) and some additional amount for permits with arrowtooth and Dover sole catch history.
3. Analyze an alternative that requires hot spot based area minimum holding requirements.

GROUNDFISH MANAGEMENT TEAM REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION ALTERNATIVES (TRAWL INDIVIDUAL QUOTAS AND COOPERATIVES)

Introduction

The Groundfish Management Team (GMT) received a report at their October meeting from Council staff on the current suite of trawl rationalization alternatives being considered. Specifically, the GMT focused on the analytical scenarios that are intended to illustrate the impact of a trawl rationalization program and highlight the key decision points within the alternatives. The GMT also discussed the concepts of rare species auctions and area management, and offers the following comments.

Rare Overfished Species Auctions

The GMT was presented with a new approach for dealing with severely constraining overfished species. This sub-option has not been considered in previous suites of alternatives, but could provide a mechanism for managing catches of rare overfished species (i.e., species with very low optimum yields [OYs], such as yelloweye and cowcod) that might otherwise confound a market-based individual quota (IQ) system. While status quo methods for responding to "disaster tows" (expansion of Rockfish Conservation Areas or area closures), would still be available, a mechanism is needed to prevent severe harm to any individual fishing operation. For example, a vessel that experienced a large encounter of a species for which a very restricted amount of quota is available may be unable to cover that quota in the foreseeable future. This situation might be avoided by auctioning some portion of needed quota periodically throughout the year to vessels holding a deficit, rather than allocating quota at the beginning of a season. Likewise, utilizing area closures for areas of highest bycatch (i.e., hotspots) might reduce the frequency of high bycatch tows, thus reducing the number of fishermen in need of auctioned quota pounds.

In order to provide the program with enough flexibility and minimize harm to a given individual, quota would need to be auctioned often enough that a vessel does not have to stay tied up for too long due to a deficit. This may require reevaluation of program performance to set the appropriate frequency of auctions. For example, if quarterly auctions result in many vessels waiting to cover needed quota, bi-monthly auctions might be more appropriate. Likewise, available data should be analyzed to examine whether there is a seasonal component of a species' availability and adjust the amount of quota or frequency of auctions accordingly. There may also be legal implications if a given permit holder loses a number of auctions such that the time off the water becomes overly punitive. A system similar to some states' limited hunting license programs, wherein an individual becomes more likely to win subsequent auctions, may be one way of ensuring the vessels are not overly penalized for encountering relatively rare species. Finally, any such system would need to be revised as species move from more to less constraining. At some point a species would rebuild to levels that make an auction system obsolete and an IQ system more appropriate.

Area Management

Currently, the Council uses latitudinal and depth-based spatial management measures, as well as gear restrictions, to achieve area management objectives. If implemented as currently specified, trawl IQs may result in catch being more concentrated in smaller areas than under status quo.

This is because the current alternatives allocate the IQ of groundfish stocks according to the Council's acceptable biological catch/OY table and the result of this level of spatial management would be a departure from existing cumulative limit management which separates the fishery into as many as three latitudinal areas (i.e., north and south of 40^{o} 10' North Latitude and between 38^{o} and 40^{o} 10' North Latitude). As the existing alternative moves forward, there may be a further increased need for spatial management measures, perhaps in a manner different than status quo.

The GMT is concerned that the implementation of an IQ program could result in spatial concentration of fishing effort. The GMT reiterates its recommendation that IQ be allocated on a more refined spatial scale than is currently being considered (see Agenda Item E.9.c, GMT Report, June 2007). In doing so, the GMT notes that care should be taken to balance biological objectives with economic objectives. Management at an overly fine scale of resolution is likely to reduce the flexibility necessary for fishers to profitably harvest groundfish and to adapt to changing conditions. However, area management at too broad a level of resolution may result in a localized concentration of effort that has adverse biological impacts or negative economic impacts on vulnerable coastal communities. In addition to biological and economic impacts, area-based quota shares could substantially increase program complexity – and therefore administrative costs – because each area is likely to require specific quota shares by species and rules that govern the quota shares held by permits operating in those areas.

While the GMT believes that work should continue on the appropriate resolution of area management, in the interim, establishing an IQ system that separates groundfish stocks north and south of 40^{o} 10' North Latitude (e.g., based on average fleet catch history in each area during the 1994-2003 period) – and allocates individual fishing quotas accordingly – would provide an appropriate balance between biological, economic, and administrative objectives until a more appropriate set of areas can be established.

GMT Recommendations

1. Include a sub-option in the alternatives for analysis that would auction quota of rare overfished species to vessels with a deficit rather than allocating quota up front.
2. Include a sub-option that would specify area-specific quota north and south of 40^{o} 10' and refine those areas as new information becomes available.

PFMC
11/07/07

Agenda Item D.7.g
Supplemental SSC Report
November 2007

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION ALTERNATIVES (TRAWL INDIVIDUAL QUOTAS AND COOPERATIVES)

The Scientific and Statistical Committee (SSC) had discussions with Mr. Merrick Burden and Mr. Jim Seger regarding details of the Trawl Rationalization Alternatives. The SSC Economics Subcommittee previously met with the Trawl Individual Quota Analytical Team (TIQAT) on September 9, 2007 to review the analytical framework and proposed analysis of trawl individual quota (TIQ) alternatives. The Subcommittee's report, which has been endorsed by the full SSC, was sent to the TIQAT and the Groundfish Allocation Committee. Below are highlights from the Subcommittee report and additional points regarding the Trawl Rationalization Alternatives.

The Trawl Rationalization Alternatives are complex and potentially confusing. To facilitate review by the Council family and the public, the SSC recommends that each option and provision begin with a clear statement of what it is intended to achieve, and conclude with an evaluation of its effectiveness relative to the stated objectives.

To facilitate understanding and proper interpretation of the Trawl Rationalization Alternatives, it will be particularly important that the TIQAT document the limitations of the data and models used, identify key assumptions underlying the analysis, distinguish between short-term and long-term effects, distinguish between economic efficiency versus distributional effects, and use methods such as sensitivity analysis to reflect the uncertainty associated with TIQ effects.

<u>Analytical Scenarios</u> (Agenda Item D.7.b, Attachment 4)

The TIQAT developed four analytical scenarios that include elements of the Trawl Rationalization Program that are expected to have major effects on the outcome of the program. Given the numerous issues that need to be addressed to establish the Trawl Rationalization Program and the multiple options associated with each issue, the SSC agrees that an approach of this type is needed to make the analysis meaningful yet tractable. However, the SSC also notes that some potentially significant options (e.g., initial allocation of quota shares by auction or "use-it-or-lose-it" provisions) have already been excluded from consideration. Excluded options such as these should be identified and the rationale for their exclusion discussed in the Draft Environmental Impact Statement (DEIS).

<u>Lessons Learned From Other Rationalization Programs</u>

Experiences from other rationalization programs may yield “real world” insights into potential effects of the Trawl Rationalization Program on harvesters, processors, and communities. To facilitate the Council's evaluation of the Trawl Rationalization Alternatives, a summary of the lessons learned from other rationalization programs should be provided for Council discussion in as early a draft of the DEIS as is possible.

Assessing Effects of Initial Allocation of Individual Fishing Quota (IFQ)

The Subcommittee recommends that the fleet consolidation analysis be accompanied by an analysis of alternative fisheries likely to be targeted by vessels displaced from the groundfish fishery. Fleet consolidation will lead to efficiency gains and reduced costs due to overcapitalization, but will also impose costs to communities through reduced economic activity and possible adverse effects on regional economies.

Illustrating Potential for Geographic Shifts in Fishery Patterns

The TIQAT proposes to use geographic differences in bycatch rates as a basis for projecting geographic shifts in non-whiting trawl effort, and to use lengthening of the whiting season that will likely occur with trawl rationalization as a basis for projecting a northward shift in midwater trawl effort. The SSC notes that other factors such as regional differences in fishery infrastructure and harvest efficiency may also affect the geographic distribution of fishing effort.

Illustrating the Potential to Reduce Overfished Species Catch Rates and Increase Target Species Catch and Revenue

For the non-whiting trawl sector, the TIQAT proposes to use the percent reduction in canary bycatch rates achieved under Washington's arrowtooth flounder exempted fishery permit (EFP) as the basis for projecting changes in harvest of all overfished species under IFQs. The SSC notes that, while the arrowtooth EFP provides evidence of changes in canary bycatch rates, these rates are not necessarily applicable to other fishing strategies and geographic areas.

The bycatch prediction method proposed by the TIQAT will have a major effect on the outcome of the analysis, as the predictions will inform or serve as inputs into a number of other components of the DEIS. The SSC recommends that the TIQAT emphasize the limitations of its bycatch projections and consider a range of bycatch rate reduction scenarios that reflect these uncertainties.

Allocation of Overfished Species

The TIQAT is currently considering three methods for allocating quota shares of overfished species: allocation based on catch histories for the bycatch species, allocation based on target species catch histories, and an auction system. The SSC notes that allocating bycatch quota shares on the basis of target species catch histories will be less disruptive and involve a less costly transition to efficiency than the method based on bycatch catch histories. It is not clear that the auction method for allocating quota pounds for overfished species will make fishers better off. The analysis will need to consider lay-up costs while waiting for the next seasonal auction and the potentially reduced supply of quota share that may be available during an auction.

Mandatory Economic Data Collection

It is important that information be collected that will allow an evaluation of the Trawl Rationalization Program. The SSC supports the mandatory economic data collection requirement.

Accumulation Limits

The setting of accumulation limits is a very important aspect of the Trawl Rationalization Program. These limits should be analyzed in terms of the economic efficiency gains that may result from the program. Additionally, the trade-offs between these efficiency gains and the adverse impacts on regional economies and communities need to be evaluated.

PFMC
11/08/07

TRAWL INDIVIDUAL QUOTA COMMITTEE REPORT ON AMENDMENT 20: TRAWL RATIONALIZATION

The Trawl Individual Quota Committee (TIQC) met October 11 & 12 in Seattle, WA and developed the recommendations contained in this report. The next TIQC meeting has not been scheduled. There are 18 members of the TIQC. The tribal representative and Washington trawl and Oregon trawl representatives were not present during the meeting. At the end of each recommendation is a note indicating whether the recommendation is a consensus or majority.

IFQs and Co-ops: Qualifying Eligibility and Allocation Time Periods

The TIQC discussed a number of aspects of the GAC recommendation to narrow the qualification periods to a single option for each sector and criteria. Concern was expressed as to whether the narrowed set of dates would provide a range adequate to meet NEPA requirements and whether a period that did not include years after 2003 would adequately address recent participation. On the other hand it was pointed out that the range could be narrowed if rationale was adequate; that the MSA requires "consideration" of recent participation (which is different from a requirement to actually use more recent catch history years); that there were other ways to take into account recent participation (e.g. allocating to harvesting vessels based on who currently owns a permit rather than who owned it at the time a landing was made); and that allocating based on history occurring after the control date could have negative repercussions for the announcement of control dates in the future. It was also noted that requiring a number of years to be dropped penalizes those with consistent history; however, using a longer range of years rewards longevity.

The GAC recommendation indicated a possible problem with the use of 1997 as the start of some of the qualifying periods. The TIQC was informed that the main data quality issue of concern appeared to be that observers did not witness every delivery but relied on vessel logbooks for some 1997 at-sea deliveries. With respect to allocation based on whiting catch history, the TIQC did not express concern about this aspect of the data.

> ***Recommendation: TIQC Recommendation:*** *Support the GAC recommendation for the MS C/V and MS qualifying years of 1997-2003 for both endorsement and permit qualification. (Majority)*

It was noted that 1997 is an appropriate start date because this is the first year that whiting was formally allocated to three sectors, and with respect to using 2003 vs. 2004, there was no difference in terms of who qualified. Those in opposition expressed concern that there be consistency in the periods used for the IFQ and co-op alternatives. A motion was put forward to add an option that would extend the qualifying period from 1997-2003 to 1997-2006, however, this motion failed. The rationale in support of the motion was to more heavily weight recent participation after 2003 and include all motherships that would qualify under the proposed Amendment 15.

The TIQC reviewed the full suite of recommendations for qualifying time periods recommended by the GAC and had no other formal recommendations.

IFQs: Entities Qualifying for an Initial Allocation (A-2.1.1)

Initial Allocation to Processors

The TIQC discussed the allocation of 50% of the whiting quota shares (QS) to processors. Those advocating for maintaining an option allocating 50% of whiting QS to processors noted that whiting processing tended to be more capital intensive than processing for nonwhiting groundfish species and that those in the whiting fishery were invested at a level to accommodate a race for fish that is not present under cumulative limit management in the nonwhiting fishery. One member suggested that whiting processors were 2/3 over capitalized. Those in opposition noted that a processor does not need to have QS in order to buy whiting while a vessel needs QS in order to harvest and that when joint production, original cost and depreciation issues are taken into account it was not clear that whiting processing was more capital intensive than nonwhiting processing or harvesting. With respect to the joint production argument, it was argued that vessels also engage in a variety of fisheries. With respect to the ultimate balance of the initial allocation of QS, it was noted that if processors get half the QS allocation and then also receive QS allocation for vessel permits they control, they would receive more than half the total QS.

> ***TIQC Recommendation:*** *Change the option that would give QS to processors from a 50% processor share for all whiting sectors to a 25% processor share for all whiting sectors to make it consistent with the non-whiting shoreside processing option. (Majority)*

Successor in Interest for Shoreside Processors

The TIQC reviewed the rules for assigning history for "shoreside processing"[1] activities. The question asked was whether or not successor in interest should be recognized. If there is reason to give processors an initial allocation of QS, to not recognize successor in interest could disadvantage processing businesses bought during or since the allocation period as compared to those processing businesses that had not changed hands over that period. The TIQC discussed the idea that when an asset is purchased it is with the expectation of being able to recover the investment through use of the asset, that it is the buyer's responsibility to make sure they acquire the key assets necessary to recover their investment, and that a processor's ability to use a particular asset might not be substantially hampered if it does not receive IFQ (a processor does not need to have IFQ to receive fish from catcher vessels). It was also noted that there may be existing legal criteria relevant to determining successor in interest.

Successor in interest can be specified in a contract and if a contract does not specify successor in interest, NMFS should have criteria and a process for addressing conflicting claims to QS.

> ***Recommendation:*** *The TIQC endorses the GAC recommendation regarding the successor in interest issue with the understanding that NMFS will need to develop criteria to evaluate successor in interest and that this criteria should include consideration of the terms and intention of a contract. (Consensus)*

Identification of the "Mothership Entity"

The TIQC reviewed the GAC recommendation that the initial allocation of QS go to the owner of the mothership, unless there is a bareboat charter, in which case it will go to the charterer.

TIQC members described the ownership structure of several different motherships. The M/V Excellence was the only bareboat charter situation identified.[2] During public comment it was noted that there may be a number of places in the co-op alternative in which there are legitimate issues for public discussion but no options have been provided. One of these is the question of whether an initial allocation should go to the bare boat charterer or the owner of a vessel. Some concern was expressed that this issue was being raised late in the process and that the TIQC had not been presented complete information on the situation.

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[1] If an allocation of QS goes to shoreside processors, one option would only give QS to the first receivers of trawl caught groundfish. This would approximate an allocation to first processors to the extent that the first receivers (buyers) and first processors are the same entity. A second option would modify this by specifying that the first receiver must have processed some trawl caught groundfish, and a third option would modify it by allowing a second receiver to receive credit for the processing history of the second receiver is the first processor and there is resolution of any conflicting claims between the first and second receivers.

[2] It was also noted that the Arctic Storm and Arctic Fjord are managed by the same company do not have identical ownership. A foreign company, Nichiro, has a 25% interest in the Golden Alaska.

__Recommendation:__ With respect to the entity that would receive the IFQ or mothership permit (co-op alternative), add a second option that would allocate to the owner and exclude the bare boat charterer (the current provision would allocate to the charterer in a bare boat charter situation). (Majority)

IFQs: Recent Participation Requirements (A-2.1.2)

If processors receive harvester quota, they would get whiting and non-whiting quota shares. The TIQC split the discussion of the shoreside processor qualification requirements into two categories: whiting and non-whiting processors.

For the whiting fishery, a motion was presented to require at least 1 mt in each of any three years during the recent participation period. The 1 mt requirement is only 1/8000th of the average. However, the three year aspect of the requirement was viewed to indicate longevity, commitment, and investment in the fishery without screening out the smallest receivers. During discussion, the view was expressed that there should be as many buyers in the fishery as possible. Those opposing a more restrictive requirement felt that if the recent participation requirement means that fewer buyers each receive larger amounts, and if buyers receiving an initial allocation of QS have a competitive advantage over those screened out, then the recent participation requirement will make it more difficult to maintain a large number of geographically dispersed buyers. Additionally, the opinion was expressed that if QS is given to these small entities and they fail or divest themselves of the QS, this QS would be the source for new entrants. Receipt of an initial allocation may also provide some certainty for financing. The motion failed and a subsequent motion was the basis for the following TIQC recommendation. Some supporting the subsequent motion noted that the contrast of the lower threshold with the higher threshold would serve to illustrate the effect of fewer versus more initial recipients.

__Recommendation:__ Add two options for shoreside whiting processor qualification: 1) in the years 1998-2003 any company that bought 1 mt of whiting in any 2 of those years, and 2) 1 delivery of any size. (Consensus)
__Recommendation:__ Add two options for shoreside non-whiting groundfish processor qualification: 1) 6 mt in each of 3 years, and 2) 1 delivery option. (Consensus)

The TIQC discussed whether the non-whiting years should be the same as the whiting years. For shoreside whiting processors, the TIQC felt that picking 1998 as the starting year for qualification, rather than 1997, was appropriate because in 1998 the shoreside processing industry became more stable.

IFQs: Allocating Overfished Species Using Target Species QS & Applying Bycatch Rates (A-2.1.3)

In June, the Council approved a method for allocating overfished stocks based on a bycatch rate. Since the bycatch rate of overfished stocks can vary widely from one area to another, this method attempts to establish an area that vessels will fish in after the fishery is rationalized. The method adopted by the Council in June would use aggregated logbook data on a species by species basis to predict where vessels would fish under rationalization. In other words, if 90% of the trawl caught Pacific cod occurred north of Cape Mendocino, and shoreward of the trawl

RCA, each permit with Pacific cod catch history would be estimated to take 90% of its Pacific cod from that same area.

At its meeting, the GAC recommended that logbooks be used on an individual permit basis, and that where the permit caught target species between 2003 and 2006 would be the estimate for where the permit would catch its target species after the fishery was rationalized. The TIQC disagreed with this recommendation.

During discussion, the TIQC initially noted that fleet average logbook data would be more appropriate than individual permit logbook history during 2003-2006 because in more recent years vessels were forced to choose between fishing shoreward or seaward of the trawl RCA in the north. Since the catch history formula is based on the years 1994-2003, permits will receive QS for species that are found both shoreward and seaward of the RCA. Therefore, the TIQC initially discussed using fleet average logbook data so that each permit would be assigned both shoreward and seaward catch history. For example, one permit may have caught 100% of its Dover sole from areas seaward of the RCA over the 2003-2006 period, while on average the fleet may have harvested 70% of its Dover sole from areas seaward of the RCA, and 30% of its Dover sole from areas shoreward of the RCA. Using fleet averages would mean that the permit would receive credit based on fleet fishing patterns in areas shoreward and seaward of the RCA, and overfished species would be allocated accordingly.

After further deliberation on the issue, the TIQC decided to recommend the use of permit specific logbooks from 1994-2003. It was felt that using 1994-2003 logbooks to estimate fishing location in a rationalized fishery would align the allocation of overfished stocks better with the allocation of target species. Furthermore, it was felt that using 1994-2003 permit specific logbooks would be a better estimator for fishing location in a rationalized fishery because permits would overfished species allocations in proportion to their allocations of target species based on fishing activity during that period.

> ***Recommendation: TIQC Recommendation:*** *The TIQC concurred with the GAC recommendation to use individual permit logbooks as part of the allocation formulas for both* ***<u>overfished species QS</u>*** *and halibut IBQ but recommends that 1994-2003 logbooks be used to determine the location of target species catch instead of 2003-2006 logbooks. (Consensus)*

IFQs: Allocation of Rare Overfished Species Using an Auction Approach (A-2.1.3)

During discussion it was noted that one of the attractive aspects of the auction approach was that it presented a way to distribute overfished species QP annually at a lower cost to those who needed it. This was preferred over allocation of QS for those species. Such QS might be held by those who don't need it to go fishing, but who might then extract a high price when the demand is high. The TIQC wondered if there were other ways to allocate overfished species quota on an "as needed" basis.

In regard to the auction idea, there was concern about the amount of time a vessel might have to be tied up. A two month timeframe for auctions might be preferred over quarterly. NMFS should supply the Council with information on how the timing might work for the auctions. There should be some consideration to anyone who isn't able to cover their deficit of rare species covered in the first auction – should that person have bidding preference in the second auction? How would those preferences be established? How will "rare" overfished species be defined? When a species is no longer rare, how would its QS be allocated. What happens for those holding QS when a species becomes rare? A question was raised as to what would happen in the last auction of the year? If not all of the QP were needed by those with overages, what would happen to the remainder? If there were not enough QP for all the overages, what would happen to those harvesters with uncovered overages and to fleet fishing opportunity? Some TIQC members saw merit in issuing QS for these species and allowing the market to allocate.

An important part of the IFQ program is the incentive provided to encourage fishermen to avoid overfished species. Special attention needs to be paid to whether the incentives are adequate in whatever options are developed for alternative ways to distribute overfished species QP.

> ***Recommendation:*** *The TIQC recommends considering allocations of QP for rare overfished species on some alternative basis (a basis other than giving it to the holders of QS for those species). An auction, occurring periodically throughout the year, is one means of allocating QP for rare overfished species on an as needed basis. Work on the auction concept should continue. Other approaches should also be explored, keeping in mind the need to provide individual incentive for avoiding bycatch of overfished species. (Consensus)*

IFQs: Direct QS Reallocation after Initial Issuance (A-2.1.6)

With Changes in Management Areas

The TIQC reviewed the concept for moving management lines and combining areas designed to ensure that the management area changes do not result in a reduction or increase in the annual QP a person receives.

> ***Recommendation:*** *Concur with GAC recommendation to move forward with the option. (Consensus)*

With Changes in Stock Status

The TIQC reviewed the GAC recommendation. When an overfished stock is rebuilt that has previously been the subject of a target fishery, there should be a way to allocate those species so that they can be taken as needed as a target species in a directed fishery or as incidental catch in another directed fishery. Some members of the TIQC felt that QS for several of the overfished species that would be rebuilt in the near future should be allocated now. The transfer of QS for these species could be frozen for the time being. Others felt that it was not necessary to allocate the species now, but knowing the allocation rules that would be applied in the future would reduce uncertainty and create stability. Still other TIQC members felt that the rules for reallocation of overfished species should be developed at the time of rebuilding to avoid having to deal with a range of issues and definitions in the current deliberations.

A related recommendation on limiting transfers in the first years of the program is provided under "***Temporary Transfer Prohibition.***"

IFQ: Vessel Quota Pound (QP) Minimum Holding Requirement (A-2.2.1)

The TIQC noted that there would be significant penalties for those who take the risk of fishing without the QP they need. Vessels will also need to take into account delays that may occur while NMFS processes transfers. There was concern that the minimum holding requirement could remove needed QP from the market.

> ***Recommendation:*** *The TIQC endorsed the GAC recommendation, which was: Drop the option that would require a vessel to hold some minimum amount of QP before departing from port.*

IFQ: Vessel QP Overage Resolution (A-2.2.1)

Concern had been expressed that a disaster tow on a rare overfished species could result in a vessel being "tied up" (Option 1) for years trying to cover the overage. The extent of the "tie up" provision needs to be determined but at a minimum would likely prohibit a vessel from participating in any fishery that might take West Coast groundfish. This might be considered victimization of the fisherman. On this basis, an attempt had been made to develop alternative means of compliance.

The TIQC was advised that there are two legal questions to consider (1) does the option achieve a legitimate goal, and (2) does NMFS have the authority. Measures that are punitive without due process may not be approvable. The TIQC believed that Options 4 and 5 might not provide adequate due process to the harvester. The performance bond required under Option 3 also appeared to be problematic given Federal rules. It was noted that Option 2 might establish a cap on the price of overfished species quota (instead of buying overfished species quota, an individual would buy and surrender the alternative species).

> ***Recommendation:***
> ***Retain***
> *Option 1 (vessel ties up until the overage is covered with QP), and*
> *Option 2 (vessel ties up or can continue fishing by surrendering QS of other species) and*
> ***Drop***
> *Option 3 (vessel ties up or can continue fishing by posting a bond).*
> *Option 4 (vessel ties up or can continue by payment of an amount based on the target species typically associated with the overage) and*
> *Option 5 (vessel ties up or can continue by payment of an amount based on fish on board)*

IFQ: Temporary Transfer Prohibitions (A-2.2.3.c)

The discussion surrounding transferability suspension of QS started as part of the discussion of options for reallocating QS for overfished species once they are rebuilt. In that context, there was a discussion of the utility of prohibiting permanent transfer of QS during the first years of the program in order to allow fishermen to gain a better understanding of how the system will function and the value of the QS. QP could continue to be traded. Some TIQC members noted that at the start of the program everyone receives less than what they need and consolidation occurs through trading. Preventing permanent transferability could hinder consolidation and might prevent people from both getting out of the fishery and from fishing. Other TIQC members felt that leasing quota pounds would take care of that. It was also noted that even with a prohibition on transfer of QS, individuals could still enter into private contracts which would obligate them to transfer of QS once the prohibition was lifted (i.e. the provision could be circumvented).

> ***Recommendation:*** *Direct Council staff to do an analysis of two scenarios: 1) all species quota shares are not permanently transferable in the first year and 2) no prohibition on transferability. (Consensus)*

IFQ: Accumulation Limits (A-2.2.3.e)

The TIQC reviewed the GAC recommendation and discussed both accumulation limits and the grandfather exception (a clause allowing those who initially qualify for QS in excess of an accumulation limit to retain that excess). It was noted that the grandfather exception would create two classes of QS holders, those capped at the accumulation limits and those substantially above. Some TIQC members suggested that no grandfather exception or a limit on the grandfather clause might be a way to limit changes in market power that could result from the initial allocation. Eliminating or limiting the clause could also reduce the maximum possible disparity among initial recipients. On the other hand, the grandfather exception is intended to allow people to receive enough QS to continue their past levels of activity. In general QS allocation formulas tend to give people less than what they need to continue past activities. Elimination of the grandfather exception would reduce that further. The TIQC members agreed that there should be analysis of the program performance with and without the grandfather exception.

> ***TIQC Recommendation****: Three options should be included in the analysis: no grandfather clause, full grandfather clause, and a grandfather clause that is 2x the vessel accumulation limit cap. (Consensus)*

The TIQC looked at the tables created to examine the accumulation cap issue. For species that were not fully utilized, the review of historic concentration levels may be misleading (for example, shortbelly rockfish). It was suggested that for calculating the percentage of fish caught by a vessel in a given year the OY be used as the denominator rather than total trawl landings. However, this would only work for trawl dominant species so for OYs that were not fully utilized some assumption would need to be made about an appropriate trawl portion for other species. It was also suggested that the tables show only the allocation years selected by the Council.

Some members of the TIQC suggested approaching the accumulation cap from a different tack. Rather than looking at the past, determine what we want the fleet to look like in the future. The control limit would then be a function of what kind of program the Council decides to develop.

IFQ: Tracking and Monitoring, Estimates of Administrative Costs and Fee (A-2.3.1 and A-2.3.3)

Dr. Steve Freese made a presentation on tracking and monitoring issues and the assessment of program costs for the purpose of determining fees. This issue will be reviewed again by the TIQC, probably in late spring. Some TIQC members felt that the difference in administrative costs between the co-op and IFQ programs will be an important part of the analysis. The TIQC encouraged Dr. Freese to examine costs in the North Pacific related to co-op and ITQ systems, while at the same time taking into account differences that have to do with such factors as number of participants.

IFQ: Mandatory Data Collection Requirement (A-2.3.2)

Dr. Todd Lee reported to the TIQC that current voluntary surveys are inadequate for assessing performance of a rationalization program. Mandatory surveys would provide 100% response rate, be more detailed, and should be started a couple of years before implementation to capture a baseline for monitoring the effects of a TIQ program. The TIQC noted challenges with respect to estimating capital costs. Some of the TIQC members felt that the level of detail requested in the survey was too onerous on industry and that there would be labor costs on the industry side to comply with the data request. Dr. Lee noted that the proposed data collection would be subject to Paperwork Reduction Act clearance, which required justification for the data being requested, including estimates of the industry related costs and burden hours. Additionally, some economic data submitted under mandatory requirements has a higher level of confidentiality protection. During a discussion of potential penalties for false submissions and the need for audits it was noted that submissions of false information could potentially be considered a criminal offense.

> **TIQC Guidance:** Provide information on the number of man-hours each company will have to provide in order to comply with a mandatory data collection requirement. (Also see recommendation for mandatory data collection under the section of this report on co-ops).

IFQ: Allocation of Pacific Halibut IBQ (A-4)

Though a member of the TIQC noted that those who trawled in the north starting after 2003 would not receive halibut IBQ, the TIQC made the following consensus recommendation:

> ***TIQC Recommendation:*** *The TIQC concurred with the GAC recommendation to use individual permit logbooks as part of the allocation formulas for both overfished species QS and* ***<u>halibut IBQ</u>*** *but recommends that 1994-2003 logbooks be used to determine the location of target species catch instead of 2003-2006 logbooks. (Consensus)*

IFQ: Trading IFQ with Limited Entry Fixed Gear Vessels

The TIQC received a proposal from Mr. Robert Alverson (FVOA) and Washington to allow trawl IFQ for some species to be used by fixed gear vessels without trawl permits. TIQC members expressed concern that while the proposal reflects the general direction the fishery is moving in, it is too late for this proposal to be part of the trawl rationalization analysis because there are so many unknowns. Additionally, TIQC members commented that this proposal would add more confusion in the first years, which is contradictory to the cooling off period proposed for quota share trading. The objective at this point is to simplify alternatives rather than complicate them. Additionally, the current makeup of the TIQC was not adequate for consideration of a proposal affecting the fixed gear fishery.

> ***TIQC Recommendation:*** *This item should be tabled, and should be taken up as part of a future FMP amendment when there is time to fully discuss the issue. If the Council decides to have this analyzed, the TIQC recommends the following be included among things to be considered in specification of the option:*
> - *payment of taxes for the buyback program,*
> - *the need for 100% observation (100% accountability),*
> - *adjustments that may be needed for accumulation caps,*
> - *transferability of quota shares both ways between trawl and fixed gear,*
> - *overfished species quota transferability among gear types,*
> - *the bycatch rates to be used for allocation (if overfished species are allocated annually using a formula based on bycatch rates), and*
> - *the Rockfish Conservation Areas that would apply. (No votes opposed, 2 abstentions)*

IFQ: Vessel Size Endorsement (New)

Part of the original FVOA proposal to allow fixed gear vessels to buy trawl IFQ included changing the limited entry permit size endorsement requirement. The TIQC discussed the need for a size endorsement under an IFQ system, and whether or not other fisheries would be affected if trawl vessels were not constrained by the size limit on their permits. Because other fisheries in which trawl vessels participate are constrained by limited entry systems which have their own size requirements, the TIQC does not believe that elimination of the size endorsement in a trawl IFQ program would have adverse effects for the groundfish trawl fleet or for the other fisheries in which these vessels participate. Additionally, elimination could result in efficiency gains within the trawl fleet.

> ***Recommendation:*** *Remove the size limit endorsement under an IQ program. (Consensus)*

IFQs and Co-ops: Bycatch Species Caps in the Whiting Fishery (A-5 and B)

The TIQC reviewed draft guidelines developed by staff on how a determination would be made regarding which bycatch species would be managed with hard caps (both for the IFQ alternative in which there is no IFQ for bycatch species and under the co-op alternative). It was expressed that the determinations should be flexible to take into account changing conditions. Designation of cap species as part of the biennial specifications process might provide that flexibility. The TIQC was comfortable with the list of species that would be assumed to be “cap species” for the purpose of the analysis.

> ***TIQC Recommendation:*** *Move ahead with the guidelines for determining which species will be managed using caps, in consultation with NMFS. (Consensus)*

Co-ops: Bycatch Management in the Mothership and Shoreside Sector Co-op Programs (B-1 and B-2)

During discussion of bycatch management under co-ops, it was noted that the amounts available would be so small and the frequency of disaster tow occurrences so rare and random, that the division of bycatch among co-ops might make it difficult for an individual co-op to cover a disaster tow within the co-op, particularly smaller co-ops with smaller whiting allocations. The main means of bycatch allocation discussed was pro rata allocation based on whiting allocations.

The concept of the inter-co-op agreement is not currently in the suite of options and needs to be added. The suggestion was made that no one be allowed to fish unless an inter-co-op is formed to manage bycatch, however, some felt this would give too much leverage to individual vessels or co-ops.

Some TIQC members believed that the provision of a co-op level allocation would provide incentive for those co-ops to join together in inter-co-ops in order to ensure they had access to the needed bycatch. At the same time, the division of allocation among co-ops would ensure that if inter-co-ops do not form, the fishery would not deteriorate into a race for bycatch.

It was noted that the allocation of bycatch to co-ops also implies an allocation of bycatch between the co-op and non-co-op fishery and it was suggested that the non-co-op fishery open later in the year (when potential bycatch problems would be lower) thus providing another incentive for vessels to form co-ops.

The alternative currently contains a roll-over option. Some TIQC members anticipate that cross-whiting-sector bycatch agreements might be reached and felt that bycatch quota exchange should be part of this program.

> ***TIQC Recommendation:*** *Endorse the GAC recommendation for an option to assign bycatch to co-ops and explicitly incorporate provisions for inter-co-op agreements, and keep the current option as well. (Consensus)*

Co-ops: Mothership Sector Co-op Alternative (B-1)

The TIQC discussed allowing catcher-processors to become motherships and vice versa in the same calendar year under the trawl rationalization program. It was noted that current regulations governing the sector allocations do not allow a vessel to operate as both a mothership and a catcher-processor in the same year. The current restriction prevents catcher-processors that have already covered their fixed costs from their operation in one sector from using their expanded harvest opportunity to lower their average costs and out compete those operating only in one sector. On the other hand, restriction of movement potentially imposes an inefficiency in a program designed to enhance efficiency. It was noted that the mothership sector was not united on this point and that therefore an additional option might be appropriate.

> ***TIQC Recommendation:*** *Add an option that would allow a vessel to operate both as a harvester and as a mothership in the same year. (Majority)*

Those advocating a limit on transfers to one per year viewed this as leveling the playing field for smaller companies that had fewer at-sea processors. A company with many ships could rotate ships through the mothership fishery, gaining the advantage of being able to supply catcher vessels with a year round market, while a company with only one ship would be absent from the market while participating in other fisheries (e.g. the Alaskan fishery) or experiencing a breakdown. In opposition, the view was also expressed that the sole purpose of the limit on the number of transfers was to alter the balance of market powers and that this was inconsistent with the stated objectives.

> ***TIQC Recommendation:*** *Add an option to allow a mothership permit to be transferred once during a year. (Majority)*

Vessels that wish to change MS must first spend one year in the non-cooperative portion of the fishery. The rationale is that it creates stability in the market and constrains vessels from jumping between markets. In the non-co-op, the delivery can be to any licensed processor. In the co-op, you must deliver to the processor to which you last delivered. If a MS leaves the fishery, the co-op vessels that were delivering to that MS should then have the option to dissolve the co-op and go either into the non-co-op fishery or to another co-op (without spending a year in the non-co-op) or go into the non-co-op. The intent is to allow vessels in a co-op with no MS to go to another MS without having to go into the non-co-op for a period of time.

> **TIQC Guidance:** Modify the mothership withdrawal provision to clarify the intent that when a mothership withdraws from the fishery and its permit is not transferred or a mutual agreement is not reached to transfer delivery to another mothership, a co-op vessel obligated to that mothership may go into another co-op of its choosing, keep the original co-op together and find another mothership but in either case will not have to go into the non-co-op fishery first. (Consensus)

The purpose to be reflected in the modified language is to provide some protection to processors and incentive for catcher vessels to bargain with processors in good faith. The disincentive is the requirement to participate for one year in the non-co-op fishery in order to move from one processor to another.

> **TIQC Guidance:** Modify the processor tie provision for CVs moving among motherships to clarify the intent that the initial linkage of a CV to a MS is established based on the MS to which the CV chooses to deliver the majority of its fish in the most recent year that it fished before the program is implemented. Once the program is implemented, a CV is required to participate in the non-coop fishery when moving from one MS to another MS. (Consensus)

NMFS noted that some of language specifying the NMFS' role goes beyond the agency's view of the cooperative agreements, which are private agreements with provisions that would not be enforced by the agency, and some of the language was overly restrictive**.** In general, the TIQC agreed with this position and NMFS indicated that it would provide more specifics at a later date.

> **TIQC Guidance:** NMFS should clarify what they will and will not do for implementation of the entire co-op option. (Consensus)

Co-ops: Continuation of the Shoreside Sector Co-op Program (B-2)

NOAA GC expressed concern as to whether the processor license program and processor ties that are part of the vessel co-op program would be permissible under the Magnuson-Stevens Act (MSA), in particular with respect to the shoreside processors. It was noted that Congress could change the law in such a way as to make the proposal permissible (as it did for the North Pacific when it enacted crab rationalization). The MSA requirement to analyze the allocation of harvest privileges to fishermen and processors working together in a co-operative manner was discussed and it was observed that the shoreside whiting co-op alternative would fulfill this requirement. At the same time, others felt that there are other ways that harvesters and processors might work together in a co-operative manner, for example through the formation of voluntary co-ops under an IFQ program. These should be reviewed. It was also noted that there were no shoreside harvesters present to represent their views when the GAC decided to recommend elimination of the option.

> ***TIQC Recommendation:*** *Move forward with this alternative, even with the advice that this option may not be legal, in order to comply with the MSA requirement. (Consensus)*

Co-ops: Mandatory Data Collection for Co-ops (New)

After hearing the report from Dr. Todd Lee on mandatory data collection for the IFQ program, the TIQC concurred with the GAC that similar provisions should be included as part of the co-op alternatives.

> ***Recommendation:*** *Add a mandatory data collection requirement to the co-op alternative. (Majority)*

PACIFIC MARINE CONSERVATION COUNCIL

September 24, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384

Re: Groundfish trawl rationalization

"We need to consider endowing communities (or regions) first and then letting the magic of individual initiative flourish underneath these community endowments rather than trying to tack "community protection" measures onto programs focused on permanent individual allocations."   Seth Macinko

Dear Chairman Hansen,

Thank you for the opportunity to offer comments on behalf of the Pacific Marine Conservation Council (PMCC).

PMCC is a West Coast wide nonprofit conservation organization now in our tenth year. Founded by a group of progressive fisherman, marine scientists, and conservationists we undertake activities that link Science, Policy, and Community to benefit the marine environment and the people and livelihoods connected to the sea. Our mission is focused on conserving healthy and diverse fisheries and marine ecosystems, and the coastal communities that depend upon them.

As you are aware, PMCC has continuing concerns that the potential benefits of the rationalization schemes under consideration may not be realized, and that social and economic harm to coastal communities could be an unintended result. In addition, unless the rationalization is carefully designed, the system could work to the detriment of marine ecosystems.

PMCC would prefer to see a comprehensive rationalization plan for the groundfish fishery that is designed to achieve conservation outputs, with clear incentives to reward fishermen for superior environmental performance. We are also interested in scaling down management to better support regional and community stewardship.

We realize that multi-sector alternatives are unlikely to be considered at this time, so we are herein offering recommendations features for analysis in the trawl rationalization and inter-sector allocation environmental impact statements. A robust analysis of these and other features will not only help to inform decisions related to the trawl rationalization, but will also provide support for future development of sustainable fishing plans.

We appreciate the commitment of the rationalization program designers to conform to the new limited access privilege (LAP) standards in the re-authorized Magnuson-Stevens Act (MSRA). Although regulatory guidance is still forthcoming, we see the following as basic requirements:

- Improve compliance with the conservation objectives of the MSA
- Allocate quota shares fairly among fishery participants
- Prevent excessive consolidation of quota shares by individuals or companies
- Protect the access of coastal fishing communities
- Preserve owner operators and working fishermen
- Provide fishing opportunities for new entrants
- Establish clear and measurable program objectives
- Include adequate monitoring and enforcement mechanisms to ensure that program objectives are achieved
- Contain a cost recovery mechanism

Many of these requirements are already being addressed, but I'll highlight a few features that PMCC sees as priorities.

Spatial components: PMCC sees the utmost importance of managing based on the best scientific information available regarding the ecology of fish populations and the dynamics of marine ecosystems. Area-specific allocations should be made at the onset of the program, as supported by current assessments. Additional area subdivision should also be executed in anticipation of emerging science, especially if there is also a ancillary benefit in preserving local community access to fishing grounds.

We can learn from British Columbia's individual vessel quota program, where area-based quota was issued. It stands to reason that consolidating quota in the future will be less disruptive than splitting it up. Nonetheless, future sub-division of quota by geographical area should be anticipated and accommodated in the system planning.

The analysis within the trawl rationalization EIS would presumably weigh the relative risks of not implementing area-based features versus developing a system that incorporates what we currently know and simplifies adaptive response.

Measurable conservation benefits: Conservation is the driver of this process. I believe that we all can agree about that, even though it sometimes gets lost amongst calculations of the initial windfall that individual businesses might expect.

Bycatch management in particular was a fundamental part of the rationalization process from the beginning. Documenting encounters with overfished species is one way to evaluate whether or not the rationalization is furthering the conservation goals of the MSRA and assisting with rebuilding as required by the Act.

Community impacts: Projected and possible adverse impacts to coastal communities, regardless of whether they receive trawl landing, should be fully evaluated. Mitigation should be provided for anticipated impacts, and quota set-asides or other accommodations should be built into the program to offset unanticipated consequences.

Trawl business impacts: We expect that there will be a **v**essel by vessel analysis of the initial allocation and added costs (observer and other recoverable program expenses.). This is just basic information that should be provided to fishermen so they can evaluate whether the rationalization or its features make sense to them. One concern is that some small operations will no longer be economically viable, even though the participants want to continue as active fishermen.

This type of data should be provided to fishermen as early in the process as possible. The public should also be provided with an aggregation and summary of this information, preserving confidential financial information.

Consolidation: Clear adequate limitations on control of quota shares, not just ownership or initial distribution.

New entrants: The implementation of a quota system will likely be socially disruptive, especially to the traditional relationships among owners, skippers and deckhands. If one party is to receive a government windfall, then fairness dictates that the program provide reasonable means for new participants to enter the fishery and to accumulate quota.

Future rationalization: The design of the program should include provisions to incorporate development of other LAPs, including:

- Provisions that anticipate and prepare for future rationalization of other sectors of the groundfish fishery, and integration of these participants into the conservation incentive programs. Ultimately, there should be a seamless flow of incentives that provide enhanced opportunities for those demonstrating the best conservation practices.

- Provisions that anticipate and prepare for future area-based LAPPs. As community stewardship areas and sustainability plans develop there should be no new impediments due to features in the trawl rationalization.

Thank you for considering our comments. I am available to answer your questions or discuss these matters at: (503) 325-8188 or email peter@pmcc.org.

Respectfully submitted,

Peter Huhtala
Senior Policy Director

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October 17, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fisheries Management Council,

The Morro Bay Commercial Fishermen's Organization represents the fishermen and fisherwomen of Morro Bay, and naturally has an interest in maintaining our Port and our City as a fishing village. We are writing to ask you to retain for analysis in the upcoming DEIS for the groundfish trawl fishery the adaptive management trust option which could help meet adaptive management and public trust objectives. This mechanism, which would be funded by holding back a small portion of the quota, will serve as an insurance policy for the program and will help ensure that social conservation goals are met.

While adoption of an individual quota program is likely to create significant economic benefits, we are concerned about possible economic disruptions in vulnerable ports and fishing communities. We are also concerned about unanticipated impacts that arise whenever there is a major shift to a new management system. **Because Morro Bay is a remote Port, and access to fishing grounds outside of the Rockcod Conservation Area are 18 miles seaward of our Port, and open access poundage allocation at much reduced levels, Morro Bay has had a very difficult time in landing any**

significant amount of fish across its docks. The expense of fuel, and the transit time required to access areas outside of the RCA, and the levels of allocation have put much of the fishing beyond the reach of our people here for many years. An alternative capable of addressing known concerns, as well as remedying unanticipated impacts that the current alternatives are unprepared to address, would help ensure that the transition to the quota system creates tangible benefits for the greatest number of people.

Please retain for inclusion in the analysis this alternative capable of meeting adaptive management and public trust purposes, which will enhance the program's ability to meet important social and ecological objectives.

Sincerely,

Jeremiah O'Brien
President of the Morro Bay Commercial Fishermen's Organization

October 17, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen:

I am writing on behalf of the owner of the P/V Excellence regarding the proposed eligibility requirements for mothership participants in the Pacific Whiting Fishery. I learned about this item last week as the Ad Hoc TIQC was about to meet in Seattle. I apologize for not being better informed of your consideration of these issues, but I had no knowledge that you were about to consider rules that would prevent the Excellence from continuing to provide a market for catcher vessels in the whiting fishery as it has in every year since the early 1990's.

As I understand the proposed language in the coop alternative, it would alter the mothership definition that the Council previously adopted to remove the right to process whiting away from the Excellence, and place it into the hands of the company that currently charters the vessel. It would also exempt them from US ownership requirements that would apply to every other operator in the fishery. The Excellence is owned by AJVS, Inc., and is 100% US owned. I believe that the Excellence is the only mothership in the whiting fishery that is under charter. The charter will expire at the end of 2009.

This proposed language would only affect our vessel, as we are the only operation where the proposed language would remove coop processing rights or IFQ's from the mothership vessel that has been operating in the fishery.

We have not had an opportunity to present our views on this matter, and would respectfully request that we have the opportunity to do so prior to consideration of any issues before the Council that would affect the Excellence's ability to continue to provide a market for catcher vessels in the whiting fishery.

Thank you for your consideration.

Sincerely,

William D. Phillips

Allocations of Harvesting Quota in the Shore-based Whiting Fishery

By Christopher C. Riley & Joseph T. Plesha[*]

The Pacific Council is in the process of examining the possibility of rationalizing[i] the Pacific whiting fishery through an individual quota-based management system. As part of this process, the Council must decide who will receive allocations of harvesting quota. But tens of millions of dollars have already been invested in harvesting and processing Pacific whiting. When the whiting fishery is rationalized about ninety percent of the value of fishing vessels and processing plants will be taken from their owners and given to those who receive allocations of quota. This paper describes how that expropriation occurs and argues that owners of fishing vessels and processing plants should receive allocations of quota to compensate for the expropriation of their investments.

I. Introduction

Recently enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act[ii] directed the Pacific Fishery Management Council to "develop a proposal for the appropriate rationalization program for the Pacific trawl groundfish and whiting fisheries, including the shore-based sector of the Pacific whiting fishery under its jurisdiction."[iii] Under this Congressional direction, the Pacific Council is analyzing rationalization of the groundfish and whiting resources through allocations of harvesting quota to private entities.

Fishery managers understand that private ownership[iv] of fishery resources is essential to maximize efficient utilization of those resources. But these efficiency gains are realized regardless of who is allocated ownership of harvesting quota.

As an example, the pollock Community Development Quota program in the North Pacific allocates ten percent of the Bering Sea pollock Total Allowable Catch to villages in Western Alaska. These CDQ communities had no involvement (initially, at least) in the pollock fishery. The pollock quota allocated to CDQ communities was simply leased by those communities to companies involved in the pollock fishery. It was very similar to an auction, as the CDQ communities generally leased their pollock quotas to the highest bidder. Because the fishery was rationalized — albeit into the hands of entities that were outsiders to the fishery — the harvesting and processing of CDQ pollock was as efficient as if a pollock company itself owned the quota.

So far the Draft Trawl Individual Quota Environmental Impact Statement generally examines why rationalizing the fishery will result in greater efficiency. The EIS lists the goals of the program as (1) increase regional and net national benefits; and (2) achieve capacity rationalization through market forces. The EIS lists the program's objectives as (1) provide for a profitable fishery; (2) minimize negative ecological impact; (3) reduce bycatch; (4) promote individual accountability; (5) increase operational flexibility; (6) minimize adverse effects on fishing communities; (8) promote economic and employment benefits; (9) provide quality products to the consumer; and, (10) increase safety. The EIS explains why the proposed rationalization program meets the goals and objectives and is thus more efficient than the existing management system. But *any* allocation of harvesting quota will achieve the goals and objectives in the EIS, regardless of whether the initial recipients of the quota are vessel owners, processing plant owners, coastal communities, the federal government, or taxi cab drivers from New York City.

The National Environmental Policy Act requires an examination of the direct and indirect effects of any allocation.[v] Because the efficiency gains of rationalization occur regardless of who receives initial allocations of harvesting quota, NEPA requires more than an analysis of why rationalizing the whiting fishery will meet the listed goals and objectives: NEPA requires an examination of why one particular allocation of harvesting privileges is preferable over another potentially reasonable allocation. Even though the most controversial aspect of this proposal is the initial allocations of harvesting privileges, the EIS does not yet contain an analysis of why one particular allocation of quota is better than another.

At its March meeting the Pacific Fishery Management Council chose to analyze allocations of whiting quota to both limited entry permit holders[vi] and owners of processing plants. The purpose of this paper is to examine why the Council's proposed allocation of quota to both vessel owners and owners of primary processing facilities in the shore-based whiting fishery is appropriate.[vii]

II. Proposed Allocations of Quota In The Shore-based Whiting Fishery

With regard to the shore-based sector of the Pacific whiting fishery, the Council is analyzing two alternatives:

- Allocating quota to owners of limited entry permits and the owners of whiting processing plants; and,
- Allocating quota to owners of limited entry permits who have formed "cooperatives" that require some form of linkage to the whiting processing plants to which the permit holders historically deliver their harvests of whiting.

It is important to note that "fishermen" are not being considered to receive allocations of quota. Those under consideration to receive allocations of harvesting quota in the whiting fishery are either owners of vessels (or a surrogate for vessels, limited entry permits) or owners of processing plants.[viii]

In fact, the potential recipients of whiting quota are virtually all corporations. Just as an example, below are the limited entry permit owners and whiting processing plant owners for 2006. (It is not known if these entities would receive allocations under the proposed alternatives. The list is provided solely as an example of the type of recipients of quota under the proposed alternatives.)

Limited Entry Permit Owners Harvesting Whiting (2006)	**Processing Plant Owners Processing Whiting (2006)**
Bay Islander Inc.	Alber Seafoods, Inc.
Blue Moon Fisheries, Inc.	Bornstein Seafoods, Inc.
Blue Sea Fisheries, Inc.	Da Yang Seafoods, Inc.
Jay Bornstein	Del Mar Seafoods, Inc.
California Shellfish Company, Inc.	Jessie’s Ilwaco Fish Co.
Captain Andy Fisheries, Inc.	Ocean Gold Seafoods, Inc
Cassandra Anne, LLC	Ocean Beauty Seafoods Corporation
Chellissa Fisheries, Inc.	Pacific Seafood Group
DASL Inc.	Trident Seafoods Corporation
Ex-1 Corporation	
Fury Group, Inc.	
F/V Jeanette Marrie, Inc.	
F/V Pacific, Inc.	
F/V Seeker, Inc.	
George Allen, Inc.	
Gerald Gunnari	
HB Lee, Inc.	
Hodges and Moreland Fishing, Inc.	
Hunters Offshore Enterprises, Inc.	
Jamie Marie, Inc.	
James Shones	
Lisa Melinda Fisheries, Inc.	
Lloyd Whaley	
Mark I, Inc.	
Marathon Fisheries, Inc.	
Marion Larkin	
Mark Cooper	
Miss Sue Fisheries, Inc.	
Miss Berdie, Inc.	
Muir Milach, Inc.	
Nicole Fisheries, Inc.	
North Sea, Inc.	
Pacific Draggers, Inc.	
Pacific Dawn, LLC	
Patience Fisheries, Inc.	
Pacific Future, LLC	
Ralph Brown	

Raven Enterprises, Inc. Yaquina Trawlers, Inc.	

III. Rationale For Proposed Allocation Alternatives

It has been argued that because our Nation's fishery resources belong to the general public,[ix] the general public should receive the full economic benefit from fishery resources when they are rationalized. This result could be accomplished by a simple auction, which is authorized by the Magnuson-Stevens Act.[x]

If a large stock of cod were suddenly discovered off a remote U.S.-owned island in the Pacific ocean, and fishery managers wanted to privatize it, the Federal government would likely auction the rights to this undeveloped cod resource rather than allocate rights to vessel or processing plant owners based in California, Oregon or Washington state.

So why allocate fishing rights to private entities at all when the fish actually belong to the general public?

In a fully-capitalized, open-access fishery, where the harvest is controlled by a single quota the participants race to exploit, a portion of the investments in fishing vessels and processing plants that are specific to the fishery being rationalized and that are also relatively durable and non-malleable, will be lost as a result of the rationalization. This lost value re-appears in the value of the quota shares. Wealth is unavoidably transferred from the fixed capital of processing plants and fishing vessels to the owners of the quota.

When such a fishery is rationalized, owners of fishing boats and processing plants can suffer enormous financial losses. The amount of the loss depends upon the extent of the initial overcapitalization and the durability of the non-malleable capital involved. Owners of such capital can expect no return on their capital, regardless of finished product prices. During the transition between the open access and privatized fishery equilibrium conditions, 100% of the expected return on all of these non-malleable capital investments in primary processing and harvesting is actually *transferred* to the new quota owners. So if the government were to auction the rights to the whiting fishery, it would be auctioning not only the rights to the economic value of the fishery resource itself, but also most of the value of the existing private investments made to harvest and process that fishery resource!

Roughly based on the Pacific whiting fishery, the following is a hypothetical example to help demonstrate the impacts that rationalizing a fishery will have on owners of harvesting and processing capacity.

There are two basic types of investments made in the primary production of seafood: investments in harvesting capacity and investments in processing capacity.[xi] Figure 1 is an industry profile showing the hypothetical operating characteristics of the harvesting and processing sectors and the characteristics of the fishery they prosecute.

Figure 1. Basic Characteristics of the Fishery

Resource.

*	Annual Quota (in metric tons)	100,000
*	Potential (Biological) Season Length (in days)	180

Harvesting.

*	Catch Capacity per Vessel (in MT per day)	70
*	Variable Harvesting Cost (in $ per MT)	$70
*	Capital Cost (per Vessel)	$2,000,000
*	Interest Rate on Capital (also discount rate)	8%
*	Depreciation[xii] of Harvesting Capacity (in years)	15
*	Fish Price (in $ per MT)	$143.3

Processing.

*	Processing Capacity per Plant in MT per day	350
*	Variable Processing Cost (in $ per MT)	$235
*	Capital Cost (per plant)	$10,000,000
*	Interest Rate on Capital	8%
*	Depreciation of Harvesting Capacity (in years)	15
*	Finished Product Value (in $ per MT of round fish)	$451

In this hypothetical example a vessel is valued at two million dollars and has a fifteen-year depreciation. Harvesting costs include an estimated variable cost of seventy dollars per metric ton for necessities like labor, fuel and groceries. The daily harvesting capacity of a vessel is about 150,000 pounds (rounded to seventy metric tons) and the ex vessel price for the fish is $0.065 per raw pound or $143.30 per metric ton. Similarly, a processing plant is valued at ten million dollars and processes about 775,000 pounds of raw fish per day (rounded to 350 metric tons). The variable cost of items such as labor, utilities, packaging and finished product ingredients, is estimated to be about ten cents per raw pound of fish (or rounded to $235 per metric ton) processed at the plant.

One standard shore-based processing plant requires five vessels to maximize its productive capacity; thus, ten million dollars are invested in the plant and ten million invested in the five harvesting vessels, making the total capital investment in a harvesting and processing "unit" twenty million dollars.

This model shows how the fishery develops over time. Initially the fishery is unexploited. At the start of exploitation, initial entrants earn returns substantially above market rates of return on investments, fueling additional investment. This investment continues until, on average, each participant is earning only a market rate of return on its investments. Figure 2 is an income statement for the first "unit" of fishing vessels and a processing plant to invest in the fishery in its first year of operation.

Figure 2. Combined Vessels and Plant Income Statement at Initial Stage of Industry Development in an Open Access Fishery

Harvesting Sector.

*	Number of Vessels	5
*	Total Investment in Vessels	$10,000,000
*	Total Revenue (63,000 MT @ 143.3 per MT)	**$9,030,000**
*	Costs	
	- Variable Costs	$4,410,000
	- Interest	$800,000
	- Depreciation	$666,667
	- Total Cost	**$5,876,667**
*	Profit	**$3,153,333**
*	Return on Investment	32%

Processing Sector.

*	Number of Plants	1
*	Total Investment in plants	$10,000,000
*	Total Revenue (63,000 MT @ 451.6 per MT)	**$28,455,000**
*	Costs	
	- Raw Fish Purchases	$9,030,000
	- Variable Costs	$14,805,000
	- Interest	$800,000
	- Depreciation	$666,667
	- Total Cost	**$25,301,666**
*	Profit	**$3,153,333**
*	Return on Investment	32%

A thirty-two percent return on investment *will* attract additional investments into the open access fishery. During the development phase of the fishery, a balance in the returns earned by the harvesting and processing sectors is enforced by market conditions. If harvesting capacity exceeds processing capacity, it will lead to reduced ex-vessel prices as vessel owners compete with one another for a processing market. This reduces the returns on fishing vessels and increases the returns on processing, thus discouraging further investments in fishing vessels and encouraging investments in processing capacity. The market thereby encourages equal returns on investments earned by each sector.

Additional investment will continue to occur so long as any economic profits are being earned. As new investments are made, the seasons are shortened, costs rise, and returns fall on all investments. When the rate of return falls to the market rate of return on capital investments, investment stops. Open access equilibrium has been reached. This condition is analogous to the current situation facing both the harvesting and processing sectors of the Pacific whiting fishery. In the model, the harvesting and processing operations shown in Figure 2 would reach an open access equilibrium in a 100,000 metric ton per year fishery with twenty-five vessels delivering to five standard processing plants in a season now reduced to fifty-seven days.

Figure 3. Combined Harvesters and Processors Income Statement at Equaliburim Condition in Open Access Fishery

Harvesting Sector.

*	Number of Vessels	25
*	Total Investment in Vessels	$50,000,000
*	Total Revenue (100,000 MT @ 143.3 per MT)	**$14,333,333**
*	Costs	
	- Variable Costs	$7,000,000
	- Interest	$4,000,000
	- Depreciation	$3,333,333
	- Total Cost	**$14,333,333**
*	Profit	$0
*	Return on Investment	0%

Processing Sector.

*	Number of Plants	5
*	Total Investment in Plants	$50,000,000
*	Total Revenue (100,000 MT @ 451.6 per MT)	**$45,166,666**
*	Costs	
	- Raw Fish Purchases	$14,333,333
	- Variable Costs	$23,500,000

-	Interest	$4,000,000
-	Depreciation	$3,333,333
-	Total Cost	**$45,166,666**

*	Profit	$0
*	Return on Investment	0%

Under open access equilibrium, shown above in Figure 3, both harvesting and processing sectors are covering all costs, yet neither sector is earning economic rent from the resource. (Individual operators may be receiving quasi-rents because of their fishing skills, plant locations or marketing skills, etc.)

Fishery managers use the phrase "over-capitalized" to describe the capital invested in harvesting and processing fishery resources in an open access equilibrium condition. One commentator has even characterized those who have made these investments as "part of the problem" because of their "racing, over-capitalizing, excessively entering" the fisheries.[xiii] But these characterizations are wrong. The capital invested in the open access fishery is, on average, making a market rate of return. *In fact, the capital invested in the fishery is completely appropriate for an open access managed fishery. The fishery is only "over-capitalized" in comparison to the amount of capital required if the fishery were rationalized.*

From the viewpoint of society as a whole, if this hypothetical open access fishery were rationalized, it would be utilized just as effectively by eight vessels, delivering to one-and-one-half standard processing plants, 180 days of the year. This would result in the elimination of capital and depreciation costs for an annual savings (over the open access equilibrium) of $10,010,581. The 100,000 metric ton fishery would generate slightly over $100 per metric ton of economic rent that did not exist in the open access fishery. This is the primary economic benefit of rationalization. Figure 4 shows the fishery after it has reached the rationalized equilibrium point.

Figure 4. Combined Harvesters and Processors Income Statement at Equilibrium Condition in a Rationalized Quota Based Fishery

Season Length.	180 days

Harvesting Sector.

*	Number of Vessels	8
*	Total Investment in Vessels	$15,873,015
*	Total Revenue (100,000 MT @ 193.39 per MT)	**$19,338,624**
*	Costs	

	- Variable Costs	$7,000,000
	- Interest	$1,269,841
	- Depreciation	$1,058,201
		$10,010,584
	- Total Cost	**$19,338,624**
*	Profit	**$0**
*	Return on Investment	0%

Processing Sector.

*	Number of Plants	1.5
*	Total Investment in Plants	$50,000,000
*	Total Revenue (100,000 MT @ 451.6 per MT)	**$45,166,666**
*	Costs	
	- Raw Fish Purchases	$19,338,624
	- Variable Costs	$23,500,000
	- Interest	$1,269,841
	- Depreciation	$1,058,201
	- Total Cost	**$45,166,666**
*	Profit	**$0**
*	Return on Investment	0%

Quota Share Holder Sector.

***	***Income (Pure Profit)***	***$10,010,581***

A comparison between open access equilibrium and private property equilibrium conditions shows the benefit that is expected from fishery rationalization. In an open access fishery, society receives $45,166,000 worth of fishery products in exchange for $45,166,000 worth of resources. In a rationalized fishery, society receives $45,166,000 worth of fishery products in exchange for only $35,156,000 worth of resources.

All of the economic rent resulting from rationalization is captured by quota share holders. At first glance, the fact that owners of fishing vessels and processing plants do not receive any rent from the fishery does not appear to be a problem. After all, vessel and plant owners were not receiving any economic rent under open access equilibrium conditions either. But in a fully capitalized open access fishery the owners of the fishing vessels and processing plants would suffer enormous losses during the transition between the open access and privatized fishery equilibrium conditions.

This is how those losses occur: A quota holder wishes to lease his quota for a year. A number of vessel-owning firms compete to lease the quota. In order for a vessel-owning firm to make a bid, it must know the price it will receive for the harvested fish. Each vessel-owning firm offers to deliver the harvested fish to a number of processing companies, who compete to buy the raw fish. The processing companies face a situation where any price above that which covers their variable cost is preferable to the only alternative, which is leaving their plant idle. The price that a processing company will offer is analogous to the price a one hundred dollar bill would receive in an auction. As long as the current offer allows for any return above variable cost, a processing company will make a higher offer. In the end, the price will be infinitesimally close to that which covers only the variable cost of processing the fish.[xiv] The vessel-owning firm is therefore capable of securing processing services at the variable cost of those services.

The vessel-owning firms, armed with the commitment from processing companies, begin negotiations with the quota holder. In negotiations, the vessel-owning firms find themselves in exactly the same position that the processing companies faced when negotiating the raw fish price. As long as the most recent offer for quota allows for any revenue in excess of that needed to cover variable costs, all rational vessel-owning firms will offer a higher price. Inevitably the price paid for the quota by the vessel-owning firm will allow it only to cover its variable costs.

The excess processing capacity caused the processing companies to forgo any return on their investments when they bargained for the purchase of raw fish. The vessel-owning firms, because of the excess fishing capacity, will inevitably bargain away any return on their own capital investments, along with the price concessions they were able to extract from processing companies. The quota holder thus collects all the return on the capital of both the vessel and plant owners.

In the model, therefore, the quota holder would be able to generate $147 in net revenue from each metric ton of fish, or approximately $47 per metric ton more than the quota holder would be able to generate once the fishery reached the rationalized equilibrium state.

This $47 per metric ton is, in effect, a direct transfer from the owners of fishing vessels and processing plants to the holder of quota. Immediately after the rationalization system is in place, those who are allocated quota receive, along with the fishing rights and the corresponding economic rent from the fishery, the right to expropriate the value of investments made by vessel and processing plant owners!

Figure 5. Combined Harvesters and Processors Income Statement During Transition Phase Between the Open Access Equilibrium Condition and the Rationalized Quota Based Fishery Equilibrium Condition

Season Length.		180 days
Harvesting Sector.		
*	Number of Vessels	25
*	Total Investment in Vessels	$50,000,000
*	Total Revenue (100,000 MT @ 216.67 per MT)	$21,666,666
*	Costs	
	- Variable Costs	$7,000,000
	- Interest	$4,000,000
	- Depreciation	$3,33,333
		$14,666,666
	- Total Cost	$28,999,999
*	Profit	**($7,333,333)**
*	Return on Investment	(14.6%)
Processing Sector.		
*	Number of Plants	5
*	Total Investment in Plants	$50,000,000
*	Total Revenue (100,000 MT @ 451.6 per MT)	$45,166,666
*	Costs	
	- Raw Fish Purchases	$21,666,666
	- Variable Costs	$23,500,000
	- Interest	$4,000,000
	- Depreciation	$3,333,333
	- Total Cost	$52,499,999
*	Profit	**($7,333,333)**
*	Return on Investment	(14.6 %)
Quota Share Holder Sector.		
*	***Income (Profit)***	***$14,666,666***

During the transition period between open access and rationalized equilibrium conditions, nearly a third of the annual income received by quota share holders is *a direct expropriation of wealth* from those who have invested in harvesting and processing capacity! It is a transfer from owners of harvesting and processing equipment to those who receive allocations of quota.

The magnitude of the losses the harvesting and processing sectors should expect, as a percentage of total investment, will depend upon the relative amount of overcapitalization. In other words, the more excess capital drawn into the fishery during open access, the harder rationalization will be on the owners of that capital, regardless of when any particular investment was made.

In the model, the fishery reached open access equilibrium at a capitalization ratio of 3.2. This means that after the transition period, when the long-run rational capitalization level is reached, 68% (100%-32%) of the capital will disappear in the form of an uncompensated loss to the industry. This point should be emphasized. *If the transition period between open access and rationalized equilibrium conditions were somehow instantaneous, fishing vessel and processing plant owners would lose 68% of the value of their capital investments after the fishery was rationalized*. This 68% loss in wealth is the very lower limit on the losses that investors in the harvesting and processing sectors could suffer.

But the transition period is not instantaneous: When an open access fishery is rationalized, fishing vessel and plant owners will not start earning income on their capital investments until the "surplus" capacity is no longer physically available to participate in the fishery.

The length of the transition period is therefore a critical factor in determining the loss facing processing plant and fishing vessel owners. The longer the transition period lasts, the lower the present value of the return on the 32% (in the hypothetical model) of the capital that is appropriate to a rationalized fishery.

The length of the transition period is a function of only two things:

1. The amount of "overcapitalization" in the harvesting and processing sectors at the start of rationalization. This determines how much capacity must physically leave the fishery before the rationalized equilibrium condition is reached; and

2. The rate at which harvesting and processing equipment physically leaves the fishery after it is first rationalized. In other words, the "malleability and durability" of the harvesting and processing equipment.

Under open access conditions, as fishing and processing equipment wears out, it is replaced with major (as opposed to routine) maintenance expenditures; therefore, the capacity remains constant. When the quota system is imposed, however, the marginal value of fishing or processing capacity is zero, so expenditures to maintain this excess capacity will not occur. Eventually harvesting and processing equipment will wear out and no longer be available. In the model, we assume that harvesting and processing capacity falls by 6.7% annually during the transition period. Given that there is just a little over three times the rational level of capacity at the onset of the program, the transition period lasts seventeen years in the model.

The transition period may be longer than seventeen years. Harvesting and processing equipment is quite durable and the transition period does not depend upon whether or nor the equipment is actually used in the fishery. As long as there is excess equipment available which can potentially participate in the fishery, it prevents equipment in use from earning any return.

Figure 6. Economic Impact of Rationalization by Sector

Sector	Change in Discounted[xv] Value of Earnings During Transition Period	Original Value of Capital Investment	Value of Investments When Fishery is First Rationalized	Percentage of Value That Investment Losses When Fishery is Rationalized
Harvesting	-45,810,000	$50,000,000	$4,190,000	91.6%
Processing	-45,810,000	$50,000,000	$4,190,000	91.6%

Under the model, assuming a transition period of seventeen years, on the day rationalization is implemented, 91.6% of the value of fishing vessels and processing plants will be taken from its owners.

IV. How the Proposed Alternatives Address the Expropriation Suffered by Owners of Fishing Vessels and Processing Plants

Allocating quota to owners of fishing vessels that are members of cooperatives that are required to deliver their catch to a particular processor.

This proposal would allocate quota to vessel owners, who are then required to deliver their catches to the processing plants to whom they historically have sold their fish. The intention is that both the vessel and the processing plant retain their historical throughput of product and each remains whole after the implementation of rationalization.

There are two serious problems with this proposal: First, the degree in which a processor's throughput is protected is based on the strength of the "linkage" between the vessel and the plant. To the degree a vessel can leave and deliver its catch elsewhere, the processor could have the value of its plant expropriated by the vessel owner who receives allocations of quota.

Second, the cooperative proposal, at best, creates a bilateral monopoly. A bilateral monopoly arises when a monopolistic seller[xvi] deals exclusively with a monopsonistic buyer. In this case, the vessel owner has a monopoly on the sale of a certain amount of fish and the processor has a monopsony on the purchase of a certain amount of fish.

Bilateral monopolies are rare because price under a bilateral monopoly is indeterminate. (This price instability is a source of problems with the "two-pie" system found in crab rationalization.) The price that is established has to be determined outside of the traditional method of supply and demand. As Nobel Prize-winning economist George Stigler noted: *in a bilateral monopoly, price will be determined by things such as "skill in negotiation; public opinion; coin flipping; a wise marriage. The difficulty in naming interesting examples of bilaterally monopoly arises because it is an unstable form of organization: only the trading between a monopsonist employer and an all-inclusive labor union is likely to survive as an example*."[xvii]

For the above reasons, the proposed alternative of allocating quota to fishing vessel owners who are members of "cooperatives" required to deliver to a particular processor does not necessarily protect owners of vessels or plants.

Allocating harvesting quota to fishing vessel owners and the owners of whiting processing plants.

Since the value of fishing vessels and processing plants is transferred from their owners to the holders of quota when a fishery is rationalized, a simple way to assure such owners are compensated is to allocate quota shares to both owners of fishing vessels and owners of processing plants. Indeed, this is the only rationale under which either fishing vessel or processing plant owners can justify receiving allocations of the public's fishery resources. This proposal would still transfer the value of fishing vessels and processing plants from the vessel and plant owners to quota share holders, but it would ensure that the quota share holders and vessel and plant owners were one and the same, thereby avoiding the expropriation of their wealth.[xviii]

At the March 2007 meeting of the Pacific Council, Professor James Wilen expressed the opinion that it may be inappropriate to allocate quota to investors in the whiting industry. He believed rationalization would cause only a small loss in the value of the capital invested in the whiting fishery. Professor Wilen noted that the decrease in value of capital that is suddenly surplus to the fishery's needs depends upon that capital's "next best alternative use," which might be nearly equal in value to its current use.[xix]

An examination of the value of surplus fishing vessels and processing plants, however, shows how *little* they will be worth in their "next best alternative use."

There are few financially viable places for a fishing vessel to move. The most obvious region for a fishing vessel to enter is Alaska. The Alaska fisheries, however, are all already in an open access equilibrium condition. The groundfish fisheries in Alaska are also under a license limitation program; any new entrant is required to purchase a license. The Bering Sea pollock fishery is closed to any new fishing vessels entering the fishery as a result of the American Fisheries Act. The largest demand for vessels in Alaska is for salmon tender vessels, but a vessel operating exclusively as a tender vessel has limited value.

It is clear that a whiting fishing vessel would greatly decrease in value if the fishery were rationalized, but there is no accurate data on what its next best alternative use would be. We have been told that a surplus whiting fishing vessel could be used for salmon tendering or, if it were especially well maintained, as a replacement for an already existing fishing vessel working in Alaska. Vessel owners we have spoken with believe that if the whiting fishery were rationalized, a whiting trawler without quota would be worth something in the "low hundreds of thousand dollar level."

In contrast to fishing vessels that can simply be moved to different regions, shore-based processing plants are stationary. But as Professor Wilen noted, much of the used equipment in a shore-based plant has some value, even if it is not used in the whiting fishery. Equipment removal and disposal costs, however, must also be considered to determine the net value of a shore-based plant's used equipment.

Figure 7 is a detailed estimate of the "next best alternative use" for a shore-based whiting plant, using equipment actually found in a whiting plant.

Figure 7. "Next Best Alternative Use"
Value of a Shore-Based Whiting Plant

Production of Primary Product:

Offloading/Fishing Holding Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Fish Pumps	$60,000	$2,000	$30,000			$28,000
Crane	$20,000	$3,000	$5,000			$2,000
3500 Ft3 RSW Tanks	$200,000	$20,000		$10,000		-$10,000
RSW Pumps/Chillers	$250,000	$10,000	$20,000			$10,000
Conveying Equip.	$120,000	$15,000		$10,000		-$5,000
Foundations	$50,000	$5,000		$2,000		-$3,000
Catwalks	$20,000	$5,000		$1,000	$1,000	-$5,000
Electrical	$50,000	$10,000			$2,000	-$12,000
Controls	$20,000	$2,000			$200	-$2,200
Subtotal	$790,000	$72,000	$55,000	$23,000	$3,200	$2,800

Filleting Equipment Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
4 x Baader 182	$1,000,000	$20,000	$160,000			$140,000
4 x Baader 51	$200,000	$4,000	$60,000			$56,000
4 x Candeling Table	$100,000	$4,000		$5,000		$1,000
Sorting Equipment	$75,000	$10,000		$5,000		-$5,000
Raw Fish Handeling Eq	$100,000	$10,000		$15,000		$5,000
Fillet Handeling Eq.	$20,000	$2,000		$15,000		$13,000
Offal Handeling/Storage	$150,000	$30,000		$20,000		-$10,000
Fillet Packing Tables	$50,000	$5,000		$10,000		$5,000
Fillet Frames	$75,000	$500	$7,500			$7,000
Electrical	$100,000	$10,000			$5,000	-$15,000
Controls	$30,000	$500			$500	-$1,000
Subtotal	$1,900,000	$96,000	$227,500	$70,000	$5,500	$196,000

Surimi Line Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
3 x Baader 695	$270,000	$3,000	$90,000			$87,000
2 x Ratio Tanks	$30,000	$2,000		$1,000		-$1,000
3 x Duble Stack Screen	$120,000	$3,000		$1,500		-$1,500
4 x Wash Tanks	$60,000	$4,000		$2,000		-$2,000
2 x Fukoku 450 Ref.	$180,000	$8,000		$2,600		-$5,400
6 x Fukoku 5m scr. pr.	$540,000	$30,000		$7,800		-$22,200
3 x Flotweig Decanters	$1,200,000	$30,000	$60,000			$30,000
Presscake Handling Eq.	$120,000	$2,000		$2,000		$0
2 x Ishita Autoblender	$600,000	$2,000	$20,000			$18,000
2 x Extruders	$100,000	$1,000	$20,000			$19,000
15 x PD Pumps	$300,000	$7,500	$7,500			$0
Process Piping	$150,000	$2,000		$6,500		$4,500
Electrical	$130,000	$10,000			$2,000	-$12,000
Controls	$160,000	$5,000			$1,000	-$6,000
Catwalks/Foundations	$50,000	$20,000		$10,000	$4,000	-$14,000
Subtotal	$4,010,000	$129,500	$197,500	$33,400	$7,000	$94,400

Refrigeration Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Blast Freezer	$120,000	$15,000			$2,000	-$17,000
10 x Plate Freezers	$600,000	$40,000			$5,000	-$45,000
Freezer Conveyors	$100,000	$50,000	$50,000			$0
Refirg. Compressors	$40,000	$5,000			$5,000	-$10,000
Condensors	$60,000	$15,000	$60,000		$2,000	$43,000
Recievers	$50,000	$10,000			$2,000	-$12,000
Subtotal	$970,000	$135,000	$110,000	$0	$16,000	-$41,000

Structure and Utilities Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Hydraulics	$75,000	$15,000			$8,000	-$23,000
Water	$150,000	$20,000	$30,000			$10,000
Electrical	$180,000	$15,000		$5,000		-$10,000
Plumbing	$220,000	$40,000				-$40,000
Waste Water Treatment	$350,000	$15,000		$10,000		-$5,000
Structure	$600,000	$275,000			$150,000	-$425,000
Vehicles/Forklifts	$200,000		$50,000			$50,000
Office Equipment/Tools	$100,000		$10,000			$10,000
Laboratory	$60,000		$6,000			$6,000
Spare Parts	$250,000		$25,000			$25,000
Subtotal	$2,185,000	$380,000	$121,000	$15,000	$158,000	-$402,000

Subtotal for all of the Used Equipment From Primary Production = -$149,800.

Production of Fish Meal:

Offal Handling and Storage Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Truck Dump	$20,000	$10,000		$2,000		-$8,000
2 x Offal Tanks	$80,000	$10,000		$2,000		-$8,000
Lamella 350/90 Pump	$70,000	$5,000	$10,000			$5,000
4 x Screw Conveyors	$60,000	$10,000	$5,000			-$5,000
Subtotal	$230,000	$35,000	$15,000	$4,000	$0	-$16,000

Cooking Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Feed Conveyor	$35,000	$5,000	$10,000			$5,000
Feed Hopper	$20,000	$5,000		$2,000		-$3,000
Cooker	$250,000	$30,000	$25,000			-$5,000
Straining Conveyor	$30,000	$2,000		$1,000		-$1,000
Strainer Tank	$15,000	$1,000		$1,000		$0
Subtotal	$350,000	$43,000	$35,000	$4,000		-$4,000

Pressing Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Atlas NP150 Press	$325,000	$50,000	$25,000			-$25,000
3 x Press Water Tank	$60,000	$2,000	$2,000			$0
Hasher	$20,000	$1,000	$3,000			$2,000
Feed Conveyor to Dryer	$25,000	$2,000	$5,000			$3,000
Subtotal	$430,000	$55,000	$35,000	$0	$0	-$20,000

Drying/Bagging Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Dryer	$550,000	$125,000	$25,000			-$100,000
9 x Screw Conveyors	$135,000	$18,000	$9,000			-$9,000
Meal Cooler	$60,000	$10,000		$2,000		-$8,000
Vibra Screen	$12,000	$2,000	$3,000			$1,000
Hammer Mill	$50,000	$5,000	$10,000			$5,000
2 x Bag Filters	$25,000	$5,000	$5,000			$0
2 x Bagging Machine	$20,000	$5,000	$2,000			-$3,000
Subtotal	$852,000	$170,000	$54,000	$2,000	$0	-$114,000

Liquid Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
3 x Alfa Laval Decanter	$60,000	$35,000	$45,000			$10,000
2 x Alfa Laval Separato	$560,000	$25,000	$80,000			$55,000
Alfa Laval 207 Polisher	$90,000	$5,000	$10,000			$5,000
6 x Process Pumps	$140,000	$12,000	$12,000			$0
5 x Process tanks	$150,000	$10,000		$4,000		-$6,000
4 x Falling Film Evap.	$450,000	$40,000	$50,000			$10,000
Subtotal	$1,450,000	$127,000	$80,000	$4,000	$0	$74,000

Air Quality Control Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Air Scrubbers	$200,000	$30,000		$10,000		-$20,000
Ducting/Piping	$70,000	$20,000		$5,000		-$15,000
Salt water Supply/						
Discharge	$30,000	$20,000		$2,000		-$18,000
Subtotal	$300,000	$70,000	$0	$15,000	$0	-$53,000

Building, Internal Structure and Utilities Component —

Equipment	Costs New	Removal Cost	Sale Value of Used Equip.	Scrape Value of Used Equip.	Disposal Costs	Net Value of Used Item
Equipment Footings	$150,000	$30,000			$3,000	-$33,000
Equipment Foundations	$450,000	$60,000		$15,000		-$45,000
HP Boiler	$400,000	$20,000	$50,000			$30,000
Steam Piping	$40,000	$5,000		$2,000		-$3,000
Water Piping	$20,000	$3,000			$1,000	-$4,000
Electrical	$550,000	$60,000			$5,000	-$65,000
Controls	$450,000	$5,000			$3,000	-$8,000
Ventilation	$250,000	$20,000		$5,000		-$15,000
Structure	$600,000	$400,000			$200,000	-$600,000
Subtotal	$2,910,000	$603,000	$50,000	$22,000	$212,000	-$743,000

Subtotal for all of the Used Equipment From Meal Plant = -$876,000

Total value of used equipment from a shore-based whiting plant = -$1,025,800.

It would cost slightly over a million dollars *more* to dismantle a shore-based whiting plant and remove its equipment than the used equipment is worth. This should not be a surprise. Consider an average residential home: The home has many used items which can be sold, such as a furnace, refrigerator, dishwasher and the like. But the costs of dismantling the home and disposing of all the ruined sheetrock, shingles, siding and insulation would far exceed any current value the used items may still retain.

In summary, the value of whiting fishing vessels would be very low in their "next best alternative use." There is a very limited market for these fishing vessels. Unlike fishing vessels, a shore-based whiting processing plant cannot move to a new location. A shore-based plant's "next best alternative use" would be to sell its used equipment. But used equipment has a limited market, and the costs required to de-construct a shore-based plant and remove its equipment would exceed the value of the equipment. Therefore, the decrease in value of capital invested in fishing vessels and processing plants that would result from rationalization of the whiting fishery should be compensated through the allocation of quota to owners of fishing vessels and plants as that capital's "next best alternative use" is not close to being equal in value to its current use.

IV. Conclusion

Rationalization of Pacific whiting will result in more efficient utilization of this resource, regardless of who receives quota. Moreover, the goals and objectives set by the Pacific Council will be achieved no matter how the quota is allocated. The issue then becomes this: Why would any private entity be allocated quota of Pacific whiting when the government owns the resource and the general public can receive the full benefits of rationalization through a simple auction? The rationale for allocating quota to private entities is that the owners of whiting fishing vessels and whiting processing plants will lose most of the value of their investments to quota holders when the fishery is rationalized. Owners of fishing vessels and processing plants therefore must receive allocations of whiting quota so that the tens of millions of dollars they have invested in developing the fishery will not be expropriated.

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[*] These comments are taken from a paper the authors wrote in 1991 regarding the pollock fishery in Alaska.

[i] "Rationalization" is a euphemistic word for "privatization." In this paper we define "rationalization" as "privatizing the privilege to utilize fishery resources."

[ii] Pub. L. 109-479 (2007).

[iii] Pub. L. 109-479, sec. 302(f) [uncodified].

[iv] Professor Daniel W. Bromley asserts that the "claim that IFQ programs offer 'market-based' allocations of harvest quota is patently false" because fishery resources are already

owned by the federal government. Mr. Bromley notes that when the Magnuson-Stevens Act became law in 1976, it gave the United States ownership of fishery resources within the 200-mile exclusive economic zone. Bromley then states, "[s]ince the transition period [from open access to privatized equilibrium conditions] already happened almost 30 years ago, it is curious that the fisheries literature has failed to acknowledge the flawed presumption that no one owns the fish until they have been captured." Bromley, *Purging the frontier from our mind: Crafting a new fisheries policy*, 15 Reviews in Fish Biology and Fisheries, p. 218 (2005). (Hereinafter, "Bromley") The mere fact that the government has ownership over an item does not mean that the utilization of that particular item will be market-based, however. The government in the Soviet Union, for example, owned the means of production in communist Russia. But the utilization of that means of production was based on politics, not on the free market. Similarly, the United States government owns fishery resources with the 200-mile exclusive economic zone but, in an open access fishery, utilization of those resources is based on a race to harvest and process the fish, and not a market-based approach.

[v] 40 C.F.R. §1502.16.

[vi] We believe that limited entry permit holders to be a surrogate for vessel owners. To the degree this is not the case, there are two issues that should be considered. Permits issued by the government are technically a privilege and subject to revocation without compensation. To the degree permit holders are not also the owners of the fishing vessel, there is a serious risk that the fishing vessel owner will have the value if its investment expropriated.

[vii] This paper focuses exclusively upon the shore-based Pacific whiting fishery.

[viii] The only rationalization scheme to award allocations of harvesting privileges to "fishermen" was the crab rationalization program in the North Pacific, which allocated three percent of the rationalized crab harvest to captains who worked on fishing vessels.

[ix] The United States claims sovereign rights over all fish within the United States exclusive economic zone. 16 U.S.C. §1811(a).

[x] The recently enacted amendments to the Magnuson-Stevens Act allows for auctions. The legislation states: "In establishing a limited access privilege program, a Council shall consider, and may provide, if appropriate, an auction system or other program to collect royalties for the initial, or any subsequent distribution of allocations in a limited access privilege program…" 16 U.S.C. §1853a.

[xi] Fish are highly perishable before being processed into a primary product. Investors in fishing vessels and primary processing capacity have made those investments based on the requirement that fish be handled quickly, i.e. these investors have invested in the "race to fish" caused by the open access fishery management regime. Investors in

secondary processing of seafood, on the other hand, have not made their investments based upon the "race to fish" caused by open access. Secondary processors have not overcapitalized as a result of the existing management regime and will not be adversely impacted, therefore, by the privatization of fishery resources. Being that secondary processors are consumers of processed seafood, their investments may benefit if the utilization of fishery resources is increased through privatization.

[xii] Depreciation, as it is used in the income statements here must be strictly defined. It is assumed that the physical equipment deteriorates by a certain amount each year. (6.7%) In order for the capacity of the asset to remain constant, this must be offset by major maintenance projects. The absolute amount of this is estimated from our own fishing and processing operations. At open access equilibrium this is a real cost of staying in business. Immediately after the imposition of the quota program this type of expenditure becomes irrational, not made, and no longer figures into the supply function of fishing (or processing) services. This results in the slow decline in capacity from the equilibrium amount under open access, toward the equilibrium amount under private property equilibrium. Were this not to occur — in the case where physical capital perfectly durable — the transition period continues forever, and the loss to owners of physical capital is 100%. The depreciation listed is non-liner in that one-fifteenth of the existing capital as originally valued disappears each year.

[xiii] Bromley, p. 221.

[xiv] See, Herbert Hovenkamp, Enterprise and American Law 1836-1937, (1991), p. 143. Hovenkamp describes the situation where a second railroad enters a previously profitable market. “They will begin cutting prices in order to steal business from one another. Any price above operating (variable) costs is ‘profitable’ in the sense that it covers the direct costs of shipping and contributes something to the amortization of fixed costs. … even though it is not nearly enough to cover all its costs.”

Citing Francis Edgeworth from 1881, a good description of the situation was also made by Nobel Prize-winning economist George Stigler, who gave the following example: “Let each servant work for only one master, and each master employ only one servant. Let each servant demand at least $50 per unit of time, and each master offer at most $100. If the number of servants and masters is large and equal, the wage rate will be indeterminate between $50 and $100. More important; one servant can drive the wage rate to $100 by withdrawing from the market (and similarly a master could drive the rate to $50), so even one of a thousand servants or masters can affect the rate.” George Stigler, The Organization of Industry, (1968), p. 7.

[xv] In the model a discount rate of 8% was used. This discount rate is higher than that normally used in cost benefit calculations for such things as public works projects. The reason why the higher discount rate was used was to reflect the higher uncertainty in the level and duration of the benefit stream that exists in fisheries, when compared to, for

example, a bridge. The 8% was chosen as a round number within the range of the discount rate that can be derived from lease transactions and sales transactions in the Dock Street Brokers quota sales web site.

[xvi] But for the fact they are established by governmental action, the creation of an Individual Fishing Quota system that allocates an exclusive right to harvest a particular percentage of a fishery to specific fishermen is a clear violation of the antitrust laws. Even under the antitrust exemption granted by the Fishermen's Collective Marking Act of 1936, a group of fishermen would be in violation of antitrust laws if they attempted to exclude others from participating in a particular fishery.

[xvii] George Stigler, The Theory of Price, 4th Edition (1987), p. 215.

[xviii] One assertion that we have recently heard made against considering the impact that rationalization has on processing plants is that the assets of the pacific whiting industry are largely of an age where they can be considered largely or fully depreciated, and therefore, can be confiscated or destroyed without negative consequences to their owners. This argument is fallacious, but is easy to see how such a conclusion could be reached given that the term "depreciation" has a variety of definitions depending on weather the context is tax, finance or economics. First we will demonstrate that the is assertion is in fact fallacious with an example to show that the book value of the underlying physical assets is essentially irrelevant in calculating the loss resulting from the destruction of the asset or an interruption of the income stream

Imagine a taxicab owner with a five-year old cab. The cab earns $100 per day after all operating expenses such as driver wage, oil and gas and routine wear and tear. The cab is uninsured (for theft). The cab is stolen. The owner replaces the cab with a car of similar age and condition, for a price including modifications and inspections of $1000. It takes 30 days for modifications and inspections during which time the cab business is interrupted.

How worse off is the cab owner? Does the fact that the cab was on his books for $0 mean that he wasn't harmed? Of course not. The "book" value of the cab is entirely irrelevant, whether the cab is on the books for zero dollars or a billion dollars, the fixed capital component of his loss is $1000, the amount he had to pay for a replacement. His business was interrupted for thirty days, during which he lost $3000. The total loss would therefore have been $4000.

[xix] March 2007 Powerpoint presentation by Professor James Wilen, Department of Agric. & Resource Economics, University of California, Davis, before the Pacific Fishery Management Council. Professor Wilen focused his comments only on the processing sector, but the issue is relevant for owners of both fishing vessels and processing plants.

It should also be noted that Professor Wilen acknowledged that the whiting fishery is similar to the pollock fishery in Alaska prior to the American Fisheries Act, in that it involves a "race to fish." But Professor Wilen also stated it was different in large part because shore-based processing of whiting is *more* highly concentrated than the Alaska pollock fishery prior to rationalization. The inference was that processors in the whiting fishery do not need to be included in rationalization (as they were in the pollock fishery) because they have market power over harvesters, even if the fishery were rationalized.

This is a remarkable claim. Dr. Wilen had previously testified before the North Pacific Fishery Management Council that the Alaska pollock fishery had ostensibly only *two* buyers at the time of passage of the American Fisheries Act.

To quote Dr. Wilen's testimony before the North Pacific Council in April of 1999:

> … the (American Fisheries) Act clearly has the finger prints of special interest lobbying all over it, with various provisions inserted that serve no public interest but that give the processing sector an unfair advantage over an already disadvantaged harvesting sector. One of the most bald-faced provisions designed to eliminate competition in the ex-vessel market is the provisio that requires members to sell to the processor that handled the bulk of their fish the previous year. This essentially transforms an oligopsony (*with two players*) into several monopsonies which give sole buyer status to each plant in turn. Hence instead of negotiating a price with *(ostensibly) two firms* and then negotiating side deals about where to deliver, vessels owners must negotiate a price with just one buyer, with whom they are locked into delivering."

No one except Dr. Wilen has seriously argued there are fewer than two buyers in the shore-based whiting fishery.

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October 29, 2007

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Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland OR 97220-1384

RE: TRAWL RATIONALIZATION ALTERNATIVES- REQUEST TO RETAIN THE ADAPTIVE MANAGEMENT TRUST OPTION FOR THE GROUNDFISH TRAWL FISHERY

Dear Chairman Hansen and Members of the Pacific Fisheries Management Council,

Morro Bay, California (population 10,000) is a coastal community with long and deep ties to fishing. Our local fishing industry is constantly exploring proactive ways to improve fishing methods and maintain viability for this industry in response to on-going changes in regulations.

With this in mind, in the upcoming DEIS for the groundfish trawl fishery, we ask you to retain for analysis the adaptive management trust option, which could help meet adaptive management and public trust objectives. This mechanism, which would be funded by holding back a small portion of the quota, will serve as an insurance policy for the program and will help to enable the social and conservation goals to be met.

While adoption of an individual quota program may create significant economic benefits, we are seriously concerned about potential negative economic impacts to the viability of small ports and harbors if trawling activity were consolidated to a few “buyer’s markets” or offshore.

We are also concerned about unanticipated impacts that arise whenever there is a major shift to a new management system. An alternative capable of addressing known concerns, as well as remedying unanticipated impacts that the current alternatives are unprepared to address, would help ensure that the transition to the quota system creates tangible benefits for the greatest number of people.

Please retain for inclusion in the analysis this alternative capable of meeting adaptive management and public trust purposes, which will enhance the program’s ability to meet important social and ecological objectives.

Sincerely,

Janice Peters

cc: Morro Bay City Council
City Manager

American Seafoods Company

Agenda Item D.7.b
Public Comment
November 2007

October 30, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Whiting Sector Mothership Co-op Program

Dear Chairman Hansen and Council Members:

We are submitting comments with respect to the proposal for a whiting mothership sector co-op program, item D.7.b on the Council's November agenda. American Seafoods Company is a long term participant in both the catcher processor and mothership sectors of the Pacific whiting fishery. Although most of our prior public testimony involved our catcher processor operations, we have also operated a mothership processor every year since the sector was formed in 1997 and in some years have processed in excess of 40% of all of the whiting processed in the sector. We also own a catcher vessel permit with significant mothership catcher vessel history.

As one of the founding members of the Pacific Whiting Conservation Cooperative, we are a strong advocate for rationalized fisheries and the associated benefits of increased utilization and decreased bycatch. We firmly believe that a cooperative system for the mothership sector is a viable alternative that should be fully considered as the Council moves forward with Amendment 20. However, we also believe that the mothership coop program, as currently proposed, suffers from a number of deficiencies and needs to be substantially modified. As explained in greater detail below, we feel that certain provisions require greater clarity, that several of the provisions suffer from a lack of alternatives and that a number of the provisions are inconsistent with the express goals and objectives of Amendment 20.

A. Mothership Processor Permits

1. Citizenship. The general IFQ analysis provides that only documentation qualified U.S. citizens are eligible to own or hold Quota Share. However, the draft provides an exception for "any person or entity eligible to own or control a U.S. fishing vessel with a fishery endorsement pursuant to sections 203(g) and 213(g) of the AFA". We believe this potential exception is unclear and potentially much broader than anyone has considered. We ask that the analysis identify the scope of persons that potentially benefit from this exemption to the U.S. citizenship requirement and whether

any persons that currently own or control any of the mothership processors or catcher vessels fail to meet the U.S citizenship requirement.

2. Transferability. The current draft provides that "MS permits may only be used for processing by one vessel per year" (B-1.2.2.c (4)). This may be a reasonable alternative for companies that hold multiple mothership permits but it is not reasonable for a company such as American Seafoods that will receive only one permit under current proposals. There is no statement in the analysis that justifies such a restriction and it is directly contrary to Objective 4 – Increase operational flexibility. We support the TIQC recommendation to add an alternative to allow one transfer per year and we further support adding a second alternative that would provide for no restrictions on annual transfers.

3. Operating Restrictions. The current draft provides that "MS permits may not be transferred to a vessel engaged in the harvest of whiting in the year of transfer" (B-1.2.2.c(3)). This would mirror the current regulatory restriction that prohibits a vessel from operating as both a catcher processor and mothership in the same year. This may be a viable alternative but it clearly conflicts with the Program Goal to "create and implement a capacity rationalization plan that increases net economic benefits…", with Objective 2 to "provide for a viable, profitable and efficient groundfish fishery", and with Objective 4 to "increase operational flexibility". We strongly support the TIQC recommendation to include an alternative that will allow a vessel to operate in both capacities. By including both alternatives, the Council will retain the flexibility to consider both options and to make a decision on the merits. A failure to adopt the TIQC recommendation would be prejudging a very important issue without adequate analysis or debate.

B. **Mothership-Catcher Vessel Linkage**

4. Initial Linkage. The current draft provides only one alternative for determining the mothership processor to which a catcher vessel is initially linked: the processor where the catcher vessel permit holder delivered the majority of its catch in the year before the coop program is implemented (B-1.3.1, B-1.4.1). Throughout the Amendment 20 alternatives, fishing and/or processing rights will be awarded based almost entirely on historical participation. However, this single linkage alternative in the mothership coop proposal gives no reward to historical participation and bases the initial linkage reward completely on a future event. If catcher vessels are to be allocated harvesting privileges based on historical catch, why shouldn't processor privileges also be based on historical processing? At a minimum, such an alternative needs to be included for purposes of analysis. We request that the Council add an alternative to base initial mothership processor-catcher vessel linkages on processing history from 1997-2004.

5. Percent Linkage. The current draft provides only one alternative with respect to how much of its catch a catcher vessel must deliver to its linked mothership processor: One Hundred Percent! In contrast, under the American Fisheries Act, there is zero mandated linkage between pollock catcher vessels and mothership processors. We believe this lack of market flexibility is designed primarily to protect the less efficient mothership processors. This is questionable justification and it clearly conflicts with the stated program goals of greater economic efficiency and operational flexibility. We believe that any analysis that includes only a single option on this critical component of the mothership coop program is deficient. We ask the Council to include alternatives to look at 50%, 75% and 90% linkage.

6. Mothership Processor Withdrawal. Under the single alternative offered in the draft mothership coop program, if a mothership elects not to participate in the fishery and does not either transfer its permit to another processor or transfer its delivery rights to another mothership, its linked catcher vessels are forced out of the coop fishery and into the non-coop fishery (B-1.4.3). We believe this alternative is punitive to catcher vessels and that if a mothership chooses to not participate in the fishery, its linked catcher vessels should be free to join any mothership coop. We ask the Council to add an alternative to this effect.

Thank you in advance for considering these comments.

Sincerely,

AMERICAN SEAFOODS COMPANY LLC

Mike Hyde

Michael Hyde

West Coast Seafood Processors Association
1618 SW First Avenue
Suite 318
Portland, OR 97201
503-227-5076
November 1, 2007

Mr. Don Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

Dear Mr. Chairman:

We are writing regarding the Council's proposed trawl individual quota plan and the issue of initial allocation of harvest quota to processors.

For five years, members of the West Coast Seafood Processors Association have supported the development of a trawl rationalization plan, with the understanding that processor investment, employment and community interdependence must be considered and accounted for in any initial allocation of quota. We believe that the best way to do this is by initially allocating a percentage of harvesting quota to processors who have demonstrated a history of participation in the fishery.

As the program is implemented, the resulting consolidation of quota will affect processors. Our concern has been our ability to preserve access to the resource once it is effectively placed into private hands. Access is fundamental to our ability to sustain a workforce, contribute to overhead that supports other fisheries, and continue to supply markets we developed for groundfish and whiting.

It is this access that we want to preserve through an initial allocation of quota. Our interest in quota is not to lease it out as a revenue source. We are processors, not quota brokers. Our intent is to use quota directly allocated to processors as an enticement to vessels to deliver to historical processors. In other words, we want to put our quota on boats that fish for our plants, so long as we are the purchaser of all fish caught by that vessel. This provides greater opportunity to the vessel, and also helps us attract more total fish for processing.

We hope that this letter clarifies our intentions as processors seeking an initial allocation of harvest quota, and will aid in your analysis of the program and its likely outcomes.   We will continue working with you to narrow program alternatives and to move the analysis forward.

(Approved by the following individuals / company members of WCSPA)

Jon Black, Ocean Beauty Seafoods
Jay Bornstein, Bornstein Seafoods
Jim Caito, Caito Fisheries
Barry Cohen, Olde Port Fisheries
Frank Dulcich, Pacific Seafood Group
Tom Libby, California Shellfish Company
Joe Plesha, Trident Seafoods
Annette Traverso, Alioto-Lazio Fish Company

Food and Water Watch
470 3rd St., Suite 103
San Francisco, CA 94107

October 30, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Amendment 20: Trawl Rationalization Alternatives

Dear Mr. Hansen and members of the Pacific Fisheries Management Council,

Please accept this letter on behalf of Food & Water Watch, a national non-profit public interest organization. Our mission is to work with grassroots organizations and other allies around the world to create an economically and environmentally viable future by empowering people to maintain public control over our food and water supply.

Food & Water Watch is greatly concerned about the use of individual fishing quotas in the management of the West Coast trawl fishery. The current regulatory trend toward IFQs favors a regime that in effect is like a private property right that encourages exclusive entry to fisheries resources over public control and community access.

As documented in the Food and Water Watch report *Irrational Approach*, previous experiences with IFQs, such as in the Bering Sea and Aleutian Islands crab fishery, indicate such programs can result in job losses and decrease in crew pay, unsafe and environmentally destructive fishing practices, damage to coastal fishing communities, and dramatic consolidation of industry in the hands of just few individuals, and corporations. This benefits few and harms many.

Any limited access privilege program that is based on a top-down allocation of quota shares is an inherently high-risk arrangement subject to undue influence from big business. This influence threatens small boat owners and fishing dependent economies and risks undercutting conservation objectives in favor of economic efficiency. IFQs have potentially enormous economic value, therefore initial quota allocations, once made, are hard to revoke. Once established, IFQs programs are difficult to reverse.

Other management alternatives should be explored that do not indicate ownership of a fishery by private entities and that allow for equitable community participation. Careful review of alternate options should inform all program designs and management decisions to avoid unintended consequences such as increased bycatch, high-grading, or unfair market control by processors or corporate fishing interests. A revised trawl FMP must contain *specific* measures that restore fish stocks and habitat, promote the livelihoods of working fishermen, and place stewardship of the public trust above financial gain of a few individuals. In keeping with these principles, Food & Water Watch calls on the Council to create management standards that:

1. Prevent the privatization of a public resource by ensuring that fishing privileges are revocable without a right of compensation.

2. Promote fishing gear with the lowest bycatch by offering incentives to convert to clean, low-impact gear, such as hook and line.

3. Improve compliance with the conservation objectives of the Magnuson-Stevens Act.

4. Fairly allocate fishing privileges among participants by considering factors such as extent of community dependence on fishery resources, economic need, evidence of good stewardship practices, and past compliance with conservation measures.

5. Prevent excessive consolidation of fishing privileges in the hands of individuals or companies by establishing clear limits on industry control.

6. Maintain free and open markets by ensuring that fishermen can choose where and when to sell their catch (no processor quotas).

7. Support new entrants to a fishery through set asides and economic incentives.

8. Include adequate monitoring and enforcement mechanisms to ensure that program objectives are achieved.

9. Include a multi-species management approach.

10. Protect the access of coastal fishing communities to their local resources.

11. Contain a cost recovery mechanism for administration.

To this end, Food & Water Watch favors a precautionary approach when making major changes to the Pacific trawl or any fishery management regime. We believe that more time and resources should be given to studies that:

- Assess the potential effects of IFQs on the entire west coast trawl fleet and its associated coastal communities
- Analyze the effects of current IFQ regimes
- Identify alternatives to IFQs
- Yield more information on current pilot projects that make use of community based fisheries management

We strongly support alleviating overfishing and restoring imperiled fishing economies, and great strides are being made in community based management approaches that vest decision-making control in the hands of local experts, such as fishermen, scientists, and non-governmental organizations. We encourage the Council to review alternate programs to IFQs. Examples of community based management can be found nationwide, from the Port Orford Ocean Resource Team in Oregon to the Penobscot East Resource Center in Maine, on up to the myriad community development quota programs in Alaska.

In summary, Food & Water Watch believes that IFQs present serious obstacles to the long-term sustainability of the nation's fisheries. The PFMC should increase its support for the exploration of sustainable alternatives to IFQs that incorporate the management objectives enumerated above, and we are pleased to report that Food & Water Watch is currently investigating these alternatives as well. Such options should always be considered as we move forward in finding better forms of fisheries management.

Thank you for your consideration of our comments, and we look forward to working with you in the future to improve compliance with the economic and conservation goals of the Magnuson-Stevens Act.

Sincerely,

Jeffrey Blumenthal
Food and Water Watch

October 30, 2007

Pacific Fishery Management Council
Via email: pfmc.comments@noaa.gov

Re: Item D.7, Amendment 20: request to analyze fixed-term allocations in EIS

Dear Dr. McIsaac, Chairman Hansen and Members of the Council:

The Pacific Fishery Management Council (Council) is contemplating what alternatives to analyze as you take the next steps to further rationalize the west coast groundfish trawl fishery. The Natural Resources Defense Council, Ocean Conservancy, and the Pacific Marine Conservation Council submit for your consideration in that decision the attached paper by Dr. Seth Macinko. This paper considers an alternative that features assignments of fixed-term catch shares to participants in the trawl fishery, initially by landings history but over the longer term by auction.

Dr. Macinko finds that the fixed-share allocation alternative developed in the paper meets the objectives of the trawl rationalization program at least as well as other options, but with lower costs (construed as economic, social, and ecological costs). The alternative is consistent with the recommendations of the U.S. Commission on Ocean Policy, and may provide enhanced benefits relative to other options. For example, fixed-term shares provide opportunities for greater flexibility in designing incentives to reduce bycatch. Based on this paper, we consider a fixed-term allocation system like the one Dr. Macinko describes to be a reasonable alternative that warrants more analysis and that could enhance the options available to the Council. We respectfully ask the Council to include this option in the Trawl Rationalization EIS.

We would be happy to answer any questions the Council may have related to this issue, and we appreciate the opportunity to comment.

Sincerely,

Karen B Garrison

Karen Garrison, Natural Resources Defense Council
Meghan Jeans, Ocean Conservancy
Peter Huhtala, Pacific Marine Conservation Council

Rationalizing West Coast Trawl Groundfish Fisheries:
The Case for Fixed-Term Catch Shares and Auctions

Introduction

The Pacific Fishery Management Council (Council) is currently contemplating options to further "rationalize" the west coast trawl groundfish fishery. This paper presents a consideration of a new option featuring assignments of fixed-term catch shares to participants in the trawl fishery. This paper is structured into two parts as follows. First, the rationale supporting consideration of an additional alternative is presented. This rationale is based on both generic considerations of the goals of fishery management (i.e., from a national perspective) and specific considerations from the standpoint of the goals elaborated by the Council for the west coast trawl groundfish fishery. Second, a consideration of some design options particular to fixed-term catch shares is presented. The aim of this second part is to identify areas where particular tailoring to local conditions and preferences is needed.

I. The Rationale for an Additional Alternative

The basic rationale for considering any additional policy option is that it provides either a different blend of benefits and costs compared to options currently under consideration *or* the same benefits with fewer adverse consequences (i.e., "costs"). The Council (Council) is currently contemplating an elaborate menu of options to rationalize the west coast trawl groundfish fishery. Despite this apparent diversity, all of the options share a fundamental similarity—they all rely upon the allocation of essentially permanent catch shares to initial recipients. An option that features the assignment of fixed-term catch shares is missing from the mix presently under consideration. This is unfortunate because fixed-term catch shares can provide the same benefits with fewer costs compared to the existing options before the Council. Moreover, fixed-term shares can provide enhanced and additional benefits. For example, fixed-term shares provide opportunities for greater flexibility in designing incentives to reduce bycatch (one conservation objective of the individual quota (IQ) program). This assessment holds at both a generic level (considering general experience in the U.S. with programs based on assignments of catch shares) and a more specific level focused on the goals articulated by the Council in planning documents produced to date.

Permanent allocations have been associated with a variety of problems that are arguably responsible for the relatively slow rate of adoption of catch share-based systems in the United States. These problems have been summarized (Macinko, 2005:237) as:

- Speculative "fishing for history"
- Inter-generational equity concerns
- Intra-generational equity concerns

- Concerns for the social and economic impacts on coastal fishing communities

- Increasingly intense jockeying by harvesters and processors over benefits from the all-important initial allocation, to the point of transforming the Council into a referee over a lobbying brawl. This diversion of focus from the fundamental task at hand—natural resource management—is an example of the "cost" of what is called rent-seeking.

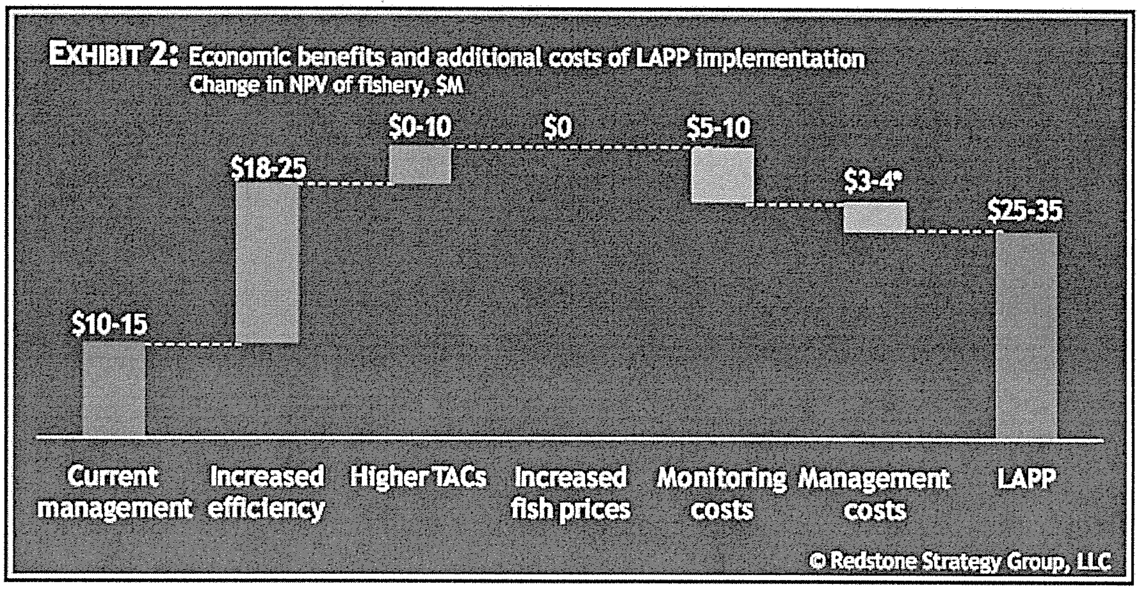
- A national interest concern focused on the perceived privatization of public resources.

From a review of Council documents regarding potential rationalization of the trawl sector it seems clear that many if not all of these concerns are pertinent in this case. The last concern listed above warrants special mention for the treatment (and dismissal) it receives in COUNCIL planning documents and will be addressed further below.

The Problem of Permanent Shares

The concerns listed above are associated with the options currently under consideration precisely because those options feature permanent allocations. The problem here can be summed up as: good things can happen when catch shares are assigned, bad things happen when the original assignment is: free, in perpetuity, and based on catch history.

Dramatic evidence of the underlying problem was recently provided in the context of the South Atlantic Fishery Management Council's (SAFMC) evolving consideration of a Limited Access Privilege Program (LAPP) for the snapper-grouper complex. At the most recent meeting of the SAFMC, the LAPP Working Group received a presentation from the consulting firm, Redstone Strategy Group (Redstone Group). The Redstone Group has been working with/for Environmental Defense in conjunction with the latter organization's interest in promoting adoption of LAPPs. At the Working Group session, the Redstone Group presented the results of a recent effort to model the potential economic benefits of a LAPP in the snapper-grouper fishery (relative to the status quo regime). Among the findings presented to the Working Group was a chart estimating the discounted future value of the fishery under both the status quo and a LAPP program (defined as featuring assigned catch shares). This chart (Redstone, 2007:7 is reproduced below:



Read from left to right, the chart shows the consultants' estimate of: the future value of the fishery under the status quo regime; the gains (blue in color) attributable to a LAPP; the costs attributable to a LAPP; and finally, the future value of the fishery under a LAPP. In sum, the analysts estimated that a LAPP fishery would provide $15-$20 million in gains relative to the status quo.[1] But this estimate was focused on gains provided to original recipients of the initial allocation of fishing privileges. As the consultants emphasized:

> "The overall fishery may benefit economically from a LAPP, although the cost of buying the quota of exiting fishermen may consume much, if not the majority, of the fishery's overall gains (Redstone Group, 2007:1)."

The important point here is an interpretation not explicitly stated by the consultants. What the LAPP regime is doing (given the assumption of free, permanent assignment of transferable catch shares) is *transferring the entire future (enhanced) value of the fishery into the hands of those chosen by the particular qualification scheme* (to be selected by the SAFMC). All other participants, including members of the present *and* future generations, get saddled with what has been called the transitional gains trap:

> "[T]he initial generation of beneficiaries is able to capitalize the stream of future benefits and extract them from those succeeding them, who must purchase these rights at their full value. As a result, succeeding generations enjoy no net benefits, as their gross benefits will be offset by the purchase price they were required to pay [Copes, 1986:287)]."

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[1] The principal economic gain estimated by the consultants came from consolidation/decapitalization in the LAPP fishery. The consultants estimated that 75%-90% of current participants could exit under the LAPP scheme (see Redstone Group, 2007:7).

Conveying the future value of the fishery into the hands of individuals selected by a government entity (the Council) by an inherently political process is the antithesis of using the market (ostensibly regarded by most modern capitalist societies as the most neutral of mechanisms) and is the root of the distributional concerns itemized above.

Daring to think about non-permanent catch shares

> "... assign quota shares for a limited period of time to reduce confusion concerning public ownership of living marine resources, allow managers flexibility to manage fisheries adaptively, and provide stability to fishermen for investment decisions [USCOP, 2004:290]."

The quotation above is from the report of the United States Commission on Ocean Policy (USCOP). The USCOP notes three benefits that would spring from assigning fixed-term catch shares rather than permanent catch shares. First, the very periodicity of fixed-term shares would serve as a powerful reminder to all that fishery resources in the U.S. are public resources. As the Council website devoted to trawl groundfish rationalization correctly notes, the perceived privatization associated with conventional IFQ programs is a "hot topic" but then this controversy is effectively dismissed as a non-issue:

> **Privatization of a public resource?** Fish stocks are a publicly-owned resource. IFQs are an alternative way of controlling the harvest. Under IFQs, the fishing opportunity is controlled primarily through a poundage limit that can be bought and sold, so many view harvest control through IFQs to be "privatization" of the resource. However, as under the current groundfish license limitation system, under IFQs the fish will continue to be under public ownership until some time after they are brought on board the vessel, at which time they become private property.
> [http://www.pcouncil.org/groundfish/gfifq.html#current]

Technically, the COUNCIL commentary is correct (the fisheries remain publicly owned under an IFQ regime), but the USCOP is also correct, there is profound concern and confusion regarding ownership in the context of catch share programs built on permanent catch shares (this is the national interest concern referred to earlier). Confusion and concern cannot be a surprise in an environment that has been treated to decades of literature emphasizing "rights-based fishing" and the apparent necessity of introducing private property rights if ever fishery management is to become something other than a cruel oxymoron. Thus, the USCOP recommends that fixed-term shares would have a much-needed clarifying (and one hopes calming) effect regarding public ownership.

Next, the USCOP suggests that fixed-term shares would provide managers with the flexibility that is much needed when managing highly dynamic resources. Such flexibility is a necessary component of the adaptive management the USCOP mentions. The point here is that carving off select portions of the overall ocean ecosystem in the form of permanent assignments that people may then come to regard as "theirs" or even as "rights" is likely to represent an impediment to future management flexibility.

At this point, it may seem that flexibility for managers comes at the expense of security for the industry. However, the final benefit of fixed-term catch shares identified by the USCOP clearly challenges this notion of there being a zero-sum game tradeoff between the interests of management and the interests of industry. The USCOP boldly declares that fixed-term catch shares can "provide stability for investment decisions." No doubt this will strike some (at least at first glance) as counter-intuitive if not outright heresy. The key here is to recognize the distinction between security and stability on the one hand and permanency on the other. Clearly, business entrepreneurs need security in the rule structure they are operating under. But security does not equate to permanent entitlements. Most business enterprise in America operates under terms of secure leases and there is no reason to believe that the commercial fishing industry needs different treatment.

Importantly, just as periodicity provides managers with flexibility, it provides industry with a similar flexibility to adapt to changing conditions and interests and this observation directly relates to the specific context of the trawl rationalization considerations.

The Advantages of Fixed-Term Shares over Permanent Shares relative to the COUNCIL Goals and Objectives

As suggested above, permanent catch shares give rise to several problems that either do not arise or are severely attenuated when catch shares have fixed-terms. At the same time, fixed-term shares provide all of the benefits that permanent shares do. It is instructive to consider the two options for the duration of the catch shares relative to the stated goals and objectives for trawl rationalization:

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. Increased operational flexibility.
5. Minimize adverse effects from an IFQ program 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. Increased safety in the fishery.

On all counts, there is either no difference between fixed-term shares and permanent shares or fixed-term shares provide opportunities for program designs that achieve greater benefits. Specifically, objectives 3-5 above are better addressed via fixed-term shares than they are by permanent shares. By definition, the fixed-term shares expire and have to be re-issued or re-upped by some means at the end of their term and there is thus a *periodicity* inherent in programs built around fixed-term shares. This periodicity presents many advantages.

With regard to bycatch reduction and ecological impacts, the periodicity of fixed-term shares provides the opportunity to design additional incentive structures that are not possible under permanent shares. With permanent shares, an individual (firm or operation) can in effect hold or hoard shares relatively oblivious to external factors such as program emphasis on clean fishing. In the long run, the theory of markets promoting efficiency should bear out and the shares should migrate to those most efficient under the particular rule structure established. This of course is "in theory" *and* "over the long run." The shorter time horizon involved in the periodicity provided by fixed-term shares presents a steadier stream of opportunities for incentives to be effective. For example, royalty bids could be subject to a bycatch multiplier (described further below) or when a term comes due, those shares could be reserved for a 'clean-fishing pool.' Finally, note that all of these features and arguments apply fixed-term shares for bycatch species as well as target species.

The flexibility offered by periodic re-issuance of fixed-terms shares also presents opportunities to industry. That is, operational flexibility (objective 4 above) ought to be enhanced by the opportunity to adjust one's portfolio of catch shares at costs that will be lower than the costs of adjustment when catch shares are permanent. People can become "trapped" by high investments. In general, the shorter the term, the lower the price such shares will fetch, and it is a design decision whether the terms should be relatively long (in the interests of security) or shorter (in the interests of lower costs of entry and greater operational flexibility).

Finally, the COUNCIL planning documents indicate that there is considerable concern for spillover effects on other fisheries and on coastal communities. Permanent catch shares that give rise to large windfalls to selected individuals in the current generation exacerbate these concerns. Once endowed, these individuals may invest significantly in other fisheries. They may also take the wealth out of circulation in local communities. Fixed-term shares temper the wealth transfer effected by the initial allocation and this should reduce (though not eliminate) spillover effects on other fisheries. Periodicity will allow easier entry and exit thus addressing part of the concern for adverse effects on other fisheries and communities. Finally, it is possible to consider an option to have communities hold fixed-term permits which they could lease to individuals, thus ensuring the communities' linkage to the fishery. For example, a "community fishing trust" could be formed to hold and lease shares that serve as a natural resource endowment for that community.

It is possible, too, for fixed-term shares to generate a revenue stream that could be shared with communities or state and federal governments, or could fund part of the management infrastructure necessary to implement and monitor a catch share-based program. For example, these revenues could help cover additional observer and monitoring costs.

For all of the reasons reviewed above, it is clear that an option featuring fixed-term catch shares is a reasonable alternative that should be analyzed in the EIS. They can meet the objectives of the program as well as, or better than, other alternatives, and do so with lower costs. Fixed-term shares *do* necessitate some additional policy decisions and these are briefly introduced below.

II. Issues involved in Contemplating Fixed-Term Catch Shares

1) Initial Allocation Design

As with permanent catch shares, the initial allocation of fixed-term shares is likely to be a highly sensitive issue. In very general terms, the options available are likely to be:

a) by lottery
b) by lease auction
c) by some qualifying formula emphasizing historical participation

Note that these same general options apply to initial allocations featuring permanent shares and the reasons that the first two are generally dismissed are likely to apply to fixed-term shares as well. That is, distribution by lottery appears too arbitrary and dismissive of the fact that there are existing investments at stake. Similarly, an instant switch to auctions appears untenable given the existence of a mature industry and associated investments. Thus, there is no reason to believe that the initial allocation formula has to, or is likely to, depart from the kind of formulae under consideration when the catch shares are permanent with one notable exception.

Given that the value of the fishery tends to increase markedly even in the first year of a "rationalized" fishery, it is possible to argue that qualifying initial recipients do not need to receive 100% of their history to be made "whole." For example, in the halibut fishery off Alaska, the ex-vessel price approximately doubled in the first year of the IFQ program relative to the pre-IFQ ex-vessel value. Thus, if one of the objectives of the initial allocation was to place qualifying initial recipients in the same financial position as before, it could be argued that (in the Alaskan case) only a 50% allocation was necessary and the remaining 50% of the TAC could have been reserved for some access/distribution by some other means than gifting to initial recipients.

The implication of this "lesson from history" is that it is possible to imagine conditions under which something less than a 100% allocation of qualifying catch history might be made (e.g., one could consider a spectrum of possibilities, say, from 50% to 100% or any proportion in between). This does not detract from the basic premise that it is important to consider the scope of existing investments when designing the initial allocation regardless of the length of the term of the shares. Below, an option is suggested for consideration in the analysis that employs this concept of recognizing existing interests in the transition from the status quo regime to a new long-term program featuring fixed-term shares. One of the critical design elements concerns *how* to effect that transition. Another critical issue is what to do when the share terms expire. These issues are discussed further below.

2) Subsequent re-issuance of fixed-term shares

However long the fixed term is (e.g., 5, 10, or 15 years—and this would be a policy decision by the Council), at some point the term would come "due" and then a decision would be necessary regarding how to re-issue those shares. Again, some general options seem plausible:

a) let existing holders renew the shares for another term period (history-based allocation)
b) "expired" shares revert to some managing entity for redistribution by lottery
c) "expired" shares revert to some managing entity for redistribution by royalty lease auction

Again, distribution by lottery has an arbitrary quality that many will object to. The option to let existing holders renew or have some kind of preferential right of first refusal has the appeal of recognizing the interests of those currently fishing but on the other hand if this logic is continued ad infinitum, nothing is accomplished by opting for fixed-term shares. That is, the reason to transition to a regime involving fixed-term shares is to achieve the benefits of periodicity reviewed above. At some point, competition via an open market seems fairest for all (current and aspiring participants in the fishery).

3) Phasing the Transition between the Initial Allocation Fishery and the Long-term Program

At this point, what has been described is a desire to recognize existing participants with an initial allocation but then transition to a fishery in the future that truly takes advantage of market mechanisms to help achieve the full array of program objectives. Royalty lease auctions of fixed-term catch shares (the combination of markets and periodicity) are an effective means to accomplish this overall goal. The question then becomes how to effect this transition. Here is where the great flexibility provided by fixed-terms shares *and* by markets (flexibility in the design of markets) comes into play. For the purposes of this discussion paper, three distinct phases of the overall transition will be outlined: an Initial Fishery; a Transition Fishery; and the Final Stage Fishery. The latter two stages make use of a Reversion Pool holding shares that are available for acquisition by lease auctions.

a) Initial Allocation Fishery

This fishery is based on allocations to qualified participants (eligibility determined by the Council under their existing options) where the allocation formula is based on qualifying history as determined by the Council. The term of the catch shares allocated in this initial phase would be determined by the Council from a range of options (say, e.g., 3-7 years).

b) Transition Fishery

At the end of the Initial Allocation Fishery, a Transition Fishery would begin. As an illustration, consider an Initial Allocation Fishery designed by the Council to last 5 years and consider a transition period (also to be determined by the Council, say from a range of options of 5-15 years) of 10 years. In year 6, 10% of all initial recipients' share holdings would revert into a pool, the Reversion Pool, for subsequent redistribution by lease auction. Each successive year of the Transition Fishery, 10% of an individual's Initial Fishery shares would be transferred to the Reversion Pool. At the end of 10 years (under this example), all Initial Fishery shares would be transferred into the Reversion Pool and the Final Stage Fishery would commence.

Notice that under this scenario, the initial recipients would have a 15-year period over which the Final Stage Fishery is gradually phased in. New entrants could begin entering anytime during years 6-15. During the Transition Fishery there is a varying blend of Initial Shares and Final Stage shares being fished. As the Transition Fishery progresses, the proportion of the total TAC that is in the Reversion Pool (as Final Stage shares and thus available to anyone who wishes to fish) is gradually increasing while the proportion of the TAC that is controlled on the basis of historic participation (Initial Shares) will decline.

b-1) Reversion Pool

As described above, during the Transition Fishery, catch shares allocated during the Initial Fishery would gradually revert into a pool for subsequent acquisition by any eligible participants. The Council would determine eligibility. As these shares come into the Reversion Pool they would become Final Stage shares with the term (duration) assigned to them as determined by the Council. Continuing the above example, if the Council elects to define the Final Stage shares as having a 10-year length, then every 10 years those shares will again revert back to the Reversion Pool for reacquisition.

c) Final Stage Fishery

At the end of the Transition Fishery, all catch shares would be the long-term, Final Stage shares, and all would be in the Reversion Pool. As under the Transition Fishery, all eligible participants would be able to acquire Final Stage shares via competitive bidding in lease auctions.

4) The Importance of Staggered Auctions/Pools and Partitions

Just as the initial allocation for the Initial Fishery should recognize existing participants' interests, it will be important to set up the Final Stage Fishery so that there are staggered auction offerings. The important point here is that an individual have the opportunity to structure a portfolio of Final Stage share holding that do not all expire in the same year so as to provide a better environment for business planning. Staggering can be introduced during the Transition Fishery and will call for careful attention to design details but it should be noted that staggering (or phasing) is well-known in the field of market design.

Similarly, it will be important for the Council to consider partitioning the Reversion Pool into separate sub-pools to meet Council objectives. For example, partitions (each with a dedicated portion of the overall TAC) could be established on the basis of vessel size classes or gear types. The idea of a "Clean Pool" as a special type of partition to promote bycatch reduction is discussed further below. Finally, if there is concern that processors will "buy up" harvesting shares then it would be possible to create a partition exclusively reserved for processors while prohibiting processors from bidding on shares in other partitions.

5) Options for Bycatch Reduction Incentives

As discussed earlier, the periodicity supplied by fixed-term catch shares provides new opportunities to craft incentives for clean fishing. For example, auction bids (in all partitions) could be subject to a form of bycatch reduction bid multiplier indexed to some bycatch performance standard (i.e., cleaner fishing would result in a higher bid multiplier). Alternatively, or additionally, a special partition—a "Clean Pool"—could be established that would be reserved for bidding only by qualified bidders where the qualification criterion would be built around attainment of some performance standards specified by the Council.

6) Generic concerns about auctions

Some closing comments on auctions are perhaps appropriate. Talk of auctions frequently disturbs people in the fisheries management community. Won't auctions lead to dominance by "big firms" (e.g., processors)? One response to this quite understandable concern is to ask how auctions would be different than an IQ program featuring a market for permanent catch shares (as the Council is currently contemplating). *If* big firms are going to dominate a market for catch shares, they are going to dominate a market for permanent shares as much, or more, than periodic markets for fixed-term shares. Additionally, there are many ways to design auctions to address these fears. Auctions and the fixed-term shares they distribute can and should be designed in ways that provide fairer, more equitable, and more efficient management systems than what is being offered to the industry and the larger public with gifted permanent catch shares.

III. Conclusion and Recommendations

The case has been made above that a system featuring fixed-term catch shares with a transition to periodic distribution of these fixed-term shares by royalty lease auctions would provide *at least* the level of attainment of the Council's goals and objectives for rationalization of the trawl groundfish fishery as options currently being considered. Such a system would attain these benefits at lower costs (construed as economic, social, and ecological costs consistent with the sense of costs and benefits in E.O. 12866) compared to existing options. Given this comparative distribution of benefits and costs, a reasonable alternative for the Council to consider in the EIS on Trawl Rationalization is a fixed-term catch share option, initially allocated by landing history with a transition to distribution by auction. That alternative could involve a range of options both for the length of the Initial Fishery (say 5-10 years) and for the term of the shares in the Final Stage fishery (say 5-15 years). The Council could incorporate various sub-options for partitions, bycatch reduction multipliers, and specific auction designs into this and other alternatives to meet additional goals and objectives. The analysis of this alternative should consider application of the system to both target and bycatch species.

References

Copes, P. 1986. “A Critical Review of the Individual Quota as a Device in Fisheries Management.” *Land Economics*, **62**,(3):278-291.

Macinko, S. 2005. “In Search of Transition, Community and a New Federalism: Six Questions to Confront on the Road Towards a National Policy on Dedicated Access Privileges.” Pp. 236-244 in: Witherell, D. (ed.). 2005. *Managing Our Nation’s Fisheries II: Focus on the Future*. Anchorage: North Pacific Fishery Management Council.

Redstone Group. 2007. "South Atlantic Snapper Grouper LAPP Options: Preliminary economic and design input, by Redstone Strategy Group, LLC, September 18, 2007." 30pp. Redstone Strategy Group, LLC. Boulder, CO.

Agenda Item D.7.h
Supplemental Public Comment 3
November 2007

Westport Seafood, Inc.

PO Box 2071
Westport, WA 98595

October 24, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

RECEIVED
OCT 29 2007
PFMC

Dear Chairman Hansen and members of the Pacific Fishery Management Council:

I am a fish buyer/processor from Westport, Washington and I am writing to ask you to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers up and down the coast.

The way the alternatives are currently structured only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system will enable that small number of large processors to become even larger, and will make it easier for them to continue to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage eliminating the potential for small buyers/processors to partner with fishermen on innovative marketing arrangements.

There is absolutely no justification for a giveaway of public trust resources to a handful of very large processing companies that will create such devastating impacts for other processors/buyers who are not entitled to receive a piece of the allocation pie. Please oppose initial allocation of quota to processors.

Sincerely,

Douglas Cornman
Owner/COB

cc: Senator Murray
Senator Cantrell
Senator Wyden
Senator Smith
Senator Boxer
Senator Feinstein
Congressman Dicks

P.O. BOX 249 · AVILA BEACH
CALIFORNIA 93424
(805) 595-5400 · Fax 595-5404
www.portsanluis.com

JAY K. ELDER *Harbor Manager*
THOMAS D. GREEN *Legal Counsel*
PHILLIP J. SEXTON, CPA *Treasurer*

October 23, 2007

RECEIVED
OCT 29 2007
PFMC

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen,

The Port San Luis Harbor District is a public entity that supports public safety, fishing, boating, recreation, natural resources, and cultural resources. As a small public entity, PSLHD has a significant interest in maintaining the viability of our ports by supporting coastal dependent activities such as commercial fishing.

I am asking you to include the adaptive management trust as one option to consider in the upcoming DEIS for the groundfish trawl fishery.

- ✓ This option will serve as an insurance policy for the program and will help ensure that social and conservation goals are met.

- ✓ The adaptive management trust option would also tend to minimize impacts to small ports and help ensure the transition to the quota system creates tangible benefits for the greatest number of people.

Again, please include the adaptive management trust as one option to consider in the upcoming DEIS for the groundfish trawl fishery.

Sincerely,

KIRK

Kirk Sturm
Harbor Manager

KS:al

cc: Board of Commissioners
Rick Algert, Harbor Director, Morro Bay

RECEIVED
OCT 3 0 2007
PFMC

Date: Oct 30 2007

To: Pacific Fisheries Mgt. Council
FAX (503) 820-2299

From: Oregon Ocean Seafoods

Re: Groundfish ITQ's

Norm Kujala
Oregon Ocean Seafoods

A Family Business Since 1978

OREGON OCEAN SEAFOODS

Home of **SKIPANON BRAND**

225 SE Galena • Warrenton, OR 97146
503-861-1434 fax 503-861-7602

October 29, 2007

Pacific Fisheries Management Council

Re: Groundfish ITQ

Dear Sirs:

This letter pertains to the proposed quota system for groundfish harvesting to fishermen and processors.

Our company, Oregon Ocean Seafoods, processed groundfish for over twenty years: 1977 to 1998. Since then we have been processing and canning Albacore, Salmon, and Sturgeon as "Skipanon Brand."

Although we have processed little groundfish in the past ten years, we do not wish to be excluded from doing so in the future. Thus we do not wish to see a few processors with exclusive rights to buy fish. If or when we decide to fillet bottomfish again, we want to buy the raw product directly from the fishermen.

We would appreciate the Council including Oregon Ocean Seafoods as a groundfish processor.

Thank you for fulfilling this request.

Yours truly,

OREGON OCEAN SEAFOODS

Norman Kujala

Norman Kujala, Owner

C: Peter Leipzig
Fishermen's Marketing Ass'n

Brad Pettinger
Oregon Trawl Commission

FROM : FAX NO. : Oct. 30 2007 02:56PM P2

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

November, 03, 2007

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

My name is Michael Lucas and I am an owner of North Coast Fisheries Inc., based out of Santa Rosa, CA. We buy fish from Ports ranging from Southern CA. to the Washington State line. We have facilities that we own and maintain with work forces in the various locations. I am writing to ask you to oppose the allocation of quota to processors in the IFQ program for the West Coast Trawl Fleet. If quota is allocated to processors based on past processing history it will be a great injustice to smaller processors such as me.

There are a handful of processors remaining who would own the entire quota. Actually I am one of those (although smaller) I would gain strictly from a monetary standpoint. However there is no fair way to allocate this resource to companies who have not played fairly while building their processing histories. In the past there have been many unfair tactics used by the bigger companies to have market advantages over the smaller companies. Some tactics within the law and many which were not.

I for one have been hurt by these tactics and bought much less volume than I would have; if I were not competing with cheap fish that was below what was a legit cost. If you would like details at a later time I could explain the circumstances that did exist.

I do not believe in quotas of any sort to anyone period. It is my strong belief that the resource is a public property and should not be willed into the hands of the private sector in any way shape or form. Persons wanting to get into this business should have the right to do so provided they are able without having to purchase the chance to catch fish that have not even been harvested.

There is absolutely no justification for a giveaway of public trust resources to a handful of very large processing companies that will create such devastating impacts for other processors and in-kind create a devastating scenario for the fishermen who would quickly become puppets for a small handful of processors. Competition is healthy for all and is and always has been the American way of life. Why create a scenario that changes that? Please oppose initial allocation of quota.

Sincerely, Michael T Lucas

Michael T Lucas, President North Coast Fisheries Inc.

10-19-07

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council:

This allocation of quota is just another way for Larger companies (AKA Pacific Choice) to control more of the market. This company holds such a large market share and does anything and everything to hold that share; this just is one way to make it legal for them to push us smaller processors out of business. We are already being squeezed out of our crab markets directly and indirectly thro practices that border legal. No matter how many business names they acquire it does not cover up, their control on our markets.
I am a fish buyer/processor from Charleston, OR and I am writing to ask you to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers up and down the coast. We are barley surviving now; this Quota will just finish all of us small buyers off.

The way the alternatives are currently structured only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system will enable that small number of large processors to become even larger, and will make it easier for them to continue to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage eliminating the potential for small buyers/processors to partner with fishermen on innovative marketing arrangements.

There is absolutely no justification for a giveaway of public trust resources to a handful of very large processing companies that will create such devastating impacts for other processors/buyers who are not entitled to receive a piece of the allocation pie. Please oppose initial allocation of quota to processors. I can not see any benefit to this proposed quota, for anyone except one or two larger companies. We fight an uphill battle everyday against these companies, please to not give them the power to squeeze the smaller companies out through a legal IFQ Program, they already play dirty enough as it is.

Sincerely,

Marvin Warman

Starvin Marvin Seafoods
Charleston, Oregon

TILLAMOOK BAY BOATHOUSE LLC

PO BOX 163
500 S BIAK
GARIBALDI, OR 97118

Phone 503-322-3600
Fax 503-322-3557
Email boathouse@oregoncoast.com

11/5/2007

Mr. Donald K Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council:

I am writing to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. I am a processor/fish buyer from Garibaldi, Oregon and can see no good from allowing quotas to the large processors. If the quota is allocated to processors based on processing history it will put the small operators like myself out of business. The free market concept our country is based on, will be taken away ...again.

It is hard enough to compete with the large processors and the control they have on the industry. We as small businesses work hard to put a quality product on the market at a fair price. If you take away our ability to compete with large processors, we will be finished.

Smaller ocean ports like ours depend on the relationship we have built between the buyers and the fishermen who support them. Take our fishermen to the large ports and we will be finished,along with all of the supporting business in this town.

Please oppose any allocation of quota to processors.

Sincerely,

Darus Peake

OLYMPIC STAR LLC 112 Harrison Street Chehalis, WA 98531 360-269-4906

November 6, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

My name is Don Jester and I am a commercial fisherman from Washington. I am writing to ask you to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers and fishermen on the west coast.

The way the alternatives are currently structured only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system will enable that small number of large processors to become even larger, and will make it easier for them to continue to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage eliminating the potential for small buyers/processors to partner with fishermen to get a better price.

I am the owner of king and opillo crab IFQ'S in the State of Alaska and I have seen first hand the problems that processor quotas have caused in the crab fishery.

Sincerely,

Don Jester
Managing Member
Olympic Star LLC

DEL MAR SEAFOODS, INC.
#2 HANGAR WAY, ASTORIA, OR 97103

November 6, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

I am a fish buyer/processor from Oregon and California, and I am writing to ask you to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers up and down the coast.

The way the alternatives are currently structured only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system will enable that small number of large processors to become even larger, and will make it easier for them to continue to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage eliminating the potential for small buyers/processors to partner with fishermen on innovative marketing arrangements.

There is absolutely no justification for a giveaway of public trust resources to a handful of very large processing companies that will create such devastating impacts for other processors/buyers who are not entitled to receive a piece of the allocation pie. Please oppose initial allocation of quota to processors.

Sincerely,

Joe Cappuccio
President, Del Mar Seafood's Inc.

Board of Clallam County Commissioners

223 East 4th Street, Suite 4
Port Angeles, WA 98362-3015
360.417.2233 Fax: 360.417.2493
Email mdoherty@co.clallam.wa.us

From the Desk of
COMMISSIONER MIKE DOHERTY

File: A34

6 November 2007

Mr. Donald K. Hansen, Chair
Pacific Fishery Management Council
7700 Northeast Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Mr. Hansen:

I am a Clallam County Commissioner and represent the geographic area where HighTide Seafoods Inc. operates three processing plants.

I am very concerned about the rumored attempt by several large seafood processing companies to mandate the allocation of Pacific Coast ground fish based upon historical data. This scenario will jeopardize the economic viability of many smaller processors resulting in lost jobs and lost revenues for their respective communities. Because of this deleterious situation, I vigorously oppose allocating ground fish quotas to processors based upon their tenure in the industry.

As you may know, many coastal communities have suffered through severe downturns in the timber and fishing industries. For some small communities, the small processors represent one of the few traditional/local economic opportunities left.

Sincerely,

Mike Doherty

OFFICE ADDRESS
303 Tumwater Truck Rt. #200
Port Angeles, WA. 98362
PHONE (360) 452-8756

PENINSULA SEAFOODS INC
AN INTERNATIONAL TRADING COMPANY

MAILING ADDRESS
P.O. Box 2109
Port Angeles, WA. 98362
FAX (360) 452-8757

Tuesday, November 06, 2007

To: Donald K. Hansen
Chairman, Pacific Fishery Management Council

Dear Chairman Hansen and members of the Pacific Fishery Management Council:

We are a fish buyer/processor from Port Angeles, Washington. We have been in the ground fish business for over 17 years. I am writing to ask you to oppose the initial allocation of quota to processors in the IQF program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers up and down the coast.

The way the alternatives are currently structured, only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system would only serve to make the large processors even larger, and will make it easier for them to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage, eliminating the potential for small buyers/processors to partner with fisherman on innovative marketing arrangements.

Please oppose initial allocation of quota to processors.

Sincerely,

Russell Smith
President
Peninsula Seafoods, Inc.

November 6, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council

Chairman Hansen and members of the Council

I am the owner of Morning Star Fisheries. Being a comparatively small buyer/processor, the allocation of quota to processors in the IFQ program for the west coast trawlers, as it is currently set up, would not be beneficial to either me nor the two trawlers who fish for me. I oppose the plan and am asking you do the same.

The current plan favors the big boys and removes any semblance of bargaining power for the smaller players and the boats who sell to them and the communities they live in.

The fishing industry has been hit with plenty of restrictions, quotas or outright elimination of certain fisheries in the last ten years, one has to be especially industrious in order to survive. This would be another especially heavy hit for my company and others like me who would receive such a small piece of the pie. Please oppose the initial allocation of quota to processors.

Sincerely,
David Mallory, Morning Star Fisheries

DATE: 11/06/07

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hanson and members of the Pacific Fishery Management Council,

I am a fish buyer/processor from Charleston, Oregon and I am writing to ask you to Oppose initial allocation of quota to processors in the IFQ program for the west coast Trawl fleet. If quota is allocated to processors based on processing history, it will have A disastrous effect on small processors/buyers up and down the coast.

The way the alternatives are currently structured only a handful of the very largest Processors would be eligible to receive any allocation. Such an allocation system will Enable that small number of large processors to become even larger, and will make it Easier for them to continue to squeeze out small processors/buyers. Large processors will Become the beneficiaries of an even larger market advantage eliminating the potential for Small buyers/processors to partner with fisherman on innovative marketing arrangements.

Our company, Oregon Brand Seafood, has been able to partner with several fisherman To develop unique markets for several groundfish species. Under the initial allocation Of quota to processors our company would not receive any allocation as we have only A short history processing groundfish.

There is absolutely no justification for a giveaway of public trust resources to a handful Of very large processing companies that will create such devastating impacts of other Processors/buyers who are not entitled to receive a piece of the allocation pie. Please Oppose initial allocation of quota processsors.

Sincerely,

Bernie Michalke
Oregon Brand Seafood
P.O. Box 178
North Bend, OR. 07459

FROM DONNA PARKER

WHITING COOP MANAGEMENT

Include in Trawl Rationalization Alternatives, Attachment D.7.b Attachment 2, on page 38 in the section titled, Whiting Sector Management Under Coops, the following:

Whiting Sector Management Under Coops

Intercoop Agreements may be formed to manage and transfer whiting between coops in the same sector.

RATIONALE:
Successful management of whiting using the cooperative structure will require a mechanism to better ensure attainment of OY. By authorizing the use of Intercoop Agreements, whiting allocations can be appropriated transferred and monitored when shifted to another coop in the same sector. This flexibility is necessary to best achieve the efficiencies of a coop management structure. For example, when a coop has too little bycatch remaining to responsibly attempt capture of the remaining whiting or the remaining amount of coop whiting is too small to target without risking an overage, an Intercoop Agreement would allow transfer of whiting to another coop in the same sector .

COOP BYCATCH MANAGEMENT

The current section on pages 38 and 39 discusses potential options for management of bycatch using a coop management structure. This suite of options is designed to provide more specific guidance to staff as the analysis moves forward. It includes the options discussed in this section as well as some others designed to flesh out a range of alternatives that will allow the council to compare and contrast bycatch management approaches within a cooperative structure.

Include in Trawl Rationalization Alternatives document, Attachment D.7.b Attachment 2, on pages 38 and 39 in section titled, Bycatch Species Management.

Bycatch Management Options for Whiting Coop-Managed Fisheries

1. Sector allocation of overfished stocks by species based on*;
a) pro-rata to whiting allocation
b) historical catch **

***Council may choose to allocate differently by species or in the same proportion for all species, and in any amount within the range of pro-rata and historical catch.**

****Regardless of distribution formula to a sector, the bycatch allocation to coops within a sector would be on a pro-rata basis because vessels in the same sector fish with the same constraints as other participants in that sector.**

RATIONALE:
Bycatch of overfished stocks is known to occur at different rates based on areas fished and, perhaps, times of year. The three sectors tend to fish in different areas and at different times of year. These differences in timing and area also vary by species. Based on the information gathered in the analysis, the council can make an informed decision should it decide to allocate bycatch at the sector or coop level.

2) Fishery-wide allocation of overfished stocks to the whiting fishery using;

- **a) seasonal allocations**
  - **specific to species**
  - **same proportion to all species**
- **b) area closures**
  - **determined on a species-by-species basis**
  - **applied to all species**
- **c) area closures**
  - **applied annually**
  - **applied seasonally**
  - **triggered by a bycatch amount**

RATIONALE:
Because the amount of overfished species is managed using a hard cap that makes available only small amounts of canary, widow and dark-blotched rockfish, division of those amounts into smaller pools at the sector and coop level may be so constraining that a few "lightning strike" tows could close down the fishery for all other participants in that coop or sector. For that reason the Council should consider continued management at the fishery-wide level using area and seasonal allocations to constrain the fishery.

3) Intercoop Agreements may be formed between coops and across sectors to manage bycatch. Coops with Intercoop Agreements in place to manage bycatch could:

- **a) Transfer bycatch between coops and sectors.**
- **b) Be exempt from bycatch area closures.**
- **c) Be exempt from seasonal allocations of bycatch.**

RATIONALE:
These options recognize that Coop and Intercoop Agreements may make these area and seasonal closures obsolete for the Coop fishery, but necessary for the Non-Coop fishery. It also provides an alternative that would allow sectors to trade bycatch by species to better meet their needs should the Council allocate bycatch at the sector or coop level.

Non-Coop Whiting Fishery

1) **An allowance of Non-Coop bycatch would be made by the agency on a pro-rata basis to whiting allocated to the Non-Coop fishery.**

2) **A Non-Coop bycatch buffer would be set aside on a species-by-species basis within the Non-Coop bycatch allowance at:**
   a) **20%**
   b) **10%**
   c) **5%**
   d) **No buffer set-aside**

3) **Participants in the Non-Coop fishery would be subject to all area closures and sector and seasonal bycatch constraints.**

RATIONALE:
A mechanism is needed to describe the allocation of bycatch to the Non-Coop fishery so that it is clear that participants in the Non-Coop fishery cannot use the bycatch allocated to the Coop fishery. Without the bycatch management constraints built into a Coop or Intercoop Agreement, some other constraints such as area closures, seasonal allocations and buffers may be required to control bycatch in the Non-Coop fishery.

ALSO FROM DONNA PARKER

Coop Agreement Requirements:
In order for a coop to be authorized, it must file with NMFS and the Council a COOPERATIVE MEMBERSHIP AGREEMENT that includes the following:

1) A list of all permit holders participating in the coop and their share of allocated catch,
2) A plan to adequately monitor catch and bycatch,
3) Enforcement and penalty provisions for overages,
4) A coop manager to serve as the contact person with NMFS, the Council and other coops and to be responsible for annual distribution of catch and bycatch, oversight of transfers, preparation of annual reports and is authorized to receive or respond to any legal process against the coop.
5) A provision that prohibits coop membership by permit holders that have incurred legal sanctions that prevent it from fishing groundfish in the Pacific Fishery Management Region,
6) A provision that requires changes in ownership to comply with member restrictions in the Coop Agreement,
7) The agreement must be signed by all permit holder owners participating in the coop.
8) A requirement that at least a majority of the members are required to dissolve a coop,

Intercoop Agreements
1) In the case of multi-coop or multi-sector management of bycatch, an Intercoop Agreement is required,
2) In the case of multiple coops within a sector, an Intercoop Agreement is required to manage directed catch,
3) In the case of two or more cooperatives entering into an Intercoop Agreement, provisions must include monitoring, enforcement and penalty provisions.

Other requirements:
1) Each fishery cooperative must file a signed copy of a cooperative contract with the Council and NMFS that is available for public review before it is authorized to engage in fishing activities.
2) Any material changes or amendments to the contract must be filed annually with the Council and NMFS by a date certain.
4) Each coop must prepare and file an annual report with the Council and NMFS by a date certain. The report will document the catch, bycatch and transfer of the coop's annual distribution of fish during that year. The annual report will be available to the public and reviewed by the Council.
5) Each coop must file with the Council and NMFS a copy of a letter from the coop requesting a business review letter on the fishery cooperative from the Department of Justice and any response to such request.

November 6, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

To Whom it May Concern:

I am Plant Manager for Hightide Seafoods, Inc. located in LaPush, Washington. I am very concerned about the attempt by several large seafood processing companies to mandate the allocation of Pacific Coast ground fish based upon historical data. This scenario will jeopardize the economic viability of many smaller processors resulting in lost jobs and lost revenues for their respective communities.

Our company, Hightide Seafoods, Inc., has processed groundfish for over 31 years.

Our groundfish harvesting is an integral part of our business and were this to be placed out of our reach, our business would suffer a serious blow. The economic impact would be tremendous in our area, impacting vendors, customers, staff, and employees.

We certainly do not want to see a few processors with exclusive rights to buy fish. Please consider our position very seriously. Vote against allowing any processors exclusivity in this industry.

We would appreciate the Council including Hightide Seafoods, Inc. as a groundfish processor.

Sincerely,
Robert Nevaril

Robert Nevaril
LaPush Plant Manager

HIGH TIDE SEAFOODS, INC.

November 6, 2007

Pacific Fisheries Management Council

RE: Groundfish ITQ

To Whom It May Concern:

Our letter pertains to the proposed quota system for groundfish harvesting to fishermen and processors.

Our company, Hightide Seafoods, Inc., has processed groundfish for over 31 years.

Our groundfish harvesting is an integral part of our business and were this to be placed out of our reach, our business would suffer a serious blow. The economic impact would be tremendous in our area, impacting vendors, customers, staff, and employees.

We certainly do not want to see a few processors with exclusive rights to buy fish. Please consider our position very seriously. Vote against allowing any processors exclusivity in this industry.

We would appreciate the Council including Hightide Seafoods, Inc. as a groundfish processor.

Respectfully yours,

Mr. Ernest J. Vail
Owner

6

OFFICE (360) 452-8488 • FAX (360) 452-6710
808 MARINE DRIVE • P.O. BOX 2141 • PORT ANGELES, WA 98362

Clallam netWorks
ECONOMIC DEVELOPMENT COUNCIL
A PRIVATE NON-PROFIT CORPORATION WORKING FOR BUSINESSES IN CLALLAM COUNTY
102 E Front Street, 2nd Floor • PO Box 1085 • Port Angeles, WA 98362

November 6, 2007

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1348

Attn: Pacific Fishery Management Council

Ladies and Gentlemen:

It is has come to the Clallam Economic Development Council's attention that a very significant decision could be made that would dramatically impact small, probably rural, fish processing businesses. After being contacted by our local, small, rural fish processor and understanding the potential economic impact of this proposal, we oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet.

The way the alternatives are currently structured, only a handful of the very largest processors would be eligible to receive any allocation. This action would categorically disallow participation by small processors and, therefore, permit unfair advantage to the large processors.

This action will, once again, greatly impact small, rural counties and their natural resource business activities while giving unfair advantage to big business. Please oppose initial allocation of quota to processors.

Sincerely,

Linda Rotmark
Executive Director

Orville Campbell/lem
Orville Campbell, Co-Chair
Clallam EDC
Marine Services Industry Cluster

Leonard Beil, Co-Chair
Clallam EDC
Marine Services Industry Cluster

***Phone:* 360.457.7793 • *Fax:* 360.452.9618 • *Web:* www.clallam.org**

DATE 11/7/07

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

As a fish buyer/processor from Costarella Seafoods... I have a strong interest in improving the quantity and quality of groundfish landed on the Pacific coast. I applaud the efforts of the Pacific Fishery Management Council to make the transformational change to an IFQ system, which, through the reintroduction of individual accountability, should allow fishermen to increase landings of target species and improve the quality of fish landed, while avoiding overfished stocks. However, not all IFQs are created equal. It is critical to incorporate the appropriate design elements in order to ensure the success of the program and to maximize the expected benefits. I am writing to ask you to make the correct choice on one of those design alternatives by opposing any allocation of quota to processors based on their processing history.

From a processor/buyer perspective there are numerous potential benefits of an IFQ system: 1) 100% observer coverage and real-time accounting will allow the fleet to adopt gear and strategies that will eventually lead to landings of nearly all of the biologically allowed fish; 2) individual boats will develop a sense of ownership of their quota leading them to seek new and innovative marketing arrangements with processors/buyers; 3) the quota system will allow vessels and plants/buyers to develop marketing plans that are flexible and capable of taking advantage of shifting marketing conditions; 4) fishermen and processors/buyers will be able to work together to develop marketing plans that emphasize niche marketing based on increasing consumer interest in local and sustainable products; 5) the regulatory environment will stabilize which will facilitate better business decisions; 6) biological information will also improve significantly strengthening the reliability of stock assessments and further enhancing the ability of plants/buyers to make good business decisions.

These benefits may never be achieved if quota is allocated to processors based on processing history. Initial processor allocation will allow a handful of large processors to further solidify their stranglehold on the industry thereby maintaining the status quo and eliminating many of the potential innovative changes in fishing practices and on the marketing front that are the hallmarks of a successful IFQ program. Moreover, the alleged reasons for processor allocation are unfounded. There is no guarantee that processors will stay in a particular community once quota is granted to them. Nor have they shown that they will actually incur any stranded capital due to the change in management regimes.

Please oppose initial processor allocation as it will thwart the goals of the IFQ.

Sincerely,

Bob Costarella

....

PORTS seafood
The Fresh Fish Company

November 7, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

As a fish buyer from Ports Seafood, Inc., I have a strong interest in improving the quantity and quality of groundfish landed on the Pacific coast. I applaud the efforts of the Pacific Fishery Management Council to make the transformational change to an IFQ system, which, through the reintroduction of individual accountability, should allow fishermen to increase landings of target species and improve the quality of fish landed, while avoiding overfished stocks. However, not all IFQs are created equal. It is critical to incorporate the appropriate design elements in order to ensure the success of the program and to maximize the expected benefits. I am writing to ask you to make the correct choice on one of those design alternatives by opposing any allocation of quota to processors based on their processing history.

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These benefits may never be achieved if quota is allocated to processors based on processing history. Initial processor allocation will allow a handful of large processors to further solidify their stranglehold on the industry thereby maintaining the status quo and eliminating many of the potential innovative changes in fishing practices and on the marketing front that are the hallmarks of a successful IFQ program. Moreover, the alleged reasons for processor allocation are unfounded. There is no guarantee that processors will stay in a particular community once quota is granted to them. Nor have they shown that they will actually incur any stranded capital due to the change in management regimes.

Please oppose initial processor allocation as it will thwart the goals of the IFQ.

Sincerely,

Timothy Ports
Ports Seafood, Inc

DATE 11/3/07

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council,

As a fish buyer/processor from Monterey Fish Market… I have a strong interest in improving the quantity and quality of groundfish landed on the Pacific coast. I applaud the efforts of the Pacific Fishery Management Council to make the transformational change to an IFQ system, which, through the reintroduction of individual accountability, should allow fishermen to increase landings of target species and improve the quality of fish landed, while avoiding overfished stocks. However, not all IFQs are created equal. It is critical to incorporate the appropriate design elements in order to ensure the success of the program and to maximize the expected benefits. I am writing to ask you to make the correct choice on one of those design alternatives by opposing any allocation of quota to processors based on their processing history.

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I oppose initial processor allocation.

Paul Johnson

Agenda D.7.h
Supplemental Public Comment 7
November 2007

Evaluating Processors' Claims of Stranded Assets in the Proposed Pacific Groundfish Trawl IFQ Program: Findings and Policy Recommendations

James E. Wilen
Dept. of Agric. & Resource Economics
University of California, Davis
Davis, CA 95616

Draft White Paper prepared for
Environmental Defense

October 2007

Executive Summary

Current policy options being considered to rationalize West Coast groundfish and whiting fisheries include several options that allocate harvester quota to processors. Allocating harvester quota to processors is a highly unusual and potentially precedent-setting policy action, and worthy of serious assessment. Processor allocations have been included as policy options at the behest of processors, who justify the allocations as a means to compensate them for "stranded capital" anticipated with rationalization. This raises several questions, the most important of which is whether current options can be justified as remedies for the alleged stranded capital problem. This paper discusses stranded capital in light of this question. We discuss: the origin of the concept, the manner in which it is used elsewhere, preconditions for stranded capital, measurement, and remedies for addressing it.

Our main finding it that, in contrast to other deregulation cases such as electricity production, rationalization of fisheries is unlikely to generate significant stranded capital costs for processors. Most of the capital involved in fisheries processing is mobile, flexible, and has alternative uses, and hence not likely to be devalued as a result of rationalization. The preconditions for stranded capital are largely absent in fisheries processing. If it is nevertheless judged desirable to consider compensation, a legitimate process requires that compensation amounts should be tied to anticipated or demonstrated capital losses. Current policies proposed to transfer harvester quota are arbitrary and without any justification based on empirical estimates of the magnitude of the problem, and likely to generate important spillover effects that could negate some of the intended benefits of rationalization.

In light of this negative finding, our recommendation is that a cautious, staged approach is warranted. In the first stage, benchmark estimates of the maximum potential possible stranded capital should be made. This should be done using verifiable accounting information provided by potential claimants and should follow approved and agreed-upon procedures for identifying strandable capital. In the second stage, a judgment should be made about whether the estimates of most probable total claims justify the transactions and administrative costs of moving ahead with policy schemes to compensate. If it is decided to proceed, the third stage would establish an appropriately-sized fund out of which claims are to be paid. In the fourth stage, after rationalization has been initiated, processors would present claims with documentation to legitimize capital losses and request compensation. Finally, after compensation were completed, the fund would sunset and the residual would be dispersed.

Stranded Capital in Fisheries

The issue of stranded capital has arisen in recent and ongoing fisheries rationalization policy debates on the West Coast. While the concept of stranded capital has also been part of recent electricity deregulation debates, its appearance in the fisheries policy arena is new and potentially precedent setting. The stranded capital concept has been introduced by processors who claim that fisheries rationalization on the West Coast will cause large reductions in the value of their processing capital. The argument is then that the allocation of harvester quota is necessary to compensate them for these losses. Current allocation options under consideration involve huge compensation, on the order of one hundred million dollars, and they may generate structural impacts that will reduce the intended benefits from rationalization. It is thus worth examining whether these options actually address a problem of substance, and whether proposed remedies fit the alleged problem at hand.

This paper surveys and synthesizes the literature and addresses the following questions:

- What is stranded capital? What is the origin of the concept?
- How has stranded capital been treated in settings other than fisheries?
- What are the preconditions for stranded capital?
- How did the stranded capital concept get injected into fisheries debates?
- How should stranded capital costs be measured?
- What policy remedies are available to address stranded capital?
- What issues of process are important to ensure legitimacy?

I. What is Stranded Capital? What is the origin of the concept?

The concept of stranded capital costs refers to reductions in the value of capital that are the direct result of regulatory changes. The term was first used during discussions of electricity deregulation. Electricity generators have historically been granted monopoly rights to be sole providers in various regions but only by accepting regulations on the maximum consumer prices that could be charged. Prices are determined by evaluating generator assets and costs, and then computing "fair" prices that guarantee a fixed rate of return on invested capital. Under this regulatory system, some utilities made investments in high-cost power-generating facilities, long term contracts to purchase high cost power, and other expenses that were intended to be paid through rate surcharges over long periods of time. These investments have become the issue of contention as electricity markets become candidates for deregulation. In particular, in markets that are opened up to competition among providers, prices generally fall. Utilities that are no longer guaranteed price floors that translate into fair rates of return for large and long term investments claim that their investments are "stranded" by deregulation.

II. How has stranded capital been treated in other settings?

In the 1980s, the ascendancy of the free-market-oriented Reagan administration paved the way for the wave of deregulation that opened trucking, airlines, railroads, banking, natural gas production, and telecommunications to competitive pressures. The results of deregulation were disruptive to incumbents during the transition. All of the industries deregulated in the 1980s wave found need to adjust as a result of deregulation (Winston, 1998). Large interstate trucking firms had too many trucks in their fleets and needed to divest, whereas smaller local firms consolidated and merged. Airlines reallocated their fleets and other facilities over the routing system in response to new entrants and incumbent consolidation. Banks and railroads merged and reformed as they found themselves with capital structures ill-suited to the new market realities imposed by competition in the marketplace. All of this restructuring occurred relatively quickly within minimal disruption because the capital in question was mobile, flexible, and easily moved, reconfigured, consolidated and divested. Because of these characteristics, while many firms undertook adjustments in capital structure in response to deregulation, none claimed that capital had been "stranded" and none asked for or received compensation for capital values that were influenced by changes associated with deregulation (Tye and Graves, 1997). The dominant precedent in the U.S. has thus been to deregulate without consideration of compensation for transition costs.

It was not until electricity generation began to be deregulated in the early 1990s that the concept of stranded capital first appeared in regulatory discussions (Maloney et. al., 1997). Utilities argued that they be granted compensation for: 1) generation facilities that would be less profitable under deregulation; 2) obligations mandated by prior regulations that could not be recovered under deregulation, and 3) debt incurred to finance programs for various social objectives such as efficient appliance rebate programs (U.S. CBO, 1998). For the most part, regulators have accepted arguments that obligations incurred to address mandated social objectives should be compensated. But there has been heated debate and lawsuits over whether investments in less profitable generation facilities should be compensated.[1] Virtually all of the high profile contested cases involve compensation demands for expensive nuclear power plants (Maloney et. al. 1997). In many cases, regulators have denied compensation, whereas in other cases utilities have successfully lobbied for transfers from either consumers or taxpayers.[2]

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[1] Utilities attempted various legal arguments to support their claims, including that deregulation involved a "takings" of asset values, and that utility regulation involved an implicit "contract" that guaranteed against devaluation of assets (Baumol and Sidak, 1995a, 1995b, Brennan and Boyd, 1997, Boyd and Brennan, 1996, Boyd, 1998, Rossi, 1998). Neither of these legal arguments has been upheld in the courts.

[2] The argument that compensation ought to be denied is based on the notion that capital decisions that are discretionary are made with the understanding that there are risks of deregulation. Moreover, the argument goes, rational decisions in the face of deregulation risk would already be earning above-normal returns to compensate for the risk (Hovenkamp, 1999, Van Doren, 1998).

III. What are the preconditions for stranded capital?

There are two preconditions necessary to support a legitimate claim of stranded capital. First, the capital in question must truly suffer a demonstrable reduction in value. Second, the reduction in value must be clearly attributable to a policy change rather than other background economic conditions or imprudent decisions of an entity.

Determining Capital Value Reductions

Capital equipment is expected to yield a flow of earnings into the future, and the value of the anticipated flow of earnings and the expected lifetime determines its value. Importantly, the value of existing capital is not its purchase price, or its book value computed as the original price less depreciation, but rather the present value of its potential future earnings in its best use. Consider a hypothetical example of a nuclear power plant under circumstances in which regulators allow the utility to charge electricity prices of 16 cents per kilowatt hour. Suppose that these prices guarantee 160 million dollars rate of return per year. Using an 8 percent discount rate, the present value of a guarantee of 160 million dollars per year for an indefinite period is 160/.08 millions, or two billion dollars.[3] This is what an investor would be willing to pay to own this nuclear power plant capital, and it is the value of the capital.

Now suppose that electricity production in our hypothetical state is deregulated, and competition drives electricity prices down to 8 cents per kilowatt hour rather than 16. If the plant were mobile, the utility could shut the plant down, disassemble it, sell the land and buildings, and move to a state where prices were still 16 cents. In that case, there would be only small losses due to deregulation associated with the transition costs of relocating the capital elsewhere. But for a nuclear plant, this is clearly not an option because the capital is immobile and custom built to fit the site. Since the operating costs for nuclear power are low (certainly less than 8 cents) the utility would rationally stay in business in situ and continue to use the capital as before.[4] But now a willing buyer for the plant would only pay an amount reflecting the new lower earnings, say 80/.08 million, or one billion for the plant under deregulated circumstances.

In this (very unique) case, where capital is highly specialized and highly immobile, the investment and capital is quite literally and economically "stranded". Although it will still pay to operate the plant and produce electricity, the nuclear power

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[3] The general formula for present value computations is: $PV = \frac{X}{r}\left[1 - \left(\frac{1}{(1+r)^T}\right)\right]$ where X is the annual earnings flow, r is the discount rate, and T is the lifetime of the asset. When the lifetime is large ($T \to \infty$) the present value is the annual earnings flow divided by the discount rate.

[4] This example brings up an important point and that is that **no facility will be rationally shut down because of stranded capital costs**. Capital costs undertaken in the past, regardless of how large, are "sunk" and have no bearing on whether the plant should remain open and in production in the future. As long as revenues exceed variable costs it is rational for any owner to continue production.

plant capital will now have to be revalued on the utility's books and by shareholders to reflect its profitability under deregulation. In this example, the utility must adjust to the lower expected earnings flows by devaluing or "writing down" the value of nuclear plant capital. Who bears this reduction in value? In the unlikely case that deregulation was completely unanticipated, existing shareholders would suffer share value losses reflecting asset revaluation. More plausibly, if the market anticipated some risk of deregulation, the original valuation of the nuclear plant capital would already have been discounted to reflect investor expectations of the chances of deregulation changes.

Specialized Capital and Alternative Uses

The above discussion illuminates a common misconception in discussions of stranded capital, particularly in fisheries. It is often inferred that fisheries rationalization policies that disrupt or change economic conditions for a particular entity will reduce the value of its installed capital to virtually zero.[5] But capital almost always has alternative uses, sometimes after modifications to fit a new production setting. A machine that is not useful in any particular location can be sold on the used market and moved to another location and hence does not become "worthless". In the final analysis, the productivity of a machine in alternative uses determines its value in the market, not its particular usefulness at any one place at any point in time.

When is a policy change likely to cause a significant reduction in the value of capital? The answer is only when the capital involved is highly specialized and immobile with virtually no alternative uses so there is little value as used capital. This is the situation that the literature refers to as "non-malleable" capital, i.e. where capital lacks the flexibility to be utilized in some alternative activities that are as productive as the original use. But, and this is critical, ***non-malleable capital is very rare in practice***. Consider, for example, a processing plant with a filleting machine that cuts raw fish. Suppose that a policy change completely eliminates the need for the machine at the site. Then the value reduction would be the difference between the machine's pre-policy value at the site in question and the present value of earnings in its next best use. But the next best use would be filleting fish in some other plant at some other location and the value in that use would be determined in the market for used filleting machines. Importantly, even seemingly specialized equipment like filleting machines will not be "stranded" by policy changes in the sense that a unique, immobile and highly specialized nuclear plant would be.

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[5] See for example the testimony of Mr. Joseph Plesha, General Counsel, Trident Seafoods, before the 2004 Senate hearings on seafood processor quotas "Simply put, you do not need all of the harvesting and processing capacity that exists when an overcapitalized fishery is rationalized. Primary processing plants and fishing vessels with no alternative uses become nearly worthless. Both fishing vessel owners and processing plant owners should, therefore, receive rights in a rationalized fishery as compensation for having the value of their existing investments expropriated by the new management system." http://commerce.senate.gov/hearings/testimony.cfm?id=1066&wit_id=3008

IV. How did the stranded capital concept get injected into fisheries debates?

Alaskan Crab Rationalization

When Alaska began contemplating rationalizing the crab fishery, the crab fishery was, like the pre-rationalized British Columbia (BC) derby halibut fishery, profoundly inefficient with all of the classic race-to-fish symptoms. There were many more vessels and gear than necessary, frantically fishing over artificially shortened seasons of 3-5 days, experiencing high levels of injuries, sinkings and death, and a huge volume of crab frozen for distribution to markets over the rest of the year. But incumbent processors were particularly wary of the threat of competition from new entrants and of shifts in the location of deliveries that had occurred in British Columbia. They thus lobbied regulators to impose constraints that locked in existing harvester/processor delivery patterns. Processor lobbying was aided by communities that had historically been centers of crab landings and that feared local employment reductions if landings were allowed to shift geographically.

The result was a crab rationalization plan called the "two-pie" quota system. The two-pie system gives both IFQs to harvesters and individual processing quotas (IPQs) to processors. The Council ultimately approved a plan that guaranteed existing processors 90% of their historical shares of deliveries in various regions. This feature created legislatively sanctioned regional monopsonies (single buyers) that not only protect incumbent processors from new entrants but also give them uncontested bargaining power in the ex-vessel market. Their single buyer status required another mechanism to prevent processors from exploiting harvesters, and a complicated negotiation process has been mandated to serve as a proxy for the ex-vessel market.

The two-pie system was subject to very heated opposition in Alaska, and by agencies and high level political opponents at the federal level. The objection at the federal level was over the inefficiencies associated with reduced competition within the processing sector, curtailed entry and exit, inefficient geographic allocation of processing and harvesting, and the potential that such complicated and restrictive schemes would become precedent. In the Senate, there was heated opposition expressed by Republican Senators including McCain and Snowe, but this opposition was eventually overcome by the powerful Alaskan Senator Stevens. Economists have, with the exception of the designer of the two-pie system, roundly criticized the two-pie system as replacing one inefficient system (regulated open access) with another (regulated monopsonists), with protecting incumbents from competition, and with requiring a complex negotiated price settlement mechanism rather than allowing competitive markets to establish ex vessel prices.[6] Astute observers of the politics of fisheries management believe that the two-pie system created for the crab fishery was a one-time fluke, influenced by Senator Stevens' uniquely powerful position, and that it will not be implemented again in any similar form in future fisheries allocation disputes.

Pacific Coast Rationalization

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[6] See Halvorsen 2004, Milon and Hamilton, 2002.

The speculation that another two-pie system is politically unlikely may explain why recent rationalization program proposals on the West Coast have not proposed dedicated processor quotas. Instead, West Coast processors, including important participants in the rationalization programs in Alaska, have cast the debate in terms of stranded capital. The claim mirrors those appearing in electricity deregulation debates, namely that harvester-only IFQ programs being proposed on the Pacific Coast will leave processor capital values diminished and worthy of compensation.

The electricity deregulation case thus appears to be the principle basis for any precedent, theories, and experience that might be used to support analogous claims in fisheries. On the surface, there are some similarities between electricity deregulation and fisheries rationalization. Both involve changes in regulatory environments that are aimed at improving efficiency, and these changes are likely to require adjustments in capital, either via consolidation and merger, or accelerated depreciation and new investment. But while there are some similarities on superficial characteristics, the two cases differ dramatically on the fundamentals that bear on whether a logical case for compensation can be made. First, in electricity deregulation, much of the approved compensation for stranded capital is actually for stranded obligations associated with specific requirements that were imposed on generators by regulators, rather than capital investments per se.[7] There are no counterparts to these kinds of mandated obligations in fisheries. Second, where physical capital investments are being compensated, they are unusual, highly contested, and mostly cases such as recently-constructed nuclear power plants. Nuclear power plants are unique in that the capital invested is virtually all embedded in the reactor and containment facilities and is highly specialized, immobile, with no alternative uses. Fisheries capital in processing does not share these unique characteristics.

The other major difference between the electricity deregulation cases and the West Coast fisheries processor case is with the design of the proposed remedy. Specifically, processor proposals for West Coast fisheries rationalization plans are not, as is the case with electricity, asking for temporary surcharges that would directly amortize out the compensation claims over a short period. Instead, processors on the Pacific Coast are asking for up-front allocations of harvester quota to compensate for stranded capital. While such a scheme could be used to compensate demonstrable stranded capital losses, it has important drawbacks including protecting incumbents against outside competition and distorting processor bargaining power in the ex-vessel market.

V. How should stranded capital costs be measured?

Measuring Policy-Induced Capital Value Changes

If compensation is to be arranged, some estimates of stranded capital losses must be provided to legitimize the remedy. How should we go about measuring the amount of stranded capital? Basically there are two approaches: either an ex-ante (before the policy) approach or an ex post (after the policy) approach (Hicky, 1998, Hirst, 1998). An ex ante approach relies on **estimating** how much capital is likely to be stranded and the corresponding capital value losses, whereas an ex post approach waits to compensate

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7 For example, mandated long term contracts with small scale "green" electricity suppliers at very favorable prices are clearly uneconomic in a more competitive market for power.

until **actual** changes have been measured. In practice, schemes being developed in other settings blend the two, by estimating the most likely effects, and then adjusting with "true-up" schemes after measurements of actual post-policy losses have been conducted. The basic aim of all methods is to determine regulation-induced capital losses, which can be measured as the difference between the pre-policy book value of designated capital and the post-policy book or actual sale value of relevant capital (Maloney et. al. 1997).

Ideally, claimants must show or forecast clear links between the design features of the policy in question, and the manner in which specific components of capital are expected to be revalued as a consequence. For example, if a particular product line is eliminated because of a policy change, the equipment to produce that product is a candidate for compensation. Once linkages between particular components of capital and the policy are established, the second question is: how much capital value reduction can be ascribed to the policy change? While this seems difficult, some guidance can be given by recalling that it is not necessary to look at all capital. The potential size of stranded capital losses is related to whether the capital in question is highly specialized, that is, to whether there are alternative uses for the capital in question.

The Importance of Alternative Uses

Most capital, whether harvesting or processing capital, has alternative uses and hence will not become "worthless" or even change value at all after a policy change. The value of a pump, or pressure tanks, or cranes or other offloading facilities is basically determined by their values in the next best use. For any of these kinds of capital there are obvious next best uses that would generate capital prices fully reflecting fair (used) market value, and those prices would be close to, or exactly, the same before or after a policy change. For example, a pump that cost $1000 new might be worth $400 as used equipment after some years of use. Suppose that a policy eliminates the need for the pump. Before a policy change, the pump's book value would be $400. But after the policy change, the pump would still also be worth $400 since its value is determined by alternative uses. Hence even when the pump's usefulness is eliminated by the policy, there is no stranded capital loss. For items that seem more specialized, such as a fish filleting machine, again it is the case that their values would not be significantly reduced by a policy change that made them obsolete. Fish filleting machines can be unbolted, moved, sold on a used market at prices that would be similar before or after a policy change. Even seemingly highly specialized pieces of capital, such as parts of a surimi line can be removed, shipped to another location, and installed with minimal losses. Very little, if any, fishing processing capital qualifies as being so highly specialized that it is stranded in place and will be worthless as a result of policy changes.

Benchmarking estimates

There are some accounting principles that are useful for putting bounds on potential stranded capital losses. First, the maximum losses that might be incurred from stranded capital can be no larger than the full value of an entity. A rough estimate of total value might be made by reviewing the books of firms that contend they are candidates for losses. Alternatively, one might use public records (eg. property tax assessments) to estimate the upper bound. For many businesses, land and buildings are among the largest components of the firm's total capital value. But these are not components of valid stranded capital computations. Even in the extreme event that the business on site closes down, buildings that house processing plants and waterfront land clearly have other valuable uses, and these would be immune from rationalization policy effects.[8] The second step is thus to subtract land and buildings values from total values. Third, all non-specialized equipment involved in processing must be removed from the list of potential strandable capital. This category is likely to be an important component of on-site capital, since it would include vehicles, loading facilities, pumps, conveyors, hoses and slurry lines, etc. In sum, land, buildings, and non-specialized capital values need to be removed (subtracted from benchmark values) from consideration as components of potentially strandable capital, leaving only the category of specialized capital for which the value might be reduced by a policy change.

The total book value of specialized equipment represents an upper bound to potential stranded capital losses. A more accurate estimate of potential stranded capital losses would require forecasting post-policy values. There may exist some fully specialized capital with very little functional use after a policy change, such as custom-made chilling holding tanks built for a particular plant, or on-site blast freezer capacity for handling derby fishery volumes. For the first item, there would be some minimal salvage value associated with materials; stranded capital would be book value less salvage values. For the excess freezing capacity, an important issue would be how much capacity was made obsolete by the specific policy in question. A freezer used to blast freeze halibut during part of the year but also salmon during the other part could not be considered stranded capital.

An important conclusion of this walk-through example of how one might benchmark the maximum possible stranded capital losses is that there is really very little, if any, processing capital that qualifies as being truly non-malleable. Virtually any capital we can imagine that is involved in processing has some alternative uses and is therefore malleable. When this is combined with the other observation that in-house processing line equipment is likely to be swamped by other ineligible components like land and buildings, the conclusion must be that the likelihood of significant amounts of stranded capital is very small.

VI. What policy remedies are available for addressing stranded capital?

Lock-in Policies

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[8] Processing facilities are typically located on waterfront properties that have potentially high value as residential, retirement, or tourist developments. In many West Coast ports, the waterfronts are on the verge of transition from industrial use to other uses. This transition is often delayed in deference to long standing contributions of fishing to local employment. But when processing and fishing related activities are halted, planners are often quick to step in and rezone coastal properties for newer and higher valued uses. So it is possible (and likely in many West Coast ports) that fisheries policies that cause shifts of processing out of ports also trigger rezoning that actually makes the waterfront property more valuable than before deregulation. This "stranded benefit" would have to be netted out of any claims for stranded costs that resulted from policy changes.

There are three broad policy instruments that might be used to address potential stranded capital losses if that were deemed desirable. The first is to attempt to prevent them from occurring in the first place, by what we might call a lock-in. This is essentially the approach that has been taken in the two-pie Alaskan crab rationalization scheme. Locking in traditional patterns of landings reduces disruption of conventional processor/harvester relationships. At the same time, this policy creates additional problems that have adverse economic effects. As discussed above, locking in traditional patterns bestows local monopsony power on incumbents. Monopsony power distorts the bargaining relationship over ex vessel prices in favor of processors unless it is addressed with another layer of regulations that govern bargaining. In addition, bestowing monopsonies inhibits new competitors from entering and bringing new marketing innovation to the processing sector, which experience has shown is a major driver of the benefits of rationalization.

Harvester Quota Transfer Policies

The granting of harvester quotas to incumbent processors is the prime policy instrument favored and promoted by the processing sector on the West Coast. This policy also conveys competitive advantages to incumbents over both potential entrants and fishermen. By reducing free quota in the hands of harvesters, a processor allocation increases bargaining power of processors vis-à-vis harvesters. This has particular significance on the West Coast in light of the concentration of processing. Allocating harvester quota to highly concentrated buyers would only enhance bargaining power over ex-vessel prices. In addition, allocating harvester quotas to processors sets up barriers to entry for prospective entrants, potentially reducing innovation and market development that might emerge under rationalization.

Transition Funds

Lock-in policies and transfers of harvester quota to processors create permanent rigidities, distortions, and barriers to competition in order to solve a problem that is essentially a transition problem. More suitable policy instruments treat the problem correctly as a temporary transition problem, without creating the permanent distortions in economic incentives and power that might occur under the above policies. These are, in fact, the principle means by which stranded capital in electricity deregulation is being addressed when he political decision has been made to compensate.

The best approach for remedying stranded capital using a transition-based policy is to establish a temporary fund out of which legitimate claims for stranded capital may be paid once such claims are verified. Funds for compensation can be raised from a variety of sources including: federal or state loans; loans from NGOs, philanthropic organizations, or development funds; temporary holdbacks and lease auctions of a fraction of harvester IFQs; landings taxes on harvesters with IFQs; or transfer taxes at the point of sale of IFQs.

The size of the fund needed depends upon the size of the expected capital losses. A sensible approach would develop a ballpark estimate of the maximum potential stranded capital losses (following the procedure above), identifying the elements of specialized capital equipment that are expected to be made obsolete or redundant after rationalization. If the ballpark estimates seem significant enough, a fund could be established using any of the above sources. If compensation is actually implemented, there are good reasons to utilize an ex post compensation scheme or a hybrid rather than one implemented upfront as the rationalization is initiated. The reason is that compensating before the rationalization process is implemented (such as a harvester quota allocation to processors) requires that the remedy be based on estimates of anticipated stranded capital losses rather than actual losses. Schemes implemented in other settings have been based on ex post demonstration of losses (eg. either direct asset sales or bundling stranded assets into new stock certificates) as well as schemes with some ex ante payment that is adjusted after the policy change. The most transparent systems establish and document evidence of pre-policy book value for capital expected to be harmed, and then compensate after evidence of post-policy value reduction is substantiated.

VII. What issues of process are important?

Whatever policy instrument is chosen to address stranded capital, good policy making and implementation require paying attention to certain issues of process. Of primary importance is the need for policy makers to select and implement policies based on measured losses, that do not inefficiently generate transactions costs that exceed benefits, and that do not create additional inefficient distortions and spillovers.

Legitimizing the Remedy---the Need for Measurement

One principle that seems vital to legitimizing the political process is to insist that claims for stranded compensation be based on actual estimates or measurement rather than assertion or unsubstantiated claims. The most questionable feature of recent discussions of stranded capital on the West Coast is the complete absence of documented quantitative justification for compensation requests being made by the processing sector. The compensation requests are huge, and it is highly unlikely that documented stranded capital would ever come close to even a small fraction of these amounts. For example, my rough estimate of the potential total value that will be generated from rationalizing the whiting fishery is approximately one hundred million dollars. Current proposals to allocate 50% of the quota to whiting processors are thus equivalent to a claim of stranded capital losses of fifty million dollars. Similarly, I anticipate that the asset value of rationalizing the remainder of the groundfish fishery will be approximately two hundred million, making the option for a 25% processor allocation also equivalent to a fifty million dollar stranded asset claim. Even a cursory benchmark estimate of maximum potentially strandable costs would show that these remedies are many multiples of plausible actual values.

Thresholds

Another policymaking principle that seems essential is to establish some kind of threshold below which it is deemed not worth the transactions costs to deal with stranded capital in the political process. As argued earlier, the conditions that are likely to yield significantly large stranded capital values appear unlikely in most fisheries. Since the time and money costs involved in setting up a process to document stranded capital losses will not be insignificant, it makes some sense to require that the processing sector provide an initial estimate of potential stranded costs, including a detailed documentation of methodology used to generate such estimates before large amounts of additional time are invested by the Council process. In the end, important policy questions that arise include: how high must anticipated stranded capital costs be to justify diverting the Council's time and effort to the problem, setting up a legitimate remedy, and forestalling the benefits of rationalization? What circumstances would be required to generate this threshold value? Are these circumstances likely to hold in any particular case in question?

Assessing and Minimizing Spillovers

A last principle that needs consideration in discussion of remedies for potentially stranded capital is one of assessing and minimizing spillovers. Current proposals to address stranded capital by allocating harvester quota to processors suffer serious shortcomings. The most significant shortcoming is that current proposals are arbitrary and not supported with any empirical substantiation of claims. If these proposals are, in spite of the absence of justification, implemented for political reasons, they will generate important financial risks to harvesters. The most significant problem is that the remedies being proposed are likely to alter the competitive environment in ways that are unfavorable to all but processors. Allocation of quota to processors alters the ex-vessel price negotiation balance of power, it bestows incumbent advantages, and forestalls the kind of vigorous competition responsible for generating so much of the value created on the marketing side of past rationalization programs.

VIII. Discussion/Recommendations

Current policy proposals for processor quota allocations are based on the unsubstantiated assertion that rationalization will leave processors with enormous amounts of uncompensated stranded capital costs. This paper argues that rationalization of fisheries is unlikely to generate substantial stranded capital costs for processors. Most of the capital involved in fisheries processing will not be devalued in the transition to a harvester quota system, and hence the preconditions for stranded capital are absent. In light of this negative finding, our recommendation is that a cautious, staged approach is warranted. In the first stage, ballpark estimates of the maximum potential possible stranded capital should be made, using verifiable accounting information provided by potential claimants and following agreed-upon procedures for identifying potentially strandable capital. In the second stage, once ballpark estimates are compiled, a decision should be made about whether the estimates of most probable total claims justify moving ahead with policy schemes to compensate. If it is judged that potential claims warrant incurring the transactions costs, the third stage would be to establish an appropriately-sized fund out of which claims are to be paid. In the fourth post-rationalization stage, processors would present claims with documentation to legitimize capital losses and request compensation. After compensation was completed, the fund could be closed and the residual dispersed.

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ENVIRONMENTAL DEFENSE

finding the ways that work

November 7, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen:

Re: West Coast Groundfish Individual Fishing Quota Program: Critical elements for inclusion in the DEIS analysis

We want to thank the Pacific Fishery Management Council members and staff for their perseverance and commitment in developing an IFQ program for the groundfish trawl fishery. A well-designed IFQ program will help the fishery provide significant ecological, economic and social benefits. Environmental Defense pledges our continued support for this effort and welcome guidance from the Council about how best to contribute in the most constructive way towards a successful outcome.

Getting the program design right is crucial to success. Conversely, getting key program design elements wrong could impede the ability of the program to achieve desired outcomes – both biological and economic. We have therefore prepared this set of recommendations on how best to shape key elements of the program. We recommend that the Council carry forward on evaluation of these elements in the DEIS. We stand ready to work with Council members and staff in that effort.

Integrate the Adaptive Management Program as an allocation option to clarify its place in initial and annual assignment of quota

The Adaptive Management Program (AMP) option would hold back 10% of the quota to provide a flexible mechanism capable of remedying anticipated problems and mitigating against unexpected ones. We seek the Council's support for the AMP to be moved from its current place in the alternatives document (A-3) to the section governing initial quota allocation (A-2.1.1a). As currently structured, the alternatives document does not make clear how the Adaptive Management Program will interact with the initial allocation formulas. Specifically, we recommend amending Table 3, section A-2.1.1 Initial Split of Quota Share (page 11) by inserting the following language:

Option 3: 100% QS to permit holders applied to that amount of the annual trawl allocation remaining after 10% of the annual quota pounds are allocated for the Adaptive Management Program described in A-3. Any portion of the quota pounds not used for the AMP will be

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distributed pro rata among all QS holders. The 10% AMP (quota pounds) would be available for the Council identified priorities.

This is intended as an amendment to clarify how the Adaptive Management holdback provisions in A-3 mesh with the options for the initial allocation of quota as described in A-2.1.1. The current description of the initial allocation options does not currently make clear how the holdback would be incorporated. The quota pounds set aside in the AMP would be available for the Council to use to address the purposes as articulated in section A-3.

100% accountability is needed to achieve both the economic and ecological benefits of the program

At this time, we believe that the only two methods capable of producing full accountability are 100% at-sea observer coverage, or video monitoring coupled with full retention and 100% shoreside monitoring. We are supportive of evaluating an exemption for small vessels with the understanding that full accountability is the principle and goal and should not be compromised.

We recognize that monitoring is one of the most costly elements of the IFQ program and want to explore creative mechanisms to finance it without causing undue strain on the fishery. We are assembling information and will work diligently with the Council and NOAA to develop ideas to ensure that full accountability is accomplished for the program in ways that are economical, efficient and effective.

Limit the recovery of costs to incremental costs and phase in the recovery over time -- as the value of the fishery increases

An important goal of the recently reauthorized MSA is to recover management costs from LAPP (IFQ) fisheries. We have recommended to NOAA that it clarify that incremental costs be the focus of cost recovery; and that implementation of the 3% cap be aligned with the increasing value of the fishery. In the case of full recovery, a phase-in may be necessary. We support this same approach in the context of the groundfish trawl IFQ program. We consider the principal of "sharing the dividend" an important point of policy.

Therefore, at least in the early stages, only the incremental costs (i.e. the management costs in excess of costs under the current system) should be recovered. In addition, cost recovery should phase-in over time as the value of the fishery increases.

Maintain support for gear switching as a vital component of the IFQ program

This management program has the strong potential to be a model for catch shares management. Environmental Defense joins many other stakeholders in supporting that the gear switching component be maintained in the development of the EIS. We think the flexibility to fish quota with other gear types is an exciting opportunity for fishermen to explore ways to target species and reduce habitat impacts. This is an important step that the Council is taking, and will undoubtedly set a positive precedent going forward.

Through this groundfish trawl IFQ program, lay the groundwork for -- or do not impede -- future opportunities to allow intersectoral trading of quota between all groundfish sectors

As currently structured, the groundfish trawl IFQ program will not allow trawl fishermen to sell or lease quota to those who wish to fish that quota in other sectors of the groundfish fishery. While this may make sense from a tracking and enforcement standpoint at this time, ultimately the greatest economic and environmental benefits could be achieved through the ability of all sectors to trade quota back and forth.

Evaluate and implement area-based quotas to avoid localized depletion

While the fishery is managed coast-wide, recent science indicates that there are many stocks and sub-stocks with local variations in growth rate, population density, and recruitment success. IFQ allocations should take those local variations into account in an effort to minimize localized adverse impacts. Where information is available, the Council should implement area-specific quotas to protect important substocks. In addition, a clear procedure for introducing additional area-specific quotas should be included in the program. Quota holders should be clearly put on notice that the use of the quota may become geographically constrained in the future if data demonstrates biologically distinct substocks or localized depletion.

Structure the IFQ alternatives in order to support or allow development of Regional Fishing Associations (RFAs)

RFAs provide an opportunity for innovative community and regional involvement, and could be the tool that facilitates area management and creative business arrangements between industry and community participants. Because RFAs could be such a valuable tool, it is important that the IFQ alternatives selected in November do not impede later development of RFAs.

Conduct a robust analysis of the economic, community and environmental implications of initial allocation alternatives

The initial allocation of quota is one of the most important design features for the overall program. For each allocation alternative, we request that to the extent possible the Council evaluate the short and long term implications for achieving the environmental, economic and social goals of the program.

In particular, Environmental Defense has consistently been on record expressing our concerns about the claims by large seafood processors that they are warranted an initial allocation of quota. We remain convinced that there are defensible and appropriate means to ensure processor recognition in this IFQ program; and we have offered the Adaptive Management Program as a mechanism. The AMP can be used as a compensation tool for stranded assets, as a means to mitigate impacts or provide support for traditional ports, and as an incentive for creative business arrangements between processors and fishermen. We strongly encourage the Council to explore means like the AMP that avoid a detrimental if not fatal showdown in this important area.

However, we strongly support having the Council evaluate the basis and impacts of allocation of quota to processors. It is arguably a point of law under Magnuson that this impact analysis be completed; and we believe that a robust analysis will demonstrate that there is no economic or policy basis for such an allocation. In this process, it is imperative that the Council ask the right questions in the DEIS analysis. Foremost among these is the question of whether processors will be hurt by the transition to an IFQ program. Empirical evidence of injury resulting from the program should be a prerequisite to any allocation. At the core of this argument is the notion of "stranded capital", which was the subject of a recent study by Dr. James Wilen from the University of California at Davis. His paper, which we have submitted into the Council record, concluded that the IFQ program is unlikely to create significant "stranded assets" in the processing sector. We request that the Council review this paper and consider its recommendations for conducting analysis in the DEIS.

In conclusion, we want to thank the Council members and NOAA for the perseverance on the development of the program alternatives and for being responsive to Environmental Defense's input throughout this process. Please do not hesitate to contact me at (510) 658-8008 or Shems Jud at (503) 358-7053 with any questions about the contents of this letter.

Sincerely,

Johanna Thomas

Johanna Thomas
Pacific Regional Policy Director
Oceans Program

Bruce B. Buckmaster
P.O. Box 1186
Astoria, OR 97103

November 5, 2007

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen:

As a recent appointee to the Trawl Individual Quota Committee, I accept my representation of the coastal communities with the utmost commitment. Following the October 12-13 TIQC meeting I have had the opportunity to discuss options being suggested for analysis with several fishermen and processors from Oregon and Washington. As expected there was no consensus regarding their preferred options. However, there did appear to be a common concern about how the Council proposes to evaluate the "Status Quo" alternative.

"Status Quo" is <u>not</u> a program or a system of programs. It is in fact the application of the existing programs. As the incumbent system it is subject to impediments of execution that will surely confront any new system adopted by the PFMC. Technological issues, both software and hardware, plus limitations of staffing significantly reduce the effectiveness, accuracy, and timeliness of the current design. Inadequate funding issues have been cited as continuing roadblocks to the realization of management goals. We should not expect any new system to be immune from similar problems.

It is impossible to anticipate the full range of unique execution challenges for any of the options being considered. We cannot conduct a comparable analysis to the "Status Quo". There is a sense within segments of the fishing community that the Council, in response to Congress, feels compelled to make broad based changes to management. They also believe that the current system, if executed more thoroughly, is preferable to any other proposed option. The only defensible analytic approach is to scrap "Status Quo" in favor of a non-restricted "current" program. Consequently, I recommend that the Council conducts an analysis of the current management system as if it were a totally new program.

Sincerely,

Bruce Buckmaster
Community Representative
Trawl Individual Quota Committee

Agenda Item D.7.h
Supplemental Public Comment 9
November 2007

Fixed-Term Catch Shares as an Additional "Plug In" Option for Analysis.

Seth Macinko
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Why consider an additional alternative for *analysis*?

The goal is to get more of the good with less of the bad. We *have* options.

U.S. Commission on Ocean Policy Recommendation:

… assign quota shares for a limited period of time to reduce confusion concerning public ownership of living marine resources, allow managers flexibility to manage fisheries adaptively, and provide stability to fishermen for investment decisions.

[USCOP 2004:290]

1) Good (very good) things can happen when you *assign catches*.

* racing stops/slows
* fish smarter not harder
* safety gains (but…)
* product enhancements
* finer attainment of TACs
* less lost gear

2) Bad things can happen when the original assignment is: free, in perpetuity, and based on catch history.

Currently, the initial allocation is an exercise in the government “picking winners”……

(antithesis of a ‘market solution’)

- Speculative "fishing for history"
- Inter-generational equity concerns (new entry opportunities)
- Intra-generational equity concerns
- Concerns for the social and economic impacts on coastal fishing communities
- Increasingly intense jockeying by harvesters and processors to benefit from the all-important initial allocation

- Missed opportunities for management *and* industry flexibility

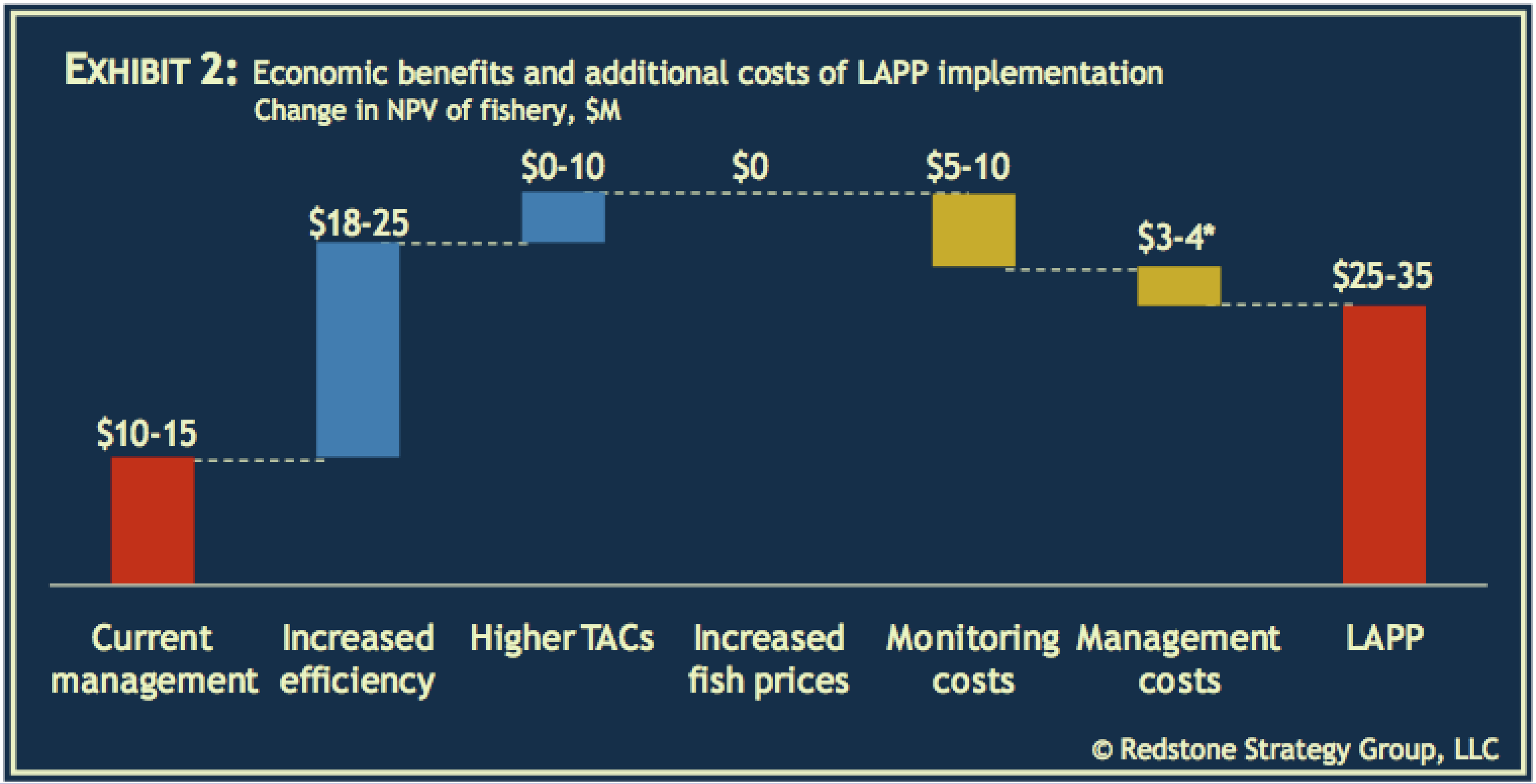

EXHIBIT 2: Economic benefits and additional costs of LAPP implementation
Change in NPV of fishery, $M
$10-15
$18-25
$0-10
$0
$5-10
$3-4*
$25-35
Current management
Increased efficiency
Higher TACs
Increased fish prices
Monitoring costs
Management costs
LAPP
© Redstone Strategy Group, LLC

The overall fishery may benefit economically from a LAPP, although the cost of buying the quota of exiting fishermen may consume much, if not the majority, of the fishery's overall gains.

[Redstone Group, 2007:1]

Current participants/investments deserve recognition, but do all other generations of new entrants deserve this…?

(especially if there is an option that could be *analyzed*)

… assign quota shares for a limited period of time to reduce confusion concerning public ownership of living marine resources, allow managers flexibility to manage fisheries adaptively, and provide stability to fishermen for investment decisions.

[USCOP 2004:290]

OK… fixed-term catch shares, same benefits, additional benefits, lower costs. Sounds great…

but how?

Initial Fishery

QS distributed based on history as per Council preferences for initial allocation

Transition Fishery

features history-based QS *and* gradually increasing % of fixed-term QS accessible through open, transparent market(s)

Final Stage Fishery

continual staggered offerings of fixed-term QS accessible through open, transparent market(s) , markets partitioned to meet broad Council objectives

An Example

Initial Fishery

QS good for 5 years, allocated by Council preferred option recognizing catch history.

(This is the same as current Council approach to initial allocation but featuring fixed-term shares.)

Transition Fishery

Beginning in year 6, 10% per year of initial allocation of QS is withheld and placed in a pool for access by royalty lease auctions (for new 10 year shares). Pools could be partitioned by gear, vessel size, etc.

In this example, the overall length of the transition fishery would be 10 years but combined with the 5 years of the Initial Fishery, there is 15 year transition period overall recognizing historic participants.

Final Stage Fishery

Staggered offerings of fixed-term QS accessible through open, transparent markets, markets partitioned to meet broad Council objectives.

Staggered offerings important to ensure that individual portfolios of QS do not all expire at the same time.

* lease proceeds could go towards management costs, research, and buyout funds if desired/necessary

Received 11/6/07
— after deadlines —
Agenda Item D.7.
November 2007

10-19-07

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chairman Hansen and members of the Pacific Fishery Management Council:

This allocation of quota is just another way for Larger companies (AKA Pacific Choice) to control more of the market. This company holds such a large market share and does anything and everything to hold that share; this just is one way to make it legal for them to push us smaller processors out of business. We are already being squeezed out of our crab markets directly and indirectly thro practices that border legal. No matter how many business names they acquire it does not cover up, their control on our markets.
I am a fish buyer/processor from Charleston, OR and I am writing to ask you to oppose initial allocation of quota to processors in the IFQ program for the west coast trawl fleet. If quota is allocated to processors based on processing history, it will have a disastrous effect on small processors/buyers up and down the coast. We are barley surviving now; this Quota will just finish all of us small buyers off.

The way the alternatives are currently structured only a handful of the very largest processors would be eligible to receive any allocation. Such an allocation system will enable that small number of large processors to become even larger, and will make it easier for them to continue to squeeze out small processors/buyers. Large processors will become the beneficiaries of an even larger market advantage eliminating the potential for small buyers/processors to partner with fishermen on innovative marketing arrangements.

There is absolutely no justification for a giveaway of public trust resources to a handful of very large processing companies that will create such devastating impacts for other processors/buyers who are not entitled to receive a piece of the allocation pie. Please oppose initial allocation of quota to processors. I can not see any benefit to this proposed quota, for anyone except one or two larger companies. We fight an uphill battle everyday against these companies, please to not give them the power to squeeze the smaller companies out through a legal IFQ Program, they already play dirty enough as it is.

Sincerely,

Marvin Warman

	Topics in D.7.a, Attachment 1	
1	A-2.1 & Co-op Time Periods	IFQ and Co-op qualification '98'-03 for shorside processors, '97-'03 for everyone else IFQ allocation '97-'03 for MS processors, '94-'03 for everyone else. Co-op catch history allocation: '97-'03 for everyone.
2	A-2.1.3 Overfished Species	If the TIQC or GAC recommendations are accepted, should a fall back be maintained in case there is a problem with the logbook approach. If so, consider maintaining the feet average approach adopted by the Council in June as the fall back.
3	" " "	Direction from TIQC on rare-overfished species. What is expected from the TIQC direction on auctions to continue to explore approaches other than auctions.
4	B-1.4.3. Mothership Withdrawal	TIQC recommendation does not mention that linkage stays in place when the mothership returns. Mothership representives on the TIQC have agreed that such links should stay in place unless the CV goes into the non-co-op fishery, but this has not been discussed with the TIQC.
	Not in the D.7.a Attachment 1 **IFQs**	
5		Does the relative pounds issue provide rationale to drop the option of allocation of overfished species based on catch history. Is there any interest in allocating overfished species based on catch history? Also, is there any interest in allocation of QS for bycatch species in whiting fishery on a history basis.
6	A-2.1.1.d Attr Processor History	NOAA GC: Change "a non-agency adjudication process" to "an agency appeal process"
7	A-2.1.3b and c	QS allocation of bycatch species for CPs and MSs, (the way currently stated bycatch would be allocated based on history. Consisder a pro rata option, like for vessels.
8	A-2.2.1 Vessel Overage	Extent of fishing prohibition (maximum extent feasible has been working assumption. Does Council want to change?
9	A-2.2.2.b Carry-over	Should consideration be given to carry-over for pounds that are not in a vessel account (currently carry-over applies only for vessels)?
10	A-2.2.3.a Eligible to Own	Consider restricting item (ii) such that it applies to an entity that owns a mothership that participated in the Pacific whiting fishery the fishery during the allocation period.
11	A-2.2.3.e Accum Lim	Consider proposed rewording of the individual and collective rule.
12	A-2.3.2 Data Collection	Note there is no mention of mandatory collection of social data (e.g. crew residence location). (presumably there would still be voluntary data collection of social data)
13	A-2.3.4 Program duration and modification	Review every 4 years. (MSA: First review must be within 5 years, periodic review at least every 7 years)? (consider even number to match/offset with bienniel specs cycle.)
14	A-2.4. Processor Measures	Option 3: Can't auction QP to generate funds to provide financial consideration (can direct QP to benefit processors)
15	**Co-ops**	Consider adding option for whiting rollover if not used after a certain date? How would it be distributed?
16		How will overage be distributed/handled if the non-co-op fishery goes over? Buffer?
17		What happens to the CV if the MS it has delivered to does not qualify? Go to the non-co-op fishery or join co-op of its choosing?
18	B-1.3.3 Co-op agreements	Consider adding sections e. and f. as proposed in D.7.b, Attachment 3.
19	A-3	Consider extending IFQ adaptive management provision to co-ops.

FINAL CONSIDERATION OF INSEASON ADJUSTMENTS

Consideration of inseason adjustments to 2007 and 2008 groundfish fisheries may be a two-step process at this meeting. The Council will meet on Wednesday, November 7, 2007 and consider advisory body advice and public comment on inseason adjustments under Agenda Item D.6. If the Council elects to make final inseason adjustments under Agenda Item D.6, then this agenda item may be cancelled, or the Council may wish to clarify and/or confirm these decisions. If the Council tasks advisory bodies with further analysis under Agenda Item D.6, then the Council task under this agenda item is to consider advisory body advice and public comment on the status of 2007 and 2008 groundfish fisheries and adopt final inseason adjustments as necessary.

Council Action:

1. **Consider information on the status of ongoing 2007 fisheries and adopt inseason adjustments as necessary .**
2. **Consider information on the status of 2008 fisheries and adopt inseason adjustments as necessary.**

Reference Materials: None

Agenda Order:

a. Agenda Item Overview — Merrick Burden
b. Report of the Groundfish Management Team — Kelly Ames
c. Agency and Tribal Comments
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. Council Action: Adopt or Confirm Final Adjustments to 2007 and 2008 Fisheries

PFMC
10/16/07

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON FINAL CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2007 AND 2008

2007 INSEASON ADJUSTMENTS

COMMERCIAL

<u>Non-Whiting LE Trawl for 2007</u>

The GMT considered the request to increase sablefish limits in the non-whiting trawl fishery for the remainder of the year. The current catch of sablefish in the trawl sector is several hundred tons below the allocation and, under currently scheduled limits, the allocation of sablefish is not expected to be attained. Therefore, the GMT analyzed increasing sablefish trip limits in the trawl fishery for period 6 and recommends the following:

- Increase sablefish limits for large and small footrope trawl gear north of 40°10' N. lat. to 30,000 lbs per/2 months for the remainder of 2007 on or as close as possible to December 1.
- Increase sablefish limits south of 40°10' N. lat. to 30,000 lbs/2 months for the remainder of 2007 on or as close as possible to December 1.

The rebuilding species impacts and target species catches, as well as proposed trip limit tables and current Rockfish Conservation Area (RCA) boundaries are shown below.

Table 1. Rebuilding species impacts and target species catches under proposed 2007 inseason management actions for the non-whiting trawl fishery.

	Species	North	South	Total	Harvest Target
Rebuilding Species	Canary	9	1.1	10.1	
	POP	80.07	.00	80.0	
	Darkblotched	211.6	32.6	244.1	
	Widow	1.7	0	1.8	
	Bocaccio	0	25.2	25.2	
	Yelloweye	0.4	0	0.4	
	Cowcod	0	1.4	1.4	
Target Species	Sablefish	2,197	437	2,633	2,651
	Longspine	651	322	973	2,220
	Shortspine	712	266	978	1,634
	Dover	8,626	1,890	10,516	16,500
	Arrowtooth	3,510	89	3,599	5,800
	Petrale	2,021	395	2,416	2,499
	Other Flat	1,142	493	1,635	4,884
	Slope Rock	131	156	287	1,786

Table 2. Proposed Trip Limit Adjustments for the Remainder of 2007.

Area	Period	Shoreward Line	Seaward Line	Sable	Longspine	Shortsp	Dover	Othr Flat	Petrale	Arrowt'th	Slope Rock
N 40 10	1	75	150	13,000	22,000	7,500	80,000	110,000	50,000	100,000	4,000
	2			13,000	22,000	7,500	80,000	110,000	30,000	100,000	4,000
	3			15,000	22,000	10,000	60,000	110,000	20,000		1,500
	4	see attached table		15,000	25,000	10,000	60,000	110,000	20,000	Combined	1,500
	5		200	22,000	25,000	12,000	95,000	150,000	20,000	with Other	1,500
	6	75	200*	**30,000**	25,000	12,000	95,000	150,000	40,000	Flat	1,500
North Select Flatfish	1	75	150	5,000	3,000	3,000	40,000	90,000	16,000	90,000	4,000
	2			8,000	3,000	3,000	40,000	90,000	25,000	90,000	4,000
	3			5,000	3,000	3,000	38,000	70,000	20,000		1,500
	4	see attached table		5,000	3,000	3,000	38,000	70,000	20,000	Combined	1,500
	5		200	5,000	3,000	3,000	38,000	70,000	15,000	with Other	1,500
	6	75	200*	5,000	3,000	3,000	25,000	30,000	8,000	Flat	1,500
38 to 40 10	1	100	150	14,000	22,000	7,500	70,000	110,000	50,000	10,000	15,000
	2	100	150	14,000	22,000	7,500	70,000	110,000	30,000	10,000	15,000
	3	100	150	14,000	22,000	7,500	70,000	110,000	25,000		15,000
	4	100	150	14,000	22,000	7,500	80,000	110,000	25,000	Combined	10,000
	5	100	150	22,000	25,000	13,000	95,000	150,000	25,000	with Other	10,000
	6	100	150	**30,000**	25,000	13,000	95,000	150,000	50,000	Flat	15,000
S 40 10	1	100	150	14,000	22,000	7,500	70,000	110,000	50,000	10,000	40,000
	2	100	150	14,000	22,000	7,500	70,000	110,000	30,000	10,000	40,000
	3	100	150	14,000	22,000	7,500	70,000	110,000	25,000		40,000
	4	100	150	14,000	22,000	7,500	80,000	110,000	25,000	Combined	40,000
	5	100	150	22,000	25,000	13,000	95,000	150,000	25,000	with Other	55,000
	6	100	150	**30,000**	25,000	13,000	95,000	150,000	50,000	Flat	55,000

Table 3. Current 2007 RCA Boundaries for the Non-Whiting Trawl Fishery North of 40°10' N. Lat.

Rockfish Conservation Area North of 40 deg 10 min Lat

	Jan-Feb	March-April	May-June	Jul-Aug	Septembr-Octobr	Nov-Dec
North of Alava	75-250*	75-250	shore-150		shore-200	75-200*
Alava - Leadbetter			75-150		75-200	75-200*
Leadbetter - OR/WA Border			60-150		60-200	75-200*
OR/WA Border - Cascade Head			75-150	75-200		75-200*
Cascade Head - Humbug Mt			75-200			75-200*
Humbug Mt - Cape Arago			shore-200			75-200*
Cape Arago - 40 deg 10 min Lat			75-200			75-200*

*Indicates modified petrale areas

<u>Open Access Daily Trip Limit (DTL) Fishery Between of 36° and 40°10' N. lat.</u>

The Council requested that the GMT reconsider the Groundfish Advisory Subpanel (GAP) proposal to increase the sablefish DTL fishery limits between of 36° and 40°10' N. lat. relative to the 2007 sablefish optimum yield (OY) and specifically whether there would be associated yelloweye rockfish impacts. The GMT evaluated the amount of yelloweye rockfish impacts and upon further review of available information, the GMT does not believe that yelloweye rockfish are a concern at depths greater than 150 fm south of 40°10' N. lat. Therefore, the GMT recommends increasing the open access (OA) DTL limits to 300 lbs per day, 1,000 lbs per week, and 3,000 lbs/2 months beginning December 1, or as close as possible thereafter, through the remainder of 2007.

2008 INSEASON ADJUSTMENTS

RECREATIONAL

Washington and Oregon

Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife (ODFW) staff reviewed the 2007 recreational fishery harvests to project overfished species impacts for 2008 and revised the scorecard accordingly.

California

California Department of Fish and Game (CDFG) does not currently have revised 2007 California Recreational Fisheries Survey (CRFS) recreational catch data available to appropriately model the projected catch of scorecard species in 2008 (see Agenda Item D.6.c). CDFG intends to manage catch at or below the harvest guidelines for the California recreational fishery. The 2008 scorecard values represent projected impacts, at the harvest guideline levels. This estimate will be revised in March 2008 after data are available to model catch projections for the 2008 season.

COMMERCIAL

<u>Open Access</u>

Open Access Sablefish Daily Trip Limit Fishery (Between 36° and 40°10' N. lat.)

The GMT explored opportunities for liberalizing the OA daily trip limit (DTL) fishery north of the Conception area. The GMT reviewed target species catch projections relative to overfished species impacts and an increase in trip limits can be accommodated. Therefore, the GMT recommends setting OA DTL limits at 300 lbs per day, 800 lbs per week, 2,400 lbs/2 months.

Conception Area OA Sablefish (South of 36° N. Latitude)

The GMT and GAP re-evaluated the Council motion that Conception area sablefish limits be set at 300 lbs per day or 1 landing per week of up to 800 lbs relative to the 2008 sablefish OY. The GMT emphasizes that available information indicates that increased effort and per-vessel catch in the OA fishery have been responsible for an increase in Conception area sablefish landings. The increased trip limits in August 2007 combined with speculations regarding OA limitation caused an increase in effort. Unless effort in the Conception area is decreased, the 2008 OY will be exceeded. Furthermore, the limited entry (LE) fixed gear sector may be adversely affected by increases in the OA fishery. Therefore, the GMT recommends that Conception area sablefish limits in the OA fishery be reduced to 300 lbs per day or 1 landing per week of up to 700 pounds for all of 2008. These limits would be lower than the limits proposed for the north and would encourage vessels to return to the northern areas. These trip limits would remain unchanged if the Nature Conservancy exempted fishing permit (EFP) receives final approval. The GMT will track sablefish landings throughout the 2008 season and re-evaluate whether a bi-monthly limit should be set at a later date.

<u>Limited Entry Fixed Gear</u>

Shortspine Thornyheads South of 34° 27' N Lat.

The GMT was asked to maintain the increase in the LE fixed gear limits for shortspine thornyhead south of 34°27' N. lat. that were adopted in June 2007 and subsequently revisited at the September 2007 Council meeting. The trip limit in this area is currently 3,000 lbs/2 months.

The GMT was originally concerned that increasing this trip limit would increase effort, resulting in higher sablefish catch and higher catches of other species and a premature closure of other fishing opportunities.

Current data indicates shortspine catches south of 34°27' N. lat. are well within the 421 mt OY and the inseason increases for shortspine made in 2007 did not result in a significant effort shift. The GMT does not anticipate a change in behavior for 2008 and recommends that the LE fixed gear shortspine limit south of 34°27' N. lat. be maintained at 3,000 lbs/2 months for all of 2008.

Limited Entry Non-Whiting Trawl

Limited Entry Non-Whiting Trawl Coastwide

The GMT reviewed the Council's request to have trip limits under Alternative 2 be equal to those under Alternative 1 to determine the canary rockfish savings. If Alternative 2 limits were set equal to Alternative 1, the canary impacts would be reduced by 0.1 mt.

Based on the Council's assessment that 5.5 mt of canary rockfish would accommodate research catch in 2008, and the guidance to provide recreational fishery projected impacts instead of harvest guidelines, the GMT recommends that the Council adopt Alternative 2, the low LE non-whiting trawl proposal covered under the initial inseason agenda item (Agenda Item D.6.b, Supplemental GMT Report 2).

Chilipepper – South of 40°10' N. lat.

The GMT received a request to increase trip limits for chilipepper rockfish south of 40°10' N. lat using small footrope gear. In past years, the GMT has stated our concern that chilipepper is more highly associated with bocaccio, and therefore increasing chilipepper opportunities may be problematic if bocaccio impacts are increased. The amount of bocaccio remaining in the 2008 scorecard is 101.9 mt, meaning that there is room to accommodate increased bocaccio impacts if increased impacts would occur as a result of expanded chilipepper opportunities. The GMT has also been concerned with canary rockfish impacts that may occur if chilipepper targeting occurred. However, available data shows that the majority of chilipepper caught in the trawl fishery is discarded, meaning that some increase in cumulative limits may be acceptable because it would prevent regulatory discard and should not invoke targeting. Therefore, the GMT considered the existing level of chilipepper rockfish discard relative to cumulative limits that may encourage targeting (and therefore increase overfished species impacts). The GMT recommends increasing chilipepper rockfish limits with small footrope trawl gear south of 40°10' N. lat. to 2,000 lbs/2 months, which will reduce discard without encouraging chilipepper targeting.

Limited Entry Non-Tribal Whiting

The GMT analyzed seasonal distributions of whiting catch and bycatch data from 2004-2007 to help facilitate the discussion of potential management measures for the 2008 non-tribal whiting fishery. Current options considered by the Council include: 1) season start date changes, 2) timed or scheduled releases of bycatch limits, and 3) sector-specific bycatch caps. The GMT understands that such actions are not routine and would require a two-meeting process and analysis in an environmental assessment tiered to the 2007-08 specifications EIS. Such actions would necessarily require re-prioritization of Council initiatives since the GMT, state, NMFS, and Council staffs are fully subscribed with assigned duties.

Inseason adjustments, based on the performance of the fishery is a routine tool. In recent years, GMT analyses of whiting fishery bycatch has been used to inform bycatch limits. These limits have often been adjusted later in the season as inseason fishery data is made available to managers that suggests such an adjustment is needed. In 2007, the team deviated from the standard practice of using a weighted average for widow rockfish. Due to obvious increasing trends in the fishery, the team used linear interpolation. It was apparent that the bycatch rates observed in 2007 were steeper than the slope predicted by the interpolation method. Therefore, the team will review appropriate methodologies and potential widow bycatch limits, and will bring forth our recommendation at the March 2008 Council meeting.

In 2008, the team recommends that the Council establish the bycatch limit using historic fishery information in conjunction with the setting of the 2008 whiting OY in March. At the June 2008 Council meeting, the GMT would review the performance of the California early season as well as data from the first three weeks of the at-sea fishery. At the September meeting, the GMT would have up to 13 additional weeks of data from the at-sea sector and up to 11 weeks of data from the shoreside fishery. Depending on the performance of the fishery, in either June or September the bycatch limit could be adjusted, if necessary.

Seasonal Patterns in Bycatch

Whiting data was initially analyzed with Generalized Additive Models, where the independent variables included sector, year, month, week into season, and the interactions of these main effects. Smoothing of these variables was used, where possible. Most of the interactions were significant; however, trends were difficult to interpret with this small, unbalanced dataset. Therefore, separate sector models with only month as a categorical variable was used to look at the monthly trend, over all years, and by sector (Figures 1-3). The plots reveal that bycatch of darkblotched, Pacific ocean perch (POP), and widow in the catcher-processor sector decreases as the season progresses. The trend for canary is less certain but there is a slight decline. Mothership participation in the whiting fishery is greatest in May and June, but less in summer and fall. As a result, confidence intervals are wide and trends are less certain. However, for darkblotched, widow, and canary rockfish some decrease in bycatch is evident. For the shoreside fishery, seasonal bycatch trends are less evident, though an increase in POP bycatch is seen later in the year. Specifically, the lack of data later than August precludes meaningful insight for seasonal trends in this sector.

GMT Recommendations

2007 Season

1. Increase sablefish limits for large and small footrope trawl gear north of 40°10’ N. lat. to 30,000 lbs/2 months for the remainder of 2007 on or as close as possible to December 1.
2. Increase sablefish limits south of 40°10’ N. lat. to 30,000 lbs/2 months for the remainder of 2007 on or as close as possible to December 1.
3. Increase the OA sablefish DTL limits between 36° and 40°10’ N. lat. to 300 lbs per day, 1,000 lbs per week, 3,000 lbs/2 months for the remainder of 2007 on or as close as possible to December 1.

2008 Season

1. Increase OA sablefish DTL limits north of the Conception area (north of 36° N. lat.) to 300 lbs per day, 800 lbs per week, 2,400 lbs/2 months for all of 2008.
2. Increase Conception area (south of 36° N. lat) sablefish limits to 300 lbs per day or 1 landing per week of up to 700 pounds for all of 2008.
3. Increase the LE fixed gear shortspine limit south of 34°27 N. lat. to 3,000 lbs/2 months for all of 2008.
4. Adopt the non-whiting limited entry trawl proposal Alternative 2 as presented under Agenda Item D.6 for all of 2008.
5. Increase chilipepper rockfish limits with small footrope trawl gear south of 40°10’ N. lat. to 2,000 lbs/2 months.

6.

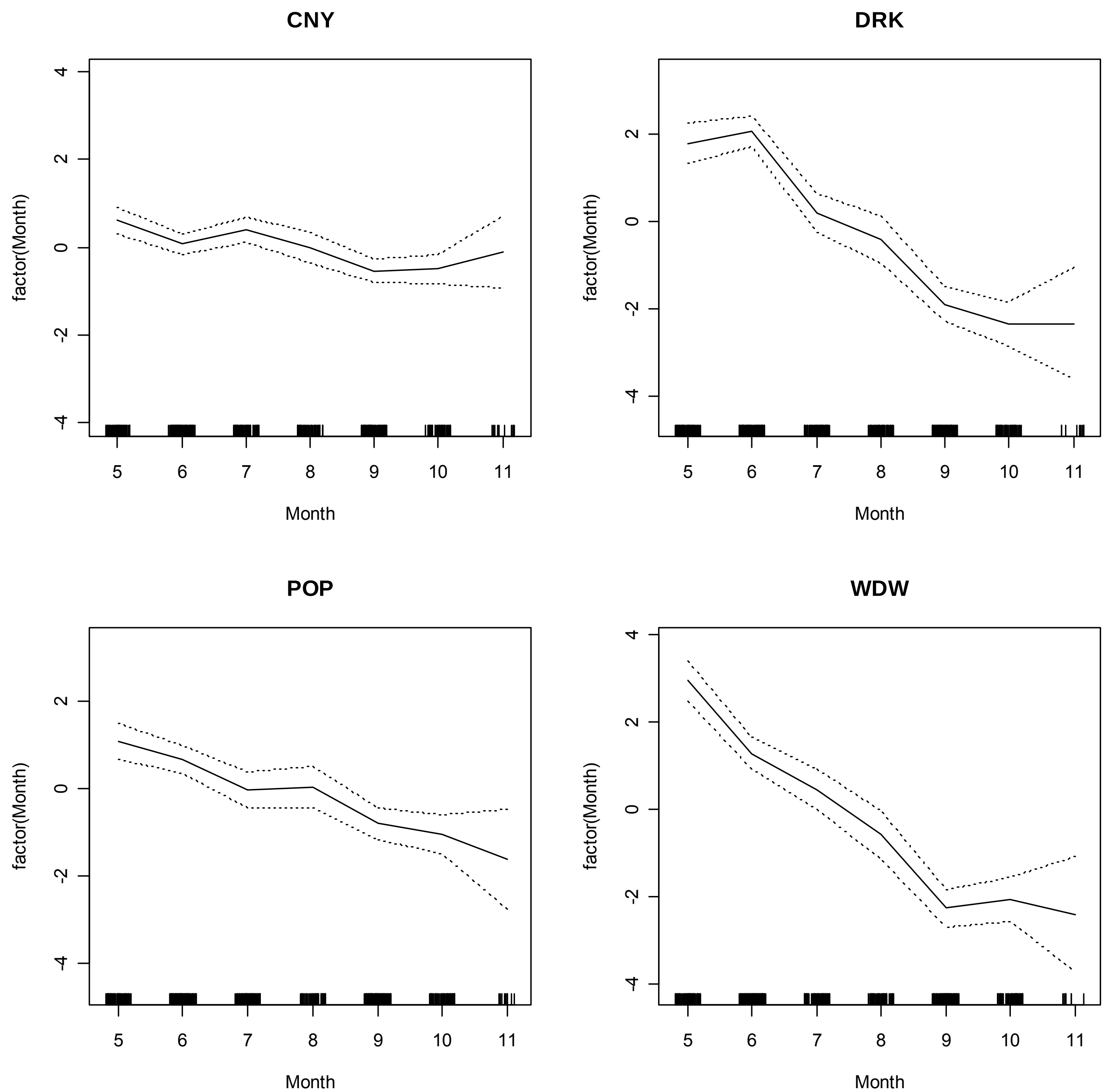

Figure 1. Catcher-processor data modeled. Dependent variable is log of daily aggregated bycatch weight divided by daily aggregated hake catch. The independent variable is month as a category. Y-axes contain relative coefficients. Note that the ranges on the y-axes are equal.

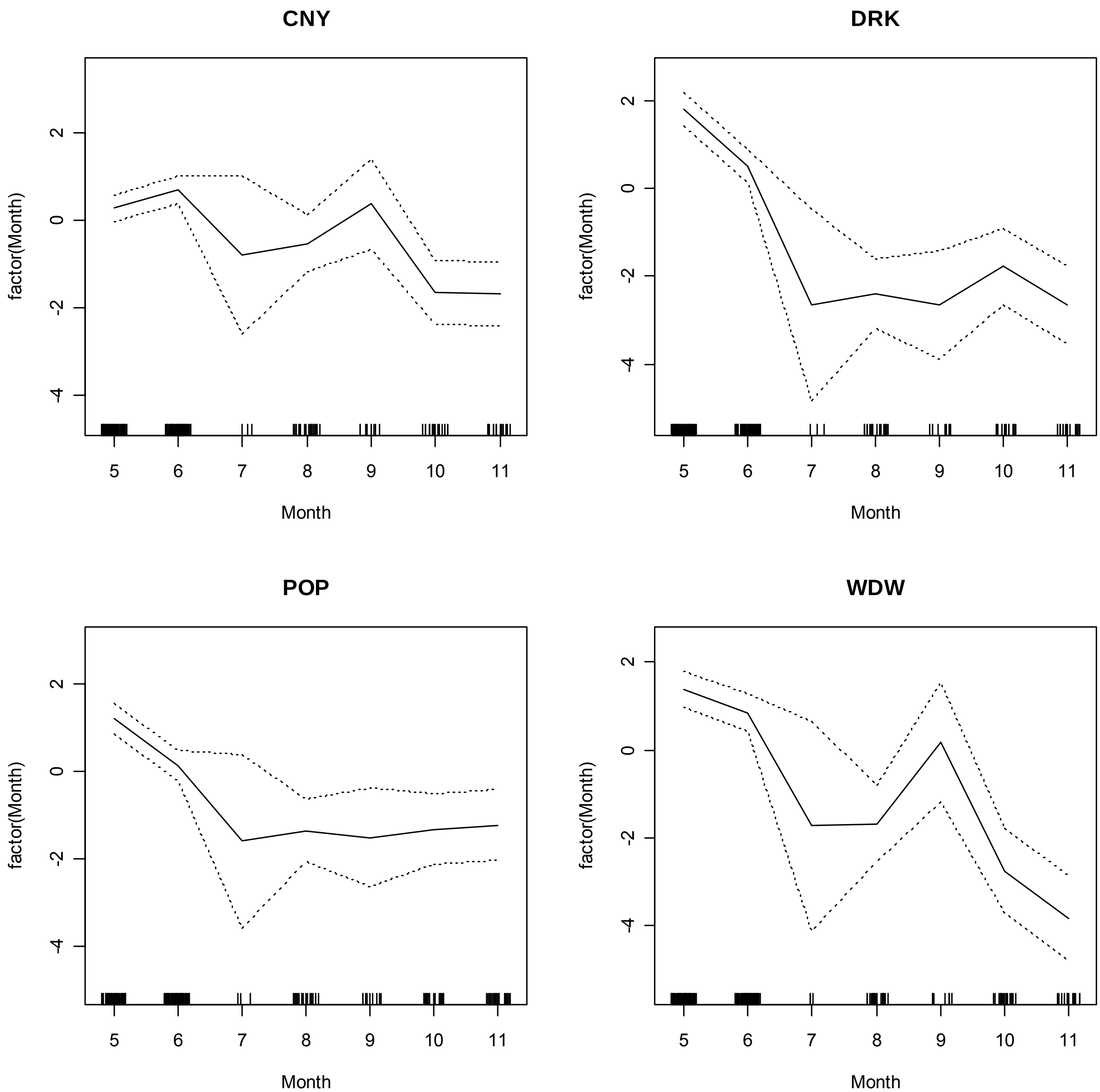

Figure 2. Mothership data modeled. Dependent variable is log of daily aggregated bycatch weight divided by daily aggregated hake catch. The independent variable is month as a category. Y-axes contain relative coefficients. Note that the ranges on the y-axes are equal.

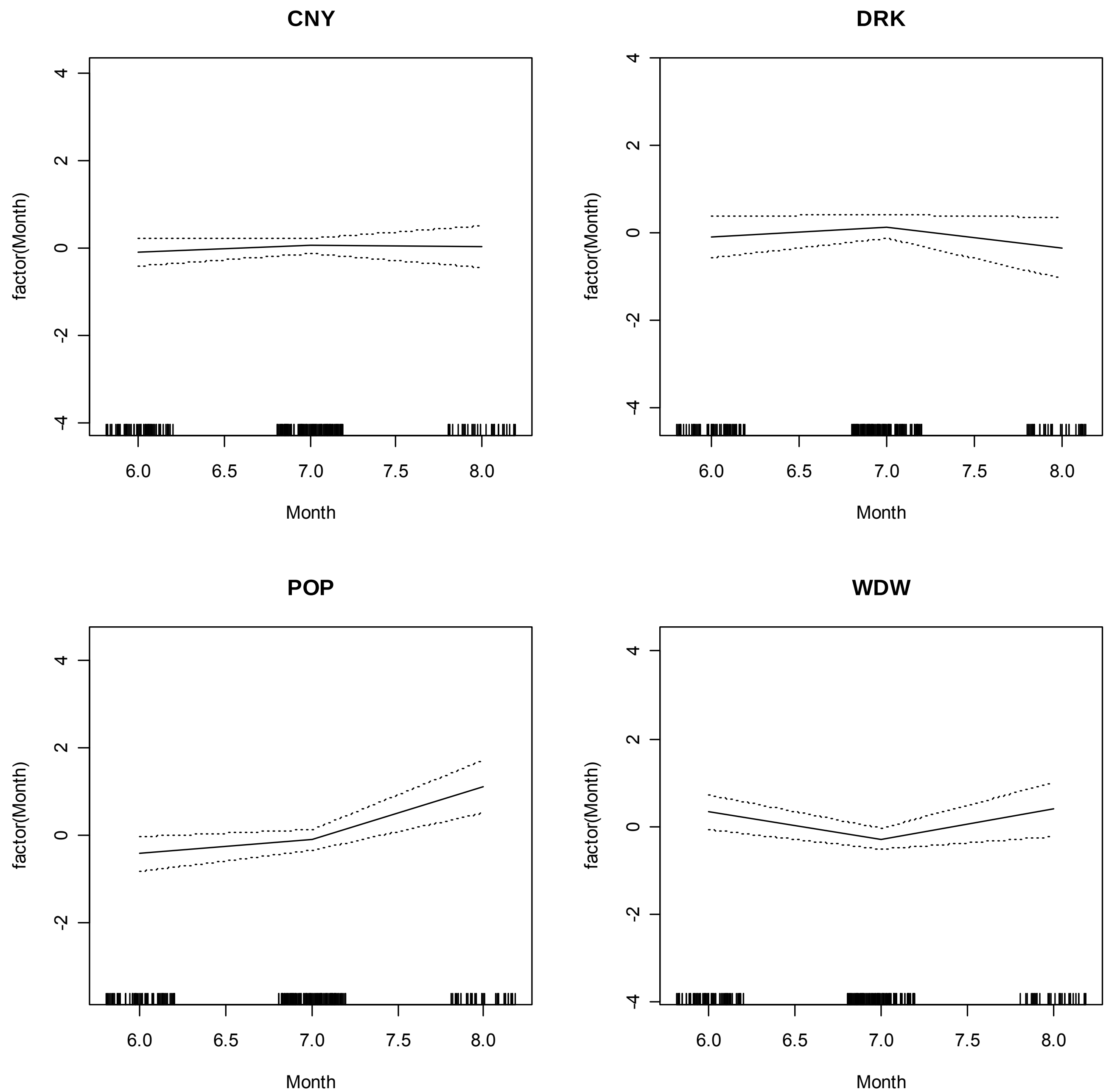

Figure 3. Shoreside data modeled. Dependent variable is log of daily aggregated bycatch weight divided by daily aggregated hake catch. The independent variable is month as a category. Y-axes contain relative coefficients. Note that the ranges on the y-axes are equal.

2008 Projected mortality impacts (mt) of overfished groundfish species with LE non-whiting trawl Alternative 2, projected recreational impacts, preliminarily approved EFPS, and a Council recommended estimate of canary rockfish in research catches .

11/06/07

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	11.5	**8.0**	1.4	209.1	80.9	6.6	0.5
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/					1.9		0.0
At-sea whiting cat-proc a/		4.7		25.0		**220.0**	0.0
Shoreside whiting a/					0.0		0.0
Tribal whiting		0.7		0.0	0.6	6.1	0.0
Tribal							
Midwater Trawl		1.8		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Limited Entry Fixed Gear		1.1		1.3	0.4		2.8
Sablefish	13.4		0.0			0.0	
Non-Sablefish			0.1			0.5	
Open Access: Directed Groundfish		1.0					
Sablefish DTL	0.0	0.2		0.2	0.1	0.0	0.3
Nearshore (North of 40°10' N. lat.)	0.0	1.7	0.1	0.0	0.0	0.5	1.5
Nearshore (South of 40°10' N. lat.)	0.0			0.0	0.0		
Other	10.6			0.0	0.0	0.0	0.1
Open Access: Incidental Groundfish							
CA Halibut	0.1	0.0		0.0	0.0		
CA Gillnet c/	0.5			0.0	0.0	0.0	
CA Sheephead c/				0.0	0.0	0.0	0.0
CPS- wetfish c/	0.3						
CPS- squid d/							
Dungeness crab c/	0.0		0.0	0.0	0.0		
HMS b/		0.0	0.0	0.0			
Pacific Halibut c/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pink shrimp	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	0.8	0.0	0.0	0.0	0.3	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)							
Recreational Groundfish e/							
WA		**5.7**					**6.2**
OR						**1.4**	
CA	**66.3**	**9.0**	**0.3**			**8.0**	**2.1**
Preliminarily EFP	11.0	0.1	0.2	1.0		3.4	0.1
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs. f/							
	2.0	5.5	0.2	2.0	2.0	1.1	3.0
TOTAL	116.1	42.0	2.3	238.7	89.6	288.0	19.3
2008 OY	218	44.0	4.0	290	150	368	20
Difference	101.9	2.0	1.7	51.4	60.4	80.1	0.7
Percent of OY	53.3%	95.5%	57.5%	82.3%	59.8%	78.2%	96.3%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available					

a/ Non-tribal whiting numbers reflect bycatch limits for the non-tribal whiting sectors.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts. However, harvest guidelines for 2008 are as follows: canary in WA and OR combined = 8.2 mt and in CA = 9.0 mt; yelloweye in WA and OR combined = 6.8 mt and in CA = 2.1 mt.

f/ Research projections updated November 2007.

MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES—PART II

This meeting marks the initiation of the Council harvest specifications and management measures decision-making process for 2009-2010 fisheries. The last stock assessments and rebuilding analyses were adopted for management use under Agenda Item D.3 and a range of optimum yields for each stock and stock complex was adopted under Agenda Item D.4 allowing for analysis of 2009-2010 harvest specifications. Under this agenda item, the Council should adopt or give guidance on concepts and a range of management measures designed to stay within the harvest specifications adopted under Agenda Item D.4.

The Council should attempt to give as much specific guidance on concepts and management measures as possible to facilitate informative impact analysis and preparation of a draft Environmental Impact Statement (DEIS) or draft Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) over the winter. The NEPA analyses will help the Council develop a preferred suite of 2009-2010 management measures by next April, when a preferred alternative needs to be decided. Helpful guidance would be a range of recreational and commercial allocations for key species such as canary rockfish; a range of season and area restrictions for the primary fishing sectors; a range of trip limits, daily-bag-limits, and other harvest control measures for key target and constraining bycatch species; a range of geographic or sector-specific harvest guidelines; and a sense of how far fisheries should be restricted in 2009-2010 to rebuild depleted species more quickly. The Council could give this specific direction under this agenda item or otherwise delegate the structuring of alternatives to the Groundfish Allocation Committee, which is tentatively scheduled to meet next February.

To facilitate guidance on concepts to be included in the analysis of 2009-2010 management measures, a list of potential management issues solicited from agencies, industry, and the general public is provided in Agenda Item D.9.a, Attachment 1. The Council should carefully consider the intended scope of action and staff workload when deciding which issues are the highest priorities for analysis (see the schedule for the three large concurrent groundfish projects the Council will undertake over the next year, Agenda Item C.1.a, Attachment 1). Some matters on the list of potential issues may be particularly labor-intensive and others may not be as closely linked to the decisions typically considered in the biennial harvest specifications and management measures process.

Council Action:

Adopt, or give guidance on, a preliminary range of 2009-2010 management measures, including initial allocations.

Reference Materials:

1. Agenda Item D.9.a, Attachment 1: Issues to Consider in the 2009-2010 Groundfish Specifications and Management Measures Process.
2. Agenda Item D.9.e, Public Comment.

Agenda Order:

a. Agenda Item Overview John DeVore
b. Agency and Tribal Comments
c. Report of the GMT Kelly Ames
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. **Council Action:** Adopt Concepts and Guidance for a Preliminary Range of Management Measures, Including Initial Allocations

PFMC
10/19/07

Agenda Item D.9.a
Attachment 1
November 2007

Issues to Consider in the 2009-2010 Groundfish Specifications and Management Measures Process.

Issues
Tribal whiting allocations
Separate trip limits/mgmt measures in limited entry fixed gear for line vs. pot/trap gears
Trawl trip limits/mgmt measures specifed at a finer geographic scale
Groundfish Fishing Areas (aka "cold spots"), Rockfish Conservation Areas (aka "hot spots") in lieu of larger Rockfish Conservation Areas
Sector-specific bycatch caps in whiting fishery
Seasonal (i.e., phased-in) bycatch caps for the whiting fishery
Changing season start dates in the whiting fishery
Consider closing the whiting fishery on a projection of attaining a bycatch cap rather than waiting until the bycatch cap has been attained or exceeded
Consider shorter notice for closing the non-treaty whiting fishery upon attaining a bycatch cap or a whiting quota
Analyze unmonitored midwater trawl efforts in the trawl Rockfish Conservation Area during the primary season by vessels sorting catch w/o 100% observer coverage
Consider re-defining at-sea processing to allow some minimal processing at-sea by small vessels
Consider changes to whiting trip limits using bottom trawls
Declaration for trawl vessels to fish exclusively seaward or shoreward of the Rockfish Conservation Area on a
New essential fish habitat closed areas (i.e., Olympic National Marine Sanctuary?)
Consider changing the length variance in limited entry permit length endorsements from 5 feet to ? (10 ft
Consider dropping vessel ownership from the definition of ownership and control of a sablefish tier; Ownership of less than 50% of a vessel would not count towards ownership and control of a sablefish tier
Sorting requirement for skates and other groundfish species
Request coordinates for 20 fm boundary line approximation off CA
Add coordinate points on all contour lines for each latitude of interest, at all crossings of that latitude
Check all Rockfish Conservation Area lines to eliminate all cross-overs
Adjust the 50, 60, and 75 fm lines off San Diego (lines in other areas off CA) to more closely approximate the fathom contours, as applicable
Consider managing recreational groundfish catch in numbers instead of weight
Yelloweye spatial analysis
Consider allowing limited entry fixed gear fishermen to access their allocations using open access gears
No retention regulations for bronzespotted rockfish
Shortbelly specifications
Change the 0-1 nm longlining prohibition in CA to 0-0.5 nm
More timely implementation of inseason adjustments
More routine management measures that can be adjusted during inseason action
Allow conversion of longlines to pots/traps
Federal electronic fish tickets and logbooks
One trawl gear on board (per trip or per period)
Mandatory logbooks for charterboat fishing trips

California Department of Fish and Game
Practical Range of Management Specifications for California's 2009-2010 Commercial and Recreational Groundfish Fisheries

The California Department of Fish and Game (CDFG) has developed a draft range of management options for the 2009-2010 commercial and recreational fishing seasons. The options described below were developed with input received from the Fish and Game Commission at their November 2007 meeting and a Groundfish Taskforce meeting held to solicit recommendations from industry and environmental representatives. The CDFG is proposing the following possible changes to existing management measures with the intent of remaining within harvest guidelines (HGs), particularly for species under rebuilding plans.

COMMERCIAL AND RECREATIONAL

Specific Fishing Area Prohibitions:
Proposals for incorporating specific groundfish closed areas ("hot spots") into the management specifications are still being developed.

COMMERCIAL

The management options below are the proposed possible changes to the current commercial management measures to be considered and analyzed for inclusion in the 2009-2010 Management Specifications:

- *Range of trip limits for scorpionfish with higher limits than 2007-08 EIS.*
- *Range of trip limits for minor nearshore north of 40º10' with lower limits than 2007-08 EIS.*
- *Revise RCA lines to more closely approximate depth contours.*
- *Revise the EFH designation boundaries for the Eel River area.*

RECREATIONAL

The proposed management options below represent possible changes to the current recreational management measures to be considered and analyzed for inclusion in the 2009-2010 Management Specifications:

- *Changes in Management Area Season Lengths.*
- *Make the timing of the lingcod closure period in the Rockfish Lingcod Management Areas* consistent with Rockfish Cabezon Greenling (RCG) season.
- *Changes in Depth Restrictions in Management Areas.*
- *Inclusion of 2-fish lingcod bag limit as a sublimit within the 10-fish RCG bag limit.*
- *Change bag sublimits for some species in the 10-fish RCG bag limit.*
- *Consider retention of 1 canary rockfish within the 10-fish RCG bag limit in Management Areas where they are uncommon.*
- *Require possession and use of a "descending assistance device" to minimize barotrauma-induced mortality.*
- *Elimination of gear restrictions for "Other flatfish".*
- *Inclusion of additional recreational management lines within Management Areas.*
- *Changes to Management Area Boundaries.*
- *Addition or removal of Management Areas.*

GROUNDFISH MANAGEMENT TEAM REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART II

ABC/OY TABLES

Based on the Council guidance under Agenda Item D.4, the Groundfish Management Team (GMT) has updated tables of preliminary acceptable biological catch (ABC) and optimum yield (OY) values for the 2009 and 2010 management cycle, including the basis for the alternative OY values (updated Attachments 2-1b, 2-1c and 2-2). These attachments do not include a table of average 2009-2010 OY values, but such a table could be produced for future consideration.

Included in these tables are Council-recommended preliminary preferred rebuilding target years for the three rebuilding species for which perceptions of stock productivity have changed notably (canary revised T_{target}=2021; darkblotched revised T_{target}=2030; cowcod revised T_{target}=2065), and preliminary preferred OY values for several other rebuilding species (Pacific ocean perch, widow, bocaccio, cowcod, and yelloweye rockfish).

Yellowtail rockfish

The GMT notes that yellowtail rockfish ABC and OY values were added to Tables 2-1b and 2-1c; these values were in Table 2-1a but were inadvertently excluded from Tables 2-1b and 2-1c.

Cowcod

The GMT notes that under the preferred alternative for cowcod (2 mt), the 2009-2010 OY would be less than the existing scorecard value for cowcod total catches (2.1 mt), based on Agenda Item D.6.b, Supplemental GMT Report. Consequently, the GMT recommends that additional management measures, such as spatial closures and depth restrictions, be included among the issues to consider in the 2009-2010 Groundfish Specifications and Management Measures Process.

Blue rockfish

In the previous Council action, the Council deferred a decision on setting preliminary ABC and OY values for blue rockfish. This was based on an incomplete understanding of how the values based on the stock assessment would be combined with historic ABC/OY estimates for the unassessed area, as well as how the results of the assessment could be integrated into the minor nearshore rockfish assemblages, should the Council choose to continue to manage blue rockfish as a component of this assemblage. To avoid confusion the GMT notes that the ABC value for blue rockfish is based on the base scenario from the recently adopted assessment with the addition of 18 mt based on the 1994-99 historical catches outside of the assessed area (e.g., south of Point Conception).

Four OY alternatives are provided for blue rockfish. Because these OY alternatives are calculated using the 2010 ABC (lowest ABC of two years), the same OY alternatives are listed in both the 2009 and 2010 Action Alternatives tables. Alternatives 1 and 2 present the OY possibilities when blue rockfish is managed under the minor nearshore rockfish complexes while Alternatives 3 and 4 present OY possibilities as managed under a statewide California OY. For each of these alternatives, the appropriate contribution of the blue rockfish stock between 42° N. lat. (OR/CA border) and 34° 27’ N. lat. (Point Conception) is calculated using information from either the 40:10 base case scenario from the blue rockfish assessment (Alternative 1, Alternative 3) or the 40:10 high productivity scenario (as constrained by the 2010 blue rockfish maximum sustainable yield (MSY) from the blue rockfish assessment (Alternative 2, Alternative 4). The GMT is not recommending the adoption of independent ABC/OY values for blue rockfish, but recommends managing blue rockfish within the minor nearshore rockfish complexes based on the newly estimated contribution.

California Scorpionfish

The GMT notes that the 2009-2010 ABC values for California scorpionfish have been revised from the values included in the GMT Statement and attachments under Agenda Item D.4 (Management Recommendations for 2009-2010 Groundfish Fisheries- Part I), based on a recently discovered error in how these values were derived. The earlier values were mistakenly based on units of 1000's of fish for the recreational fishery, rather than metric tons of total catch. The corrected ABC for 2009 has been changed from 277 to 175 mt, and the corrected ABC for 2010 has been changed from 249 to 155 mt. Correction of these errors resulted in very modest changes to the OY alternatives, which have also been revised accordingly. However, Alternative 2 is currently based on setting the OY equal to the base model ABC. The GMT notes that correction of this error will require a concurrent correction to the 2008 specifications (from 374 to 236 mt in 2007 and 319 to 202 mt in 2008, see attached ABC/OY Table). The GMT understands that the 2007 catch levels did not exceed what would have been the correct 2007 ABC; therefore, overfishing of California scorpionfish did not occur in 2007.

Longnose skate

Due to uncertainty in the assessment the GMT recommends that longnose skate continues to be managed in the Other Fish complex, with a point of concern identified based on proposed alternatives. The GMT intends to calculate the new alternative Other Fish complex specifications once the Council decides the management intent for this stock.

2009-2010 MANAGEMENT SPECIFICATIONS

The GMT reviewed issues relative to the 2009-2010 management specifications analysis (Agenda Item D.9.a Attachment 1). In prioritizing these items, the GMT first considered actions necessary for specifying management measures for 2009-2010. Recommended items are expected to provide reduced overfished species impacts, increased precision in the impact projections, and provide increased fishing opportunities at lower costs. Additionally, we identified several items on the list that were not appropriate for the specifications process.

The following items are recommended for the 2009-2010 management specifications analysis.

1. Consider managing recreational groundfish catch in numbers instead of weight. *There is a national movement of managing recreational fish by number, which would provide management stability.*

2. Finer scale spatial management. *This item would increase complexity in management and require increased enforcement presence. However, the action is expected to reduce overfished species impacts and provide greater access to target species.*
    a. Consider trip limits and management measures specified at a finer geographic scale.

b. Yelloweye and canary rockfish spatial analysis. *This would require analysis of West Coast Groundfish Observer Data by the NWFSC.*
    i. Consider new groundfish rockfish conservation areas (RCAs), or “hot spots” to reduce bycatch of overfished species, in lieu of larger RCAs.
    ii. Consider groundfish fishing areas, a.k.a. “cold spots” (areas with low bycatch of overfished species) for target species. This item is a lower priority within the suite of spatial management options.

3. Re-define selective flatfish trawl gear specifications through the legal gear committee process.

4. Provide guidance on species, specifically skates, to be sorted under the scientific sorting designation in Amendment 18. *Lack of species specific information is a large source of uncertainty in the longnose skate stock assessment and presumably any future skate assessments.*

5. Limited Entry (LE) Trawl
    a. Declaration for trawl vessels to fish exclusively seaward or shoreward of the RCA during a two month cumulative limit period. *This would reduce uncertainties in the bycatch model.*
    b. Consider a requirement to allow only one trawl gear on board (per trip/period). *NOTE: if declaration to fish inside or outside the RCA exclusively during a cumulative limit period moves forward, this may be an unnecessary restriction.*
    c. Consider development of a bycatch model for the targeted whiting slope fishery outside the primary whiting season.

6. LE Fixed Gear
    a. Consider allowing LE fixed gear fishermen with a longline endorsement to access all of their landings limits using pot/trap gear. *This would reduce bycatch.*
    b. Consider separate trip limits and management measures in the LE fixed gear sablefish and lingcod fishery for longline and pot/trap gears. *This option is recommended only if the gear switching option in 6a is allowed.*

7. RCA latitude and longitude adjustment.

8. Mandatory logbooks for commercial/for hire recreational charter boats. *Consideration mandated in the Magnuson-Stevens Re-Authorization; logbooks would provide valuable data for management of recreational fisheries.*

9. Federal electronic fish tickets and logbooks.

10. Non-retention regulations for bronzespotted rockfish.

11. Whiting
    a. Sector specific bycatch limits.
    b. Scheduled releases of bycatch limits.
    c. Closing the non-treaty whiting fishery on a projection of attaining a bycatch cap.
    d. Re-defining at-sea processing to allow some minimal processing at sea by small vessels.
    e. Regulations requiring full retention for catcher vessels delivering to motherships.

f. Analyze un-monitored midwater trawl efforts in the trawl RCA, by both catcher vessels delivering shoreside and to motherships during the primary season, by vessels sorting catch without 100% observer coverage.

The GMT recommends excluding the following items

Non-Whiting Issues

- New essential fish habitat closed areas (i.e., Olympic National Marine Sanctuary) *Defer to the Essential Fish Habitat Oversight Committee or to the Marine Protected Area Committee.*
- Consider dropping vessel ownership from the definition of ownership and control of a sablefish tier: Ownership of less than 50% of a vessel would not count towards ownership and control of a sablefish tier. *Unrelated to harvest specifications.*
- Consider changing the length variance in LE permit length endorsements. *Defer to the trawl rationalization analysis.*
- More timely implementation of inseason adjustments.
- Consider shorter notice for closing the non-treaty whiting fishery upon attainment of bycatch caps.
- Consider analysis of more management actions to redefine them as routine.
- Shortbelly specifications. *Already adopted by the Council under ABC/OY.*

Whiting Issues

- Change season start dates. *Lack of industry consensus.*
- Tribal whiting allocations. *Unrelated to harvest specifications. This item was originally intended to analyze and define the tribal whiting sliding scale allocation framework so the methodology can be specified in regulations.*

PFMC
11/9/07

TABLE 2-1b. Preliminary PFMC-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009, including preliminary preferred alternatives. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 Action Alternatives								
	2007 ABC a/	**2008 ABC a/**	**2007-08 OY a/**	**2009 ABC**	**2010 ABC**	**Alt 1 OY**	**Alt 2 OY**	**Alt 3 OY**	**Alt 4 OY**	**Alt 5 OY**	**Alt 6 OY**	**Preliminary preferred alternative**
Lingcod - coastwide b/	6,706	5,853		5,278	4,829							
N of 42º (OR & WA)			5,558			4,593	4,593					
S of 42º (CA)			612			612	685					
Pacific Cod	3,200	3,200	1,600	3,200	3,200	1,600						
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887				
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	9,795	8,423	6,250				
N of 36º (Monterey north)			5,723			9,452	7,052	5,233				
S of 36º (Conception area)			210			343	1,371	1,018				
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	130	164	189			189
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900				
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	371	522				371
CANARY ROCKFISH	172	179	44	937	940	0	35	44	85	105	155	Ttarget=2021
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	3,037				
BOCACCIO	602	618	218	793	793	0	218	288				218
Splitnose Rockfish	615	615	461	615	615	461						
Yellowtail Rockfish	4,585	4,510	4,548	4,562	4,562	4,562						
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411							
Shortspine Thornyhead - N of 34º27'			1,634			1,608						
Shortspine Thornyhead - S of 34º27'			421			414						
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671							
Longspine Thornyhead - N of 34º27'			2,220			2,231						
Longspine Thornyhead - S of 34º27'			476			395						
COWCOD	36	36	4	13	14	0	2	4				2 Ttarget=2065
S of 36º (Conception area)	17	17										
N of 36º (Monterey area)	19	19										
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	159	229	300			Ttarget=2030
YELLOWEYE	47	47	Ramp-down c/	31	32	0	13	17	15			17
Black Rockfish (WA)	540	540	540	490	464	490						
Black Rockfish (OR-CA)	725	719	722	1,469	1,317	920	1000	1,469				

TABLE 2-1b. Preliminary PFMC-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2009, including preliminary preferred alternatives. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2009 Action Alternatives								
	2007 ABC a/	**2008 ABC a/**	**2007-08 OY a/**	**2009 ABC**	**2010 ABC**	**Alt 1 OY**	**Alt 2 OY**	**Alt 3 OY**	**Alt 4 OY**	**Alt 5 OY**	**Alt 6 OY**	**Preliminary preferred alternative**
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish complexes			241	**239**	Managed under minor nearshore rockfish complexes		207	230			
Minor Rockfish North	3,680	3,680	2,270	3,678	3,678	2,280	2,283					
Nearshore Species			142			152	155					
Blue rockfish contribution				28	28	25	28					
Shelf Species			968			968						
Slope Species			1,160			1,160						
Minor Rockfish South	3,403		1,904	3,384	3,382	1,970	1,990					
Nearshore Species			564			630	650					
Blue rockfish contribution				213	211	182	202					
Shelf Species			714			714						
Slope Species			626			626						
California scorpionfish	236	202	175	175	155	111	175					
Cabezon (off CA only)	94	94	69	106	111	69	74	69				
Dover Sole	28,522	28,442	16,500	29,453	28,582	16,500						
English Sole	6,773	5,701	6,237	14,326	9,745	14,326						
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,433						
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	11,267					
Starry Flounder	1,221	1,221	890	1,509	1,578	1,004						
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884						
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**	**TBD d/**	**TBD d/**				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	901	1,349	3,428				
Kelp Greenling HG (OR)			OR HG			OR HG						

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

TABLE 2-1c. Preliminary PFMC-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2010, including preliminary preferred alternatives. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2010 Action Alternatives								
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY	Preliminary preferred alternative
Lingcod - coastwide b/	6,706	5,853		5,278	4,829							
N of 42º (OR & WA)			5,558			4,173	4,173					
S of 42º (CA)			612			612	656					
Pacific Cod	3,200	3,200	1,600	3,200	3,200	1,600						
Pacific Whiting (U.S.)	612,068 (2007 U.S. & Can.)	To be determined in March 2008	242,591 (2007)	To be determined in March 2009	To be determined in March 2010	121,296	242,591	363,887				
Sablefish (Coastwide)	6,210	6,058	5,934	9,914	9,217	8,988	7,729	5,777				
N of 36º (Monterey north)			5,723			8,673	6,471	4,837				
S of 36º (Conception area)			210			315	1,258	941				
PACIFIC OCEAN PERCH	900	911	150	1,160	1,173	0	137	173	200			200
Shortbelly Rockfish	13,900	13,900	13,900	6,950	6,950	3,475	6,950	13,900				
WIDOW ROCKFISH	5,334	5,144	368	7,728	6,937	0	362	509				371
CANARY ROCKFISH	172	179	44	937	940	0	35	44	85	105	155	
Chilipepper Rockfish	2,700	2,700	2,000	3,037	2,576	2,000	2,099	2,576				
BOCACCIO	602	618	218	793	793	0	227	302				227
Splitnose Rockfish	615	615	461	615	615	461						
Yellowtail Rockfish	4,585	4,510	4,548	4,562	4,562	4,562						
Shortspine Thornyhead - coastwide	2,488	2,463		2,437	2,411							
Shortspine Thornyhead - N of 34º27'			1,634			1,591						
Shortspine Thornyhead - S of 34º27'			421			410						
Longspine Thornyhead - coastwide	3,953	3,860		3,766	3,671							
Longspine Thornyhead - N of 34º27'			2,220			2,175						
Longspine Thornyhead - S of 34º27'			476			385						
COWCOD	36	36	4	13	14	0	2	4				2
S of 36º (Conception area)	17	17										
N of 36º (Monterey area)	19	19										
DARKBLOTCHED	456	487	290 (2007) 330 (2008)	437	440	0	165	235	323			Ttarget=2030
YELLOWEYE	47	47	Ramp-down c/	31	32	0	14	14	15			17
Black Rockfish (WA)	540	540	540	490	464	464						
Black Rockfish (OR-CA)	725	719	722	1,454	1,303	831	1000	1,317				

TABLE 2-1c. Preliminary PFMC-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2010, including preliminary preferred alternatives. (Overfished stocks in CAPS; Stocks with new assessments in bold).

Stock	No Action Alternative			2010 Action Alternatives								
	2007 ABC a/	2008 ABC a/	2007-08 OY a/	2009 ABC	2010 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY	Preliminary preferred alternative
Blue Rockfish (CA)	Managed under the Minor Nearshore Rockfish complexes			**241**	**239**	Managed under minor nearshore rockfish complexes		207	230			
Minor Rockfish North	3,680	3,680	2,270	3,678	3,678	2,280	2,283					
Nearshore Species			142			152	155					
Blue rockfish contribution				28	28	25	28					
Shelf Species			968			968						
Slope Species			1,160			1,160						
Minor Rockfish South	3,403		1,904	3,384	3,382	1,970	1,990					
Nearshore Species			564			630	650					
Blue rockfish contribution				213	211	182	202					
Shelf Species			714			714						
Slope Species			626			626						
California scorpionfish	236	202	175	175	155	99	155					
Cabezon (off CA only)	94	94	69	106	111	69	74	79				
Dover Sole	28,522	28,442	16,500	29,453	28,582	16,500						
English Sole	6,773	5,701	6,237	14,326	9,745	9,745						
Petrale Sole (coastwide) b/	2,917	2,919	2,499	2,811	2,751	2,393						
Arrowtooth Flounder	5,800	5,800	5,800	11,267	10,112	5,245	10,112					
Starry Flounder	1,221	1,221	890	1,509	1,578	1,077						
Other Flatfish	6,731	6,731	4,884	6,731	6,731	4,884						
Other Fish	14,600	14,600	7,300	**TBD d/**	**TBD d/**	**TBD d/**	**TBD d/**	**TBD d/**				
Longnose Skate	Managed under the Other Fish complex			3,428	3,269	902	1,349	3,269				
Kelp Greenling HG (OR)												

a/ The Council elected to average OY projections for 2007 and 2008. ABCs are year-specific.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The yelloweye ramp-down strategy ramps the harvest rate down from the status quo harvest rate and resumes a constant harvest rate strategy in 2011. The 2007-2010 OYs are 23 mt, 20 mt, 17 mt, and 14 mt, respectively under the ramp-down strategy.

TABLE 2-2. Basis for the preliminary 2009-2010 optimum yield alternatives recommended by the PFMC for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY
Lingcod - coastwide						
N of 42º (OR & WA)	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg	Adjusted the projected OY from the 2005 assessment for N of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was added to the projected OY for N of 43 deg. to determine an appropriate OY for N of 42 deg				
S of 42º (CA)	Status quo	Adjusted the projected OY for S of 43 deg (Col. and U.S.-Van areas) as follows: derived the percentage of the 2005-06 OY estimated for the area between 42 and 43 deg. (107 mt/719 mt) and applied this proportion to the estimated OY S of 43 deg. to determine an estimated OY for the area between 42 and 43 deg. This was subtracted from the projected ave. 2009-10 OY for S of 43 deg. to determine an appropriate OY for S of 42 deg				
Pacific Cod	Status quo					
Pacific Whiting (U.S.)	50% of 2007 U.S. OY	2007 U.S. OY	150% of 2007 U.S. OY			
Sablefish (Coastwide)	From Schirripa 2007; Note: 2009-10 ave. OY > 2010 ABC	From Schirripa 2007 base model, based on the sum of South of Conception OY with 50% precautionary adjustment and North of Conception OY	From Schirripa 2007 low abundance model, based on the sum of South of Conception OY with 50% precautionary adjustment and North of Conception OY			
N of 36° (Monterey north)	96.5% of coastwide OY, which is the status quo apportionment.	72% of coastwide OY, which is the 2003-06 ave. proportion of the estimated swept-area biomass from the NWFSC shelf-slope survey	72% of coastwide OY, which is the 2003-06 ave. proportion of the estimated swept-area biomass from the NWFSC shelf-slope survey			
S of 36° (Conception area)	3.5% of coastwide OY, which is the status quo apportionment	28% of the base model coastwide OY (based on 2003-06 ave. biomass from the NWFSC shelf-slope survey) with a 50% precautionary adjustment due to assessment and survey uncertainty, and lack of access to fishing grounds in the CCA	28% of the low productivity model coastwide OY (based on 2003-06 ave. biomass from the NWFSC shelf-slope survey) with a 50% precautionary adjustment due to assessment and survey uncertainty, and lack of access to fishing grounds in the CCA			
PACIFIC OCEAN PERCH	T (@ F=0) = 2010	SPR = F90.3%; Ttarg = 2010; Pmax = 95.6%	**SPR = F88% (HR that produces the 0708 ave. OYs); Ttarg = 2011; Pmax = 95%**			
Shortbelly Rockfish	25% of status quo ABC/OY; stock projected to rebuild	50% of status quo ABC/OY; stock projected to remain in equlibrium	Status quo ABC/OY; stock projected to decrease dramatically			
WIDOW ROCKFISH	T (@ F=0) = 2009	**SPR = F96.4% (HR that produces the 0708 ave. OYs); Ttarg = 2009; Pmax = 100%**	Status quo SPR = F95%; Ttarg = 2009; Pmax = 100%			
CANARY ROCKFISH	T (@ F=0) = 2019	SPR associated with a 2009 OY of 35 mt Ttarg = 2020; Pmax = 75.0%	Status quo OY: SPR = F96.6%; Ttarg = 2020; Pmax = 75.0%	SPR = F93.6%; Ttarg = 2020; Pmax = 75.0%	SPR = F92.2%; Ttarg = 2020; Pmax = 75.0%	Status quo SPR = F88.7%; Ttarg = 2021; Pmax = 75%

TABLE 2-2. Basis for the preliminary 2009-2010 optimum yield alternatives recommended by the PFMC for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY
Splitnose Rockfish	Status quo					
Yellowtail Rockfish	OY = ABC projected from 2005 assessment					
Shortspine Thornyhead - coastwide	No coastwide OY (status quo)					
Shortspine Thornyhead - N of 34º27'	OY = 66% of the projected coastwide ABC/OY since the 2005 assessment indicated 66% of the biomass occurs N. of Pt. Conception (status quo methodology)					
Shortspine Thornyhead - S of 34º27'	OY = 34% of the projected coastwide ABC/OY since the 2005 assessment indicated 34% of the biomass occurs S of Pt. Conception with an additional 50% precautionary reduction to account for the paucity of survey data S of Pt. Conception (status quo methodology)					
Longspine Thornyhead - coastwide	No coastwide OY (status quo)					
Longspine Thornyhead - N of 34º27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 79% of the assessed coastwide biomass occurs N of Pt. Conception, with a 25% precautionary reduction to account for relatively higher assessment uncertainty (status quo methodology).					
Longspine Thornyhead - S of 34º27'	Coastwide ABC/OY projected from the 2005 assessment was apportioned N & S of Pt. Conception as follows: Assumed constant density throughout the Conception area and estimated 21% of the assessed coastwide biomass occurs S of Pt. Conception, with a 50% precautionary reduction to account for relatively higher assessment uncertainty and a paucity of survey data for the Conception area (status quo methodology).					
COWCOD	T (@ F=0) = 2061; Pmax = 78.4%	**Status quo SPR = F90%; Ttarg = 2065; Pmax = 72.4%**	SPR = F82.1% (produces the 2007-08 OY); Ttarg = 2072; Pmax = 66.2%			
DARKBLOTCHED	T (@ F=0) = 2018	SPR = F75.6%; Ttarg = 2022; Pmax = 97.7%	SPR = F60.7%; Ttarg = 2030	Status quo SPR = F67.7%; Ttarg = 2030; Pmax = 76.7%		
YELLOWEYE	T (@F=0) = 2049	Constant HR strategy; SPR = F71.9%; Ttarg = 2082; Pmax = 69.5%	**HR ramp-down strategy (2009 OY = 17 mt, SPR HR = F66.3%; 2010 OY = 14 mt, SPR HR = F71.3%); Ttarg = 2082; Pmax = 68.9%**	Constant HR strategy; SPR = F69.3%; Ttarg = 2090 (= Tmax); Pmax = 50%		

TABLE 2-2. Basis for the preliminary 2009-2010 optimum yield alternatives recommended by the PFMC for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY
Blue Rockfish (CA)	Managed under minor NS complexes		Represents 40:10 base case scenario plus 9 mt from 50% of the original 94-99 Pt Conception south contribution of blue rockfish to minor nearshore south ABC	Based on setting the OY equal to the ABC (high productivity model as constrained by the base model ABC) plus 9 mt from 50% of the original 94-99 Pt Conception south contribution of blue rockfish to minor nearshore south ABC		
Minor Rockfish North	Based on the increased blue rockfish contribution	Based on the increased blue rockfish contribution				
Nearshore Species	Based on revising the contribution of blue rockfish using the 40:10 base case scenario from the blue rockfish assessment	Based on revising the contribution of blue rockfish using the 40:10 high productivity scenario (as constrained by the ABC) from the blue rockfish assessment				
Blue rockfish contribution	Based on the historical northern (42° to 40°10') proportion of blue rockfish applied to the 40:10 base case OY	Based on the historical northern (42° to 40°10') proportion of blue rockfish applied to the 40:10 high productivity scenario (as constrained by the ABC) from the blue rockfish assessment				
Shelf Species	Status quo					
Slope Species	Status quo					
Minor Rockfish South	Based on increased blue rockfish contribution	Based on increased blue rockfish contribution				
Nearshore Species	Based on revising the original contribution of blue rockfish using the 40:10 base case scenario from the blue rockfish assessment	Based on revising the contribution of blue rockfish using the 40:10 high productivity scenario (as constrained by the ABC) from the blue rockfish assessment				
Blue rockfish contribution	Based on the historical central (40°10' to 34°27') proportion of blue rockfish applied to the 40:10 base case OY	Based on the historical central (40°10' to 34°27') proportion of blue rockfish applied to the 40:10 high productivity scenario (as constrained by the ABC) from the blue rockfish assessment				
Shelf Species	Status quo					
Slope Species	Status quo					
California scorpionfish	Based on the results of the 2005 assessment modified to incorporate CRFS monitoring data for the CPFV component	Status quo:Based on a value between 137 (2007-8 OY as modified by CRFS) and 219 (base model without CPFV modification)				
Cabezon (off CA only)	Status quo OY(average 2007-2008 projection) based on F50% harvest rate with a 60:20 adjustment from the 2005 assessment	Average OY from the 2005 Assessment for 2009-2010 based on F50% harvest rate with a 60:20 adjustment	Year-specific OY from the 2005 Assessment for 2009-2010 based on F50% harvest rate with a 60:20 adjustment			
Dover Sole	Equilibrium MSY under the proxy HR (SPR = F40%) from 2005 assessment					
English Sole	OY from base model					
Petrale Sole (coastwide)	Projected from 2005 assessment: sum of ave. 40:10 adjusted northern OYs and 75% of 40:10 adjusted southern OYs (75% precautionary adjustment for assessment uncertainty)					

TABLE 2-2. Basis for the preliminary 2009-2010 optimum yield alternatives recommended by the PFMC for analysis.

Stock	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Alt 6 OY
Arrowtooth Flounder	Equilibrium MSY under the proxy HR (SPR = F40%)	OY = ABC from base model; Note OY > 2010 ABC				
Other Fish	TBD	TBD	TBD			
Longnose Skate	Projected OY under the current estimated exploitation rate	OY based on a 50% increase in average landings and discard mortality relative to the base model	OY = ABC under the proxy SPR HR (F45%)			
Kelp Greenling HG (OR)	Status quo					

Agenda Item D.9.d
Supplemental EC Report
November 2007

ENFORCEMENT CONSULTANTS REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART II

The Enforcement Consultants (EC) have reviewed Agenda Item D.9.a, Attachment 1, November, 2007 and have the following recommendations.

There are a few management regime proposals the EC would like to request be included in the 2009/2010 specifications process.

Under the current monitoring regime, catcher/processors have 100% observer coverage, motherships have 100% observer coverage, and shoreside catcher vessels have 100% camera monitors. The only aspect of the whiting fishery which is not monitored either by camera or live body is the at-sea catcher vessel delivering to a mothership. The at-sea catcher vessel fleet is comprised of approximately 50% of the shoreside catcher vessels, the same fleet that experienced increased discard events this past season. At-sea and shoreside fleets fish common areas, thus there is no reason to believe that fleet behavior when encountering bycatch would be different. Given the totality of the situation, the EC believes it is prudent management to move the at-sea catcher vessel/mothership fishery to a full retention fishery with 100% camera monitoring of the at-sea catcher vessels.

Additionally, the EC would like to have the following management measures listed in Agenda Item D.9.a, Attachment 1, considered in the 2009/2010 specifications analysis: one trawl gear on board (per trip or per period); allow conversion of longline to pot/traps; adjustment to the 50, 60, and 75 fm lines; closing the whiting fishery on a projection of attaining a bycatch cap, and finally; we would like to see continued development of the federal electronic fish ticket and logbook programs.

We have concerns in regards to allowing limited entry fixed gear fisherman to access their allocations using open access gear, specifying trawl management lines in finer geographic scale, and the development of Rockfish Conservation Areas as hot/cold spot areas. Regarding the latter two issues, our concerns here are increased complexity being added to an already overwhelmingly complex management regime, and the creation of small exclusion zones which compromises existing vessel monitoring system capabilities, (a one hour pinging rate dictates a minimum size area threshold). We request that any work done on these latter two issues be done in close consultation with the EC.

PFMC
11/09/07

GROUNDFISH ADVISORY SUBPANEL REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2009-2010 GROUNDFISH FISHERIES – PART II

Agenda Item F.2.c, Supplemental GAP Report of June 2006 outlined and identified the impacts of the effect of management actions specified to minimize the bycatch of overfished species on the fishing industry. This is an update to that report and provides the Council with the rationale and justification for increases in optimum yield (OY) for 2009-2010.

Groundfish fishermen have experienced the negative impacts of many stringent management actions which have created hardship. These actions have reduced fishing opportunities resulting in severe economic hardship to fishermen, processors, and communities. Time/area closures imposed by depth restrictions by geographic area as well as reduced catch limits in the open areas are a few of these actions.

Widow Rockfish – The Groundfish Advisory Subpanel (GAP) notes the widow rockfish stock is projected to be re-built by 2009; however, fishing on this soon to be rebuilt, healthy stock is not possible until 2011-2012 pending a new full stock assessment. The GAP supports an OY of 522 mt which would provide for an increased harvest of yellowtail rockfish and bycatch needs in the whiting fishery. A 522 mt OY allows full attainment of the whiting OY, as well as partial restoration of the midwater trawl yellowtail fishery. This would facilitate the landing of 40 million lbs of whiting, worth $3.2 million dollars exvessel value. Yellowtail deliveries of 7.5 million lbs worth $3.2 million of exvessel value with $9.4 million community impact could be restored.

Darkblotched Rockfish - The GAP recommends the darkblotched OY be set at the upper end of the OY range, near 300 mt. A 300 mt OY will meet the needs of the industry while making rebuilding progress. An OY less than 240 mt, as projected to be harvested in 2007, will result in additional economic losses to the fleet and communities with little gain in recovery time.

Canary Rockfish - The GAP recommends the 2009-2010 canary OY go forward with a preferred range of 85-155 mt. This range of allowable harvests will restore some of the many lost opportunities resulting from past management decisions. We make the following recommendations for the non-whiting trawl fishery:

1. Reopen the closed areas shoreward of the trawl Rockfish Conservation Area (RCA) north of Cape Alava on the North Washington Coast. This closure has greatly reduced the opportunity to harvest Pacific cod and arrowtooth as well as other groundfish species. Fishing opportunity should be restored to the fishermen and communities.

2. Reopen the closed area shoreward of the trawl RCA from Humbug Mountain to Cape Arago. Opportunity should be restored to fishermen in this area off the Oregon Coast.

3. Restore shelf fishing opportunities using selective flatfish trawls by opening areas shoreward of the RCA out to 75 and 100 fm through all or a portion of the year. Many options with associated opportunities to increase catch and reduce bycatch impacts would then be available. This action will greatly increase opportunity to harvest Pacific cod valued at $1.2 million with an

associated $3.6 million of community benefit. Arrowtooth flounder, which have gone under-harvested in recent years, would also then be available for harvest. Other opportunities which would be available include increased landings of lingcod, yellowtail rockfish, shelf Dover and sablefish. Economic benefits could result by accessing 6,000 mt of Dover Sole, and an additional amount of arrowtooth and Other Flatfish, which are currently under-harvested. Restoration of lingcod harvest to full utilization represents a benefit of $3.5 million to the fleet and an associated $10.5 million to affected communities. The GAP estimates an OY range of 85-155 mt will also increase recreational opportunities by about 40%. It is difficult to estimate the economic benefit, but it is a substantial amount.

4. Explore restoring a midwater trawl opportunity to harvest yellowtail rockfish. This species has been significantly under-harvested in recent years with severe impacts to fishermen and market opportunities of flatfish. A mix of round fish is very important in the marketing of sole species. This fishery should be restored, perhaps on a limited basis, given the constraints of other species of concern. The amount of canary needed in this endeavor will depend on the amount of opportunity, area where prosecuted, and time of year.

Cowcod: With respect to cowcod, the GAP recommends an OY of 4 mt for 2009-2010. An OY of 2 mt will impact all sectors including trawl. Trawl impacts are truly incidental and limited to the Monterey area. Reducing bycatch from 2007 will require Draconian measures.

Yelloweye Rockfish - The GAP discussed the impacts of yelloweye rebuilding measures on all sectors. Yelloweye is particularly constraining to recreational and hook-and-line fisheries. While the GAP recognizes the need for the ramp-down strategy, this will entail severe impacts to these fisheries.

In summary, slightly higher 0Ys for widow, canary and darkblotched rockfish could restore about $14 million of exvessel revenues to the commercial fleets and $42 million to the communities with only a slight increase in rebuilding times. Additionally, the GAP believes more recreational opportunities south of 40°10' could be restored. The restoration of fishing opportunities north of the Queets River and in areas adjacent to Mt. Humbug would be possible. The GAP asks the Council to give consideration to the minimum needs of all user groups who depend on fishing.

PFMC
11/09/07

Agenda Item D.9.e
Public Comment
November 2007

October 11, 2007

Jim G. Likes
2326 Vista Ave. SE
Olympia, WA + 98501
(360) 352-5971

RECEIVED
OCT 1 5 2007
PFMC

John D. DeVore, Staff Officer - Groundfish
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland,Oregon 97220-1384

Dear Staff Officer John D. Devore:

This concerns wastage of marine fish and in particular bocaccio, a rockfish and member of the family Scorpaenidae. Alec MacCall (September, 2007) presented management performance data on bocaccio fish. It is my understanding that these bocaccio represented by-catch and were therefore non-target species. (see attached Table 1, page 2 from MacCall's report). Note the attached table includes substantial amounts (in metric tons) of bocaccio that were discarded at sea. It is my understanding that regulatory trip limits were the reason that the fish were discarded.

Fish wastage is certainly not a new concern to the Council. The Council has been under internal pressure (from its membership and advisory bodies) and from external pressure (lawsuits from conservation/environmental groups) to reduce by-catch for some time. Also, the Council has been under increasing recent pressure to manage fish stocks from an ecological perspective. All of this has relevancy to the previously referenced bocaccio data as reported by MacCall.

The question remains as to how to better manage the economically and politically difficult fish wastage problem. One possible option is to require full retention of total catch i.e., commercial/recreational catch including discards. This total catch should be landed at port dock facilities, processed, and sold as appropriate. Money from the sale, of what would have been discarded fish, should not go to the harvesters. Within the context of state and/or Federal law, the money should be given to an appropriate government entity to manage and disburse the funds. It seems that the easiest part of improving management of the fish wastage problem would be in allocating and disbursing any money proceeding from wastage sales.

Based on the assumption that it would be legally permissible, any money produced by fish wastage sales could be used in a variety of ways. For instance, the Council might use such money for development of an ecosystem Fishery Management Plan (ecosystem FMP) including bocaccio considerations. This would include money for doing the administrative work necessary for assembling and funding an ecosystem FMP team. If this was not acceptable then perhaps the accrued money could be offered to higher education institutions for fisheries research.

The Council has great talent and because of this it is very reasonable to see hope in solving a substantial proportion of the fish wastage problem. More specifically, the Council processes and products are truly impressive in terms of the quality of public meetings/workshops, public input, scientific objectivity/rigor, and written documentation. Relatedly, the Council has access to a huge amount of scientific expertise in the form of the Advisory Bodies and their dedicated personnel.

I appreciate the opportunity to comment on the important fish wastage issue. If you have any questions concerning this letter, please contact me at the letterhead address and/or phone number.

Sincerely,

Jim G. Likes

Jim G. Likes

REFERENCE

MacCall, Alec D. September 2007. Bocaccio Rebuilding Analysis for 2007. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA. MacCall's document presented at the Stock Assessment Review (STAR) Panel for Rockfish Rebuilding Analyses (October 1-5, 2007). National Marine Fisheries Service, Alaska Fisheries Science Center, Sand Point Way, Seattle, WA. 11 p

2003: In response to the 2002 bocaccio assessment, which indicated very low productivity, the 2003 OY was set at "less than" 20MT, and the retained catch was about 10MT, nearly all of which was in the recreational fishery. Including mortality of estimated discards, estimated 2003 total kill was 14MT.

2004: Based on the 2003 assessment, which showed a much more productive stock, the 2004 OY was set at an operational target of 199MT; the final catch was 66MT. Discards brought the estimated 2004 kill to 82MT.

2005: The OY was set at 307MT. Landed catch was 42MT, and estimated an discard of 45MT resulted in an estimated 2005 kill of 87MT.

2006: The OY was set at 306MT. Landed catch was 42MT, and estimated an discard of 25MT resulted in an estimated 2005 kill of 67MT.

2007: The 2007 and 2008 OYs were set at 218MT. The year is not yet complete, but as of August, the projected 2007 kill (landings plus discards) was 151MT (J. DeVore, PFMC, pers. comm.).

Summary: Although the rebuilding OY was exceeded during the first three years of rebuilding, kill during the subsequent five years (including the 2007 projection) has fallen far below the respective rebuilding OYs. For the eight years of rebuilding, the cumulative kill has fallen 40% below the cumulative OY, indicating excellent management performance overall.

Table 1. Recent history of bocaccio management performance.

	Commercial			Recreational			Total			ABC	OY
Year	Catch	Discard	Total	Catch	Discard	Total	Catch	Discard	Total		
2000	28	49	77	103	9	112	128	58	189	164	100
2001	22	76	98*	103	6	109	125	82	207	122	100
2002	21	27	48	82	2	84	103	32	132	122	100
2003	1	2	3	9	2	11	10	4	14	244	<20
2004	12	8	20	55	8	62	66	18	82	400	199
2005	8	41	49	34	4	38	42	45	87	566	307
2006	5	20	25	37	5	42	42	25	67	549	306
2007			53**			98**			151**	602	218
2008										618	218

* Discarded commercial catch was not estimated and is assumed to be negligible.
** Projected as of August, 2007 (John. DeVore, pers. comm.)

Subject: Fwd: Recommendations For 2009-2010 Groundfish Fisheries
From: Douglas Fricke <fricked@techline.com>
Date: Thu, 18 Oct 2007 09:39:27 -0700
To: Don McIsaac <Donald.McIsaac@noaa.gov>
CC: John DeVore <John.DeVore@noaa.gov>, Chuck Tracy <Chuck.Tracy@noaa.gov>, Phil Anderson <anderpma@dfw.wa.gov>, Michele Culver <Culvemkc@dfw.wa.gov>, Paul Heikkila <Pheikkila@mycomspan.com>
X-Mozilla-Status: 0001
X-Mozilla-Status2: 00000000
Return-path: <fricked@techline.com>
Received: from relay-east.nems.noaa.gov ([140.90.121.175]) by vmail4.nems.noaa.gov (Sun Java System Messaging Server 6.2-7.05 (built Sep 5 2006)) with ESMTP id <0JQ4001PH8YC5130@vmail4.nems.noaa.gov>; Thu, 18 Oct 2007 09:39:49 -0700 (PDT)
Received: from noaa02.newworldapps.com ([65.221.110.162]) by relay-east.nems.noaa.gov (Sun Java System Messaging Server 6.2-3.04 (built Jul 15 2005)) with ESMTP id <0JQ40096O8YBXD60@relay-east.nems.noaa.gov>; Thu, 18 Oct 2007 12:39:48 -0400 (EDT)
Received: from noaa02.newworldapps.com (unknown [127.0.0.1]) by noaa02.newworldapps.com (Symantec Mail Security) with ESMTP id B8C246D7; Thu, 18 Oct 2007 12:39:47 -0400 (EDT)
Received: from noaa03.nems.noaa.gov (unknown [192.168.110.135]) by noaa02.newworldapps.com (Symantec Mail Security) with ESMTP id 0FDE5101E6; Thu, 18 Oct 2007 12:39:47 -0400 (EDT)
Received: from smtpout.techline.com (mx4.techline.com [64.95.182.151]) by noaa03.nems.noaa.gov (Postfix) with ESMTP id 69AD3A8159; Thu, 18 Oct 2007 12:39:46 -0400 (EDT)
Received: from DOUG.techline.com (sip.techline.com [64.95.182.139]) (authenticated bits=0) by smtpout.techline.com (8.12.10/8.12.10) with ESMTP id l9IGc5Pr021773; Thu, 18 Oct 2007 09:38:09 -0700
Message-ID: <7.0.1.0.2.20071018093621.044c4508@techline.com>
MIME-Version: 1.0
X-Mailer: QUALCOMM Windows Eudora Version 7.0.1.0
Content-type: multipart/alternative; boundary="=====================_136378562==.ALT"
X-AuditID: c0a86ea2-ace96bb0000061b5-ff-47178c53360c
X-Brightmail-Tracker: AAAAAA==

The Washington Trollers Association (WTA) is requesting that the PFMC consider a landing allowance for the salmon troll fleet of lingcod while trolling for salmon in the management measures for the 2009-2010 groundfish fisheries considerations. The requested lingcod landing allowance is designed to allow some of the incidentally encountered lingcod while salmon trolling to be retained and delivered with the salmon catch which is similar to the currently allowed landing allowance for the yellowtail rockfish. A review of the landing allowance for yellowtail rockfish will show most salmon landings do **not** include the full allowance of yellowtail rockfish which indicates that the landing allowance does **not** lead to targeting on yellowtail rockfish. For the following reasons we request this lingcod landing allowance is considered in the 2009-2010 management measures.

- Canary Rockfish stocks are rebuilding faster than anticipated and encounters of canary rockfish stocks was a major concern when this request was reviewed for the 2007-2008 management period.
- Lingcod have recovered to a status that will allow increasing the total allowable catch on a sustainable basis in the EEZ along the Washington Coast.

- It is well documented that salmon trollers while targeting salmon will incidentally encounter lingcod.
- Lingcod are found while trolling for salmon outside of yelloweye rockfish habitat. Insuring that the lingcod landing allowance is tied to salmon incidental encounters will restrict any potential increase in yelloweye rockfish encounters.
- Even though we know that lingcod have a good survival rate when released from salmon trolling gear, one of the goals of the Magnuson Act is to reduce bycatch and this lingcod landing allowance will help achieve this goal.
- Some of the historic information reviewed shows that off of the Washington coast, the incidental encounter of lingcod while trolling for salmon is in the range of one ling cod for each ten salmon.

Based on the above information, we are asking that the PFMC and appropreiate sub panels consider a landing allowance of one lingcod plus one additional lingcod for each 15 salmon aboard in the 2009-2010 management mesures. - Doug Fricke- WTA President