ELECTRONIC MONITORING PROGRAM INFORMATIONAL BRIEFING

This informational briefing is preparatory to Agenda Item C.7 "Electronic Monitoring Program Development Including Preliminary Approval of Exempted Fishing Permits" that comes to the Council floor session on Monday, April 7. To facilitate consideration of the complexities of this agenda item in advance of the Council floor session, this briefing will present information on principle decision points and the Pacific States Marine Fisheries Commission (PSMFC) will provide a presentation that would otherwise have been presented on April 7. The PSMFC presentation will provide background information on current research findings and future work regarding electronic monitoring of some vessels in the Pacific Coast Groundfish Limited Entry Trawl Fishery.

At this informational briefing, the Council will receive a presentation from PSMFC regarding preliminary results of the National Marine Fisheries Service/PSMFC 2013 field study. PSMFC will also provide insights from the 2012 and 2013 field studies that may inform the development of an electronic monitoring program and implications regarding potential exempted fishing permits (Agenda Item C.1.b, Attachment 1). A final 2013 field study report will be available in June. PSMFC will also discuss a project that is currently underway to estimate species density and discard weights (Agenda Item C.1.b, Attachment 2). The goal of the project is to evaluate whether data collected using proposed electronic monitoring methods can be used to generate species-specific estimates of discard weight.

Council Action:

No Action.

Reference Materials:

1. Agenda Item C.1.b, Attachment 1: PSMFC Preliminary 2013 Report.
2. Agenda Item C.1.b, Attachment 2: PSMFC 2014 Supplemental Study Design.

Agenda Order:

a. Agenda Item Overview — Brett Wiedoff
b. Informational Briefing — Dave Colpo
c. Council Questions and Discussion

PFMC
03/21/14

Agenda Item C.1

Electronic Monitoring Program Informational Briefing

Council Action

- No Council Action
- Informational Briefing Only
  - C1b Attachment 1 PSMFC Preliminary 2013 Report
  - C1b Attachment 2 PSMFC 2014 Supplemental Study Design

Overview

- Informational Briefing
  - Overview of Council Timeline for EM
  - Overview of Agenda Item C7 (Council Action Monday)
  - Quick Summary of EFPs received

Overview

- Presentation by Dave Colpo (PSMFC)

- Council Questions and Discussion

Overview of Timeline for Current EM Considerations

Dates	**Process Considerations**
April 2013- Nov 2013	Initial Scoping and Preliminary Development of Regulatory Alternatives
April 2014	• EM Regulatory Program Development • Consider EFPs for Preliminary Approval
June 2014	• Consider full analysis of regulatory alternatives. • Select preliminary preferred regulatory alternatives. • EFP Final Council Approval, Forward to NMFS
Sept 2014	• Select final preferred regulatory alternatives.

Sept 2014
through 2015
	• Secretarial approval process and implementation, including
	    ○ regulation drafting and paperwork reduction act submissions,
	    ○ securing contracts for video review,
	    ○ commercial installation and testing, and
	    ○ observer program adjustments.

Jan 1, 2016	• Final Rule is Effective with Implementation of EM Program

Overview of Timeline
Regulatory EM vs. EFP

Agenda Item C7a, Supplemental Attachment 11

Timeline for Regulatory EM and EFPs are compared in Table 2

- There are apparent workload issues; both the Regulatory process and EFPs are competing on the same timeline
- Any final regulatory EM decisions made in Sept are scheduled to be implemented in Jan 2016
- Most EFPs are proposed to start Jan 2015

Overview of Agenda Item C7

- GEMTAC Report
- Expect a report from the WCGOP
- Other management entity reports
- Advisory body statements
- Public Comment Council Action

Council Action Under C7, on Monday, April 7

- **Provide guidance on further development of EM program.**
  - **Confirm or add to the range of alternatives in Attachment 3.**
  - **Alter or add options to the action alternatives in Attachment 3.**
  - **Consider options for responsible party payments for biological observers.**
  - **Guidance on specific analysis of the alternatives and options.**
- **Recommendations for further consideration of EFPs.**
- **Provide guidance on schedule and process calendar.**
- **Provide other guidance as necessary.**

Summary of EFPs

EFP Applicant (Name, Attachment)	Purpose	Gear	Number of Vessels
Earl and Ronald Silva, Attachment 6	To fish without an observer	Bottom-trawl	1
Fisherman's Marketing Assoc., Attachment 7	To "…evaluate components of an overall monitoring program…"	Trawl	"several dozen," up to 120
California Risk Pool Attachment 8	Assist in EM program development	Fixed gear	3
		Bottom Trawl	3
At-sea and Shoreside West Coast Whiting Fishery, Attachment 9	Test if "…utilizing cameras in lieu of human observers proves both cost effective and logistically effective…"	Midwater Trawl	12 to 20, up to 37
Eder, Corbin, Parker, Blue, Supp Attachment 12	"…to accurately track and correctly identify an individual's fish catch, including discards,…"	Fixed gear (pot or longline)	4, up to 20 in the second year

Summary of EFPs

EFP Applicant (Name, Attachment)	Proposed Discard Species
Earl Silva and Ronald Silva, Attachment 6	Max retention, use discard with chute, no species identified for discard
Fisherman's Marketing Assoc., Attachment 7	Max retention (incl. prohibited species), Allow minor amounts operational discard, large marine organisms, debris
California Risk Pool, Attachment 8	Fixed gear - Max retention
	Trawl - "optimized retention" allow discard species that can be clearly identified
At-sea and Shoreside West Coast Whiting Fishery, Attachment 9	Max retention; Allow discard of ESA, prohibited species, halibut, trash, mud, coral, crabs, etc, and for safety reasons
Eder, Corbin, Parker, and Blue, Supp Attachment 12	"full retention of IQ species"; May discard "unmarketable IFQ", Halibut, Non-IFQ, large organisms

Questions?

Agenda Item C.1.b
Attachment 1
April 2014

Draft Report Electronic Monitoring Program: Review of the 2013 Season

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Publication Date: March 2014

Contents

Fixed Gear

Comparisons of compliance monitor and video retained and discarded catch counts and weights at the haul level. No weight estimates were made in 2012.

Bottom Trawl

Comparisons of compliance monitor and video retained and discarded catch weights at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

Overview/History

The objective of the Electronic Monitoring (EM) program is to test the viability of Electronic Monitoring as a source of data to document individual accountability of catch and bycatch in the Pacific Trawl Rationalization Program.

Pacific States Marine Fisheries Commission (PSMFC) launched the Electronic Monitoring program in 2012 in anticipation of the Pacific Fishery Management Council (PFMC) considering EM as a compliance monitoring tool in the newly implemented Pacific Trawl Rationalization Program.

In order to effectively and accurately debit discarded catch from individual fishing quota (IFQ) holder accounts, the PFMC instituted 100% human observer coverage on all trips for all vessels participating in the IFQ fishery. The cost of this program was regulated to transition from federally subsidized to industry funded over the course of the first 3 years of the program. The industry is interested in finding a less costly and more flexible method to monitor catch and discards at sea.

During the April 2013 PFMC meeting, "the Council indicated their desire to move ahead with consideration of electronic monitoring (EM) by stating that **compliance monitoring, rather than the collection of biological data, would be the primary focus for EM in the trawl catch share program**[...]"

The electronic monitoring program is meant to address some key questions, including; can video monitoring be used effectively to track an individual's catch to be debited from a quota account? And how much would such a program cost the industry as compared to the human compliance monitor program?

The expectation is that the West Coast Groundfish Observer Program (WCGOP) will continue to administer a level of scientific observer coverage to provide stock assessors and other scientists the necessary scientific data for effective management of the various West Coast fisheries. The EM program is not meant to replace scientific observers. This program is solely meant to explore the ability of electronic monitoring systems to estimate the at-sea discards of vessels for the purposes of effectively debiting quota accounts throughout the fishing season, therefore replacing the need for 100% at-sea human compliance monitor coverage. For this reason, throughout this document we will use the term observer when we are referring to the tasks performed by a WCGOP observer for the purposes of science data collection and refer to at-sea Compliance Monitors (CMs) when reporting data related to the compliance monitoring role.

Finalized 2012 and 2013 at-sea compliance monitoring data were received from the WCGOP for comparison to the video data. Since retained catch is weighed and accounted for by fish dealers at the dock, discards were the main concern for at-sea catch accounting of IFQ species on this project. While analysis of both retained and discarded data are presented in this report, the discard analysis should be more closely scrutinized for this reason.

Providers

PSMFC contracted with Archipelago Marine Research (AMR) in 2012 and both AMR and Saltwater, Inc. in 2013 to provide and install electronic monitoring (EM) systems on volunteer fishing vessels in the midwater trawl, bottom trawl, and fixed gear fisheries, collect data drives from the vessels, training PSMFC video reviewers, and providing logistical support. AMR also provided Electronic Monitoring Interpret™ Pro (EMI) software for converting the raw data into usable catch information.

Archipelago Marine Research

The on-board AMR system includes sensors for drum movement, hydraulic pressure, and GPS locations from which the speed of the vessel is calculated, and 1-4 cameras. To aid in review and interpretation of the video data, the sensor, GPS and video output are integrated within the EMI software mentioned above. A GPS location along with any sensor data was recorded every ten seconds during a trip. Sensor data was recorded at all times that the vessel's power was on. Gaps therefore occurred when in port and the vessel was powered down or the system was turned off manually to prevent the system from draining the vessel's battery when in port. On midwater and bottom trawl vessels, the system was configured to trigger recording video when the vessel moved outside of a "port area" geo-fence designated by AMR and continue recording imagery until they returned to port. On fixed gear vessels, systems were configured to trigger recording video when the hydraulic pressure exceeded a threshold that was set by the technician that installed the equipment and was specific to each vessel. Imagery recording would then continue for 20 minutes in 2012 and 30 minutes in 2013 past the last use of those hydraulics to allow for all catch handling to be captured for each haul.

When the raw sensor and video data were received by PSMFC, annotations were made using the AMR software EMI. Start and end dates, times and locations, for trips and hauls as well as gear and catch information were captured using EMI. The annotation data were imported into a Microsoft Access Database for analysis.

Saltwater, Inc.

The on-board Saltwater system includes a sensor for hydraulic pressure, a GPS for location data which is stamped on the video of one camera, and 2 cameras. One camera is situated high above to capture the entire deck in a single view, while the second camera is positioned closer to the fishing activity to get a better view for the identification of retained and discarded fish. The cameras are capable of initializing and recording either 100% of the time or only when the hydraulic sensor achieves a pressure level preset by the technician and for 15 minutes after the pressure drops below that set level. The sensor and video data are not integrated.

When the raw sensor and video data were received by PSMFC, Mobotix software was used to identify trips and hauls. Since no data capturing tool was provided, video reviewers recorded all information on sheets of paper that will be data entered into a database by PSMFC. Start and end dates, times and locations, for trips and hauls as well as gear and catch information were captured.

Saltwater, Inc. data were not data entered at the time of this draft and thus, are not presented in this report.

Definition of Catch

For the purposes of EM review, catch is anything that we see that breaks the surface, excluding sea birds and marine mammals that are swimming freely alongside the vessel. If it is kept on the vessel, it is recorded as retained. If it is not kept on the vessel, it is recorded as discard. Discard includes marine organisms that wash out of the net before the net comes onboard the vessel, that fall off or out of fishing gear before it makes it on the vessel, or are free floating on the surface.

Hake

Methods

EM systems were installed on 6 volunteer hake trawl vessels fishing IFQ quota out of Newport and Astoria, Oregon in 2012 and 4 in 2013. All fishing vessels carried the EM system for the most of the fishing seasons. In 2012, all 6 made both shoreside and mothership deliveries. In 2013, less than three made mothership deliveries, barring our ability to report results for that fishery. Results for 2013 shoreside hake delivery trips are reported.

Retained catch, or catch transferred to the mothership, was calculated by video reviewers by counting the number of straps of the codend that contained fish. This number was then multiplied by an estimated weight per strap in 2012, and a known weight per strap supplied by the skipper in 2013, to get the total weight of retained fish in the codend.

Compliance monitors are advised to use skipper hailed weights recorded in the vessel's logbook for retained catch when they are available and to make individual estimates of the catch only when a vessel logbook is not available (Ryan Shama, personal communication, March 19, 2013).

While specific protocols are in place to try to accurately estimate the weight of discards, general methods can be described here. One method is visualizing how many round baskets the discarded fish may fill. With the conversion of 80 lbs of hake per basket, the video reviewer is able to calculate an estimate of total weight. A second method is using the codend and the supplied weight per strap values to visually estimate the weight of fish lost. If the video show approximately one strap worth of fish spilling out of the net and the known weight per strap for that codend is 2,000 pounds then the video reviewer will record 2,000 pounds of discard. Estimating weight of discards that are floating on the surface of the water with no real reference is more subjective. Video reviewers will use a variety of methods to try estimating the weight as closely as possible, including visualizing how many round baskets the fish would fill and taking into account how densely packed the fish are on the surface.

Compliance monitor and video hauls were matched using vessel ID, set date, and order of haul on that fishing date. For example, haul 3 of a fishing day in the compliance monitor data was matched to haul 3 of the same fishing day for the same vessel in the video data. This was necessary since there could be multiple hauls in a day and the haul times did not match exactly. The quality of the match was then confirmed manually in excel and adjustments were made where necessary. Adjustments were only necessary if a time gap occurred in the electronic data that led to the EM system missing a haul, a haul occurred near the midnight time mark causing a different date in each of the datasets, if the EM data recorded an individual haul with very little catch (~5000lbs) that was put in the hold when the observer data did not, or if the EM data recorded a net cleaning where the observer data did not.

Most hauls in the EM data had corresponding hauls in the compliance monitor data. It was therefore possible to compare catch at the haul level.

Of all the hake trips reviewed by EM, 15 were mothership catcher-vessel trips in 2012 and 236 were shoreside delivery hake trips with 154 from 2012 and 82 from 2013. One trip in the dataset included one mothership delivery haul and the catch from the remaining hauls of the trip was stored onboard and delivered shoreside (Table 1).

In 2012 and 2013 a total of 75 hake trips were missing electronic data entirely, 65 of which were due to skippers not turning the system on when they went fishing. This was a concentrated occurrence with a small number of vessels. Three were due to improper activation of the system by a technician. Seven were from a single vessel that had a technical problem with the EM system interfering with the VMS system. Since VMS is mandatory, the EM system was kept turned off until the issue was resolved.

Official haul level catch amounts delivered to motherships were available from NORPAC data in PacFIN. Since fish tickets are not available for this fishery, the NORPAC dataset is the best estimate for total catch amounts delivered from the catcher vessels to the motherships. The NORPAC official total catch weight of a haul is the aggregated total weight of retained and discarded fish of that haul. To extract the weight of the codend that was delivered to the mothership from the official total catch weight, the WCGOP recorded discards were subtracted from the official total catch weight of the haul.

Official trip level landed weights were available for the shoreside deliveries from the state landing receipts in PacFIN. These were matched based on vessel ID and return date. All hauls or trips had corresponding official retained catch amounts.

To address concerns voiced in the PFMC Electronic Monitoring Workshop about quality of EM discard estimation with night light versus day light, hauls brought on board in day light and night light were differentiated in the figures where possible. Hauls brought onboard between 6 AM and 6 PM were labeled day hauls, and hauls brought onboard between 6 PM and 6 AM the next day were labeled night hauls.

Results and Discussion

Shoreside Hake
(2012 and 2013)

Results
Retained

Retained catch estimated by the video compared to the compliance monitor data and the official catch data on fish tickets from PacFIN had very similar patterns (Figures 2, 4, 6 and 7). In both 2012 and 2013, the trend line qualitatively tracked the video = compliance monitor reference line closely. In 2012, the trend line hovered just above the reference line.

Discard

In 2012, the compliance monitor data contained a larger number of discard events than the video data. Despite this, the total amount of discarded weight captured by the video was estimated to be almost double the discarded weight captured by the compliance monitor (Table 3). Most discard events were very small (Figures 3 and 5). In 2012, only six observations of discards occurred during the night and all were from the compliance monitor dataset. There were only 4 hauls where discards were recorded in both datasets.

In 2013, the video data contained a larger number of discard events than the compliance monitor data. Again, the total amount of discarded weight captured by the video was estimated to be almost double the discarded weight captured by the compliance monitor (Table 3). Most discard events were very small (Figures 3 and 5). In 2013, both datasets observed discard events during the night. There were only 15 hauls where discards were recorded in both datasets

Discussion
The shoreside hake haul level retained weights were on average (using the trend line as a gauge) accurate but had variability when assessing at the trip level (Figures 6 and 7). In 2012 the variability was higher with the EM estimates larger on average. This was likely due to vessel to vessel variability of nets and codend capacity and the lack of information about each vessel that the video reviewers had available to them when estimating catch. In 2013, with skipper provided net capacities, variability was lower with the trend lines tracking the reference line very closely.

The discarded catch estimates were more variable than in the at-sea catcher vessel fishery with only 4 of the 30 total discard observations in 2012 and 15 of the 100 total discard observations in 2013 overlapping in both datasets (Table 3). Most of the discard observations were only detected in one of the two datasets. The magnitude of most of these discard events were generally small at less than 2,000 pounds (Figures 3 and 5).

In 2012, there were four discard events that were larger than 2,000 pounds that were recorded by the video but not the compliance monitor. Two of these were blowout panel discards prior to the net boarding the vessel. The other two were due to deck washing of fish. The one discard event recorded in the compliance monitor data but not in the video data that was larger than 2,000 pounds was also a deck washing event.

In 2013, there were four discard events that were larger than 2,000 pounds that were recorded by the video but not the compliance monitor. All four were blowout panel discards prior to the net boarding the vessel. This means that the discard occurred as the codend was approaching the stern of the vessel. The one discard event recorded in the compliance monitor data but not in the video data that was larger than 2,000 pounds was not evident upon a second review of the video data.

Discussion with WCGOP suggested that while additional training is in order to ensure discards are not missed, some of these discard events not being recorded is due to safety concerns, and the difficulty to see and quantify discards that are in the water from the low angle of standing on the deck of the boat. It is important to note that the EM system has cameras mounted on the aft gantry that provide a long field of view behind the vessel that the CM cannot get. Also, the EM system has multiple views of the vessel and the water at once and can be reviewed multiple times if needed to get an accurate estimate of total discards.

Mothership Catcher Vessels
(2012 Only, 2013 is Confidential)

Results
Retained

Retained catch estimated by the video compared to the compliance monitor data and the official catch data from NORPAC had very similar patterns (Figure 8). Again, the relationship of video to compliance monitor retained estimates was consistent regardless of whether the haul was retrieved in night-time or day-time lighting. The relationship between video and compliance monitor retained estimates fell across the video = compliance monitor/NORPAC reference line. Video retained catch estimates tended to be higher than compliance monitor estimates on loads smaller than 50,000 pounds, and tended to be lower than compliance monitor estimates on loads larger than 50,000 pounds (Figure 8).

Discard

The video data contained a larger number of discard events than the compliance monitor data, and those discard events were estimated by the video to be larger than the compliance monitor estimate (Figure 9). Most discard events were very small. The relationship of video to compliance monitor discard estimates was consistent regardless of whether the haul was retrieved in night-time or day-time lighting.

Discussion
No information was obtained from the vessels in 2012 about the capacity of their nets or the dimensions of their vessel to aid in catch estimation from the camera view prior to video reviewing. Obtaining this information in 2013 helped with the accuracy of estimation of retained catch weight in codends.

Discard events were much more abundant in the video data than in the compliance monitor data for this fishery (Table 3). The majority of the discard events recorded in the video data were of a magnitude smaller than 2,000 pounds. This suggests that compliance monitors were not recording discards in most instances when the magnitude was considered small. In 2012, compliance monitors were instructed to only record discard events that were larger that 2-3 baskets or more than 100 pounds. Protocols were revised just prior to the 2013 season so that all discard events, regardless of their size, were recorded.

In 2012, there were five large discard events above 2,000 pounds, ranging from 3,000 to 16,000 pounds not reported in the compliance monitor data. All five of these events were net bleeds due to the codend being over full making it impossible to tie the codend off prior to transfer to the mothership. When WCGOP reviewed video of such events they agreed that there was a large discard. Compliance monitors reported that they were instructed by the Captain to stand amid-ships rather than near the stern due to safety concerns. This might have prevented them from seeing some discard events which happened very close to the stern ramp causing there to be no record of a discard in the WCGOP data.

Fixed Gear

(*2012 and 2013)*

Methods

The electronic monitoring system was installed on volunteer fixed gear vessels (5 in 2012 and 4 in 2013) fishing IFQ quota out of Morro Bay, CA, Half Moon Bay, CA, Coos Bay, OR and Newport, OR. All but one of the vessels fished pot gear solely. One fished both pot and longline gear.

Two definitions for fixed gear hauls are presented in the WCGOP manual for the IFQ fishery:

> "A set begins at a buoy and ends at a buoy. The set includes all of the hooks or pots in between the two buoys." (NWFSC 2012, Section 5-8)
>
> "Small pieces of gear with individual buoys are often set haphazardly in a general area or fishing spot. The gear is frequently set and retrieved over and over again, with individual pieces of gear soaking for as little as 5 minutes between retrievals. If each retrieval was considered a set, one day of fishing could have over fifty sets, with each set only having one or two fish caught. Obviously, this would create an unreasonable quantity of paperwork for the amount of data collected. Therefore, individual pieces of gear can be grouped to form a single set using a standard set of criteria." (NWFSC 2012, Section 6-10)

Since strings of gear were distinguishable by the EM system, the former definition was used. The compliance monitor used the second method to define a haul on some of the corresponding trips.

On many trips, the haul count in the compliance monitor data was much lower than the count from the video data (Table 1). This difference in haul definition at the data level led to an inability to assess catch at the EM haul level and thus catch data were compared to compliance monitor data at the compliance monitor haul level. EM hauls were aggregated to correspond to the compliance monitor haul designation and were matched manually in excel. All trips monitored electronically had corresponding trips in the compliance monitor data.

In the two years of fixed gear participation in the EM project four trips did not have any EM data recorded. Three trips were due to the skipper failing to turn the system on and one was due to a system failure (Table 1).

In-season feedback

In 2012, fishermen and technicians were not given in-season feedback on how to maximize data quality for the video project. Thus, there were instances where the fishermen or the compliance monitors stood with their backs to the camera while sorting, or sorting of catch was conducted out of camera view, or cameras were poorly placed, which made counting and classifying catch into species groupings impossible.

In 2013, fishermen and technicians were given in-season feedback on how to maximize data quality for the video project. Increased communication greatly reduced technical and behavioral issues that would hinder catch identification and quantification.

Weights or counts

In 2012, weights were not directly estimated by the video reviewer. Instead, counts of individual pieces for each species or grouping were recorded. All fish seen on the video were counted by the reviewer including fish that dropped off of the line before being pulled onto the fishing vessel and fish that were damaged or partially eaten. Fish whose fate could not be determined due to being taken or thrown out of camera view or the video ending before fish being put into the hold or discarded were recorded as disposition 'unknown'.

In 2013, in addition to counts, weights were also estimated. Weight estimation was done by either obtaining information from the skippers on the hold capacity of discrete areas on their vessel where they tended to sort fish, or by obtaining information on how much a standard round basket weighed when filled with specific species. This information aided in converting visual estimates of volumes of fish to weights.

Weights recorded by the compliance monitor were based on actual or average weights collected during each trip.

Compliance monitor data contained more species specific information than was possible to collect from the video data. Data were therefore aggregated to different levels of groupings to aid in comparisons of catch quantities.

Excluded data

Some compliance monitor hauls were subsampled then the counts and weights were expanded to the full haul. Since these numbers were not true counts and weights, hauls that were expanded were excluded from the catch comparison.

Other reasons for exclusion include gear problems, if a clean haul merge was not possible between the CM and video data, or if the condition of the video data was not usable.

Filtering left 1,095 of the total 1,254 EM recorded hauls to be included in the analysis.

Retained and discarded counts and weights of fish were compared to compliance monitor data at the haul and IFQ complex and species group level. Results for the IFQ groupings sablefish, rockfish, thornyheads, and flatfish are reported in this document.

Since only one vessel used longline gear, results could not be reported by fixed gear types (pot vs. longline) due to confidentiality rules. Both pot and longline gears were therefore reported on the same figures.

Results

Three general patterns emerge for all results. The first is that video reviewers had higher species identification success in 2013 than they did in 2012. The second is that in 2013, the relationship between CM and video reviewer weight estimates showed more variability than the relationship between counts. Finally, discarded catch had lower speciation and quantification success than the retained catch.

For the target species of this fishery, Sablefish, compliance monitor and video reviewer estimates of retained and discarded catch tracked the reference line closely in both 2012 and 2013 (Figure 10).

For Pacific Hake, no retained hake were recorded in either datasets. The CM record shows 30 fish discarded on observed hauls in 2013 while the video reviewer only recorded 10. There were four instances of CM recorded hake where the video review recorded none (Table 2, Figure 11).

For flatfish, quantification of retained counts improved from 2012 to 2013. Fewer discards were recorded in 2013 than in 2012 (Table 2).

Dover sole were the most frequently seen flatfish in the fixed gear fishery. In 2012, CM recorded more Dover sole retained than the video reviewer. This aggregate trend reversed in 2013 (Table 2). Video recorded fewer discards in both years (Table 2, Figure 12). Records of 11 discarded and retained Petrale sole recorded in 2013 by the CM were not recorded by the video reviewer (Table 2). Similarly, records of 8 Arrowtooth Flounder in the EM dataset in 2012 had no corresponding record in the CM dataset. Record of one discarded Arrowtooth in the

CM dataset was recorded as retained in the EM dataset. Number of unidentified flatfish decreased from 2012 to 2013 (Table 2).

For rockfish, fewer rockfish were recorded as unidentified in the EM data in 2013 (Table 2, Figures 14 and 15). In 2012, all of the rockfish recorded by the CM were from the Minor Slope Rockfish complex, most of these were recorded as unidentified rockfish by the video reviewer. In the 2013 CM dataset, all except one of the rockfish seen in this fishery were from the Minor Slope Rockfish complex (Table 2, Figure 14). A single Pacific Ocean Perch Rockfish was recorded in the CM dataset. This fish was recorded as unidentified in the EM dataset. There were 5 fish identified as Darkblotched rockfish in the EM dataset but recorded as Minor Slope Rockfish in the CM dataset (Blackgill or Rougheye rockfish). At the haul level, the trend line for retained minor slope rockfish in 2013 tracked the reference line closely for counts and was slightly above for weights (Figures 15 and 16).

For Thornyheads, Longspine thornyheads were consistently recorded as Mixed Thornyheads in the EM dataset (Table 2, Figure 17). Retained haul level Shortspine thornyhead and total thornyhead counts in both 2012 and 2013 tracked the reference line very closely. There were few discards of thornyheads yet the EM data recorded fewer individuals than the CM dataset. Some of these thornyheads were identified as “Red rockfish” in the EM data.

Discussion

Video reviewers’ higher species identification success in 2013 than in 2012 could be due to multiple factors. First, AMR cameras were upgraded from analog to digital at the beginning of the 2013 season. This means that the video reviewers were working with higher resolution video and an ability to zoom into the camera views. Second, the video reviewers had moved up the learning curve, improving their species identification by camera. Third, feedback to fishers and technicians was a focus during the 2013 season, improving camera angles, video coverage of the deck, and fisher or compliance monitor behavior.

The higher variability in the relationship between CM and video reviewer weight estimates than between count estimates is simple. Compliance monitors weigh fish on scales while video reviewers are making educated estimates of the weight of fish that they see. Using onboard measuring boards to assist in convert length to weight for some species is being tested along with testing accuracy of volume estimates and establishing tested volumetric weight conversions. Results are not available.

Video reviewers have noted that speciation of discards was more difficult than retained catch due to the nature of where the CM work station was on the deck of the vessel. The CM was often in a corner of the deck further from the camera than where retained catch was being sorted. Although efforts were made to place a camera focused on the part of the deck where the CM typically worked, this location was not always constant between trips or even hauls on a trip.

Fish can generally be identified to the species group level (Rockfish or Flatfish) successfully but this is not sufficient for the IFQ fishery. Since quota is tracked at the IFQ complex level, including a number of individual flatfish and rockfish species, discards must be traced at the IFQ grouping level. In the fixed gear fishery this is successfully done in 2013 for the larger volume IFQ species seen in the fishery, such as sablefish, Dover sole, and minor slope rockfish. For the lower volume species, detection and quantification variability was higher.

Bottom Trawl

(2013 Only, no volunteers in 2012)

Methods

The AMR electronic monitoring system was installed on 6 volunteer bottom trawl vessels fishing IFQ quota out of Morro Bay, CA, Coos Bay, OR and Newport, OR. Some were not installed until after the shrimping season in November of 2013.

EM hauls were matched to the compliance monitor hauls manually based on vessel, haul date and time.

Nine trips did not have any EM data recorded. All 9 were due to interference with the VMS system onboard two of the vessels (Table 1). The skippers intentionally kept the systems turned off until the problem could be resolved.

In-season feedback

In 2013, fishermen and technicians were given in-season feedback on how to maximize data quality for the video project. Increased communication greatly reduced technical and behavioral issues that would hinder catch identification and quantification. Despite this, the bottom trawl fishery is a high volume mixed species fishery. In this fishery, catch is sorted onboard and there can be large amounts of selective discarding at sea. This means that larger changes in fisher behavior are required to accurately speciate and quantify catch.

Weights or counts

Counts were not estimated by the video reviewer for all catch due to the nature of this fishery. Instead, weights and species of catch were estimated.

All fish seen on the video were estimated by the reviewer including fish that spilled from the net before being pulled onto the fishing vessel. Fish whose fate could not be determined due to being taken or thrown out of camera view or the video ending before fish being put into the hold or discarded were recorded as fate 'unknown'. Weight estimation was done by either obtaining information from the skippers about how much areas on their vessel that they tended to sort fish into could hold, or by obtaining information on how much a standard round basket weighed when filled with specific species. This information aided in converting visual estimates of volumes of fish to weights.

Compliance monitor data contained more species specific information than was possible to collect from the video data. Data were therefore aggregated to different levels of groupings to aid in comparisons of catch quantities.

Excluded data

Some hauls were excluded from the catch comparisons. Reasons for exclusion include gear problems, if a clean haul merge was not possible between the CM and video data, or if the condition of the video data was not usable. Filtering left 220 of the total 246 EM recorded hauls to be included in the analysis.

Retained and discarded weights of fish were compared to compliance monitor data at the haul and IFQ complex and species group level. Results for the IFQ groupings sablefish, rockfish, thornyheads, and flatfish are reported in this document.

Results

Reminder: Weight estimates were made in the bottom trawl fishery from video data. As seen in the fixed gear fishery, weight estimates can have more variability than counts since there is no direct way to measure the weight of the fish. Therefore, all of the results will show noise around the trend lines. Counts were not recorded in all instances due to the high volume nature of the fishery. Counts are therefore not used in this report.

Also, in most cases, discarded IFQ fish were being sorted by the on board catch monitor prior to discarding. If subsampling occurred, the remainder of the discarded catch was pushed overboard unsorted. These data therefore represent accuracy of speciation and quantification of sorted discarded catch.

For Sablefish (Figure 19), Lingcod (Figure 21) and Pacific Halibut (Figure 22) compliance monitor and video reviewer estimates of retained and discarded catch tracked the reference line closely on average. There was one halibut that was recorded by the CM as discard that was recorded as retained in the EM dataset.

For Pacific Hake, the discard estimates tracked the reference line but the retained estimates were far off (Table 2, Figure 20). The EM data estimated 3,565 pounds of retained weight for the bottom trawl fishery where the CM data recorded only 480 pounds.

For flatfish, in aggregate at the flatfish group level, both retained and discard estimates from the video data were lower than measurements in the CM data (Table 2, Figure 23). There are a number of clustered points in the retained figure on the X- axis giving the appearance that there are a number of hauls where the EM data did not see more than 2000 pounds of catch. These fish were recorded by the video reviewer but were categorized as Unidentified groundfish (or mixed groundfish). These were cases where the crew did not sort their retained catch on board but pushed mixed catch into the hold. This behavior makes it impossible for the video reviewer to identify and quantify the retained catch. When sorting is done prior to retained catch being stowed in the hold, identification and quantification is more successful.

For the larger magnitude species, Arrowtooth flounder and Petrale sole, the retained and discard trend line falls on or slightly below the reference line for retained catch and below the reference line for discarded catch. For

Dover sole, retained catch is quantified effectively with the trend line falling on the reference line whereas discarded catch is not captured by the video reviewer with the CM data reporting 790 pounds of discards and the EM data reporting only 233 pounds.

For rockfish, in aggregate at the haul level, quantification of both discards and retained catch tracked the reference line (Table 2, Figure 25). There are a number of data points clustered on the Y-axis with the EM data having record of 200-500 pounds of retained rockfish that were not recorded by the CM. Many of these data points were instances where the video reviewer categorized the catch as unidentified rockfish but could not see the species, and the CM recorded them as Longspine thornyheads. The trend line for discarded rockfish fell slightly below the reference line due to a number of hauls where the CM data reported rockfish but the EM data did not. All of these were due to lack of sorting of discarded catch with large volumes of catch that were subsampled by the observer being shoveled off of the deck and pushed out the scuppers.

Splitnose rockfish was consistently recorded as unidentified rockfish (Table 2, Figure 26).

Retained chilipepper rockfish were accurately identified and quantified (Table 2, Figure 26)

Retained Minor Slope Rockfish were accurately categorized for most hauls with only three hauls of large magnitude being categorized as unidentified rockfish causing the trend line to fall below the reference line (Figures 26 and 28).

Discarded minor slope and minor shelf rockfish were consistently recorded as unidentified rockfish by the video reviewer (Table 2).

For Thornyheads, Longspine thornyheads were consistently recorded as Mixed Thornyheads or unidentified rockfish in the EM dataset (Table 2, Figure 29). Retained haul level total thornyhead weights tracked the reference line very closely (Figures 25 and 29). The trend line for retained shortspine thornyhead was slightly low. Discards of thornyheads were all recorded as 70 pounds or less. Most of these discards were categorized as Mixed Thornyheads or unidentified rockfish by the video reviewer.

Discussion

As in the fixed gear fishery, fish can generally be identified to the species group level (Rockfish, Thornyheads or Flatfish) successfully with bottom trawl gear. Since quota is tracked at the IFQ complex level, including a number of individual flatfish and rockfish species, discards must be recorded at the IFQ complex level. With the exception of Minor slope, minor shelf, splitnose rockfish and longspine thornyheads, other IFQ complexes were successfully identified by video reviewers with the current technology available. Weight estimation could be improved using other methods that will be tested in the coming months.

When complete sorting of discards and retained fish occurred on deck, most of the flatfish species were identified effectively to the IFQ complex. For rockfish, identification was less successful with most of the rockfish being categorized as unidentified rockfish by the video reviewer. Video reviewers have noted that if they cannot identify a rockfish to the species level, it is not possible with the current camera views to categorize them into broader categories such as minor slope, minor shelf, or neither. Speciation was even more difficult for discarded catch due to the nature of where the CM work station was on the deck of the vessel. The CM was often in a corner or at the end of the trawl alley further from the camera than where retained catch was being sorted. Although efforts were made to place a camera focused on the part of the deck where the CM typically worked, this location was not always constant between trips or even hauls within a trip.

Sorting discards in a specific location of the deck may improve the video reviewer’s ability to consistently identify discarded IFQ rockfish. Video reviewers, however, still could not identify almost all of the splitnose rockfish that were retained or discarded when the catch was sorted. Preliminary results of a discard chute study indicate that identification of splitnose is possible using a discard chute where it is not possible on the same haul using other camera views. Whether identification is accurate is yet to be determined. Results from that study will be published at a later date.

Finally longspine thornyheads were impossible to identify to the species level. When in hand, a longspine thornyhead often requires careful examination to confirm its identity. Shortspine thornyheads are easier to identify due to the larger size that they can achieve. This means that if the video reviewers see what looks like a thornyhead and the specimen is larger than a longspine could be, they are able to use the size of the fish to categorize it as a shortspine thornyhead explaining the higher success of identification for shortspine thornyheads. Despite this, thornyheads are red, spiny fish and sometimes cannot be differentiated from a red rockfish on the deck.

Acknowledgements

We would like to thank the owners, skippers, and crew of the volunteer fishing vessels for volunteering and helping this project. We would like to thank the West Coast Groundfish Observer Program for providing data for this report.

References

Northwest Fisheries Science Center (NWFSC). 2012. West Coast Groundfish Observer Program 2013 Catch Shares Training Manual. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd. East, Seattle, Washington, 98112.

Tables

Table 1. Summary of data including: number of vessels, number of trips, trip length, number of hauls, haul level distribution of confidence in data from video, reasons for low confidence or no confidence (unusable), and reasons for no video and missing trips.

	Bottom Trawl	Fixed Gear		Mothership Catcher Vessel		Shoreside Hake	
Number of Vessels	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**
Total	6	5	4	6	-	6	4
Fishery Total	68	25	18	16	-	24	25
Trips							
Number of Trips							
Video	39	72	26	15	-	154	82
Compliance Monitor	48	74	28	16	-	185	124
Fishery Total	1222	281	122	37	-	719	948
Sea Days Per Trip							
Minimum	1	1	1	2	-	1	1
Median	2	1	3	12	-	2	3
Mean	2	1	3	11	-	3	3
Maximum	5	3	6	18	-	5	11
Total	96	104	78	170	-	386	220
Fishery Total	4340	913	465	530	-	1881	2053
Hauls							
Number of Hauls							
Video	246	873	381	299	-	391	202
Compliance Monitor	312	290	246	341	-	473	319
Fishery Total	10230	2214	1300	956	-	1599	1763
Confidence in Data from Video (Number of Hauls)							
High	75	618	340	180	-	265	143
Medium	100	205	31	85	-	93	37
Low	62	49	0	32	-	16	0
Unusable	6	0	3	0	-	0	0
No Video	3	1	7	2	-	17	22
Reason for Low Confidence in Data from Video (Number of Hauls / Number of Vessels)							
Corrupt Video Files	0 / 0	1 / 1	0 / 0	0 / 0	-	2 / 2	0 / 0
Crew Catch Handling - Not in Camera View	0 / 0	35 / 2	0 / 0	0 / 0	-	0 / 0	0 / 0
Poor Image Quality - Glare	7 / 1	1 / 1	0 / 0	0 / 0	-	0 / 0	0 / 0
Poor Image Quality - Night Lighting	10 / 2	6 / 1	0 / 0	6 / 3	-	13 / 1	0 / 0
Poor Image Quality - Out of Focus	7 / 1	0 / 0	0 / 0	0 / 0	-	0 / 0	0 / 0
Poor Image Quality - Poor Camera Angles	1 / 1	4 / 1	0 / 0	24 / 1	-	1 / 1	0 / 0
Poor Image Quality - Poor Camera Resolution	28 / 1	0 / 0	0 / 0	0 / 0	-	0 / 0	0 / 0
Poor Image Quality - Water Spots	9 / 1	0 / 0	0 / 0	2 / 2	-	0 / 0	0 / 0
Unclosed Video Files	0 / 0	2 / 1	0 / 0	0 / 0	-	0 / 0	0 / 0
Total	62 / 4	49 / 2	0 / 0	32 / 3	-	16 / 2	0 / 0
Reason for Unusable Data from Video (Number of Hauls / Number of Vessels)							
Camera Failure - Incomplete data	6 / 2	0 / 0	2 / 1	0 / 0	-	0 / 0	0 / 0
Poor Image Quality - Poor Camera Angles	0 / 0	0 / 0	1 / 1	0 / 0	-	0 / 0	0 / 0
Total	6 / 2	0 / 0	3 / 1	0 / 0	-	0 / 0	0 / 0
Reason for No Video - System is recording sensor data but video has failed (Number of Hauls / Number of Vessels)							
Complete Power Failure	0 / 0	1 / 1	0 / 0	0 / 0	-	3 / 1	2 / 1
Drive Filled	2 / 1	0 / 0	0 / 0	2 / 1	-	14 / 2	0 / 0
Installation Error - Video Recording Not Activated	0 / 0	0 / 0	0 / 0	0 / 0	-	0 / 0	9 / 1
Power Failure to Cameras	0 / 0	0 / 0	7 / 1	0 / 0	-	0 / 0	11 / 1
VMS Interference	1 / 1	0 / 0	0 / 0	0 / 0	-	0 / 0	0 / 0
Total	3 / 2	1 / 1	7 / 1	2 / 1	-	17 / 3	22 / 2
Reason for Missed Trips (Number of Trips / Number of Vessels)							
Behavioral - System Not On	0 / 0	2 / 1	1 / 1	1 / 1	-	31 / 3 *	33 / 1
Technical - Recording Not Activated	0 / 0	0 / 0	0 / 0	0 / 0	-	0 / 0	3 / 1
Technical - System Failure	0 / 0	0 / 0	1 / 1	0 / 0	-	0 / 0	0 / 0
Technical - VMS Interference	9 / 2	0 / 0	0 / 0	0 / 0	-	0 / 0	7 / 1
Total	9 / 2	2 / 1	2 / 1	1 / 1	-	31 / 3	43 / 3

- Confidential data

* 27 from one vessel

Table 2. Summary of aggregated recorded catch by the catch monitor and the video reviewer in 2012 Fixed gear (counts only), 2013 fixed gear (counts and weights), and 2013 bottom trawl (weights only).

	BottomTrawl - 2013				FixedGear - 2012				FixedGear - 2013							
	Weight				Count				Count				Weight			
	Discarded		Retained		Discarded		Retained		Discarded		Retained		Discarded		Retained	
IFQ Complex	CM	Video	CM	Video	CM	Video	CM	Video	CM	Video	CM	Video	CM	Video	CM	Video
Lingcod	**3,494**	**3,488**	**3,783**	**3,936**												
Pacific Hake	**4,412**	**4,730**	**480**	**3,565**					**30**	**10**			**61**	**16**		
Pacific Halibut	**1,570**	**1,335**														
Sablefish	**123**	**145**	**38,278**	**42,306**	**458**	**438**	**41,653**	**40,346**	**1,436**	**1,362**	**51,742**	**52,202**	**6,497**	**5,069**	**274,357**	**258,771**
Flatfish																
Arrowtooth Flounder	7,391	5,825	12,740	14,225		4		4	1			1	15			6
Dover Sole	790	233	117,460	126,486	123	76	99	22	28	22	88	114	55	49	133	246
English Sole	734	706	3,728	2,682												
Petrale Sole	32	16	134,621	98,091					2		9		3		14	
Starry Flounder		3	70	40												
Other Flatfish	2,994	1,351	10,806	15,260					3		1	13	2		1	24
Unidentified Flatfish		831		5,485		29		45				1				1
NonIFQ	1,736	1,264		6					5	3	1	1	6	6	1	1
Flatfish Total	**13,676**	**10,229**	**279,425**	**262,275**	**123**	**109**	**99**	**71**	**39**	**25**	**99**	**130**	**81**	**55**	**149**	**278**
Rockfish and Thornyheads																
Rockfish																
Bocaccio Rockfish			632	413												
Canary Rockfish			257	286												
Chilipepper Rockfish	12	3	5,415	5,973												
Cowcod Rockfish			33	44												
Darkblotched Rockfish	9	5	1,326	1,156								5				12
Pacific Ocean Perch Rockfish		1	333	190							1				2	
Splitnose Rockfish	14,234	29	1,225													
Widow Rockfish			2	9												
Yelloweye Rockfish			7	8												
Yellowtail Rockfish			60	25												
Minor Shelf Rockfish	1,238	1	18	300								1				2
Minor Slope Rockfish	468	5	20,174	14,095	203	1	3,622	20	55	44	1,947	1,834	110	90	4,112	4,820
Unidentified Rockfish		12,036	6,375	19,204		178		3,317		17		77		25		184
NonIFQ	15															
Rockfish Total	**15,976**	**12,079**	**35,858**	**41,702**	**203**	**179**	**3,622**	**3,337**	**55**	**61**	**1,948**	**1,917**	**110**	**115**	**4,113**	**5,018**
Thornyheads																
Longspine Thornyhead	147		57,795	12	6				38				16			
Shortspine Thornyhead	267	6	42,495	28,929	19	8	107	91	11	8	57	48	43	48	222	154
Mixed Thornyhead		235		63,829		7		6		23		14		13		26
Thornyheads Total	**414**	**241**	**100,290**	**92,770**	**25**	**15**	**107**	**97**	**49**	**31**	**57**	**62**	**59**	**61**	**222**	**179**
Rockfish and Thornyheads Total	**16,390**	**12,320**	**136,148**	**134,471**	**228**	**194**	**3,729**	**3,434**	**104**	**92**	**2,005**	**1,979**	**169**	**176**	**4,336**	**5,197**
Groundfish Unidentified		**3**		**33,501**												
Grand Total	**39,664**	**32,249**	**458,114**	**480,053**	**809**	**741**	**45,481**	**43,851**	**1,609**	**1,489**	**53,846**	**54,311**	**6,807**	**5,316**	**278,842**	**264,245**

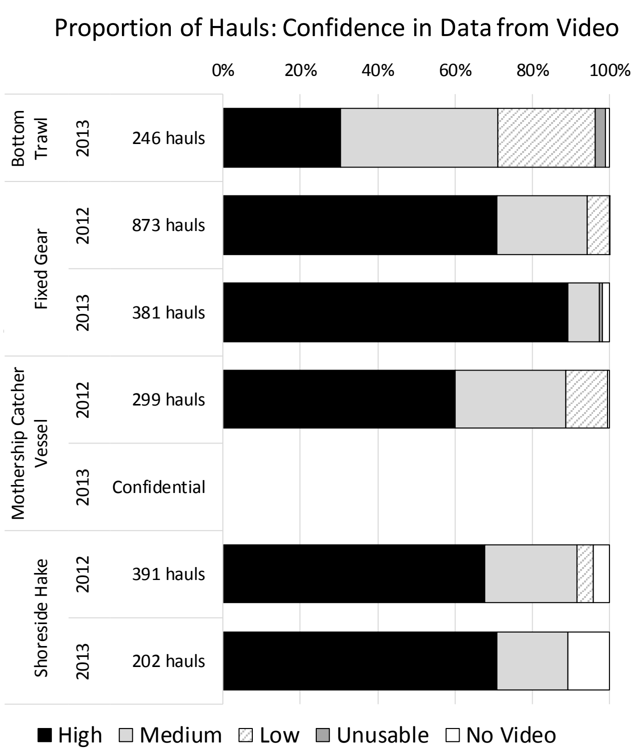
Table 3. Summary of number of discard events (haul counts) in the compliance monitor and video data, and the catch weight that they represent in the mothership catcher vessel and shoreside hake fisheries.

Hauls with Discards in		Mothership Catcher Vessel - 2012 Number of Discard Events	Mothership Catcher Vessel - 2012 Discard (lbs)	Shoreside Hake - 2012 Number of Discard Events	Shoreside Hake - 2012 Discard (lbs)	Shoreside Hake - 2013 Number of Discard Events	Shoreside Hake - 2013 Discard (lbs)
Both Datasets		22		4		15	
	Compliance Monitor		24,650		62,690		45,709
	Video		52,790		77,000		55,233
the Compliance Monitor Dataset but not the Video Dataset		4	5,000	18	14,499	26	7,579
the Video Dataset but not the Compliance Monitor Dataset		115	83,420	8	55,255	59	34,500
Total Number of Discard Events in Each Dataset	Compliance Monitor	26	29,650	22	77,189	41	53,288
	Video	137	136,210	12	132,255	74	89,733

Figures

For all catch comparison figures (figures 2 through 30), the dashed grey line is the video = compliance monitor (or official catch) line. If video and compliance monitor counts agreed, the point would fall on the dashed line. The solid line is a fitted trend line to give a snapshot of the relationship between the two datasets. If the trend line falls below the video = compliance monitor line, compliance monitor estimates tend to be larger than video estimates. If the trend line falls above the video = compliance monitor line, compliance monitor estimates tend to be smaller than video estimates.

Figure 1. Distribution of confidence in data from video in all fisheries in all years (left). For hauls labeled low confidence, distribution of reason for low confidence in video (right).



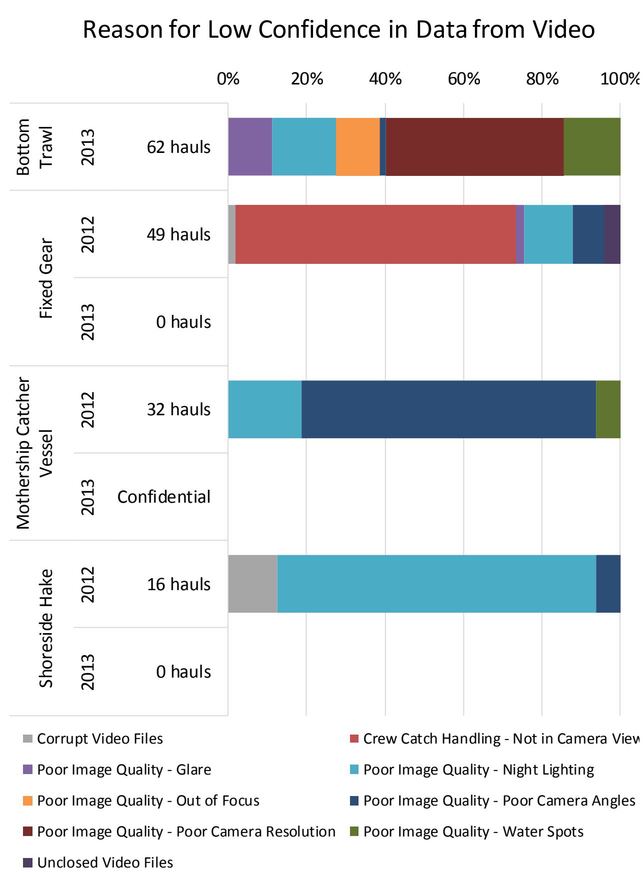


Figure 2. Shoreside Hake 2012. Comparing on-board compliance monitor haul level retained catch estimates with video reviewer estimates.

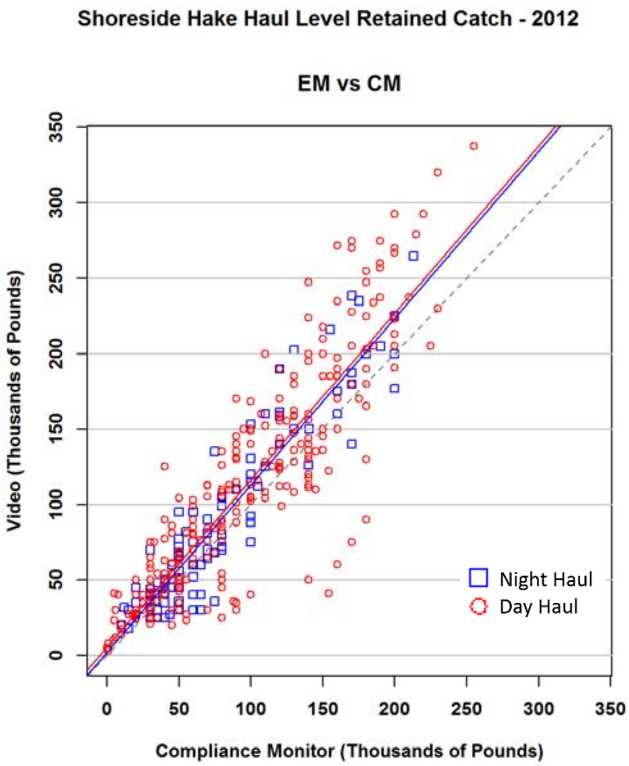


Figure 3. Shoreside Hake 2012. Comparison of compliance monitor and video discarded catch weight of all species aggregated to the haul level. Figure b. is the same data as figure a. with different axis scales to show the data clustered in the bottom left corner of figure a.

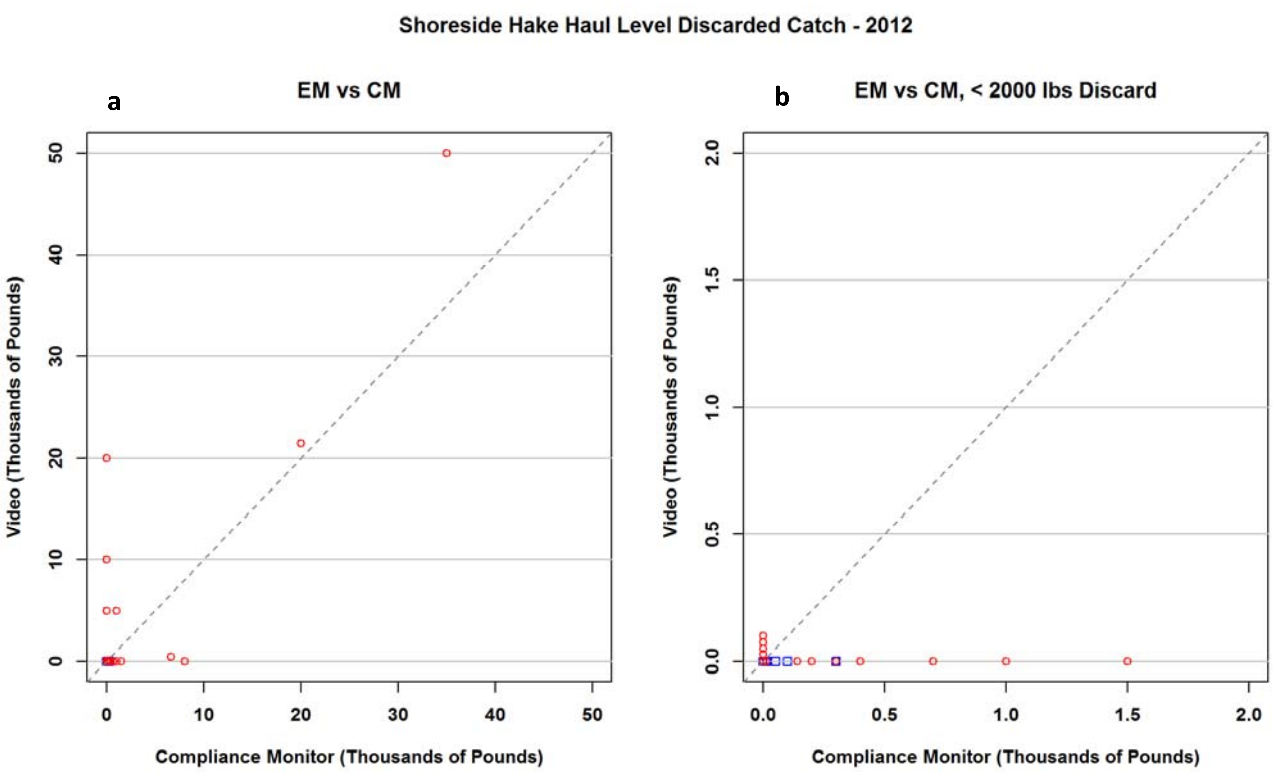


Figure 4. Shoreside Hake 2013. Comparing on-board compliance monitor haul level retained catch estimates with video reviewer estimates.

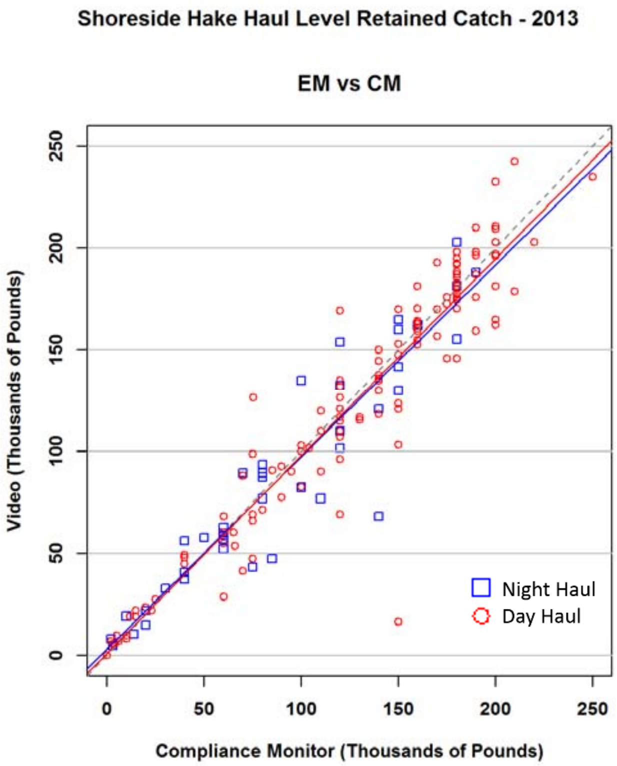


Figure 5. Shoreside Hake 2013. Comparison of compliance monitor and video discarded catch weight of all species aggregated to the haul level. Figure b. is the same data as figure a. with different axis scales to show the data clustered in the bottom left corner of figure a.

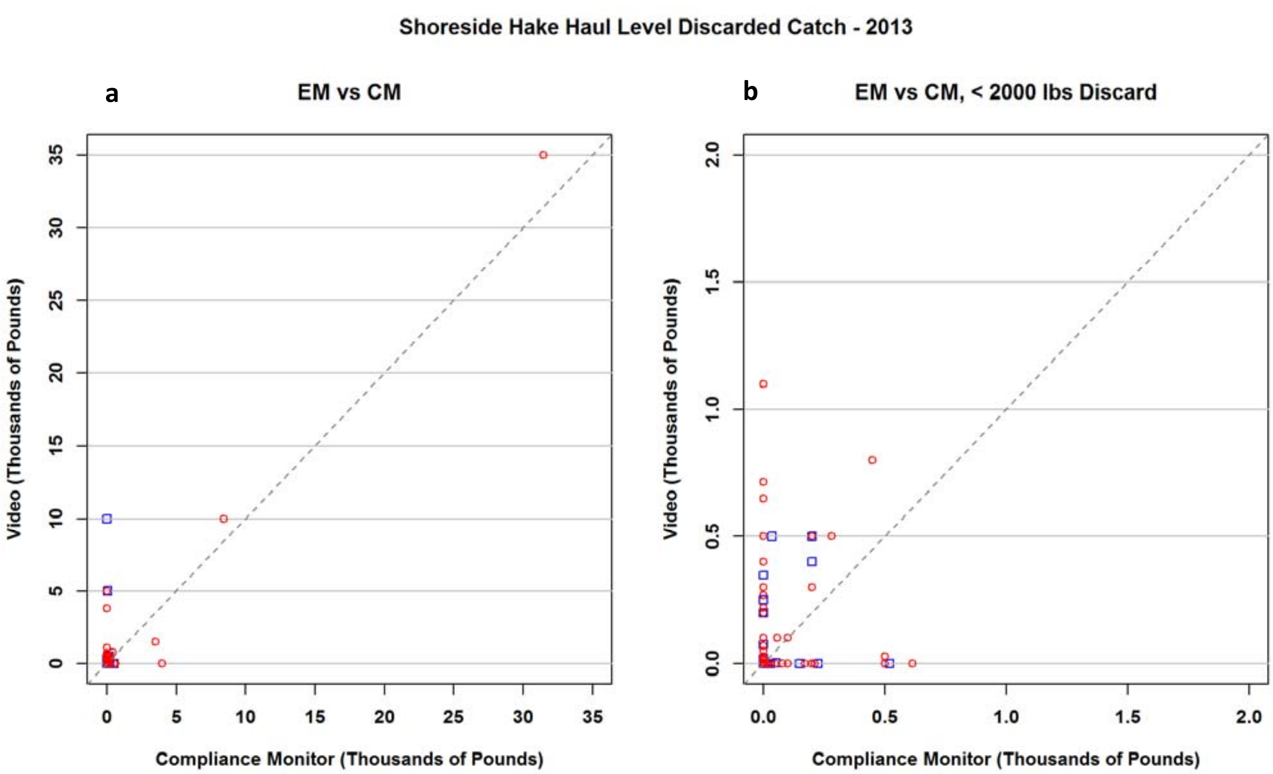


Figure 6. Shoreside Hake 2012. Comparison of video retained catch weight to: a. official landings on fish tickets (FT) and b. compliance monitor retained catch weight of all species aggregated to the trip level.

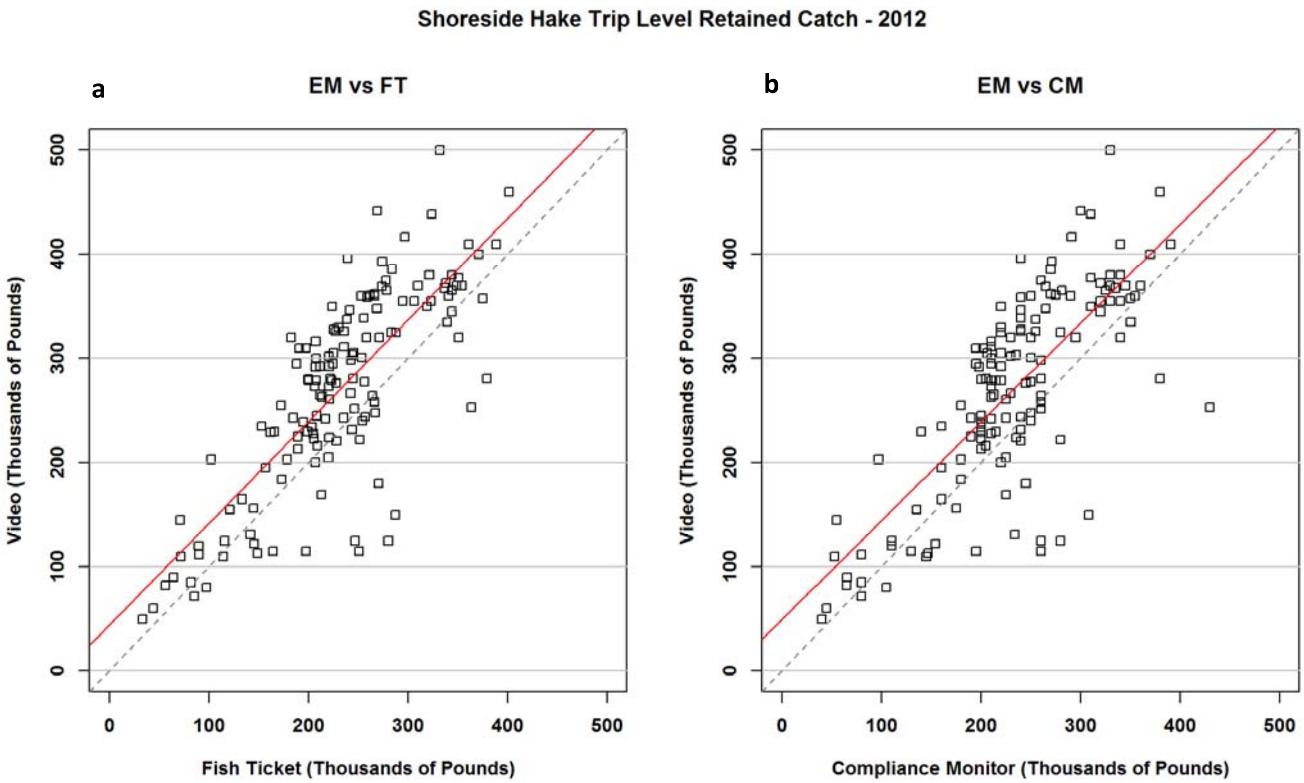


Figure 7. Shoreside Hake 2013. Comparison of video retained catch weight to: a. official landings on fish tickets (FT) and b. compliance monitor retained catch weight of all species aggregated to the trip level.

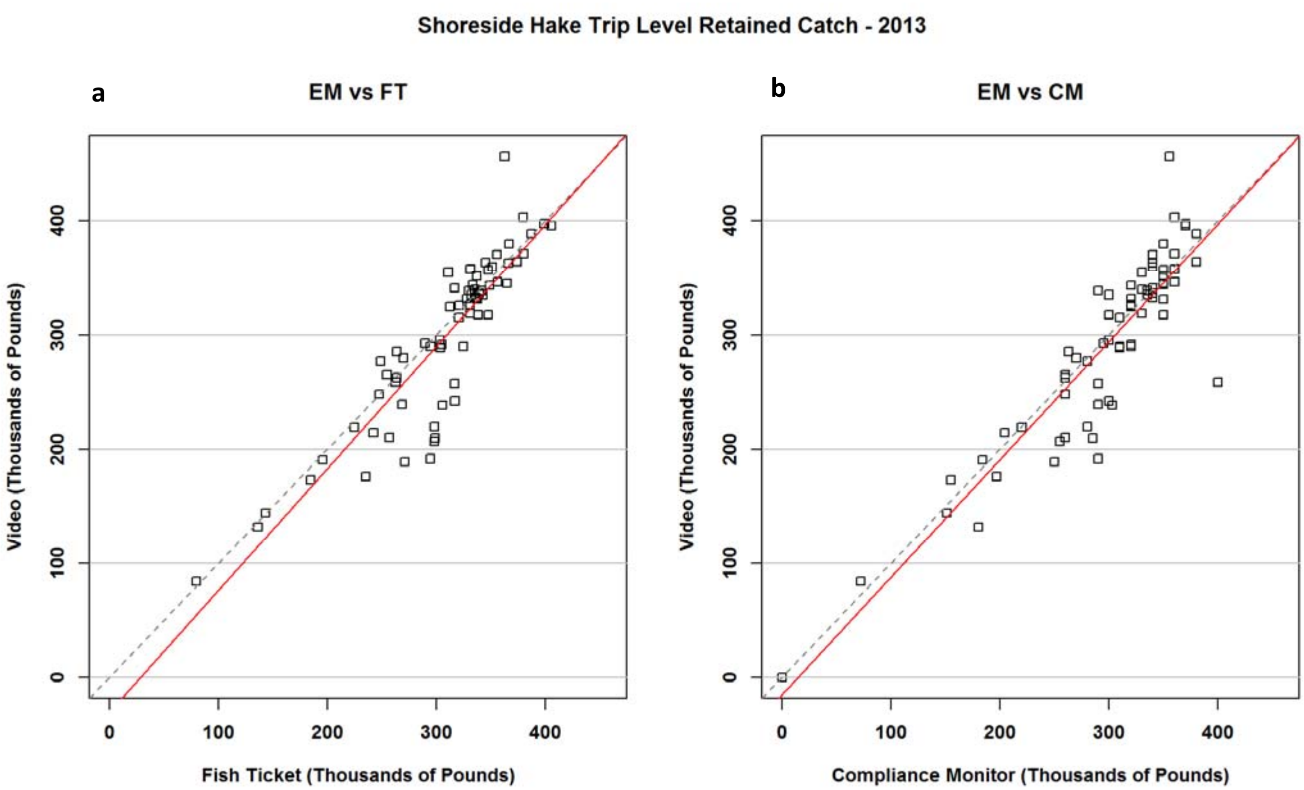


Figure 8. Mothership Catcher Vessel 2012. Comparison of video retained catch weight to: a. compliance monitor and b. official catch from NORPAC retained catch weight of all species aggregated to the haul level.

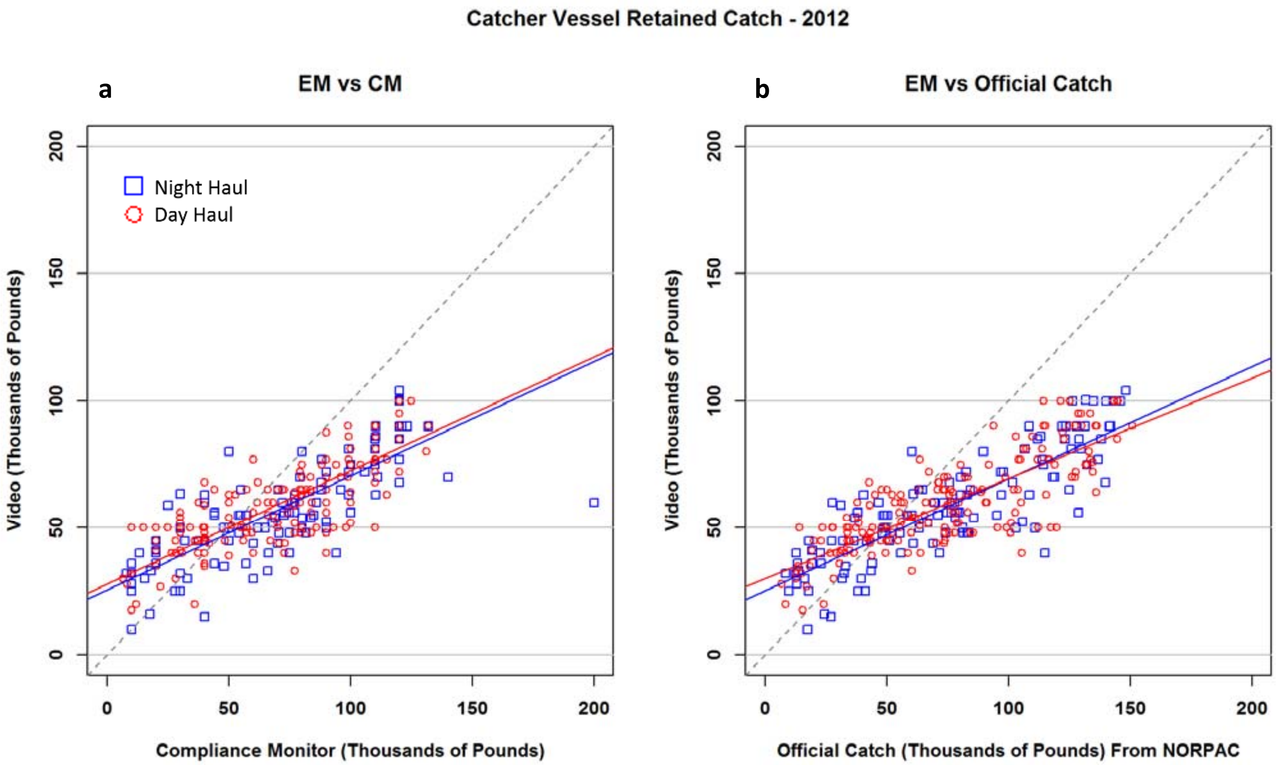


Figure 9. Mothership Catcher Vessel 2012. Comparison of compliance monitor and video discarded catch weight of all species aggregated to the haul level. Figure b. is the same data as figure a. with different axis scales to show the data clustered in the bottom left corner of figure a.

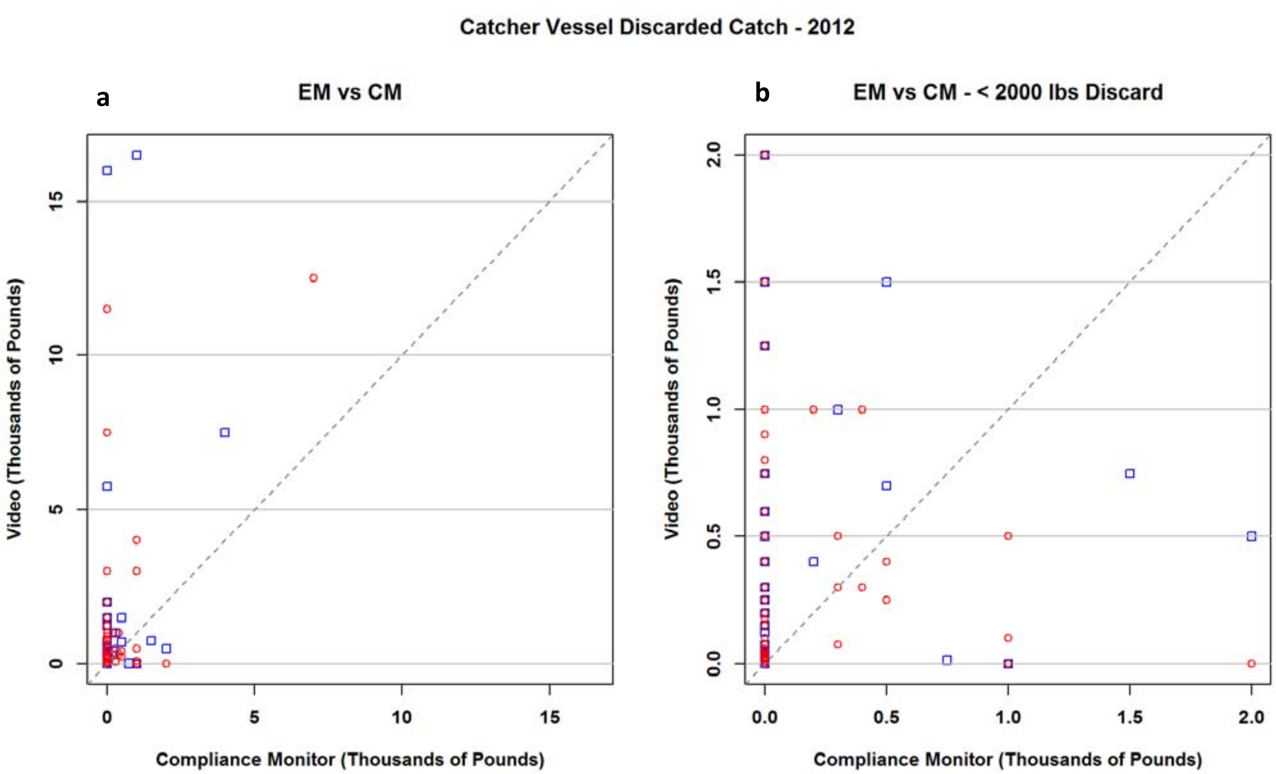
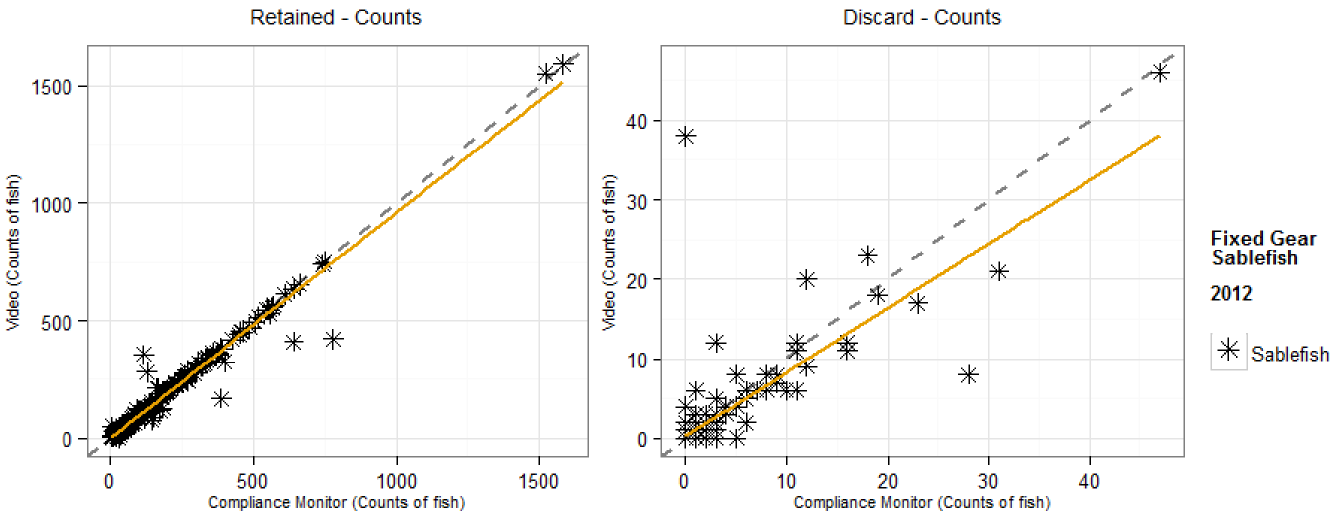


Figure 10. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Sablefish at the haul level. No weight estimates were made in 2012.

2012 Results



2013 Results

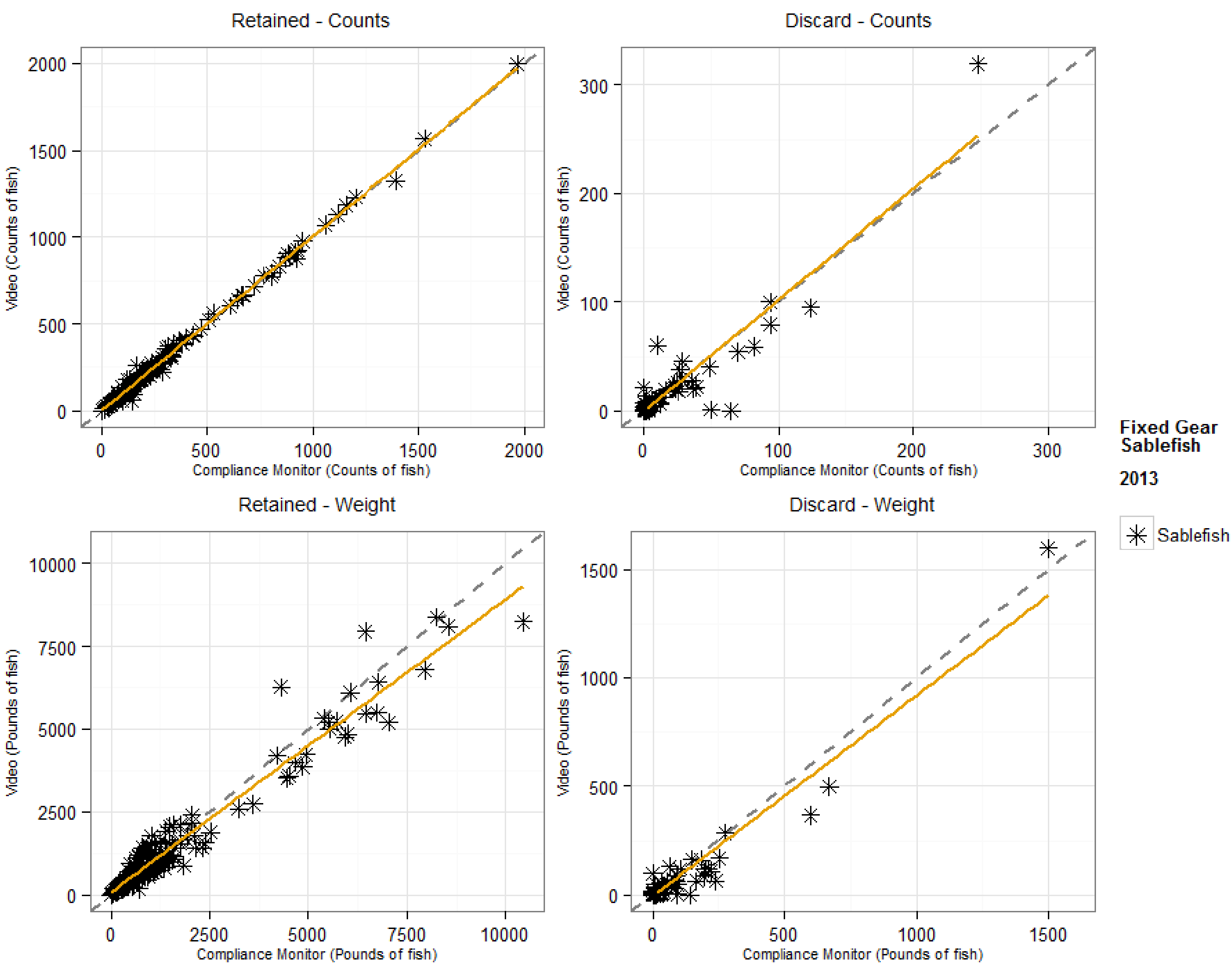


Figure 11. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Pacific hake at the haul level. No weight estimates were made in 2012.

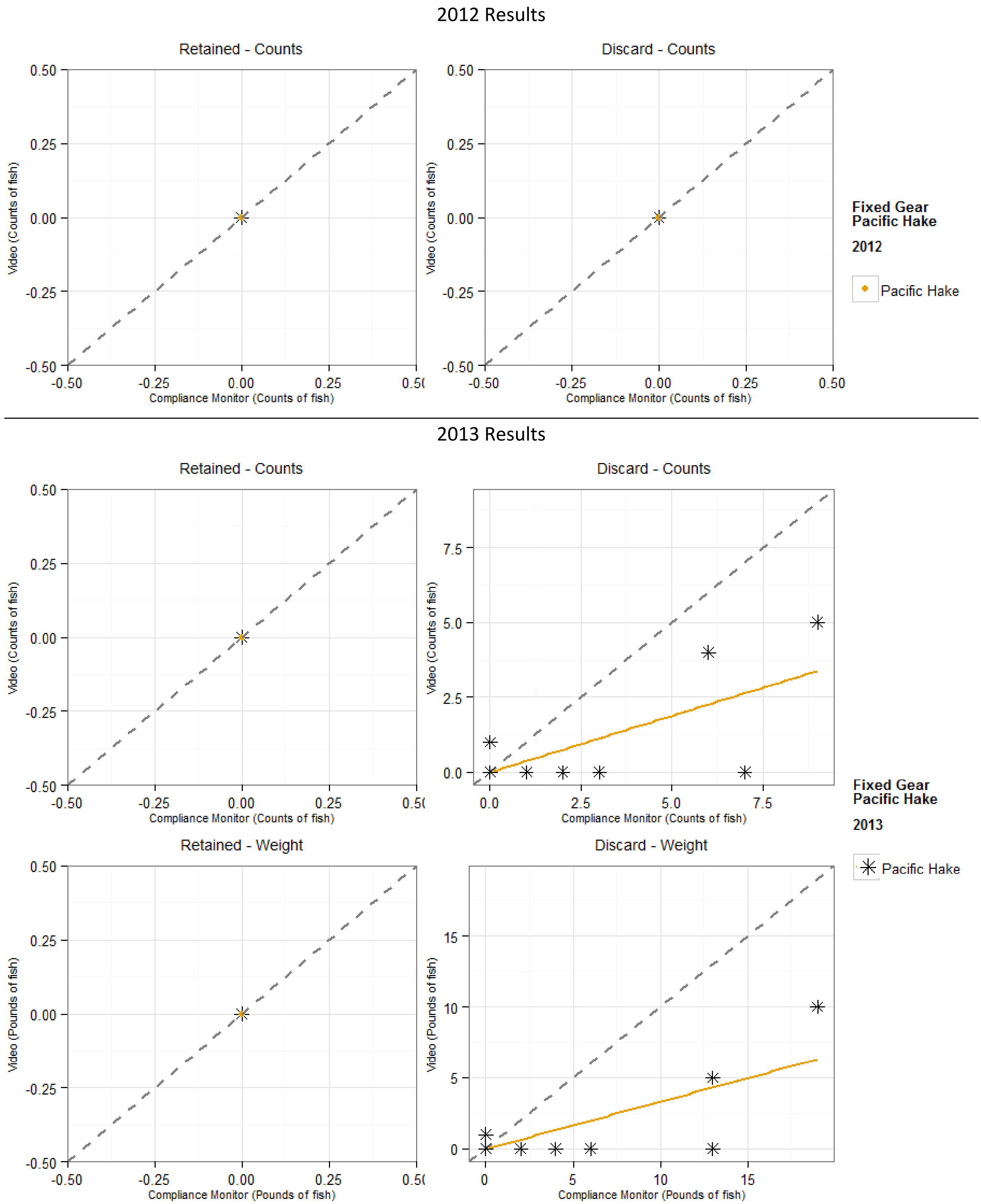


Figure 12. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of flatfish aggregated to the group and the individual component IFQ complexes at the haul level. No weight estimates were made in 2012.

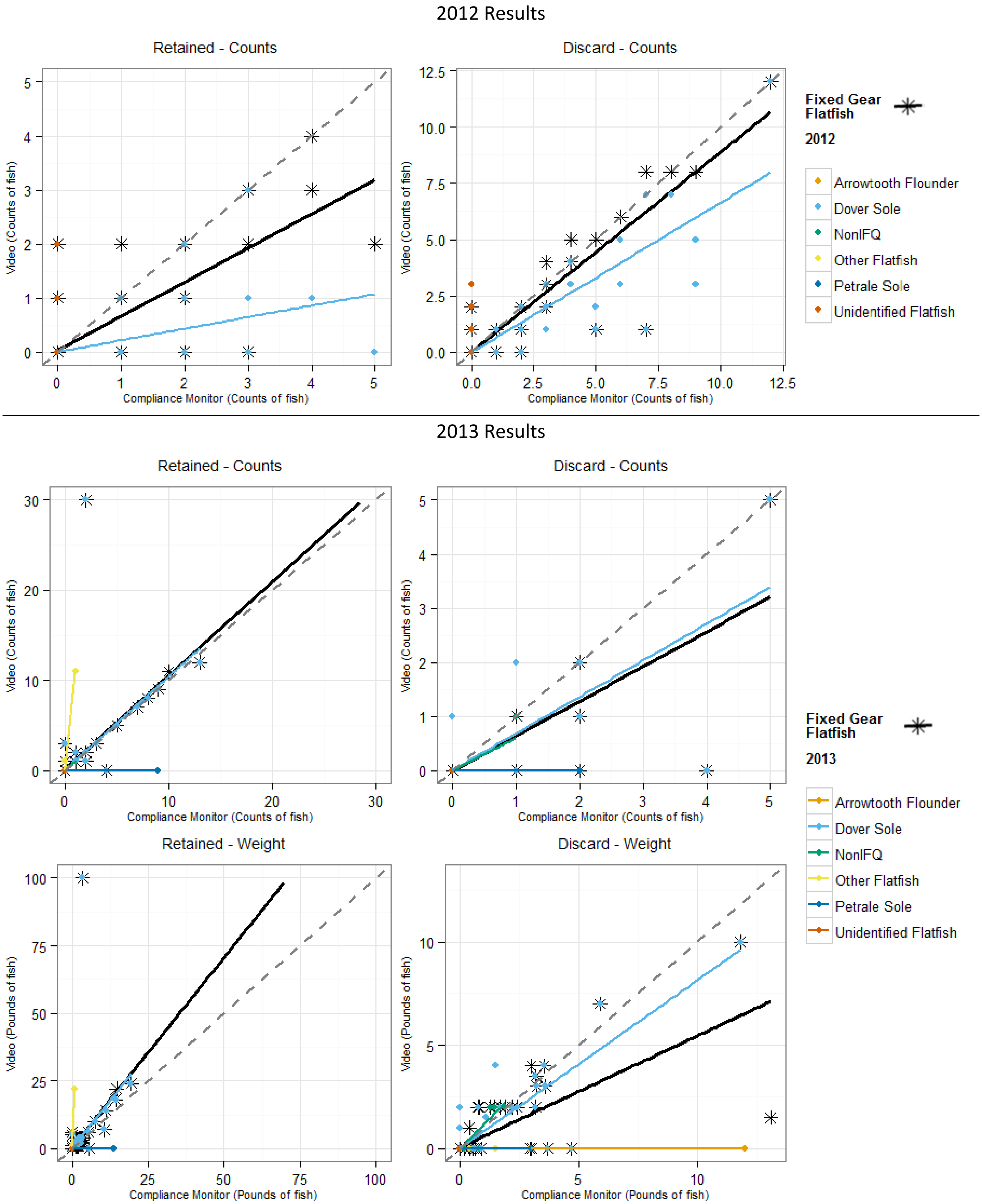
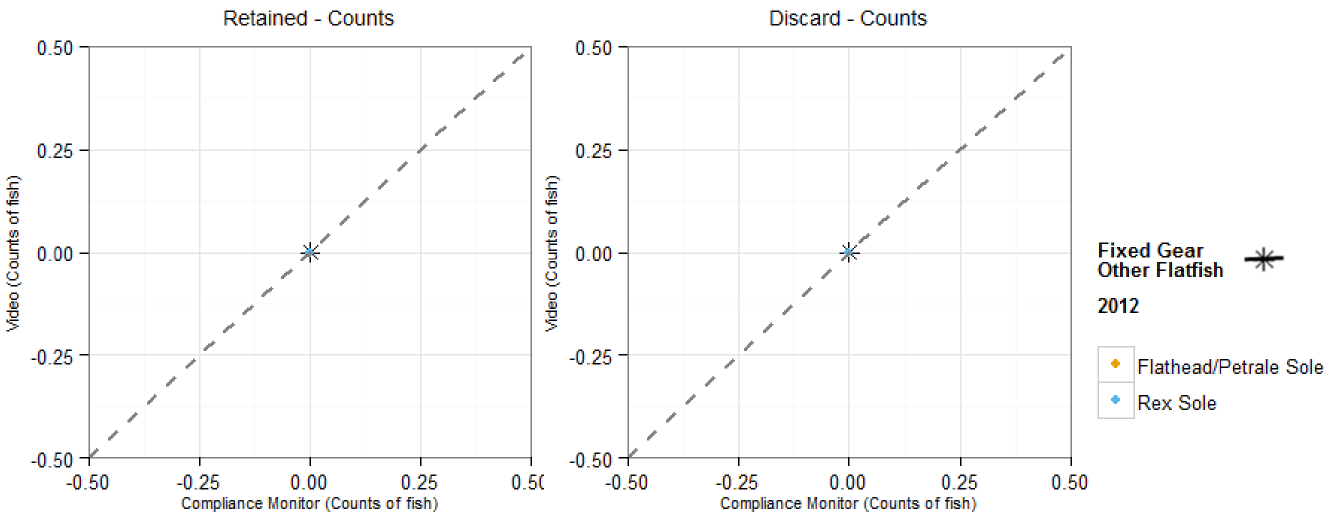


Figure 13. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Other Flatfish aggregated to the IFQ complex and the individual component species at the haul level. No weight estimates were made in 2012.

2012 Results



2013 Results

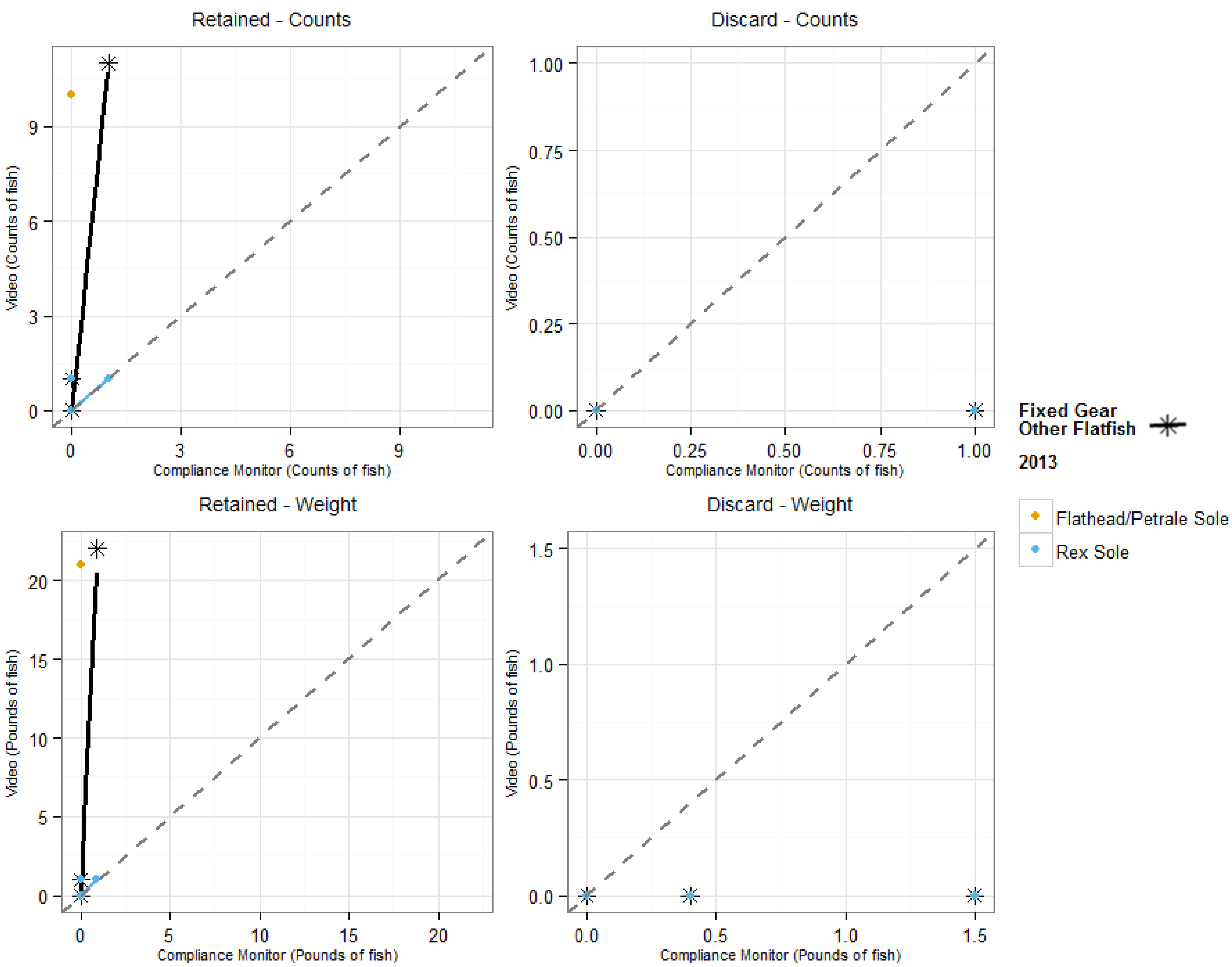


Figure 14. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Rockfish and Thornyheads aggregated to the group and the individual component IFQ complexes at the haul level. No weight estimates were made in 2012.

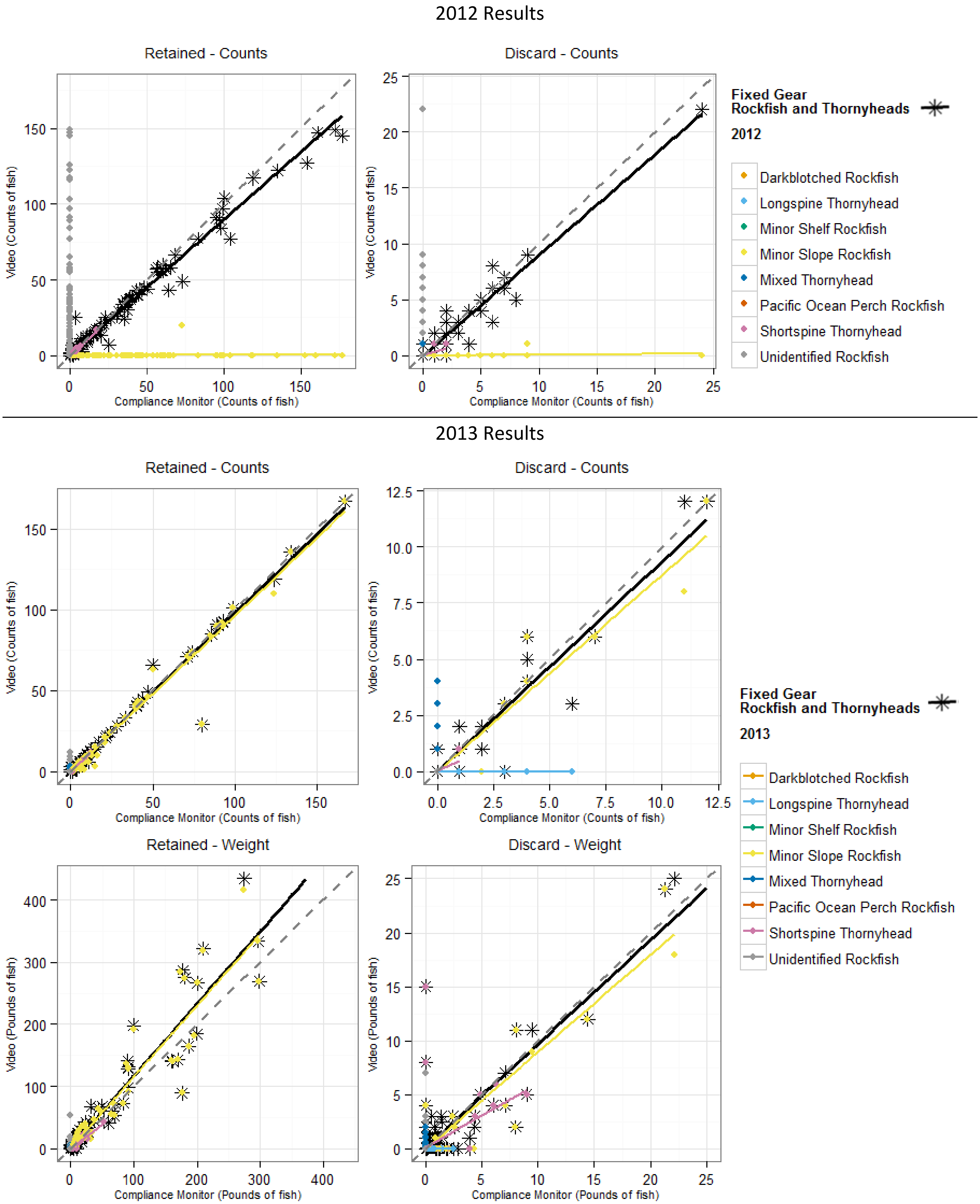


Figure 15. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Rockfish aggregated to the group and the individual component IFQ complexes at the haul level. No weight estimates were made in 2012.

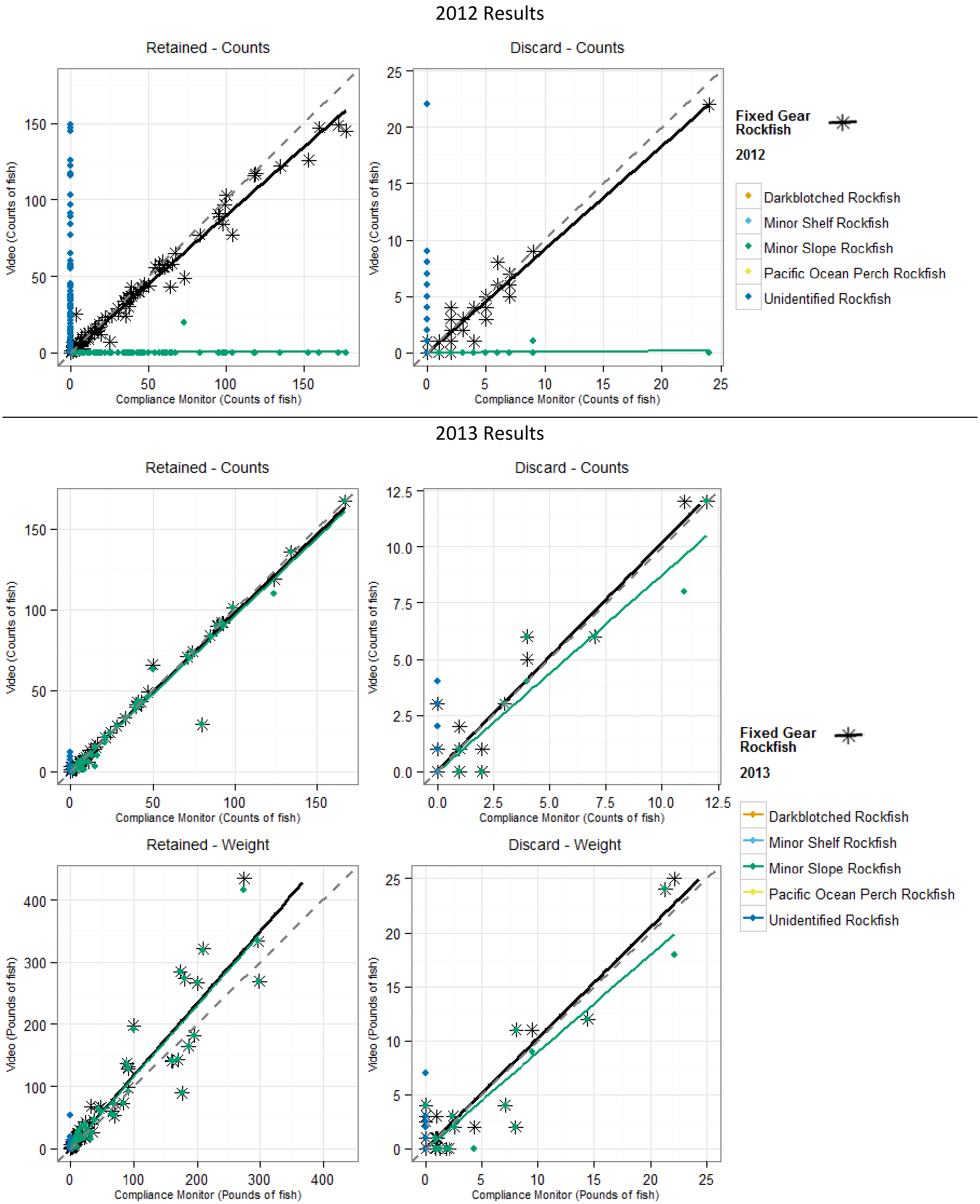
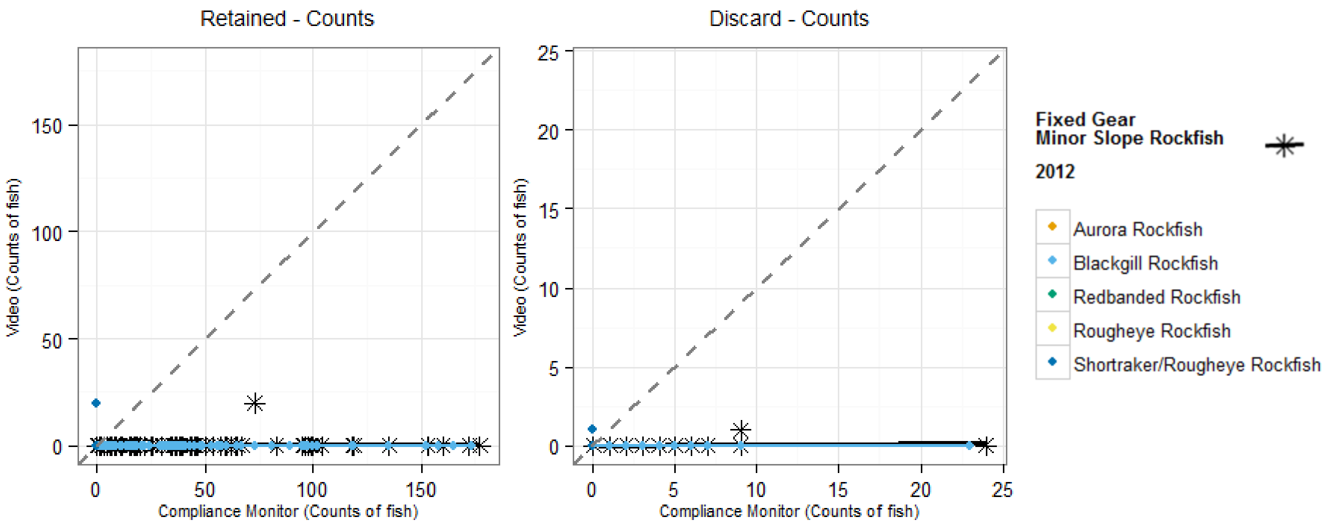


Figure 16. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Minor Slope Rockfish aggregated to the IFQ complex and the individual component species at the haul level. No weight estimates were made in 2012.

2012 Results



2013 Results

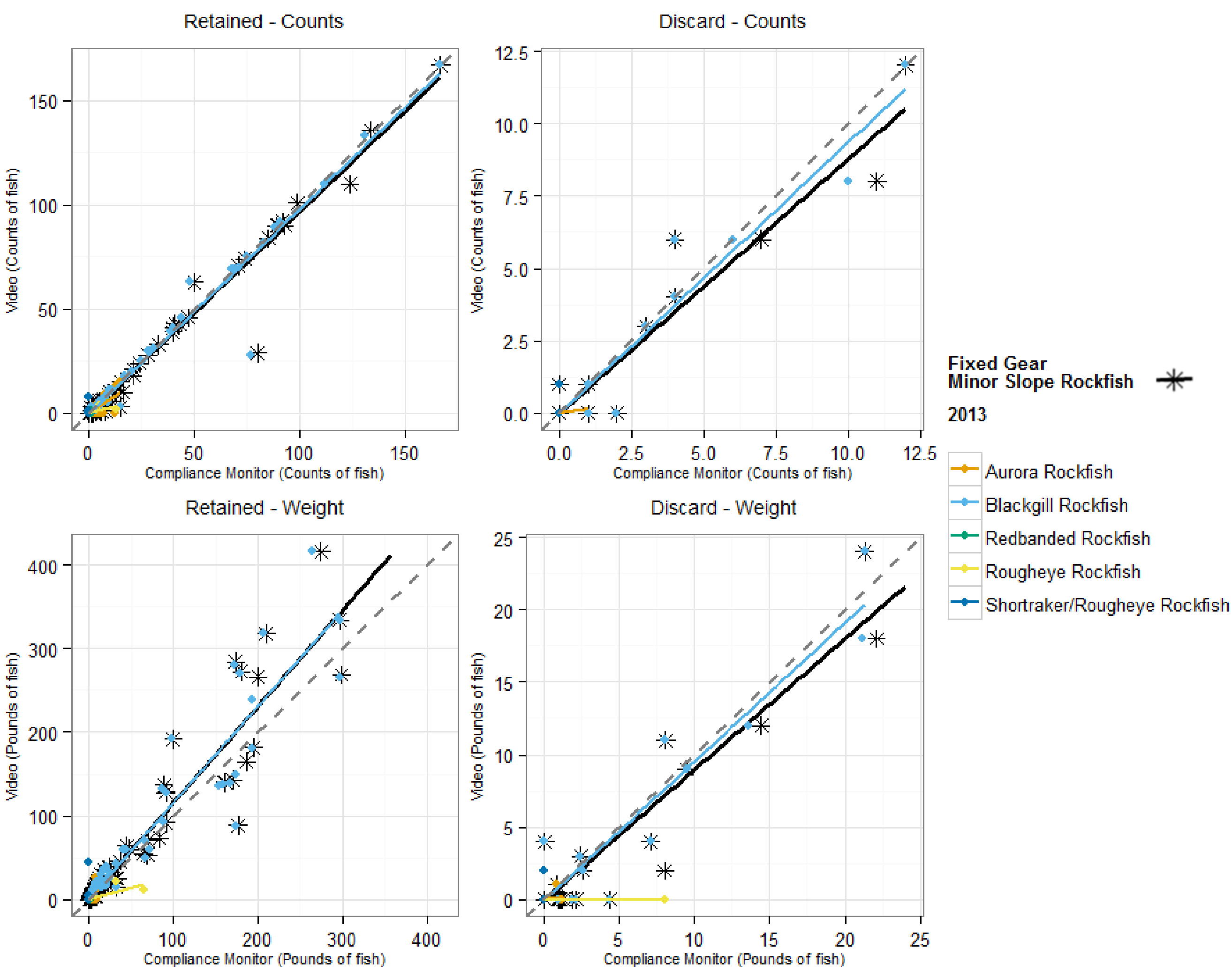


Figure 17. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of Thornyheads aggregated to the group and the individual component IFQ complexes at the haul level. No weight estimates were made in 2012.

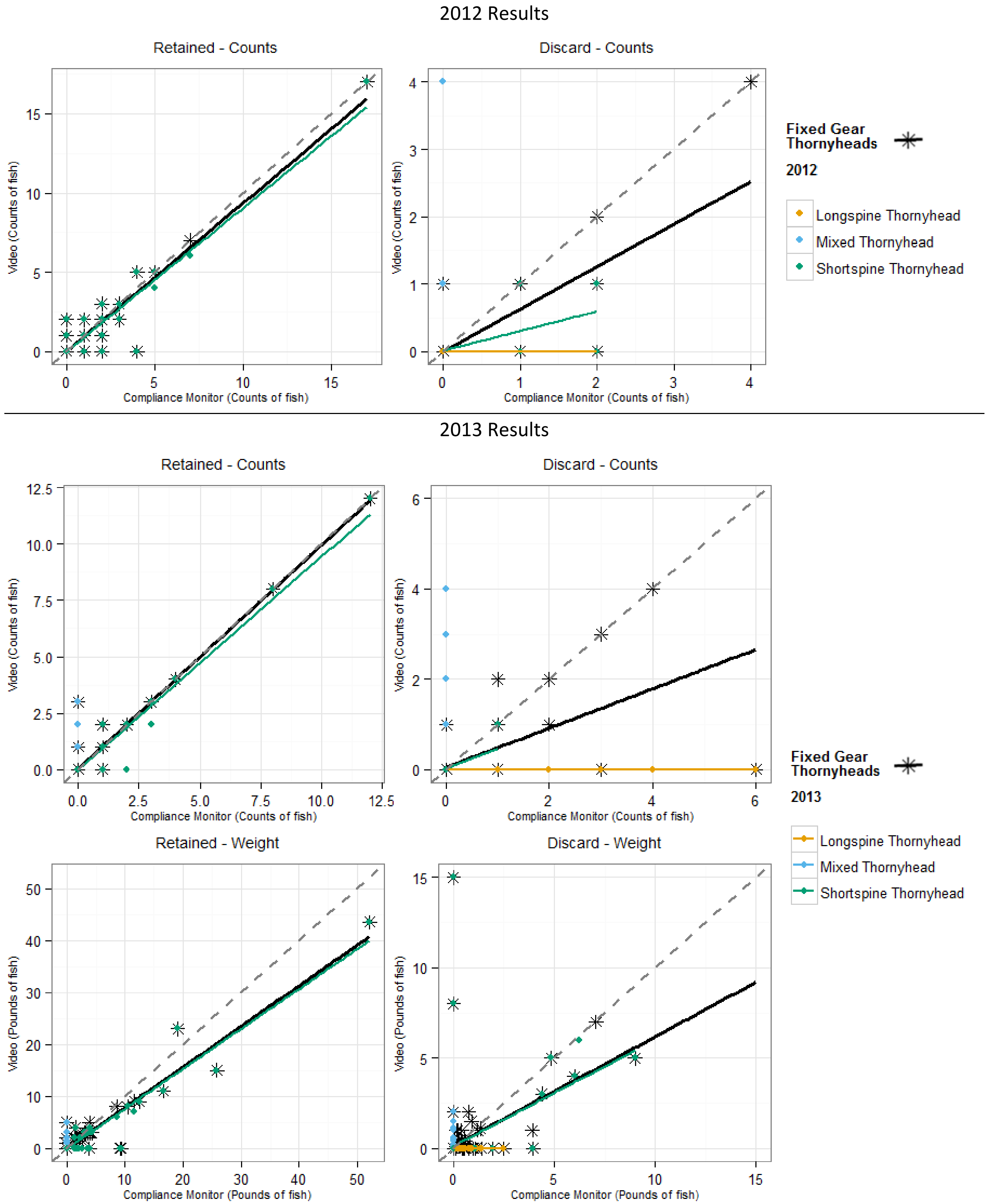
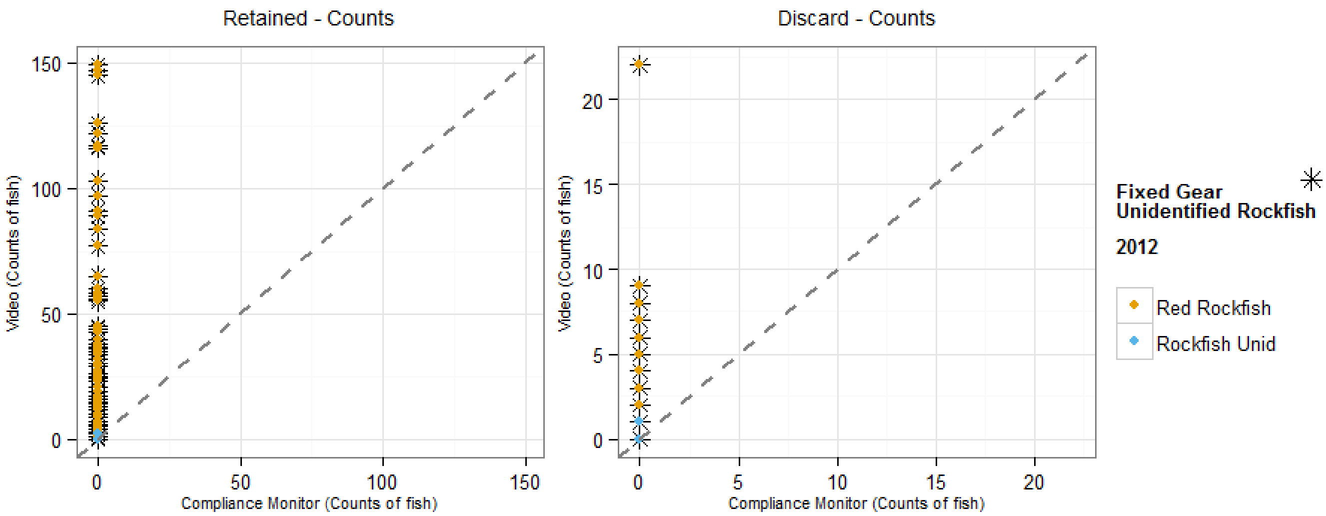


Figure 18. Fixed Gear. Comparison of compliance monitor and video retained and discarded catch counts and weights of unidentified Rockfish aggregated to the group and the individual component identified group at the haul level. No weight estimates were made in 2012.

2012 Results



2013 Results

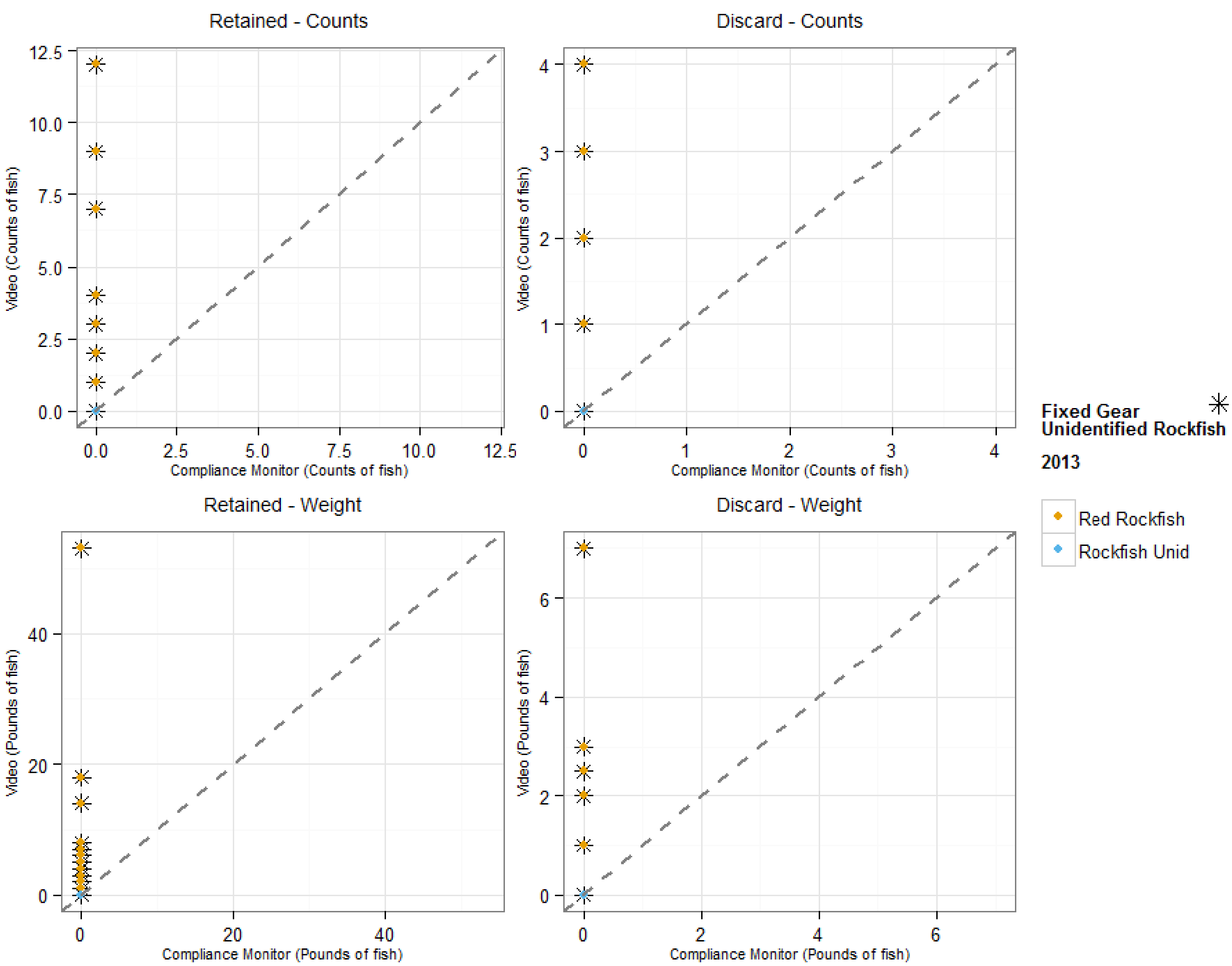


Figure 19. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Sablefish at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

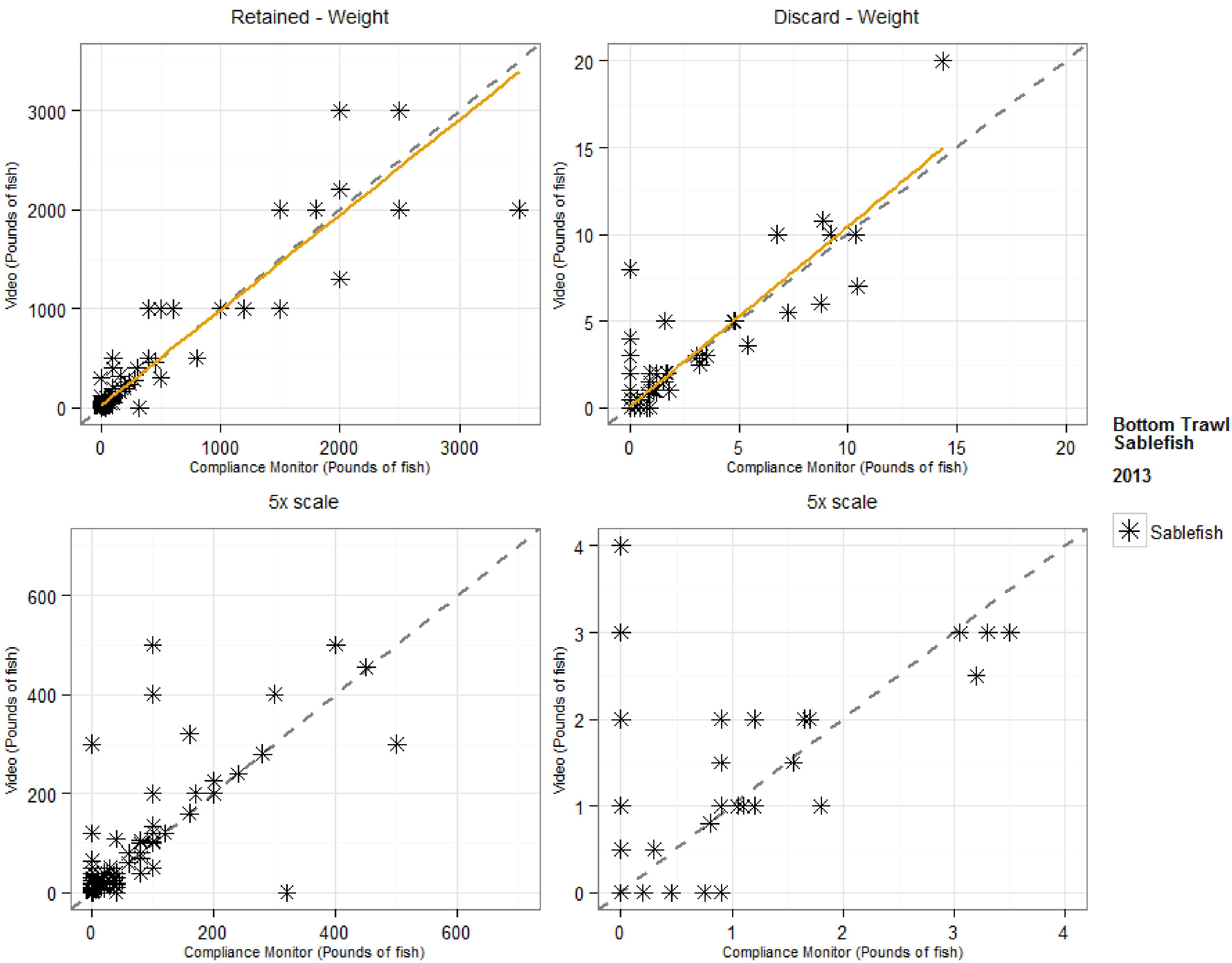


Figure 20. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Pacific Hake at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

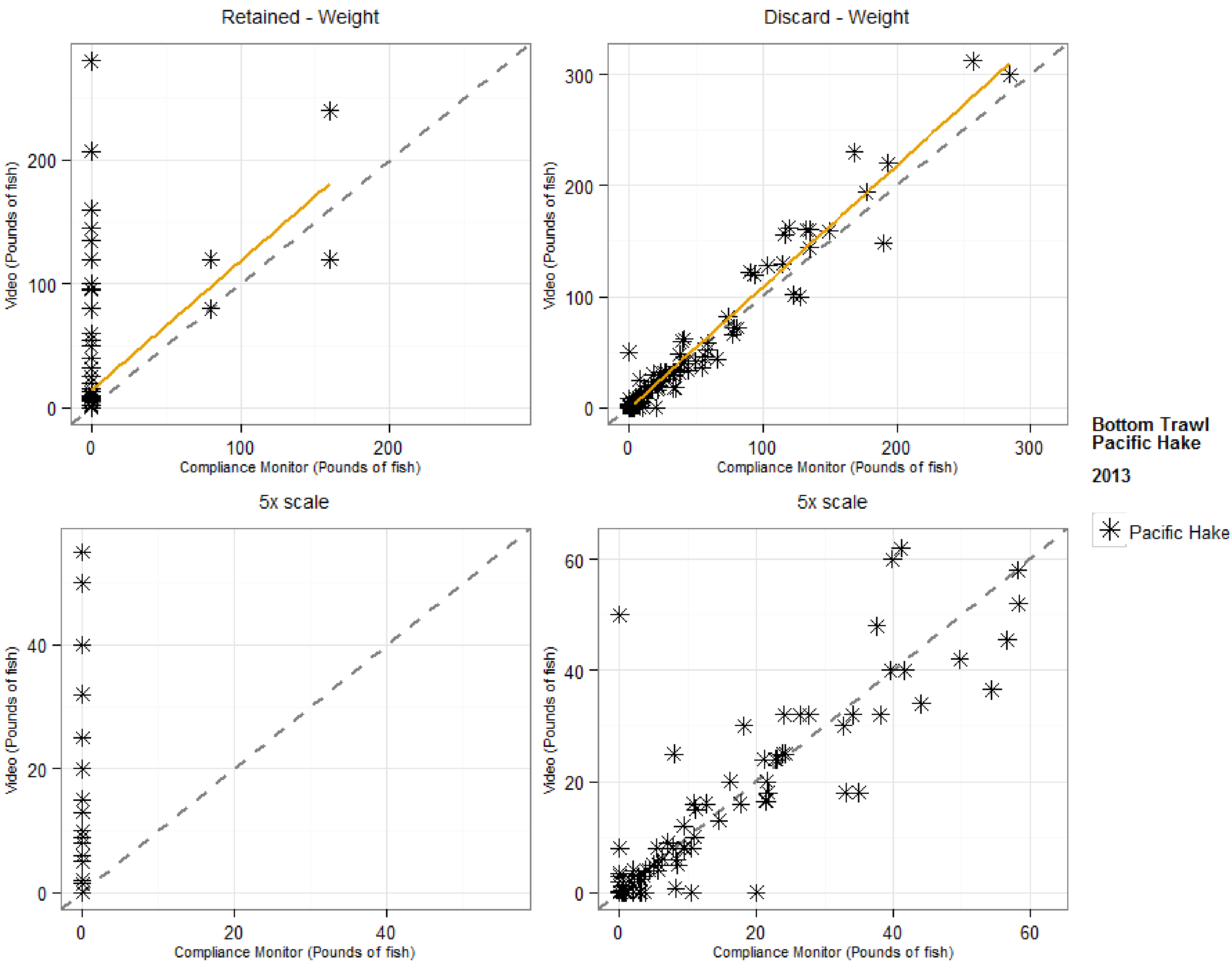


Figure 21. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Lingcod at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

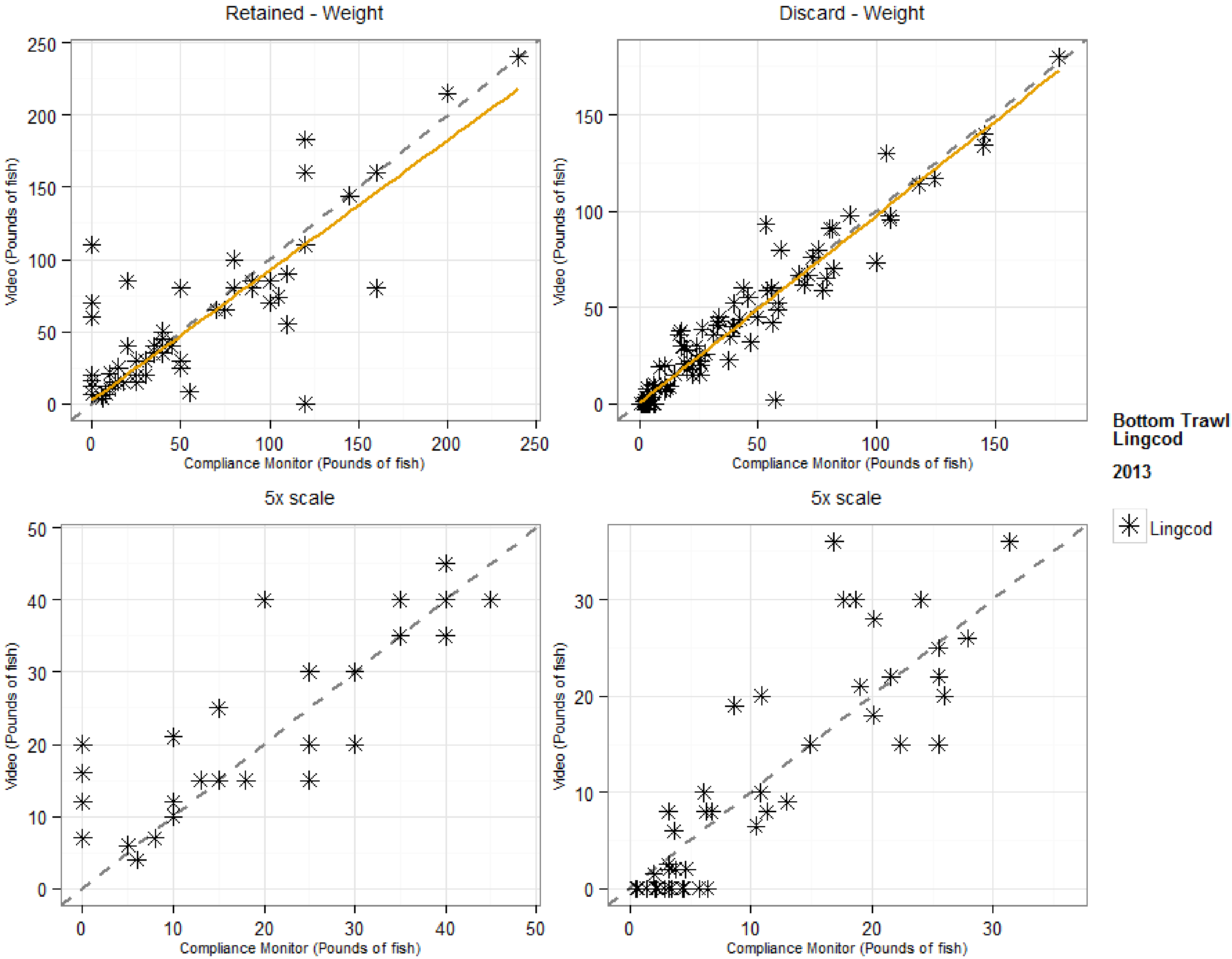


Figure 22. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Pacific Halibut at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

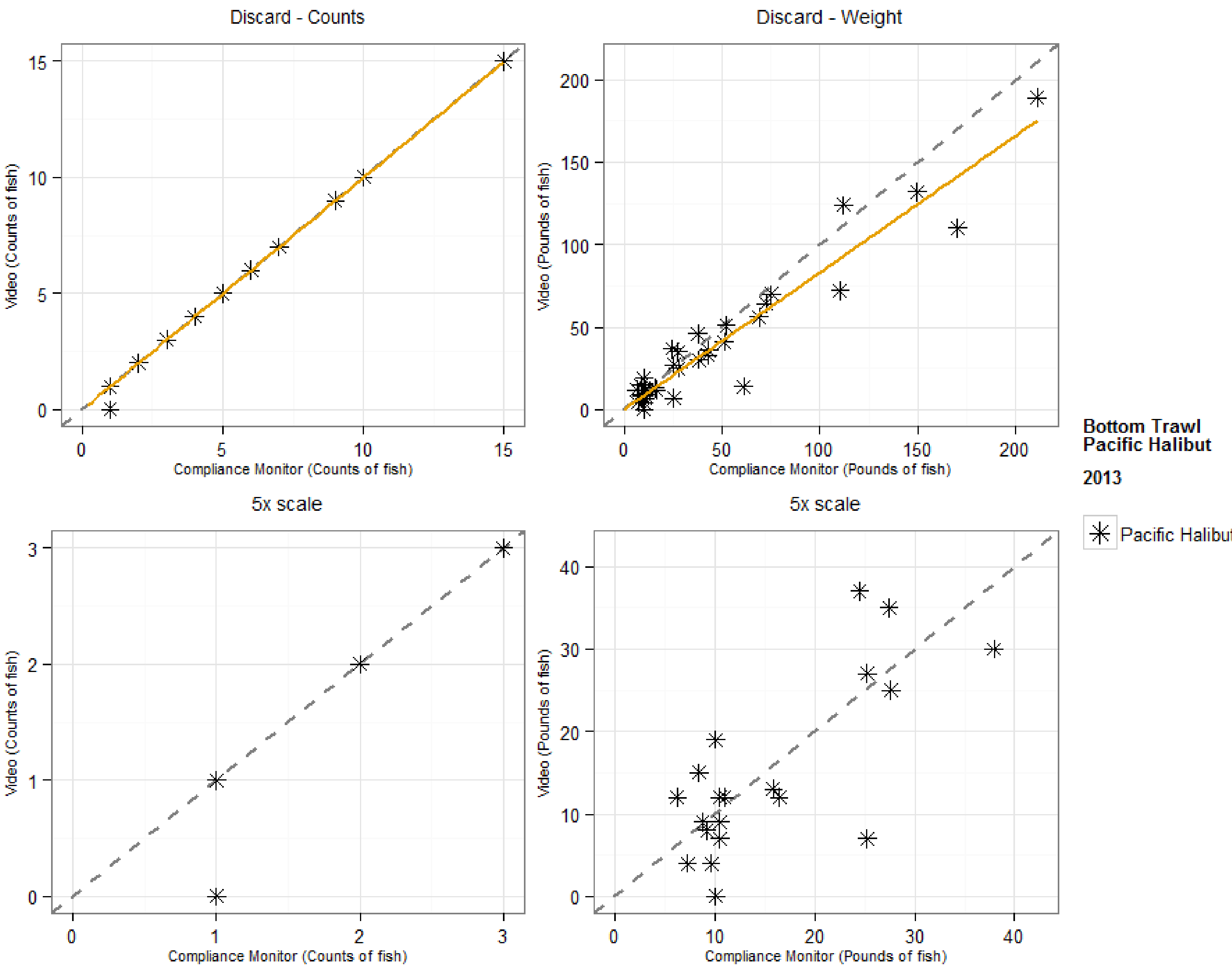


Figure 23. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Flatfish aggregated to the group and the individual component IFQ complexes at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

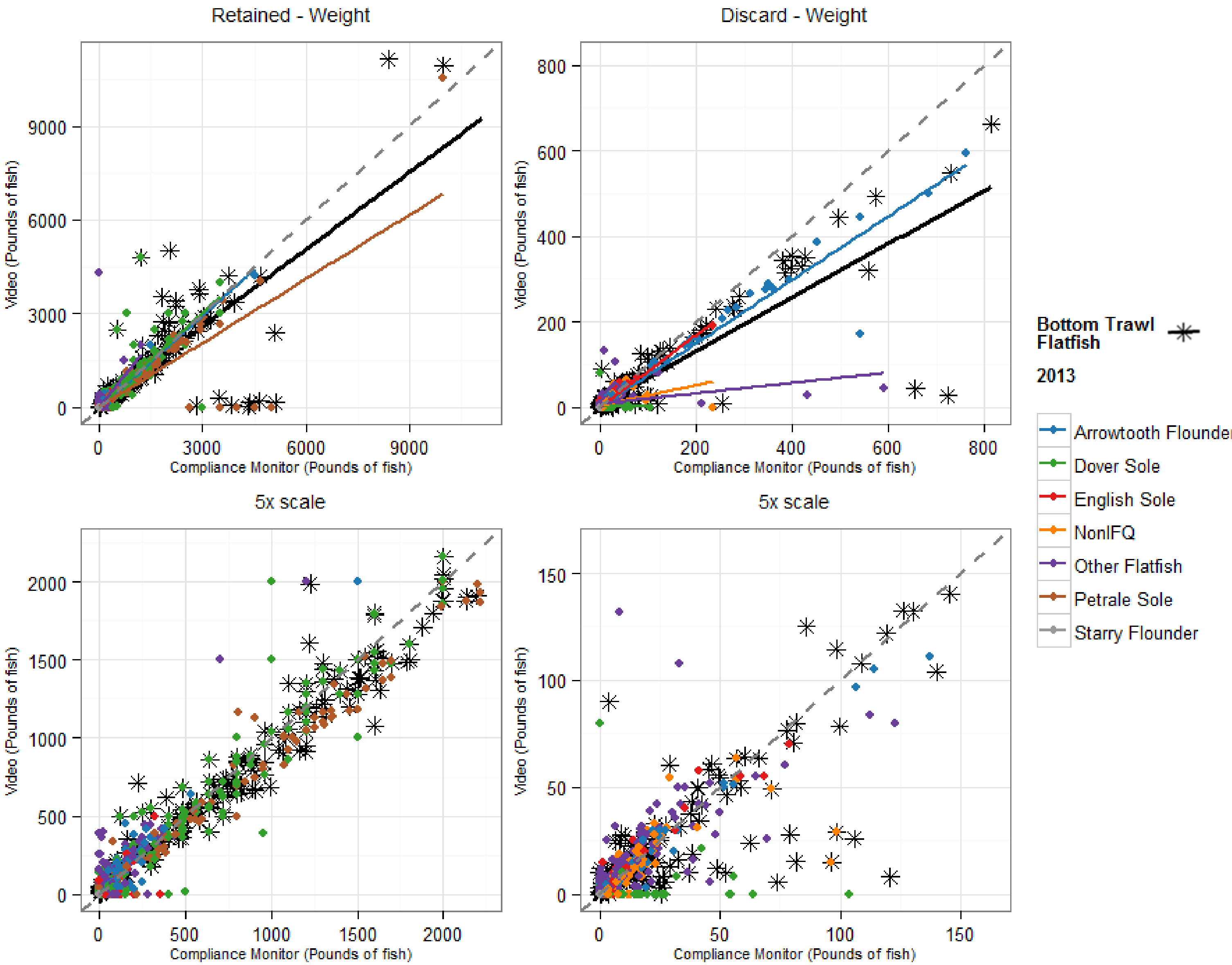


Figure 24. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Other Flatfish aggregated to the IFQ complex and the individual component species at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

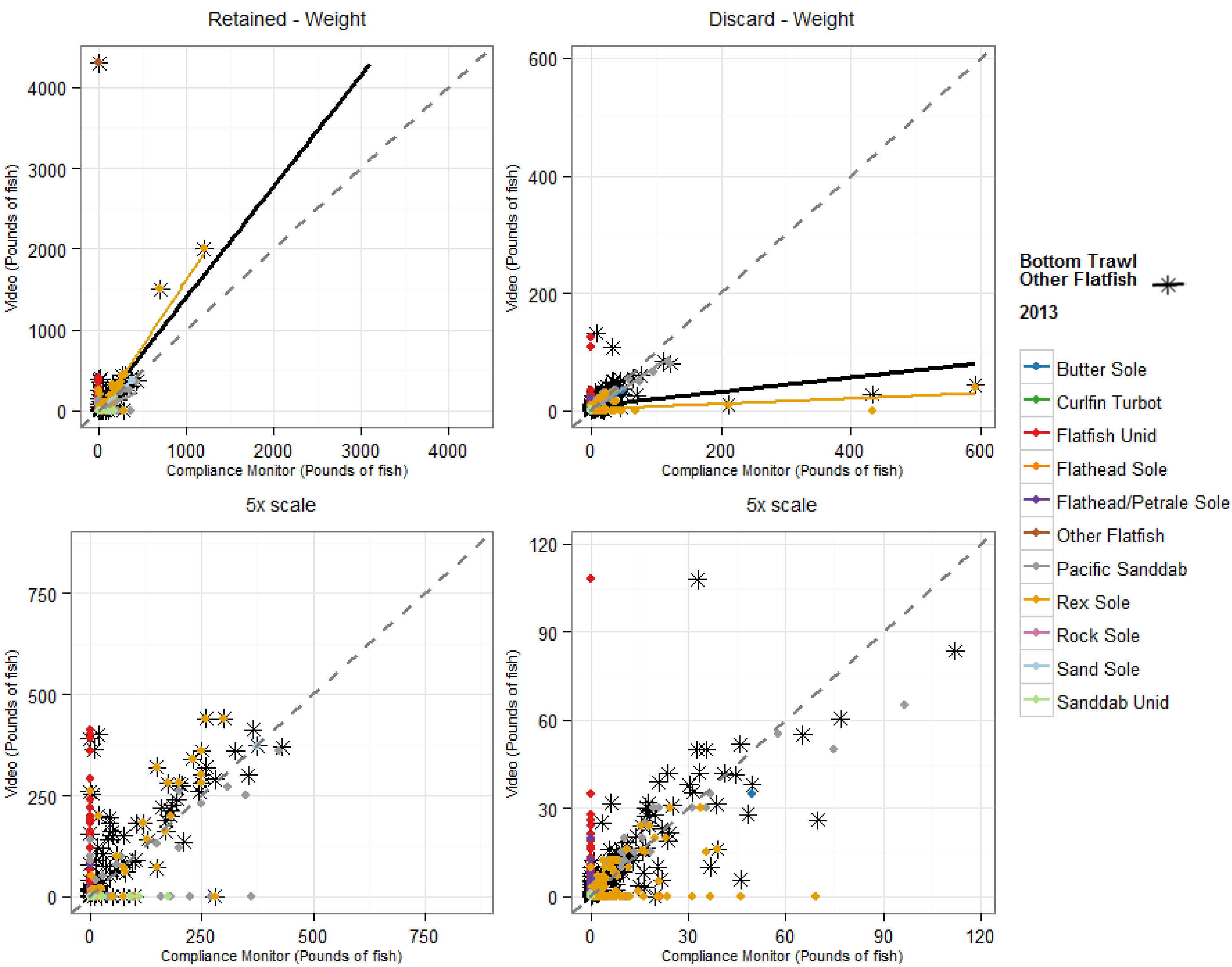


Figure 25. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Rockfish and Thornyheads aggregated to the Rockfish + Thornyheads group and the individual rockfish group and thornyheads group at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

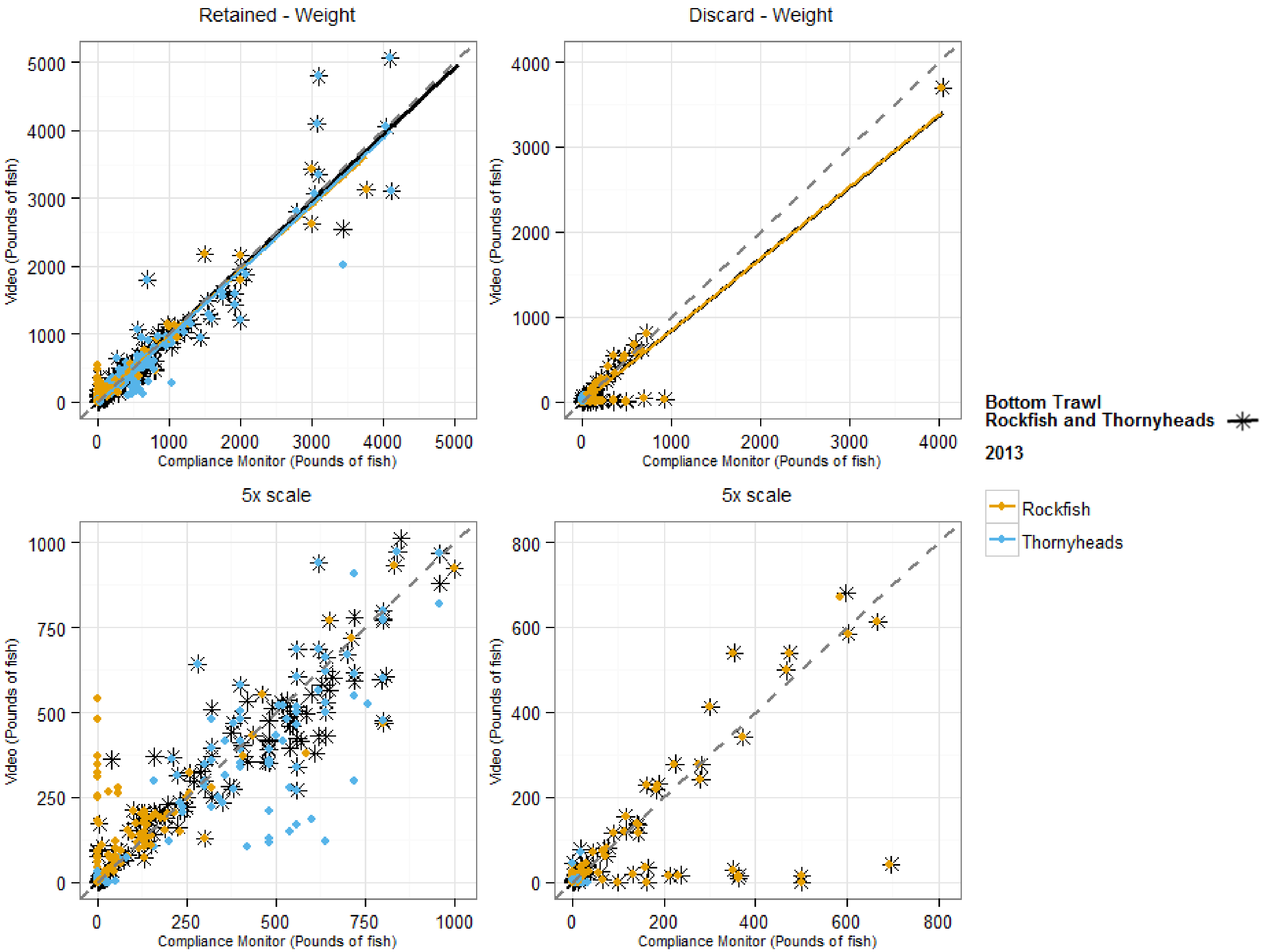


Figure 26. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Rockfish aggregated to the group and the individual component IFQ complexes at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

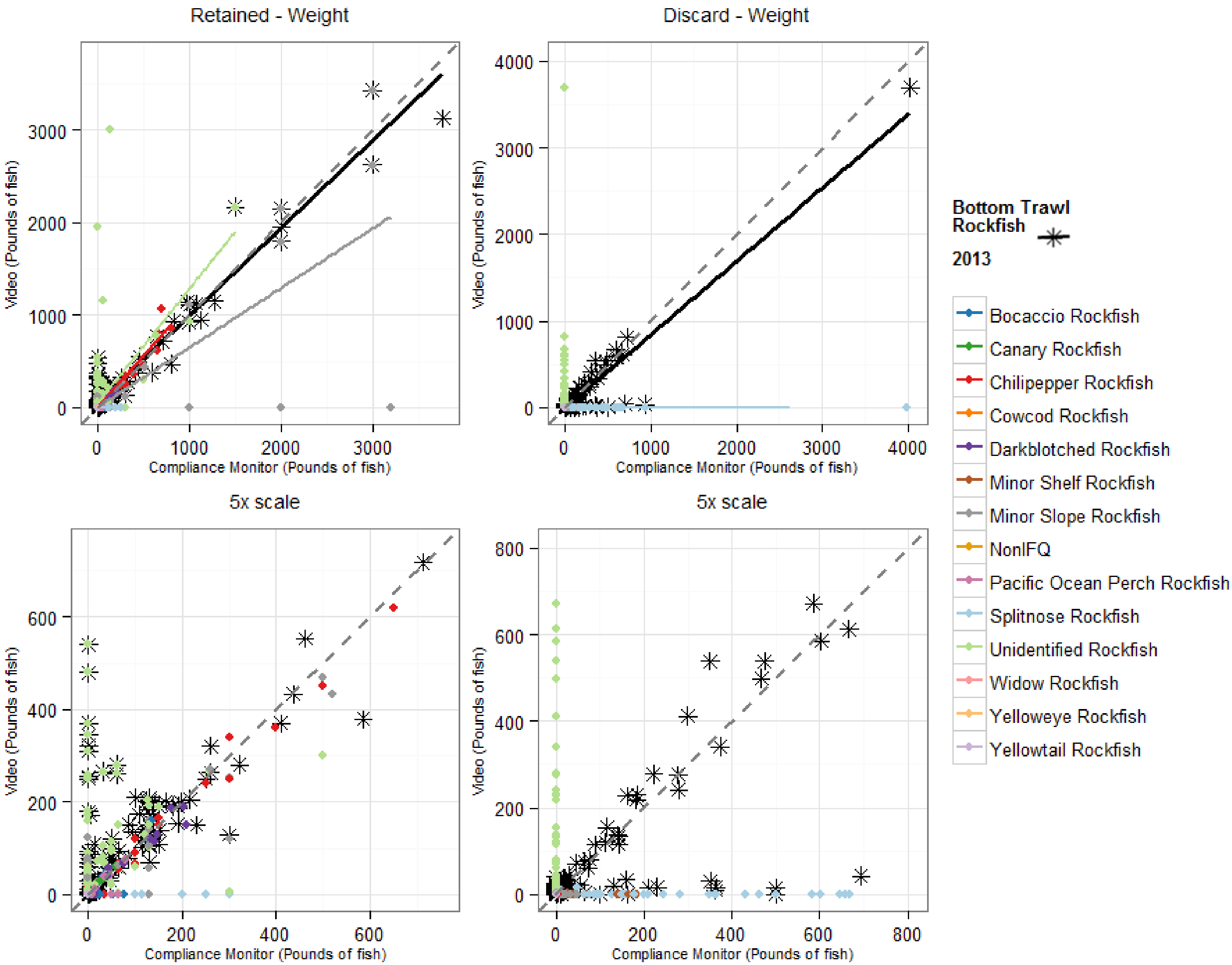


Figure 27. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Minor Shelf Rockfish aggregated to the IFQ complex and the individual component species at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

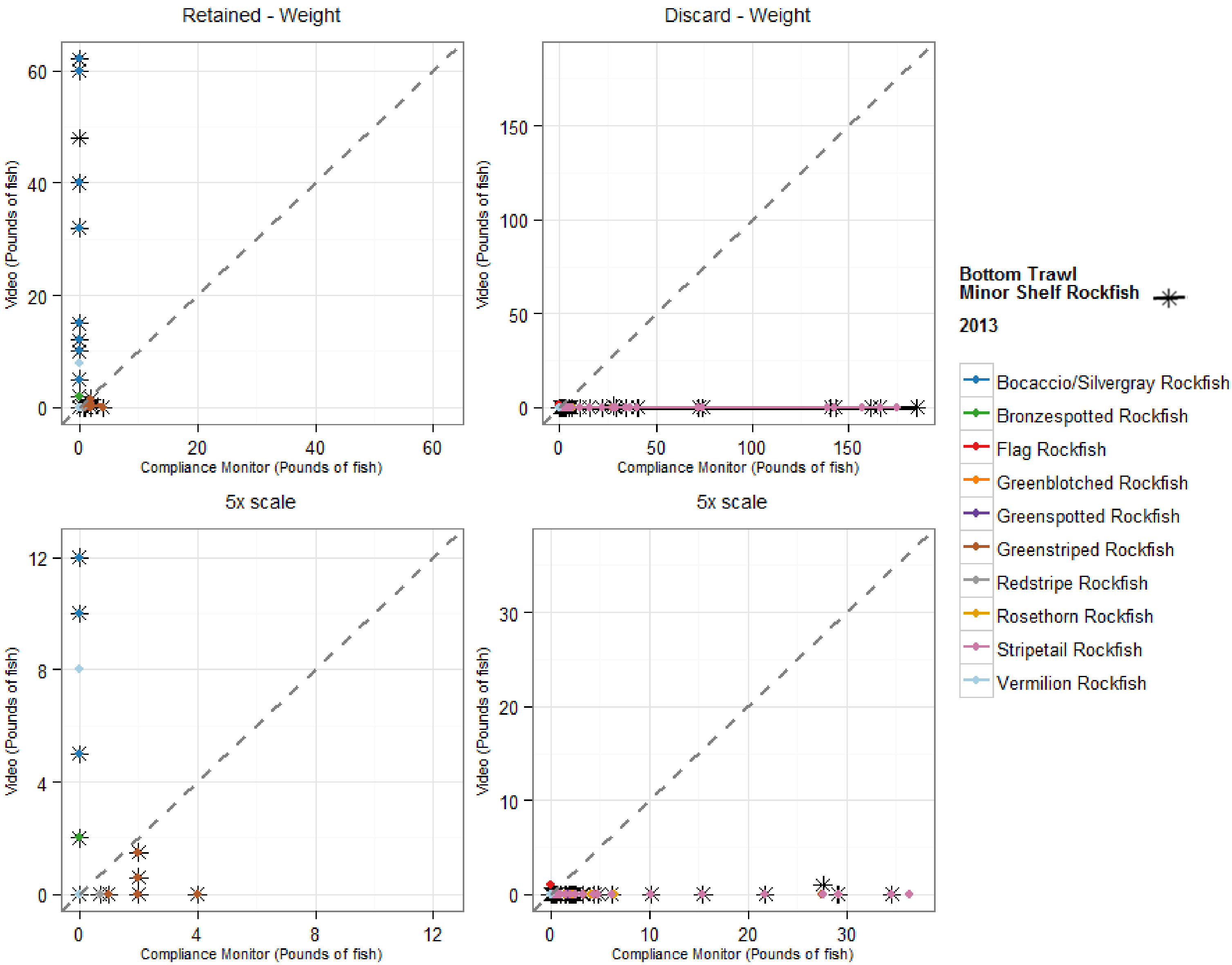


Figure 28. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Minor Slope Rockfish aggregated to the IFQ complex and the individual component species at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

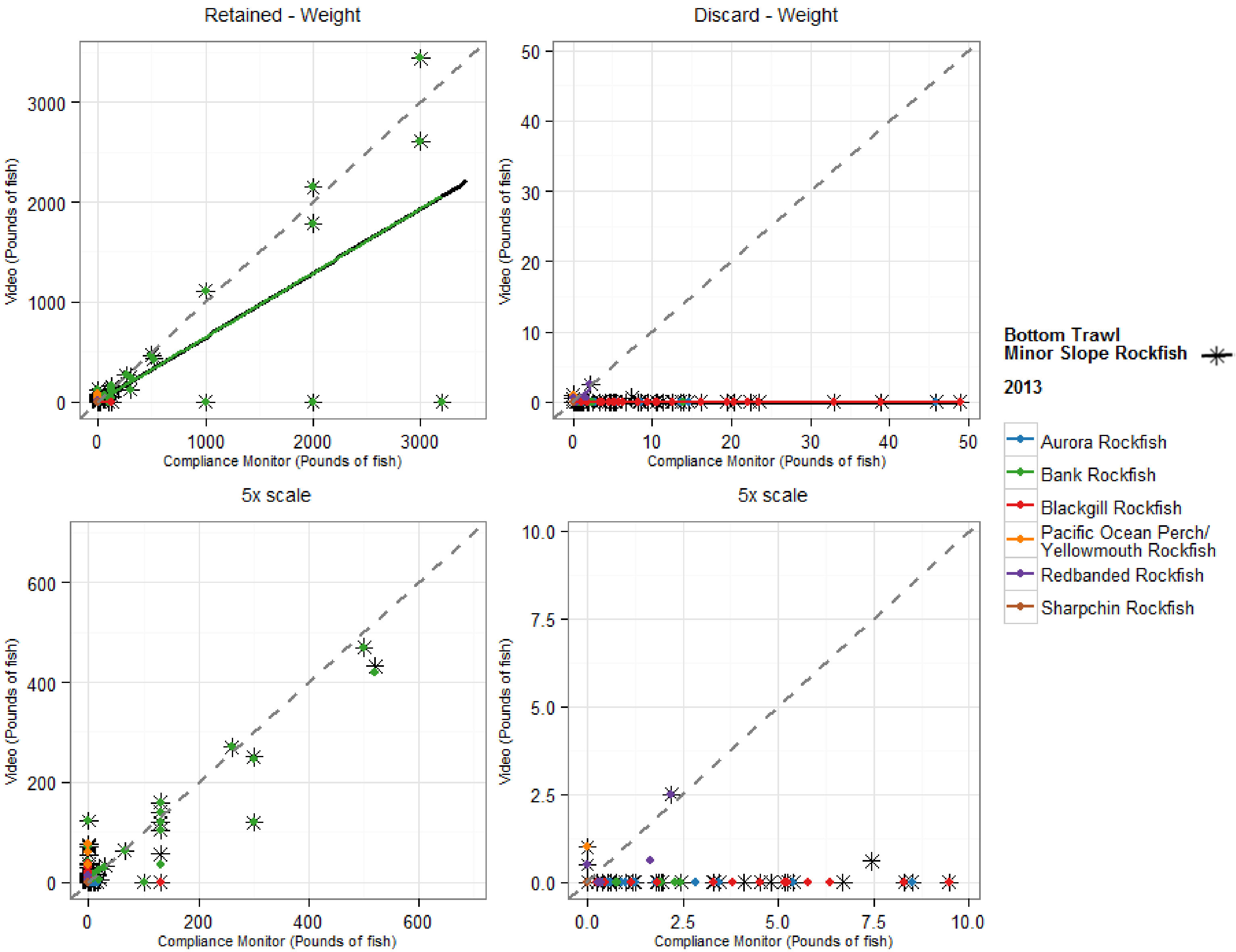


Figure 29. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Thornyheads aggregated to the group and the individual component IFQ complexes at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.

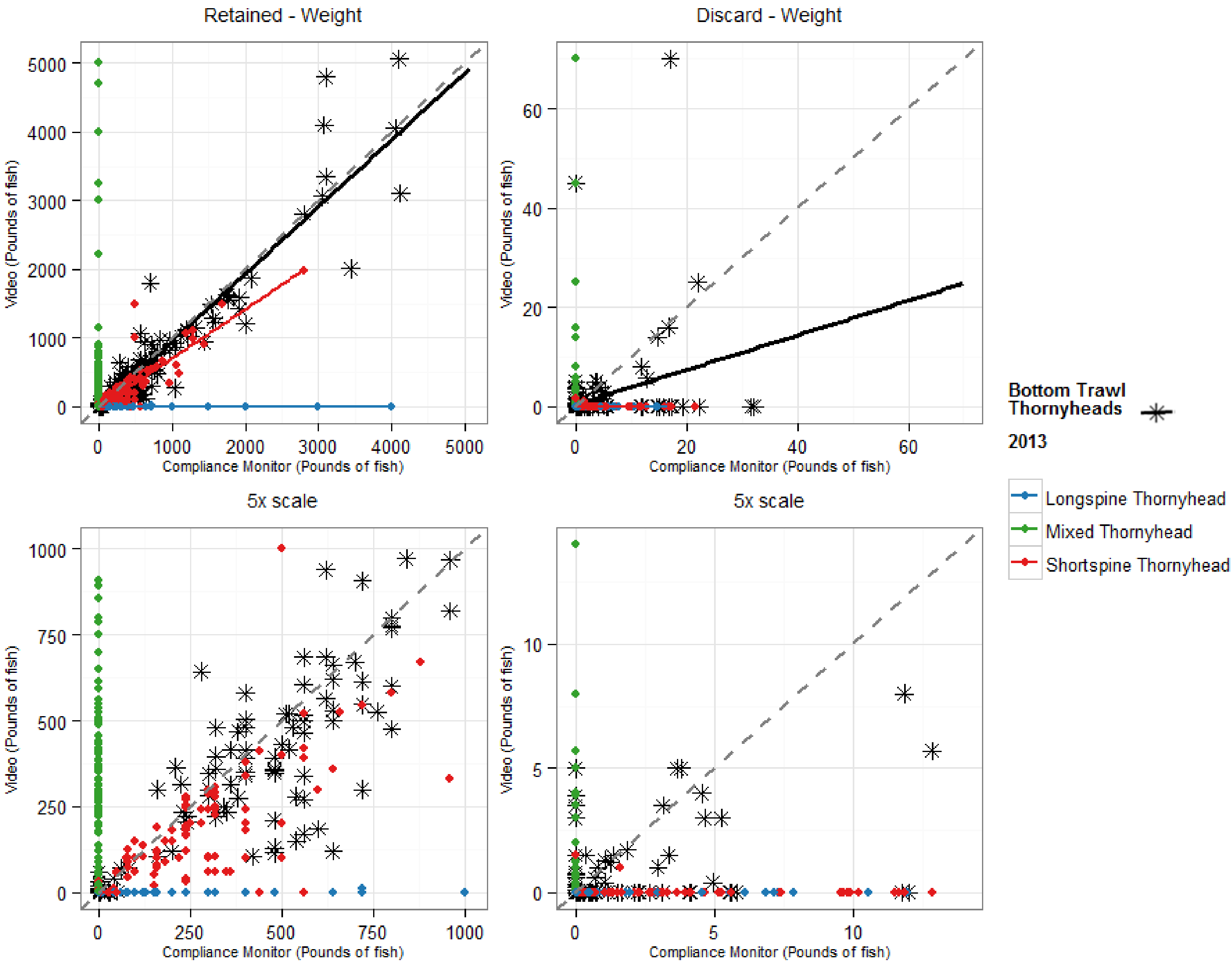
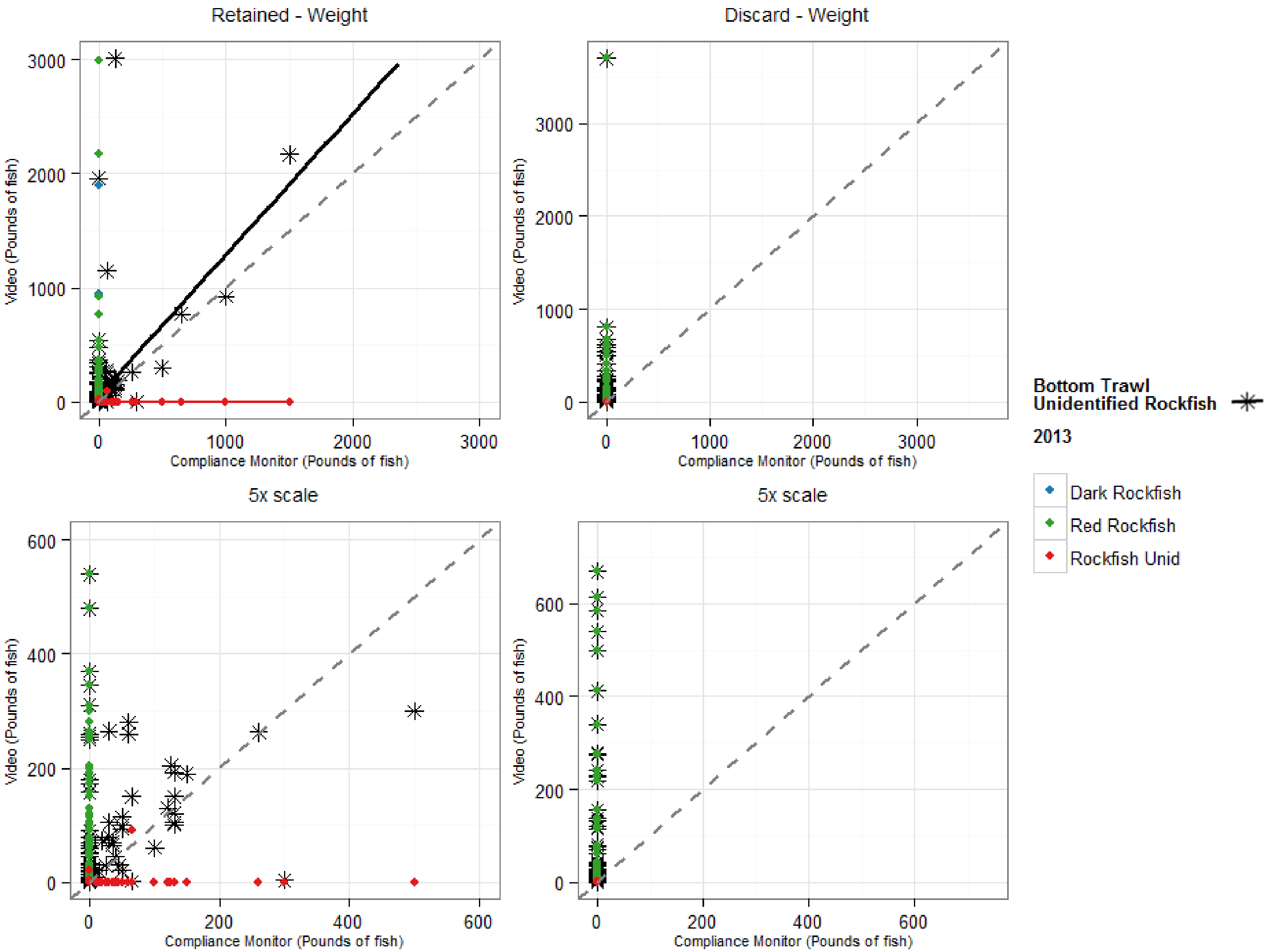


Figure 30. Bottom Trawl. Comparison of compliance monitor and video retained and discarded catch weights of Unidentified Rockfish aggregated to the group and the individual component identified group at the haul level. The bottom panels display the same data as top panels with a fifth of the axis scales to show the data clustered in the bottom left corner of the top panels.



Project Title:

PSMFC 2014 EM Research: Species Density and Discard Weight Studies

Prepared By: Alia Al-Humaidhi and Jennifer Cahalan

March 2013

Overview

Fisheries management of the Pacific Trawl Rationalization Program fishery relies on efficient and accurate estimation of the weight of discarded Individual Fishing Quota (IFQ) groundfish species (and species groups) that occur in the fishery. Quota management of these species is based on weight of fish harvested and discarded. At-sea compliance monitors are currently deployed into this fishery to identify and weigh all at-sea discards of IFQ species (100% monitoring).

This requirement is necessary since there are currently no other methods to speciate and estimate weights of at-sea discards. However, on-board monitors can increase costs and reduce flexibility in the fishery. Electronic monitoring systems, if able to provide IFQ grouping specific weights of discards, would increase fishery flexibility and may reduce costs. The question then is “Can EM technology be used to collect species-specific data used to estimate weights of discards to the IFQ grouping level?”

Electronic monitoring systems have been placed on a subset of vessels in the IFQ fishery to test the efficacy of electronic systems to help make weight estimations of IFQ species discarded at-sea. Camera systems cannot capture weight data directly without onboard scales and major changes in fisher behavior, but cameras can capture volume estimates or fish counts. Therefore, methods need to be developed to convert those volume and count data into weights for camera systems to be useful and effective in IFQ management.

The goal of this project is to evaluate whether data collected using proposed EM methods can be used to generate species-specific estimates of discard weight of the discarded groundfish species and species groupings (Appendix A.) that are included in the Pacific Trawl Rationalization Program. Two studies are proposed to address the speciation and weight estimation issues.

The first is a study that will use at-sea EM to measure the volume of retained catch and evaluate the potential of EM to estimate discard volumes. The second is an at-sea discard study where a discard chute with a dedicated camera will be installed onto active commercial trawlers to record images of fish that will be used for species identification and length determination for at-sea discards of IFQ groundfish.

Species Density Study

In this portion of the project, two approaches will be taken to try to estimate species-specific catch densities (weight per unit volume) that can be used to convert volume of catch to weight.

Two initial questions will be addressed:

1. Can prescribed species-specific densities be determined so that the total weight of at-sea discards can be estimated from the volume of discarded catch?
2. Can video monitoring of crew at-sea sorting of catch activities be used to collect species-specific catch volume measurements?

Background

Two studies have been conducted to evaluate the effectiveness of prescribed densities in catch sampling and estimation. The first was conducted in the Alaska in the mid-1990s in the Bering Sea Pollock fishery (AFA Pollock). This research resulted in the use of prescribed densities by the North Pacific Observer Program observers to determine the total weight of catches greater than 51% Pollock based on a volume of catch taken on catcher-only vessels (Dorn et al., 1999).

The second study, conducted in the New England fisheries in 2012, focused on using data from video monitoring to estimate total catch on two New England fishery trawlers (Pria et al., 2012). While this study estimated and used species-group-specific densities (gadids, flounders), these density estimates are not currently used in standard data collections. Volumes of catch were estimated based on the fullness (%) of containers of known volume; however, the fullness was measured qualitatively to the nearest 25%. In the density estimation portion of the study, the volume of 'full' containers was estimated to be 95%, since containers were known to be slightly under-filled. These approximations may have affected the precision of the resulting comparisons and density estimates.

Proposed Methods

There are two components of this study. In the first, known volumes of sorted catch (fish totes) will be weighed by dockside samplers at the point of landing allowing for calculation of species specific densities. The second component of the study incorporates the use of EM that is currently deployed into IFQ fisheries. Volumes of retained catch will be estimated from the video record while weight of the retained catch will be obtained from the landing receipts allowing for trip level species specific densities. If the estimated species (group) densities using the two methods (dockside direct measurements vs. EM estimated volume with fish ticket weights) are the same, we can conclude that the EM obtained volume measurements are unbiased.

In both approaches potential vessel, dealer, video reviewer and container effects will need to be accounted for in the data collection and analysis by conducting study activities over a range of shoreside processors and vessels and by utilizing two (or more) video reviewers.

Dockside Sampling Component:

In this portion of the study, a dockside sampler will visit shoreside processing facilities (first receivers) who are willing to cooperate with our sampling process along the Oregon and Washington coast and who receive fish from bottom trawlers fishing in the Pacific Trawl Rationalization Program.

Samplers will conduct dockside sampling of known volumes of sorted fish. They will be using the processors hopper or tote scale; each container will be measured precisely to obtain the container's volume. During the offload, the container is filled with sorted species-specific (or species group-specific) landed catch and the depth of fish will be determined by the dockside sampler. The weight of fish is recorded from the scale by the sampler. Observations will be taken for multiple totes (samples) of a species/grouping from each offload (Datasheet at Appendix B).

The volume and weight of ice will be measured (if possible), recorded on the data sheet, and subtracted from both the volume and weight of fish. Samples will be omitted from analysis in cases where the weight and volume of ice in the container cannot be accounted for by the dockside sampler. The frequency that this situation is encountered by the samplers will be recorded so that the prevalence of this activity can be documented.

The density of a species (species group) on a given trip will be estimated based on the samples for each species/grouping using a ratio estimator, equation 1.

$$\hat{D}_{ij} = \frac{\sum_{s=1}^{S_j} w_{ijs}}{\sum_{s=1}^{S_j} v_{ijs}} = \frac{\overline{w}_{ij}}{\overline{v}_{ij}} \qquad 1$$

Where *i* indexes species, *j* indexes the trip (*j*=1, …, *n* sampled trips), and *s* (*s*=1, …. S_j) indexes the all totes sampled for that trip. The variance for this trip-specific density estimate is based on the usual ratio estimator variance, equation 2 (Cochran, 1977).

$$V\hat{a}r(\hat{D}_{ij}) = \frac{\sum_{s=1}^{S_j}(w_{ijs} - \hat{D}_{ij} v_{ijs})}{\overline{v}_{ij}^2 (s-1)} = \overline{w}_{ij}^2 \overline{v}_{ij}^{-4} V\hat{a}r(\overline{v}_{ij}) + \overline{v}_{ij}^{-2} V\hat{a}r\left(\overline{w}_{ij}\right) - 2\overline{w}_{ij}\overline{v}_{ij}^{-3} C\hat{o}v(\overline{w}_{ij}, \overline{v}_{ij}) \qquad 2$$

The above assumes that trips are independent observations of catch density for a given species or species group. Since trips will be distributed among vessels, processing plants, fishing areas, and time (*e.g. months*), those covariates may be evaluated if a sufficient number of trips are sampled. Multiple trips per IFQ species/grouping will be sampled. For any species or species-group sampled within a trip (samples within a specific delivery), multiple (minimum of three) totes will be measured and weighed.

Under the assumption that trips are independent observations, the overall density for a species or species group will be the average of the trip densities, equation 3, and the variance will be the average variance divided by the number of trips sampled, equation 4.

$$\hat{D}_i = \frac{\sum_{j=1}^{n} \hat{D}_{ij}}{n} \qquad 3$$

$$V\hat{a}r\left(\hat{D}_i\right) = \frac{\sum_{j=1}^{n} V\hat{a}r\left(\hat{D}_{ij}\right)}{n^2} \qquad 4$$

Where there are a total of *n* deliveries sampled, some possibly having multiple species in the landing. The final product will be a list of densities with their error estimates for each sorted IFQ species/grouping.

EM (at-sea) Volume Component

In a parallel portion of the study, we will use the estimated total volume of retained catch derived from data collected using onboard video monitoring (EM) and the total offload weight recorded on the fish ticket to derive estimates of species and trip-specific density. The standard Archipelago EM installations will be used onboard all vessels participating in this study (http://www.archipelago.ca/EMServices.aspx). EM imagery will be reviewed by PSMFC EM project staff.

On trips where EM data are available and where the dockside sampler sampled the delivery (above), the two density estimates (EM, shoreside sampling) can be compared; in the case where the estimates differ significantly the assumptions underpinning both methodologies should be carefully evaluated to determine the potential causes of the discrepancy. In particular, the potential biases in the at-sea volume measurements are of interest.

During equipment installation, dimensions of the vessel's checker pens, totes and sorting containers will be recorded (Appendix B). During the video review process, a visual estimate of container fullness (%) will be recorded. The video reviewer will record species, container type, known volume or dimensions of container, and percent fullness for all retained fish. These data will be aggregated to the trip level to obtain the total estimated volume of each species or species grouping retained on that trip.

Landing receipt data is summarized to total weight of each species or species grouping for each delivery. This will be the weight used to derive the density estimate for that trip and species or species group.

Since there is a single observation (no sample data) for each species and delivery, the estimated density is

$$D_{ij}^* = \frac{f_{ij}}{v_{ij}^*}$$

The overall density for a given species or species group is the mean of the estimated densities, averaged across all EM-observed trips. The variance for this overall density is the standard variance of a mean.

$$\widehat{D}_i^* = \frac{\sum_{j=1}^{n} D_{ij}^*}{n}$$

$$V\hat{a}r(\widehat{D}_i^*) = \frac{\sum_{j=1}^{n} (D_{ij}^* - \widehat{D}_i^*)^2}{n(n-1)}$$

Hypothesis Testing

On those deliveries where the delivery was sampled using the both the shoreside sampling and EM at-sea sampling protocols, we can test the hypothesis that the estimates generated using data from the two methods are not different; null hypothesis is $\widehat{D}_{ij} = \widehat{D}_{ij}^*$.

A set of hypothesis tests comparing the EM-based density with the shoreside-based estimate for each trip where both data elements exist can be conducted using a variant of a t-test (see Faunce *et al*., 2013). Whether this is worthwhile will depend on the number of deliveries where data from both data collection methods exists.

Additionally, we can test whether the species-specific density estimates generated from data collected under the two methods vary from each other. For any species, the overall density estimate can be compared across the two methodologies, one hypothesis test for each species. The null hypothesis to be tested is: the density of catch of a given species estimated using data from shoreside sampling is the same as the density for that species estimated from data collected using EM. If this null hypothesis is rejected, then one of the methodologies is possibly producing biased estimates of density.

For both portions of this study, it will be important to sample across a range of shoreside processors (dealers, first receivers) as feasible and across as many different species and species groups as possible.

At-Sea Discard Study (Species identification and weight estimation)

In this second portion of the project, we propose testing the accuracy of species identification and length determination through the use of onboard discard chutes fitted with mounted cameras to record images of each fish as it is discarded. The ability to successfully identify and determine the length of IFQ species / species group fish from EM imagery allows for estimation of discards of IFQ species using EM technology. This may in turn provide a viable EM-based method for monitoring of selective at-sea IFQ discards.

In this study, three questions will be addressed:

1) Can individual discarded fish be identified from video imagery to the IFQ species or species group?
2) Can the length of individual discarded fish be recorded accurately based on the available video imagery?
3) Can the weight of individual discarded fish be estimated from the video imagery-based length and published length to weight relationships?

For each observed trip, we will obtain species and length of fish from EM video imagery, and species, weight, and length of fish from at-sea compliance monitor data for all at-sea IFQ discards that are sent through the discard chute. Data for each fish will be recorded in the same order as the fish that are discarded through the chute so that individual fish from the EM record can be matched to individual fish from the at-sea compliance monitor record. For each fish the species identification based on EM and at-sea monitor will be compared. Similarly, the length measurements obtained from the EM imagery and the at-sea monitor will be compared. For each data source (at-sea compliance monitor, EM), the total weight of each species discarded through the discard chute will be estimated. The weight of fish estimated using EM data will be generated by converting each fish length to fish weight based on published length –weight regressions (Appendix D). The weight of individual and total weight of discards for each species will be compared between the two data sources.

Background

In 2008-2010, the Nature Conservancy conducted an EM study on longline gear vessels fishing in California. The study focused on species ID and piece counts between at-sea compliance monitor, logbook and video. Overall, species identification was not found to be feasible for the rockfishes, flatfishes, and thornyheads (Rienecke et al. 2010). In 2012, a PSMFC study conducted on CA fixed gear vessels found the same results. Counts of fish pieces at the species grouping level in both studies were close (PSMFC 2013).

There are two discard chute studies conducted on EM systems in the literature that focused primarily on species identification and fish length. Both of these studies were conducted on trawlers that were actively engaged in commercial fishing activities and both studies used EM for data collection. The Northeast Fisheries Science Center tested a combination of discard chutes and EM in the Gulf of Maine (GOM) groundfish fishery. The results from that study showed that roundfish were easier to identify (>90% accuracy) than some flatfishes (19%-97% accuracy) when using a discard chute. No rockfish-like family of fish are caught in the GOM groundfish fishery and so a comparison of accuracy rate for a diverse family of similar looking fish is not available (NMFS 2012).

In Alaska, a study was conducted in 2008-2009 on trawl vessels where EM technology was used to collect counts and lengths of Pacifc halibut using a discard chute (Bonney et al., 2009). Fish weights were derived from fish lengths. This study did not reject the null hypothesis; the video and at-sea compliance monitor data are not different.

In this proposed study, for each haul observed, both the video reviewer and the at-sea compliance monitor will identify each fish to the lowest taxonomic level possible, record the number of fish discarded, and the length of each individual fish. In addition, the on-board (human) monitor will collect the weight of each fish.

Proposed Methods

There is currently (winter 2013 – 2014) one volunteer vessel operator who is participating in this study; vessels have not been randomly selected from the fleet. Fishers have agreed to install a discard chute on deck. Crew will sort and the at-sea compliance monitor will sample catch as usual.

On each haul, the at-sea compliance monitor will randomly select 40 fish (or all fish if fewer than 40) from each IFQ species on each haul. The compliance monitor will record species, length (cm) and weight (lbs.) measurements for each fish before sending the fish down the chute under the camera (Appendix C). This controlled discarding will allow for tracking of each individual fish when comparing data to the data collected from the video of the mounted camera.

The chute will be indelibly marked with 5 cm length increments that are clearly visible to a camera that will be mounted over the chute. The video of the discard chute will be reviewed and each individual fish will be identified to the lowest taxonomic level possible. The total length measurement will also be recorded by the reviewer for each fish to the nearest cm based on the length markings on the discard chute. This will necessitate slowing or stopping the video so that a clear image of the fish can be used to record the length measurement. Length will be converted to weight for each fish using published length-weight relationships (Appendix D).

In order to test the accuracy of the species identification based on the EM record, we will send fish of several species through the discard chute in haphazard order. As fish are selected from the set-aside fish (40 of each species), the at-sea compliance monitor will discard fish from different species down the chute. Hence, several of the same species of fish will not be presented to the video reviewer consecutively.

We expect most hauls to have fewer than 3 IFQ species, although some may have as many as 15 species. Hence at-sea compliance monitors and EM can be expected to record data for 120 to 400 fish on each haul. This will equate to generally fewer than 100 pounds of fish; however in some cases may exceed 500 pounds.

In situations where the total amount of discard either exceeds 40 fish per species, or the at-sea compliance monitor cannot record data for 40 fish of each species, at-sea compliance monitor data will be collected in the aggregate. Any IFQ discards not included in the individually sampled fish portion of the study will be weighed in the aggregate (weight of each basket of fish) before those fish are discarded through the discard chute. Baskets may contain sorted or unsorted catch. Data from the EM system will consist of individual fish species identification and length data. This will allow conversion of the length to an estimated weight for each fish and will be aggregated to the basket level. Comparisons will be made for each basket of discarded fish.

Hypothesis Testing

We will test three hypotheses:

Hypothesis 1: For the discarded fish in this study, the species identification for an individual fish identified using EM is the same as the identification of that same fish by the at-sea compliance monitor.

Hypothesis 2: The estimated length of an individual fish based on the EM record is equal to the length for that fish obtained by the compliance monitor (using a scale).

Hypothesis 3: The estimated weight of an individual fish based on an EM recorded length and length to weight conversion is equal to the weight for that fish obtained by the compliance monitor (using a scale).

We will test whether the proportion of correct identifications is equal to or greater than some minimal acceptable proportion (*e.g.*, 90%) (Hypothesis 1) using a two-step process similar to that used by Faunce et al., 2013. In addition, logistic regression may be used to test for differences and for vessel or other effects, if model assumptions can be met.

To test whether the length of fish obtained by the at-sea compliance monitor are the same as lengths obtained using the EM video record (Hypothesis 2), species-specific paired t-test will be used where each individual fish has two paired length measures will be used to test whether the mean difference in the paired lengths is equal to zero. If enough measurements are available, generalized regression methods (e.g. generalized linear models) will be used to test for potential effects of covariates (vessel, trip, etc).

Since the EM system cannot be used to directly measure the weight of fish, the weights obtained will be estimates based on the length-weight regression. Although the weight observations will have associated variance (resulting from the use of the regression equation), in most cases these variances are not available, hence standard methods (paired t-test) will be used to test whether the weight of individual fish based on length-weight conversions are the same as the weight obtained by the at-sea monitor (Hypothesis 3). If appropriate regression data are identified, the modified paired t-test proposed in the Density Study will be used in this study to test whether the estimated weight (EM based) is equal to the weight measured directly by the at-sea compliance monitor. Similar to the analysis of length measurements, if enough observations are available potential effects of covariates will be evaluated using generalized regression methods.

In cases where the data are collected at the aggregate level, this same hypothesis 3 can be tested; however, the EM data will be aggregated to the basket level. The EM-based weight of a basket of fish will be estimated as the sum of individual weights based on the length conversion (regression). A paired t-test can be used to test whether the weights of a basket of fish (of potentially mixed species)

Lastly, EM-derived length to sea-sampler weight regressions will be fit for each species. Although these regressions cannot be used to predict weights within this study, the regression fit can be evaluated for potential use in future studies where the prediction variance can be incorporated into the analysis. By using the EM-derived lengths and sea-sample weights, the regression model will include errors associated with EM-derivation of length such as measurement errors associated with determining length from video imagery and variance added due to the granularity of measurements (to nearest cm). These regressions will provide the most appropriate conversions for use in future studies or final implementation of the EM system.

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Appendix A. Species and Species Groups used in Density Study

Flatfish (Individual Species):
Arrowtooth flounder
Dover sole
English sole
Pacific halibut
Petrale sole
Starry flounder

Other flatfish (Group):
Butter sole
Curlfin sole
Flathead sole
Pacific sanddab
Rex sole
Rock sole
Sand sole

Roundfish (Individual Species):
Lingcod
Pacific cod
Pacific whiting
Sablefish

Rockfish (Individual Species):
Bocaccio rockfish
Canary rockfish
Chilipepper rockfish
Cowcod
Darkblotched rockfish
Longspine thornyheads
Pacific ocean perch
Shortspine thornyheads
Splitnose rockfish
Widow rockfish
Yelloweye rockfish
Yellowtail rockfish

Minor slope rockfish (Group):
Bank Rockfish
Blackgill Rockfish
Blackspotted Rockfish
Redbanded Rockfish
Rougheye Rockfish
Sharpchin Rockfish
Shortraker Rockfish
Yellowmouth Rockfish

Minor shelf rockfish (Group):
Bronzespotted Rockfish
Chameleon Rockfish
Dark Rockfish
Dusky Rockfish
Dwarf-Red Rockfish
Flag Rockfish
Freckled Rockfish
Greenblotched Rockfish
Greenspotted Rockfish
Greenstriped Rockfish
Halfbanded Rockfish
Harlequin Rockfish
Honeycomb Rockfish
Mexican Rockfish
Northern Rockfish
Pink Rockfish
Pinkrose Rockfish
Pygmy Rockfish
Redstripe Rockfish
Rosethorn Rockfish
Rosy Rockfish
Silvergray Rockfish
Speckled Rockfish
Squarespot Rockfish
Starry Rockfish
Stripetail Rockfish
Swordspine Rockfish
Tiger Rockfish
Vermilion Rockfish

Appendix B. Fish Density Study – Proposed Field Data Sheet

SAMPLER NAME:	SAMPLE DATE:	PAGE #: __________ OF __________
VESSEL NAME:	USCG NUMBER:	GEAR:
DEALER NAME:	DEALER NUMBER:	PORT:
SCALE CERTIFIED? Y N	CERTIFICATION DATE:	FISH TICKET #:

	SPECIES/ GROUPING CODE	SPECIES/ GROUPING NAME	CONTAINER DIMENSIONS (METERS)			DEPTH OF TOTE ABOVE FISH (M)	WEIGHT (LBS)
			L	W	D		
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							

Appendix C. At-Sea Discard Study – Proposed Field Data Sheet

PAGE #		OF	

SAMPLER NAME:	SAMPLE DATE:
VESSEL NAME:	TRIP START DATE:
USCG NUMBER:	HAUL NUMBER:
GEAR TYPE:	HAUL START TIME:

Fish #	SPECIES NAME	SPECIES CODE	LENGTH (CM)	WEIGHT (LBS)
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				

Fish #	SPECIES NAME	SPECIES CODE	LENGTH (CM)	WEIGHT (LBS)
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				

Fish #	SPECIES NAME	SPECIES CODE	LENGTH (CM)	WEIGHT (LBS)
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				

#	SPECIES ID	BASKET WEIGHT (LBS)	COUNT
1			
2			
3			
4			
5			

Fish #	SPECIES NAME	SPECIES CODE	LENGTH (CM)	WEIGHT (LBS)
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				
106				
107				
108				
109				
110				
111				
112				
113				
114				
115				
116				
117				
118				
119				
120				

#	SPECIES ID	BASKET WEIGHT (LBS)	COUNT
6			
7			
8			
9			
10			

Appendix D: Published length-weight regressions; $W = \alpha L^{\beta}$, where W is weight in kgs and L is length in cm. Fish length was recorded as fork length (FL) or total length (TL) or unknown (U).

				Female Only		Male Only		
Species		α	β	α	β	α	β	**Source**
Arrowtooth Flounder	U			3.79E-06	3.246	3.49E-06	3.256	Kaplan and Helser. 2007
Bocaccio Rockfish	U	7.36E-06	3.11359					Field, J. 2010
Canary Rockfish	U	1.55E-05	3.03					Stewart, I. 2009
Cowcod Rockfish	U	1.01E-05	3.09332					Dick and MacCall. 2013
Darkblotched Rockfish	U			1.110E-05	3.1351	1.205E-05	3.122	Gertseva and Thorson. 2013
Dover Sole	U			2.805E-09	3.345	2.231E-09	3.412	Hicks and Wetzel. 2011
English Sole	TL			5.47E-06	3.15447	7.28E-06	3.0728	Stewart, I. 2005
Lingcod	FL			1.760E-06	3.3978	3.953E-06	3.2149	Hamel et al. 2009
Longspine Thornyhead	TL	4.30E-06	3.352					Fay, G. 2005
Greenblotched Rockfish	U	1.103E-05	3.10572					Love et al. 1990
Greenspotted Rockfish	U	1.323E-05	3.108					Dick et al. 2011
Greenstriped Rockfish	U	7.930E-06	3.12745	9.670E-06	3.0756	8.840E-06	3.1097	Love et al. 1990
Halfbanded Rockfish	U			1.520E-05	2.93761	1.270E-05	3.01568	Love et al. 1990
Rosy Rockfish	U	5.200E-06	3.38573					Love et al. 1990
Speckled Rockfish	U			5.430E-06	3.1371	5.210E-06	3.21742	Love et al. 1990
Squarespot Rockfish	U	1.464E-05	2.96355					Love et al. 1990
Starry Rockfish	U	8.670E-06	3.15979					Love et al. 1990
Stripetail Rockfish	U			2.479E-05	2.80487	3.759E-05	2.81864	Love et al. 1990
Swordspine Rockfish	U	1.320E-05	2.97021					Love et al. 1990
Vermilion Rockfish	U	1.744E-05	2.995					MacCall, A. 2005
Aurora Rockfish	U			1.000E-05	3.14	1.000E-05	3.15	Hamel et al. 2013
Bank Rockfish	U	7.790E-06	3.14685					Piner et al. 2000
Blackgill Rockfish	U	1.132E-05	3.1005904					Field and Pearson. 2011
Blackspotted Rockfish	U	9.600E-06	3.123					Hicks et al. 2013
Rougheye Rockfish	U	9.600E-06	3.123					Hicks et al. 2013
Pacific Sanddab	U			5.117E-08	3.214	7.419E-08	3.081	He et al. 2013
Pacific Hake	U	9.17E-06	2.901411					Stewart et al. 2011
Pacific Ocean Perch Rockfish	U			1.065E-05	3.08	1.395E-05	3	Hamel and Ono. 2011
Petrale Sole	U			2.083E-09	3.473703	3.050E-09	3.360544	Haltuch et al. 2012
Sablefish	U			3.449E-06	3.26681	3.672E-06	3.250904	Stewart et al. 2011b
Shortspine Thornyhead	U	4.77E-06	3.263					Taylor and Stephens. 2013
Splitnose Rockfish	FL			2.00E-05	3.0139	2.00E-05	2.9684	Gertseva et al. 2009
Starry Flounder	U	1.474E-05	2.973					Ralston, S. 2005
Widow Rockfish	U			5.450E-06	3.28781	1.188E-05	3.06631	He et al. 2011
Yelloweye Rockfish	U			9.770E-06	3.17	1.700E-05	3.03	Stewart et al. 2009
Yellowtail Rockfish	U	2.140E-05	2.92					Tagart et al. 1997

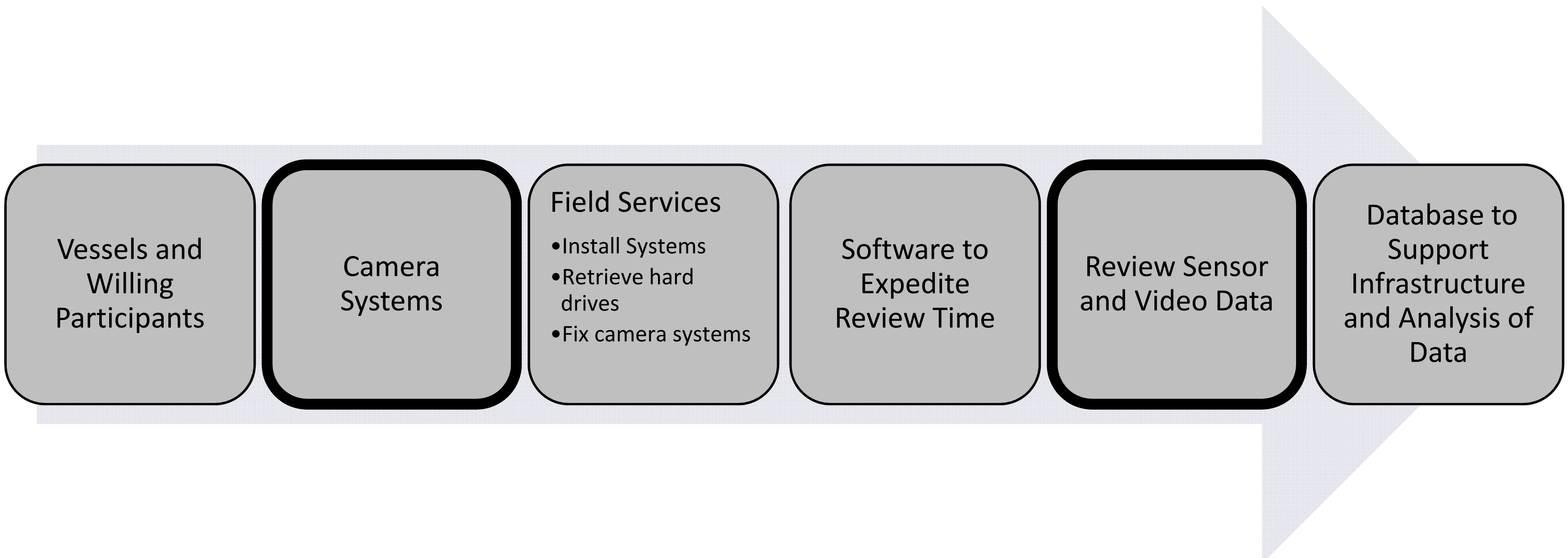
Electronic Monitoring Field Program

Pacific States Marine Fisheries Commission

Pacific Fisheries Management Council

April 5th, 2014

Moving parts of an EM Program



Basic design features

- All participants were volunteer vessels
- All trips had an observer onboard
- All observers conducted science sampling tasks as well as IFQ species compliance monitoring
  - Compliance monitoring: estimating the at-sea discards of vessels for the purposes of effectively debiting quota accounts throughout the fishing season

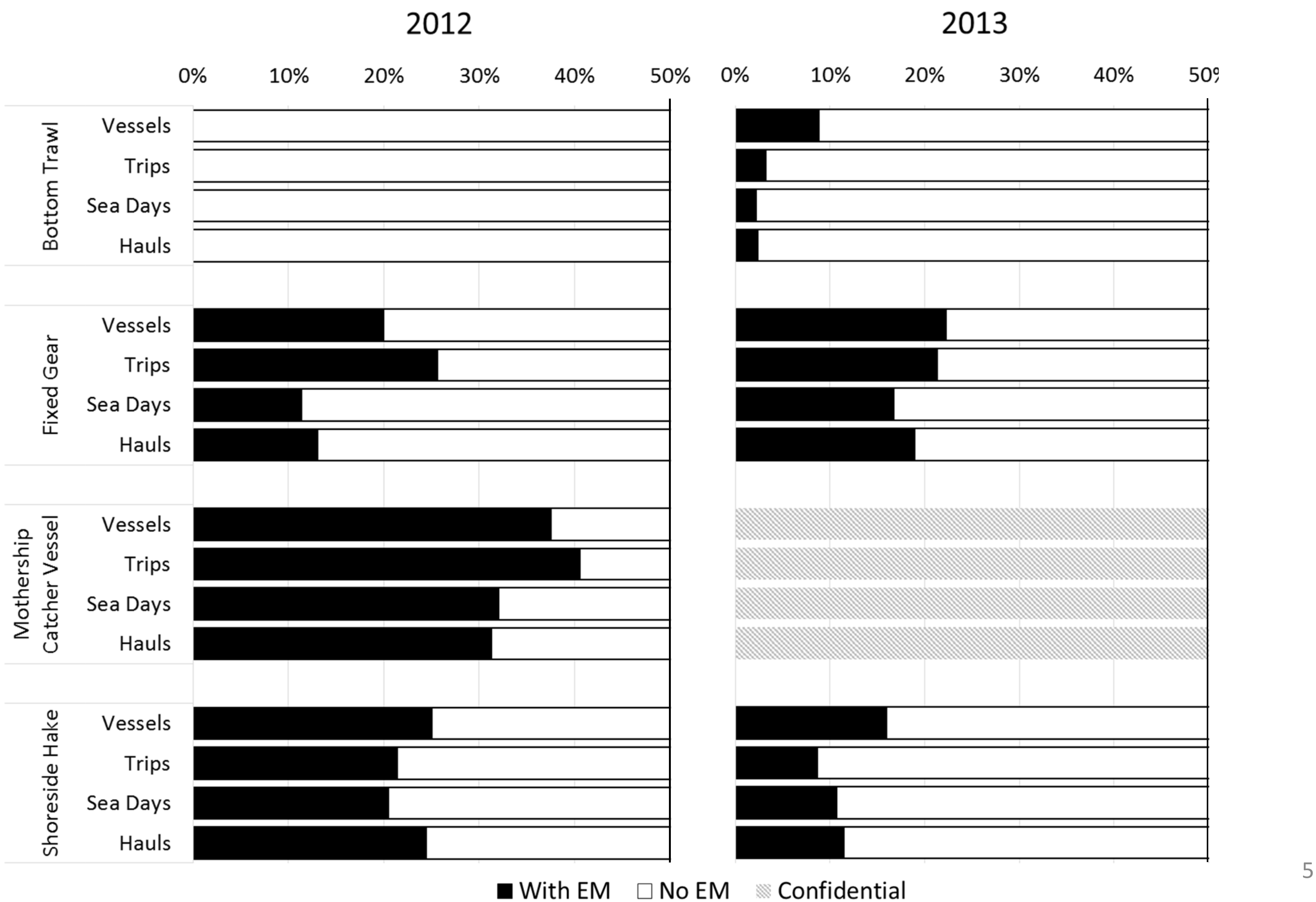
Working Definitions

Catch:
- Anything that we see that breaks the surface, excluding sea birds and marine mammals that are swimming freely alongside the vessel
- If we see it, we count it

Retained:
- Catch that is kept on the vessel

Discard:
- Catch that is not kept on the vessel
- Discard includes marine organisms that wash out of the net before the net comes onboard the vessel, that fall off or out of fishing gear before it makes it on the vessel, or are free floating on the surface

Proportion of Fleet with EM Coverage



Two camera providers

ARCHIPELAGO
MARINE RESEARCH

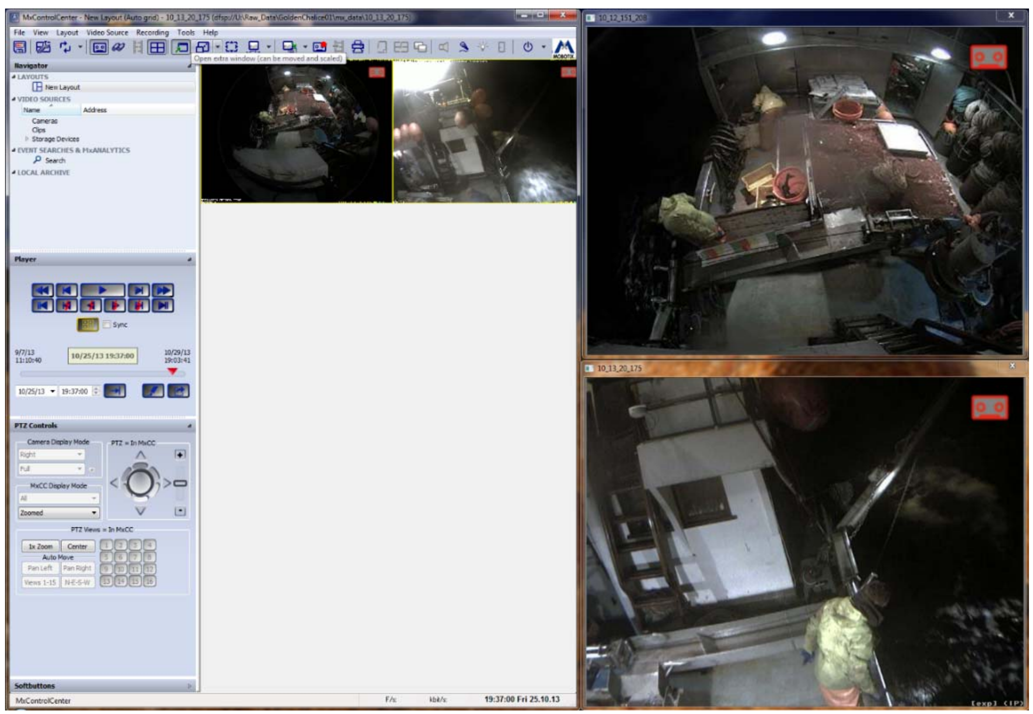
Saltwater Inc.

Saltwater Inc.'s Camera System

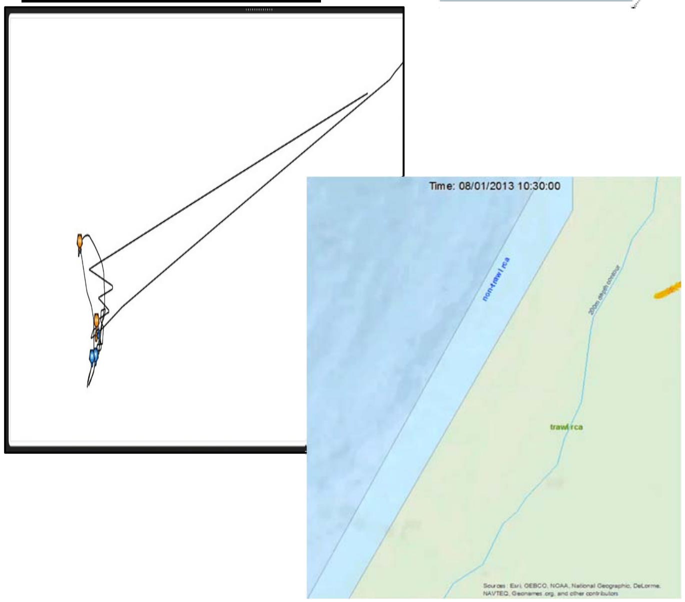
EMS Camera, GPS and Motion Sensor (2 per vessel)

Hydraulic Pressure Transducer

Control Point/User Interface

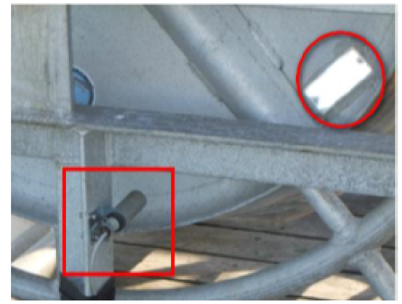


Archipelago Marine Research's Camera System



GPS Receiver

Winch/Drum Rotation Sensor

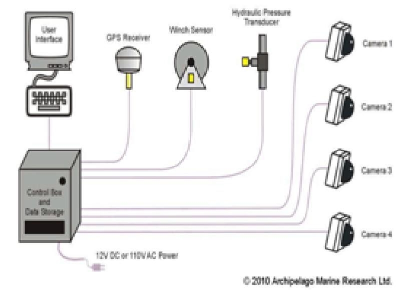


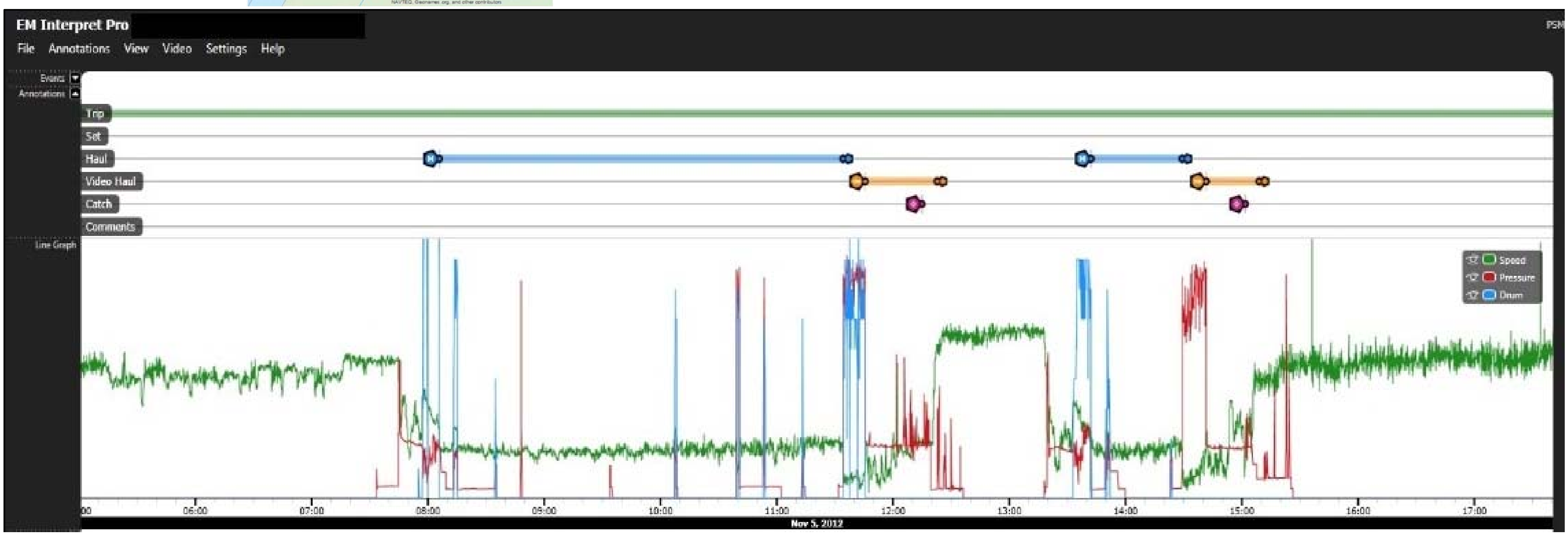
Control Box/User Interface

EMS Camera (3-4 per vessel)

Hydraulic Pressure Transducer

EMS System Components





Demonstration of AMR and Saltwater Software

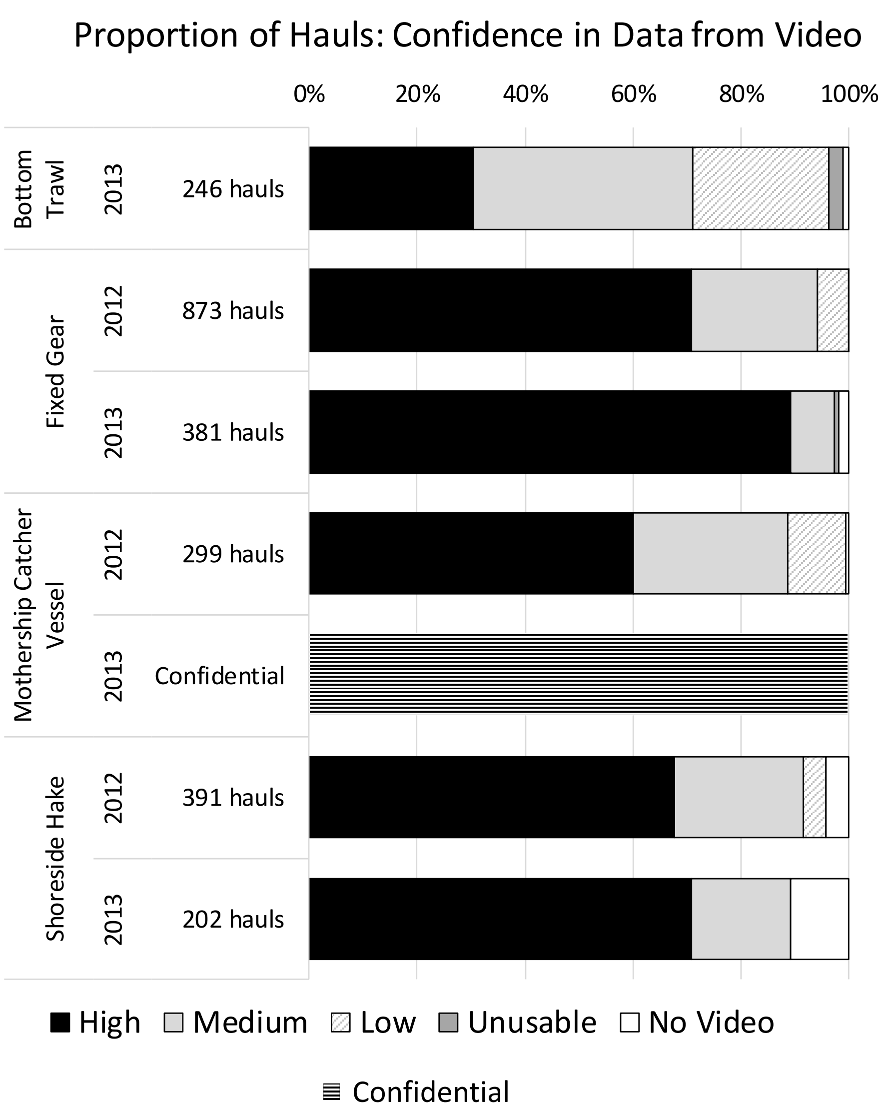
Saltwater Video

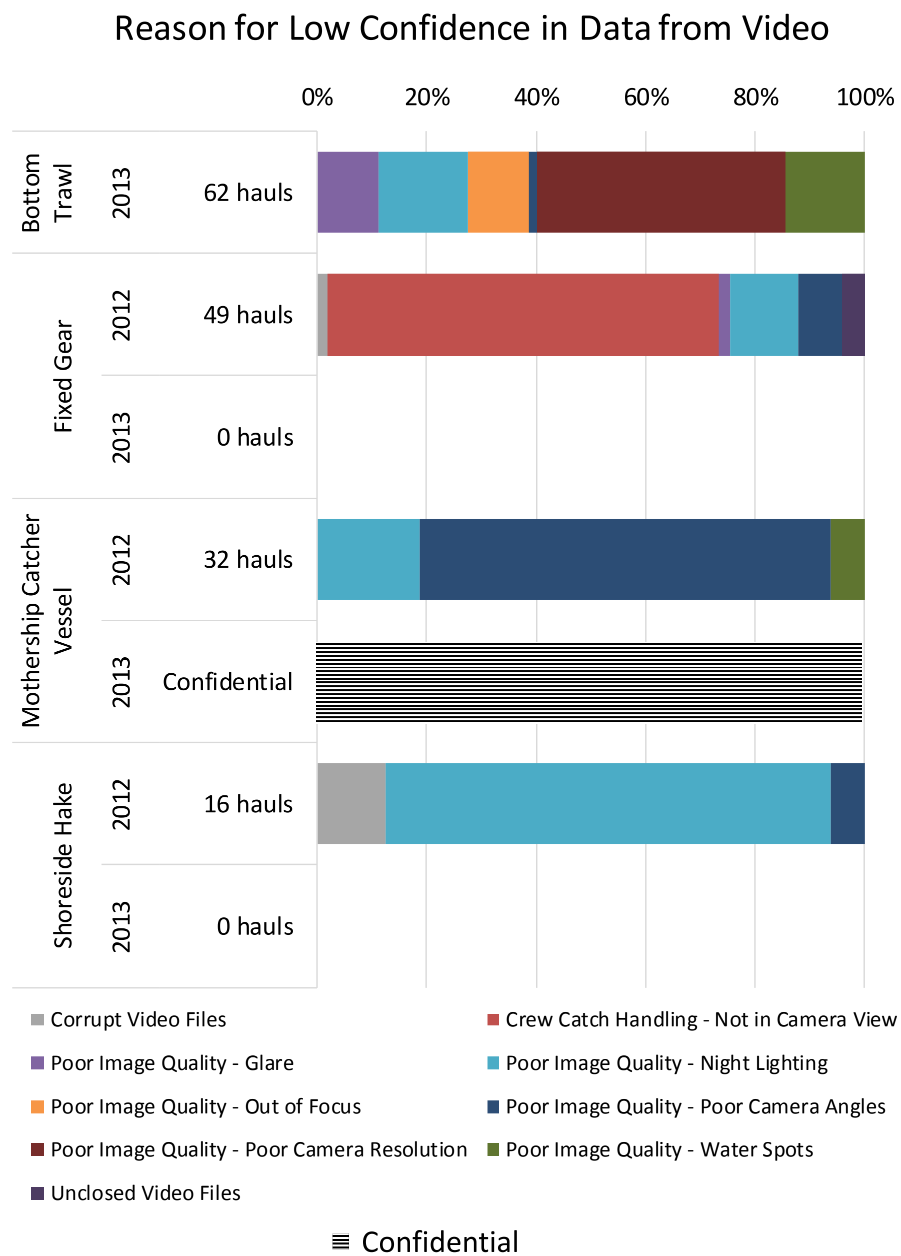
Archipelago Video

Confidence in Data from Video

- Can be:
  - High
  - Medium
  - Low or
  - Unusable
- Qualitative measures

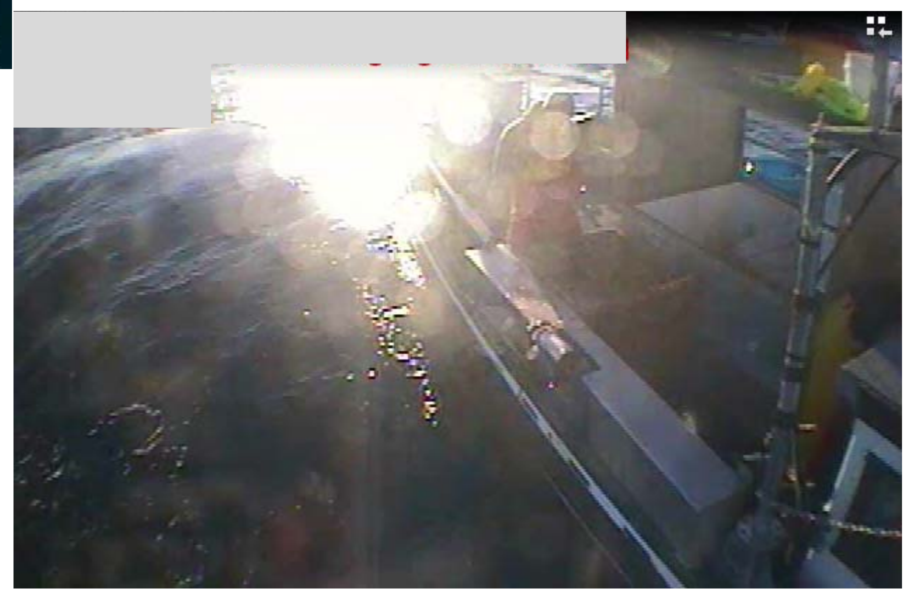
It is not the quality of the video – it is the confidence in the data that is captured from the video


Proportion of Hauls: Confidence in Data from Video
0%
20%
40%
60%
80%
100%
Bottom Trawl
Fixed Gear
Mothership Catcher Vessel
Shoreside Hake
2013
246 hauls
2012
873 hauls
2013
381 hauls
2012
299 hauls
2013
Confidential
2012
391 hauls
2013
202 hauls
High
Medium
Low
Unusable
No Video
Confidential


Reason for Low Confidence in Data from Video
0%
20%
40%
60%
80%
100%
Bottom Trawl
Fixed Gear
Mothership Catcher Vessel
Shoreside Hake
2013
62 hauls
2012
49 hauls
2013
0 hauls
2012
32 hauls
2013
Confidential
2012
16 hauls
2013
0 hauls
Corrupt Video Files
Crew Catch Handling - Not in Camera View
Poor Image Quality - Glare
Poor Image Quality - Night Lighting
Poor Image Quality - Out of Focus
Poor Image Quality - Poor Camera Angles
Poor Image Quality - Poor Camera Resolution
Poor Image Quality - Water Spots
Unclosed Video Files
Confidential

Glare

[Bottom Trawl Video](#)



Night Lighting

Bottom Trawl Video

MSCV Video

Water Spots

Bottom Trawl Video

MSCV Video (Water spots and Night lighting)

Shoreside Hake Video (Water spots and Night lighting)

Alternatives

1 - Status Quo: Human Observers Estimate Discard
2 - Camera Recordings Used to Estimate Discard (Video is data source)
3 - Logbooks Use to Estimate Discard, with Camera Audits

<u>Alternatives 2 and 3</u>

- Can’t speak to effectiveness yet of logbook auditing (Alternative 3)
- Has been used in the BC fishery effectively

The advantages of an audit over a census approach to the review of video imagery in fishery monitoring

Richard D. Stanley[1*], Howard McElderry[2], Tameezan Mawani[3], and John Koolman[4]

Stanley, R. D., McElderry, H., Mawani, T., and Koolman, J. The advantages of an audit over a census approach to the review of video imagery in fishery monitoring. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsr058.

Received 18 October 2010; accepted 10 March 2011

- Logbooks are being collected – future analysis to come.

- Program currently working under Alternative 2 – 100% video review

Alternatives 2 and 3
Component: Discard Requirements

All Options

- Allow selective discard of trash, mud, coral, etc.
- Require selective discards of prohibited species (except whiting trips);
- Require selective discards of ESA and MMPA species (i.e., protected species).
- Non-selective discard for e.g., safety, "bleeding net", zipper accidentally opened, fish came off hook, gilled in net

Note: Different options may be selected for different sectors & gears.

Option A: Maximized Retention

- No selective discard for catch share species, non-catch share groundfish species
- No selective discard for non-groundfish species

Option B: Optimize Retention of Catch Share Species - Limited Discards.

- Discard sub options are not mutually exclusive; **all species approved for discard would need to be verifiable with cameras**

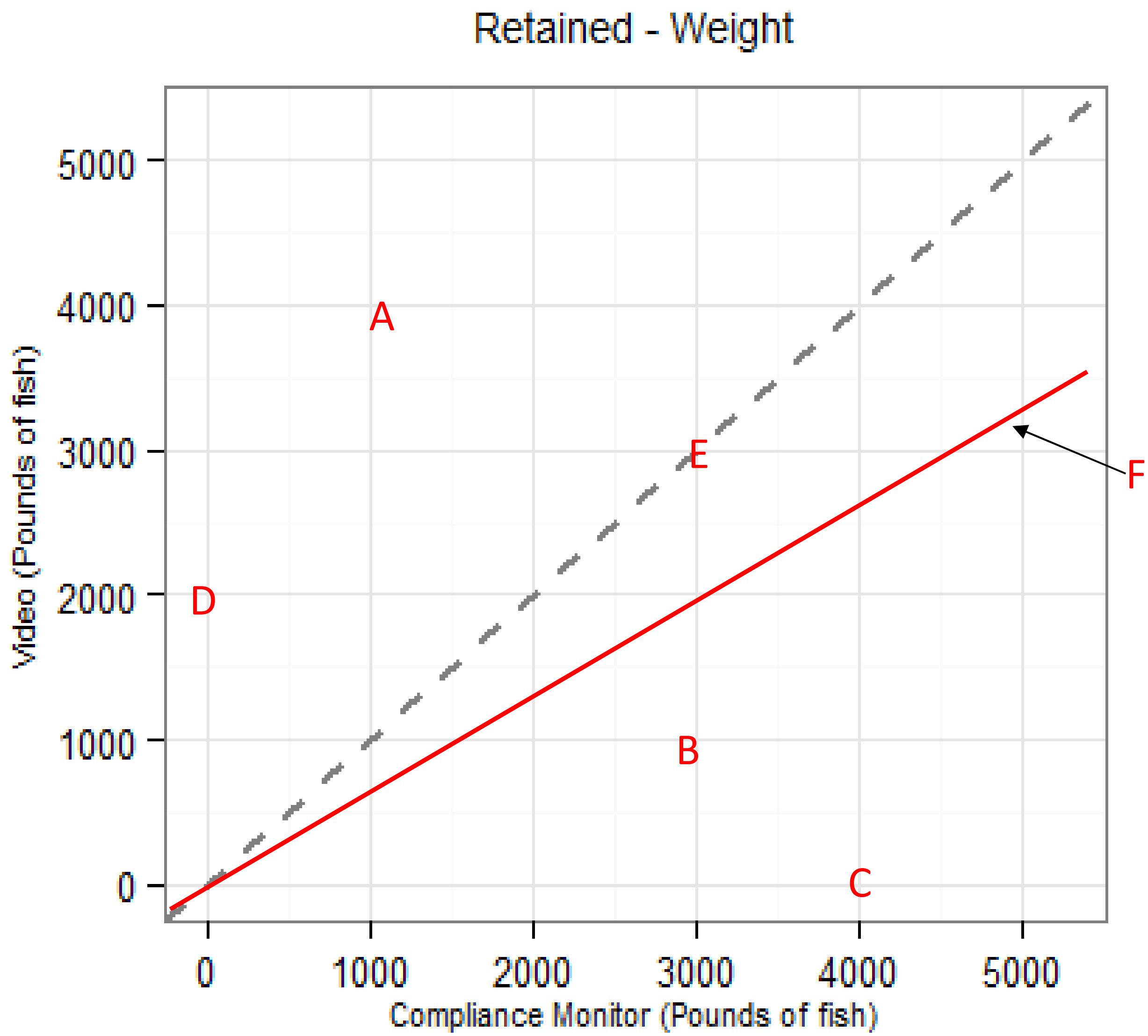
Subopt 1: flatfish
Subopt 2: lingcod & sablefish
Subopt 3: non-rockfish groundfish
Subopt 4: spp verifiable with cameras
Subopt 5: all nongroundfish spp

Option C: Discard at will (status quo)

Shoreside Hake

- Option B & C (Selective discarding) aren't applicable
  - Fishery currently working under Option A (Maximized retention)
  - EM Data generally supports discard detection of larger discards (> 2,000 pounds)
- Discards are typically from the deck
- Could not speciate well enough to support any selective discarding (Options B or C) with current configuration

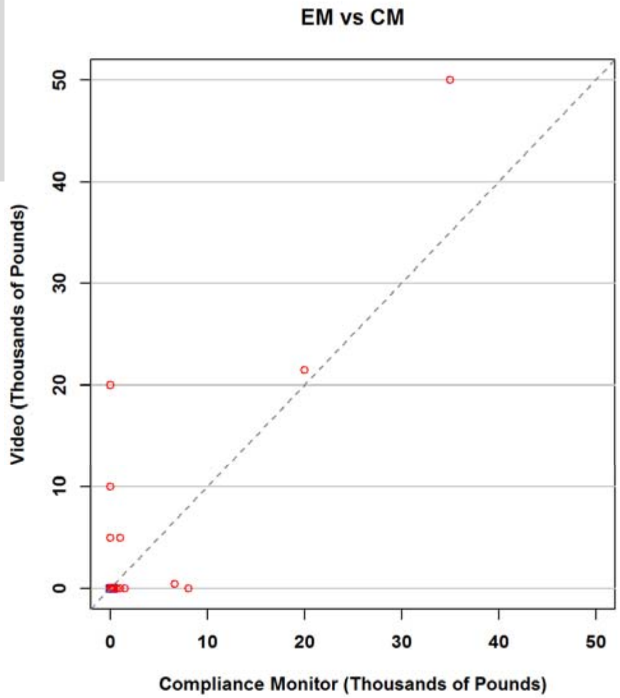
Data represented
Retained - Weight
EM on
Y axis
Video (Pounds of fish)
5000
4000
3000
2000
1000
0
1:1 agreement line
(reference line)
Axis limits always equal
(Graphs are square)
0
1000
2000
3000
4000
5000
Compliance Monitor (Pounds of fish)

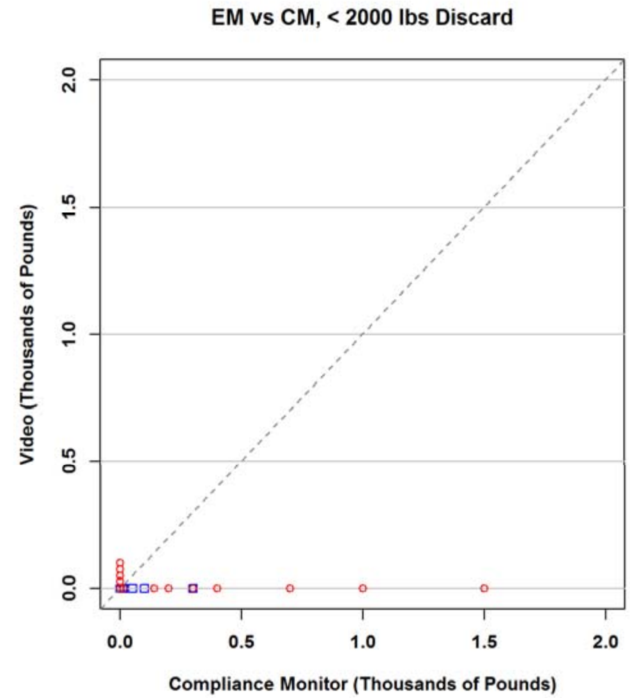

Retained - Weight
5000
4000
3000
2000
1000
0
Video (Pounds of fish)
0
1000
2000
3000
4000
5000
Compliance Monitor (Pounds of fish)
A
B
C
D
E
F

Shoreside Hake
Discarded Catch
Haul Level - EM vs CM

2012 Discards

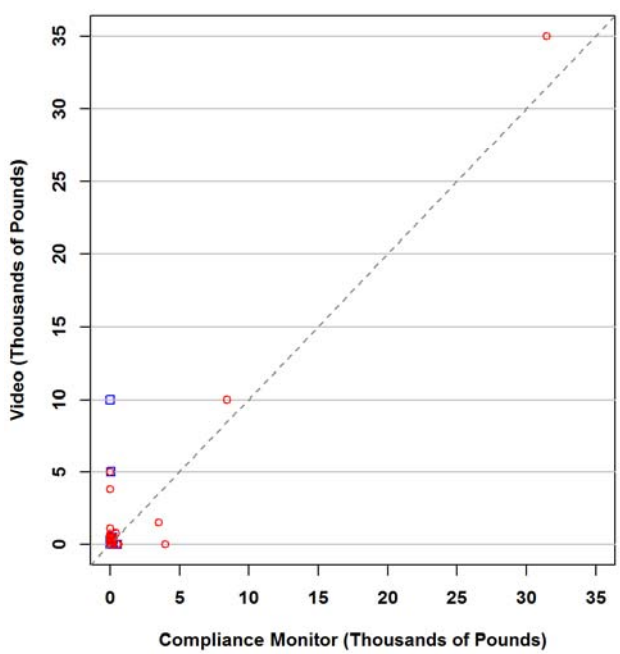
Deck wash

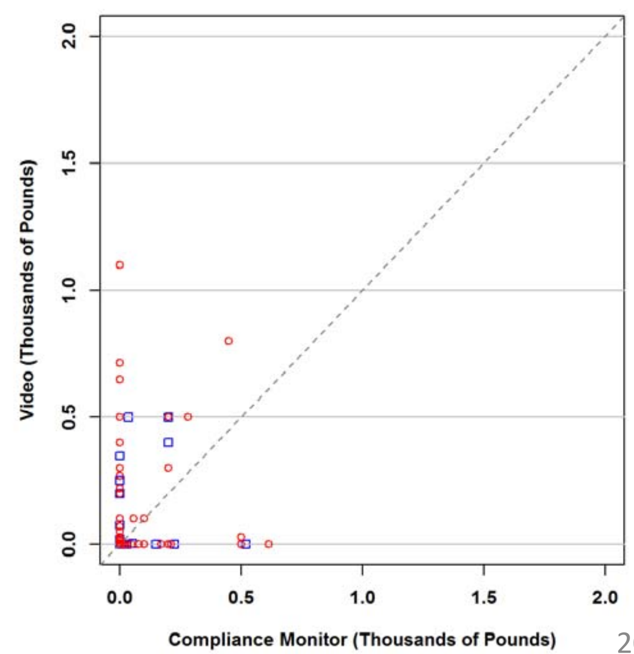




2013 Discards

Blowout Panel





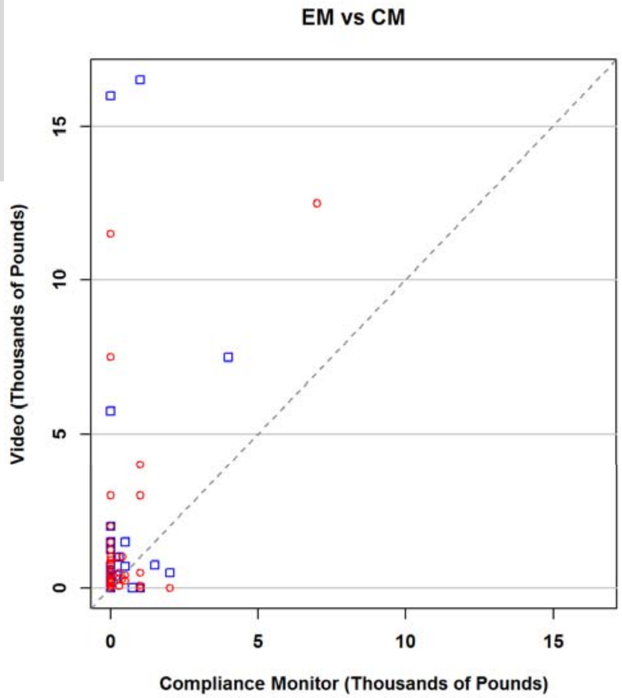
At-sea Hake

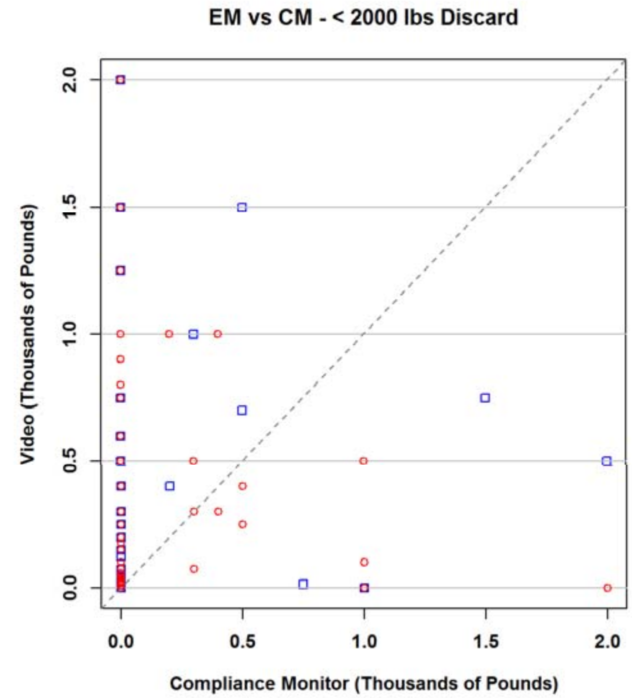
- Option B & C (Selective discarding) aren't applicable
  - Fishery currently working under Option A - Maximized retention
  - EM Data supports discard detection of larger discards (> 2,000 pounds)
- Discards are typically from the trawl alley or in the water
- Could not speciate well enough to support any selective discarding (Options B or C) with current configuration

At-sea Hake
Discarded Catch
Haul Level - EM vs CM

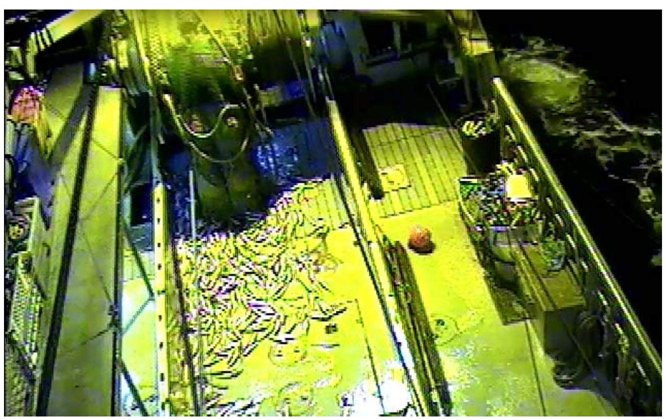
2012 Discards

(2013 Discards confidential)





Remaining fish after zippered codend removed

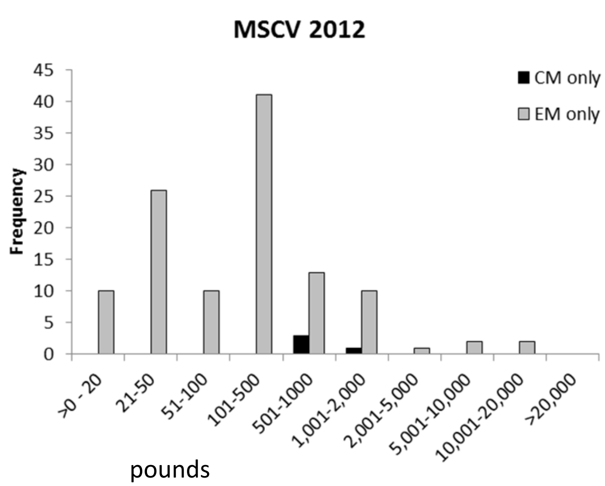


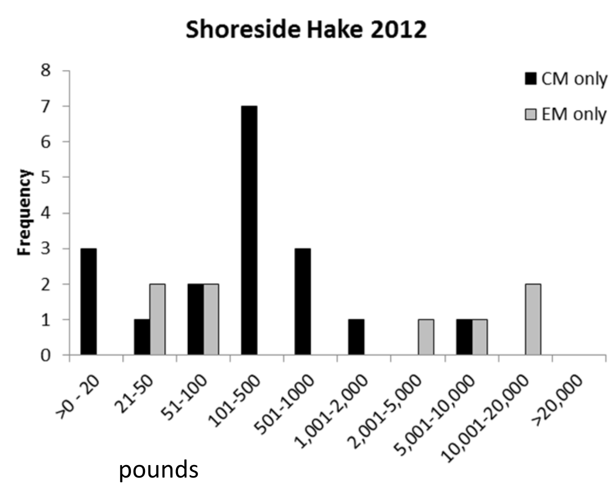
Blowout Panel

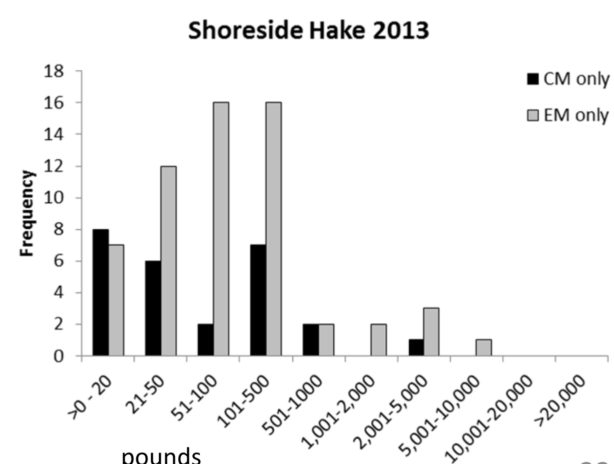
Zippering full codend

Option A - Maximized retention
EM Data generally supports discard detection of larger discards (> 2,000 pounds)

Hauls with Discards in		Mothership Catcher Vessel - 2012: Number of Discard Events	Mothership Catcher Vessel - 2012: Discard (lbs)	Shoreside Hake - 2012: Number of Discard Events	Shoreside Hake - 2012: Discard (lbs)	Shoreside Hake - 2013: Number of Discard Events	Shoreside Hake - 2013: Discard (lbs)
Both Datasets		22		4		15	
	Compliance Monitor		24,650		62,690		45,709
	Video		52,790		77,000		55,233
the Compliance Monitor Dataset but not the Video Dataset		4	5,000	18	14,499	26	7,579
the Video Dataset but not the Compliance Monitor Dataset		115	83,420	8	55,255	59	34,500
Total Number of Discard Events in Each Dataset	Compliance Monitor	26	29,650	22	77,189	41	53,288
	Video	137	136,210	12	132,255	74	89,733
			Retained (lbs)		**Retained (lbs)**		**Retained (lbs)**
Total Retained Catch Weigth	Compliance Monitor		21,146,048		33,800,751		21,374,800
	Video		17,450,700		39,131,500		20,892,094







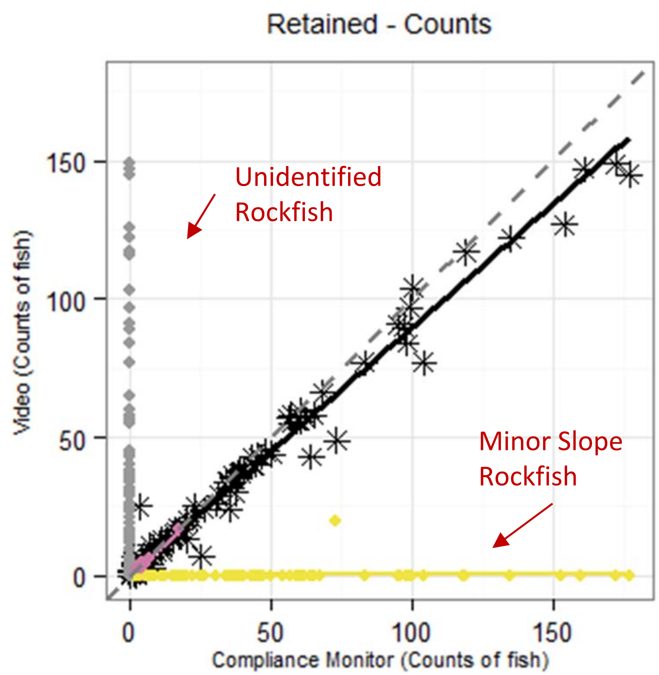
Take Home: Hake

- Under maximized retention (Option A) EM can generally detect large discards

Fixed Gear

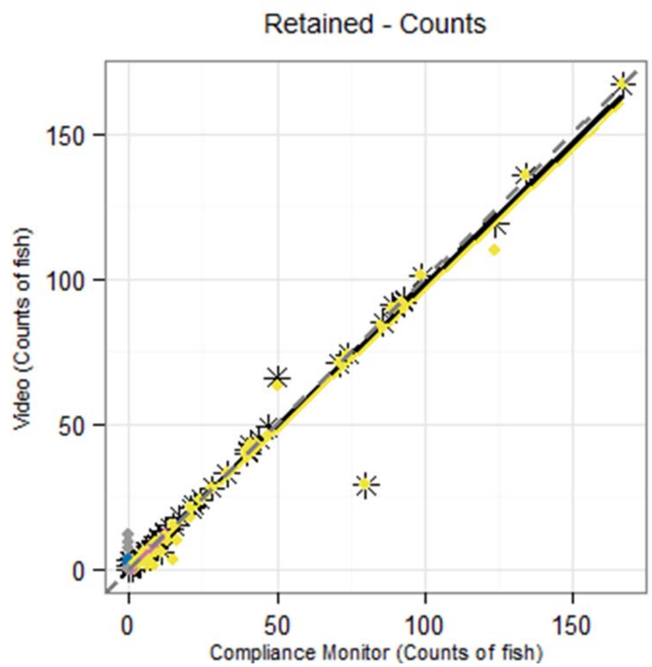
- Functioning under Option C – Discard At Will
- Things to keep in mind:
  - CM was often in a corner of the deck where a good view by video was not available
  - 7% of hauls were sub-sampled by the CM
    - These hauls were not fully sorted prior to discard
    - Data from these hauls were not included in the following graphs
  - Comparisons in the 2013 report are at the haul level
    - 2012 report was at the trip level

2012 Results



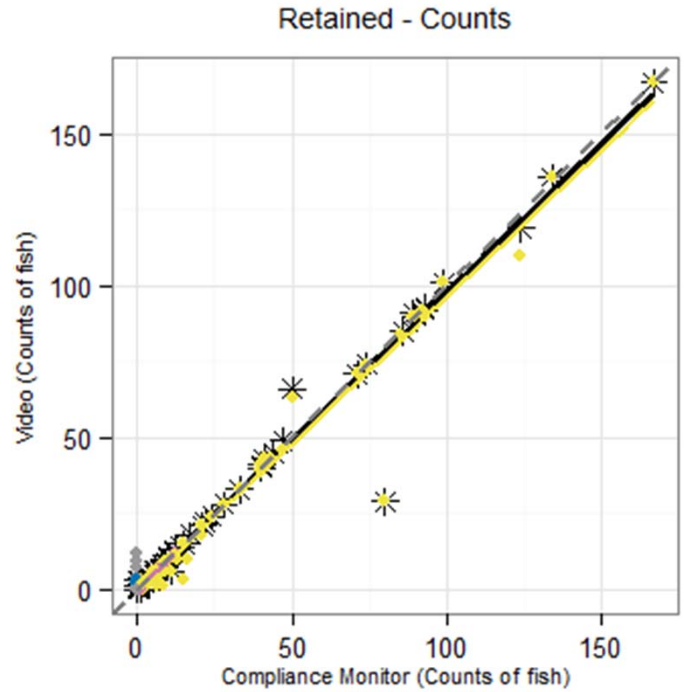
Better species/complex identification and counts in 2013

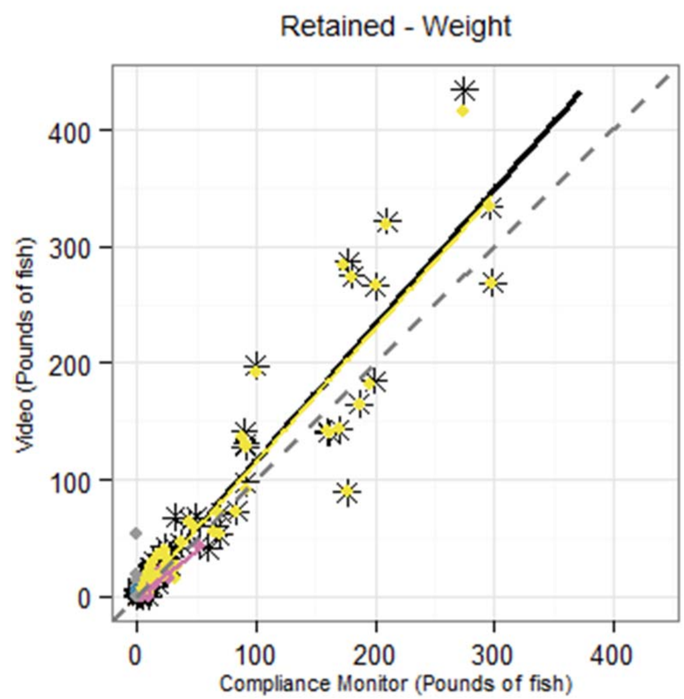
2013 Results



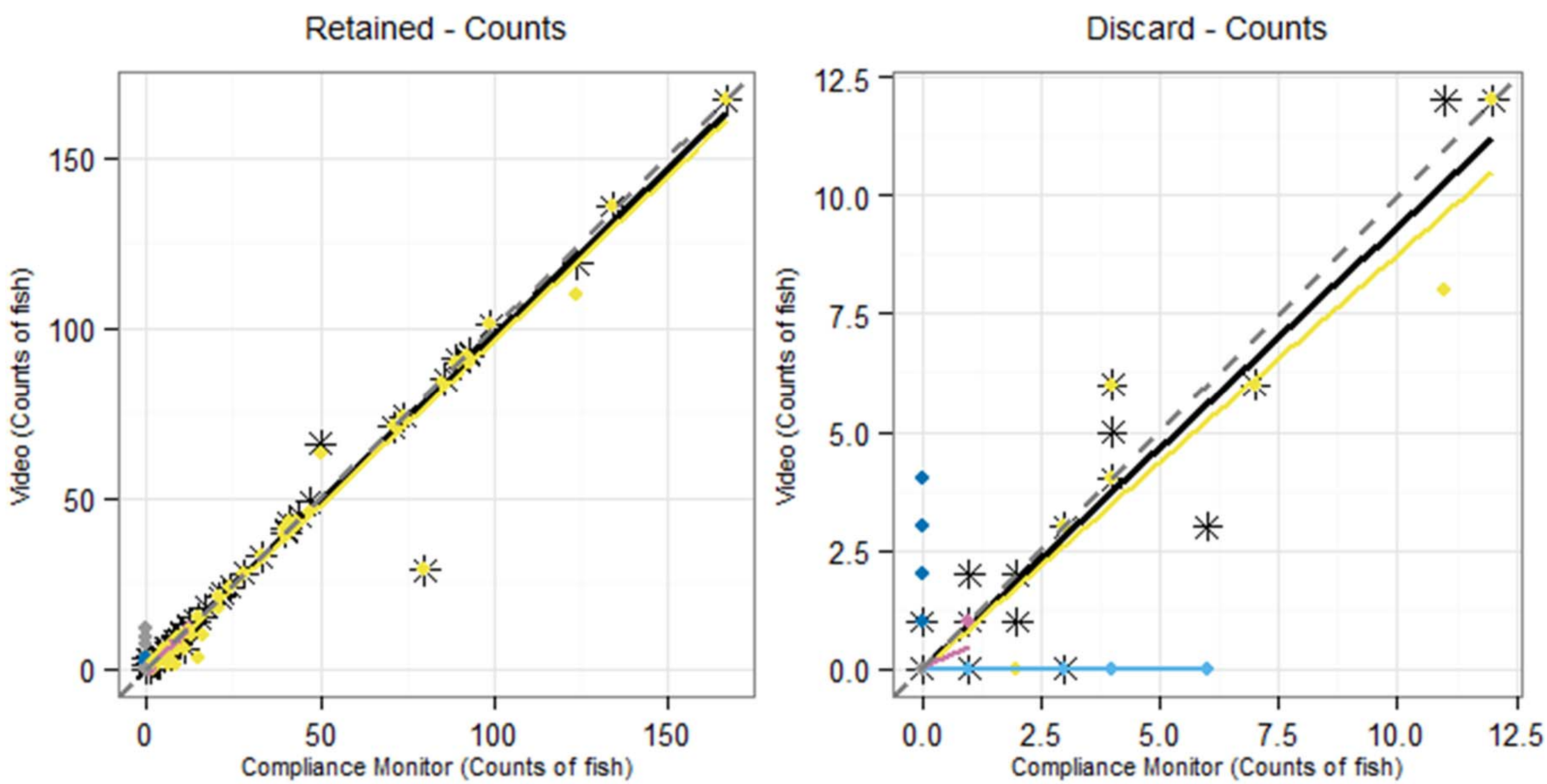
2013 Results

Counts more precise than weights





2013 Results



Species/complex ID of retained better than discards

Rockfish and Thornyheads

IFQ Complex level identification

2013 Results

	Count				Weight			
	Discarded		**Retained**		**Discarded**		**Retained**	
IFQ Complex	CM	Video	CM	Video	CM	Video	CM	Video
Rockfish								
Darkblotched Rockfish				5				12
Pacific Ocean Perch Rockfish			1				2	
Minor Shelf Rockfish				1				2
Minor Slope Rockfish	55	44	1,947	1,834	110	90	4,112	4,820
Rockfish Total	**55**	**44**	**1,948**	**1,840**	**110**	**90**	**4,113**	**4,834**
Thornyheads								
Longspine Thornyhead	38				16			
Shortspine Thornyhead	11	8	57	48	43	48	222	154
Mixed Thornyhead		23		14		13		26
Thornyheads Total	**49**	**31**	**57**	**62**	**59**	**61**	**222**	**179**
Unidentified Rockfish		17		77		25		184
Rockfish and Thornyheads Total	**104**	**92**	**2,005**	**1,979**	**169**	**176**	**4,336**	**5,197**

Flatfish

(Option B, Subopt 1)
IFQ Complex level identification

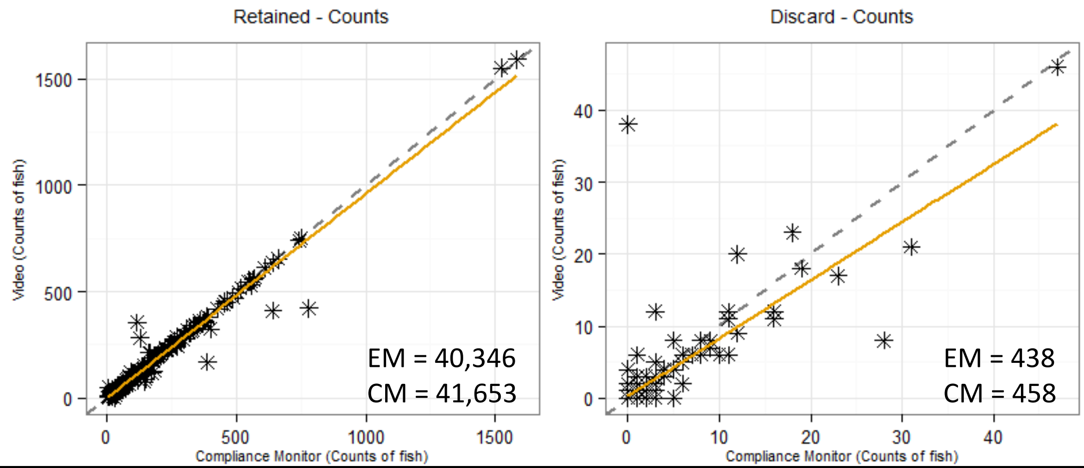
2013 Results

	Count				Weight			
	Discarded		**Retained**		**Discarded**		**Retained**	
IFQ Complex	CM	Video	CM	Video	CM	Video	CM	Video
Flatfish								
Arrowtooth Flounder	1			1	15			6
Dover Sole	28	22	88	86	55	49	133	150
English Sole								
Petrale Sole*	2		9		3		14	
Starry Flounder								
Other Flatfish	3		1	13	2		1	24
Unidentified Flatfish				1				1
NonIFQ	5	3	1	1	6	6	1	1
Flatfish Total	**39**	**25**	**99**	**102**	**81**	**55**	**149**	**182**

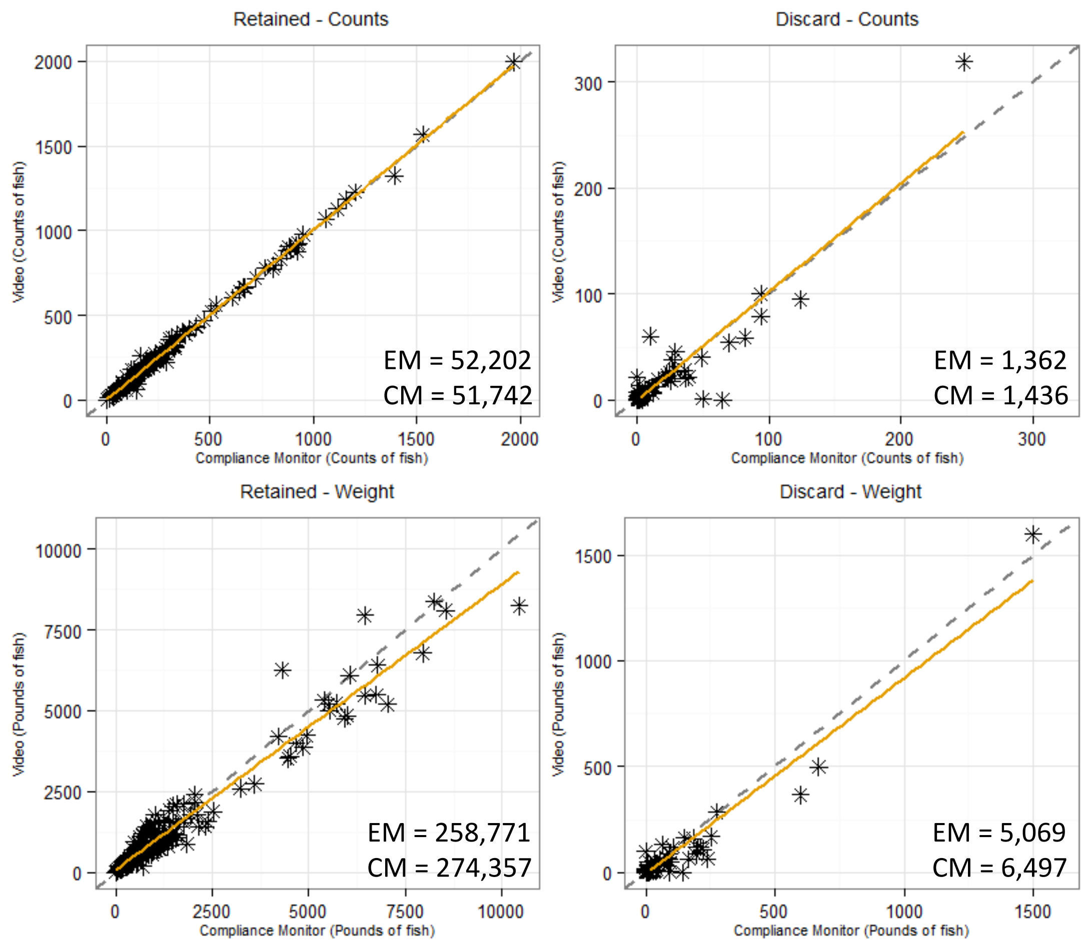
Target Species Sablefish

(Option B, Subopt 2)

2012 Results



2013 Results



Take Home: Fixed Gear

- Three Patterns:
  - Better ID and counts in 2013
  - Counts better than weights
  - Retained estimates better than discarded
- Subopt 1 (Flatfish):
  - Petrale not identifiable
    - CM 2 discards + 9 retained recorded as 10 retained "Petrale & Flathead" by video reviewer
  - Discard & retained disposition problem
- Subopt 2 (Sablefish + Lingcod):
  - Sablefish: Target species retained and discards successfully quantified (counts better than weights)
  - Lingcod: Did not see any lingcod – Cannot speak to ability to detect
- Rockfish almost all minor slope
  - Most are identified successfully in 2013
  - Video agrees with CM 73% of Discarded and 96% of Retained
- Could not identify any Longspine Thornyheads

Bottom Trawl

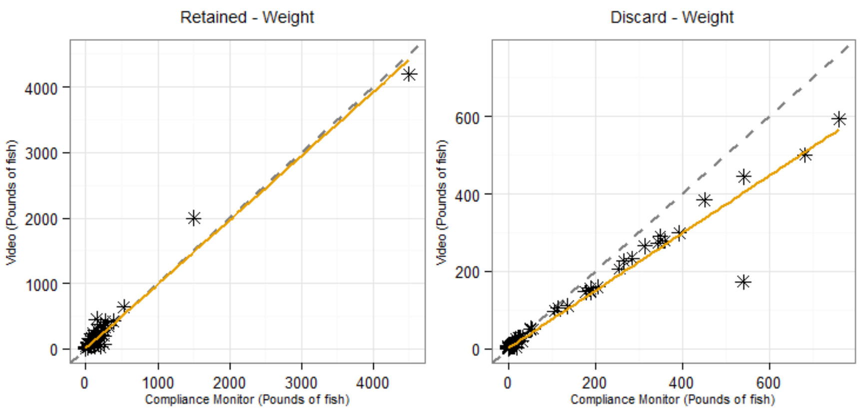
- Functioning under Option C – Discard At Will
- Things to keep in mind:
  - CM was often in a corner of the deck where a good view by video was not available
  - 18% of hauls were sub-sampled by the CM
    - These hauls were not fully sorted prior to discard
    - Data from these hauls <u>were</u> included in the following graphs
    - When discards are not sorted camera reviewers cannot speciate
  - No counts; only weight estimates

Flatfish

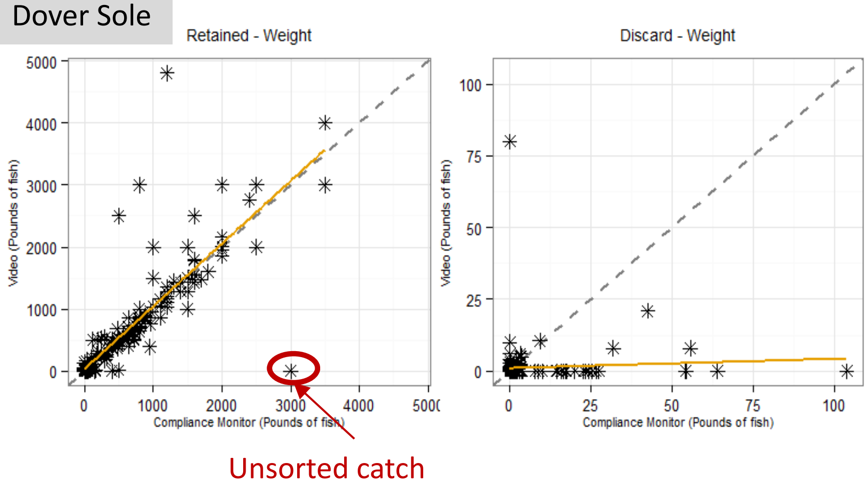
(Option B - Optimized Retention, Subopt 1)
IFQ Complex level identification

Retained = Sorted next to camera

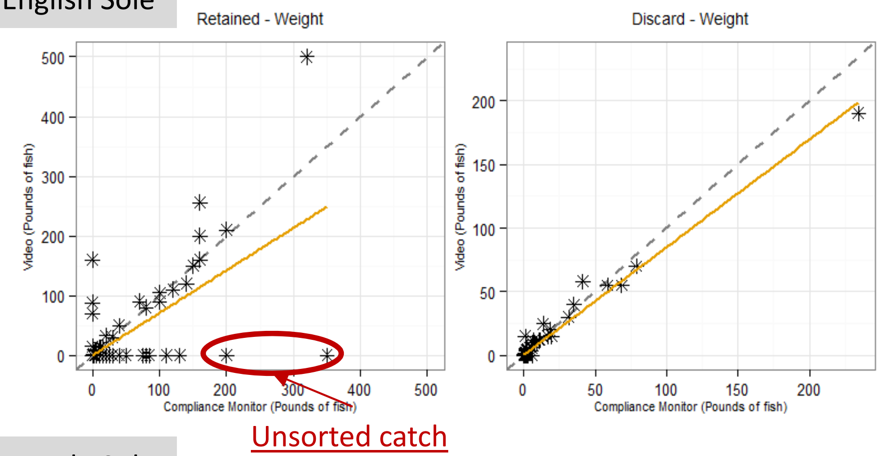
Arrowtooth Flounder



Dover Sole

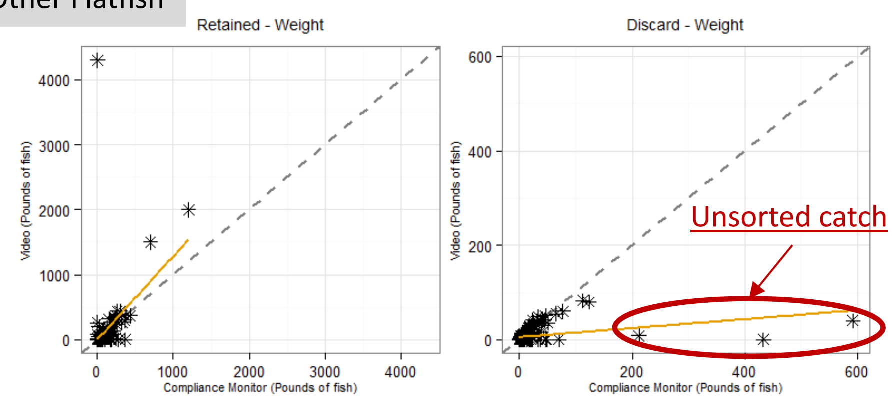


English Sole



Petrale Sole

Other Flatfish

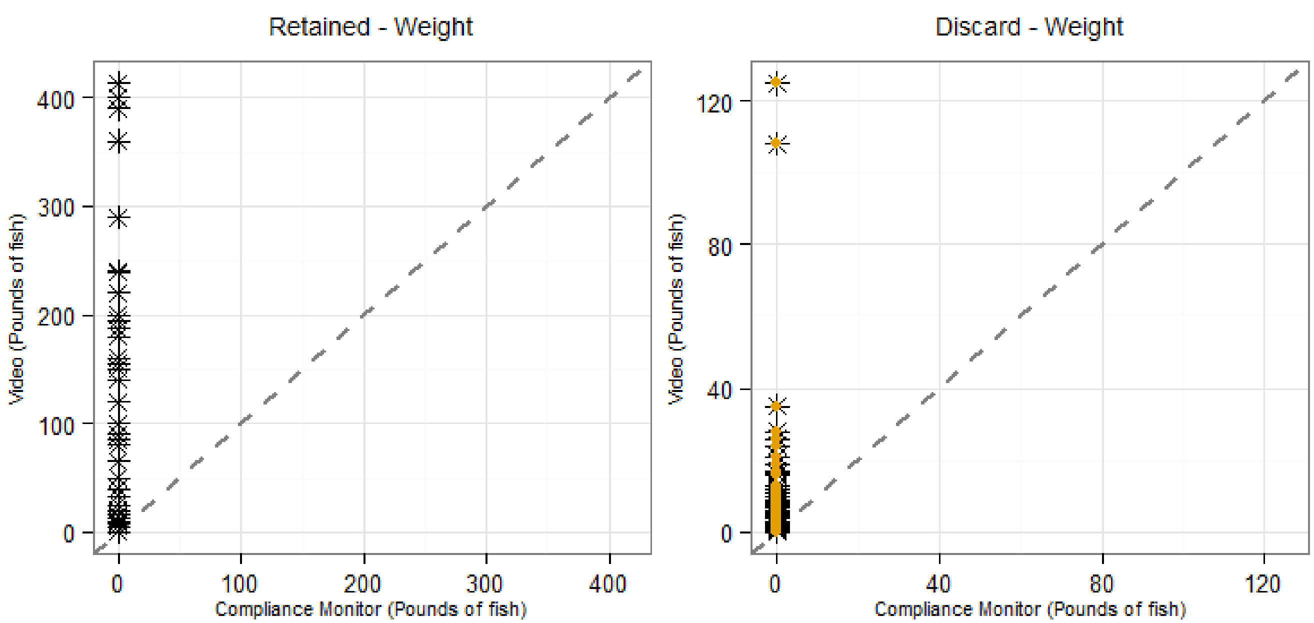


When catch not sorted camera reviewers cannot speciate

Flatfish

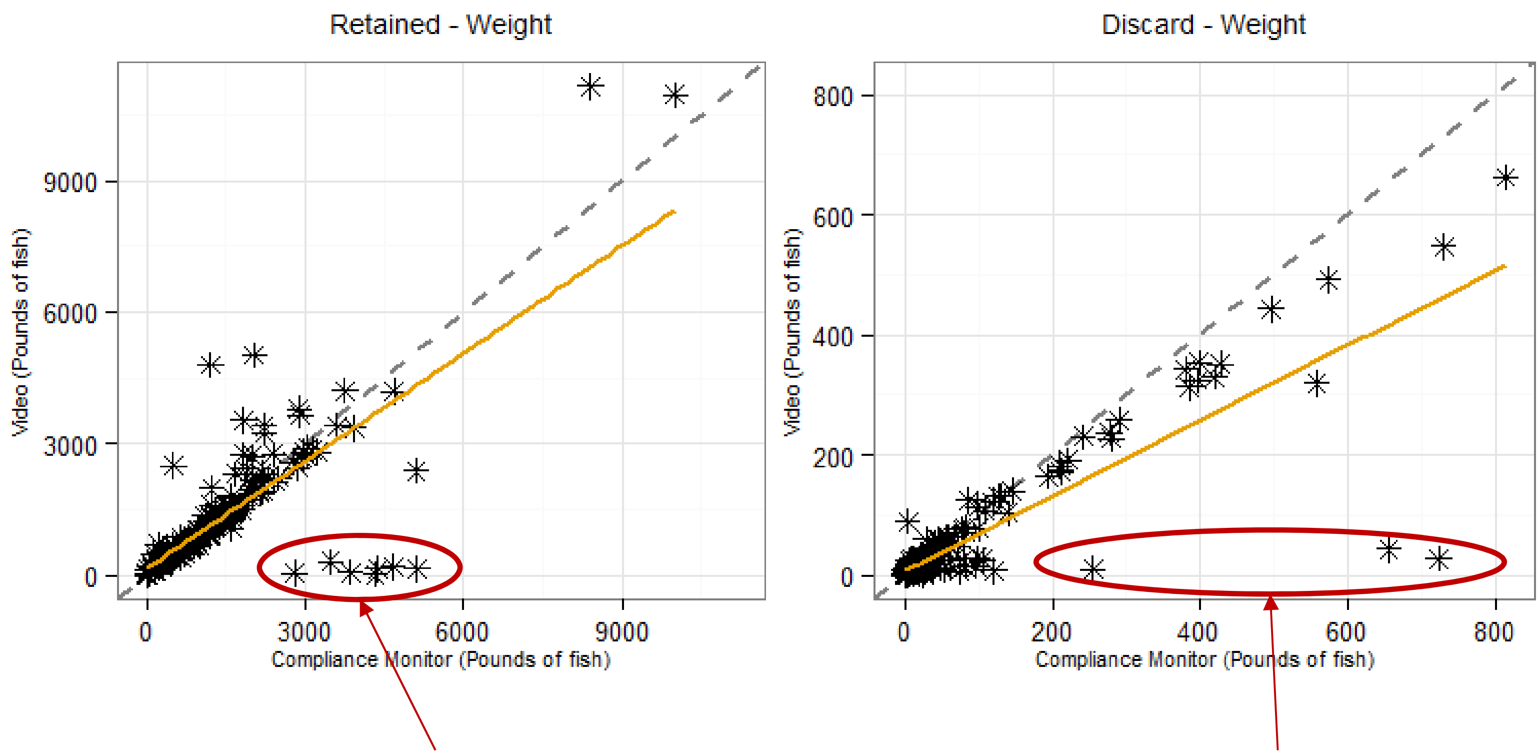
(Option B - Optimized Retention, Subopt 1)
IFQ Complex level identification

Unidentified Flatfish



Flatfish

(Option B - Optimized Retention, Subopt 1)
Can EM tell us a flatfish is a flatfish?



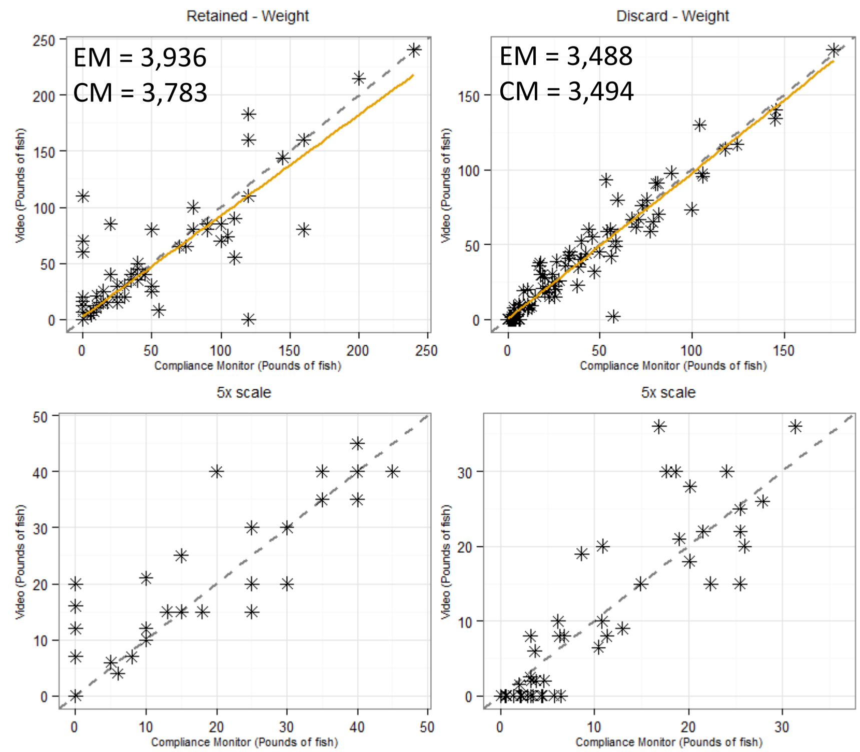
Groundfish Unid – Fish not sorted prior to placing in hold

Fish Unid – discards subsampled – not fully sorted prior to discarding

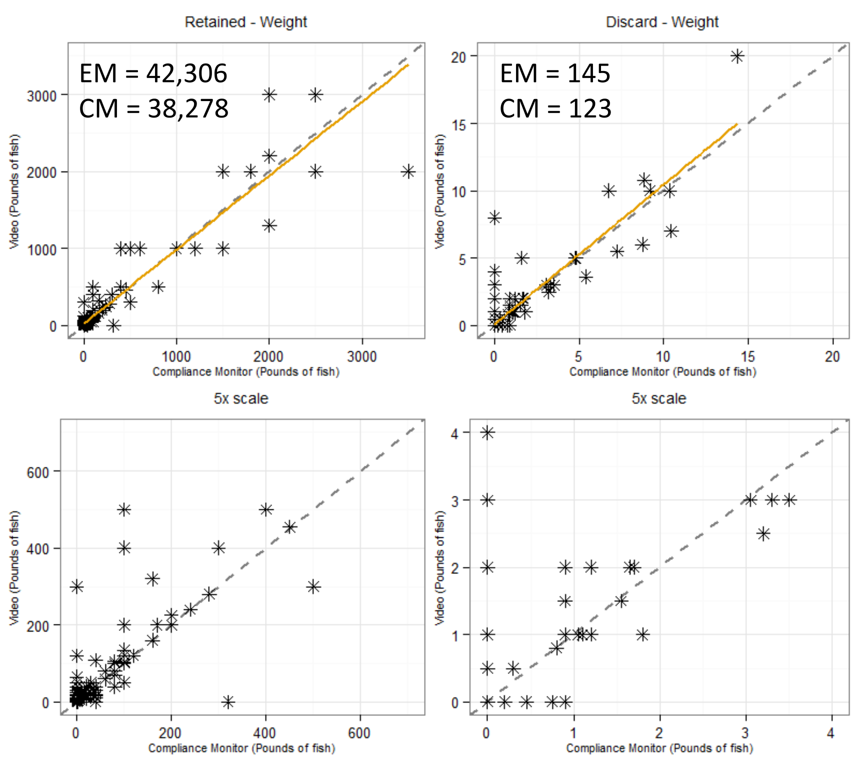
When catch not sorted camera reviewers cannot speciate

Sablefish + Lingcod
(Option B, Subopt 2)

Lingcod



Sablefish



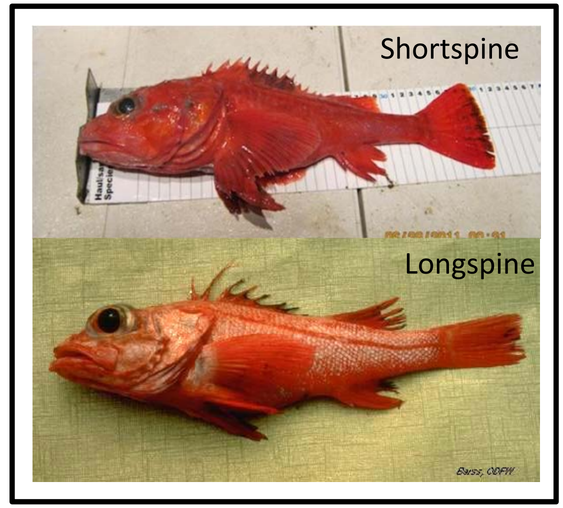
Take Home: Bottom Trawl

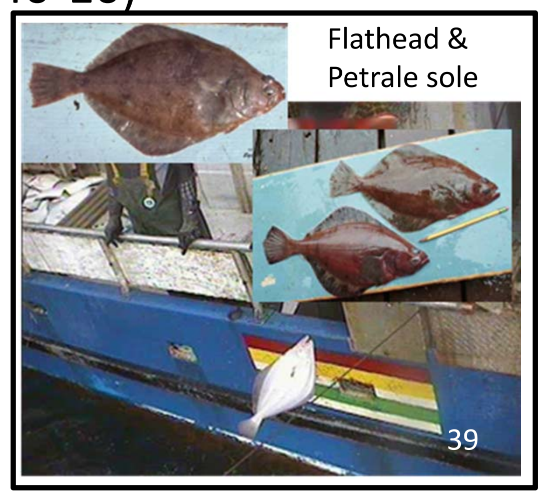
- Some species are problematic for speciation
- Estimates of retained catch is better than discarded catch
  - Retained catch is sorted more thoroughly
  - Retained sorted closer to the camera
  - With sorting of discards and/or control discard points it may be possible to discard IFQ catch of some species

Problem species

IFQ complexes that are not readily identifiable in retained and discarded catch:

- Longspine thornyheads
- Longspine & small Shortspine thornyheads
- Splitnose RF
- Splitnose & Aurora RF (Slope)
- Rougheye & Shortraker RF (both Slope Rock)
- Small Arrowtooth & English sole
- Sanddab (Other flat) & Slender sole (not IFQ)
- Yellowmouth (Slope) & Aurora (Slope) & POP (Slope S 40-10)
- Small Dover & Rex sole (Other flats)
- Petrale & Flathead (Other flats) & English sole
- Canary & Vermillion RF (Shelf)
- Yellowtail (Shelf S 40-10) & Widow RF
- Boccacio (Shelf N 40-10) & Silvergray RF (Shelf)
- Any small fish



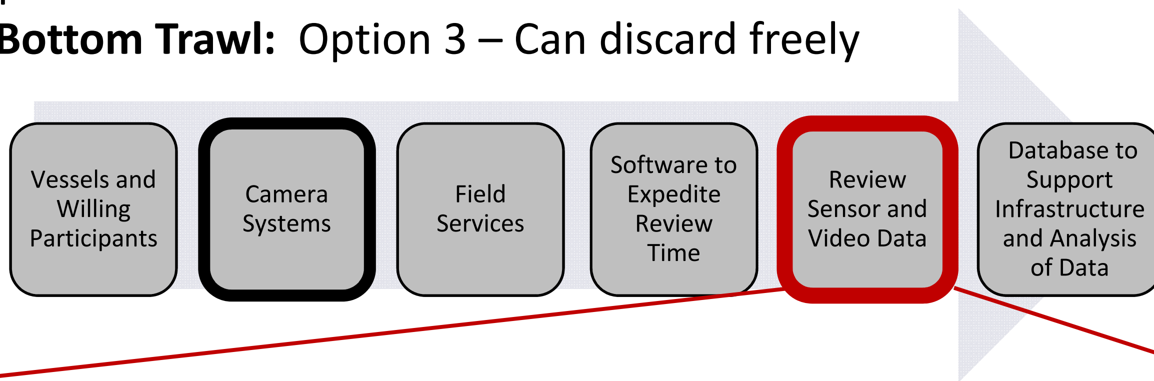


Review of At-Sea Sorting - Costs

Costs are based on Archipelago System

Hake fishery: Option 1 - Maximized retention

Fixed gear and Bottom Trawl: Option 3 – Can discard freely



Fishery	Bottom Trawl	Longline	Pot	MS Catcher Vessel	Shoreside Hake
Average Sea Days per Trip*	3.55	3.59	3.88	13.57	2.17
Average Hauls per Trip*	8.37	7.41	11.67	27.65	1.86
Average Sort Minutes per Haul	133.92	66.46	37.7	40.28	60.57
Average Review Minutes per Haul	159.25	67.5	21.47	15.04	17.53
Average Review Minutes per Sort Minute	1.19	1.02	0.57	0.37	0.29
100% Review (Review Hours per Trip)	22.22	8.34	4.17	6.93	0.54
Cost per trip for review time only (100%)	$ 1,136.00	$ 442.00	$ 233.50	$ 371.50	$ 52.00
Cost per sea day for review time only (100%)	$ 320.00	$ 123.12	$ 60.18	$ 27.38	$ 23.96
20% Review - Number of hauls reviewed	2	2	3	6	1
20% Review (Review Hours per Trip)	5.31	2.25	1.07	1.5	0.29
Cost per average trip for review time only (20%)	$ 290.42	$ 137.50	$ 78.68	$ 100.20	$ 39.61
Cost per average sea day for review time only (20%)	$ 81.81	$ 38.30	$ 20.28	$ 7.38	$ 18.25
Fraction of 100% review cost per sea day	26%	31%	34%	27%	76%

* Source 2013 WCGOP dataset

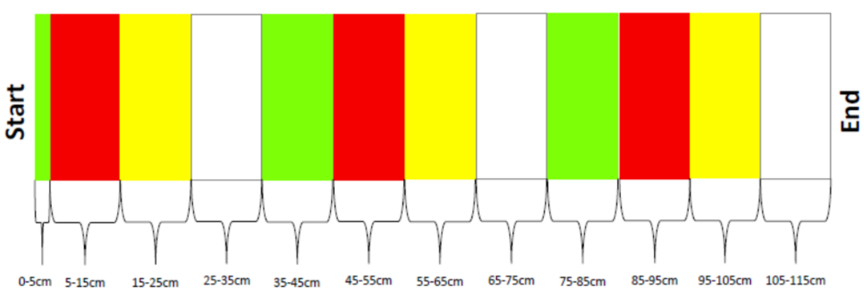
Discard Chute Study on Bottom Trawl

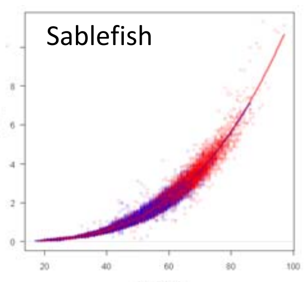
Testing ability to:

- Identify IFQ species and
- Obtain lengths to convert to weights

Will speak to Option B, Subopt 4 (Discard species verifiable with cameras) when a discard chute is used

Length-Weight Relationships

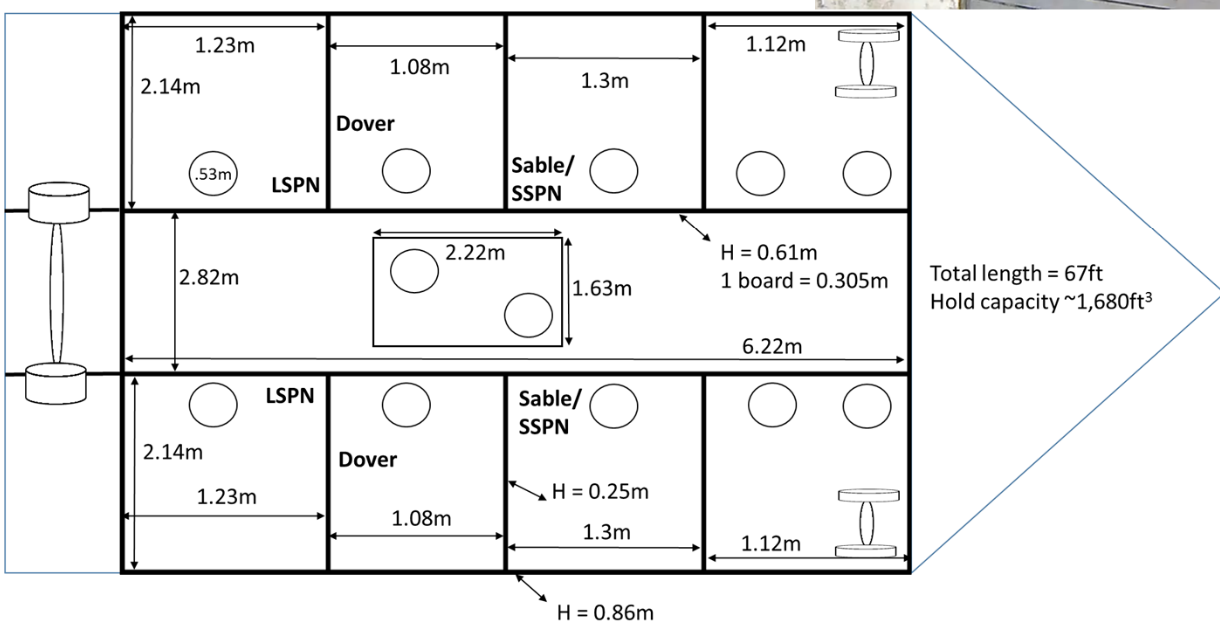




Stewart, I.J., J.T. Thorson, and C. Wetzel. 2011. Status of the U.S. Sablefish resource in 2011. NOAA-NMFS-NWFSC

Volumetric Density Study

Dockside sampling to determine density of IFQ species.
Average weight/volume



If discards are sorted into bins before going overboard, volumetric weight estimation may be usable when there are large amounts of discards

Trawl Discard Logbook

Vessel Name ____________________ Departure: Date ____________ Time ___________ Port ________________

WOC Logbook Page # ______________ Return: Date _____________ Time ___________ Port ________________

DATE (mo/day)	Set Time		Estimated pounds discarded each tow — enter 4 letter code from species list provided															
		Pounds (Required)																
		Count																
		Pounds (Required)																
		Count																
		Pounds (Required)																
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		Pounds (Required)																
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EM FIXED GEAR LOGBOOK

Year:

Permit (circle one): LE Fixed Gear - LE DTL - IFQ - Open Access **Permit #**

Vessel Name: Port of Landing:

Vessel Doc. Number: Buyer(s):

Gear (circle one): pot - barrel - bucket - longline - other

Escapement Hole Size:

Type of Pot (circle one): rectangular - conical - other

Number of Escapement Holes :

Dimensions of Pot: (H/W/L) X X

Pot/Barrel/Bucket Spacing:__________ ft. apart on groundline

PORT	GEAR

Trip No.	Fish Receiving Ticket Number

Type of Longline Gear: (circle one)
FIXED HOOK - AUTO LINE - SNAP

Gear ID

Longline **Gear ID**	Length of Skate or Line in Tub (feet)	Hook Size	Hook Spacing (feet)	# Hooks per Skate or Tub	Total Number of Skates or Tubs **Lost**
A					
B					

String or Set #	# of Skates, Tubs, or Pots per Set	LL Gear ID (A or B)	Delivery Date		Set & Up (Retrieve) Date	Time (24 Hour Clock)	String	Depth (Fm)	Latitude & Longitude (Deg = Degree): Lat. Deg	Decimal Minutes	Long. Deg	Decimal Minutes	Estimated Pounds of SABLEFISH RETAINED (Pounds / Count)	Estimated Pounds of RETAINED (Pounds / Count)	Estimated Pounds of RETAINED (Pounds / Count)	Estimated Pounds of RETAINED (Pounds / Count)	Estimated Pounds of SABLEFISH RELEASED (Pounds / Count)	Estimated Pounds of RELEASED (Pounds / Count)	Estimated Pounds of RELEASED (Pounds / Count)
				Set			Start												
				Up			End												
				Set			Start												
				Up			End												
				Set			Start												
				Up			End												
				Set			Start												
				Up			End												
				Set			Start												
				Up			End												
				Set			Start												
				Up			End												

Vessel Operator's Signature: Vessel Operator's Name (print):

Comments:

Hake Logbook

Vessel Name ______________________ Departure: Date ______________ Time ___________ Port ________________

Logbook Page # ______________ Return: Date ______________ Time ___________ Port ________________

DATE (mo/day)	Haul #	Set Time	Up Time	Estimated pounds discarded each tow — enter 4 letter code from species list provided							
				Retained Pounds	**Discarded**						**Notes**
				Total Estimated Retained Catch	**Species**						
					Discard Type						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						
					Pound (est.)						
					Count						

FISHERIES IN 2015-2016 AND BEYOND: UPDATES AND KEY DECISION POINTS INFORMATIONAL BRIEFING

The Council will receive a briefing under this agenda item on the analyses and other material informing decisions on 1) Agenda Item C.4: Fisheries in 2015-2016 and Beyond: Adopt Biennial Specifications Final Preferred Alternatives, 2) Agenda Item C.8: Fisheries in 2015-2016 and Beyond: Stock Complex Restructuring, and 3) Agenda Item C.9: Fisheries in 2015-2016 and Beyond: Adopt Management Measures Preliminary Preferred Alternatives. This is an informational briefing only, with an opportunity for Council members to ask questions about analyses on harvest specifications, management measures, and stock complex restructuring.

Council Action:

Receive briefing and ask questions about the analyses.

Reference Materials:

None.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Informational Briefing — John DeVore and Kelly Ames
c. Council Questions and Discussion

PFMC
03/21/14

Agenda Item C.2.a
Supplemental REVISED Attachment 1
April 2014

2015-2016 Harvest Specifications and Management Measures

Adopt all OFLs, ABCs, and ACLs

- In determining the last few harvest specifications, there have been some changes to OFLs (e.g., greenspotted rockfish)
- Washington cabezon specifications yet to be decided
- Confirm EC species designations
- Confirm management of kelp greenling, WA cabezon, and leopard shark – manage separately or in a Shallow Roundfish complex?

Cowcod Rebuilding Plan

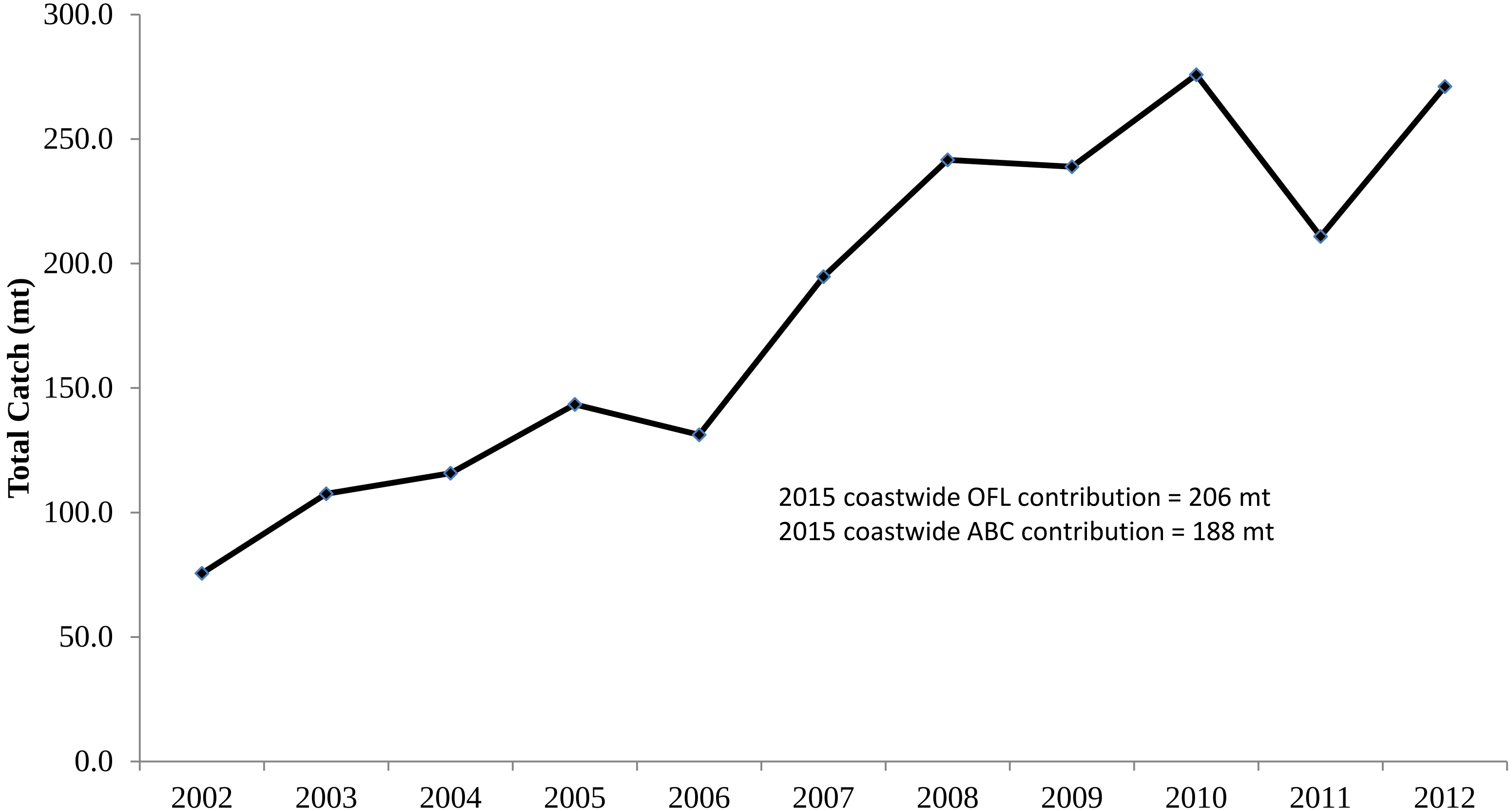
- Confirm PPA for the 4 mt ACT
- Confirm PPA for default harvest control rules (constant harvest rate) = 10 mt ACL
- Decide rebuilding year (T_{TARGET})
  - 2068 is beyond the new T_{MAX} of 2057
  - Adopt median time to rebuild under the HCR in the current rebuilding plan (2020) or later to increase the probability of rebuilding by T_{TARGET}?

Slope Rockfish Complexes

- Adopt PPA for restructuring the Slope Rockfish complexes under Agenda Item C.8
- Consider narrowed action alternatives decided for analysis in November (Agenda Item C.8.a, Attachment 1)
  - Likely delay in submitting the DEIS and implementing new regs. If all these remain in the 2015-16 spex analysis
- Biological impacts of rougheye and shortraker addressed in Prelim. DEIS section 4.1 (Agenda Item C.4.a, Attachment 3), in NMFS analysis (Agenda Item C.8.a, Attachment 2), and excerpts of DEIS Appendix B (Agenda Item C.8.a, Attachment 3)

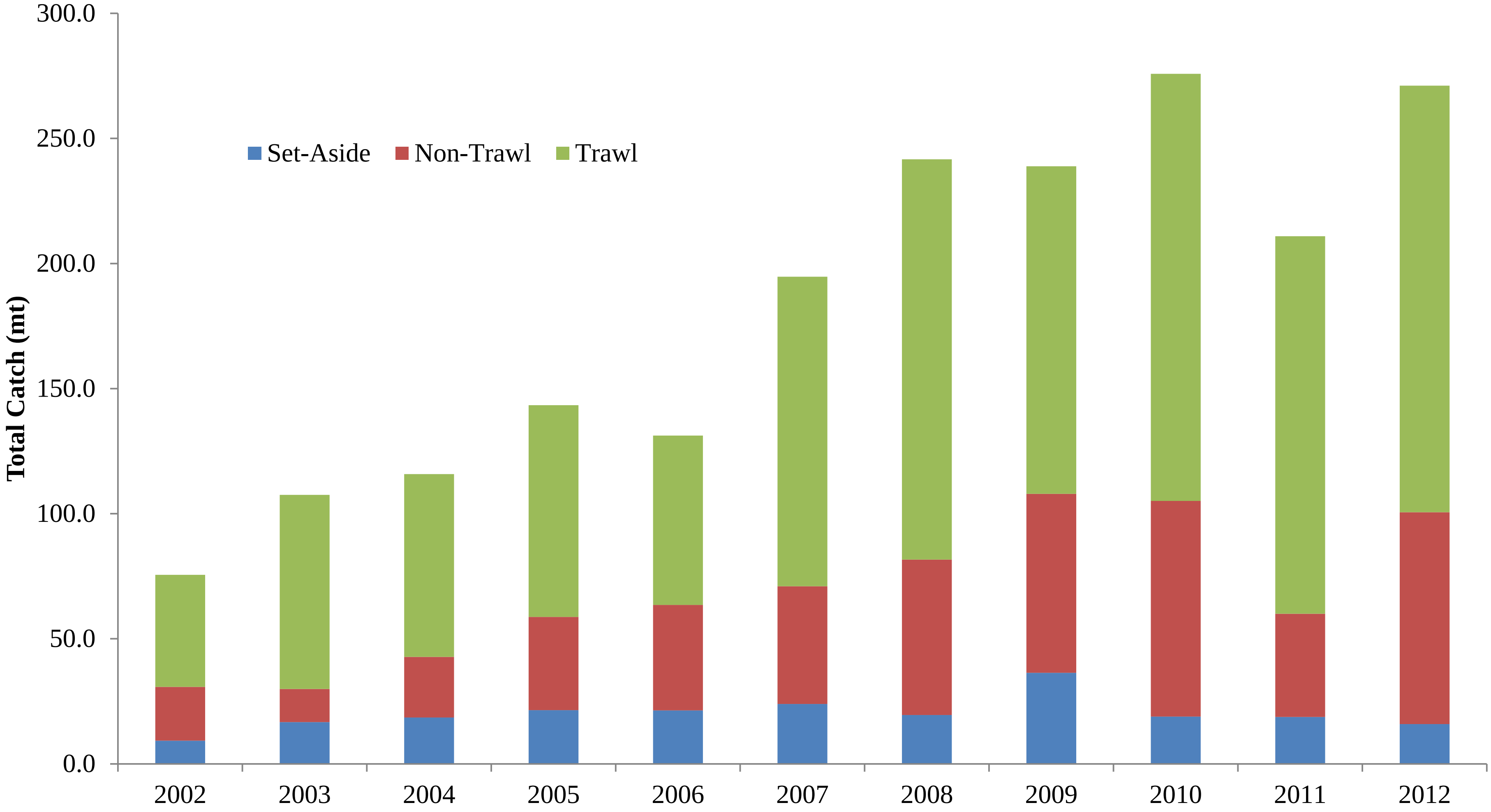
Rougheye Issue

Coastwide Fishing Mortality Relative to the 2015 OFL and ABC

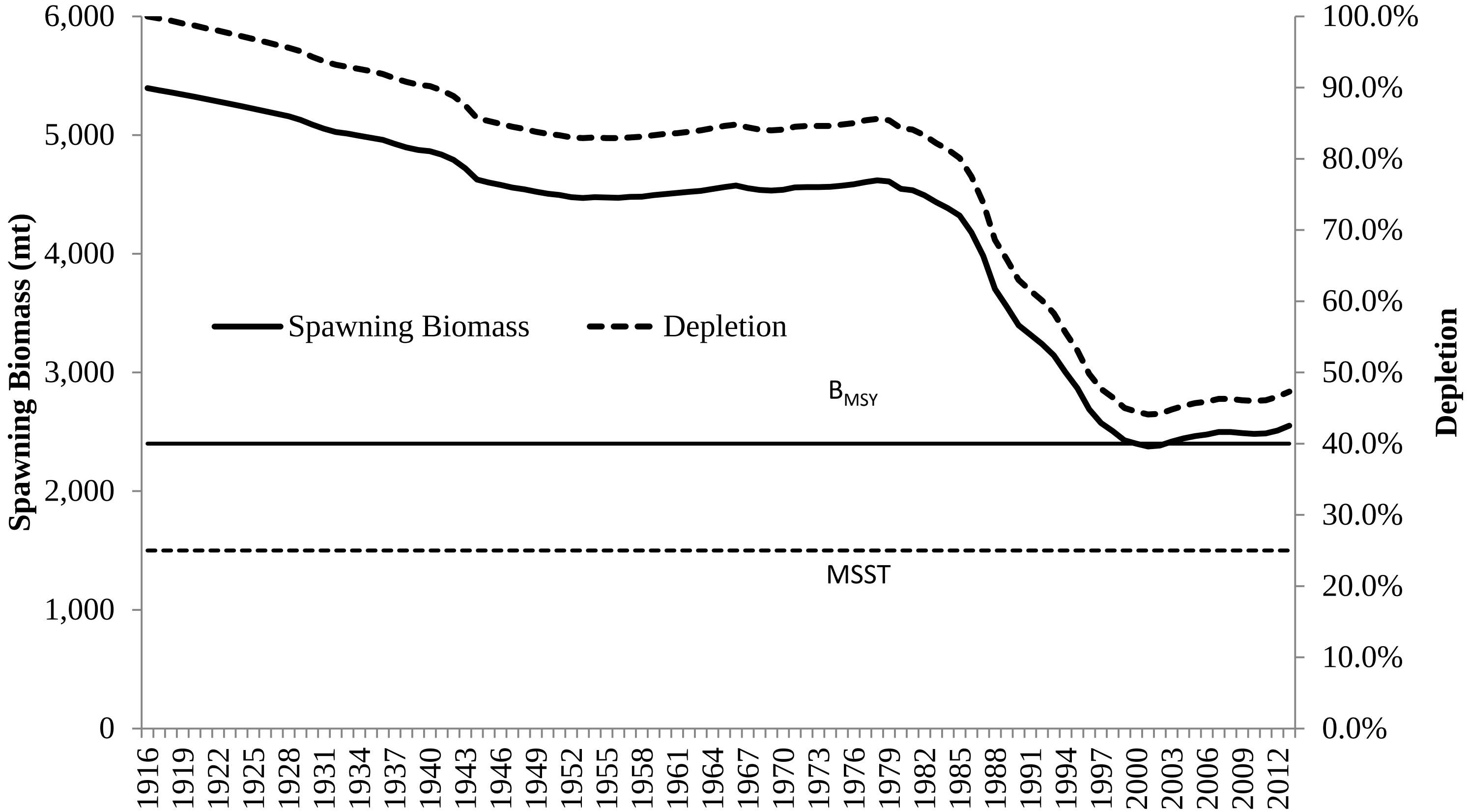


Rougheye Rockfish

Fishing Mortality by Sector

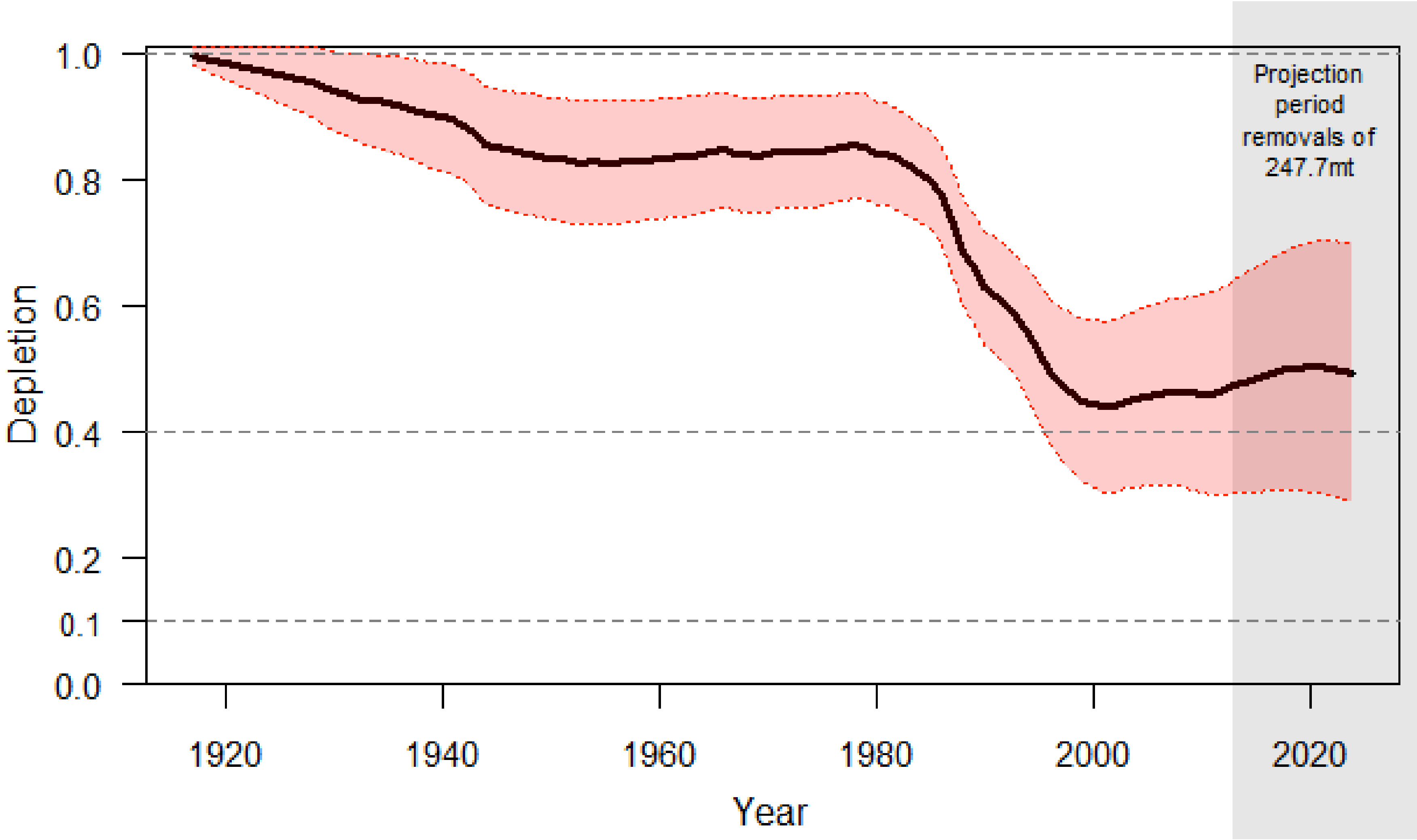


Rougheye Status



Roughye Risk

Projected Depletion Assuming the 2008-12 Catch Levels



RoughEye Management Alternatives - Trawl

No Action	Harvest Spex Alts 1-3: No Action Complex plus New MM (analyzed in DEIS)	NMFS Alt. Rougheye/Shortraker ACL (analyzed in NMFS Report)
*Slope rockfish IFQ *Slope rockfish set-aside for at-sea sectors *RCA a/	In addition to No Action measures, *GCAs – discrete area closures *HG for Trawl/Non-Trawl and/or within trawl and/or a shared HG *Rockfish excluders for midwater Pacific whiting gears - both shoreside, CP, and MS *Rougheye set-aside for at-sea, in addition to the slope rockfish set-aside	*IFQ for rougheye/shortraker and slope would be automatically issued b/ unless another process is adopted *New measures under Alts 1-3 could also be implemented, if nec.

a/ Moving the RCA from 100 to 200 fm would result in reduced rougheye rockfish interactions. The largest reductions would occur if the RCA is moved deeper than 250 fm, which would limit access to target species.

b/See regulations at 660.140(C)(3)(vii)

Rougheye Management Alternatives – Non-Trawl

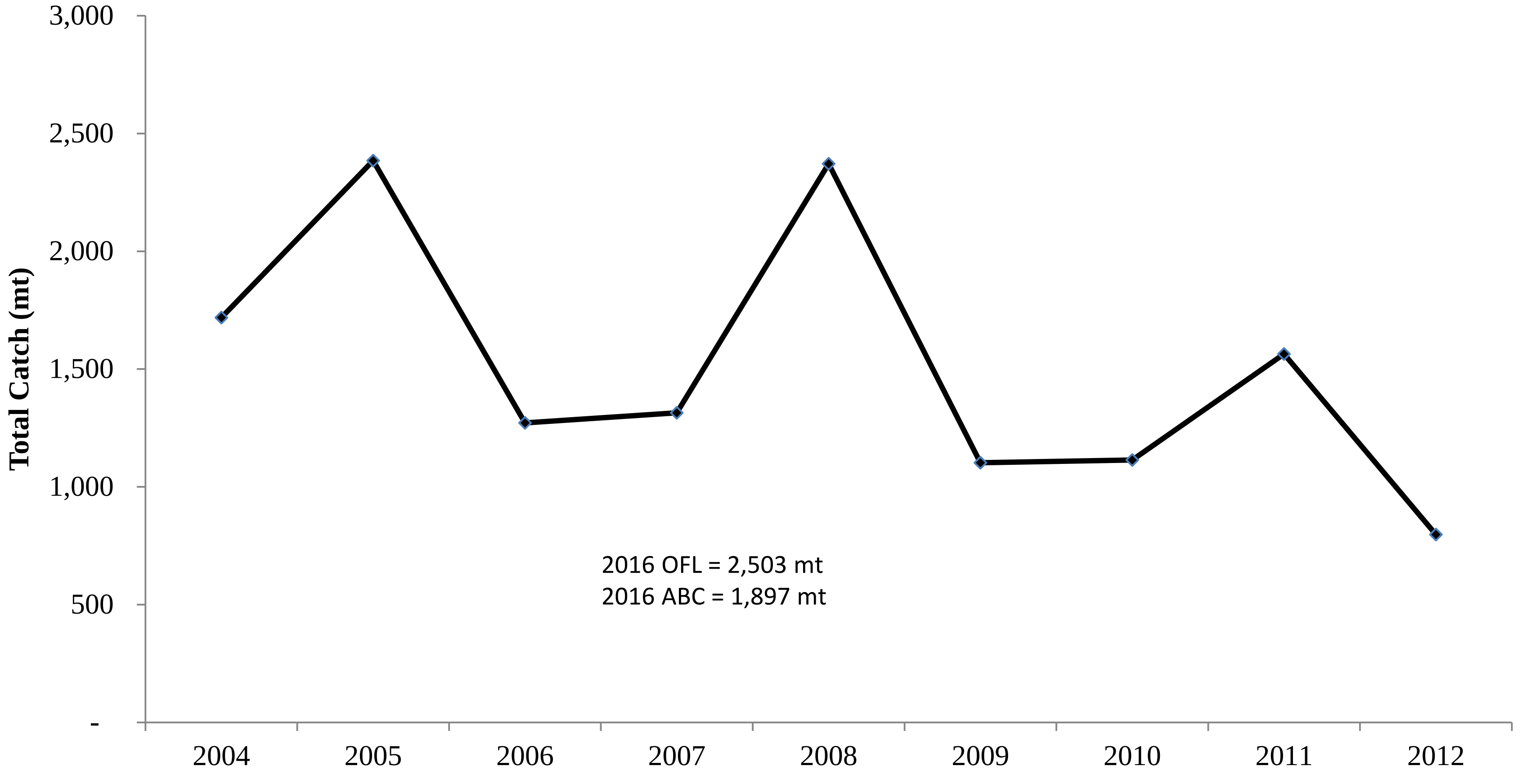
Current	Harvest Spex Alts 1-3: No Action Complex Structure plus New MM (analyzed in DEIS)	NMFS Alt. Rougheye/Shortraker ACL (analyzed in NMFS Report)
*Trip limit reductions a/ *RCAs b/	In addition to No Action measures, *GCAs – discrete area closures *Sub-trip limits for rougheye rockfish within slope?	*GCAs under Alts 1-3 could also be implemented, if nec.

a/ Reductions to the slope rockfish trip limits could reduce targeting of slope species. However, incidental catch of rougheye rockfish could still occur and most (all?) would not survive release. The efficacy of such reductions needs further analysis.

b/ Moving the RCA from 100 fm to 200 fm would result in reduced rougheye rockfish interactions. The largest reductions would occur if the RCA is moved deeper than 250 fm, which would limit access to target.

Spiny Dogfish

Fishing Mortality Relative to the 2016 OFL and ABC



Spiny Dogfish

Fishing Mortality by Sector

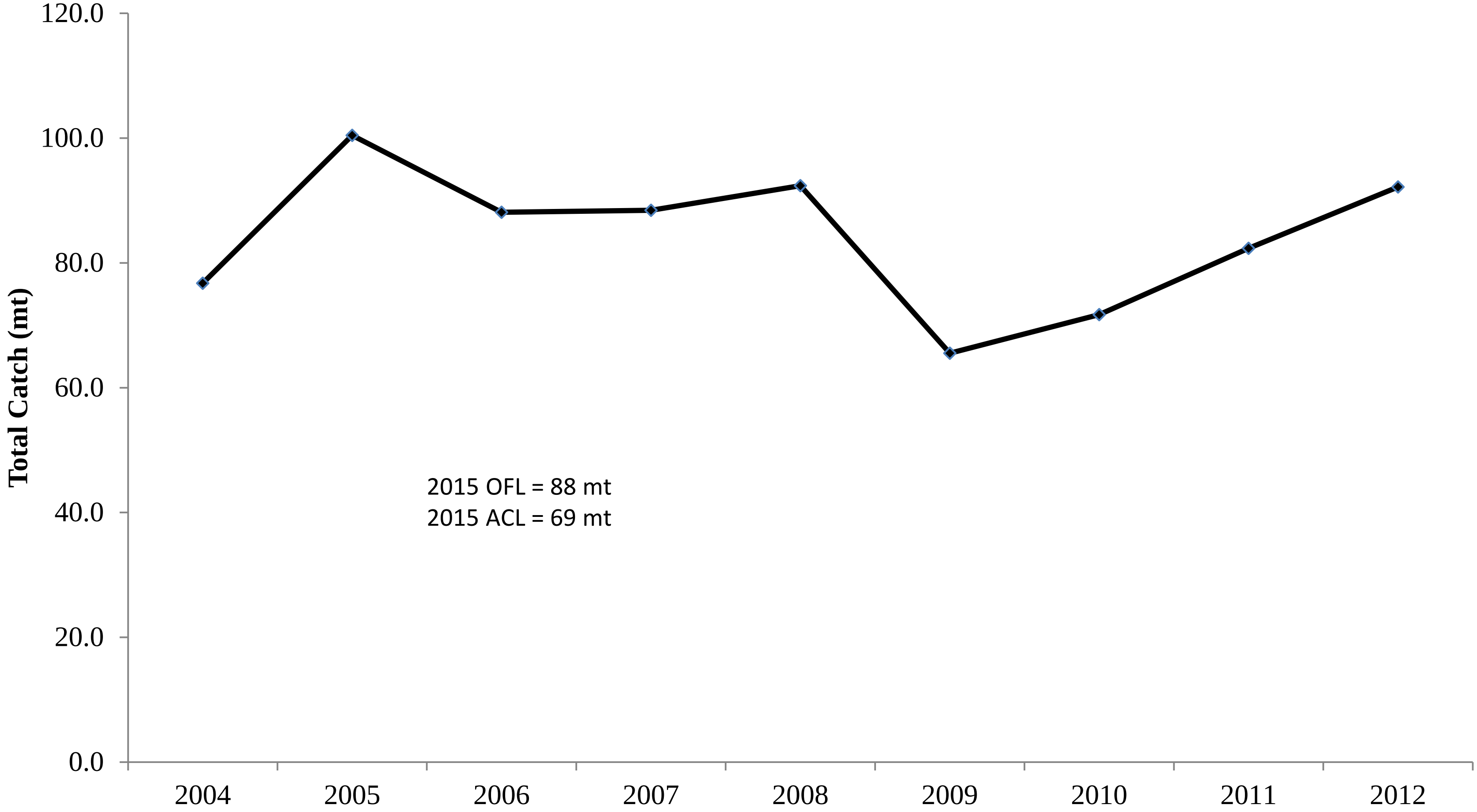
Spiny Dogfish Management Alternatives

Sector	No Action	Harvest Spex Alts 1-3: Stock-Specific ACL plus New MM (analyzed in DEIS)
Trawl	*Trip Limits a/ *Other Fish set-aside for at-sea sectors *RCA b/	In addition to No Action measures, *GCAs – discrete area closures? *HG for Trawl/Non-Trawl and/or within trawl? *Spiny dogfish set-aside for at-sea?
Non-Trawl - Commercial	*Trip limits a/ *RCA b/	In addition to No Action measures, *GCAs – discrete area closures?

a/ To the extent trip limit reductions reduce targeting, decreased mortality would occur. If fishing continues in the same area but discarding increases, the change in mortality will be less because discard mortality is 100% for trawl fisheries and 50% for fixed gear fisheries.
b/ RCA movements may need to be extensive, which would limit access to target spp.

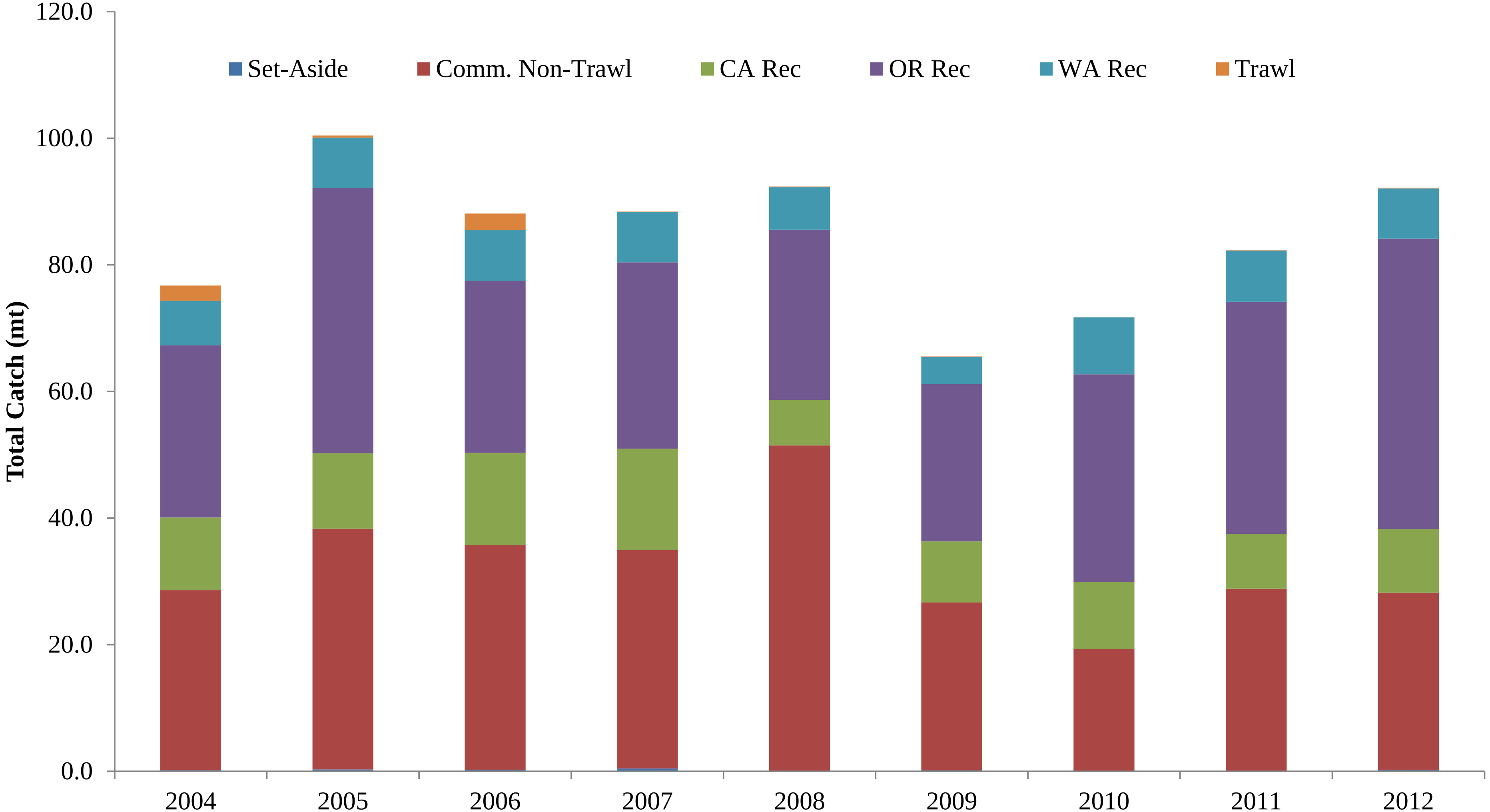
Nearshore Rockfish N

Fishing Mortality Relative to the 2015 OFL and ACL



Nearshore Rockfish N

Fishing Mortality by Sector

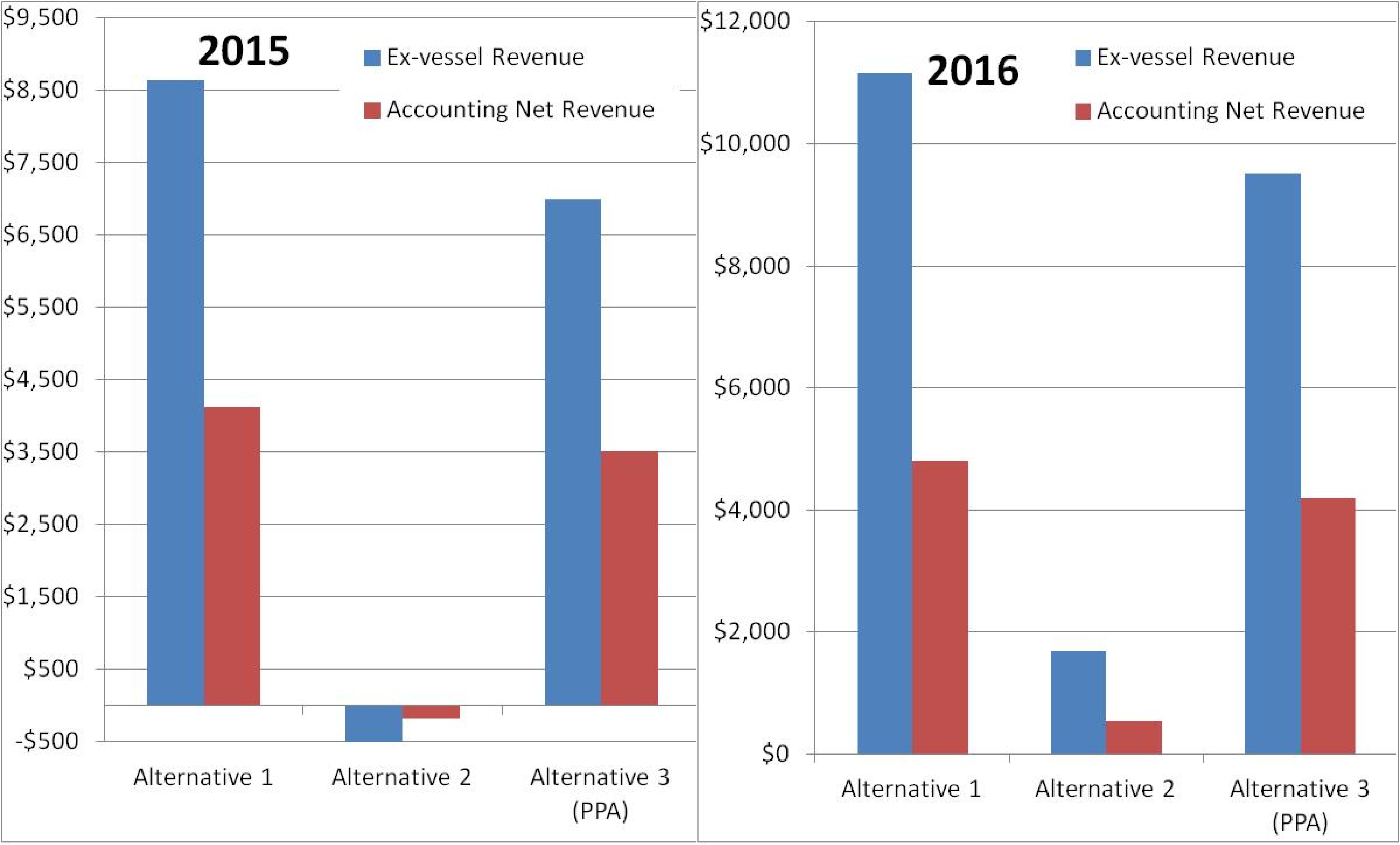


Nearshore Management Alternatives

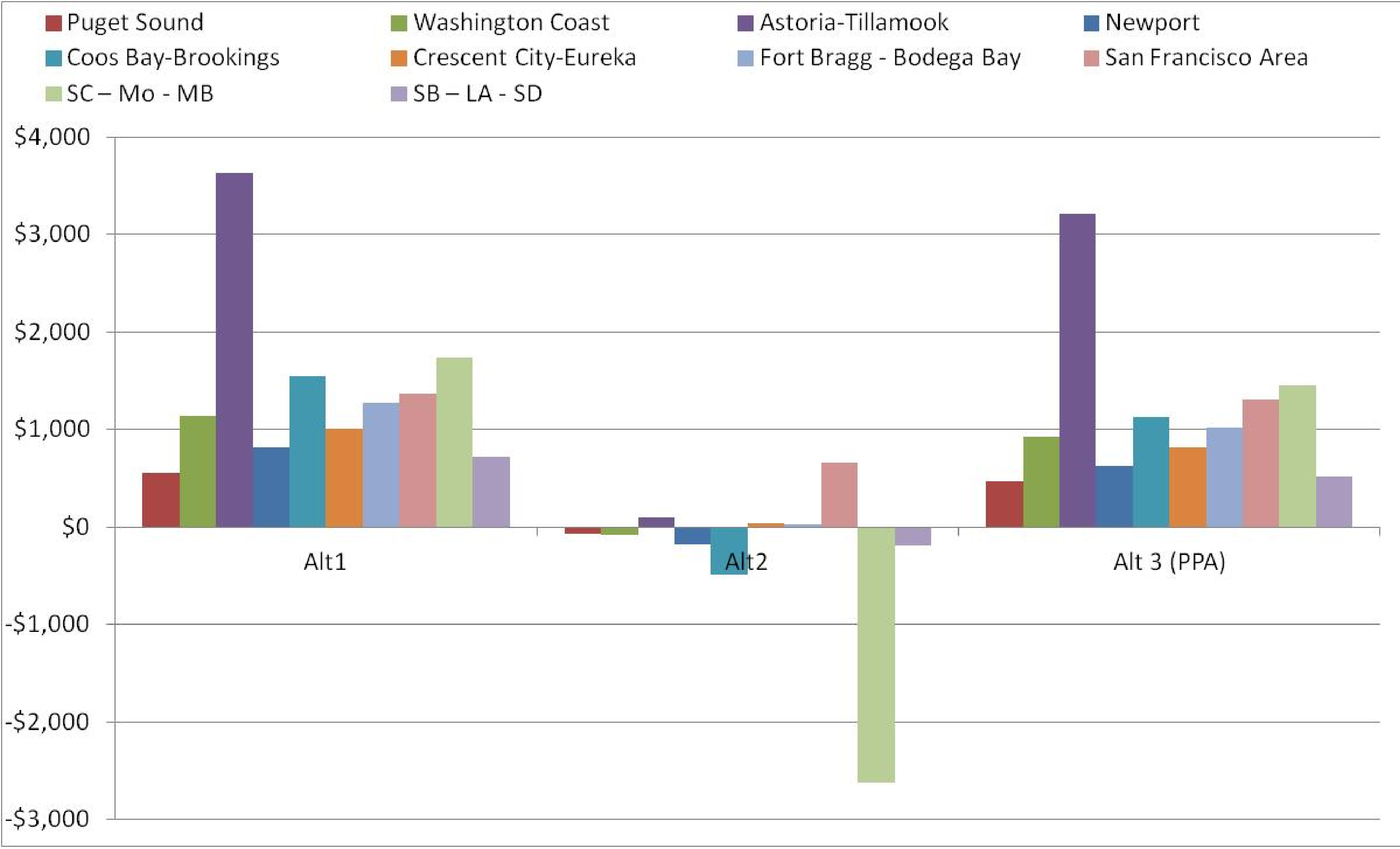
Sector	No Action	Alts 1-3:
Trawl	*Trip Limits *RCA	Same as No Action
Non-Trawl - Commercial	*Trip limits *RCA	Same as No Action
Non-Trawl – Recreational	*Season dates *Bag limits (e.g., non-retention) *Depth restrictions	Same as No Action

Fishery Harvest Guidelines

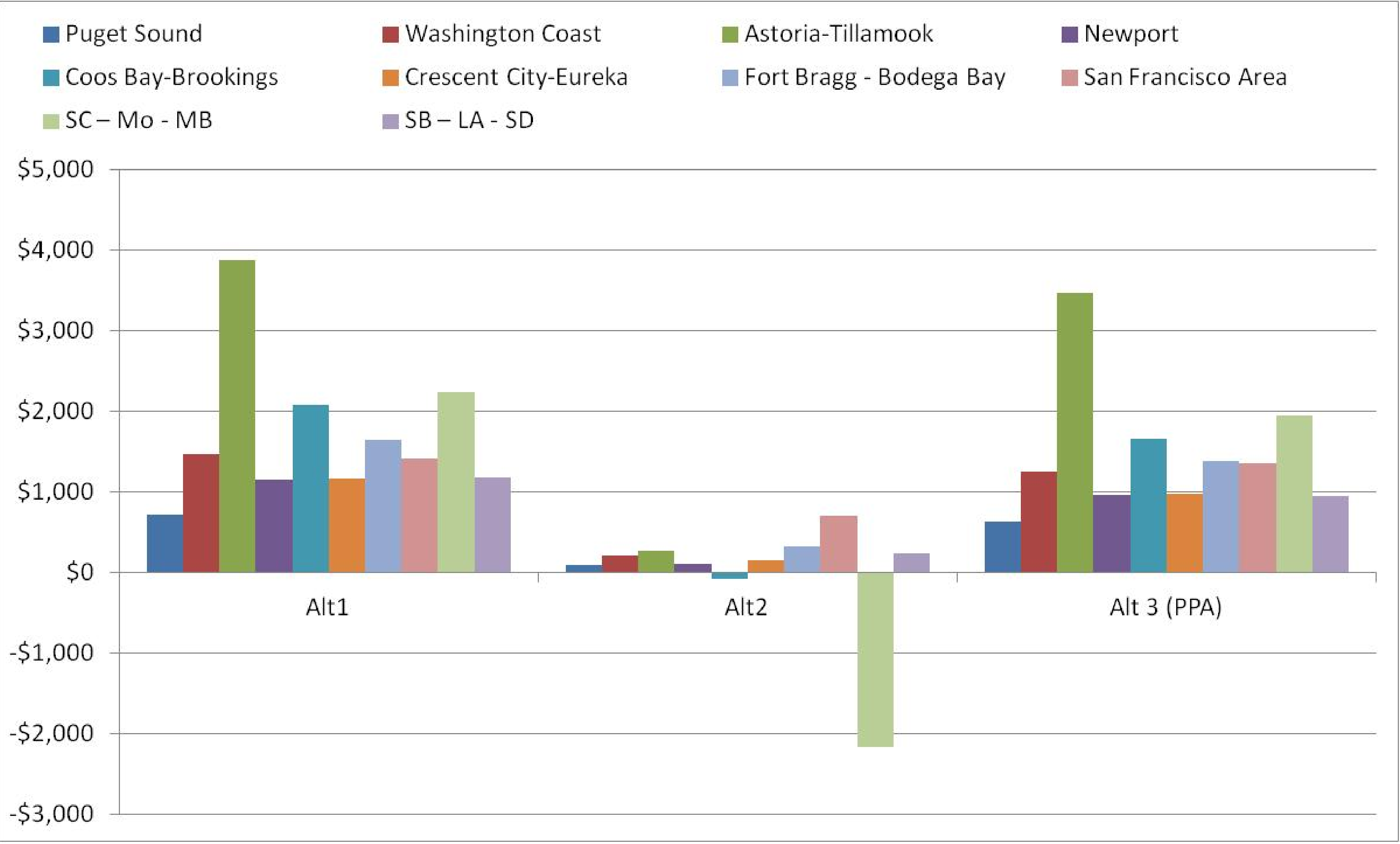
- Confirm or modify yield off the top deductions to accommodate mortality in Tribal, research, and non-groundfish fisheries (Agenda Item C.4.a, Attachment 2)
- Confirm or modify yield set-asides for the at-sea whiting sectors (off-the-top deductions from the LE Trawl allocations; Agenda Item C.4.a, Attachment 2)
  - Consider set-asides for rougheye and/or shortraker?
  - Consider set-asides for spiny dogfish?



Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from No Action under the 2015-16 alternatives ($1,000).



Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in **2015** ($1,000), recreational management option 2.



Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in **2016** ($1,000), recreational management option 2.

Agenda Item C.3
Situation Summary
April 2014

NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) West Coast Region (WCR) will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the 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 C.3.b, FR Notices: *Federal Register* Notices Published Since the Last Council Meeting.
2. Agenda Item C.3.b, NMFS Report: NMFS Cost Recovery Annual Report for the Trawl Rationalization Program.
3. Agenda Item C.3.b, NMFS Report 2: Trawl Rationalization Compliance Summary 2013.
4. Agenda Item C.3.c, NMFS NWFSC Report: Groundfish Stock Assessment Prioritization for 2015.

Agenda Order:

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

PFMC
03/19/14

Groundfish and Halibut Notices
2/19/14 through 3/18/2014

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

79 FR 9592. Pacific Coast Groundfish Fishery Management Plan. Trawl Rationalization Program; Catch Monitor Program; Observer Program. ACTION: Proposed rule; request for comments – 2/19/14

79 FR 11385. Pacific Coast Groundfish Fishery; 2014 Tribal Fishery for Pacific Whiting. ACTION: Proposed rule; request for comments – 2/28/14

79 FR 12412. Pacific Coast Groundfish Fishery Management Plan; Commercial, Limited Entry Pacific Coast Groundfish Fishery; Program Improvement and Enhancement; Correction. ACTION: Final rule; correcting amendment – 3/5/14

79 FR 13906. Pacific Halibut Fisheries; Catch Sharing Plan. ACTION: Final rule – 3/12/14

Cost Recovery Annual Report

March 2014

Trawl Rationalization Program

Fishing Year 2013 and Calculation for 2014

NOAA FISHERIES

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

Overview

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires NOAA's National Marine Fisheries Service (NMFS) to collect fees to recover the costs directly related to the management, data collection, and enforcement of a limited access privilege program (LAPP) (16 U.S.C. 1854(d)(2)), also called "cost recovery." The Pacific coast groundfish trawl rationalization program is a LAPP and consists of three sectors: the Shorebased Individual Fishing Quota (IFQ) Program, the Mothership (MS) Coop Program, and the Catcher/Processor (C/P) Coop Program.

In accordance with the Magnuson-Stevens Act and based on a recommended structure and methodology developed in coordination with the Council, NMFS collects mandatory fees of up to three percent of the ex-vessel value of groundfish by sector (Shorebased IFQ Program, MS Coop Program, and C/P Coop Program). NMFS collects the fees to recover the incremental costs of management, data collection, and enforcement of the trawl rationalization program.

Beginning in January 2014, NMFS implemented cost recovery for the trawl rationalization program. The details of cost recovery for the groundfish trawl rationalization program are in regulation at 50 CFR 660.115.

What's in this annual report?

This annual report includes information on the fee percentage calculation, program costs, ex-vessel value by sector, and total cost recovery fees collected by NMFS from previous years.

This annual report is similar to those used by other Regions for cost recovery, including:

- Alaska Crab Rationalization - http://www.fakr.noaa.gov/sustainablefisheries/crab/crfaq.htm
- Alaska Halibut/Sablefish IFQ - http://www.fakr.noaa.gov/ram/ifqfees.htm
- Northeast Tilefish IFQ - http://www.nero.noaa.gov/sfd/TileIFQDocs/2011%20Tilefish%20IFQ%20Cost%20Recovery%20Annual%20Report.pdf

For 2014 -

Fee percentages are:

- **Shorebased IFQ Program: 3.0%**
- **MS Coop Program: 2.4%**
- **C/P Coop Program: 1.1%**

MS pricing for the C/P Coop Program is:

- **$0.14/lb**

(announced in 78 FR 75268, 12/11/ 2013)

Details on Cost Recovery Calculations

For cost recovery, NMFS must make two calculations during the last quarter of every calendar year after each fiscal year ends and announce those values in a *Federal Register* notice before they would go in effect on January 1 of the following year. The calculations for these values and the data used are described further in this report. The two calculations are:

1. Fee Percentage Calculation by Sector
2. MS Pricing for the C/P Coop Program

Fee Percentage Calculation by Sector

NMFS calculates the actual fee percentage by sector using the best available information. Under the Magnuson-Stevens Act, the final fee percentage must not exceed three percent of the ex-vessel value. To calculate the fee percentage by sector, NMFS used the formula specified in regulation at § 660.115(b)(1), where the fee percentage by sector equals the lower of three percent or direct program costs (DPC) for that sector divided by total ex-vessel value (V) for that sector multiplied by 100.

Fee percentage = the lower of 3% or (DPC/V) x 100

"V" or ex-vessel value, specified in regulation at §660.115(b)(1)(ii), is the total ex-vessel value for each sector from the previous calendar year. The ex-vessel value for each sector is defined at §660.111 (see below) and includes the total ex-vessel value for all groundfish species.

> *Ex-vessel value means, for the purposes of the cost recovery program specified at § 660.115, all compensation (based on an arm's length transaction between a buyer and seller) that a fish buyer pays to a fish seller in exchange for groundfish species (as defined in § 660.11), and includes the value of all in-kind compensation and all other goods or services exchanged in lieu of cash. Ex-vessel value shall be determined before any deductions are made for transferred or leased allocation, or for any goods or services.*
>
> > *(1) For the Shorebased IFQ Program, the value of all groundfish species (as defined in § 660.11) from IFQ landings.*
> > *(2) For the MS Coop Program, the value of all groundfish species (as defined in § 660.11) delivered by a catcher vessel to an MS-permitted vessel.*
> > *(3) For the C/P Coop Program, the value as determined by the aggregate pounds of all groundfish species (as defined in § 660.11) harvested*[1] *by the vessel registered to a C/P-endorsed limited entry trawl permit, multiplied by the MS Coop Program average price per pound as announced pursuant to § 660.115(b)(2).*

"DPC" or direct program costs, defined in regulation at §660.115(b)(1)(i), are the actual incremental costs for the previous fiscal year directly related to the management, data collection, and enforcement of each sector. Actual incremental costs means those net costs that would not have been incurred but for the implementation of the trawl rationalization program, including both increased costs for new requirements of the program and reduced costs resulting from any program efficiencies. If the amount of fees collected by NMFS is greater or less than the actual net incremental costs incurred, the DPC will be adjusted accordingly for calculation of the fee percentage in the following year.

[1] While the regulations say "harvested," NMFS has clarified through a public notice that the C/P ex-vessel value and fee amount due is based on retained catch.

For 2014 - The fee percentage is:

Shorebased IFQ Program:
3.0% = the lower of 3% or (($1,877,752.00/$48,182,167) x 100)

MS Coop Program:
2.4% = the lower of 3% or (($274,936.05/$11,453,663) x 100)

C/P Coop Program:
1.1% = the lower of 3% or (($176,460.05/$16,763,066) x 100)

Table 3 shows the DPC, V, and resulting fee percentage by sector.

Cost of Management, Data Collection, and Enforcement (DPC)

As described earlier, DPCs in the calculations are the actual incremental costs for the previous fiscal year directly related to the management, data collection, and enforcement of each sector. In other words, they are costs that would not have been incurred but for the implementation of the trawl rationalization program.

For 2014, the first year of cost recovery, NMFS only included the costs of employees' time (salary and benefits) spent working on the program in the calculation of DPC rather than all incremental costs of management, data collection, and enforcement. NMFS only included the costs of employees' time in the calculation for 2014 because of limited agency resources and time to calculate additional incremental costs. In addition to personnel costs, examples of additional cost categories used by NMFS in Alaska and up for consideration for the trawl rationalization program are: rent/utilities/overhead, travel, printing, contracts, supplies, equipment, and other expenses. NMFS also did not include any federal costs resulting from duties performed by the states of Washington, Oregon, or California in the calculation of DPC for the 2014 fee percentages. NMFS, in consultation with the Council and states, will evaluate what additional incremental costs[2] should be included. Because NMFS only included some costs, the DPC for 2014 is likely an underestimate of costs compared to all incremental costs of management, data collection, and enforcement.

The cost of employees' time spent working on the trawl rationalization program are the incremental costs NMFS is including as the DPCs in the 2014 fee percentage calculations. In other words, it is the

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[2] For additional incremental costs, NMFS will consider the Council guidance and motions for cost recovery, including considering the use of Appendix B of the Cost Recovery Committee (CRC) Report from the September 2011 Council meeting (Agenda Item G.6.b).

cost of employees' time spent working on tasks that would not have been incurred but for the implementation of the trawl rationalization program. In fiscal year 2013, NMFS employees coded and tracked their time spent working on the trawl rationalization program by sector (IFQ, MS, C/P)[3]. Accordingly, NMFS determined the incremental cost of employees' time by using those costs directly attributable to management, data collection, and enforcement of the trawl rationalization program. Before trawl rationalization, employees' time was not tracked and coded in their time card for work on the trawl fishery let alone by sector within the trawl fishery, making an accurate "with and without" trawl rationalization program assessment of employee costs challenging.

Some examples of new agency costs resulting from the trawl rationalization program:

Economic Data Collection Program
Online IFQ system (QS/vessel accounts)
Expanded Observer Program
Expanded Catch Monitor Program
Increased Rulemaking

The majority of employees included in determining the DPC are either new employees directly hired to work on the trawl rationalization program or are existing employees whose time has been directed away from other agency duties to work on the trawl rationalization program (e.g. less time spent on grant work, recreational fisheries issues, open access issues). All of those employees' recorded and tracked time is an incremental cost attributable to the program. There are some employees whose time before implementation of the trawl rationalization program may have been spent working on the trawl fishery, and now is spent on the trawl rationalization program. The costs of those employees' time directly attributable to working on trawl rationalization program were included in the DPC. However, because NMFS is not including other categories of incremental costs in DPC (e.g., travel, rent/utilities/overhead, transportation, printing, supplies, equipment), NMFS believes that the cost of employees' time estimated from FY 2013 is an underestimate compared to what the DPC would be from all incremental costs of management, data collection, and enforcement.

Details of the incremental costs for management, data collection, and enforcement of the trawl rationalization program by sector are described below. The details are grouped by division within NMFS: West Coast Region, Northwest Fisheries Science Center, Office of Law Enforcement, and Northwest Section of General Counsel. Table 1 provides a summary of the incremental costs.

[3] In addition to timecard codes by sector, some divisions in the WCR and NWFSC also have a general catch shares code in their timecard for work done that affects all three trawl sectors. The cost of time in that code is shared equally among sectors.

Table 1. Incremental costs (DPC) associated with management, data collection, and enforcement of all sectors of the Trawl Rationalization Program, FY 2013 (October 1, 2012 to September 30, 2013).
For FY 2013, NMFS only calculated incremental cost of personnel.

Cost Category	WCR	NWFSC	OLE	Total
Personnel [a]	$ 1,015,314.09	$ 1,098,243.77	$ 215,590.23	$ 2,329,148.09
IFQ	*819,340.66*	*882,533.18*	*175,878.16*	*1,877,752.00*
MS	*116,319.26*	*126,433.59*	*32,183.20*	*274,936.05*
C/P	*79,654.18*	*89,277.00*	*7,528.87*	*176,460.05*
Travel [b] /Transportation [c]	$ -	$ -	$ -	$ -
Printing	$ -	$ -	$ -	$ -
Contracts/Training	$ -	$ -	$ -	$ -
Supplies	$ -	$ -	$ -	$ -
Equipment	$ -	$ -	$ -	$ -
Rent/Utilities/Overhead [d]	$ -	$ -	$ -	$ -
Other	$ -	$ -	$ -	$ -
Total	**$ 1,015,314.09**	**$ 1,098,243.77**	**$ 215,590.23**	**$ 2,329,148.09**

a Personnel costs include salary and benefits. PSMFC personnel costs are included in the WCR.
b Travel includes per diem payments.
c Transportation includes shipment of items.
d Rent/Utilities/Overhead includes costs of space and utilities and shared common space and services.

West Coast Region (WCR)

The West Coast Region (WCR, formerly the Northwest Region before October 1, 2013) manages the trawl rationalization program by working on policy issues, drafting and implementing regulations, tracking the fishery, and issuing permits. This includes work done by WCR Groundfish Branch and Fisheries Permits Office. It also includes WCR costs for work done by the Northwest Fisheries Science Center's Scientific Data Management (SDM) and Information Technology (IT) groups for work on the online IFQ system, and for work done by the Pacific States Marine Fisheries Commission for the catch monitor program. WCR employees track their time in timecards for work done on the trawl rationalization program with project and task codes by sector. For many employees, only part of their time is for trawl rationalization. The cost of employees' time that was already included in the unit cost computation for the permit fees for first receiver site licenses (FRSL), MS permits, MS/CV endorsements, and C/P endorsements are not included in DPC. For QS permits, NMFS does not currently charge a permit fee. SDM/IT was provided $300,000 from the WCR for tasks in FY 2013, applied toward eight contract employees (this cost is only for the Shorebased IFQ Program). PSMFC was provided $145,000 from the WCR in FY 2013 for salaries and benefits for two catch monitor program coordinators (this cost is only for the Shorebased IFQ Program).

The cost for FY 2013 is likely an underestimate of the incremental cost of employees' time on the trawl rationalization program because several employees that work on the program were not included. These employees should be considered for inclusion in future years if the cost of their time is an incremental cost of the trawl rationalization program. For example, the cost of SDM time for programming done for the Economic Data Collection Program was not included. In addition, the cost of electronic monitoring work should be included.

For FY 2013, the following contributed to the DPC for the WCR:

Total cost from salaries + benefits = $1,015,314.09
IFQ - $819,340.66
MS - $116,319.26
C/P - $79,654.18
Total hours of all employees included in the total cost = 11,022.88
(contractor hours not included in this estimate)
IFQ – 7,470.63 hours
MS – 2,161.88 hours
C/P – 1,390.38 hours
# of employees included in the total cost = 21

Northwest Fisheries Science Center (NWFSC)

The Northwest Fisheries Science Center (NWFSC) collects and analyzes data on the trawl rationalization program through observers on vessels and through economic and social surveys. This includes work done by the NWFSC Fishery Resource Assessment and Monitoring Program (FRAM) and additional employees paid through PSMFC contracts and grants. The values included in the NWFSC DPC do not include any of the costs paid by NMFS to PSMFC for reimbursing industry for part of the industry cost for observers.

For FRAM employees, timecards were coded with project and task codes by sector, in a manner similar to the WCR. Some employees' time was modified to account for certain circumstances. For example, because the mothership (processing vessels not the mothership catcher vessels) and C/P vessels had mandatory observers and corresponding ASHOP debriefers before the trawl rationalization program, ASHOP debriefer costs were not included. "ASHOP" is the observer program for the at-sea whiting processors, the motherships (not the catcher vessels) and the C/Ps. The West Coast Groundfish Observer Program (WCGOP) is the observer program for the shorebased catcher vessels (IFQ) and the catcher vessels fishing for and delivering to motherships. 24% of the costs attributed to the WCGOP for the Shorebased IFQ Program were deducted to account for coverage of the limited entry trawl program by the WCGOP prior to the implementation of the catch share program. This percentage was determined by using observer sea days from 2010 (pre catch shares) and observer sea days from 2012 (post catch shares) as representative years, resulting in 1658 and 6909 sea days respectively.

The PSMFC observer grant cost is only for the catch shares portion of the grant. The grant is only split catch shares and non-catch shares, however, the bulk of the catch shares portion of the grant is for the Shorebased IFQ Program. The PSMFC observer grant is for the salary and benefits (no gear) for PSMFC staff working off the West coast. The values for the PSMFC observer grant only cover staff time for observer program activities, not catch monitor program activities or any other PSMFC activities. In addition to the IFQ fishery, some of the cost is also attributable to the MS fishery for observers on MS/CVs. To determine how much of that money should be an incremental cost to the MS fishery, NMFS looked at the sea days spent on MS/CVs in 2012. Approximately 7% of observer sea days were spent on MS/CVs, so this value was used to split the cost between the IFQ and MS fisheries. As with the NWFSC estimates, 24% of the hours and costs were deducted from the IFQ amounts to account for the observer coverage levels of the limited entry trawl fishery prior to the implementation of catch shares.

The NWFSC cost for FY 2013 is likely an underestimate of the incremental cost of employees' time on the trawl rationalization program because several employees that work on the program were not included. These employees should be considered for inclusion in future years if the cost of their time is an incremental cost of the trawl rationalization program. These could include additional employees working on the Economic Data Collection Program and on Social Surveys.

For FY 2013, the following contributed to the DPC for the NWFSC:

Total cost from salaries + benefits = $1,098,243.77

IFQ - $882,533.18
MS - $126,433.59
C/P - $ 89,277.00

Total hours of all employees included in the total cost = 25,795.61
(1 contractor not included in this estimate)

IFQ – 21,536.31 hours
MS – 2,725.30 hours
C/P – 1,534.00 hours

# of employees included in the total cost = 34

Office of Law Enforcement (OLE)

NOAA's Office of Law Enforcement (OLE) enforces the requirements of the trawl rationalization program. OLE labor costs are tracked by one project/task code, but employees track their daily hours by activity codes on their timecards (1 for each sector – IFQ, MS, C/P).

The OLE estimate is likely an underestimate of the incremental cost of the trawl rationalization program because the cost of some trawl rationalization enforcement technicians' time was not included and additional technicians were added because of the trawl program. Enforcement technicians activities include, but are not limited to, tracking QS and vessel account balances, contacting vessel owners if an account is negative, assisting with fishery declarations, and tracking fishing status through the vessel monitoring system.

For FY 2013, the following contributed to DPC for OLE:

Total cost from salaries + benefits = $215,590

IFQ - $175,878.16
MS - $32,183.20
C/P - $7,528.87

Total hours of all employees included in the total cost = 3,099

IFQ - 2,660 hours
MS - 345 hours
C/P - 94 hours

# of employees included in the total cost = 12

Northwest Section of General Counsel

NMFS is not including the cost of employees from the Northwest Section of General Counsel in the determination of DPC by sector in 2014. This is consistent with how their time is treated for cost recovery purposes in other NMFS Regions.

Determining the Value of the Fishery (V)

The cost recovery program regulations define ex-vessel value slightly differently for each sector (IFQ, MS, and C/P). This results in slightly different methods to calculate "V" for each sector. In addition, for the start of cost recovery, NMFS does not yet have information on ex-vessel value reported by the MS fleet. Because NMFS does not have these values available, NMFS used data from the IFQ fishery as a proxy in estimating "V" for the MS and C/P sectors. NMFS is using information on the average price per pound of whiting from the IFQ fishery for all sectors in 2014. For 2014, NMFS used the ex-vessel value (defined at §660.111 and above in this report under "fee percentage calculation by sector") for calendar year 2012 as reported in Pacific Fisheries Information Network (PacFIN) from electronic fish tickets to determine "V." NMFS could not use ex-vessel value for calendar year 2013 because fishing in calendar year 2013 had not concluded at the time this report was generated. The electronic fish ticket data in PacFIN is for the Shorebased IFQ Program. This means that the ex-vessel value for both the MS Coop Program and the C/P Coop Program is a proxy based on the Shorebased IFQ Program ex-vessel price and on the retained catch estimates (weight) from the observer data (as reported in PacFIN from NORPAC) for the MS and C/P Coop Programs. Table 2 provides the ex-vessel value by sector for calendar year 2012. NMFS is using data from PacFIN and not the ex-vessel values reported on buyback forms (IFQ and MS submit buyback forms), because those data are not readily available in an appropriate format.

For 2014 -

"V," or ex-vessel value, from calendar year 2012 is:

- **Shorebased IFQ Program: $48,182,167**
- **MS Coop Program: $11,453,663**
- **C/P Coop Program: $16,763,066**

(announced in 78 FR 75268, 12/11/ 2013)

While the DPC is calculated on the federal fiscal year (October 1, 20XX to September 30 of the following year, V is calculated on the calendar year. NMFS considered calculating V on the fiscal year, but had concerns that the data available right after the fiscal year ends may not be accurate. Ex-vessel value for the Shorebased IFQ Program is reported in PacFIN from fish ticket data. PacFIN reports often have a time delay, with data continuing to update in the PacFIN system for several months. Therefore, pulling data based on a fiscal year, right after the fiscal year has closed, may not result in the best available data. NMFS will calculate V using the previous calendar year's ex-vessel value. There is no concern with calculating DPC on the fiscal year and V on the calendar year as long as it remains consistent among years (i.e., V doesn't switch between 2 years from calendar year to fiscal year).

To determine ex-vessel value (V) by sector for calendar year 2012, the PacFIN database was queried on October 31, 2013. Shorebased IFQ landings and revenue estimates (including all groundfish species) were taken from the Vessel Daily RockFish Distributed (VDRFD) table where nominal ticket species categories are distributed to individual rockfish species at the daily level (using area and species composition proportions supplied by the state sampling programs). For the MS and C/P fisheries, retained catch estimates and corresponding values (hake only) were taken from the NORPAC 4900 Species Composition table within PacFIN. The NORPAC 4900 Species Composition table in PacFIN estimates at-sea (MS & C/P) hake value from shorebased prices, but at a finer level of aggregation by area and time, which should lead to more accurate overall estimates. While all groundfish species are included in the Shorebased IFQ ex-vessel value, only hake is included in "value" for the at-sea sectors, as other species are predominantly discarded or used for fish meal, with little to no revenue and specific information.

Table 2. Retained catch estimates by month and sector. IFQ includes all landed species; at-sea sectors include only hake. Hake value estimates for at-sea sectors were queried from the NORPAC 4900 species comp. table in PacFIN.

Year	Month	IFQ lbs.	IFQ rev.	CP lbs.	CP value	MS lbs.	MS value
2012	Jan	1,491,862	1,141,585	0	0	0	0
2012	Feb	2,395,897	1,639,885	0	0	0	0
2012	Mar	3,329,906	2,110,348	0	0	0	0
2012	Apr	4,954,879	2,844,151	0	0	0	0
2012	May	4,265,175	2,236,024	44,844,730	6,329,660	9,390,741	1,325,467
2012	Jun	13,934,687	3,411,107	0	0	6,049,386	922,719
2012	Jul	26,469,461	5,863,888	0	0	1,097,743	167,691
2012	Aug	36,519,674	7,520,641	8,223,969	1,251,804	4,642,409	744,548
2012	Sep	26,705,062	6,256,446	35,760,005	4,935,301	12,818,454	1,721,627
2012	Oct	35,277,242	7,111,834	32,687,073	4,246,301	47,645,273	6,213,841
2012	Nov	25,327,203	5,737,083	0	0	2,850,173	357,770
2012	Dec	4,049,970	2,309,175	0	0	0	0
2012	**Sum**	184,721,018	**48,182,167**	121,515,776	**16,763,066**	84,494,178	**11,453,663**

Calculating the Fee as a Percentage of Total Fishery Value

Using the formula described above in "Fee Percentage Calculation by Sector" and the values for DPC and V, the 2014 fee percentage by sector is as follows:

Fee percentage = the lower of 3% or (DPC/V) x 100

- Shorebased IFQ Program: 3.0% = the lower of 3% or (($1,877,752.00/$48,182,167) x 100)
- MS Coop Program: 2.4% = the lower of 3% or (($274,936.05/$11,453,663) x 100)
- C/P Coop Program: 1.1% = the lower of 3% or (($176,460.05/$16,763,066) x 100)

For the MS and C/P Coop Programs, the resulting fee percentage is less than the possible upper limit fee percentage of 3.0 percent. Thus, NMFS should be able to recover all incremental costs from FY 2013 (assuming the ex-vessel value remains the same or increases). However, for the Shorebased IFQ Program, because the 3.0 percent ex-vessel value limits what the fee percentage would be otherwise (3.9 percent), NMFS will likely not be able to recover the documented incremental costs from FY 2013.

Table 3. 2014 fee percentage based on NMFS's costs for Pacific coast groundfish trawl catch share program by sector.
(cost of employees' time (salary + benefits) from FY 2013 attributable to trawl rationalization ex-vessel value from calendar 2012)

Trawl Sector	WCR	NWFSC	OLE	Total	Total by sector	ex-vessel value	fee percentage by sector	fee percentage by sector (max 3%)
General Trawl Rationalization Program (all 3 sectors)	$229,286.81	$222,672.00	$0.00	$451,958.81				
Shorebased IFQ Program	$742,911.72	$808,309.18	$175,878.16	$1,727,099.06	$1,877,752.00	$48,182,167	3.9%	3.0%
MS Coop Program	$39,890.32	$52,209.59	$32,183.20	$124,283.11	$274,936.05	$11,453,663	2.4%	2.4%
C/P Coop Program	$3,225.24	$15,053.00	$7,528.87	$25,807.11	$176,460.05	$16,763,066	1.1%	1.1%
Total	$1,015,314.09	$1,098,243.77	$215,590.23	$2,329,148.09	$2,329,148.09	$76,398,896		
	11 employees	21 employees	12 employees					
	2 contractors (PSMFC)	12 grantees						
	8 contractors (SDM/IT)	1 contractor						

Notice that there are four trawl sectors listed in the table instead of three. In addition, to the Shorebased IFQ Program, MS Coop Program, and C/P Coop Program, DPC may be tracked as applying to all three sectors (IFQ, MS, C/P) combined. For example, work drafting regulations for a cost recovery program that applies to all sectors of the trawl rationalization program would be tracked as "general trawl rationalization program" costs and would be shared equally among all three sectors. The "total by sector" column of the table includes a formula to equally split the costs from the "general trawl rationalization program" row among the three sectors (IFQ, MS, C/P). The "total by sector" column of the table is divided by the values in the "ex-vessel value" column to determine the "fee percentage by sector." Finally, the fee percentage must not be greater than 3% as shown in the "fee percentage by sector (max 3%)" column.

MS Pricing for the C/P Coop Program

"MS pricing" is the MS Coop Program's average price per pound for Pacific whiting, also called hake. The MS pricing will be used by the C/P Coop Program to determine their ex-vessel value (MS pricing multiplied by the value of the aggregate pounds of all groundfish species retained by the vessel registered to a C/P-endorsed limited entry trawl permit) which is then multiplied by the C/P fee percentage to determine the fee amount due. However, because the MS Coop Program's average price per pound as reported on the cost recovery form is not yet available, the MS pricing for the first year of cost recovery is based on the average price per pound of whiting as reported in PacFIN from the Shorebased IFQ Program. Only the value of Pacific whiting is used because the at-sea whiting fisheries (MS & C/P) target whiting and the value of non-whiting species is comparatively insignificant. For 2014, NMFS calculated the MS pricing from values reported in Table 2. NMFS calculated the average shorebased whiting price per pound for May-December 2012, the primary whiting season for the MS and C/P sectors, by dividing the revenue by the landings. The ex-vessel value for the MS and C/P sectors (in the NORPAC 4900 SP COMP table), and shown in Table 2, is the average shoreside whiting price applied to the retained catch at the finest possible level of area and time. In Table 2, a dash (-) represents months where there were no whiting landings. The resulting whiting price per pound in the table below is based on the price per pound of whiting as reported in PacFIN from the Shorebased IFQ Program. The average price per pound of Pacific whiting to be used by the C/P Coop Program to determine their fee amount is $0.14/lb.

	hake price per lb ($)	
2012	**CP**	**MS**
May	$0.14	$0.14
Jun	-	$0.15
Jul	-	$0.15
Aug	$0.15	$0.16
Sep	$0.14	$0.13
Oct	$0.13	$0.13
Nov	-	$0.13
Dec	-	-
avg	**$0.14**	**$0.14**

Fees Previously Collected

Because cost recovery was first implemented in 2014, no fees were previously collected. In future years, this section will report fees collected from previous calendar years.

Agenda Item C.3.b
NMFS Report 2
April 2014

TRAT Compliance Summary, 2013

Trat Fishery Overview*

- Shoreside IFQ Trawl
  - # of vessels: 69 in 2013 67 in 2012 64 in 2011
  - # of trips: 1225 in 2013 1121 in 2012 989 in 2011
  - Days at Sea: 4857 (includes fixed gear)
- Shoreside IFQ Fixed Gear
  - # of vessels: 18 in 2013 25 in 2012 14 in 2011
  - # of trips: 122 in 2013 281 in 2012 221 in 2011
- Shoreside IFQ Whiting
  - # of vessels: 25 in 2013 24 in 2012 11 in 2011
  - # of trips: 947 in 2013 736/2012 818 in 2011
  - Days at Sea: 2082
- Mothership Catcher Vessel
  - # of vessels: 18 in 2013 18 in 2012 ? in 2011
  - # of trips: 46 in 2013 39 in 2012 29 in2011
  - Days at Sea: 627
- *2011 data is for the first 10 months of 2011

2013 TRat IFQ Overview

- 138 Quota Share Permits/Accounts
  - 138 in 2012 and 2011 (new QS apps not accepted until 2014)
- 159 Vessel Accounts
  - 106 Fished
  - 53 Did Not Fish
  - 2012: 145,
  - 2011: 149
- 45 First Receiver Site Licenses Issued
  - 37 Purchased IFQ Groundfish
  - 2012: 51,
  - 2011: 50
- 2,352 E-Fish Ticket IFQ Landings
  - 2012: 2,529,
  - 2011: 3,027

E-Fish Ticket IFQ Landings

- 2,352 E-Ticket IFQ Landings in 2013
  - Number and Percent by State
    - California: 576 = 24%
    - Oregon: 1,514 = 64%
    - Washington: 262 = 11%
- 2,529 E-Ticket IFQ Landings in 2012
- 3,037 E-Ticket IFQ Landings in 2011

E Fish Ticket Reporting

- Since inception of program

  90% of all landing reported with 24 hours

  96% within 48 hours

  99% within 5 days
- 2352 in 2013
  - 99%+ were submitted within 48 hours
- 2529 E Ticket Reports in 2012
  - 96% of those ticket were submitted with 48 hours
    - (24hr reporting requirement)
- 3037 total in 2011
- Through 10/31/11, 2370 E Ticket submittals

  2122 submitted within 48 hrs (90%)

OLE Violation Investigation Summary

VMS/RCA Investigations Opened (all fisheries)

• SW 2010:	75	NW 2010:	171
• SW 2011:	72	NW 2011:	162
• SW 2012	89	NW 2012:	134
• SW 2013	34	NW 2013	37

VMS/RCA (Trawl)

• Non Reporting Violations:	5/2013	1/2012	11/2011
• RCA/EFH Incursions:	30 /2013	50/2012	122/2011
• Total Vessels:	26/2013	18 /2012	59 /2011

OLE Violation Investigation Summary

- 1 At Sea Discard in 2013
- Gear Violations
  - 0 in 2013
  - 0 in 2012
  - 1 in 2011
- Declaration Violations, (including MSCV and Shoreside)
  - 14 improper declarations in 2013
  - 7 in 2012
  - 11 in 2011
- 30 Day Clock Violation
  - 0 in 2013
  - 0 in 2012
  - 0 in 2011

OLE Violation Investigation Summary

- Fishing in 2 Management Areas on the Same Trip
  - 0 in 2013
  - 1 in 2012
  - 2 in 2011
- Fishing Prior to establishing Vessel Account
  - 1 in 2013
  - 0 in 2012
  - 2 in 2011
- Fishing in Deficit
  - 6 incidents in 2013 involving 4 vessels
  - 13 incidents in 2012 involving 9 vessels
    - 2 vessels accounted for 6 of these incidents
    - 7 vessels had single events
  - 60 incidents in 2011 involving 30 vessels

2013 Observer Violation Investigation Summary

ASHOP (at-sea sector)

- Safety – 5 (1 in 2012)
- Fail to Provide Reasonable Assistance – 1
- Fail to Transmit Observer Data - 1
- Total = 7

2013 Observer Violation Investigation Summary

- WCGOP
  - Safety – 21 (11 in 2012)
  - Harassment – 6 (6 in 2012)
  - Trip Refusals – 2 (1 in 2012)
  - Assault -1
  - Fail to Notify Observer of Haulback – 3 (4 in 2012)
  - Unsafe Conditions – 9
  - Interference / Bias Sampling – 6 (3 in 2012)
  - Take of a Marine Mammal - 1
  - Total = 49 (Total of 29 in 2012)

2013 Catch Monitor Violation Investigation Summary

- Inaccurate Weighing– 3 (1 in 2012)
- Inaccurate Scale - 3
- Discard/Missing catch (not weighed) – 2
- Fail to Properly Sort Catch – 3 (1 in 2012)
- Transport Unsorted Catch – 1
- Offload without a FRSL – 1
- Safety -1 (2 in 2012)
- Total =14 (11 total in 2012)

USCG District 13/11

- 85 Commercial Groundfish vessels boarded in 2013
- Two Trat Related Violations documented
    - Fixed Gear RCA Violation
    - Declaration discrepancy
- 10,895 hours expended on the Living Marine Resources (LMR) mission
- Trat represents ~9% of the total LMR boardings

We continue to engage in ongoing consultations with states that have expressed interest in implementing a BHP through the BHP Learning Collaborative, which serves as a staff level policy and technical exchange of information between CMS and the states. Through consultations with this Learning Collaborative, we have been able to get input from states on many of the specific issues addressed in this methodology.

Authority: Section 1331(d)(3) of the Affordable Care Act.

Dated: February 19, 2014.

Marilyn Tavenner,

Administrator, Centers for Medicare & Medicaid Services.

Approved: February 21, 2014.

Kathleen Sebelius,

Secretary, Department of Health and Human Services.

[FR Doc. 2014–05257 Filed 3–7–14; 4:15 pm]

BILLING CODE 4120–01–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 300

[Docket No. 131213999–4208–02]

RIN 0648–BD82

Pacific Halibut Fisheries; Catch Sharing Plan

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: The Assistant Administrator (AA) for Fisheries, National Oceanic and Atmospheric Administration (NOAA), on behalf of the International Pacific Halibut Commission (IPHC), publishes annual management measures adopted as regulations by the IPHC and accepted by the Secretary of State governing the Pacific halibut fishery. These actions are intended to enhance the conservation of Pacific halibut and further the goals and objectives of the North Pacific Fishery Management Council (NPFMC).

DATES: The IPHC's 2014 annual management measures are effective March 7, 2014. The 2014 management measures are effective until superseded.

ADDRESSES: Additional requests for information regarding this action may be obtained by contacting the International Pacific Halibut Commission, 2320 W. Commodore Way, Suite 300, Seattle, WA 98199–1287; or Sustainable Fisheries Division, NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802, Attn: Ellen Sebastian, Records Officer; or Sustainable Fisheries Division, NMFS West Coast Region, 7600 Sand Point Way NE., Seattle, WA 98115. This final rule also is accessible via the Internet at the Federal eRulemaking portal at *http://www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: For waters off Alaska, Glenn Merrill or Julie Scheurer, 907–586–7228; or, for waters off the U.S. West Coast, Sarah Williams, 206–526–4646.

SUPPLEMENTARY INFORMATION:

Background

The IPHC has adopted regulations governing the Pacific halibut fishery in 2014, pursuant to the Convention between Canada and the United States for the Preservation of the Halibut Fishery of the North Pacific Ocean and Bering Sea (Convention), signed at Ottawa, Ontario, on March 2, 1953, as amended by a Protocol Amending the Convention (signed at Washington, DC, on March 29, 1979).

As provided by the Northern Pacific Halibut Act of 1982 (Halibut Act) at 16 U.S.C. 773b, the Secretary of State, with the concurrence of the Secretary of Commerce, may accept or reject, on behalf of the United States, regulations adopted by the IPHC in accordance with the Convention (Halibut Act, Sections 773–773k). The Secretary of State of the United States, with the concurrence of the Secretary of Commerce, accepted the 2014 IPHC regulations as provided by the Halibut Act at 16 U.S.C. 773–773k.

The Halibut Act provides the Secretary of Commerce with the authority and general responsibility to carry out the requirements of the Convention and the Halibut Act. The Regional Fishery Management Councils may develop, and the Secretary of Commerce may implement, regulations governing harvesting privileges among U.S. fishermen in U.S. waters that are in addition to, and not in conflict with, approved IPHC regulations. The NPFMC has exercised this authority most notably in developing halibut management programs for three fisheries that harvest halibut in Alaska: the subsistence, sport, and commercial fisheries.

Subsistence and sport halibut fishery regulations are codified at 50 CFR part 300. Commercial halibut fisheries in Alaska are subject to the Individual Fishing Quota (IFQ) Program and Community Development Quota (CDQ) Program (50 CFR part 679), and the area-specific catch sharing plans.

The NPFMC implemented a CSP among commercial IFQ and CDQ halibut fisheries in IPHC Areas 4C, 4D and 4E (Area 4, Western Alaska) through rulemaking, and the Secretary approved the plan on March 20, 1996 (61 FR 11337). The Area 4 CSP regulations were codified at 50 CFR 300.65, and were amended on March 17, 1998 (63 FR 13000). New annual regulations pertaining to the Area 4 CSP also may be implemented through IPHC action, subject to acceptance by the Secretary of State. The NPFMC recommended and NMFS implemented through rulemaking a CSP among guided sport (charter) and commercial IFQ halibut fisheries in IPHC Area 2C (Southeast Alaska) and Area 3A (Southcentral Alaska) on January 13, 2014 (78 FR 75844, December 12, 2013). The CSP replaces the guideline harvest level (GHL) program that had been in place in these regulatory areas since 2004. The Area 2C and 3A CSP regulations are codified at 50 CFR 300.65. The CSP defines an annual process for allocating halibut between the commercial and charter fisheries so that each sector's allocation varies in proportion to halibut abundance; specifies a public process for setting annual management measures; and authorizes limited annual leases of commercial IFQ for use in the charter fishery. The CSP also authorizes supplemental individual transfers of commercial halibut IFQ as guided angler fish (GAF) to qualified charter halibut permit holders for harvest by charter vessel anglers in Areas 2C and 3A. Through the GAF program, qualified charter halibut permit holders may offer charter vessel anglers the opportunity to retain halibut up to the limit for unguided anglers when the charter management measure in place would limit charter vessel anglers to a more restrictive harvest limit. In other words, a charter vessel angler may retain a halibut as GAF that exceeds the daily bag limit and length restrictions in place for charter anglers only to the extent that the angler's halibut retained under the charter halibut management measure plus halibut retained as GAF do not exceed daily bag limit and length restrictions imposed on unguided anglers. Federal regulations for the GAF program are at 50 CFR 300.65.

The IPHC held its annual meeting in Seattle, Washington, January 13–17, 2014, and adopted a number of changes to the previous IPHC regulations (78 FR 16423, March 15, 2013). The Secretary of State accepted the annual management measures, including the following changes to the previous IPHC regulations for 2014:

1. New halibut catch limits in all regulatory areas in Section 11;

2. New commercial halibut fishery opening and closing dates in Section 8;

3. New license due dates and the separation of the directed commercial and incidental sablefish licenses for Area 2A in Section 4; and

4. New management measures for Area 2C and Area 3A guided sport fisheries.

Pursuant to regulations at 50 CFR 300.62, the 2014 IPHC annual management measures are published in the **Federal Register** to provide notice of their immediate regulatory effectiveness and to inform persons subject to the regulations of their restrictions and requirements. Because NMFS publishes the regulations applicable to the entire Convention area, these regulations include some provisions relating to and affecting Canadian fishing and fisheries. NMFS could implement more restrictive regulations for the sport fishery for halibut or components of it; therefore, anglers are advised to check the current Federal or IPHC regulations prior to fishing.

Catch Limits

The IPHC recommended to the governments of Canada and the United States catch limits for 2014 totaling 27,515,000 lb (12,481 mt), which should achieve a lower coastwide harvest rate compared to 2013 catch limits, based on the most recent coast-wide stock assessment. The IPHC adopted area-specific catch limits for 2014 that were lower than 2013 in all of its management areas except Area 2C. A description of the process the IPHC used to set these catch limits follows.

During 2012, IPHC staff conducted a full review of the data and the general approach used to assess the stock in recent years. A retrospective bias in recent assessments was found to occur because the model did not correctly account for variation in the availability of different sizes of fish in different areas. As a result of this retrospective bias, actual historical harvest rates were higher than the rates the IPHC used to inform its stock assessments. A peer review team, including the U.S. and Canadian Science Advisors, agreed that the more flexible model structure developed by the IPHC staff for use in the 2012 assessment could correct the retrospective bias. The 2012 assessment results are more consistent with observed fishery and survey results than past assessments. Based on the results derived from the new model, estimates of recent recruitment are lower than previously thought.

During 2013, IPHC staff analysts completed a thorough exploration of all available data sources. This analysis provided several new avenues for stock assessment modeling. This evaluation improved the 2013 assessment, and will be used to help structure the 2014 assessment. For the 2013 stock assessment, an ensemble of three alternative models was developed to produce the stock biomass estimates. This resulted in estimates of stock size and management reference points that are substantially more robust to current or future technical changes to the underlying models. The 2013 stock assessment indicates that the Pacific halibut stock has been declining continuously over the last decade, with recruitment strengths that are much smaller than those observed through the 1980s and 1990s, and more typical of those seen during the last century. The 2013 stock assessment notes that decreasing size at age may also contribute to lower biomass. In recent years, the estimated female spawning biomass appears to have stabilized near 200 million pounds.

As in 2013, and as part of an ongoing effort to provide Commissioners with greater flexibility when selecting catch limits, in January 2014 IPHC staff provided a decision table that estimates the consequences to stock and fishery status and trends from different levels of harvest. This decision table more fully reflects uncertainty and allowed the Commissioners to weigh the risk and benefits of management choices as they set the annual catch limits. The row in the decision table that results in the current harvest rate policy of the IPHC is the ''Blue Line'' and the application of the apportionment process determines the catch limit for each regulatory area.

After considering harvest advice for 2014 from its scientific staff, Canadian and U.S. harvesters and processors, and other fishery agencies, the IPHC recommended catch limits for 2014 to the U.S. and Canadian governments (see Table 1 below). The IPHC recommended catch limits slightly higher than the Blue Line apportionment for areas 2A and 2B because the stock assessment survey and fishery weight per unit effort (WPUE) estimates indicate a stable and upward trend in exploitable biomass in these areas. However, despite apportionments above the Blue Line, catch limits for areas 2A and 2B are reduced from 2013, in response to concerns about the coastwide stock status. For Area 2C, although exploitable biomass and WPUE in the survey and commercial fishery show upward trends, the IPHC was precautionary and recommended the Blue Line apportionment. Area 2C is the only regulatory area for which the IPHC recommended an increase in its commercial catch limit from 2013. The IPHC recommended the Blue Line apportionments for areas 3A, 3B, and 4A citing concerns about the downward trends in exploitable biomass and WPUE in these areas. Catch limits decreased in these three areas from 2013 levels. Exploitable biomass has shown a downward trend over the past five years in Area 4B, but because of concerns about the negative socioeconomic effects of a full reduction in catch to the Blue Line apportionment, the IPHC recommended a stair-step reduction in the catch limit to half way between the 2013 catch limit and the Blue Line apportionment. Likewise, indicators show a downward trend in areas 4CDE, but the Commission did not recommend the full reduction in catch limits to the Blue Line apportionment. Instead, the IPHC recommended a catch limit that it determined to be precautionary, while still providing sufficient allocation for the directed fishery to occur.

TABLE 1—PERCENT CHANGE IN CATCH LIMITS FROM 2013 TO 2014 BY IPHC REGULATORY AREA

Regulatory area	2014 IPHC Recommended catch limit (lb)	2014 Blue Line apportionment (lb)	2013 Catch limit (lb)	Percent change from 2013
2A [1]	960,000	720,000	990,000	−3.0
2B [2]	6,850,000	4,980,000	7,038,000	−2.7
2C [3]	4,160,000	4,160,000	2,970,000	+11.7
3A [3]	9,430,000	9,430,000	11,030,000	−33.7
3B	2,840,000	2,840,000	4,290,000	−33.8
4A	850,000	850,000	1,330,000	−36.1

TABLE 1—PERCENT CHANGE IN CATCH LIMITS FROM 2013 TO 2014 BY IPHC REGULATORY AREA—Continued

Regulatory area	2014 IPHC Recommended catch limit (lb)	2014 Blue Line apportionment (lb)	2013 Catch limit (lb)	Percent change from 2013
4B	1,140,000	820,000	1,450,000	−21.4
4CDE	1,285,000	640,000	1,930,000	−33.4
Coastwide	27,515,000		31,028,000	n/a

[1] Area 2A catch limit includes sport, commercial, and tribal catch limits.
[2] Area 2B catch limit includes sport and commercial catch limits.
[3] Shown is the combined commercial and charter allocation under the new Area 2C and Area 3A CSP. This value is not directly comparable to the 2013 catch limit because it also includes allocations to the charter sector, and an amount for commercial wastage. The commercial catch limits after deducting wastage are 3,318,720 lb in Area 2C and 7,317,730 lb in Area 3A. These are the values that were used to calculate the percent change from the 2013 catch limits.

Commercial Halibut Fishery Opening Dates

The opening date for the tribal commercial fishery in Area 2A and for the commercial halibut fisheries in Areas 2B through 4E is March 8, 2014. The date takes into account a number of factors, including the timing of halibut migration and spawning, marketing for seasonal holidays, and interest in getting product to processing plants before the herring season opens. The closing date for the halibut fisheries is November 7, 2014. This date takes into account the anticipated time required to fully harvest the commercial halibut catch limits while providing adequate time for IPHC staff to review the complete record of 2014 commercial catch data for use in the 2015 stock assessment process.

In the Area 2A directed fishery, each fishing period shall begin at 0800 hours and terminate at 1800 hours local time on June 25, July 9, July 23, August 6, August 20, September 3, and September 17, 2014, unless the IPHC specifies otherwise. These 10-hour openings will occur until the quota is taken and the fishery is closed.

Area 2A Catch Sharing Plan

The NMFS West Coast Region published a proposed rule for changes to the Pacific Halibut Catch Sharing Plan for Area 2A off Washington, Oregon, and California on February 6, 2014 (79 FR 7156), with public comments accepted through February 21, 2014. A separate final rule will be published to approve changes to the Area 2A CSP and to implement the portions of the CSP and management measures that are not implemented through the IPHC annual management measures that are published in this final rule. These measures include the sport fishery allocations and management measures for Area 2A.

Catch Sharing Plan for Area 2C and Area 3A

On January 13, 2014, NMFS implemented a CSP for Area 2C and Area 3A. The final rule for the CSP was published on December 12, 2013 (78 FR 75844). The CSP replaces the Guideline Harvest Level (GHL) program implemented in 2003 (68 FR 47256, August 8, 2003), defines an annual process for allocating halibut between the charter and commercial fisheries in Area 2C and Area 3A, and establishes allocations for each fishery. The commercial fishery will continue to be managed under the Individual Fishing Quota system. To allow flexibility for individual commercial and charter fishery participants, the CSP also authorizes annual transfers of commercial halibut IFQ to charter halibut permit holders for harvest in the charter fishery. Under the CSP, the IPHC will adopt combined catch limits (CCLs) for the charter and commercial halibut fisheries in Area 2C and Area 3A. The CCL will include estimates of discard mortality (wastage) for each fishery. This action was necessary to achieve the halibut fishery management goals of the NPFMC. More information about the CSP is provided in the proposed rule for the CSP (78 FR 39122, June, 28, 2013) and in the final rule implementing the CSP. Implementing regulations for the CSP are at 50 CFR 300.65. The Area 2C and Area 3A CSP allocation tables are Tables 1 through 4 of subpart E of 50 CFR part 300. The IPHC adopted a CCL of 4,160,000 lb (1,886.9 mt) for Area 2C. Following the CSP allocations in Tables 1 and 3 of subpart E of 50 CFR part 300, the commercial fishery is allocated 81.7 percent or 3,398,720 lb (1,541.6 mt), and the charter fishery is allocated 18.3 percent or 761,280 lb (345.3 mt) of the CCL. Wastage in the amount of 80,000 lb (36.3 mt) was deducted from the commercial allocation to obtain the commercial catch limit of 3,318,720 lb (1,505.3 mt). The charter catch limit for 2014 was reduced by 26,720 lb (12.1 mt), or 3.4 percent from the GHL of 788,000 lb (357.4 mt) in 2013. Further, an estimate of 45,677 lb (20.7 mt), or 6 percent, wastage is assumed to occur in the charter fishery and is factored into the management measures. To reduce Area 2C charter harvest, including discard mortality, to the lower 2014 catch limit, and keep total harvest in Area 2C to within the IPHC's stated harvest policy, required a change to the management measures for the charter fishery (discussed below).

The IPHC adopted a CCL of 9,430,000 lb (4,277.4 mt) for Area 3A. Following the CSP allocations in Tables 2 and 4 of subpart E of 50 CFR part 300, the commercial fishery is allocated 81.1 percent or 7,647,730 lb (3,469 mt), and the charter fishery is allocated 18.9 percent or 1,782,270 lb (808.4 mt) of the CCL. Discard mortality in the amount of 330,000 lb (149.7 mt) was deducted from the commercial allocation to obtain the commercial catch limit of 7,317,730 lb (3,319.3 mt). The charter catch limit was reduced by 951,730 lb (431.7 mt), or 34.8 percent from the GHL of 2,734,000 lb (1,240.1 mt) in 2013, a similar percentage reduction as the one borne by the commercial fishery. Further, an estimate of 89,113 lb (40.4 mt), or 5 percent, for wastage is assumed to occur in the charter fishery and is factored into the management measures. The reduction from the 2013 GHL to the 2014 charter catch limit required changes to the management measures for the charter fishery to keep total harvest in Area 3A to within the IPHC's stated harvest policy (discussed below). This is the first year that more restrictive management measures have been implemented for charter vessel anglers than unguided anglers in Area 3A.

Charter Halibut Management Measures for Area 2C and Area 3A

The NPFMC formed the Charter Halibut Management Implementation Committee to provide it with recommendations for annual management measures intended to limit charter harvest to the charter catch limit while minimizing negative economic impacts to the charter fishery participants in times of low halibut abundance. The committee is composed of representatives from the charter fishing industry in Areas 2C and 3A. The committee selected management measures for further analysis from a suite of more than 15 alternatives that were proposed to the NPFMC in October 2013. After analyzing the effects of the alternative measures on estimated charter harvest, charter businesses, and charter anglers, the committee recommended their preferred management measures to the NPFMC for 2014. The NPFMC adopted the committee's preferred measures to recommend to the IPHC, and the IPHC adopted the NPFMC's recommendations. The NPFMC has used this process to select and recommend annual management measures to the IPHC since 2012.

The IPHC recognizes the role of the NPFMC to develop policy and regulations that allocate the Pacific halibut resource among fishermen in and off Alaska, and that NMFS has developed numerous regulations to support the NPFMC's goals of limiting charter harvests over the past several years. The IPHC concluded that additional restrictions were necessary to limit the Area 2C and Area 3A charter halibut fisheries to their charter catch limits under the CSP, to achieve the IPHC's overall conservation objective to limit/maintain total halibut harvests to established catch limits, and to meet the NPFMC's allocation objective for these areas. The IPHC determined that limiting charter harvests by implementing the management measures discussed below would likely meet these objectives.

Reverse Slot Limit for Halibut Retained on a Charter Vessel Fishing in Area 2C

This final rule amends the 2013 measures applicable to the charter vessel fishery in Area 2C. For 2014, the IPHC adopted a management measure that prohibits a person on board a charter vessel referred to in 50 CFR 300.65 and fishing in Area 2C from taking or possessing any halibut, with head on, that is greater than 44 inches (111.8 cm) and less than 76 inches (193.0 cm), as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with mouth closed, to the extreme end of the middle of the tail. This type of restriction is referred to as a ''reverse slot limit.'' The 2013 reverse slot limit prohibited retention by charter anglers of halibut that were greater than 45 inches (114.3 cm) and less than 68 inches (172.7 cm). The 2014 reverse slot limit is more restrictive to reduce charter harvest in Area 2C to the reduced charter catch limit under the CSP of 761,280 lb (345.3 mt).

Size Limits for Halibut Retained On Board and Trip Limits for Charter Vessel Fishing in Area 3A

This final rule amends the 2013 management measures applicable to the charter halibut fishery in Area 3A. Previously, charter vessel anglers in Area 3A were allowed to catch and retain two halibut of any size per person per day, the same limit as for unguided anglers. For 2014, the IPHC adopted a two-fish daily bag limit in which one of the retained halibut may be of any size and one of the retained halibut must be less than 29 inches (73.7 cm) total length. The NPFMC recommended this measure to restrict charter harvest while minimizing the negative impacts of new restrictions on charter operations and anglers in Area 3A. A similar measure was used to reduce charter harvest in Area 2C in 2007 and 2008, before further reductions in the GHL required a one-fish bag limit in that area (72 FR 30714, June 4, 2007). A 29-inch halibut weighs approximately 10.3 lb (4.7 kg). In Area 3A in 2013, the average size of a halibut retained in the charter fishery was 31 inches and 12.8 lb (5.8 kg). Therefore, assuming an angler caught two fish of average size, this size limit would restrict an angler's total harvest by about 2.5 lb (1.1 kg). Charter operators in Area 3A stressed the importance of maintaining a two-fish bag limit for charter anglers to maintain similar angling opportunities to previous years. This management measure achieves that objective and is projected to maintain total Area 3A charter harvest close to or below the Area 3A charter catch limit.

Charter vessels will also be limited to one charter halibut fishing trip in which halibut are retained per calendar day in Area 3A. If no halibut are retained during a charter vessel fishing trip, the vessel may take an additional trip to catch and retain halibut that day. The trip limit applies to vessels only, not to charter halibut permits. A charter operator may use more than one vessel to take more than one charter vessel fishing trip using the same charter halibut permit per day. Trip limits will affect only a small number of charter operators and allow the size of the size-restricted fish to be maximized. Without a trip limit, a more restrictive size or bag limit might have been necessary to achieve harvest targets.

Areas 2C and 3A Carcass Retention

Current IPHC regulations prohibit the filleting, mutilation or other disfigurement of sport-caught halibut that would prevent the determination of the size or number of halibut possessed or landed. In Southeast Alaska (Area 2C), the IPHC has not changed the current regulation at section 28(2)(b) requiring that a person on board a charter vessel who possesses filleted halibut must also retain the entire carcass, with head and tail connected as a single piece, on board the vessel until all the fillets are offloaded. The carcass retention regulation was first implemented in Area 2C in 2011 to facilitate enforcement of a maximum size limit and a one-fish per angler daily bag limit. The IPHC adopted no changes to the carcass retention requirement in 2014 to facilitate enforcement of the U44/O76 reverse slot limit in Area 2C. The IPHC also adopted the carcass retention requirement in Area 3A to facilitate enforcement of the 29-inch maximum size limit on one of the two fish. Anglers in Area 3A will be required to retain only the carcass of the halibut that is less than the 29-inch maximum size limit if two halibut are retained. If an angler only retains one halibut in a day, the carcass does not need to be retained.

Annual Halibut Management Measures

The following annual management measures for the 2014 Pacific halibut fishery are those recommended by the IPHC and accepted by the Secretary of State, with the concurrence of the Secretary.

1. Short Title

These Regulations may be cited as the Pacific Halibut Fishery Regulations.

2. Application

(1) These Regulations apply to persons and vessels fishing for halibut in, or possessing halibut taken from, the maritime area as defined in Section 3.

(2) Sections 3 to 6 apply generally to all halibut fishing.

(3) Sections 7 to 20 apply to commercial fishing for halibut.

(4) Section 21 applies to tagged halibut caught by any vessel.

(5) Section 22 applies to the United States treaty Indian fishery in Subarea 2A–1.

(6) Section 23 applies to customary and traditional fishing in Alaska.

(7) Section 24 applies to Aboriginal groups fishing for food, social and ceremonial purposes in British Columbia.

(8) Sections 25 to 28 apply to sport fishing for halibut.

(9) These Regulations do not apply to fishing operations authorized or conducted by the Commission for research purposes.

3. Definitions

(1) In these Regulations,

(a) ''authorized officer'' means any State, Federal, or Provincial officer authorized to enforce these Regulations including, but not limited to, the National Marine Fisheries Service (NMFS), Canada's Department of Fisheries and Oceans (DFO), Alaska Wildlife Troopers (AWT), United States Coast Guard (USCG), Washington Department of Fish and Wildlife (WDFW), and the Oregon State Police (OSP);

(b) ''authorized clearance personnel'' means an authorized officer of the United States, a representative of the Commission, or a designated fish processor;

(c) ''charter vessel'' means a vessel used for hire in sport fishing for halibut, but not including a vessel without a hired operator;

(d) ''commercial fishing'' means fishing, the resulting catch of which is sold or bartered; or is intended to be sold or bartered, other than (i) sport fishing, (ii) treaty Indian ceremonial and subsistence fishing as referred to in section 22, (iii) customary and traditional fishing as referred to in section 23 and defined by and regulated pursuant to NMFS regulations published at 50 CFR Part 300, and (iv) Aboriginal groups fishing in British Columbia as referred to in section 24;

(e) ''Commission'' means the International Pacific Halibut Commission;

(f) ''daily bag limit'' means the maximum number of halibut a person may take in any calendar day from Convention waters;

(g) ''fishing'' means the taking, harvesting, or catching of fish, or any activity that can reasonably be expected to result in the taking, harvesting, or catching of fish, including specifically the deployment of any amount or component part of setline gear anywhere in the maritime area;

(h) ''fishing period limit'' means the maximum amount of halibut that may be retained and landed by a vessel during one fishing period;

(i) ''land'' or ''offload'' with respect to halibut, means the removal of halibut from the catching vessel;

(j) ''license'' means a halibut fishing license issued by the Commission pursuant to section 4;

(k) ''maritime area'', in respect of the fisheries jurisdiction of a Contracting Party, includes without distinction areas within and seaward of the territorial sea and internal waters of that Party;

(l) ''net weight'' of a halibut means the weight of halibut that is without gills and entrails, head-off, washed, and without ice and slime. If a halibut is weighed with the head on or with ice and slime, the required conversion factors for calculating net weight are a 2 percent deduction for ice and slime and a 10 percent deduction for the head;

(m) ''operator'', with respect to any vessel, means the owner and/or the master or other individual on board and in charge of that vessel;

(n) ''overall length'' of a vessel means the horizontal distance, rounded to the nearest foot, between the foremost part of the stem and the aftermost part of the stern (excluding bowsprits, rudders, outboard motor brackets, and similar fittings or attachments);

(o) ''person'' includes an individual, corporation, firm, or association;

(p) ''regulatory area'' means an area referred to in section 6;

(q) ''setline gear'' means one or more stationary, buoyed, and anchored lines with hooks attached;

(r) ''sport fishing'' means all fishing other than (i) commercial fishing, (ii) treaty Indian ceremonial and subsistence fishing as referred to in section 22, (iii) customary and traditional fishing as referred to in section 23 and defined in and regulated pursuant to NMFS regulations published in 50 CFR Part 300, and (iv) Aboriginal groups fishing in British Columbia as referred to in section 24;

(s) ''tender'' means any vessel that buys or obtains fish directly from a catching vessel and transports it to a port of landing or fish processor;

(t) ''VMS transmitter'' means a NMFS-approved vessel monitoring system transmitter that automatically determines a vessel's position and transmits it to a NMFS-approved communications service provider.[1]

(2) In these Regulations, all bearings are true and all positions are determined by the most recent charts issued by the United States National Ocean Service or the Canadian Hydrographic Service.

[1] Call NOAA Enforcement Division, Alaska Region, at 907–586–7225 between the hours of 0800 and 1600 local time for a list of NMFS-approved VMS transmitters and communications service providers.

4. Licensing Vessels for Area 2A

(1) No person shall fish for halibut from a vessel, nor possess halibut on board a vessel, used either for commercial fishing or as a charter vessel in Area 2A, unless the Commission has issued a license valid for fishing in Area 2A in respect of that vessel.

(2) A license issued for a vessel operating in Area 2A shall be valid only for operating either as a charter vessel or a commercial vessel, but not both.

(3) A vessel with a valid Area 2A commercial license cannot be used to sport fish for Pacific halibut in Area 2A.

(4) A license issued for a vessel operating in the commercial fishery in Area 2A shall be valid for one of the following:

(a) The directed commercial fishery during the fishing periods specified in paragraph (2) of section 8 and the incidental commercial fishery during the sablefish fishery specified in paragraph (3) of section 8;

(b) the incidental catch fishery during the sablefish fishery specified in paragraph (3) of section 8; or

(c) the incidental catch fishery during the salmon troll fishery specified in paragraph (4) of section 8.

(5) No person may apply for or be issued a license for a vessel operating in the incidental catch fishery during the salmon troll fishery in paragraph (4)(c), if that vessel was previously issued a license for either the directed commercial fishery in paragraph (4)(a) or the incidental catch fishery during the sablefish fishery in paragraph (4)(b).

(6) A license issued in respect to a vessel referred to in paragraph (1) of this section must be carried on board that vessel at all times and the vessel operator shall permit its inspection by any authorized officer.

(7) The Commission shall issue a license in respect to a vessel, without fee, from its office in Seattle, Washington, upon receipt of a completed, written, and signed ''Application for Vessel License for the Halibut Fishery'' form.

(8) A vessel operating in the directed commercial fishery in Area 2A must have its ''Application for Vessel License for the Halibut Fishery'' form postmarked no later than 11:59 p.m. on April 30, or on the first weekday in May if April 30 is a Saturday or Sunday.

(9) A vessel operating in the incidental catch fishery during the sablefish fishery in Area 2A must have its ''Application for Vessel License for the Halibut Fishery'' form postmarked no later than 11:59 p.m. on March 15, or the next weekday in March if March 15 is a Saturday or Sunday.

(10) A vessel operating in the incidental catch fishery during the salmon troll fishery in Area 2A must have its ''Application for Vessel License for the Halibut Fishery'' form postmarked no later than 11:59 p.m. on March 15, or the next weekday in March if March 15 is a Saturday or Sunday.

(11) Application forms may be obtained from any authorized officer or from the Commission.

(12) Information on ''Application for Vessel License for the Halibut Fishery'' form must be accurate.

(13) The ''Application for Vessel License for the Halibut Fishery'' form shall be completed and signed by the vessel owner.

(14) Licenses issued under this section shall be valid only during the year in which they are issued.

(15) A new license is required for a vessel that is sold, transferred, renamed, or the documentation is changed.

(16) The license required under this section is in addition to any license, however designated, that is required under the laws of the United States or any of its States.

(17) The United States may suspend, revoke, or modify any license issued under this section under policies and procedures in Title 15, CFR Part 904.

5. In-Season Actions

(1) The Commission is authorized to establish or modify regulations during the season after determining that such action:

(a) Will not result in exceeding the catch limit established preseason for each regulatory area;

(b) is consistent with the Convention between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea, and applicable domestic law of either Canada or the United States; and

(c) is consistent, to the maximum extent practicable, with any domestic catch sharing plans or other domestic allocation programs developed by the United States or Canadian governments.

(2) In-season actions may include, but are not limited to, establishment or modification of the following:

(a) Closed areas;

(b) fishing periods;

(c) fishing period limits;

(d) gear restrictions;

(e) recreational bag limits;

(f) size limits; or

(g) vessel clearances.

(3) In-season changes will be effective at the time and date specified by the Commission.

(4) The Commission will announce in-season actions under this section by providing notice to major halibut processors; Federal, State, United States treaty Indian, and Provincial fishery officials; and the media.

6. Regulatory Areas

The following areas shall be regulatory areas (see Figure 1) for the purposes of the Convention:

(1) Area 2A includes all waters off the states of California, Oregon, and Washington;

(2) Area 2B includes all waters off British Columbia;

(3) Area 2C includes all waters off Alaska that are east of a line running 340° true from Cape Spencer Light (58°11′56″ N. latitude, 136°38′26″ W. longitude) and south and east of a line running 205° true from said light;

(4) Area 3A includes all waters between Area 2C and a line extending from the most northerly point on Cape Aklek (57°41′15″ N. latitude, 155°35′00″ W. longitude) to Cape Ikolik (57°17′17″ N. latitude, 154°47′18″ W. longitude), then along the Kodiak Island coastline to Cape Trinity (56°44′50″ N. latitude, 154°08′44″ W. longitude), then 140° true;

(5) Area 3B includes all waters between Area 3A and a line extending 150° true from Cape Lutke (54°29′00″ N. latitude, 164°20′00″ W. longitude) and south of 54°49′00″ N. latitude in Isanotski Strait;

(6) Area 4A includes all waters in the Gulf of Alaska west of Area 3B and in the Bering Sea west of the closed area defined in section 10 that are east of 172°00′00″ W. longitude and south of 56°20′00″ N. latitude;

(7) Area 4B includes all waters in the Bering Sea and the Gulf of Alaska west of Area 4A and south of 56°20′00″ N. latitude;

(8) Area 4C includes all waters in the Bering Sea north of Area 4A and north of the closed area defined in section 10 which are east of 171°00′00″ W. longitude, south of 58°00′00″ N. latitude, and west of 168°00′00″ W. longitude;

(9) Area 4D includes all waters in the Bering Sea north of Areas 4A and 4B, north and west of Area 4C, and west of 168°00′00″ W. longitude; and

(10) Area 4E includes all waters in the Bering Sea north and east of the closed area defined in section 10, east of 168°00′00″ W. longitude, and south of 65°34′00″ N. latitude.

7. Fishing in Regulatory Area 4E and 4D

(1) Section 7 applies only to any person fishing, or vessel that is used to fish for, Area 4E Community Development Quota (CDQ) or Area 4D CDQ halibut, provided that the total annual halibut catch of that person or vessel is landed at a port within Area 4E or 4D.

(2) A person may retain halibut taken with setline gear in Area 4E CDQ and 4D CDQ fishery that are smaller than the size limit specified in section 13, provided that no person may sell or barter such halibut.

(3) The manager of a CDQ organization that authorizes persons to harvest halibut in the Area 4E or 4D CDQ fisheries must report to the Commission the total number and weight of undersized halibut taken and retained by such persons pursuant to section 7, paragraph (2). This report, which shall include data and methodology used to collect the data, must be received by the Commission prior to November 1 of the year in which such halibut were harvested.

8. Fishing Periods

(1) The fishing periods for each regulatory area apply where the catch limits specified in section 11 have not been taken.

(2) Each fishing period in the Area 2A directed commercial fishery [2] shall begin at 0800 hours and terminate at 1800 hours local time on June 25, July 9, July 23, August 6, August 20, September 3, and September 17 unless the Commission specifies otherwise.

(3) Notwithstanding paragraph (7) of section 11, an incidental catch fishery [3] is authorized during the sablefish seasons in Area 2A in accordance with regulations promulgated by NMFS. This fishery will occur between 1200 hours local time on March 8 and 1200 hours local time on November 7.

(4) Notwithstanding paragraph (2), and paragraph (7) of section 11, an incidental catch fishery is authorized during salmon troll seasons in Area 2A in accordance with regulations promulgated by NMFS. This fishery will occur between 1200 hours local time on March 8 and 1200 hours local time on November 7.

(5) The fishing period in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E shall begin at 1200 hours local time on March 8 and terminate at 1200 hours local time on November 7, unless the Commission specifies otherwise.

[2] The directed fishery is restricted to waters that are south of Point Chehalis, Washington (46°53′18″ N. latitude) under regulations promulgated by NMFS and published in the **Federal Register**.

[3] The incidental fishery during the directed, fixed gear sablefish season is restricted to waters that are north of Point Chehalis, Washington (46°53′18″ N. latitude) under regulations promulgated by NMFS at 50 CFR 300.63. Landing restrictions for halibut retention in the fixed gear sablefish fishery can be found at 50 CFR 660.231.

(6) All commercial fishing for halibut in Areas 2A, 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E shall cease at 1200 hours local time on November 7.

9. Closed Periods

(1) No person shall engage in fishing for halibut in any regulatory area other than during the fishing periods set out in section 8 in respect of that area.

(2) No person shall land or otherwise retain halibut caught outside a fishing period applicable to the regulatory area where the halibut was taken.

(3) Subject to paragraphs (7), (8), (9), and (10) of section 19, these Regulations do not prohibit fishing for any species of fish other than halibut during the closed periods.

(4) Notwithstanding paragraph (3), no person shall have halibut in his/her possession while fishing for any other species of fish during the closed periods.

(5) No vessel shall retrieve any halibut fishing gear during a closed period if the vessel has any halibut on board.

(6) A vessel that has no halibut on board may retrieve any halibut fishing gear during the closed period after the operator notifies an authorized officer or representative of the Commission prior to that retrieval.

(7) After retrieval of halibut gear in accordance with paragraph (6), the vessel shall submit to a hold inspection at the discretion of the authorized officer or representative of the Commission.

(8) No person shall retain any halibut caught on gear retrieved in accordance with paragraph (6).

(9) No person shall possess halibut on board a vessel in a regulatory area during a closed period unless that vessel is in continuous transit to or within a port in which that halibut may be lawfully sold.

10. Closed Area

All waters in the Bering Sea north of 55°00′00″ N. latitude in Isanotski Strait that are enclosed by a line from Cape Sarichef Light (54°36′00″ N. latitude, 164°55′42″ W. longitude) to a point at 56°20′00″ N. latitude, 168°30′00″ W. longitude; thence to a point at 58°21′25″ N. latitude, 163°00′00″ W. longitude; thence to Strogonof Point (56°53′18″ N. latitude, 158°50′37″ W. longitude); and then along the northern coasts of the Alaska Peninsula and Unimak Island to the point of origin at Cape Sarichef Light are closed to halibut fishing and no person shall fish for halibut therein or have halibut in his/her possession while in those waters, except in the course of a continuous transit across those waters. All waters in Isanotski Strait between 55°00′00″ N. latitude and 54°49′00″ N. latitude are closed to halibut fishing.

11. Catch Limits

(1) The total allowable catch of halibut to be taken during the halibut fishing periods specified in section 8 shall be limited to the net weights expressed in pounds or metric tons shown in the following table:

Regulatory area	Catch limit—net weight	
	Pounds	Metric tons
2A: Directed commercial, and incidental commercial catch during salmon troll fishery	197,808	89.7
2A: Incidental commercial during sablefish fishery	14,274	6.5
2B [4]	6,850,000	3,107.1
2C [5]	3,318,720	1,505.3
3A [6]	7,317,730	3,319.3
3B	2,840,000	1,288.2
4A	850,000	385.6
4B	1,140,000	517.1
4C	596,600	270.6
4D	596,600	270.6
4E	91,800	41.6

(2) Notwithstanding paragraph (1), regulations pertaining to the division of the Area 2A catch limit between the directed commercial fishery and the incidental catch fishery as described in paragraph (4) of section 8 will be promulgated by NMFS and published in the **Federal Register**.

[4] Area 2B includes combined commercial and sport catch limits that will be allocated by DFO. See section 27 for sport fishing regulations.

[5] For the commercial fishery in Area 2C, in addition to the catch limit, the estimate of incidental mortality from the commercial fishery is 80,000 pounds. This amount is included in the combined commercial and guided sport sector catch limit set by IPHC and allocated by NMFS by a catch sharing plan.

[6] For the commercial fishery in Area 3A, in addition to the catch limit, the estimate of incidental mortality from the commercial fishery is 330,000 pounds. This amount is included in the combined commercial and guided sport sector catch limit set by IPHC and allocated by NMFS by a catch sharing plan.

(3) The Commission shall determine and announce to the public the date on which the catch limit for Area 2A will be taken.

(4) Notwithstanding paragraph (1), the commercial fishing in Area 2B will close only when all Individual Vessel Quotas (IVQs) assigned by DFO are taken, or November 7, whichever is earlier.

(5) Notwithstanding paragraph (1), Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E will each close only when all Individual Fishing Quotas (IFQ) and all CDQs issued by NMFS have been taken, or November 7, whichever is earlier.

(6) If the Commission determines that the catch limit specified for Area 2A in paragraph (1) would be exceeded in an unrestricted 10-hour fishing period as specified in paragraph (2) of section 8, the catch limit for that area shall be considered to have been taken unless fishing period limits are implemented.

(7) When under paragraphs (2), (3), and (6) the Commission has announced a date on which the catch limit for Area 2A will be taken, no person shall fish for halibut in that area after that date for the rest of the year, unless the Commission has announced the reopening of that area for halibut fishing.

(8) Notwithstanding paragraph (1), the total allowable catch of halibut that may be taken in the Area 4E directed commercial fishery is equal to the combined annual catch limits specified for the Area 4D and Area 4E CDQ fisheries. The annual Area 4D CDQ catch limit will decrease by the equivalent amount of halibut CDQ taken in Area 4E in excess of the annual Area 4E CDQ catch limit.

(9) Notwithstanding paragraph (1), the total allowable catch of halibut that may be taken in the Area 4D directed commercial fishery is equal to the combined annual catch limits specified

for Area 4C and Area 4D. The annual Area 4C catch limit will decrease by the equivalent amount of halibut taken in Area 4D in excess of the annual Area 4D catch limit.

Area 2B includes combined commercial and sport catch limits that will be allocated by DFO.

12. Fishing Period Limits

(1) It shall be unlawful for any vessel to retain more halibut than authorized by that vessel's license in any fishing period for which the Commission has announced a fishing period limit.

(2) The operator of any vessel that fishes for halibut during a fishing period when fishing period limits are in effect must, upon commencing an offload of halibut to a commercial fish processor, completely offload all halibut on board said vessel to that processor and ensure that all halibut is weighed and reported on State fish tickets.

(3) The operator of any vessel that fishes for halibut during a fishing period when fishing period limits are in effect must, upon commencing an offload of halibut other than to a commercial fish processor, completely offload all halibut on board said vessel and ensure that all halibut are weighed and reported on State fish tickets.

(4) The provisions of paragraph (3) are not intended to prevent retail over-the-side sales to individual purchasers so long as all the halibut on board is ultimately offloaded and reported.

(5) When fishing period limits are in effect, a vessel's maximum retainable catch will be determined by the Commission based on:

(a) The vessel's overall length in feet and associated length class;

(b) the average performance of all vessels within that class; and

(c) the remaining catch limit.

(6) Length classes are shown in the following table:

Overall length (in feet)	Vessel class
1–25	A
26–30	B
31–35	C
36–40	D
41–45	E
46–50	F
51–55	G
56+	H

(7) Fishing period limits in Area 2A apply only to the directed halibut fishery referred to in paragraph (2) of section 8.

13. Size Limits

(1) No person shall take or possess any halibut that:

(a) With the head on, is less than 32 inches (81.3 cm) as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with the mouth closed, to the extreme end of the middle of the tail, as illustrated in Figure 2; or

(b) with the head removed, is less than 24 inches (61.0 cm) as measured from the base of the pectoral fin at its most anterior point to the extreme end of the middle of the tail, as illustrated in Figure 2.

(2) No person on board a vessel fishing for, or tendering, halibut caught in Area 2A shall possess any halibut that has had its head removed.

14. Careful Release of Halibut

(1) All halibut that are caught and are not retained shall be immediately released outboard of the roller and returned to the sea with a minimum of injury by:

(a) Hook straightening;

(b) cutting the gangion near the hook; or

(c) carefully removing the hook by twisting it from the halibut with a gaff.

(2) Except that paragraph (1) shall not prohibit the possession of halibut on board a vessel that has been brought aboard to be measured to determine if the minimum size limit of the halibut is met and, if sublegal-sized, is promptly returned to the sea with a minimum of injury.

15. Vessel Clearance in Area 4

(1) The operator of any vessel that fishes for halibut in Areas 4A, 4B, 4C, or 4D must obtain a vessel clearance before fishing in any of these areas, and before the landing of any halibut caught in any of these areas, unless specifically exempted in paragraphs (10), (13), (14), (15), or (16).

(2) An operator obtaining a vessel clearance required by paragraph (1) must obtain the clearance in person from the authorized clearance personnel and sign the IPHC form documenting that a clearance was obtained, except that when the clearance is obtained via VHF radio referred to in paragraphs (5), (8), and (9), the authorized clearance personnel must sign the IPHC form documenting that the clearance was obtained.

(3) The vessel clearance required under paragraph (1) prior to fishing in Area 4A may be obtained only at Nazan Bay on Atka Island, Dutch Harbor or Akutan, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor.

(4) The vessel clearance required under paragraph (1) prior to fishing in Area 4B may only be obtained at Nazan Bay on Atka Island or Adak, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor.

(5) The vessel clearance required under paragraph (1) prior to fishing in Area 4C or 4D may be obtained only at St. Paul or St. George, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor by VHF radio and allowing the person contacted to confirm visually the identity of the vessel.

(6) The vessel operator shall specify the specific regulatory area in which fishing will take place.

(7) Before unloading any halibut caught in Area 4A, a vessel operator may obtain the clearance required under paragraph (1) only in Dutch Harbor or Akutan, Alaska, by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor.

(8) Before unloading any halibut caught in Area 4B, a vessel operator may obtain the clearance required under paragraph (1) only in Nazan Bay on Atka Island or Adak, by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor by VHF radio or in person.

(9) Before unloading any halibut caught in Area 4C and 4D, a vessel operator may obtain the clearance required under paragraph (1) only in St. Paul, St. George, Dutch Harbor, or Akutan, Alaska, either in person or by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearances obtained in St. Paul or St. George, Alaska, can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel.

(10) Any vessel operator who complies with the requirements in section 18 for possessing halibut on board a vessel that was caught in more than one regulatory area in Area 4 is exempt from the clearance requirements of paragraph (1) of this section, provided that:

(a) The operator of the vessel obtains a vessel clearance prior to fishing in Area 4 in either Dutch Harbor, Akutan, St. Paul, St. George, Adak, or Nazan Bay on Atka Island by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearance obtained in St. Paul, St. George, Adak, or Nazan Bay on Atka Island can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel. This clearance will list the areas in which the vessel will fish; and

(b) before unloading any halibut from Area 4, the vessel operator obtains a vessel clearance from Dutch Harbor, Akutan, St. Paul, St. George, Adak, or Nazan Bay on Atka Island by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearance obtained in St. Paul or St. George can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel. The clearance obtained in Adak or Nazan Bay on Atka Island can be obtained by VHF radio.

(11) Vessel clearances shall be obtained between 0600 and 1800 hours, local time.

(12) No halibut shall be on board the vessel at the time of the clearances required prior to fishing in Area 4.

(13) Any vessel that is used to fish for halibut only in Area 4A and lands its total annual halibut catch at a port within Area 4A is exempt from the clearance requirements of paragraph (1).

(14) Any vessel that is used to fish for halibut only in Area 4B and lands its total annual halibut catch at a port within Area 4B is exempt from the clearance requirements of paragraph (1).

(15) Any vessel that is used to fish for halibut only in Area 4C or 4D or 4E and lands its total annual halibut catch at a port within Area 4C, 4D, 4E, or the closed area defined in section 10, is exempt from the clearance requirements of paragraph (1).

(16) Any vessel that carries a transmitting VMS transmitter while fishing for halibut in Area 4A, 4B, 4C, or 4D and until all halibut caught in any of these areas is landed, is exempt from the clearance requirements of paragraph (1) of this section, provided that:

(a) The operator of the vessel complies with NMFS' vessel monitoring system regulations published at 50 CFR sections 679.28(f)(3), (4) and (5); and

(b) the operator of the vessel notifies NOAA Fisheries Office for Law Enforcement at 800–304–4846 (select option 1 to speak to an Enforcement Data Clerk) between the hours of 0600 and 0000 (midnight) local time within 72 hours before fishing for halibut in Area 4A, 4B, 4C, or 4D and receives a VMS confirmation number.

16. Logs

(1) The operator of any U.S. vessel fishing for halibut that has an overall length of 26 feet (7.9 meters) or greater shall maintain an accurate log of halibut fishing operations. The operator of a vessel fishing in waters in and off Alaska must use one of the following logbooks: The Groundfish/IFQ Daily Fishing Longline and Pot Gear Logbook provided by NMFS; the Alaska hook-and-line logbook provided by Petersburg Vessel Owners Association or Alaska Longline Fisherman's Association; the Alaska Department of Fish and Game (ADF&G) longline-pot logbook; or the logbook provided by IPHC. The operator of a vessel fishing in Area 2A must use either the Washington Department of Fish and Wildlife (WDFW) Voluntary Sablefish Logbook, Oregon Department of Fish and Wildlife (ODFW) Fixed Gear Logbook, or the logbook provided by IPHC.

(2) The logbook referred to in paragraph (1) must include the following information:

(a) The name of the vessel and the State (ADF&G, WDFW, ODFW, or California Department of Fish and Game) or Tribal vessel number;

(b) the date(s) upon which the fishing gear is set or retrieved;

(c) the latitude and longitude coordinates or a direction and distance from a point of land for each set or day;

(d) the number of skates deployed or retrieved, and number of skates lost; and

(e) the total weight or number of halibut retained for each set or day.

(3) The logbook referred to in paragraph (1) shall be:

(a) Maintained on board the vessel;

(b) updated not later than 24 hours after 0000 (midnight) local time for each day fished and prior to the offloading or sale of halibut taken during that fishing trip;

(c) retained for a period of two years by the owner or operator of the vessel;

(d) open to inspection by an authorized officer or any authorized representative of the Commission upon demand; and

(e) kept on board the vessel when engaged in halibut fishing, during transits to port of landing, and until the offloading of all halibut is completed.

(4) The log referred to in paragraph (1) does not apply to the incidental halibut fishery during the salmon troll season in Area 2A defined in paragraph (4) of section 8.

(5) The operator of any Canadian vessel fishing for halibut shall maintain an accurate log recorded in the British Columbia Integrated Groundfish Fishing Log provided by DFO.

(6) The logbook referred to in paragraph (5) must include the following information:

(a) The name of the vessel and the DFO vessel registration number;

(b) the date(s) upon which the fishing gear is set and retrieved;

(c) the latitude and longitude coordinates for each set;

(d) the number of skates deployed or retrieved, and number of skates lost; and

(e) the total weight or number of halibut retained for each set.

(7) The logbook referred to in paragraph (5) shall be:

(a) Maintained on board the vessel;

(b) retained for a period of two years by the owner or operator of the vessel;

(c) open to inspection by an authorized officer or any authorized representative of the Commission upon demand;

(d) kept on board the vessel when engaged in halibut fishing, during transits to port of landing, and until the offloading of all halibut is completed;

(e) mailed to the DFO (white copy) within seven days of offloading; and

(f) mailed to the Commission (yellow copy) within seven days of the final offload if not collected by a Commission employee.

(8) No person shall make a false entry in a log referred to in this section.

17. Receipt and Possession of Halibut

(1) No person shall receive halibut caught in Area 2A from a United States vessel that does not have on board the license required by section 4.

(2) No person shall possess on board a vessel a halibut other than whole or with gills and entrails removed, except that this paragraph shall not prohibit the possession on board a vessel of:

(a) Halibut cheeks cut from halibut caught by persons authorized to process the halibut on board in accordance with NMFS regulations published at 50 CFR Part 679;

(b) fillets from halibut offloaded in accordance with section 17 that are possessed on board the harvesting vessel in the port of landing up to 1800 hours local time on the calendar day following the offload;[7] and

(c) halibut with their heads removed in accordance with section 13.

(3) No person shall offload halibut from a vessel unless the gills and entrails have been removed prior to offloading.

(4) It shall be the responsibility of a vessel operator who lands halibut to continuously and completely offload at a single offload site all halibut on board the vessel.

(5) A registered buyer (as that term is defined in regulations promulgated by NMFS and codified at 50 CFR Part 679) who receives halibut harvested in IFQ and CDQ fisheries in Areas 2C, 3A, 3B,

[7] DFO has more restrictive regulations; therefore, section 17 paragraph (2)(b) does not apply to fish caught in Area 2B or landed in British Columbia.

4A, 4B, 4C, 4D, and 4E, directly from the vessel operator that harvested such halibut must weigh all the halibut received and record the following information on Federal catch reports: Date of offload; name of vessel; vessel number (State, Tribal or Federal, not IPHC vessel number); scale weight obtained at the time of offloading, including the scale weight (in pounds) of halibut purchased by the registered buyer, the scale weight (in pounds) of halibut offloaded in excess of the IFQ or CDQ, the scale weight of halibut (in pounds) retained for personal use or for future sale, and the scale weight (in pounds) of halibut discarded as unfit for human consumption.

(6) The first recipient, commercial fish processor, or buyer in the United States who purchases or receives halibut directly from the vessel operator that harvested such halibut must weigh and record all halibut received and record the following information on State fish tickets: The date of offload; vessel number (State, Tribal or Federal, not IPHC vessel number); total weight obtained at the time of offload including the weight (in pounds) of halibut purchased; the weight (in pounds) of halibut offloaded in excess of the IFQ, CDQ, or fishing period limits; the weight of halibut (in pounds) retained for personal use or for future sale; and the weight (in pounds) of halibut discarded as unfit for human consumption.

(7) The individual completing the State fish tickets for the Area 2A fisheries as referred to in paragraph (6) must additionally record whether the halibut weight is of head-on or head-off fish.

(8) For halibut landings made in Alaska, the requirements as listed in paragraph (5) and (6) can be met by recording the information in the Interagency Electronic Reporting Systems, eLandings in accordance with NMFS regulation published at 50 CFR Part 679.

(9) The master or operator of a Canadian vessel that was engaged in halibut fishing must weigh and record all halibut on board said vessel at the time offloading commences and record on Provincial fish tickets or Federal catch reports the date; locality; name of vessel; the name(s) of the person(s) from whom the halibut was purchased; and the scale weight obtained at the time of offloading of all halibut on board the vessel including the pounds purchased, pounds in excess of IVQs, pounds retained for personal use, and pounds discarded as unfit for human consumption.

(10) No person shall make a false entry on a State or Provincial fish ticket or a Federal catch or landing report referred to in paragraphs (5), (6), and (9) of section 17.

(11) A copy of the fish tickets or catch reports referred to in paragraphs (5), (6), and (9) shall be:

(a) Retained by the person making them for a period of three years from the date the fish tickets or catch reports are made; and

(b) open to inspection by an authorized officer or any authorized representative of the Commission.

(12) No person shall possess any halibut taken or retained in contravention of these Regulations.

(13) When halibut are landed to other than a commercial fish processor, the records required by paragraph (6) shall be maintained by the operator of the vessel from which that halibut was caught, in compliance with paragraph (11).

(14) No person shall tag halibut unless the tagging is authorized by IPHC permit or by a Federal or State agency.

18. Fishing Multiple Regulatory Areas

(1) Except as provided in this section, no person shall possess at the same time on board a vessel halibut caught in more than one regulatory area.

(2) Halibut caught in more than one of the Regulatory Areas 2C, 3A, or 3B may be possessed on board a vessel at the same time, provided the operator of the vessel:

(a) Has a NMFS-certified observer on board when required by NMFS regulations [8] published at 50 CFR 679.7(f)(4); and

(b) can identify the regulatory area in which each halibut on board was caught by separating halibut from different areas in the hold, tagging halibut, or by other means.

(3) Halibut caught in more than one of the Regulatory Areas 4A, 4B, 4C, or 4D may be possessed on board a vessel at the same time, provided the operator of the vessel:

(a) Has a NMFS-certified observer on board the vessel as required by NMFS regulations published at 50 CFR 679.7(f)(4); or has an operational VMS on board actively transmitting in all regulatory areas fished and does not possess at any time more halibut on board the vessel than the IFQ permit holders on board the vessel have cumulatively available for any single Area 4 regulatory area fished; and

(b) can identify the regulatory area in which each halibut on board was caught by separating halibut from different areas in the hold, tagging halibut, or by other means.

(4) If halibut from Area 4 are on board the vessel, the vessel can have halibut caught in Regulatory Areas 2C, 3A, and 3B on board if in compliance with paragraph (2).

19. Fishing Gear

(1) No person shall fish for halibut using any gear other than hook and line gear, except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined in the Condition of Sablefish Licence can retain halibut caught as bycatch under regulations promulgated by the Canadian Department of Fisheries and Oceans.

(2) No person shall possess halibut taken with any gear other than hook and line gear, except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined by the Condition of Sablefish Licence can retain halibut caught as bycatch under regulations promulgated by the Canadian Department of Fisheries and Oceans.

(3) No person shall possess halibut while on board a vessel carrying any trawl nets or fishing pots capable of catching halibut, except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut heads, skin, entrails, bones or fins for use as bait may be possessed on board a vessel carrying pots capable of catching halibut, provided that a receipt documenting purchase or transfer of these halibut parts is on board the vessel.

(4) All setline or skate marker buoys carried on board or used by any United States vessel used for halibut fishing shall be marked with one of the following:

(a) The vessel's State license number; or

(b) the vessel's registration number.

(5) The markings specified in paragraph (4) shall be in characters at least four inches in height and one-half inch in width in a contrasting color visible above the water and shall be maintained in legible condition.

(6) All setline or skate marker buoys carried on board or used by a Canadian vessel used for halibut fishing shall be:

(a) floating and visible on the surface of the water; and

(b) legibly marked with the identification plate number of the vessel engaged in commercial fishing from which that setline is being operated.

(7) No person on board a vessel used to fish for any species of fish anywhere

[8] Without an observer, a vessel cannot have on board more halibut than the IFQ for the area that is being fished, even if some of the catch occurred earlier in a different area.

in Area 2A during the 72-hour period immediately before the fishing period for the directed commercial fishery shall catch or possess halibut anywhere in those waters during that halibut fishing period unless, prior to the start of the halibut fishing period, the vessel has removed its gear from the water and has either:

(a) Made a landing and completely offloaded its catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(8) No vessel used to fish for any species of fish anywhere in Area 2A during the 72-hour period immediately before the fishing period for the directed commercial fishery may be used to catch or possess halibut anywhere in those waters during that halibut fishing period unless, prior to the start of the halibut fishing period, the vessel has removed its gear from the water and has either:

(a) Made a landing and completely offloaded its catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(9) No person on board a vessel from which setline gear was used to fish for any species of fish anywhere in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the halibut fishing season shall catch or possess halibut anywhere in those areas until the vessel has removed all of its setline gear from the water and has either:

(a) Made a landing and completely offloaded its entire catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(10) No vessel from which setline gear was used to fish for any species of fish anywhere in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the halibut fishing season may be used to catch or possess halibut anywhere in those areas until the vessel has removed all of its setline gear from the water and has either:

(a) Made a landing and completely offloaded its entire catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(11) Notwithstanding any other provision in these Regulations, a person may retain, possess and dispose of halibut taken with trawl gear only as authorized by Prohibited Species Donation regulations of NMFS.

20. Supervision of Unloading and Weighing

The unloading and weighing of halibut may be subject to the supervision of authorized officers to assure the fulfillment of the provisions of these Regulations.

21. Retention of Tagged Halibut

(1) Nothing contained in these Regulations prohibits any vessel at any time from retaining and landing a halibut that bears a Commission external tag at the time of capture, if the halibut with the tag still attached is reported at the time of landing and made available for examination by a representative of the Commission or by an authorized officer.

(2) After examination and removal of the tag by a representative of the Commission or an authorized officer, the halibut:

(a) May be retained for personal use; or

(b) may be sold only if the halibut is caught during commercial halibut fishing and complies with the other commercial fishing provisions of these Regulations.

(3) Externally tagged fish must count against commercial IVQs, CDQs, IFQs, or daily bag or possession limits unless otherwise exempted by State, Provincial, or Federal regulations.

22. Fishing by United States Treaty Indian Tribes

(1) Halibut fishing in Subarea 2A–1 by members of United States treaty Indian tribes located in the State of Washington shall be regulated under regulations promulgated by NMFS and published in the **Federal Register**.

(2) Subarea 2A–1 includes all waters off the coast of Washington that are north of 46°53′18″ N. latitude and east of 125°44′00″ W. longitude, and all inland marine waters of Washington.

(3) Section 13 (size limits), section 14 (careful release of halibut), section 16 (logs), section 17 (receipt and possession of halibut) and section 19 (fishing gear), except paragraphs (7) and (8) of section 19, apply to commercial fishing for halibut in Subarea 2A–1 by the treaty Indian tribes.

(4) Regulations in paragraph (3) of this section that apply to State fish tickets apply to Tribal tickets that are authorized by Washington Department of Fish and Wildlife.

(5) Section 4 (Licensing Vessels for Area 2A) does not apply to commercial fishing for halibut in Subarea 2A–1 by treaty Indian tribes.

(6) Commercial fishing for halibut in Subarea 2A–1 is permitted with hook and line gear from March 8 through November 7, or until 307,500 pounds (139.5 metric tons) net weight is taken, whichever occurs first.

(7) Ceremonial and subsistence fishing for halibut in Subarea 2A–1 is permitted with hook and line gear from January 1 through December 31, and is estimated to take 28,500 pounds (12.9 metric tons) net weight.

23. Customary and Traditional Fishing in Alaska

(1) Customary and traditional fishing for halibut in Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E shall be governed pursuant to regulations promulgated by NMFS and published in 50 CFR Part 300.

(2) Customary and traditional fishing is authorized from January 1 through December 31.

24. Aboriginal Groups Fishing for Food, Social and Ceremonial Purposes in British Columbia

(1) Fishing for halibut for food, social and ceremonial purposes by Aboriginal groups in Regulatory Area 2B shall be governed by the Fisheries Act of Canada and regulations as amended from time to time.

25. Sport Fishing for Halibut—General

(1) No person shall engage in sport fishing for halibut using gear other than a single line with no more than two hooks attached; or a spear.

(2) Any minimum overall size limit promulgated under IPHC or NMFS regulations shall be measured in a straight line passing over the pectoral fin from the tip of the lower jaw with the mouth closed, to the extreme end of the middle of the tail.

(3) Any halibut brought aboard a vessel and not immediately returned to the sea with a minimum of injury will be included in the daily bag limit of the person catching the halibut.

(4) No person may possess halibut on a vessel while fishing in a closed area.

(5) No halibut caught by sport fishing shall be offered for sale, sold, traded, or bartered.

(6) No halibut caught in sport fishing shall be possessed on board a vessel when other fish or shellfish aboard said vessel are destined for commercial use, sale, trade, or barter.

(7) The operator of a charter vessel shall be liable for any violations of these Regulations committed by a passenger aboard said vessel.

26. Sport Fishing for Halibut—Area 2A

(1) The total allowable catch of halibut shall be limited to:

(a) 214,110 pounds (97.1 metric tons) net weight in waters off Washington; and

(b) 197,808 pounds (89.7 metric tons) net weight in waters off California and Oregon.

(2) The Commission shall determine and announce closing dates to the public for any area in which the catch limits promulgated by NMFS are estimated to have been taken.

(3) When the Commission has determined that a subquota under paragraph (8) of this section is estimated to have been taken, and has announced a date on which the season will close, no person shall sport fish for halibut in that area after that date for the rest of the year, unless a reopening of that area for sport halibut fishing is scheduled in accordance with the Catch Sharing Plan for Area 2A, or announced by the Commission.

(4) In California, Oregon, or Washington, no person shall fillet, mutilate, or otherwise disfigure a halibut in any manner that prevents the determination of minimum size or the number of fish caught, possessed, or landed.

(5) The possession limit on a vessel for halibut in the waters off the coast of Washington is the same as the daily bag limit. The possession limit on land in Washington for halibut caught in U.S. waters off the coast of Washington is two halibut.

(6) The possession limit on a vessel for halibut caught in the waters off the coast of Oregon is the same as the daily bag limit. The possession limit for halibut on land in Oregon is three daily bag limits.

(7) The possession limit on a vessel for halibut caught in the waters off the coast of California is one halibut. The possession limit for halibut on land in California is one halibut.

(8) The sport fishing subareas, subquotas, fishing dates, and daily bag limits are as follows, except as modified under the in-season actions in 50 CFR 300.63(c). All sport fishing in Area 2A is managed on a ‘‘port of landing’’ basis, whereby any halibut landed into a port counts toward the quota for the area in which that port is located, and the regulations governing the area of landing apply, regardless of the specific area of catch.

27. Sport Fishing for Halibut—Area 2B

(1) In all waters off British Columbia: [9] [10]

(a) the sport fishing season will open on February 1 unless more restrictive regulations are in place; [10]

(b) The sport fishing season will close when the sport catch limit allocated by DFO, is taken, or December 31, whichever is earlier;

(c) the daily bag limit is two halibut of any size per day per person.

(2) In British Columbia, no person shall fillet, mutilate, or otherwise disfigure a halibut in any manner that prevents the determination of minimum size or the number of fish caught, possessed, or landed.

(3) The possession limit for halibut in the waters off the coast of British Columbia is three halibut.

28. Sport Fishing for Halibut—Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

(1) In Convention waters in and off Alaska: [11,*12]

(a) The sport fishing season is from February 1 to December 31.

(b) The daily bag limit is two halibut of any size per day per person unless a more restrictive bag limit applies in Commission regulations or Federal regulations at 50 CFR 300.65.

(c) No person may possess more than two daily bag limits.

(d) No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with skin on all pieces.

(e) Halibut in excess of the possession limit in paragraph (1)(c) of this section may be possessed on a vessel that does not contain sport fishing gear, fishing rods, hand lines, or gaffs.

(2) For guided sport fishing (as referred to in 50 CFR 300.65) in Regulatory Area 2C:

(a) The total catch allocation, including an estimate of incidental mortality (wastage), is 761,280 pounds (345.3 metric tons).

(b) No person on board a charter vessel (as referred to in 50 CFR 300.65) shall catch and retain more than one halibut per calendar day.[13]

(c) No person aboard a charter vessel (as referred to in 50 CFR 300.65) shall take or possess any halibut that with head on that is greater than 44 inches (111.8 cm) and less than 76 inches (194.0 cm) as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with mouth closed, to the extreme end of the middle of the tail, as illustrated in Figure 3.[13]

(d) If the halibut is filleted, the entire carcass, with head and tail connected as a single piece, must be retained on board the vessel until all fillets are offloaded.[14]

(3) For guided sport fishing (as referred to in 50 CFR 300.65) in Regulatory Area 3A:

(a) The total catch allocation, including an estimate of incidental mortality (wastage), is 1,782,270 pounds (808.4 metric tons).

(b) No person on board a charter vessel (as referred to in 50 CFR 300.65) shall catch and retain more than two halibut per calendar day.

(c) At least one of the retained halibut must have a head-on length of no more than 29 inches (73.7 cm) as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with mouth closed, to the extreme end of the middle of the tail, as illustrated in Figure 4.[13] If a person sport fishing on a charter vessel in Area 3A retains only one halibut in a calendar day, that halibut may be of any length.

(d) If the size-restricted halibut is filleted, the entire carcass, with head and tail connected as a single piece, must be retained on board the vessel until all fillets are offloaded.[14]

(e) A charter vessel, as defined in section 3 (Definitions) and referred to in 50 CFR 300.65, on which one or more anglers catch and retain halibut, may only make one charter vessel fishing trip per calendar day. A charter vessel fishing trip is defined at 50 CFR 300.61 as the time period between the first deployment of fishing gear in to the water from a vessel after any charter vessel angler (as defined at 50 CFR 300.61) is on board and the offloading of one or more charter vessel anglers or any halibut from that vessel.

29. Previous Regulations Superseded

These Regulations shall supersede all previous regulations of the Commission, and these Regulations shall be effective each succeeding year until superseded.

[9] DFO could implement more restrictive regulations for the sport fishery, therefore anglers are advised to check the current Federal or Provincial regulations prior to fishing.

[10] For regulations on the experimental recreational fishery implement by DFO check the current Federal or Provincial regulations.

[11] NMFS could implement more restrictive regulations for the sport fishery or components of it, therefore, anglers are advised to check the current Federal or State regulations prior to fishing.

[12] Charter vessels are prohibited from harvesting halibut in Area 2C and 3A during one charter vessel fishing trip under regulations promulgated by NMFS at 50 CFR 300.66(v).

[13] Guided angler fish (GAF), as described at 50 CFR 300.65(c), may be used to allow a charter vessel angler to harvest additional halibut up to the limits in place for unguided anglers.

[14] For halibut caught and retained as GAF, the charter vessel guide must immediately remove the tips of the upper and lower lobes of the caudal (tail) fin, and if the halibut is filleted, the entire carcass, with head and tail connected as a single piece, must be retained on board the vessel until all fillets are offloaded (50 CFR 300.65(c)(5)(iv)(G)). Additional regulations governing use of GAF are at 50 CFR 300.65.

Classification

IPHC Regulations

These IPHC annual management measures are a product of an agreement between the United States and Canada and are published in the **Federal Register** to provide notice of their effectiveness and content. Pursuant to section 4 of the Northern Pacific Halibut Act of 1982, 16 U.S.C. 773c, the Secretary of State, with the concurrence of the Secretary of Commerce, may ''accept or reject'' but not modify these recommendations of the IPHC. The otherwise applicable notice-and-comment and delay-in-effectiveness date provisions of the Administrative Procedure Act (APA), 5 U.S.C. 553(c) and (d), are inapplicable to IPHC management measures because this regulation involves a foreign affairs function of the United States, 5 U.S.C. 553(a)(1). The additional time necessary to comply with the notice-and-comment and delay-in-effectiveness requirements of the APA would disrupt coordinated international conservation and management of the halibut fishery pursuant to the Convention. Furthermore, no other law requires prior notice and public comment for this rule. Because prior notice and an opportunity for public comment are not required to be provided for these portions of this rule by 5 U.S.C. 553, or any other law, the analytical requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 *et seq.,* are not applicable. Accordingly, no Regulatory Flexibility Analysis is required for this portion of the rule and none has been prepared.

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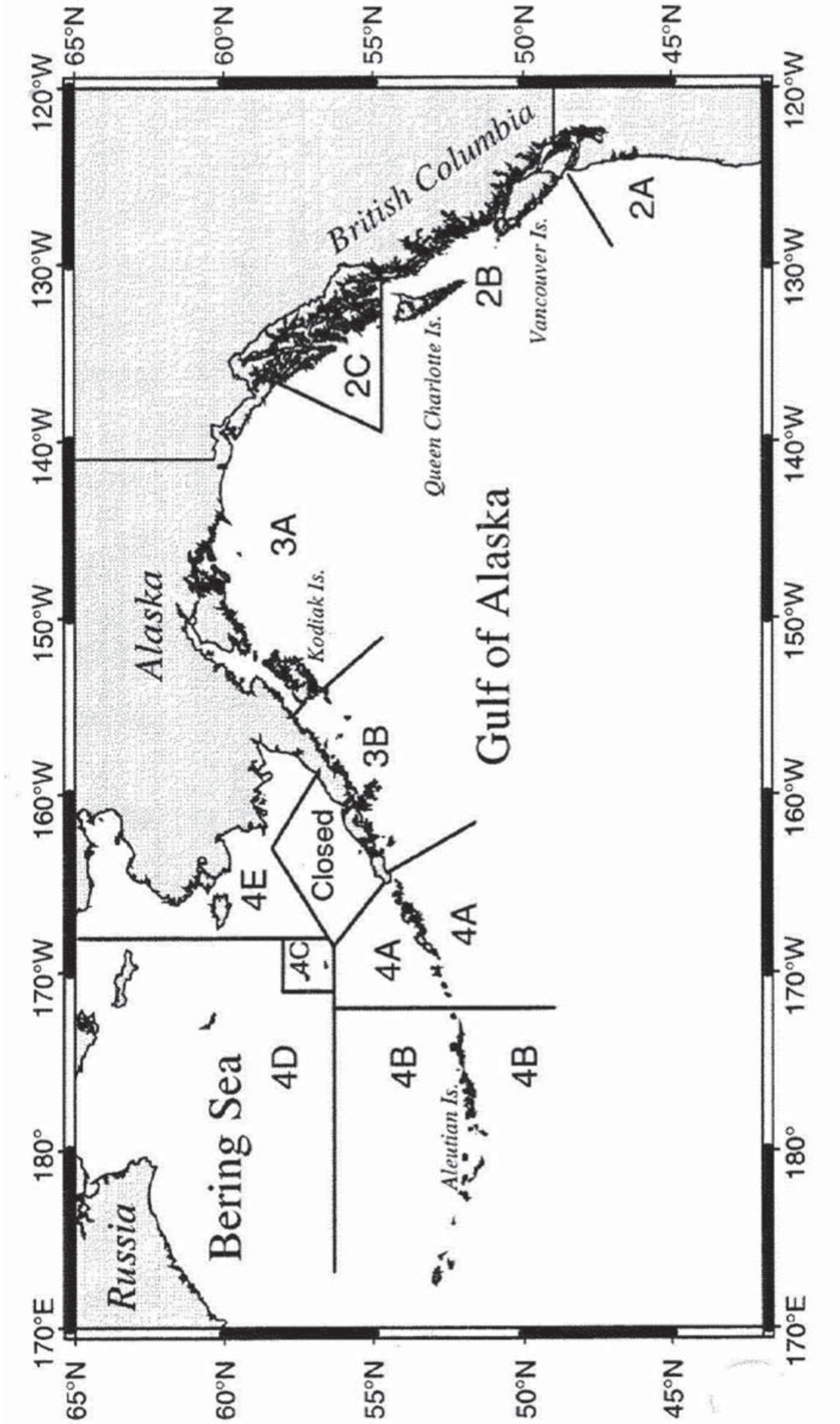

Figure 1. Regulatory areas for the Pacific halibut fishery.

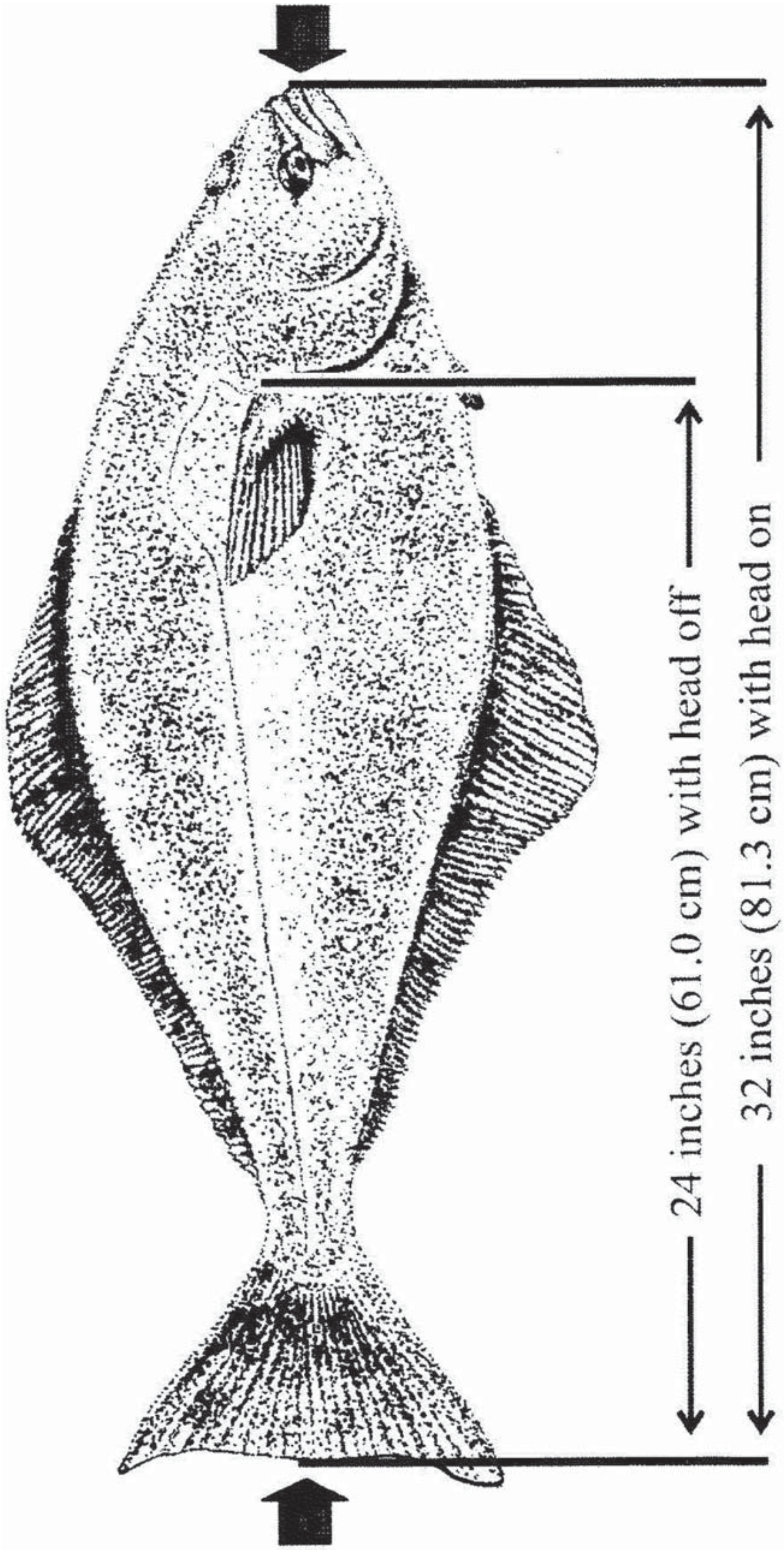

Figure 2. Minimum commercial size.

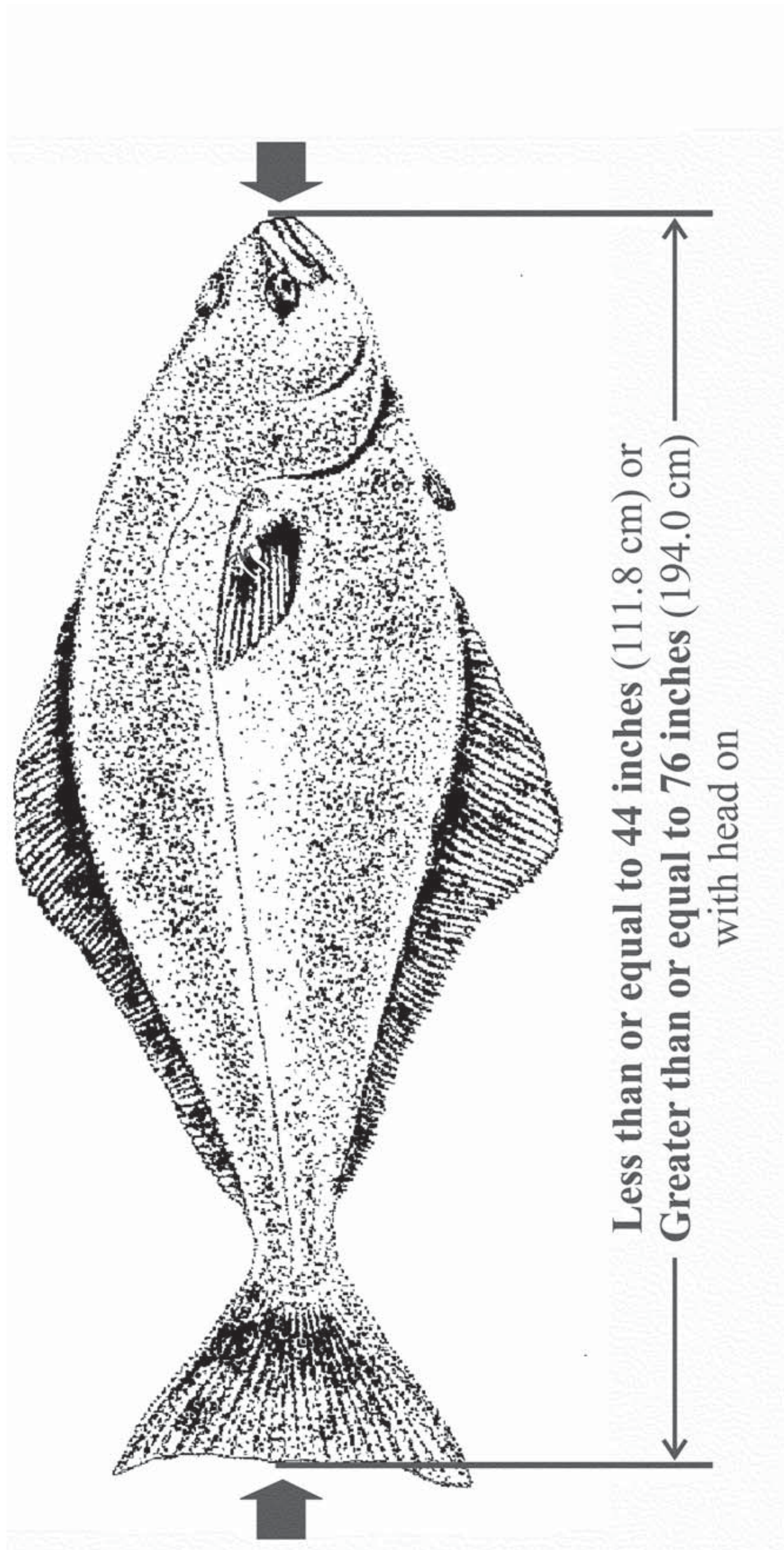

Figure 3. Recreational reverse slot limit for halibut on board a charter vessel referred to in 50 CFR 300.65 and fishing in Regulatory Area 2C (see Section 28 paragraph 2(c)).

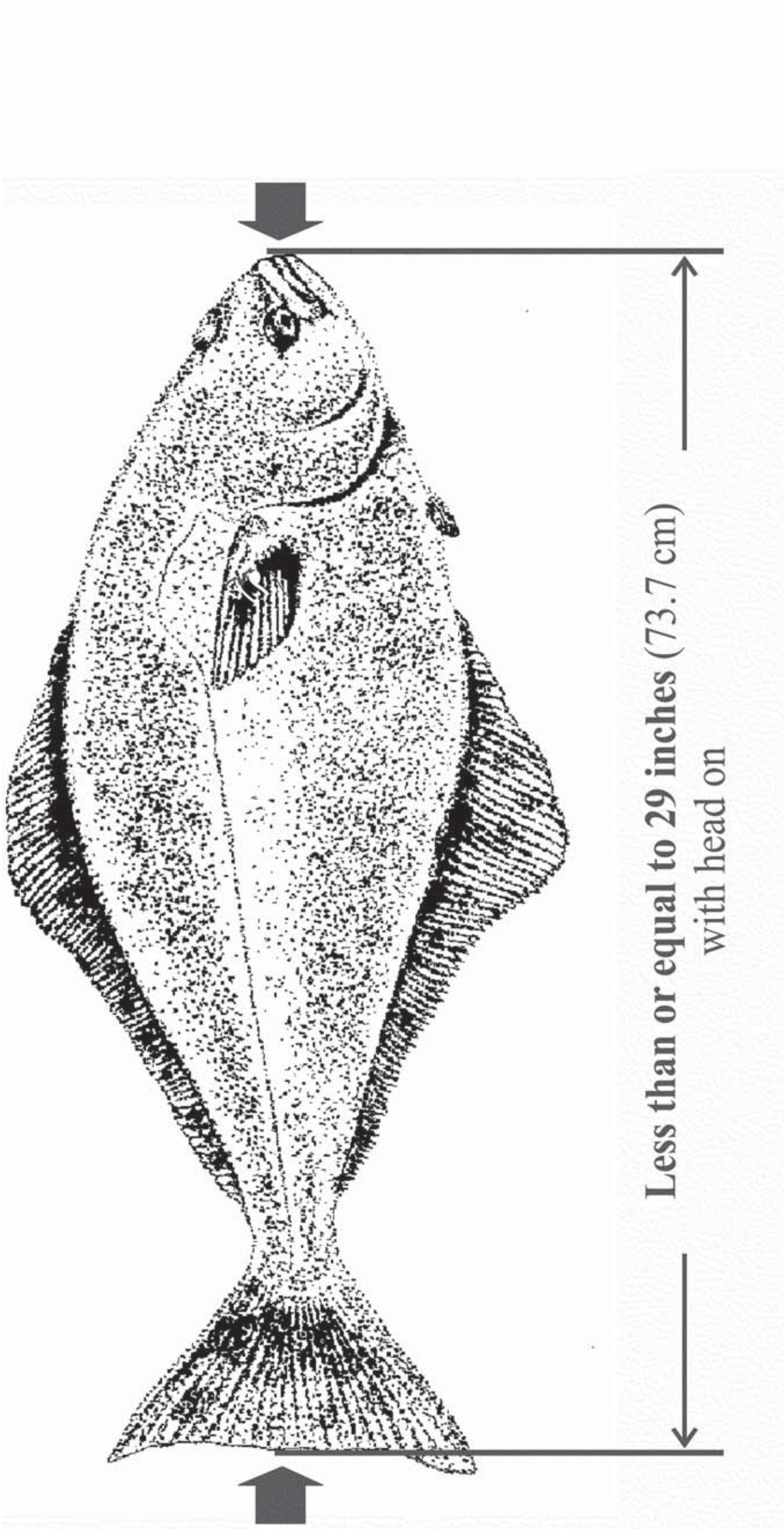

Figure 4. Recreational maximum size limit for one fish in two-fish bag limit for halibut on board a charter vessel referred to in 50 CFR 300.65 and fishing in Regulatory Area 3A (see Section 28 paragraph 3(c)). If only one halibut is retained, it may be of any size.

Authority: 16 U.S.C. 773 *et seq.*

Dated: March 6, 2014.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 2014–05339 Filed 3–7–14; 4:15 pm]

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limits, and gillnet permits were implemented for the harvest of king mackerel off Florida. Since implementation of those management measures, the impact and relevance of § 622.387 have been zero. Consequently, its removal would have no impact on small businesses.

List of Subjects in 50 CFR Part 622

Fisheries, Fishing, Gillnet, Mackerel, Reporting and recordkeeping requirements, South Atlantic, Trip limits.

Dated: March 13, 2014.

Eileen Sobeck,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 622 is proposed to be amended as follows:

PART 622—FISHERIES OF THE CARIBBEAN, GULF OF MEXICO, AND SOUTH ATLANTIC

■ 1. The authority citation for part 622 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

■ 2. In § 622.377, paragraph (b)(2)(iii) is revised and paragraph (b)(2)(vi) is added to read as follows:

§ 622.377 Gillnet restrictions.

* * * * *

(b) * * *

(2) * * *

(iii) No more than two gillnets, including any net in use, may be possessed at any one time, except for a vessel with a valid commercial vessel permit for Spanish mackerel engaged in a transfer as specified in paragraph (b)(2)(vi) of this section. If two gillnets, including any net in use, are possessed at any one time, they must have stretched mesh sizes (as allowed under the regulations) that differ by at least .25 inch (.64 cm), except for a vessel with a valid commercial vessel permit for Spanish mackerel engaged in a transfer as specified in paragraph (b)(2)(vi) of this section, in which case the vessel may possess two gillnets of the same mesh size provided that one of the nets is transferred to that vessel.

* * * * *

(vi) A portion of a gillnet may be transferred at sea only in the EEZ and only from a vessel with a valid commercial vessel permit for Spanish mackerel that has exceeded a trip limit specified in § 622.385 (b) to another vessel with a valid commercial vessel permit for Spanish mackerel that has not yet reached the trip limit (the receiving vessel). Only one such transfer is allowed per vessel per day. In addition, to complete a legal transfer at sea, all of the following must apply:

(A) All fish exceeding the applicable commercial trip limit may not be removed from the gillnet until the transfer is complete (*i.e.,* the gillnet is onboard the receiving vessel). The fish transferred to the receiving vessel may not exceed the applicable commercial trip limit.

(B) The receiving vessel may possess no more than three gillnets on board after the transfer is complete.

(C) Prior to cutting the gillnet and prior to any transfer of Spanish mackerel from one vessel to another, the owner or operator of both vessels must contact NMFS Office for Law Enforcement, Port Orange, Florida, phone: 1–386–492–6686.

■ 3. In § 622.385, the third sentence in the introductory text and paragraphs (a)(2)(i)(A) and (B) are revised to read as follows:

§ 622.385 Commercial trip limits.

* * * Except for Atlantic migratory group Spanish mackerel harvested by gillnet, as specified in § 622.377 (b)(2)(vi), a species subject to a trip limit specified in this section taken in the EEZ may not be transferred at sea, regardless of where such transfer takes place, and such species may not be transferred in the EEZ. * * *

* * * * *

(a) * * *

(2) * * *

(i) * * *

(A) From November 1 through the end of February—not to exceed 50 fish.

(B) Beginning on March 1 and continuing through March 31—

(*1*) If 70 percent or more of the Florida east coast subzone quota as specified in § 622.384(b)(1)(i)(A) has been taken—not to exceed 50 fish.

(*2*) If less than 70 percent of the Florida east coast subzone quota as specified in § 622.384(b)(1)(i)(A) has been taken—not to exceed 75 fish.

* * * * *

§ 622.387 [Removed and Reserved]

■ 4. Remove and reserve § 622.387.

[FR Doc. 2014–06062 Filed 3–18–14; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 130405338–4201–01]

RIN 0648–BC84

Fisheries off West Coast States; Pacific Coast Groundfish Fishery Management Plan; Trawl Rationalization Program; Chafing Gear Modifications

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: The proposed action modifies the existing chafing gear regulations for midwater trawl gear. This action includes regulations that affect all trawl sectors (Shorebased Individual Fishing Quota Program, Mothership Cooperative Program, Catcher/Processor Cooperative Program, and tribal fishery) managed under the Pacific Coast Groundfish Fishery Management Plan (PCGFMP).

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on April 18, 2014. During the comment period, NMFS is specifically seeking comments on the proposed method of attachment for chafing gear, including the benefits and effects relative to current minimum mesh size restrictions and prohibition on double walled codends.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2012–0218, by any of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2012-0218,* click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.
- *Fax:* 206–526–6736; Attn: Becky Renko.
- *Mail:* William W. Stelle, Jr., Regional Administrator, West Coast Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070; Attn: Becky Renko.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Becky Renko, 206–526–6110; (fax) 206–526–6736; *Becky.Renko@noaa.gov*.

SUPPLEMENTARY INFORMATION:

Background

In January 2011, NMFS implemented a trawl rationalization program, a type of catch share program, for the Pacific Coast groundfish fishery's trawl fleet. The trawl rationalization program was adopted through Amendment 20 to the PCGFMP and consists of an individual fishing quota (IFQ) program for the shorebased trawl fleet (shoreside IFQ program) and cooperative programs for the at-sea mothership (MS coop program) and catcher/processor (CP coop program) trawl fleets. Since implementing the trawl rationalization program, the Pacific Fishery Management Council (Council) and National Marine Fisheries Service (NMFS) have been working to refine the program with additional regulatory requirements, referred to as trailing actions. One trailing action is the modification of the current the chafing gear requirements for all midwater trawl gear.

Midwater trawl gear is the only type of trawl gear that harvesting vessels in the shorebased IFQ program, MS coop program, and CP coop program are allowed to use to target Pacific whiting. Midwater trawl gear may also be used by vessels in the shorebased IFQ program to target non-whiting species. The proposed action does not contemplate the use of midwater trawl gear beyond what is currently allowed by regulation.

The proposed action is to consider modifications to the chafing gear regulations that apply to all midwater trawl gear. Chafing or chafer panels are webbing or other material attached to the codend to minimize damage to the codend netting from wear caused by the codend rubbing against the stern ramp and trawl alley during net retrieval and from contact with the ocean floor. The current chafing gear restrictions at 50 CFR § 660.130 for midwater trawl gear are: restrict chafing coverage to 50 percent or less of the codend circumference; restrict chafing coverage to the last 50 meshes of the codend; prohibit sections of chafing gear from being longer than 50 meshes; and require chafing gear to be attached outside riblines and restraining straps.

In 2011, some Pacific Coast trawl vessel owners that use midwater gear to target Pacific whiting expressed concern that the current regulations limit chafing gear to the last 50 meshes of the codend. The vessel owners believe that this aspect of the current regulations was an error that inadvertently occurred when the regulations were revised in 2007. Prior to 2007, the regulations allowed chafing gear to cover the full length of midwater trawl codends. The 2007 regulatory revision consolidated the regulations into one section and was not intended to result in substantive changes to the regulations.

Chafing gear measures were originally adopted in 1994 and were intended to provide vessels with greater flexibility in respect to types, size, and attachment of material used to protect the net without reducing the effectiveness of the mesh size regulation. The measures included restricting chafing coverage to 50 percent or less of the codend circumference, which was intended to leave the top half of the net bare to improve escapement of small fish. Restrictions on the length of chafing section (50 meshes in length) and requirements for attachment outside the riblines and restraining straps were intended to allow the entire length of the codend to be covered, while providing exit points for fish trapped between the codend mesh and the chafing gear.

This proposed rule also includes minor technical revisions to related regulatory text. Section 660.11, General definitions, contains basic descriptions of small footrope, large footrope and midwater trawl gear. In-depth descriptions of these trawl gears found in § 660.130 were modified to eliminate redundancy and increase clarity.

Chafing Modifications for Midwater Trawl Gear

In 2011, while revisions to the chafing gear restrictions were being considered, some Pacific whiting vessel owners requested that broader changes be considered to address the current needs of the fishery. From 2003 to 2010, approximately 63 percent of the vessels that fished for Pacific whiting were also used in the Alaska groundfish fishery to target Pollock with pelagic trawl gear. The chafing requirements for midwater trawl gear used in Pacific Coast groundfish fisheries are more restrictive than the Alaska groundfish fishery requirements. Codends for midwater trawling range in cost from $10,000 to $200,000 each. To reduce operational costs for vessels operating in both regions, some vessel owners requested that the chafing gear requirements for midwater trawl gear in the Pacific Coast groundfish fishery be modified to allow for greater coverage so codends currently used in the Alaska fisheries could be used in both regions.

In November 2011, the Trawl Rationalization Regulatory Evaluation Committee (TREC) reported on trailing actions and included a recommendation that the Council consider revisions to the chafing gear regulations to conform to current fishery needs. The Council recommended moving forward with revisions for 2013. In March 2012, the TREC presented the Council with a preliminary analysis that included three alternative actions for chafing gear: No Action, Alternative 1 to eliminate all chafing gear restrictions as they apply to midwater trawl gear, and Alternative 2 to amend the midwater trawl gear restrictions to allow for greater chafing gear coverage on the codend consistent with the Alaska groundfish fishery regulations. The Council discussed the issue and indicated that it was important to move ahead with chafing gear revisions for the 2013 Pacific whiting season. The Council selected Alternative 2 as the Final Preferred Alternative to be analyzed in an Environmental Assessment (EA).

At the Council's September 2012 meeting, NMFS informed the Council that its Sustainable Fisheries Division (SFD) had reviewed the range of alternatives and found that Alternative 1, to eliminate all chafing gear restrictions, appeared to be inconsistent with the Council's ''Bycatch Mitigation Plan'' and measures specified in Amendment 18 to the PCGFMP. Although implementation of trawl rationalization has reduced concerns about groundfish bycatch, the bycatch of non-groundfish species including Endangered Species Act (ESA) listed species and forage fish was a concern. Section 6.6.1.2 of the PCGFMP describes the Council's bycatch mitigation relative to mesh size restrictions as follows: Regarding the ''success of minimum mesh size restrictions in allowing juvenile fish to escape trawl nets, the Council also developed restrictions preventing trawlers from using a double-walled codend. Further restrictions related to this objective include prohibitions on encircling the whole of a bottom trawl net with chafing gear and restrictions on the minimum mesh size of pelagic trawl chafing gear (16 inches)''. Given the PCGFMP bycatch mitigation measures added under Amendment 18, SFD recommended narrowing the scope of the EA by removing the alternative for unrestricted use of chafing gear. SFD also requested the addition of a new alternative in the EA. The new alternative was to revise the regulations to be consistent with the midwater trawl chafing gear requirements that had been in place prior to 2007 and which represented gear in use in the fishery. The difference between the new SFD requested alternative and No Action was that the new alternative would allow chafing gear to cover the full length of a codend rather than restricting it to the last 50 meshes (No Action); all other provisions were the same. In addition, SFD requested that the Council reconsider its recommendation of a Final Preferred Alternative at the Council's November 2012 meeting following review of an analysis that included the new alternative. In response, the Council recommended removing the unrestricted alternative from the EA and adding the new SFD requested alternative with reconsideration of the new alternative at its November meeting. In addition, the Council recommended adding a variation of the new alternative consistent with a Groundfish Advisory Panel (GAP) request for unrestricted chafing section lengths and the allowance for chafing attachment to be either under or over the codend riblines.

At the Council's November 2012 meeting, a preliminary EA was available. The EA contained three alternatives: (1) No Action, (2) Alternative 1, to amend the midwater trawl gear restrictions to allow for greater chafing gear coverage on the codend consistent with the Alaska groundfish fishery regulations, and (3) Alternative 2, to reinstate the pre-2007 regulations by allowing the full length of the codend to be covered. Two sub-options were considered for Alternative 2. Alternative 2A would eliminate the restrictions on the length of each chafing panel (50 meshes) and allow chafing gear to be attached either under or over the ribelines of the codend; and, Alternative 2B would retain the chafing panel length restrictions. Alternative 2B is the status quo gear restriction currently used in the fishery.

During public comment members of the fishing industry spoke in favor of less restrictive chafing gear measures. However, one commenter raised concerns about potential negative impacts on ESA-listed eulachon, ecosystem prey species, and essential fish habitat (EFH). This same commenter also noted that the Alaska groundfish regulations may have fewer chafing gear restrictions for pelagic trawl gear, but indicated that the Alaska groundfish regulations do have other more restrictive regulations pertaining to the performance of midwater trawl gear that are intended to mitigate possible negative impacts on forage fish and EFH. After considering comments from the advisory bodies and the public, the Council recommended implementation of Alternative 1 with modifications recommended by the GAP (Agenda Item 1.5.b, November 2012). The GAP recommended modifying the language of Alternative 1 slightly to clarify that attaching the chafing gear inside or outside the riblines and straps should be allowed.

Non-Whiting Midwater Trawl

The chafing gear changes proposed by this action would apply to all midwater trawl gear regardless of the target species. Although the Council initially considered the changes in respect to the Pacific whiting fishery, at its September 2012 meeting the Council confirmed its intent for the changes to apply to all midwater trawl gear. In the 1990s, midwater trawl gear was used to target yellowtail, widow, and chilipepper rockfish. Since 2002, when several species that co-occur with the target species were declared overfished, midwater targeting for species other than Pacific whiting was eliminated or in the case of chilipepper rockfish restricted to waters seaward of the Rockfish Conservation Areas (RCAs). In 2012, widow rockfish was declared rebuilt. In 2013, the Annual Catch Limits (ACLs) for both widow rockfish and bocaccio were increased over 2012. The increased ACLs for widow rockfish and bocaccio are likely to lead to greater use of midwater trawling by vessels targeting non-whiting species.

Midwater trawl gear is generally not designed to touch the ocean bottom, but can be effectively used off-bottom or pelagically to target groundfish species that ascend above the ocean floor. Because the proposed action provides greater flexibility for protecting the portions of the codend that are subject to wear from contact with the seafloor, an increased number of non-whiting vessels may choose to increase chafing gear coverage and use midwater trawl gear.

Limited data are available to understand how the non-whiting midwater trawl fishery might develop and the depths, times, and areas where the fishery is likely to occur. The current shorebased trawl IFQ fishery is very different from the trip limit management structure that was in place the late 1990s. The midwater trawl fishery that emerges from the shorebased IFQ fishery could be very different from the fishery that historically occurred, as different sized midwater nets and codends may be used, and vessels may fish in different areas and at different times of the year or they may target a different array of species.

Tribal Fishery

The chafing gear requirements would affect the tribal fishers using midwater trawl gear to fish in their usual and accustomed fishing areas. At this time, the Makah Tribe is the only tribe that conducts a midwater trawl fishery with trips targeting Pacific whiting and targeting non-whiting. The non-whiting fishery targets yellowtail rockfish. Because the proposed measures are to liberalize the current chafing gear restrictions, vessels fishing in the tribal sector may choose to continue using their current codends or modify their gear.

Environmental Impacts of the Proposed Action

The primary environmental impacts from the allowance for greater chafing gear coverage of midwater trawl codends are the possible increase in the catch of small fish, such as forage fish, and changes in contact with EFH bottom habitat within the trawl RCAs (where bottom trawl has been prohibited since 2002, changing the baseline environment considered in previous NEPA documents on trawl gear impacts). Between 2006 and 2011, the most common forage fish species observed in the at-sea (MS and CP coops) and tribal sectors targeting Pacific whiting with midwater trawl gear were squid, American shad, jack mackerel, shortbelly rockfish, Pacific herring, Pacific mackerel, lanternfish, Pacific sardine, and a variety of smelts including eulachon. Relative to the catch of Pacific whiting, observer data shows that forage fish species make up a low proportion of the overall catch and are expected to continue at levels similar to those observed in recent years. Relative to vessels using midwater trawl gear to target non-whiting species, the change in catch of small fish is difficult to project given the lack of historical total catch (discard plus retained catch) data and because the emerging fishery may be substantially different from historical fisheries. Even with greater chafing coverage on the codend, midwater trawl nets are constructed with very large mesh in the forward sections where small fish may escape capture. The incidental catch of non-groundfish species will continue to be monitored (all trawl vessels are required to carry at least one groundfish observer) and catch will be evaluated on an annual basis.

Midwater trawls, also called pelagic or off-bottom trawls, are trawls where the doors may be in contact with the seabed (although they usually are not), while the footrope generally remains suspended above the seafloor, but may contact the bottom on occasion. Midwater trawls are generally towed above the ocean floor, although they may be used near the bottom. When fishing close to the bottom, the footropes of pelagic trawls can cause benthic animals to be separated from the bottom. Because of the large mesh in the forward sections of the net, most bottom animals would likely fall through the mesh and immediately be returned to the ocean floor. Sessile organisms that create structural habitat may be uprooted or pass under the footropes of midwater trawls towed close to the bottom, while those organisms that are more mobile or attached to light substrates may pass over the footrope with little damage. The unprotected footrope on midwater trawls effectively precludes the use of the nets on rough or hard substrates, meaning that they are not expected to affect the more complex habitats that occur on those substrates.

Although the trawl RCAs were intended to minimize interactions between trawl vessels and overfished rockfish species, the trawl RCAs have effectively removed groundfish bottom trawling from a large portion of the EEZ since 2002. Because the RCAs have been closed to bottom trawling for over 10 years, the seafloor habitats have likely recovered considerably from pre-RCA years. In other words, it was necessary for the analysis in the EA to consider the effects of the proposed action on a recovered EFH habitat. Although the boundaries of the RCAs have varied between years, north of 40°10′ N. latitude the RCAs have continuously restricted much of the bottom trawling in waters between 75 and 200 fm. The proposed action would allow increased chafing coverage for all midwater trawl gear. With increased intensity from vessels targeting whiting plus non-whiting vessels, it is expected that more vessels will be making ''occasional'' contact with the benthic organisms and habitat than has been seen with the midwater fishery targeting Pacific whiting. Similarly, effort may increase in EFH conservation areas where only midwater trawling is allowed, and where bottom trawling has been prohibited since 2005.

Double-walled codends

Regulations at § 660.130(b)(1) specifically prohibit the use of double-walled codends. A double-walled codend is a codend constructed of two walls (layers) of webbing. To prevent chafing gear from being used to create the effect of a double-walled codend, NMFS is considering clarifying the prohibition relative to chafing gear in the final regulations.

Classification

NMFS has made a preliminary determination that the proposed action is consistent with PCGFMP, the MSA, and other applicable law. In making its final determination, NMFS will take into account the complete record, including the data, views, and comments received during the comment period.

An EA was prepared for this action. The EA includes socio-economic information that was used to prepare the RIR and IRFA. The EA is available on the Council's Web site at *http://www.pcouncil.org/*. This action also announces a public comment period on the EA.

Pursuant to the procedures established to implement section 6 of Executive Order 12866, the Office of Management and Budget (OMB) has determined that this proposed rule is not significant.

An initial regulatory flexibility analysis (IRFA) was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A description of the action, why it is being considered, and the legal basis for this action are contained at the beginning of this section in the preamble and in the **SUMMARY** section of the preamble. A copy of the IRFA is available from NMFS (see **ADDRESSES**) and a summary of the IRFA, per the requirements of 5 U.S.C. 604(a) follows: The Pacific Fishery Management Council and NMFS are proposing to liberalize current midwater trawl chafing gear regulations. In revising these regulations, the Council and NMFS have reviewed the differences of how the regulations should be interpreted and enforced and current industry practices. NMFS and the Council have also reviewed the current status of species being harvested and similar regulations for Alaska fisheries. With the recent implementation of the Pacific Coast Groundfish trawl rationalization program, NMFS and the Council took into account the increased potential to target rebuilt rockfish species with midwater gear. In proposing these regulations, NMFS and Council also considered the effects upon essential fish habitat, protected and ESA listed species, the harvest of small fish (groundfish and non-groundfish including forage and juvenile fish), and the effects of other conservation and management measures contained in the PCGFMP. NMFS and the Council also considered the economic effects of various chafing gear alternatives, particularly upon harvesting vessels.

Fishermen use chafing gear to protect their trawl nets, particularly codends, from abrasion. Regulations specify the limits on the use of chafing gear panels. The main differences among the alternatives reviewed by NMFS and the Council related to how much of the circumference and length of the codend could be covered and what size of chafer panels could be used. The No Action alternative (existing regulations) would limit chafing gear to the very end of the codend (the last 50 mesh lengths) and to 50 percent of the codend's circumference via a single panel. Under Alternative 1 (Council Preferred Alternative), fishermen would have the option of covering up to 100 percent of the length of the codend and up to approximately 75 percent of the codend's circumference through the use of a single panel or multiple panels. Alternative 2A differs from Alternative 1 by limiting coverage to 50 percent of the codend circumference. Fishermen would have the option of covering up to 100 percent of the length of the codend and up to 50 percent of the codend's circumference with a single panel or multiple panels.

Alternative 2B (Status Quo) differs from Alternative 1 in circumference coverage and from Alternative 2A in panel size. Under Alternative 2B, fishermen would have the option of covering up to 50 percent of the length of the codend and up to 50 percent of the codend's circumference; however, no single panel could cover more than 50 meshes of the codend. For example, to cover the length of a 500 mesh codend, 10 panels would be required. This alternative is labeled the ''Status Quo Alternative'' as it reflects the midwater chafing gear restrictions that were in effect during the 2006 season. According to the EA, ''Up until 2011, the current regulations were interpreted and enforced in a manner that allowed fishers to cover the entire length of their codends using a series of 50-mesh panels, provided the panels did not exceed 50 percent of the codend circumference and the terminal end of each panel was unattached to allow small fish to escape. Recently, these regulations have been reinterpreted as allowing the use of only a single 50-mesh panel (see Section 1.4 of the EA for a complete history). This reinterpretation has not yet been enforced because it would entail a sudden and unexpected change in regulatory enforcement and require industry to incur expenses while deliberations are underway on whether to realign the regulations with standing policy or change the policy.'' The Council did consider eliminating all chafing gear restrictions. The Council rejected this option because it could have allowed for up to 100 percent chafing gear coverage of the net, including the main body and the codend, which could be damaging to biota escaping the net and would likely be in conflict with the PCGFMP's Amendment 18 bycatch mitigation program.

This proposed rule would affect those vessels that use midwater trawl gear in Pacific Coast groundfish fisheries. Annual midwater whiting revenues were about $47 million in both 2011 and 2012 and non-whiting midwater trawl revenues averaged about $500,000 during this period. Nine catcher processors, 19 mothership catcher vessels, and 27 shoreside vessels participated in these fisheries during 2012 and 2013. Three different vessels operated in the non-tribal non-whiting shoreside midwater fishery—three in 2012 and one in 2013. The tribal fleet consists of 4–5 tribal whiting vessels of which 2–3 per year also fish in the Alaska groundfish fisheries. Five tribal midwater vessels operate in the tribal yellowtail rockfish fishery. These vessels do not participate in the Alaska groundfish fishery. As part of the permitting processes for 2014, NMFS asked non-tribal vessel owners to assess whether they are small businesses based on following criteria: A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $19.0 million for all its affiliated operations worldwide. Tribal vessels are considered small businesses. After taking into account vessels that fish in multiple midwater fisheries and affiliations, there are 28 midwater businesses, 22 of which are small businesses.

The costs to replace a midwater net including its codend are as high as $400,000. Codends for midwater trawling range in cost from $10,000 to $200,000 each. Uses of chafing gear can double the life of a net. The number of tows, tow size, and other features of the vessel and its operations affect the life of a net. With chafing gear covering the side and bottom panels of a midwater codend, nets can be used for 5 to 15 years or longer if vessel owners periodically replace the chafer panels. The EA assessed changes in costs and revenues and by fishery (tribal, non-tribal, whiting, and pelagic). Expected differences in net costs between whiting and pelagic fisheries are likely to be small; therefore, the EA used the costs associated with the Pacific whiting fishery to analyze the alternatives. Codends used for the pelagic rockfish fishery may be the same size or smaller, but are unlikely to be larger than the codends used for whiting. The useful life of a net used just for pelagic rockfish may be longer than a net used for Pacific whiting, because the volume of fish handled by a single codend will likely be smaller, on average. For this reason, the costs of whiting codends are used as a proxy, but should be considered an upper bound on the cost differences that might be expected for the midwater pelagic rockfish fishery.

Adoption of any alternative other than the No-Action alternative will result in increased codend useful life because of greater protection from onboard abrasion sources and some wear reduction on those occasions when seafloor contact occurs. Under the No Action alternative, vessel owners will likely have to modify the chafing gear they use so that the gear is compliant. As a result, their nets will have the least amount of protection and thus have to be replaced more often. Currently, fishermen are using gear compliant with Alternative 2B, and so there would be no additional costs associated with this alternative. The gear currently used in the fishery (compliant with Alternative 2B) would also be compliant with the other action alternatives. The other alternatives also would not necessarily require additional expenditures on gear.

Alternative 1 is the Council's Final Preferred Alternative (FPA). Alternative 1 allows fishermen more flexibility as up to 75% of the cod-end's circumference could be covered, comports with the chafing gear currently used by the majority of the fleet in both Pacific Coast and Alaska fisheries, and provides the best protection for expensive codends. The EA states: ''Fishers that only participate in the Pacific Coast whiting fishery would have a one-time cost of $5,000 to $10,000 to bring their codends into compliance. For fishers that fish in Alaska and the Pacific Coast fishery they would likely either obtain an additional codend for use in the Pacific Coast fishery or incur an annual chafer replacement cost of between $5,000 and $10,000 to limit their coverage to the terminal 50 net meshes. Data in the EA shows that 62 percent of Pacific Coast whiting vessels also fished off Alaska between 2004 and 2010. These along with most other whiting vessels likely have codend chafing gear on their codends that is noncompliant with Pacific Coast whiting fishery regulations, as they were recently reinterpreted. The increased codend replacement cost under the PFMC Preferred Alternative (Alternative 1) could be as high at $9,500 per year with no chafer replacement after about 10 years to extend codend useful life or $7,321 per year with chafer replacement after about 10 years of use. The replacement cost under the other two action alternatives would be expected to be higher, but very close to Alternative 1. This is because of lower amount of chafer coverage provided under those alternatives (50 percent of codend circumference) compared to Alternative 1 (up to 75 percent of codend circumference).'' For perspective, the EA assessed the costs of the No-Action Alternative relative to Pacific whiting revenues and found them to be about 2 percent of the 2011 average ex-vessel value in the shoreside fishery, about 1 percent of that value for the mothership sector catcher vessels and about 1 percent of the that value for catcher processors. (Note that these revenues exclude revenues from other Pacific Coast and Alaska fisheries. Inclusion of such revenues would lower these percentages.)

Increased chafing gear may potentially increase the catch of small or undersized fish. The EA finds under the trawl catch share program, vessels have substantial incentive to avoid the catch of small, unmarketable groundfish for which quota is required. For each pound of these fish caught, fishermen must use a pound of quota, forgoing their opportunity to use that quota to cover catch for which they can get paid. The effect of catching small fish which must be covered with quota is the reduction of vessel revenue. On this basis, regardless of the amount and continuity of chafing gear allowed on a codend, the incentive of fishermen is to configure the gear to avoid the catch of target fish of small size. Thus, they may not use the maximum amount of chafing gear, minimum mesh size, etc. to the degree allowed under any particular alternative. Liberalizing the chafing gear regulations increases the flexibility fishermen have in configuring their gear and may allow fishermen to develop other means for avoiding small size fish. A review of various discussions in the EA suggests that processors and fishing communities will not be negatively impacted by implementation of Alternatives 1, 2A, or 2B. The No-Action alternative will impose costs on the fishery, reduce vessel profits and may have a small but likely negligible effect on communities. Increased small fish landings may have a small negligible effect on processors.

Based on the discussion above, NMFS has determined that this proposed rule would not have a significant economic effect on a substantial number of small entities. This rule would revise existing regulations to conform to current industry chafing gear practices while increasing the flexibility of vessel owners to make chafing gear modifications according to their own individual operations and needs. There are no significant alternatives to the proposed rule that accomplish the stated objectives and that minimize the impact of the proposed rule on small entities. For transparency purposes, NMFS has prepared this IRFA. Through the rulemaking process associated with this action, we are requesting comments on this conclusion.

This proposed rule does not contain a collection-of-information requirement subject to review and approval by OMB under the Paperwork Reduction Act (PRA).

Pursuant to Executive Order 13175, this proposed rule was developed after meaningful consultation and collaboration with tribal officials from the area covered by the PCGFMP. Under the Magnuson-Stevens Act at 16 U.S.C. 1852(b)(5), one of the voting members of the Pacific Council must be a representative of an Indian tribe with federally recognized fishing rights from the area of the Council's jurisdiction. The proposed regulations, which have a direct effect on the tribes, were deemed by the Council as ''necessary or appropriate'' to implement the PCGFMP as amended.

NMFS issued Biological Opinions under the Endangered Species Act (ESA) on August 10, 1990, November 26, 1991, August 28, 1992, September 27, 1993, May 14, 1996, and December 15, 1999 pertaining to the effects of the PCGFMP fisheries on Chinook salmon (Puget Sound, Snake River spring/summer, Snake River fall, upper Columbia River spring, lower Columbia River, upper Willamette River, Sacramento River winter, Central Valley spring, California coastal), coho salmon (Central California coastal, southern Oregon/northern California coastal), chum salmon (Hood Canal summer, Columbia River), sockeye salmon (Snake River, Ozette Lake), and steelhead (upper, middle and lower Columbia River, Snake River Basin, upper Willamette River, central California coast, California Central Valley, south/central California, northern California, southern California). These biological opinions have concluded that implementation of the PCGFMP is not expected to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS, or result in the destruction or adverse modification of critical habitat.

NMFS issued a Supplemental Biological Opinion on March 11, 2006 concluding that neither the higher observed bycatch of Chinook in the 2005 whiting fishery nor new data regarding salmon bycatch in the groundfish bottom trawl fishery required a reconsideration of its prior ''no jeopardy'' conclusion. NMFS also reaffirmed its prior determination that implementation of the PCGFMP is not likely to jeopardize the continued existence of any of the affected species. Lower Columbia River coho (70 FR 37160, June 28, 2005) and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead.

On January 22, 2013, NMFS requested the reinitiation of the biological opinion for listed salmonids to address changes in the fishery, including the trawl rationalization program and the emerging midwater trawl fishery. The consultation will not be completed prior to publication of this proposed rule to modify chafing gear regulations for the Pacific whiting fishery. NMFS has considered the likely impacts on listed salmonids for the period of time between the proposed rule and, if appropriate, final rule and the completion of the reinitiated consultation relative to sections 7(a)(2) and 7(d) of the ESA. On December 18, 2013, NMFS determined that ongoing fishing under the PCGFMP, assuming that the proposed chafing gear modifications are implemented in early 2014, prior to the completion of the consultation would not be likely to jeopardize listed salmonids or result in any irreversible or irretrievable commitment of resources that would have the effect of foreclosing the formulation or implementation of any necessary reasonable and prudent alternatives.

On December 7, 2012, NMFS completed a biological opinion concluding that the groundfish fishery is not likely to jeopardize non-salmonid marine species including listed eulachon, green sturgeon, humpback whales, Steller sea lions, and leatherback sea turtles. The opinion also concludes that the fishery is not likely to adversely modify critical habitat for green sturgeon and leatherback sea turtles. An analysis included in the same document as the opinion concludes that the fishery is not likely to adversely affect green sea turtles, olive ridley sea turtles, loggerhead sea turtles, sei whales, North Pacific right whales, blue whales, fin whales, sperm whales, Southern Resident killer whales, Guadalupe fur seals, or the critical habitat for Steller sea lions. With this rulemaking, an informal consultation on eulachon was initiated on January 21, 2013. NMFS considered whether the 2012 opinion should be reconsidered for eulachon in light of new information from the 2011 fishery and the proposed chafing gear modifications and determined that information about the eulachon bycatch in 2011 and chafing gear regulations did not change the anticipated extent of effects of the action, or provide any other basis to reinitiate the December 7, 2012 biological opinion. Therefore, the December 7, 2012 biological opinion meets the requirements of section 7(a)(2) of the ESA and implementing regulations at 50 CFR 402 and no further consultation is required at this time.

On November 21, 2012, the U.S. Fish and Wildlife Service (FWS) issued a biological opinion concluding that the groundfish fishery will not jeopardize the continued existence of the short-tailed albatross. The FWS also concurred that the fishery is not likely to adversely affect the marbled murrelet, California least tern, southern sea otter, bull trout, nor bull trout critical habitat.

This proposed rule would not alter the effects on marine mammals over what has already been considered for the fishery. West Coast pot fisheries for sablefish are considered Category II fisheries under the MMPA's List of Fisheries, indicating occasional interactions. All other West Coast groundfish fisheries, including the trawl fishery, are considered Category III fisheries under the MMPA, indicating a remote likelihood of or no known serious injuries or mortalities to marine mammals. On February 27, 2012, NMFS published notice that the incidental taking of Steller sea lions in the West Coast groundfish fisheries is addressed in NMFS' December 29, 2010 Negligible Impact Determination (NID) and this fishery has been added to the list of fisheries authorized to take Steller sea lions (77 FR 11493, February 27, 2012). On September 4, 2013, based on its negligible impact determination dated August 28, 2013, NMFS issued a permit for a period of three years to authorize the incidental taking of humpback whales by the sablefish pot fishery (78 FR 54553, September 4, 2013).

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, and Indian fisheries.

Dated: March 13, 2014.

Eileen Sobeck,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES

■ 1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq., 16 U.S.C. 773 et seq., and 16 U.S.C. 7001 et seq.

■ 2. In § 660.130, paragraphs (b)(2–)(4) and the introductory text of paragraph (c) are revised as follows:

§ 660.130 Trawl fishery—management measures.

* * * * *

(b) * * *

(2) *Mesh size.* Groundfish trawl gear, including chafing gear, must meet the minimum mesh size requirements in this paragraph. Mesh size requirements apply throughout the net. Minimum trawl mesh sizes are: Bottom trawl, 4.5 inches (11.4 cm); midwater trawl, 3.0 inches (7.6 cm). Minimum trawl mesh size requirements are met if a 20-guage stainless steel wedge, less one thickness of the metal wedge, can be passed with only thumb pressure through at least 16 of 20 sets of two meshes each of wet mesh.

(3) *Bottom trawl gear.*—(i) *Large footrope trawl gear.* Lines or ropes that run parallel to the footrope may not be augmented with material encircling or tied along their length such that they have a diameter larger than 19 inches (48 cm). For enforcement purposes, the footrope will be measured in a straight line from the outside edge to the opposite outside edge at the widest part on any individual part, including any individual disk, roller, bobbin, or any other device.

(ii) *Small footrope trawl gear.* Lines or ropes that run parallel to the footrope may not be augmented with material encircling or tied along their length such that they have a diameter larger than 8 inches (20 cm). For enforcement purposes, the footrope will be measured in a straight line from the outside edge to the opposite outside edge at the widest part on any individual part, including any individual disk, roller, bobbin, or any other device.

(A) *Selective flatfish trawl gear.* 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 headrope or attached to the top panel except on the riblines. The footrope must be less than 105 ft (32.26 m) in length. The headrope must be not less than 30 percent longer than the footrope. The headrope shall be measured along the length of the headrope from the outside edge to the opposite outside edge. An explanatory diagram of a selective flatfish trawl net is provided as Figure 1 of part 660, subpart D.

(B) [Reserved]

(iii) *Chafing gear restrictions for bottom trawl gear.* Chafing gear may encircle no more than 50 percent of the net's circumference and may be in one or more sections. Chafing gear may be used only on the last 50 meshes, measured from the terminal (closed) end of the codend. Only the front edge (edge closest to the open end of the codend) and sides of each section of chafing gear may be attached to the codend; except at the corners, the terminal edge (edge closest to the closed end of the codend) of each section of chafing gear must not be attached to the net. Chafing gear must be attached outside any riblines and restraining straps.

(4) *Midwater (pelagic or off-bottom) trawl gear.* Midwater trawl gear must have unprotected footropes at the trawl mouth, and must not have rollers, bobbins, tires, wheels, rubber discs, or any similar device anywhere on any part of the net. The footrope of midwater gear may not be enlarged by encircling it with chains or by any other means. Ropes or lines running parallel to the footrope of midwater trawl gear must be bare and may not be suspended with chains or any other materials. Sweep lines, including the bottom leg of the bridle, must be bare. For at least 20 ft (6.15 m) immediately behind the footrope or headrope, bare ropes or mesh of 16-inch (40.6-cm) minimum mesh size must completely encircle the net.

(i) *Chafing gear restrictions for midwater trawl gear.* Chafing gear may cover the bottom and sides of the codend in either one or more sections. Only the front edge (edge closest to the open end of the codend) and sides of each section of chafing gear may be attached to the codend; except at the corners, the terminal edge (edge closest to the closed end of the codend) of each section of chafing gear must not be attached to the net. Chafing gear is not permitted on the top codend panel except as provided in paragraph (b)(4)(ii) of this section.

(ii) *Chafing gear exception for midwater trawl gear.* A band of mesh (a ''skirt'') may encircle the net under or over transfer cables, lifting or splitting straps (chokers), riblines, and restraining straps, but must be the same mesh size and coincide knot-to-knot with the net to which it is attached and be no wider than 16 meshes.

(c) *Restrictions by limited entry trawl gear type.* Management measures may vary depending on the type of trawl gear (i.e., large footrope, small footrope, selective flatfish, or midwater trawl gear) used and/or on board a vessel during a fishing trip, cumulative limit period, and the area fished. Trawl nets may be used on and off the seabed. For some species or species groups, Table 1 (North) and Table 1 (South) of this subpart provide trip limits that are specific to different types of trawl gear: Large footrope, small footrope (including selective flatfish), selective flatfish, midwater, and multiple types. If Table 1 (North) and Table 1 (South) of this subpart provide gear specific limits for a particular species or species group, it is unlawful to take and retain, possess or land that species or species group with limited entry trawl gears other than those listed. The following restrictions are in addition to the prohibitions at § 660.112(a)(5).

* * * * *

[FR Doc. 2014–06058 Filed 3–18–14; 8:45 am]

BILLING CODE 3510–22–P

small entities for the purposes of the RFA.

This proposed rule would not change the U.S. Atlantic BFT baseline quota, amount of carryover, or implement any new management measures not previously considered. The baseline quota and category subquotas are codified and remain effective until changed (for instance, if any new ICCAT western Atlantic bluefin tuna TAC recommendation is adopted). Thus, the affected entities will not experience any negative, direct economic impacts as a result of this rule.

The annual specification process that this proposed rule follows, including application of underharvests and overharvests, is described in detail in Chapters 2 and 4 of the 2006 Consolidated HMS FMP. Because the economic impacts of carrying forward the allowable unharvested quota are expected to be generally positive, this rule, if adopted, would not have a significant economic impact on a substantial number of small entities. Accordingly, no initial regulatory flexibility analysis is required, and none has been prepared.

Authority: 16 U.S.C. 971 *et seq.* and 1801 *et seq.*

Dated: April 1, 2014.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 2014–07549 Filed 4–1–14; 4:15 pm]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 130405338–4201–01]

RIN 0648–BC84

Fisheries off West Coast States; Pacific Coast Groundfish Fishery Management Plan; Trawl Rationalization Program; Chafing Gear Modifications; Correction

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments; correction.

SUMMARY: On March 19, 2014, NMFS published a proposed rule in the **Federal Register** to modify chafing gear restrictions for midwater trawl in the Pacific Coast Groundfish Fishery. The identification number for submitting comments listed in the **ADDRESSES** heading section of the rule is being corrected.

DATES: This correction is effective April 4, 2014. Comments on this proposed rule must be received no later than 5 p.m., local time on April 18, 2014. During the comment period, NMFS is specifically seeking comments on the proposed method of attachment for chafing gear, including the benefits and effects relative to current minimum mesh size restrictions and prohibition on double walled codends.

ADDRESSES: You may submit comments on the proposed rule, identified by NOAA–NMFS–2014–0028, by any of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2014-0028*, click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.
- *Fax:* 206–526–6736; Attn: Becky Renko.
- *Mail:* William W. Stelle, Jr., Regional Administrator, West Coast Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070; Attn: Becky Renko.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Becky Renko, 206–526–6110; (fax) 206–526–6736; *Becky.Renko@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Need for Correction

In the **Federal Register** of March 19, 2014, in FR Doc. 2014–06058, on page 15296, please make the following corrections: Under the **ADDRESSES** heading, in the first sentence and in the text following the first bullet point, please remove ''NOAA–NMFS–2012–0218'' and replace it with ''NOAA–NMFS–2014–0028.''

Dated: March 28, 2014.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 2014–07468 Filed 4–3–14; 8:45 am]

BILLING CODE 3510–22–P

NATIONAL MARINE FISHERIES SERVICE -
NORTHWEST FISHERIES SCIENCE CENTER REPORT

Groundfish Stock Assessment Prioritization For 2015

In preparation for this year's Council discussion and determination of groundfish assessments to be conducted in 2015, the NWFSC (in consultation with the SWFSC) has prepared a table (attached) which summarizes information that may be useful in evaluating priorities for 2015. Many types of factors have influenced Council decision-making on scheduling assessments over the past decade, but typically very little in the way of comprehensive supporting material has been available in a convenient format at the outset of each cycle's discussions. This table represents our first effort to assemble, in one place, information relating to many of the factors that have influenced prior assessment scheduling decisions. Color-coding in the table is intended to draw attention to factors that support consideration of a species for assessment in 2015, with green representing the upper tier, and yellow the intermediate tier, *for that factor*. There has been no attempt to derive a systematic overall priority rating for all species.

The first page of the table focuses on species which we believe are reasonable candidates for some level of assessment (or data report). The first columns indicate what level/type of assessment we think would be appropriate. Our highest priorities are marked with capital 'X's and highlighted in green (e.g. black rockfish), with less compelling choices designated by lower-case 'x's, in yellow. For several species, an assessment could be conducted as one of two or three different types, and the selection of a particular type (if any) will depend on workload considerations, species' priority, and other factors. The next set of columns summarizes information from the most recent assessment (excluding data-poor), if one exists. The column showing the year of the most recent assessment is colored green for stocks that are unassessed or were last assessed before 2009. Stocks assessed in 2009 or 2011 are colored yellow. This section includes the current Tier in which each species is managed, the last estimated depletion level, and an indicator for rebuilding stocks.

The next column shows each species' the PSA (vulnerability) score. Frequently, the highest PSA values are coded red, to indicate the stocks' higher vulnerability. However, since greater vulnerability elevates the importance for assessing a stock, those values are colored green in this table. Next is a block of 5 columns containing information regarding the importance of each stock to commercial and recreational fisheries. The commercial columns show the ranking of each species, on the basis of shoreside, ex-vessel revenue (2008-2012), for all gears and for hook-and-line gears. The recreational columns rank species on the basis of landed catch amounts for the entire coast, for California, and for Oregon and Washington, combined. In addition to the green and yellow coloring, situations where rebuilding species ranked outside the top-30 but are constraining for a fleet were highlighted in blue. The next two columns report the estimated fishing mortality in 2012, for each species as a percentage of its ABC and OFL (or the species' contributions to assemblage ABCs and OFLs). Where necessary, catch and specifications were combined across multiple areas, for purposes of this table. The final column provides a qualitative indication of the suitability of the NWFSC's bottom-trawl survey to provide index and biological information to support an assessment. Species cells for which the survey is most informative are colored green.

The list of species on page 1 is a larger list than could likely be completed in 2015, even if the least time-consuming option were selected for each species. Given issues that arose in the 2013 data-moderate assessment and review process, it is probably desirable to limit the number of species assessed in that manner to 4 or 5, so that assessments using both modeling platforms can be completed and reviewed for each species. In most cases, models must be developed for multiple areas, which increases the development and review burden. The issue of single species requiring multiple assessment models is also a concern in the STAR process. Often multiple modeling areas are dictated by differences in the available data, as with black rockfish. In determining how many species can be assigned to a particular STAR panel, attention should be paid to how many separate models the panel will be asked to review.

The second page of the table shows information for all remaining previously-assessed (above data-poor) species in the upper section, and a selection of the remaining species that have some high-priority aspects, in terms of PSA score, fleet importance, or ABC attainment. The last page of the table includes all of the remaining species for which have only data-poor assessments have been conducted.

Although the Council is not scheduled to take final action on the 2015 assessment schedule until September, it would be very useful to have as clear a statement of Council priorities as is possible during the June discussion of this topic. Many of the species under consideration for full or update assessments have not been assessed for 5 or more years. In many such cases, there may be a substantial inventory of unaged otoliths, and the additional 3 months of ageing time may be quite important.

Background Information Pertaining to Selection of Groundfish Stocks for Assessment in 2015.

Species	Suggestions for 2015 Assessments				Most Recent Assessment and Current Status						PSA	Fleet rank, based on 2008-2012: Comm. $		Rec. mt			2012 catch as a % of		Survey Trend
	Full	Up-date	D-M	Data Report	Current Assess. Tier	Year of last assmnt.	Type	Platform	Last Est. Status	Rebuild-ing?		All gear	Hook & Line	All	CA	OR-WA	ABC *	OFL *	NWFSC Shelf/ Slope
arrowtooth flounder			x		2	2007	Full	SS v2	79%		1.21	**8**	48	52		**26**	21%	17%	
bank rf			x		2	2000	"Full"	SS v1			2.02	**30**	42	47	44		4%	3%	
black rf	X				1	2007	Full	SS v2	65%		1.94	**6**	**3**	**1**	**1**	**1**	53%	51%	
blue rf			x		2	2007	Full	SS v2	30%		2.01	33	**17**	**4**	**9**	**5**	33%	29%	
bocaccio	x	x		x	1	2013	Update	SS v 3	31%	Y	1.93	42	**26**	**7**	**5**	**13**	20%	19%	
CA scorpionfish			x		1	2005	Full	SS v2	80%		1.41	36	**20**	**5**	**4**		65%	62%	
canary rf	X				1	2011	Update	SS v 3	23%	Y	2.01	46	67	**17**	**19**	**12**	8%	7%	
chilipepper	x	x			1	2007	Full	SS v2	71%		1.35	**14**	**27**	**30**	**29**	39	17%	16%	
cowcod	x			x	2	2013	Full	xDB-SRA	34%	Y	2.13	73	56	45	42		11%	9%	
darkblotched rf				x	1	2013	Full	SS v3	36%	Y	1.92	**22**	**24**				22%	21%	
gopher rf			x		1	2005	Full	SS v2	97%		1.76	**12**	**7**	**10**	**7**		42%	39%	
kelp greenling	x		x		1	2005	Full	SS v2	49%		1.56	**18**	**10**	**15**	**17**	**6**	79%	59%	
longnose skate	x				1	2007	Full	SS v2	66%		1.68	**9**	**25**	61		32	34%	33%	
olive rf			x		3						1.87	47	31	**13**	**13**	31	21%	17%	
Pacific grenadier			x		3						1.82	51	79				7%	6%	
Pacific ocean perch	x	x		x	1	2011	Update	SS v3	19%	Y	1.69	31	43				6%	6%	
petrale sole	X	X			1	2013	Full	SS v3	22%	Y	1.94	**3**	44	40	40	**19**	91%	87%	
sablefish	X	X			1	2011	Full	SS v3	33%		1.64	**1**	**1**	42	48	**15**	66%	63%	
widow rf	X				1	2011	Full	SS v3	51%		2.05	**28**	41	33	32	**17**	6%	6%	
yelloweye rf	x			X	2	2011	Full	SS v3	21%	Y	2.00	61	45	**27**	33	**11**	25%	24%	

Key	
(green)	Higer Priority
(yellow)	Lower Priority
(cyan)	Constraining
X	Recommended
x	Potential

* In cases where individual ABCs and OFLs were not published for a species, its ABC- and OFL-contributions were used

Background Information Pertaining to Selection of Groundfish Stocks for Assessment in 2015. (cont.)

Species	Suggestions for 2015 Assessments				Most Recent Assessment and Current Status						PSA	Fleet rank, based on 2008-2012: Comm. $		Rec. mt			2012 catch as a % of		Survey Trend
	Full	Up-date	D-M	Data Report	Current Assess. Tier	Year of last assmnt.	Type	Platform	Last Est. Status	Rebuild-ing?		All gear	Hook & Line	All	CA	OR-WA	ABC *	OFL *	NWFSC Shelf/ Slope
starry flounder					2	2005	Full	SS v2	50%		1.02	41	49	41	39	24	1%	1%	
cabezon					1	2009	Full	SS v3	49%		1.48	10	4	11	12	4			
greenstriped rf					2	2009	Full	SS v3	81%		1.88	45	60	38	36	26	3%	2%	
lingcod					1	2009	Full	SS v3	67%		1.55	7	5	2	2	2	28%	26%	
splitnose rf					1	2009	Full	SS v3	66%		1.82	34	46				6%	6%	
blackgill rf					1	2011	Full	SS v3	30%		2.08	15	9				77%	73%	
Dover sole					1	2011	Full	SS v3	84%		1.54	2	33	57	53	37	17%	16%	
greenspotted rf					2	2011	Full	SS v3	35%		1.98	53	34	18	16	32	11%	9%	
spiny dogfish					1	2011	Full	SS v3	63%		2.13	29	23	31	30	23	41%	38%	
aurora rf					1	2013	Full	SS v 3	64%		2.10	38	30				116%	97%	
brown rf					2	2013	D-M	xDB-SRA	40%		1.99	13	6	9	6	20	57%	48%	
China rf					2	2013	D-M	xDB-SRA	55%		2.23	25	12	16	15	10	124%	104%	
copper rf					2	2013	D-M	xDB-SRA	59%		2.27	32	16	8	8	9	65%	54%	
English sole					2	2013	D-M	exSSS	89%		1.19	24	63	58	55	39	2%	2%	
longspine thd					2	2013	Full	SS v3	75%		1.53	5	14				32%	27%	
Pacific sanddab					3	2013	Full	SS v3	96%		1.25	20	22	12	10	21	9%	6%	
rex sole					2	2013	D-M	exSSS	79%		1.28	16	64				15%	10%	
rougheye/blksp. rf					2	2013	Full	SS v3	47%		2.27	23	15	28	26	37	375%	313%	
sharpchin rf					2	2013	D-M	exSSS	89%		2.05	55	72				7%	6%	
shortspine thd					1	2013	Full	SS v3	74%		1.80	4	2				41%	39%	
stripetail rf					3	2013	D-M	exSSS	78%		1.80	75	75	51	47		35%	29%	
yellowtail rf					1	2013	D-M	exSSS	69%		1.88	11	29	6	11	3	36%	34%	
black and yellow rf					3						1.70	21	11	21	20	34	76%	63%	
calico rf					3						1.57	82	77	34	34		95%	91%	
flag rf					3						1.97	57	40	25	24	39	65%	55%	
grass rf					3						1.89	17	8	23	22	25	72%	60%	
honeycomb rf					3						1.97	78	69	29	27		96%	80%	
kelp rf					3						1.59	43	28	22	21		91%	76%	
quillback rf					3						2.22	35	18	20	28	7	169%	141%	
redbanded rf					3						2.02	37	21	52	52	34	71%	59%	
shortraker rf					3						2.25	40	35				365%	304%	
squarespot rf					3						1.86	66	58	32	31		95%	79%	
starry rf					3						2.09	50	32	14	14		41%	34%	
tiger rf					3						2.06	54	36	36	45	14	274%	229%	
tree rf					3						1.73	39	19	24	23		117%	98%	
vermilion/sunset rf					3						2.05	27	13	3	3	8	94%	79%	

Key	
(green)	Higer Priority
(yellow)	Lower Priority

* In cases where individual ABCs and OFLs were not published for a species, its ABC- and OFL-contributions were used

Background Information Pertaining to Selection of Groundfish Stocks for Assessment in 2015. (cont.)

Species	Suggestions for 2015 Assessments				Most Recent Assessment and Current Status						PSA	Fleet rank, based on 2008-2012:					2012 catch as a % of		Survey Trend
												Comm. $		Rec. mt					
	Full	Up-date	D-M	Data Report	Current Assess. Tier	Year of last assmnt.	Type	Platform	Last Est. Status	Rebuild-ing?		All gear	Hook & Line	All	CA	OR-WA	ABC *	OFL *	NWFSC Shelf/ Slope
redstripe rf					3						2.16	70	70	62	59	39	5%	4%	
bronzespotted rf					3						2.12	74	65						
California skate					3						2.12	69	73	55	50		5%	3%	
greenblotched rf					3						2.12	64	54	43	41		5%	4%	
speckled rf					3						2.10	63	51	**26**	**25**		27%	23%	
rosethorn rf					3						2.09	60	52				35%	29%	
chameleon rf					3						2.03	65	55						
pink rf					3						2.02	79	79				34%	28%	
silvergray rf					3						2.02	62	59	49		**22**	2%	2%	
soupfin shark					3						2.02	44	50	46	43	39	6%	4%	
leopard shark					3						2.00	49	38	**19**	**18**		33%	23%	
big skate					3						1.99	58	71	48	46	**28**	24%	17%	
yellowmouth rf					3						1.96	52	47				6%	5%	
southern rock sole					3						1.95	48	61	39	38	34	32%	22%	
harlequin rf					3						1.94								
Swordspine rf					3						1.94	81	76	62	58		1%	0%	
rosy rf					3						1.89	56	39	50	50	**29**	20%	17%	
pinkrose rf					3						1.82	80	74	60	55				
Mexican rf					3						1.80	67	57	59	53		2%	1%	
spotted ratfish					3						1.72	71	66	54	48		9%	6%	
freckled rf					3						1.55	77	68						
pygmy rf					3						1.55	83	79						
halfbanded rf					3						1.38			35	35				
Pacific cod					3						1.34	**19**	37	44		**16**	29%	20%	
curlfin sole					3						1.23	68	62				30%	21%	
sand sole					3						1.23	**26**	53	37	37	**18**	16%	11%	
butter sole					3						1.18	72	79	55	57	**30**	72%	50%	
shortbelly rf					2				73%		1.13	76	78				0%	0%	
flathead sole					3						1.03	59	79				39%	27%	

Key	
(green)	Higer Priority
(yellow)	Lower Priority

* In cases where individual ABCs and OFLs were not published for a species, its ABC- and OFL-contributions were used

Science, Service, Stewardship

Agenda Item C.3.c
Supplemental NWFSC PowerPoint
April 2014

Groundfish Science Report

Michelle McClure and Jim Hastie
Northwest Fisheries Science Center

April 5, 2014

NOAA FISHERIES SERVICE

NWFSC
NORTHWEST FISHERIES SCIENCE CENTER

Overview

- Stock Assessment prioritization for 2015 (‘17/’18 spex)
- Economic data collection
- Bycatch reduction projects
- Observer data delivery to Vessel Account system

2015 Stock Assessment Priorities

- Formal Council consideration will begin in June; final decision in September
- Preparation for 2015 assessments will be best served if Full/Update assessments are pretty settled in June
- We are initiating discussions with advisors at this meeting
- As in prior years, NWFSC has assembled a list of potential species
- This year, we have included more supplemental information than has been the case, previously.

Candidates for 2015 Stock Assessments

Species	Suggestions for 2015 Assessments				Most Recent Assessment and Current Status					PSA	Fleet rank (2008-2012):					Survey info
											Comm. $		Rec. mt			
	Full	Up D	D-M	Dat Rpt	Cur Tier	Last year	Type	Last Dep.	Rbld?		All	H & L	All	CA	OR-WA	
arrowtooth fl.			x		2	2007	F	79%		1.21	8	48	52		26	
bank rf			x		2	2000	F			2.02	30	42	47	44		
black rf	X				1	2007	F	65%		1.94	6	3	1	1	1	
blue rf			x		2	2007	F	30%		2.01	33	17	4	9	5	
bocaccio	X				1	2013	U	31%	Y	1.93	42	26	7	5	13	
CA scorpionfish			x		1	2005	F	80%		1.41	36	20	5	4		
canary rf	X				1	2011	U	23%	Y	2.01	46	67	17	19	12	
chilipepper	x	x			1	2007	F	71%		1.35	14	27	30	29	39	
China rf	x		x		2	2013	D-M	55%		2.23	25	12	16	15	10	
cowcod	x			x	2	2013	F	34%	Y	2.13	73	56	45	42		
darkblotched rf	X				1	2013	F	36%	Y	1.92	22	24				
gopher rf			x		1	2005	F	97%		1.76	12	7	10	7		
kelp greenling	x		x		1	2005	F	49%		1.56	18	10	15	17	6	
lingcod	x	x			1	2009	Full	67%		1.55	7	5	2	2	2	
longnose skate	x				1	2007	F	66%		1.68	9	25	61		32	
olive rf			x		3					1.87	47	31	13	13	31	
POP	x	x		x	1	2011	U	19%	Y	1.69	31	43				
petrale sole	X	X			1	2013	F	22%	Y	1.94	3	44	40	40	19	
quillback rf	x		x		3					2.22	35	18	20	28	7	
sablefish	X	X			1	2011	F	33%		1.64	1	1	42	48	15	
widow rf	X				1	2011	F	51%		2.05	28	41	33	32	17	
yelloweye rf	x			X	2	2011	F	21%	Y	2.00	61	45	27	33	11	

Other Stocks, Including Previously-Assessed

Species	Most Recent Assessment and Current Status					PSA	Fleet rank (2008-2012):					Survey info
							Comm. $		Rec. mt			
	Cur Tier	Last year	Type	Last Dep.	Rbld?		All	H & L	All	CA	OR-WA	
starry flounder	2	2005	Full	50%		1.02	41	49	41	39	24	
cabezon	1	2009	Full	49%		1.48	10	4	11	12	4	
greenstriped rf	2	2009	Full	81%		1.88	45	60	38	36	26	
splitnose rf	1	2009	Full	66%		1.82	34	46				
blackgill rf	1	2011	Full	30%		2.08	15	9				
Dover sole	1	2011	Full	84%		1.54	2	33	57	53	37	
greenspotted rf	2	2011	Full	35%		1.98	53	34	18	16	32	
spiny dogfish	1	2011	Full	63%		2.13	29	23	31	30	23	
vermilion/sunset	3	2005				2.05	27	13	3	3	8	
black and yellow r	3					1.70	21	11	21	20	34	
grass rf	3					1.89	17	8	23	22	25	
starry rf	3					2.09	50	32	14	14		

2015 Stock Assessment Priorities

- Likely Assessment Capacity:
  - 3-4 STARs with Full assessments
  - 1 STAR with 3-4 Data-Moderate assessments
    - Multiple areas and modeling approaches to review
  - 3-4 Update assessments
  - Data reports for remaining rebuilding species
- Council and Stakeholder Input welcomed

Science, Service, Stewardship

Economic and Social Science Research

Economic Data Collection Update

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2013 EDC Data Submissions

- Option to complete the EDC forms through a web form.
  - In May – paper forms and instructions for web submission
- New question -- number of employees (crew and workers) directly engaged in fishing and processing.
  - Better track employment changes

Science, Service, Stewardship

Bycatch Reduction Research Projects

Waldo Wakefield (NWFSC) and Mark Lomeli (PSMFC)

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Hake retention & rockfish escapement among excluder designs tested by the NWFSC and PSMFC under normal fishing conditions

Excluder design	Year	Hake retention (% weight)	Rockfish escapement (% weight)	Rockfish species encountered
Open escape window BRD	2011	98.8	8.3	yellowtail, widow
Flexible sorting grid A	2012	96.7	15.4	widow, canary
Flexible sorting grid B	2012	93.9	70.2	yellowtail, widow, rougheye
Flexible sorting grid C	2013	92.7	26.2	widow

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Issues Surrounding the Flexible Sorting Grid Excluder designs - Clogging

Since 2012, modifications have been made to improve the gear's performance under moderate to high fish volumes; *however*, under heavy fish volumes (e.g., over 90 mt of Pacific hake being caught in haul durations <45 minutes) clogging is still an issue.

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Upcoming Research in 2014

- The NWFSC and PSMFC will likely continue their excluder research during the 2014 Pacific hake fishery.
- Within the next month the NWFSC and PSMFC will likely be having discussions with industry to begin developing an alternative excluder design for testing.

Science, Service, Stewardship

Observer Data Delivery

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Discard data reporting for IFQ/IBQ

- Observer discard data is submitted to the Vessel Account System (VAS) as soon as it is available in the observer database.
- 94% of 2014 trips reported to VAS w/in 14 days.
- Data is only uploaded to the VAS 4x week (M-Th).
    - ❖ OLE and industry concern – avoid deficits on weekends.
- Discard numbers reported to the VAS may change after they are loaded due to data errors found during the debriefing process.

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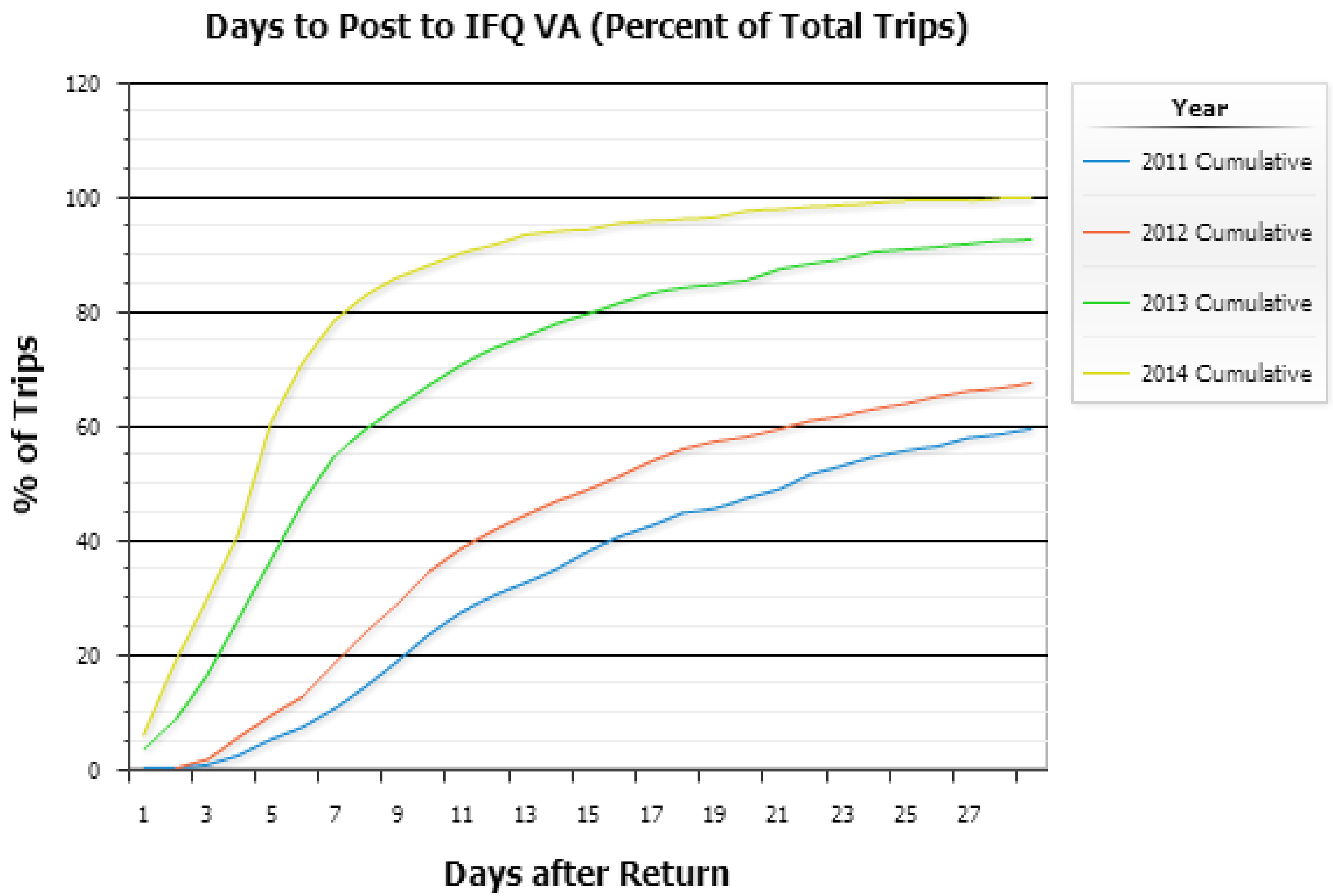
Improving Observer Data Processing



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Projects in 2014

Each of these projects have or will shorten the timelines for data submission and finalization.

- Offline database entry program
- Trip Error Report expansion and build
- Data Digitization Project
- Data Form Redesign

Agenda Item C.3.d
Supplemental EC Report
April 2014

ENFORCEMENT CONSULTANTS REPORT ON
NATIONAL MARINE FISHERIES SERVICE REPORT

The Enforcement Consultants (EC) understands that in the proposed rule on chafing gear National Marine Fisheries Service (NMFS) is requesting comments on additional regulatory language which would prevent chafing gear from being used to create the effect of a double-walled codend. Not knowing what that language is we have no ability to comment but we will be monitoring the development of that language through our NOAA representative.

PFMC
04/05/14

GROUNDFISH ADVISORY SUBPANEL REPORT ON NATIONAL MARINE FISHERIES REPORT

The Groundfish Advisory Subpanel (GAP) discussed the National Marine Fisheries Service (NMFS) report on the Cost Recovery program for the Trawl Rationalization program.

The GAP notes that based on the information presented in the report close to 40,000 hours of employee time was spent working on the catch share program in 2013. This includes NMFS employees but not contractors – which could be as much as an additional 10,000 hours. The report also notes that it does not account for additional costs such as travel, rent and other costs associated with managing the program. These numbers would appear to equate to approximately 24 people working full time on the program in 2014.

The GAP would like to see increased transparency with regard to the cost recovery program. The information should be broken down not just by sector but by employee and/or contractors along with associated tasks. What were these 50,000 hours actually spent doing? Are these incremental costs? The Magnuson Act allows for collection of fees based on incremental costs that would not exist were it not for the catch share program. We are unable to make this determination because there is not enough information provided in the report. The report does indicate that employees tracked their time in 2013 by sector and task so this information should be easily available.

Further, the GAP notes that the information provided in cost recovery program reports in the North Pacific Fishery Management Council provide information at a much finer scale so providing this information is not unprecedented.

The GAP further requests that the Council ask NMFS to clarify the review process for this item. How will NMFS allow the Council and affected industry to provide input into the decisions on how much money it takes to manage the fishery? It appears that the decision for 2014 has been made – the program is already operational. How will this process occur in 2015? Will the Council's cost recovery committee be involved? Why weren't they involved in reviewing the plan for 2014 PRIOR to implementation?

As the Council is well aware, the industry is facing huge costs to participate in the trawl individual quota program, including: the 5 percent buyback loan payments (5 percent of ex-vessel value), the increasing costs of observers, and the 3 percent cost recovery fee. These are all in addition to the state landings taxes and other fixed costs associated with fishing. Overall these costs are approaching 18 percent of a business' gross income. As such, the GAP believes that the affected industry should be afforded a more transparent look into what the actual incremental costs for management, data collection and enforcement truly are. Currently there is little confidence in the numbers and the industry feels more like a blank check is being written potentially for costs not associated with the program.

It is frustrating to continually hear about the workload issues at NMFS that are preventing the many important trawl trailing amendments from being discussed and implemented given that there is an estimate of 50,000 hours having been expended on this program in 2013.

PFMC 04/06/14

FISHERIES IN 2015-2016 AND BEYOND: ADOPT BIENNIAL SPECIFICATIONS FINAL PREFERRED ALTERNATIVES

In September and November 2013, the Council adopted overfishing limits (OFLs) and other harvest specifications for most of the actively-managed groundfish stocks and stock complexes. The Council further adopted Amendment 24 process alternatives and other 2015-2016 harvest specification and management measure alternatives for analysis. In March 2014, the Council adopted proposed OFLs for cowcod south of 40º10' N lat. and the Oregon substock of kelp greenling. The Council also requested a recalculation of OFLs for the Washington substock of cabezon based on the Scientific and Statistical Committee (SSC) advice (Agenda Item D.5.b, Supplemental SSC Report, March 2014); a new estimate of OFLs for the Washington substock of kelp greenling assuming an overfishing probability (P*) of 0.4; and all the projected harvest specifications for brown, China, and copper rockfish that were not available at the March meeting. All the requested 2015 and 2016 harvest specifications are available at this meeting for review by the Council, the SSC, and other Council advisors. Pending the SSC review and their recommendations, the recommendations of other Council advisors, and public comment, the Council is scheduled to adopt final 2015 and 2016 harvest specifications. Materials informing this decision include the preliminary Draft Environmental Impact Statement (DEIS) in consideration of decisions to be made for Amendment 24 and 2015-2016 Harvest Specifications and Management Measures (provided electronically with some parts excerpted and provided as attachments), the preliminary draft 2014 Stock Assessment and Fishery Evaluation (SAFE) document (provided electronically), and draft proposed Amendment 24 FMP language.

On Saturday, April 5 under Agenda Item C.2, Council staff will provide an overview of analyses informing Council action under this agenda item; under Agenda Item C.8: Fisheries in 2015-2016 and Beyond: Stock Complex Restructuring; and under Agenda Item C.9: Fisheries in 2015-2016 and Beyond: Adopt Management Measures Preliminary Preferred Alternatives. Many of the materials informing these decisions are provided under this agenda item (see the Reference Materials section below). Any decisions scheduled under this agenda item that the Council wishes to defer until later in the meeting can be made under Agenda Item C.9.

The Council is tasked with adopting a final preferred alternative for 2015 and 2016 harvest specifications (OFLs, acceptable biological catches, and annual catch limits) for groundfish stocks and stock complexes. The Council is also tasked with deciding a final Amendment 24 alternative, if possible, and providing guidance on the FMP language necessary for Amendment 24. The Council will receive advice from the SSC on any remaining proposed OFLs, as well as the science informing any of these decisions. The Council will also receive recommendations from other Council advisors and the public to aid in making these decisions.

Council Action:

1. **Decide a final preferred alternative for 2015 and 2016 harvest specifications (OFLs, acceptable biological catches, and annual catch limits) for groundfish stocks and stock complexes.**

2. **Decide a final preferred Amendment 24 alternative, if possible, and provide guidance on the FMP language necessary for Amendment 24.**

Reference Materials:

1. Agenda Item C.4.a, Attachment 1: Action Item Checklist.
2. Agenda Item C.4.a, Attachment 2: Proposed 2015 and 2016 Harvest Specifications and Select Management Measures for Groundfish Stocks and Stock Complexes.
3. Agenda Item C.4.a, Attachment 3: Excerpted Portions of the preliminary DEIS concerning the Biological Risk Analysis for Select Stocks and Stock Complexes.
4. Agenda Item C.4.a, Attachment 4: Proposed FMP Language under the Amendment 24 Alternatives.
5. Agenda Item C.4.a, Attachment 5: Preliminary Draft of the 2014 Stock Assessment and Fishery Evaluation Document (electronic only).
6. Agenda Item C.4.a, Attachment 6: Preliminary Draft of, "Groundfish Harvest Specifications and Management Measures and Amendment 24: Draft Environmental Impact Statement" (electronic only).
7. Agenda Item C.4.a, Attachment 7: Excel Workbook containing Historical Landings and Revenue Tables for the Groundfish Fishery (electronic only).
8. Agenda Item C.4.a, Attachment 8: Adopted Schedule for Developing the 2015-2016 and Beyond Groundfish Harvest Specifications and Management Measures.
9. Agenda Item C.4.b, GMT Report: Appendix B to Proposed Harvest Specifications and Management Measures for the 2015-2016 Pacific Coast Groundfish Fishery and Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan Preliminary Draft Environmental Impact Statement (electronic only).
10. Agenda Item C.4.b, ODFW Report: Oregon Department of Fish and Wildlife Comments Regarding the Recent Model Development and OFL Determination for Kelp Greenling for 2015-2016 Harvest Specifications.
11. Agenda Item C.4.b, WDFW Report: Washington Department of Fish and Wildlife (WDFW) Report on Groundfish Biennial Harvest Specifications and Management Measures for 2015-2016 and Beyond.
12. Agenda Item C.4.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — John DeVore and Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Final Preferred Harvest Specifications for 2015-2016 Decide a Final Preferred Amendment 24 Alternative, if Possible, and Provide Guidance on the FMP Language Necessary for Amendment 24.

PFMC
03/21/14

ACTION ITEM CHECKLIST

#	Category	Sector	Measure
Preferred Harvest Specifications			
1	OFL		Adopt remaining OFLs, as recommended by the SSC
2	ABC		Confirm or modify P*[1] and adopt ABCs
3	ACL		Confirm or modify PPA ACLs[2]
4	ACT		Confirm or modify the 4 mt ACT for cowcod
5	Rebuilding		Confirm PPA rebuilding plan parameters. Adopt new T_{TARGET} for cowcod
Preferred Stock Complexes			
6			Confirm EC species' designations
7			Confirm PPA to manage CA kelp greenling, OR kelp greenling, WA kelp greenling, WA cabezon, and leopard shark with stock-specific specifications or decide to manage these stocks in a Shallow Roundfish complex
8			Decide PPA for Slope Rockfish complexes under Agenda Item C.8

[1] The PPA P* decision was 0.45 for all stocks and complexes except arrowtooth (0.40), sablefish (0.40), spiny dogfish (0.35), starry flounder (0.40), lingcod south (0.40), longspine thornyheads (0.40), shortspine thornyheads (0.40), kelp greenling in WA (0.40), and the Other Flatfish complex (0.40).

[2] The PPA ACL decision was to set the ACL equal to the ABC for all non-overfished species except maintain a constant catch for black rockfish (OR/CA) of 1,000 mt and constant catch for longnose skate (2,000 mt). The Council also recommended a range of Dover sole (25,000 to 50,000 mt) and widow rockfish (1,500 to 3,000 mt) ACLs be analyzed. For overfished species, except cowcod and petrale sole, the PPA ACL was based on the SPR rate in the current rebuilding plan. For petrale sole, the ACL was based on the 25-5 harvest control rule. For cowcod, the SPR rate in the current rebuilding plan was translated into an exploitation rate since the XDB-SRA model cannot use SPR rates. A new rebuilding plan is required for cowcod.

Preliminary Preferred Allocations and Harvest Guidelines (HG)			
9	Fishery HG		Confirm or modify amounts set-aside[3] for groundfish mortality in Tribal, non-groundfish fisheries, and research
10	HG		Confirm or modify HG for species managed within a complex • Blue rockfish in California within the nearshore rockfish complexes north and south of 40°10 • Blackgill rockfish within the slope rockfish complex south of 40°10 • Rougheye rockfish?
11	Allocations	Trawl/Non-Trawl	Confirm or modify 2-year trawl and non-trawl allocations for • Overfished species: bocaccio, canary, cowcod, petrale[4], and yelloweye • Longnose skate: trawl (90%) and non-trawl (10%) allocation • Shelf rockfish north trawl (60.2%) and non-trawl (39.8%) allocation • Shelf rockfish south trawl (12.2%) and non-trawl (87.8%) allocation • Rougheye rockfish? • Spiny dogfish?
12	Set-Aside	Within Trawl, At-Sea	Confirm or modify the at-sea whiting set-asides adopted in November Consider establishing set-asides from the trawl allocation to account for at-sea whiting bycatch of • Spiny dogfish[5] • Rougheye rockfish?

[3] Final action on exempted fishing permit set-asides is scheduled for the June Council meeting.
[4] The Amendment 21 allocation for petrale sole has been suspended since the stock is overfished and under a rebuilding plan. The action alternatives analyzed the status quo allocation (35 mt to non-trawl and remainder to trawl). Further, the Council requested an analysis that would give 15 mt to the non-trawl sector and the remainder to the trawl sector.
[5] The Council requested a range of spiny dogfish set-asides be analyzed for the at-sea sectors from 163 mt to 725 mt.

13	HG	Non-Trawl	Confirm or modify 2-year within non-trawl HG or shares for • Overfished species including bocaccio, canary, cowcod, and yelloweye[6] • Black rockfish: 58% OR, 42% CA • Blue rockfish: 40-10 adjustment for CA • Blackgill south of 40°10: 40-10 adjustment; 60% limited entry and 40% open access fixed gears • Sablefish south of 36º: 55% limited entry and 45% open access fixed gears • Nearshore rockfish HG north of 40°10 for California (between 40°10 and 42° N. lat.) • China rockfish HG north of 40°10' by state or by CA and OR/WA combined
Adopt Preliminary Preferred Season Structures			
14		Treaty Fisheries	Management measures
15		Shorebased IFQ	Trawl RCA, non-IFQ trip limits
16		Non-Nearshore	Non-Trawl RCA seaward configuration, trip limits (including sablefish)
17		Nearshore	Non-Trawl RCA shoreward configuration, trip limits
18		WA Recreational	Season dates, bag limits, area closures
19		OR Recreational	Season dates, bag limits, area closures
20		CA Recreational	Season dates, bag limits, area closures

[6] The action alternatives analyzed the trawl/non-trawl and within non-trawl allocations from the September 2013 scorecard. Further, the Council requested analysis that would move 0.6 mt from the non-nearshore fishery to the nearshore fishery.

Adjustments to Existing or Routine Measures			
21		Trawl	RCA boundary adjustments to better approximate depth
22		Trawl	Using underutilized set-asides in the projections for the shorebased IFQ carryover
23		Non-Trawl	Trip limit adjustments for lingcod N. of 40°10' N lat., slope rockfish N. of 40°10' N lat., shortspine thornyhead N. of 34°27' N lat., bocaccio S. of 34°27' N. lat., and shelf rockfish S. of 34°27' N. lat.
24		Non-Trawl - Rec	Modifications to groundfish retention regulations in the Pacific halibut fisheries[7]
New Management Measures			
25		Trawl/Non-Trawl	Establish rougheye rockfish Groundfish Conservation Area closures
26		Trawl/Non-Trawl	Establish spiny dogfish Groundfish Conservation Area closures
27		Trawl	Require rockfish excluders for the at-sea and shoreside Pacific whiting fisheries
28		Non-Trawl	Provide for lingcod retention in Periods 1,2, and 6
29		Non-Trawl	Remove or modify commercial gear restrictions for targeting flatfish in California
30		Non-Trawl - Rec	Allow canary rockfish retention in the recreational fisheries

[7] Action to modify the groundfish retention allowances in the Pacific halibut fishery would occur during the development of the annual Catch Sharing Plan.

4.1 Biological Impacts of 2015-16 Biennial Harvest Specifications on Groundfish Stocks

This section evaluates the biological impacts of proposed 2015-2016 harvest specifications on a select list of groundfish stocks (the 2014 Stock Assessment and Fishery Evaluation document (PFMC 2014) provides more detailed information on all west coast groundfish stocks and the biological effects under the groundfish harvest specification framework). The focus of this section are on those overfished stocks currently managed under rebuilding plans, the stocks where the Council chose a range of alternative ACLs for analysis, those stocks and stock complexes where total catches in recent years have been at least 80 percent of specified ACLs, and those stocks proposed to be removed from a status quo stock complex and managed with stock-specific harvest specifications.

4.1.1 Overfished Groundfish Stocks

There are currently 6 overfished rockfish stocks (bocaccio south of 40º10' N lat., canary rockfish, cowcod south of 40º10' N lat., darkblotched rockfish, Pacific ocean perch, and yelloweye rockfish) and 1 overfished flatfish stock (petrale sole) managed under rebuilding plans. New assessments and rebuilding analyses for these overfished stocks do not indicate any need to modify existing rebuilding plans since all these analyses indicate progress towards rebuilding is on track and, in most cases, ahead of schedule. Table 4-1 provides the estimated times to rebuild and rebuilding probabilities under alternative harvest control rules for the overfished stocks according to the most recent rebuilding analyses.

Table 4-1. Estimated time to rebuild and spawning potential ratio (SPR) harvest rate relative to alternative 2015-2016 ACLs for overfished west coast groundfish stocks (no changes to rebuilding plans were recommended for any of these stocks except cowcod where the target year to rebuild (T_{TARGET}) was changed to X).

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt)		SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
					2015	2016					
Bocaccio S of 40°10' N lat. a/	2022	77.7%	2022		0	0	100%	2019	0	88.0%	99.0%
					150	158	90.0%	2019	0	77.0%	97.0%
				PPA	349	362	77.7%	2021	2	60.0%	90.0%
					483	496	70.0%	2023	4	49.0%	70.0%
					670	679	60.0%	2027	8	33.0%	63.0%
					801	803	53.9%	2031	12	23.0%	51.0%
Canary	2027	88.7%	2030		0	0	100%	2028	0	48.2%	75.0%
					50	52	95.1%	2028	0	41.2%	75.0%
					106	109	90.0%	2029	1	36.4%	75.0%
				PPA	122	125	88.7%	2030	2	34.4%	75.0%
					154	158	85.9%	2030	2	31.7%	75.0%
					191	196	82.9%	2031	3	29.9%	75.0%
					224	230	80.3%	2032	4	27.9%	74.9%
					310	316	74.0%	2035	7	26.1%	73.6%
					401	407	67.9%	2040	12	25.1%	66.3%
					454	459	64.7%	2045	17	25.0%	59.4%
					496	500	62.2%	2050	22	25.0%	50.0%

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt) 2015	ACLs (mt) 2016	SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
Cowcod	2068	82.7%	X		0	0	E = 0	2019	0	95.9%	93.8%
					1.8	1.9	E = 0.0013	2019	0	95.2%	93.0%
					2.4	2.5	E = 0.0018	2019	0	95.0%	92.7%
					3.0	3.1	E = 0.0022	2019	0	94.7%	92.4%
					3.7	3.8	E = 0.0027	2019	0	94.4%	91.9%
				PPA ACT	4.3	4.4	E = 0.0031	2019	0	94.0%	91.5%
					4.9	5.0	E = 0.0036	2019	0	93.4%	91.3%
					5.5	5.6	E = 0.0040	2019	0	93.4%	91.0%
					6.1	6.3	E = 0.0045	2019	0	93.1%	90.6%
					6.7	6.9	E = 0.0049	2019	0	92.7%	90.2%
					7.3	7.5	E = 0.0054	2019	0	92.4%	89.8%
					7.9	8.1	E = 0.0058	2019	0	92.0%	89.6%
					8.5	8.8	E = 0.0063	2019	0	91.5%	89.2%
					9.1	9.4	E = 0.0067	2019	0	91.2%	88.8%
				PPA ACL	9.5	9.8	E = 0.007	2020	1	90.9%	88.4%
					9.7	10.0	E = 0.0072	2020	1	90.9%	88.5%
					55.8	55.8	E = 0.0409	2039	20	55.0%	53.4%
					62.5	62.2	E = 0.0458	2057	38	51.4%	50.0%
Darkblotched	2025	64.9%	2025		0	0	100%	2016	0	100.0%	100.0%
				PPA	338	346	64.9%	2017	1	100.0%	100.0%
					369	376	62.6%	2017	1	100.0%	100.0%
					375	382	62.1%	2018	2	100.0%	100.0%
					394	401	60.7%	2018	2	100.0%	100.0%
					445	452	57.1%	2018	2	100.0%	100.0%

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt) 2015	2016	SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
POP	2020	86.4%	2051		0	0	100%	2043	0	25.0%	85.5%
					62	64	94.3%	2045	2	25.0%	81.0%
					138	143	88.0%	2050	7	25.0%	75.0%
				PPA	158	164	86.4%	2051	8	25.0%	73.0%
					166	172	85.8%	2052	9	25.0%	72.6%
					191	198	83.9%	2054	11	25.0%	70.1%
					209	216	82.6%	2055	12	25.0%	68.0%
					258	266	79.2%	2060	17	25.0%	62.0%
					303	312	76.2%	2065	22	25.0%	55.8%
					341	350	73.8%	2071	28	25.0%	50.0%
Petrale	2016	25-5 Rule	2016		0	0	100%	2013	0	100.0%	100.0%
					1,116	1,197	60%	2013	0	100.0%	100.0%
					1,548	1,624	50%	2013	0	100.0%	100.0%
					2,081	2,118	40%	2013	0	100.0%	100.0%
				PPA	2,816	2,910	25-5 Rule	2013	0	100.0%	100.0%
Yelloweye	2074	76.0%	2074		0	0	100%	2045	0	99.2%	99.9%
					10	10	86.4%	2053	8	85.3%	93.7%
					14	15	80.5%	2060	15	75.1%	82.8%
					15	16	79.5%	2061	16	73.2%	81.0%
					18	18	76.5%	2066	21	64.1%	73.9%
				PPA	18	19	76.0%	2067	22	62.1%	72.9%
					22	22	72.7%	2074	29	50.0%	61.3%
					25	25	69.7%	2083	38	37.2%	50.0%

a/ All bocaccio alternatives have been reduced from the rebuilding analysis results by 6% to represent the portion of the stock south of 40°10' N lat.

4.1.1.1 Bocaccio South of 40º10’ N lat.

A bocaccio stock assessment update (Field 2011b) and rebuilding analysis (Field 2011a) were prepared in 2011. The 2011 bocaccio assessment was originally scheduled to be an update of the 2009 full assessment; however, the STAT some limited changes in the 2009 model structure since a strict update estimated that the 2010 year class was extraordinarily and unrealistically strong, based on length frequency data collected in the 2010 NMFS trawl survey. The modified update was ultimately reviewed, endorsed by the SSC, and adopted for use in management decision-making. The 2011 bocaccio rebuilding analysis indicated rebuilding progress was well ahead of schedule with a predicted median year to rebuild of 2021 or one year earlier than the target rebuilding year (Field 2011a). The Council elected to maintain the revised rebuilding plan implemented in 2011.

An update of the 2011 bocaccio assessment model was prepared in 2013, which confirmed the 2009 and 2010 year classes were indeed strong (Field 2013). The assessment estimated a depletion of 31.4 percent at the start of 2013 and predicted the stock would rebuild by 2015. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Field 2011a) was used to inform the projections in Table 4-1.

The Council’s preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the estimated strong recruitment will result in successfully rebuilding the stock as predicted.

4.1.1.2 Canary Rockfish

The 2007 canary assessment estimated relative depletion level was 32.4 percent at the start of 2007 (Stewart 2008b). This was a significant departure from the previous assessment and largely driven by a higher assumed steepness (h = 0.51) relative to past assessments. The 2007 canary rebuilding analysis (Stewart 2008a) predicted the SPR harvest rate in the rebuilding plan (88.7%) would rebuild 42 years earlier (2021) than the originally estimated rebuilding schedule (2063). A modification of the Amendment 16-4 canary rockfish rebuilding plan specifying a target rebuilding year of 2021 while maintaining the SPR harvest rate of 88.7% was implemented in 2009.

The 2009 canary assessment (Stewart 2009c), an update of the 2007 assessment, estimated stock depletion at 23.7% at the start of 2009. This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical California catches from a formal reconstruction of 1916-1980 California catch data (Ralston, *et al.* 2010). The 2009 canary rebuilding analysis (Stewart 2009a) predicted the stock would not rebuild to the target year of 2021 with at least a 50% probability even in the absence of fishing-related mortality starting in 2011 ($T_{F=0}$). The rebuilding plan was revised by changing the target to rebuild the stock to 2027 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2011.

Another update assessment was prepared in 2011 (Wallace and Cope 2011), which estimated stock depletion was 23.2 percent at the start of 2011. This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical Oregon catches from a formal reconstruction of Oregon catch data. For the period 2000-2011, the spawning biomass was estimated to have increased from 11.2 percent to 23.2 percent of the unfished biomass level.

The 2011 canary rebuilding analysis (Wallace 2011) predicted the stock would not rebuild to the target year of 2027 with at least a 50% probability. The rebuilding plan was revised slightly by changing the target to rebuild the stock to 2030 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2013.

The SSC recommended against preparing a new canary rockfish rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Wallace 2011) was used to inform the rebuilding projections in Table 4-1. A canary catch report was provided in 2013 (Agenda Item F.5.a, Attachment 9, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.1.3 Cowcod South of 40º10' N lat.

A new cowcod assessment of the stock in the Southern California Bight was conducted in 2013 (Dick and MacCall 2013b), which estimated stock depletion to be 33.9 percent of unfished spawning biomass at the start of 2013. The 2013 assessment suggested that cowcod in the Southern California Bight constitute a smaller, but more productive stock than was estimated from previous assessments. Median unfished and 2013 spawning biomasses were estimated to be 1,549 mt and 524 mt, respectively.

The 2013 assessment used the Extended Depletion-Based Stock Reduction Analysis (XDB-SRA) modeling platform to estimate stock status, scale, and productivity. Dick et al. (2013b) fit five fishery-independent data sources: four time series of relative abundance (CalCOFI larval abundance survey, Sanitation District trawl surveys, NWFSC trawl survey, and NWFSC hook-and-line survey), and the 2002 Yoklavich et al. (2007) visual survey estimate of absolute abundance.

The 2013 rebuilding analysis (Dick and MacCall 2013a) was unique in that the Punt rebuilding program (Punt 2005) was not used given its incompatibility with XDB-SRA. In each rebuilding model run, 15,000 simulated trajectories were generated using draws from the joint posterior distribution. Since the XDB-SRA platform is not compatible with spawning potential ratios, harvest control rules were translated into exploitation rates (E) calculated as catch/estimated age 11+ biomass. Similar to the previous cowcod rebuilding analysis, variability in future recruitment was expressed as a weighted set of different states of nature (parameter values), rather than random deviations from an average stock-recruitment relationship. While the previous rebuilding analysis accounted only for uncertainty in the Beverton-Holt steepness parameter, the current analysis accounts for uncertainty in all estimated model parameters. Estimates of total cowcod mortality have not exceeded the ACL (or OY) in any year since 2003. The estimate of median time to rebuild under the current harvest rate (2020) is 48 years earlier than the current target year of 2068.

4.1.1.4 Darkblotched Rockfish

A full darkblotched stock assessment in 2013 (Gertseva and Thorson 2013) estimated a stock depletion of 36 percent at the start of 2013. The assessment also predicts the stock will be rebuilt by the start of 2015. The improved stock status and rebuilding outlook were largely attributed to 1) reduced fishing mortality under the rebuilding program; 2) inferences that follow from more favorable perceptions of steepness, fecundity, and age at maturity of the stock; and 3) length and age data indicating relatively large recruitments in 1999, 2000, and 2008. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Stephens 2011) was used to inform the rebuilding projections in Table 4-1.

The Council's preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the stock will successfully rebuild as predicted.

4.1.1.5 Pacific Ocean Perch

A full assessment in 2011 estimated a stock depletion of 19.1 percent at the start of 2011 (Hamel and Ono 2011). The significant decrease in the estimated depletion of the stock was largely due to a much higher estimate of initial, unfished biomass (B_0). Previous assessments assumed a large recruitment in the late 1950s provided the higher biomass to support the estimated removals by the foreign fleets without any data to support that assumption. The assumption in the 2011 assessment is that the large foreign fleet catch fished the biomass down to critical levels, thus resulting in a substantially larger B_0 estimate. The 2011 assessment also estimated a longer sequence of higher recruitment based on fitting to the data available for early years of the assessment period. The 2011 rebuilding analysis (Hamel 2011) predicted rebuilding would not occur by the target year of 2020 with at least a 50% probability even in the absence of fishing-related mortality beginning in 2013 (i.e., $T_{F=0}$). Therefore the rebuilding plan was revised by changing the target rebuilding year to 2051 while maintaining the constant SPR harvest rate of 86.4%.

The SSC recommended against preparing a new POP rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Hamel 2011) was used to inform the rebuilding projections in Table 4-1. A POP catch report was provided in 2013 (Agenda Item F.5.a, Attachment 10, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.1.6 Petrale Sole

The 2013 petrale assessment (Haltuch, *et al.* 2013) estimated a stock depletion of 22.3 percent of its unfished biomass at the start of 2013 and short of the prediction from the 2011 rebuilding analysis; spawning biomass is predicted to reach the B_{MSY} target by the start of 2014. The 2013 stock assessment continued with the coastwide stock assessment, but was restructured to summarize petrale sole landings by the port of landing and combined Washington and Oregon into a single fleet. The down-weighting of the trawl CPUE index used in the 2011 assessment was largely responsible for the more pessimistic result and the one year lag in rebuilding relative to the previous assessment. However, the estimation of recent recruitments indicated two very strong year classes (2007 and 2008) recruiting into the spawning population, which increases the likelihood of imminent success in rebuilding this stock. The SSC recommended against preparing a new petrale sole rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Haltuch 2011) was used to inform the rebuilding projections in Table 4-1.

The Council's preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the stock will successfully rebuild as predicted.

4.1.1.7 Yelloweye Rockfish

The benchmark 2009 yelloweye assessment estimated a stock depletion of 20.3 percent of initial, unfished biomass at the start of 2009 (Stewart, *et al*. 2009). The resource was modeled as a single stock, but with three explicit spatial areas: Washington, Oregon and California. Each area was modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial), with the stocks linked via a common stock-recruit relationship with negligible adult movement among areas. The assumed level of historical removals and estimated steepness were identified as the main axes of uncertainty.

The 2009 yelloweye rebuilding analysis (Stewart 2009b) was used to inform a revised rebuilding plan that was implemented under FMP Amendment 16-5. The revised rebuilding plan implemented in 2011 specified a constant harvest rate (SPR = 76%) strategy (the ramp-down strategy was abandoned) and a target year to rebuild the stock of 2074.

The 2011 yelloweye assessment (Taylor and Wetzel 2011), an update of the 2009 assessment, estimated stock depletion at 21.4 percent of initial, unfished biomass at the start of 2011. The update assessment results were very similar to those in the previous assessment. The 2011 yelloweye rebuilding analysis (Taylor 2011) indicated rebuilding progress was on schedule and no revisions were made to the rebuilding plan.

The SSC recommended against preparing a new yelloweye rockfish rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Taylor 2011) was used to inform the rebuilding projections in Table 4-1. A yelloweye catch report was provided in 2013 (Agenda Item F.5.a, Attachment 11, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.2 Non-Overfished Stocks with Annual Catch Limit Alternatives Identified for Analysis

4.1.2.1 Dover Sole

The 2011 Dover sole assessment indicated the stock was healthy with an increasing abundance trend. Spawning stock biomass depletion was estimated to be 83.7 percent of unfished biomass at the start of 2011 (Hicks and Wetzel 2011). The 2011 Dover sole assessment is data-rich and the species is readily tracked in the NMFS trawl survey (most survey tows are positive for Dover).

The spawning biomass of Dover sole reached a low in the mid-1990s before beginning to increase throughout the last decade. The estimated depletion has remained above the 25 percent biomass target and it is unlikely that the stock has ever fallen below this threshold. Throughout the 1970s, 1980s, and 1990s the exploitation rate and SPR generally increased, but never exceeded the SPR 30 percent F_{MSY} target. Recent exploitation rates on Dover sole have been much lower than F_{MSY}, even with increased catch levels since 2007.

Two ACL alternatives for 2015 and 2016 are analyzed: 1) the status quo ACL of 25,000 mt and 2) an ACL of 50,000 mt. Given the productivity of the stock and constraints on fishing, projections assuming a 25,000 mt constant annual catch predict the stock would remain above the target B_{MSY} level in the next ten years even under the more pessimistic and less likely low state of nature in the assessment decision table (Table 4-2). The higher ACL of 50,000 mt is predicted to be sustainable; Table 4-2 indicates that future mortalities assuming full OFL removals in 2013-2022 would maintain the stock above the target level of $B_{25\%}$ under the most likely base case model in the 2011 assessment. This high catch stream in the decision table predicts a decline in spawning biomass in the ten-year projection to a level above the B_{MSY} target; the decline would be predicted to be less under a revised projection since 2013 and 2014 catches were well below the OFL (and below the 25,000 mt ACL). The average annual 2015-2022 catch in Table 4-2, assuming OFL removals, is higher (50,350 mt) than the alternative ACL of 50,000 mt.

The effective limit of Dover sole in the 2015 and 2016 shorebased IFQ fishery is likely to be driven by the sablefish allocation, which is increasing slightly relative to No Action. Sablefish quota is needed to target Dover sole and the other DTS species using trawl gear. Sablefish IFQ quota is also used in a single-species target fishery using fixed gears. The competition and price for sablefish quota is affected by Asian sablefish demand and supply from north Pacific fisheries outside the west coast EEZ (e.g., BC and the Gulf of Alaska fisheries). It may be the case that the supply and demand of west coast Dover sole will remain limited until there is an increased harvestable surplus of sablefish above the levels proposed for 2015 and 2016. On the other hand, access to a larger volume of Dover sole may allow west coast processors to develop better markets for Dover sole. To the extent that trawl IFQ fishermen can more selectively target quality Dover sole without running out of sablefish quota, a higher catch can be expected achieving a greater positive socioeconomic impact on trawl fishing communities.

Table 4-2. Projected spawning biomass and depletion of Dover sole under three catch streams and two states of nature (the low state of nature and base case models) analyzed in the 2011 stock assessment, from Hicks and Wetzel (2011).

Catch Stream	Year	Catch (mt)	State of nature: Low $M_f = 0.110$ $M_m = 0.125$ Spawning biomass (mt)	Low Depletion	Base case $M_f = 0.117$ $M_m = 0.142$ Spawning biomass (mt)	Base case Depletion
OFL	2013	90,411	240,029	70.20%	377,601	80.40%
	2014	75,517	195,784	57.20%	329,856	70.20%
	2015	64,885	158,399	46.30%	289,873	61.70%
	2016	57,488	127,579	37.30%	257,379	54.80%
	2017	52,453	102,664	30.00%	231,515	49.30%
	2018	49,065	82,887	24.20%	211,283	45.00%
	2019	46,768	67,323	19.70%	195,619	41.60%
	2020	45,158	54,995	16.10%	183,484	39.10%
	2021	43,964	45,020	13.20%	173,995	37.00%
	2022	43,017	36,676	10.70%	166,455	35.40%
Current ACL	2013	25,000	240,029	70.20%	377,601	80.40%
	2014	25,000	228,381	66.80%	362,668	77.20%
	2015	25,000	217,371	63.60%	348,791	74.20%
	2016	25,000	207,555	60.70%	336,770	71.70%
	2017	25,000	199,131	58.20%	326,838	69.60%
	2018	25,000	192,128	56.20%	318,967	67.90%
	2019	25,000	186,405	54.50%	312,909	66.60%
	2020	25,000	181,701	53.10%	308,280	65.60%
	2021	25,000	177,758	52.00%	304,702	64.80%
	2022	25,000	174,364	51.00%	301,870	64.20%
Status quo catches	2013	12,127	240,029	70.20%	377,601	80.40%
	2014	12,135	234,602	68.60%	368,952	78.50%
	2015	12,143	229,771	67.20%	361,268	76.90%
	2016	12,149	226,014	66.10%	355,274	75.60%
	2017	12,154	223,476	65.30%	351,155	74.70%
	2018	12,157	222,149	65.00%	348,848	74.20%
	2019	12,158	221,870	64.90%	348,089	74.10%
	2020	12,158	222,375	65.00%	348,485	74.20%
	2021	12,158	223,398	65.30%	349,654	74.40%
	2022	12,157	224,732	65.70%	351,296	74.80%

4.1.2.2 Widow Rockfish

The 2011 widow rockfish assessment indicated the stock was healthy with a spawning biomass depletion of 51 percent at the start of 2011 (He, *et al*. 2011). The assessment indicated the estimated spawning stock biomass had increased steadily from a low of 30.6 percent at the start of 2001. The estimated relative spawning stock biomass never dropped below the 25 percent MSST.

Widow rockfish are caught mostly in midwater trawls used to target Pacific whiting and, before 2002 and after trawl rationalization was implemented in 2011, used to target widow and yellowtail rockfish. The exploitation rate was above the target SPR of 50 percent (i.e., $F<F_{MSY}$) until the late 1970s when trawl catches in the target midwater fishery increased to rates beyond the target. This continued until the stock was declared overfished and managed under a rebuilding plan. Harvest declined dramatically and the estimated SPR harvest rates increased rapidly above target F_{MSY}. The increase in biomass during the past decade was the result of reduced catches rather than strong year-classes. The stock was declared rebuilt in 2013 based on the results of the 2013 assessment.

Two ACL alternatives for 2015 and 2016 are analyzed: 1) the status quo ACL of 1,500 mt and 2) an ACL of 3,000 mt. Decision table projections in the 2011 assessment assumed constant annual catches varying between 1,500 and 3,000 mt (Table 4-3). A 3,000 mt constant annual catch is predicted to maintain the stock above the target B_{MSY} level in the next ten years under the more likely state of nature in the assessment (Table 4-3). However, there is great uncertainty in the stock's estimated biomass, relative productivity (steepness was fixed), and other aspects of the stock's dynamics.

Table 4-3. Widow rockfish decision table (from He *et al.* 2011).

Management decision	Year	Catch (mt)	State of nature			
			***h* = 0.41**		**Base case (*h*=0.76)**	
			Depletion (%)	**Spawning biomass (mt)**	**Depletion (%)**	**Spawning biomass (mt)**
Constant catch (1,500 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	1,500	28.6%	21,686	49.9%	35,514
	2014	1,500	27.2%	20,619	48.5%	34,473
	2015	1,500	26.1%	19,839	47.5%	33,785
	2016	1,500	25.6%	19,443	47.2%	33,585
	2017	1,500	25.7%	19,515	47.8%	34,014
	2018	1,500	26.4%	19,993	49.2%	35,022
	2019	1,500	27.2%	20,655	51.1%	36,325
	2020	1,500	28.1%	21,354	53.1%	37,737
	2021	1,500	29.0%	22,029	55.1%	39,182
	2022	1,500	29.9%	22,648	57.1%	40,603

Management decision	Year	Catch (mt)	State of nature			
			***h* = 0.41**		**Base case (*h*=0.76)**	
			Depletion (%)	**Spawning biomass (mt)**	**Depletion (%)**	**Spawning biomass (mt)**
Constant catch (2,000 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	2,000	28.6%	21,686	49.9%	35,514
	2014	2,000	26.8%	20,332	48.1%	34,184
	2015	2,000	25.4%	19,283	46.7%	33,223
	2016	2,000	24.6%	18,639	46.1%	32,770
	2017	2,000	24.4%	18,486	46.3%	32,967
	2018	2,000	24.7%	18,755	47.5%	33,759
	2019	2,000	25.3%	19,217	49.0%	34,860
	2020	2,000	26.0%	19,720	50.7%	36,082
	2021	2,000	26.6%	20,197	52.5%	37,347
	2022	2,000	27.2%	20,609	54.3%	38,596
Constant catch (2,500 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	2,500	28.6%	21,686	49.9%	35,514
	2014	2,500	26.4%	20,046	47.7%	33,896
	2015	2,500	24.7%	18,729	45.9%	32,663
	2016	2,500	23.5%	17,838	44.9%	31,957
	2017	2,500	23.0%	17,460	44.9%	31,922
	2018	2,500	23.1%	17,520	45.7%	32,499
	2019	2,500	23.4%	17,783	47.0%	33,398
	2020	2,500	23.8%	18,089	48.4%	34,429
	2021	2,500	24.2%	18,364	49.9%	35,513
	2022	2,500	24.5%	18,565	51.4%	36,589
Constant catch (3,000 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	3,000	28.6%	21,686	49.9%	35,514
	2014	3,000	26.0%	19,758	47.2%	33,607
	2015	3,000	24.0%	18,171	45.1%	32,100
	2016	3,000	22.4%	17,032	43.8%	31,140
	2017	3,000	21.7%	16,430	43.4%	30,871
	2018	3,000	21.5%	16,281	43.9%	31,232
	2019	3,000	21.5%	16,341	44.9%	31,928
	2020	3,000	21.7%	16,447	46.1%	32,765
	2021	3,000	21.8%	16,516	47.3%	33,665
	2022	3,000	21.7%	16,500	48.6%	34,565

4.1.3 Non-Overfished Stocks with Higher Annual Catch Limit Attainment Rates or Proposed to be Removed from a Status Quo Stock Complex and Managed with Stock-Specific Harvest Specifications

4.1.3.1.1 Cabezon in Oregon

Cope and Key (2009) estimated the spawning biomass depletion of the Oregon substock of cabezon (*Scorpaenichthys marmoratus*) was 52% at the start of 2009. The stock was managed as a component of the Other Fish complex until 2011 when the stock was removed from the complex and managed under stock-specific specifications.

Total estimated catch by sector in 2004-2012 is provided in Table 4-4, with an estimated average annual catch of 43.1 mt. Oregon recreational catches were obtained from a March 23, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1).

Table 4-4. Estimated total catch (in mt) of cabezon in Oregon by sector, 2004-2012.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside	**0.002**	**0.01**	**0.003**	**0.01**		**0.01**	**0.002**		
Incidental	0.002		0.003				0.002		
Pink Shrimp		0.01		0.01		0.01			
Trawl	**0.03**	**0.1**	**0.1**	**0.02**	**0.1**	**0.1**	**0.01**		**0.1**
Limited Entry Trawl Permit - Trawl Gear	0.03	0.1	0.1	0.02	0.1	0.1	0.01		0.1
Non-Trawl	**44.6**	**45.9**	**38.4**	**38.3**	**41.4**	**46.5**	**40.2**	**47.3**	**44.5**
Nearshore Fixed Gear	27.2	28.3	22.3	21.9	24.8	30.3	23.6	29.8	29.0
OR Recreational	17.4	17.6	16.1	16.3	16.6	16.2	16.5	17.5	15.5
Grand Total	**44.6**	**46.1**	**38.5**	**38.3**	**41.5**	**46.6**	**40.2**	**47.3**	**44.6**

The 2015 and 2016 OFL and ABC is 49 mt and 47 mt (P* = 0.45), respectively. Total estimated catch in 2004-2012 of Oregon cabezon has never been over the 2015 OFL or ABC (Figure 4-1), although the 2011 total catch was equal to the new proposed ABC. The estimated cumulative 2004-2012 catch was 87.9% and 91.9% of the cumulative 2015 OFL and ABC, respectively. Continued management of this stock under the default harvest control rules is predicted to be sustainable.

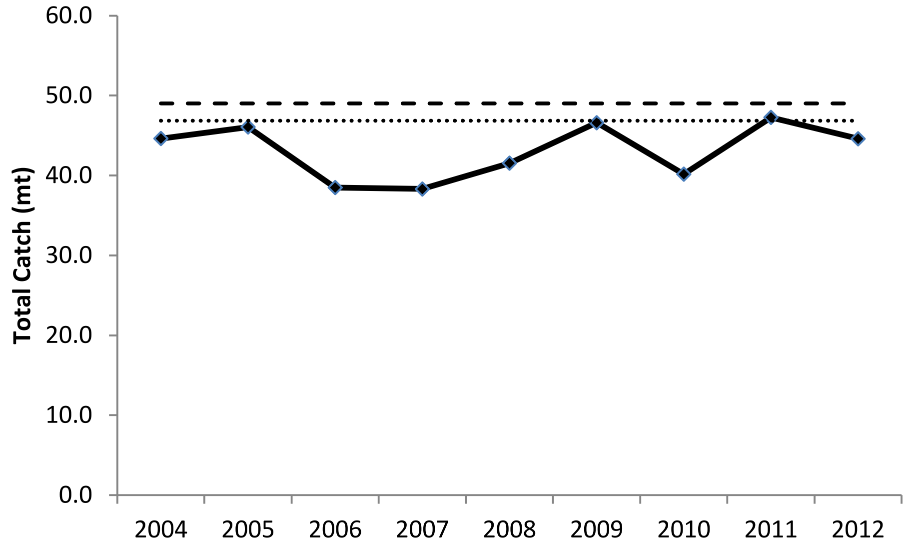

Figure 4-1. Estimated total catch of cabezon in Oregon, 2004-2012, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.2 Cabezon in Washington

The cabezon population in Washington has never been assessed. Cabezon have a very shallow distribution with most common occurrence in waters 30 fm and shallower. Cabezon are distributed almost solely in state waters on the U.S. west coast.

New OFLs for cabezon in Washington were originally proposed using a DB-SRA and a depletion prior of 62% in 1997 based on estimated depletion estimated in the 2009 assessment of the Oregon substock (Cope and Key 2009) (Table 4-5). The SSC noted in March 2014 that the population off Washington was estimated to be at a lower fraction of its unfished level than that off Oregon, even though catches increased substantially off Oregon following the mid-1990s. This resulted from the full assessment for cabezon off Oregon indicating increased recruitment after 1997 which cannot be reflected in the DB-SRA assessment method applied for cabezon off Washington. Therefore, the SSC recommended that the DB-SRA assessment for cabezon off Washington be revised, assuming that the depletion in 2010 equals that inferred from the assessment for Oregon (48%). The Council will decide the P* for deciding 2015 and 2016 OFLs and ABCs for Washington cabezon at the April meeting. The 2016 OFL varies by the P* choice since the 2015 is assumed to be removed in 2015 when projecting the 2016 OFL.

Total estimated catch by sector in 2004-2013 (the recreational fishery is the only sector in the time series) is provided in Table 4-6, with an estimated average annual catch of 5.8 mt. Nearshore commercial fisheries have been prohibited in Washington waters since 1999. Washington recreational catches were obtained from a March 22, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1).

Table 4-5. Washington cabezon OFLs and ABCs for 2015 and 2016, assuming different depletion levels and ABC catches in 2015.

Depletion	P*	OFL		ABC	
		2015	2016	2015	2016
62% in 1997	0.45	4.0	4.4	3.3	3.6
62% in 1997	0.25	4.0	4.7	1.5	1.8
48% in 2010	0.45	4.5	4.8	3.7	4.0
48% in 2010	0.40	4.5	4.9	3.1	3.4
48% in 2010	0.35	4.5	5.0	2.6	2.9
48% in 2010	0.30	4.5	5.1	2.1	2.4
48% in 2010	0.25	4.5	5.1	1.7	1.9

Table 4-6. Estimated total catch (in mt) of cabezon in Washington by sector, 2004-2013.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Non-Trawl	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**2.7**	**8.7**	**6.5**	**5.9**
WA Recreational	5.9	7.9	5.8	4.3	2.7	5.2	2.7	8.7	6.5	5.9
Grand Total	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**5.3**	**8.7**	**6.5**	**5.9**

4.1.3.3 Kelp Greenling in California

The kelp greenling (*Hexagrammos decagrammus*) population in California has never been assessed[1]. Kelp greenling have a very shallow distribution with most common occurrence in waters 10 fm and shallower. Kelp greenling are distributed solely in state waters on the U.S. west coast.

The proposed 2015 and 2016 OFL of 118.9 mt is based on a 2012 DB-SRA estimate first implemented in 2013. The proposed ABC of 99.2 mt is based on a P* of 0.45. Total estimated catch by sector is provided in Table 4-7, with an estimated average annual catch of 13.3 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were provided by the GMT. Set-asides (estimated catch in the California halibut and incidental groundfish fisheries) were assumed to be from fisheries in California, while all trawl catches were assumed to be from fisheries in Oregon. Commercial non-trawl catches were reported by state. Total estimated catch in 2004-2011 of kelp greenling in California has been well below the 2015 OFL and ABC (Figure 4-2). The estimated cumulative 2004-2011 catch was 11.2% and 13.4% of the cumulative 2015 OFL and ABC, respectively.

[1] A 2005 assessment of kelp greenling in California was reviewed by a STAR panel and the SSC but was not recommended for management use due to insufficient data to adequately estimate status or biomass.

Table 4-7. Estimated total catch (in mt) of kelp greenling in California by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Set-Aside	**0.001**	**0.013**	**0.003**	**0.017**	**0.012**	**0.000**	**0.000**	**0.006**
California Halibut		0.012						
Incidental	0.001	0.001	0.003	0.017	0.012			0.006
Non-Trawl	**14.3**	**7.8**	**8.9**	**7.6**	**9.8**	**15.6**	**17.8**	**24.6**
California Commercial	2.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0
California Recreational	12.3	5.8	6.9	6.6	8.8	14.6	15.8	22.6
Grand Total	**14.3**	**7.8**	**8.9**	**7.6**	**9.8**	**15.6**	**17.8**	**24.6**

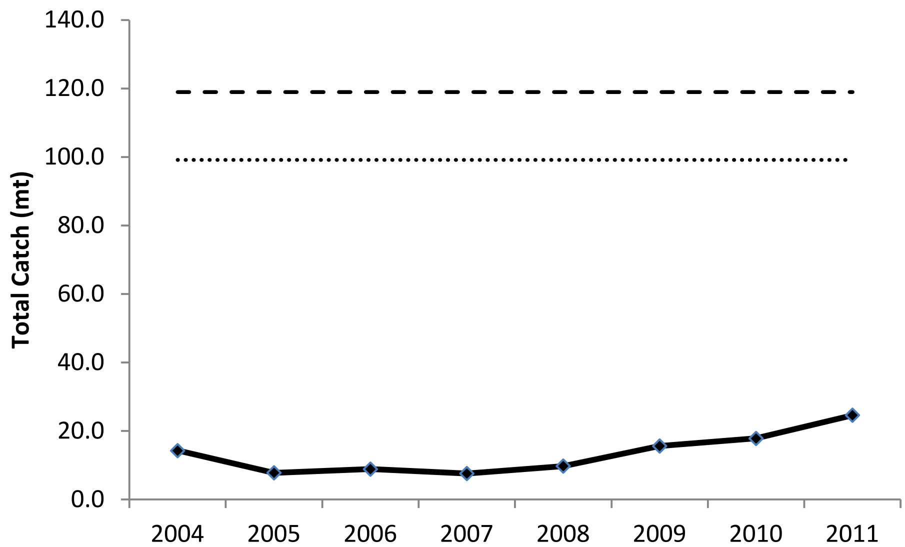

Figure 4-2. Estimated total catch of kelp greenling in California, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.4 Kelp Greenling in Oregon

The kelp greenling population was assessed in 2005 (Cope and MacCall 2006) with an estimated depletion of 49% at the start of 2005. The SSC recommended the assessment was adequate for determining status of the population, but there was too much uncertainty in the biomass estimate to use for deciding harvest specifications. The stock has been managed under an annual state HG of 28 mt since 2007.

A new DB-SRA-based OFL estimate was developed for kelp greenling in Oregon using the 49% depletion prior from the 2005 assessment. Total estimated catch by sector is provided in Table 4-8, with an estimated average annual catch of 24.2 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were provided by the GMT. Set-asides (estimated catch in the California halibut and incidental groundfish fisheries) were assumed to be from fisheries in California, while all trawl catches were assumed to be from fisheries in Oregon. Commercial non-trawl catches were reported by state. Total estimated catch in 2004-2011 of kelp greenling in Oregon has been over the 2015 OFL and ABC (Figure 4-3). The estimated cumulative 2004-2011 catch was 173.1% and 207.5% of the cumulative 2015 OFL and ABC, respectively.

Table 4-8. Estimated total catch (in mt) of kelp greenling in Oregon by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Trawl	**0.1**	**0.1**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.1**
Limited Entry Trawl Permit - Trawl Gear	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.1
Non-Tribal At-Sea Hake		0.0	0.0					
Non-Trawl	**26.4**	**25.1**	**17.1**	**21.5**	**25.6**	**24.2**	**24.8**	**28.5**
Oregon Commercial	22.0	21.0	14.0	18.0	22.0	20.0	18.0	21.0
Oregon Recreational	4.4	4.1	3.1	3.5	3.6	4.2	6.8	7.5
Grand Total	**26.5**	**25.3**	**17.2**	**21.7**	**25.6**	**24.2**	**24.9**	**28.5**

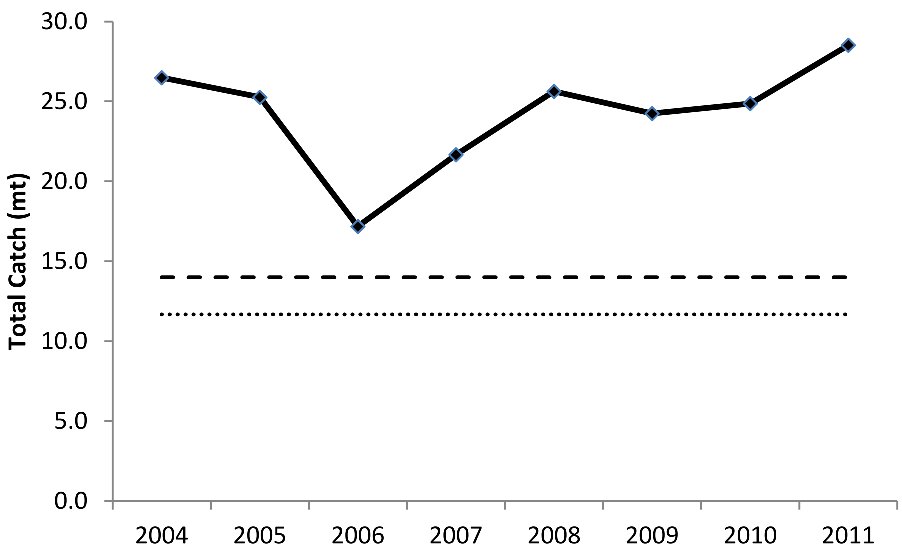

Figure 4-3. Estimated total catch of kelp greenling in Oregon, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.5 Kelp Greenling in Washington

The kelp greenling population in Washington has never been assessed. The proposed 2015 and 2016 OFL of 31.4 mt for kelp greenling in Washington as based on a new DB-SRA estimate using the 49% depletion prior from the 2005 assessment. The proposed ABC of 31.4 mt is based on a P* of 0.4. Total estimated catch by sector (the recreational fishery is the only sector in the time series) is provided in Table 4-9, with an estimated average annual catch of 1.7 mt. Nearshore commercial fisheries have been prohibited in Washington waters since 1999. Washington recreational catches were provided by the GMT. Total estimated catch in 2004-2011 of kelp greenling in Washington has been well below the 2015 OFL and ABC (Figure 4-4). The estimated cumulative 2004-2011 catch was 5.4% and 7.8% of the 2015 OFL and ABC, respectively.

Table 4-9. Estimated total catch (in mt) of kelp greenling in Washington by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Non-Trawl	**2.0**	**1.9**	**1.3**	**1.2**	**1.0**	**1.3**	**2.7**	**2.1**
Washington Recreational	2.0	1.9	1.3	1.2	1.0	1.3	2.7	2.1
Grand Total	**2.0**	**1.9**	**1.3**	**1.2**	**1.0**	**1.3**	**2.7**	**2.1**

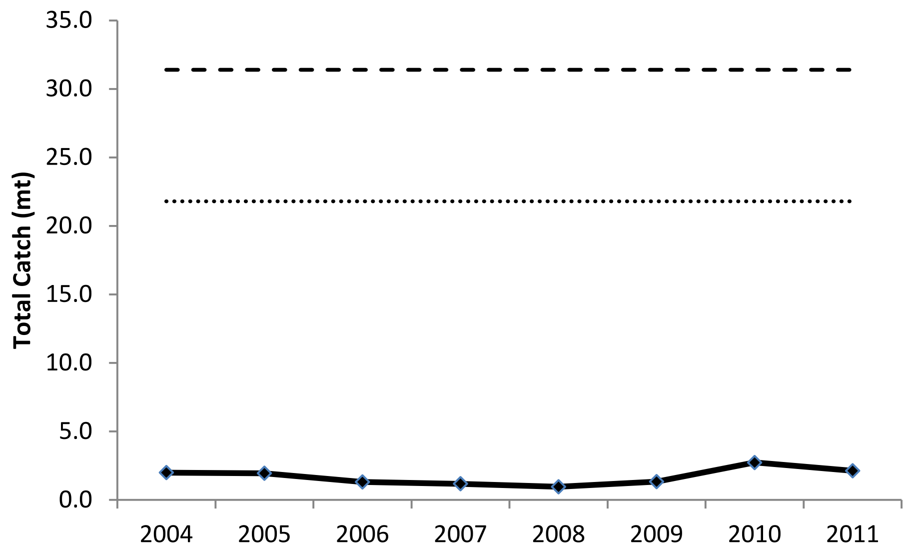

Figure 4-4. Estimated total catch of kelp greenling in Washington, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.6 Leopard Shark

The leopard shark (*Triakis semifasciata*) population on the U.S. west coast has never been assessed. Leopard shark have a very shallow distribution. While they are occasionally found as deep as 50 fm, their most common occurrence is 2 fm and shallower. Leopard shark are only caught in nearshore waters off California.

The proposed 2015 and 2016 OFL of 167.1 mt is based on a 2012 DB-SRA estimate first implemented in 2013. The proposed ABC of 139.4 mt is based on a P* of 0.45. Total estimated catch by sector is provided in Table 4-10, with an estimated average annual catch of 26.8 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were obtained from a March 23, 2014 RecFIN query of landed catch (A) and reported dead catch (B1). Total estimated catch in 2004-2012 of leopard shark in California has been well below the 2015 OFL and ABC (Figure 4-5). The estimated cumulative 2004-2012 catch was 15.8% and 19% of the cumulative 2015 OFL and ABC, respectively.

Table 4-10. Estimated total catch (in mt) of leopard shark by sector, 2004-2011.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside	**7.6**	**8.2**	**5.9**	**13.3**	**12.1**	**9.1**	**4.6**	**2.5**	**2.3**	**7.6**	**1.7**
California Halibut	0.7	2.3	1.0	7.8	4.9	1.2	2.8	1.2	0.5	5.6	0.0
Incidental	6.9	5.9	4.9	5.5	7.1	7.9	1.8	1.3	1.8	2.0	1.6
Pink Shrimp	0.1	0.05	0.1		0.0				0.03		0.01
Non-Trawl	**6.0**	**3.4**	**22.0**	**21.8**	**61.6**	**5.2**	**10.7**	**3.3**	**12.3**	**15.6**	**25.4**
Nearshore Fixed Gear	0.2	0.2	0.2	0.5	1.1	1.0	0.4	0.1	0.2	0.2	0.2
Non-nearshore Fixed Gear	5.8	3.2	5.6	5.8	2.6	1.8	0.7	0.3	0.7	0.2	1.0
CA Recreational			16.2	15.5	58.0	2.4	9.6	2.8	11.4	15.2	24.2
Trawl	**0.0**	**0.1**	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
Limited Entry Trawl Permit - Trawl Gear	0.0	0.1	0.0	0.9	0.0	0.0				0.0	0.3
Grand Total	**13.7**	**11.7**	**28.0**	**36.0**	**73.7**	**14.3**	**15.3**	**5.7**	**14.6**	**23.2**	**27.3**

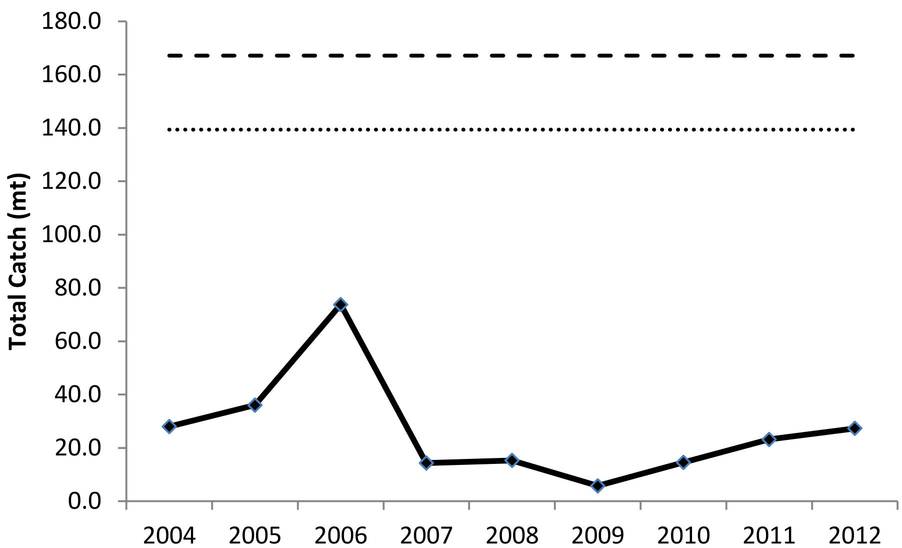

Figure 4-5. Estimated total catch of leopard shark off California, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.7 Sablefish North of 36º N lat.

The 2011 sablefish (*Anoplopoma fimbria*) assessment estimated spawning stock biomass to be at 33 percent of its unfished biomass at the beginning of 2011 (Stewart, *et al*. 2011). The resource was modeled as a single stock; however, there is some dispersal to and from offshore seamounts and along the coastal waters of the continental U.S., Canada, Alaska, and across the Aleutian Islands to the western Pacific which was not explicitly accounted for in this analysis. They are found in waters as from 27-1,000 fm but are most common in the 110-550 fm depth zone.

Sablefish is a major target species in offshore fixed gear and bottom trawl fisheries and is the most valuable commercial groundfish stock on a per pound basis. While the assessment is coastwide and coastwide OFLs and ABCs are specified for the stock, ACLs are apportioned north and south of 36º N lat. since long-term formal allocations have been decided for the portion of the population north of 36º N lat. Only the population north of 36º N lat. has experienced catches with high attainment rates relative to specified ACLs/OYs; the percent difference in the cumulative 2002-2012 catch of sablefish south of 36º N lat. has been 27.1% of the cumulative 2015 ACL.

The proposed coastwide OFL of 7,857 mt is projected from the 2011 assessment. The proposed ABC of 7,173 mt is based on a P* of 0.4. The coastwide ABC is apportioned 73.6% to the north based on the average annual 2003-2010 proportion of estimated swept-area biomass from the NWFSC trawl survey. The 2015 40-10 adjusted ACL for sablefish north of 36º N lat. is 4,793 mt.

Total catches by sector of sablefish north of 36º N lat. are provided in Table 4-11. The cumulative 2002-2012 total catch of sablefish north of 36º N lat. was 19.5% higher than the cumulative 2015 ACL, although the OY (now ACL) was only exceeded in 2007 due to a data glitch in a PacFIN data feed which has now been fixed. In hindsight, the 2015 ACL was exceeded in 9 of the 11 years analyzed (Figure 4-6). Sablefish is one of the most closely tracked species in the U.S. west coast groundfish fishery and the chance of overfishing the stock in 2015 and 2016 is low.

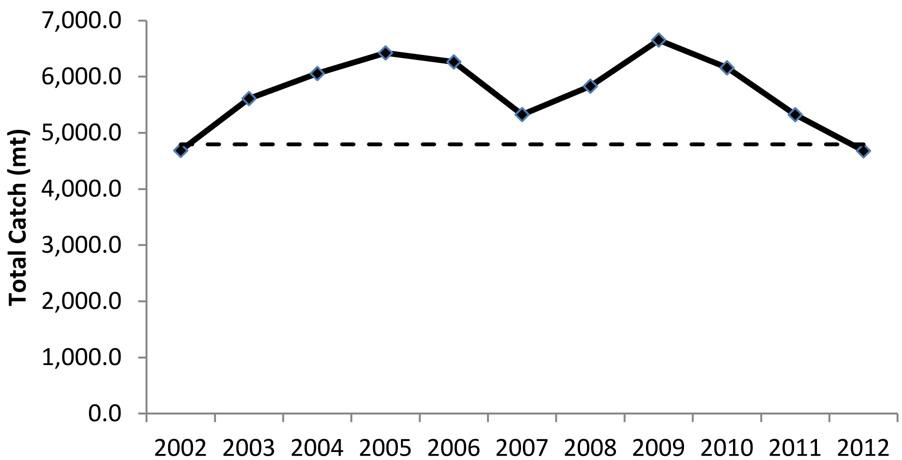

Figure 4-6. Estimated total catch of sablefish north of 36º N lat., 2002-2012 relative to the proposed 2015 ACL (horizontal dashed line).

Table 4-11. Estimated total catch by sector of sablefish north of 36º N lat., 2001-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sablefish (North of 36° N. lat.)											
Set-Aside	**492.3**	**734.4**	**871.8**	**803.6**	**735.0**	**597.8**	**570.8**	**673.2**	**593.0**	**551.9**	**593.7**
California Halibut		0.0	0.1	0.0			0.0				
Incidental	42.3	131.2	161.1	109.7	66.1	82.1	41.3	32.8	12.2	18.7	31.6
Pink Shrimp	13.8	0.6	0.7	0.4		0.3	2.2	0.9	1.3	0.1	0.2
Tribal At-Sea Hake	0.5	0.1	0.1	0.0		0.0	0.8	0.0		0.1	
Tribal Shoreside	435.7	602.5	709.9	693.5	668.8	515.5	526.5	639.5	579.5	533.0	561.9
Non-Trawl	**1,700.0**	**2,450.9**	**2,580.9**	**3,075.6**	**2,890.3**	**2,119.0**	**2,323.3**	**2,791.6**	**2,791.6**	**2,388.3**	**1,899.4**
Nearshore Fixed Gear	14.9	10.7	2.1	41.5	8.6	2.6	3.3	3.2	2.9	1.4	1.7
Non-nearshore Fixed Gear	1,685.1	2,440.2	2,578.8	3,034.1	2,881.7	2,116.3	2,319.9	2,788.5	2,788.7	2,386.8	1,897.7
Trawl	**2,494.1**	**2,425.6**	**2,603.6**	**2,543.7**	**2,637.5**	**2,609.1**	**2,937.2**	**3,187.5**	**2,773.4**	**2,383.6**	**2,186.8**
Non-Tribal At-Sea Hake	21.1	17.1	28.5	15.2	2.4	3.2	1.6	0.2	12.4	5.0	5.1
Shoreside Hake	132.9	40.3	129.4	22.4	11.1	9.0	0.3	49.2	20.8	30.4	47.2
Limited Entry Trawl Permit - Trawl Gear	2,340.0	2,368.2	2,445.7	2,506.1	2,624.1	2,596.9	2,935.3	3,138.1	2,740.2	1,661.0	1,407.7
Limited Entry Trawl Permit - Fixed Gear										687.2	726.8
Grand Total	**4,686.3**	**5,610.9**	**6,056.4**	**6,422.9**	**6,262.8**	**5,325.9**	**5,831.3**	**6,652.3**	**6,158.0**	**5,323.7**	**4,679.8**

4.1.3.8 Spiny Dogfish

Gertseva and Taylor (2011) estimated the spawning stock output of spiny dogfish to be 44,660 thousands of fish, which represented 63% of the unfished spawning output level at the start of 2011. While this depletion level indicated the stock was healthy, fishing at the target SPR of 45% was predicted to severely reduce the spawning output over the long term because of the extremely low productivity and other reproductive characteristics of the stock.

The SSC's recommended change in the proxy F_{MSY} harvest rate to calculate the OFL for this stock from an SPR of 45% to an SPR of 50% addresses the conservation need for a more conservative OFL (see the 2014 Stock Assessment and Fishery Evaluation document (PFMC 2014) for more information on the meta-analysis used to recommend the new proxy F_{MSY} harvest rate for elasmobranchs). The new proposed 2015 and 2016 OFLs based on the 50% SPR harvest rate of 2,523 and 2,503 mt, respectively compare to 2015 and 2016 OFLs based on the status quo 45% SPR harvest rate of 2,921 and 2,893 mt, respectively.

Total annual catches of spiny dogfish from 2004-2012 by sector of the groundfish fishery are provided in Table 4-12. Spiny dogfish catches prior to 2004 were not included in the biological impact analysis due to a lack of confidence in the precision of catch estimates derived from the Marine Recreational Fisheries Statistical Survey (MRFSS), which was the basis of California recreational catch estimates prior to implementation of the California Recreational Fisheries Survey (CRFS) in 2004. Spiny dogfish catches in recreational fisheries by state were generated from a March 15, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1). Since spiny dogfish catches in the Washington recreational fishery are reported in the Unidentified Sharks category, the A + B1 catches of Unidentified Sharks were used with an assumption 100% of that reported catch was spiny dogfish. Gertseva and Taylor (2011) made a similar assumption in the 2011 assessment. Catches by sector in the non-tribal at-sea hake fishery (Catcher-Processors and Mothership) were generated from a NMFS Alaska Fisheries Information Network NORPAC database query on March 14, 2014. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program.

Figure 4-7 compares the 2004-2012 annual total catches of spiny dogfish to the proposed 2016 OFL and ABC limits (2016 limits are slightly lower than 2015 limits so these values were chosen). In hindsight, the stock did not exceed the 2016 OFL and experience overfishing during the time series (Figure 4-7). The 2016 ABC was exceeded twice (2005 and 2008) primarily due to high bottom trawl catches (Table 4-12). Trawl catches seem to have stabilized at levels below the 2016 ABC in recent years with the lowest bottom trawl catches occurring since 2011 when the sector was rationalized under IFQ management (catches in the trawl IFQ sector since 2011 are the sum of those in the limited entry trawl permit – fixed gear, limited entry trawl permit – trawl gear, and shoreside hake categories in Table 4-12) While spiny dogfish is not an IFQ species, the distribution of bottom trawl effort in the shorebased IFQ sector changed dramatically since implementation of trawl rationalization. Total catches of spiny dogfish in 2012 were the lowest in the time series.

Managing the stock with its own OFL and ABC starting in 2015 will provide more direct catch accounting and control. There does not appear to be a high risk of the stock being subject to overfishing in the next management cycle. If further catch controls are needed in the future to reduce impacts, the Council and NMFS can consider a trawl allocation designating the species as an IFQ species through a regulatory amendment. However, determining an equitable catch history-based allocation of quota shares by trawl permit may be very difficult given the uncertain catch history of spiny dogfish (dogfish are rarely landed and have been discarded in most fisheries). In the meantime, cumulative landing limits and area closures are the catch control tools available to manage spiny dogfish (PFMC and NMFS 2012).

The cumulative catch of spiny dogfish in 2004-2012 was 39.4% less than the cumulative 2016 OFL (the 2016 OFL times the number of years in the analysis (9)), indicating the proposed harvest specifications and the total catch since 2004 have not created a significant biological risk for the stock of spiny dogfish on the U.S. west coast.

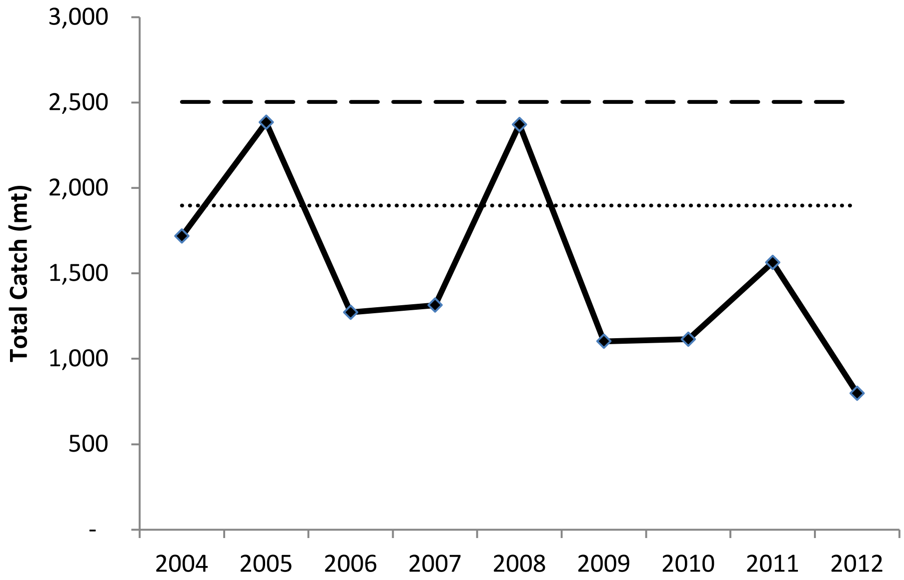

Figure 4-7. Estimated total catch of spiny dogfish, 2004-2012 relative to the proposed 2016 OFL (upper dashed line) and ABC (lower dotted line).

Table 4-12. Annual total catches of spiny dogfish by sector, 2004-2012.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**453**	**324**	**127**	**192**	**485**	**259**	**149**	**191**	**5**	**2,185**
California Halibut	35	25	8	3	3	3	3	2	2	84
Incidental	98	8	6	0.2	15	1	1	0.1	0.1	131
Pink Shrimp	5	1		1	4	0.5	16	3	1	31
Tribal At-Sea Hake	275	285	35	69	159	128	122	59	1	1,133
Tribal Shoreside	40	6	77	119	303	125	7	128	2	806
Non-Trawl	**251**	**303**	**351**	**347**	**290**	**125**	**135**	**73**	**85**	**1,961**
Nearshore Fixed Gear	0.04	0.18	0.03	0.27	0.78	0.49	0.11	0.28	0.02	2.20
Non-nearshore Fixed Gear	247	298	347	342	286	120	133	63	82	1,918
CA rec a/	2.3	4.1	3.2	5.0	2.5	3.7	1.3	9.5	2.6	34.10
OR rec a/	0.07	0.09	0.005	0.04	0.02	0.07	0.08	0.05	0.06	0.48
WA rec a/	1.6	0.5	0.8	-	0.9	0.7	1.1	0.2	0.4	6.3
Trawl	**1,015**	**1,757**	**794**	**775**	**1,596**	**719**	**830**	**1,300**	**707**	**9,499**
Limited Entry Trawl Permit - Fixed Gear								27	29	56
Limited Entry Trawl Permit - Trawl Gear	644	1,591	737	637	1,024	663	523	367	340	6,530
Catcher-Processor b/	331	42	6	63	488	28	110	641	148	1,859
Mothership b/	10	28	17	23	24	7	45	85	30	269
Shoreside Hake	30	96	34	51	59	21	151	181	160	785
Total Non-Treaty Groundfish Sectors	**1,266**	**2,060**	**1,145**	**1,122**	**1,886**	**844**	**965**	**1,373**	**793**	**11,461**
Grand Total	**1,719**	**2,385**	**1,272**	**1,314**	**2,371**	**1,103**	**1,114**	**1,564**	**798**	**13,647**

a/ Catches generated from a RecFIN query (03/15/2014) of spiny dogfish catches (A + B1) in CA and OR; and of unidentified shark catches (A + B1), assumed to be spiny dogfish, in WA.
b/ Catches generated from a NORPAC query (03/14/2014).

4.1.4 Stock Complexes and Component Stocks Currently Managed in Stock Complexes with Higher Annual Catch Limit Attainment Rates

4.1.4.1 Nearshore Rockfish North of 40º10’ N lat.

In recent years, the ACL (formerly OY) for the Nearshore Rockfish complex north of 40º10’ N lat. has typically had a high attainment rate. The bulk of the harvest has occurred in nearshore recreational fisheries in all three states and nearshore commercial fisheries in California and Oregon. The proposed ACL for the northern nearshore rockfish complex in 2015 and 2016 is 69 mt, a 26.6% decrease from the 2014 ACL of 94 mt. Most of this decrease is due to new assessments for brown, China, and copper rockfish, as well as a blue rockfish ACL contribution that is trending downwards. Figure 4-8 depicts the annual total catch estimated in 2004-2012 for the complex relative to the proposed 2015 OFL, ABC, and ACL. In only one year in this time period (2009) has total catch been below the proposed 2015 ACL. In hindsight, total catch has been at or above the proposed 2015 OFL in 5 of the 9 years analyzed.

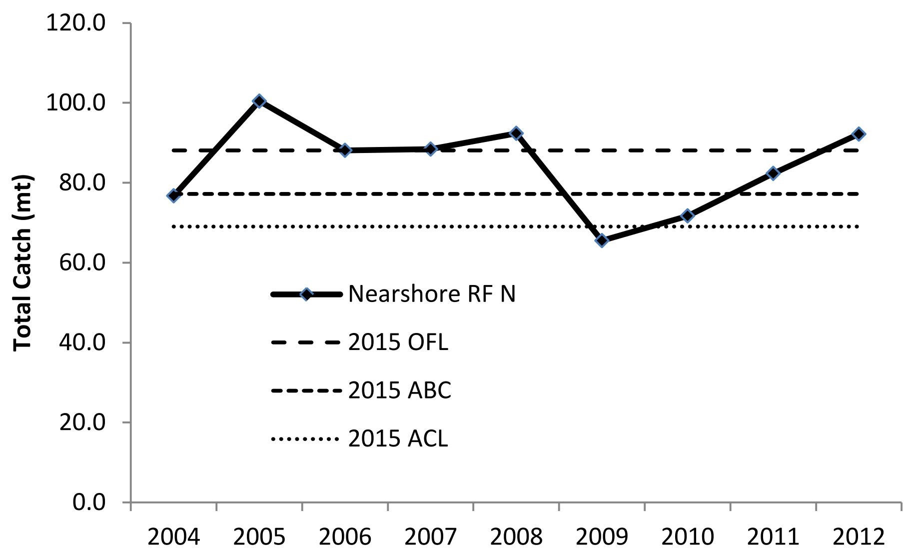

Figure 4-8. Estimated total catch of nearshore rockfish north of 40º10’ N lat. in 2004-2012 relative to the proposed 2015 OFL (upper dashed line), ABC (middle dashed line), and ACL (lower dotted line).

Table 4-13 shows the 2004-2012 total catches of species in the northern Nearshore Rockfish complex by sector. Northern Nearshore Rockfish catches prior to 2004 were not included in the biological impact analysis due to a lack of confidence in the precision of catch estimates derived from the Marine Recreational Fisheries Statistical Survey (MRFSS), which was the basis of California recreational catch estimates prior to implementation of the California Recreational Fisheries Survey (CRFS) in 2004. Northern Nearshore Rockfish catches in recreational fisheries by state were generated from a March 18, 2014 RecFIN query by querying for landed catch (A) plus the reported dead catch (B1). Catch estimates for the Redwood District (Humboldt and Del Norte counties) were used in the query to represent catches north of 40º10’ N lat. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program.

Two of the assessed stocks managed in the northern Nearshore Rockfish complex (blue rockfish in California and China rockfish) are in the precautionary zone. Both stocks are category 2 stocks with the status of China rockfish informed by a 2013 data-moderate assessment (PFMC 2014). Blue rockfish catches in California have been managed with a statewide HG since 2009. The HG was calculated using the default 40-10 ACL harvest control rule. Total mortality has been maintained within the HG and the stock is predicted to be increasing in abundance. The Council is considering HG management for the entire complex and/or China rockfish to be implemented in 2015.

Other assessed stocks managed in the northern Nearshore Rockfish complex include brown rockfish in California, copper rockfish, and gopher rockfish in California. All of these stocks are estimated to be healthy.

Table 4-13. Annual total catches of nearshore rockfish north of 40°10’ N lat. by sector, 2004-2012.

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**0.2**	**0.3**	**0.3**	**0.4**	**0.0**	**0.1**	**0.0**	**0.0**	**0.2**	**1.6**
Incidental	**0.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.4**
Black and Yellow Rockfish										0.0
Blue Rockfish	0.0	0.0		0.0					0.1	0.1
Brown Rockfish							0.0			0.0
China Rockfish				0.0						0.0
Copper Rockfish				0.0						0.0
Gopher Rockfish				0.0						0.0
Nearshore Rockfish Unid	0.1	0.0	0.0	0.0						0.1
Olive Rockfish							0.0			0.0
Quillback Rockfish	0.0								0.1	0.1
Pink Shrimp	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
Blue Rockfish				0.2	0.0					0.2
Copper Rockfish		0.0								0.0
Olive Rockfish								0.0		0.0
Quillback Rockfish										0.0
Tribal Shoreside	**0.1**	**0.2**	**0.3**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.9**
Copper Rockfish	0.0									0.0
Nearshore Rockfish Unid	0.0	0.2	0.0		0.0	0.1		0.0	0.1	0.4
Quillback Rockfish	0.1	0.1	0.2	0.1						0.5
Non-Trawl	**74.2**	**99.8**	**85.2**	**87.9**	**92.3**	**65.3**	**71.7**	**82.2**	**91.8**	**750.5**
Nearshore Fixed Gear	**28.3**	**38.0**	**35.5**	**34.5**	**51.5**	**26.4**	**19.3**	**28.8**	**28.0**	**290.2**
Black and Yellow Rockfish	0.1	0.5	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.9
Blue Rockfish	15.0	21.2	19.8	14.5	29.7	11.7	10.8	15.2	12.3	150.2
Brown Rockfish	0.3	0.9	0.7	0.4	0.4	0.2	0.1	0.0	0.3	3.3
China Rockfish	7.5	4.7	5.8	8.1	9.8	8.8	5.3	8.5	9.4	68.0
Copper Rockfish	2.0	2.5	2.1	3.2	3.8	1.9	1.2	1.7	2.2	20.5

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand
Gopher Rockfish	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.8
Grass Rockfish	0.9	2.0	1.3	0.9	0.4	0.3	0.2	0.2	0.2	6.4
Nearshore Rockfish Unid	0.3	1.4	0.8	0.2						2.8
Olive Rockfish	0.0		0.0	0.4	0.0	0.7	0.0	0.1	0.1	1.3
Quillback Rockfish	2.2	4.7	4.9	6.6	7.1	2.6	1.5	2.9	3.4	35.9
Non-nearshore Fixed Gear	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.3**
Copper Rockfish						0.1				0.1
Olive Rockfish	0.2									0.2
Quillback Rockfish						0.1				0.1
CA Rec	**11.5**	**11.9**	**14.6**	**16.0**	**7.2**	**9.6**	**10.6**	**8.7**	**10.1**	**100.1**
Black and Yellow Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Blue Rockfish	8.0	8.5	9.3	6.6	2.2	3.1	4.1	2.7	2.9	47.4
Brown Rockfish	0.1	0.2	0.7	0.6	0.7	0.5	0.8	0.4	0.5	4.6
China Rockfish	0.5	0.5	0.6	1.5	1.0	1.6	0.9	1.2	1.4	9.2
Copper Rockfish	1.3	0.8	1.6	3.5	1.5	2.2	2.4	1.5	1.4	16.4
Gopher Rockfish	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.2	0.1	0.8
Grass Rockfish	0.1	0.1	0.0	0.2	0.2	0.3	0.6	0.2	0.1	2.0
Olive Rockfish	0.4	0.1	0.4	0.4	0.0	0.2	0.2	0.1	0.1	1.8
Quillback Rockfish	1.0	1.7	1.8	2.9	1.4	1.7	1.4	2.2	3.6	17.7
OR Rec	**27.2**	**41.9**	**27.2**	**29.4**	**26.9**	**24.9**	**32.8**	**36.7**	**45.9**	**292.8**
Black and Yellow Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blue Rockfish	20.8	33.2	16.0	17.3	16.2	15.9	22.0	21.4	26.1	188.8
Brown Rockfish	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.6
China Rockfish	2.0	2.1	2.6	3.1	2.9	2.3	2.6	3.4	3.7	24.6
Copper Rockfish	2.0	3.2	3.7	4.2	3.7	2.8	3.8	5.9	7.2	36.6
Grass Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Olive Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Quillback Rockfish	2.4	3.3	4.8	4.8	4.1	3.7	4.2	5.7	8.8	41.8

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand
WA Rec	**7.1**	**8.0**	**8.0**	**8.0**	**6.7**	**4.3**	**9.0**	**8.1**	**7.9**	**67.0**
Blue Rockfish	1.4	2.3	2.1	1.8	1.0	0.6	2.6	1.4	1.8	15.0
China Rockfish	2.1	2.0	2.4	2.6	2.4	1.7	3.5	2.8	2.7	22.1
Copper Rockfish	0.9	1.2	1.1	1.2	1.3	0.6	1.3	2.2	1.2	11.1
Quillback Rockfish	2.8	2.5	2.4	2.3	2.1	1.3	1.6	1.7	2.2	18.8
Trawl	**2.4**	**0.3**	**2.6**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**5.8**
Limited Entry Trawl Permit - Trawl Gear	**2.4**	**0.3**	**2.5**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**5.7**
Blue Rockfish		0.0						0.0		0.0
Brown Rockfish	0.4	0.0	0.0		0.0			0.0	0.0	0.4
China Rockfish										0.0
Copper Rockfish	0.0	0.1	0.1		0.0					0.2
Nearshore Rockfish Unid	0.3	0.1	0.1	0.0					0.0	0.6
Olive Rockfish	0.1									0.1
Quillback Rockfish	1.5	0.1	2.3	0.1	0.1	0.1	0.0	0.1	0.1	4.3
Non-Tribal At-Sea Hake	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Blue Rockfish			0.0							0.0
Quillback Rockfish			0.0		0.0					0.0
Shoreside Hake	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**
Blue Rockfish			0.0							0.0
Nearshore Rockfish Unid			0.1	0.0	0.0		0.0			0.1
Quillback Rockfish		0.0			0.0					0.0
Grand Total	**76.7**	**100.4**	**88.1**	**88.4**	**92.4**	**65.5**	**71.7**	**82.3**	**92.2**	**757.9**

4.1.4.2 China Rockfish North of 40º10' N lat.

The populations of China rockfish (*Sebastes nebulosus*) north and south of 40º10' N lat. were assessed by Dick and Cope (2014) in a new 2013 data-moderate assessment. The southern population was estimated to be healthy with an estimated depletion of 72% at the start of 2013. However, the northern population, managed as a component stock in the northern Nearshore Rockfish complex, was estimated to at 33% of unfished biomass at the start of 2013 (*cite new figure of SpB and depl time series*), and hence in the precautionary zone.

(*insert new figure of SpB and depl time series*)

China rockfish have a shallow distribution and are most common in the 10-50 fm zone (Love, *et al.* 2002). They are primarily caught in nearshore commercial fisheries in California and Oregon, as well as nearshore recreational fisheries in waters off all three states. Table 4-14 provides the estimated annual catches of China rockfish north of 40º10' N lat. by sector in 2004-2012. The average annual total catch in 2004-2012 is estimated to be 13.8 mt.

The estimated 2015 OFL contribution of China rockfish in the north Nearshore Rockfish complex is 7.2 mt. Under the preferred P* of 0.45, the 2015 ABC contribution is 6.6 mt and the 40-10 adjusted ACL contribution is 6.2 mt. Figure 4-9 depicts total estimated catch of China rockfish north of 40º10' N lat. relative to the 2015 OFL and ACL contributions to the complex. The cumulative 2004-2012 total estimated catch of China rockfish north of 40º10' N lat. was 191% and 221% of the cumulative 2015 OFL and ACL contributions, respectively. Maintaining these catch levels is predicted to lead to continued stock decline (*need final decision table with depletion projections*).

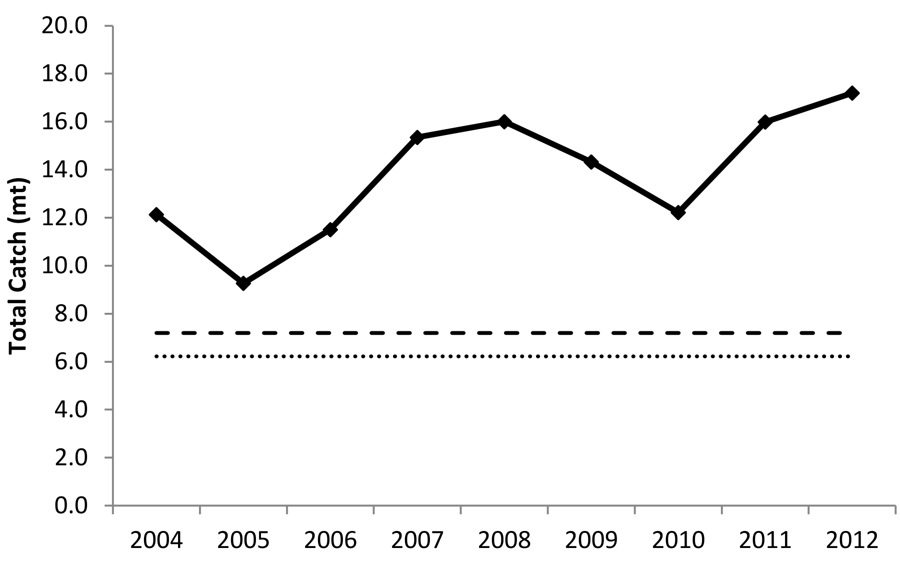

Figure 4-9. Estimated total catch of China rockfish north of 40º10' N lat. in 2004-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ACL contribution (lower dotted line).

Table 4-14. Annual total catches of China rockfish north of 40º10' N lat. by sector, 2004-2012.

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside				**0.01**					
Incidental				**0.01**					
China Rockfish				0.01					
Non-Trawl	**12.1**	**9.3**	**11.5**	**15.3**	**16.0**	**14.3**	**12.2**	**16.0**	**17.2**
Nearshore Fixed Gear	**7.5**	**4.7**	**5.8**	**8.1**	**9.8**	**8.8**	**5.3**	**8.5**	**9.4**
China Rockfish	7.5	4.7	5.8	8.1	9.8	8.8	5.3	8.5	9.4
CA Rec	**0.5**	**0.5**	**0.6**	**1.5**	**1.0**	**1.6**	**0.9**	**1.2**	**1.4**
China Rockfish	0.5	0.5	0.6	1.5	1.0	1.6	0.9	1.2	1.4
OR Rec	**2.0**	**2.1**	**2.6**	**3.1**	**2.9**	**2.3**	**2.6**	**3.4**	**3.7**
China Rockfish	2.0	2.1	2.6	3.1	2.9	2.3	2.6	3.4	3.7
WA Rec	**2.1**	**2.0**	**2.4**	**2.6**	**2.4**	**1.7**	**3.5**	**2.8**	**2.7**
China Rockfish	2.1	2.0	2.4	2.6	2.4	1.7	3.5	2.8	2.7
Grand Total	**12.1**	**9.3**	**11.5**	**15.3**	**16.0**	**14.3**	**12.2**	**16.0**	**17.2**

4.1.4.3 Shallow Roundfish Complex

An alternative to managing cabezon in Washington; kelp greenling in California, Oregon, and Washington; and leopard shark with stock-specifications is to manage these five populations in a coastwide Shallow Rockfish complex.

4.1.4.4 Slope Rockfish Complexes North and South of 40º10' N lat.

Alternative Slope Rockfish complex structures are under consideration due primarily to concerns about catches exceeding new OFL contributions for rougheye/blackspotted and shortraker rockfish. Agenda Item C.8 provides information on the Slope Rockfish complex alternatives. The following sections address potential biological risks for rougheye/blackspotted and shortraker rockfish.

4.1.4.5 Rougheye/Blackspotted Rockfish

Rougheye and blackspotted rockfish are currently managed in the Slope Rockfish complexes north and south of 40º10' N lat., although they are a very minor component of the southern Slope Rockfish complex. Both species share broad overlap in their depth and geographic distributions from the Eastern Aleutian Islands along the North American continental margin to southern Oregon, with blackspotted rockfish's range extending east beyond the Aleutian chain to the Pacific Coast of Japan (Gharrett, *et al.* 2005; Hawkins, *et al.* 2005; Orr and Hawkins 2008). It is very difficult to visually distinguish between the two species and they have been persistently confused in surveys and catches. It has only been from recent genetic studies in the early 2000s that the two separate species have been identified and described (Orr and Hawkins 2008).

Hicks et al. (2013) conducted the first assessment of the U.S. west coast stock of rougheye and blackspotted rockfish as a complex of two species. The coastwide population was modeled assuming parameters for combined sexes (a single-sex model) and assuming removals beginning in 1916. The predicted spawning biomass from the base model generally showed a slight decline over the entire time series with a period of steeper decline during the 1980s and 1990s. Since 2000, the spawning biomass has stabilized and possibly increased because of reduced catches and above average recruitment in 1999. The 2013 spawning biomass relative to unfished equilibrium spawning biomass was estimated to be 47 percent of its unfished equilibrium at the start of 2013. The stock has been estimated to be healthy throughout the time series in the new assessment (Figure 4-10).

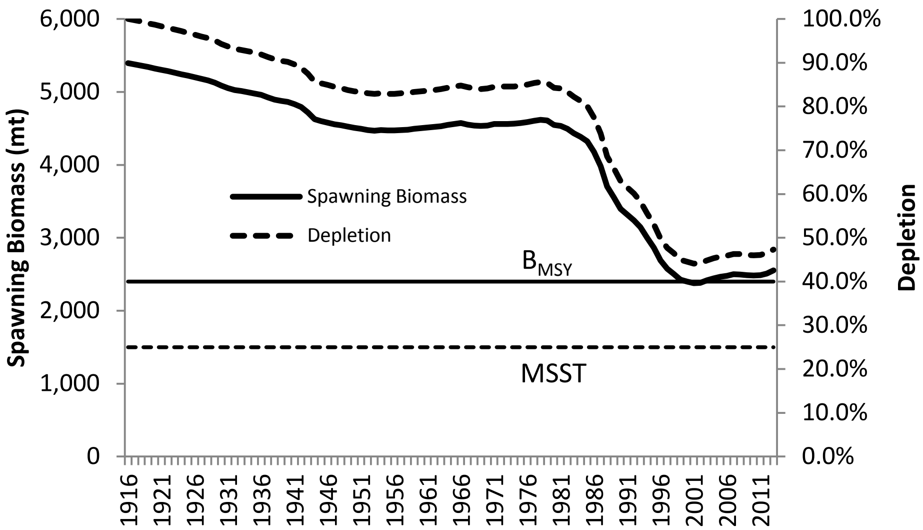

Figure 4-10. Time series of estimated spawning biomass and depletion of rougheye/blackspotted rockfish, 1916-2013 (from Hicks et al. 2013).

Total estimated annual catches of rougheye/blackspotted by sector of the groundfish fishery in 2002-2012 are provided in Table 4-15. Catches by sector in the non-tribal at-sea hake fishery (Catcher-Processors and Mothership) were generated from a NMFS Alaska Fisheries Information Network NORPAC database query on March 14, 2014. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program. Catches by sector in Table 4-15 are the sum of rougheye/blackspotted rockfish catches plus the proportion of rougheye/blackspotted rockfish catches reported in the shortraker-rougheye market category.

Figure 4-11 compares the 2002-2012 annual total catches of rougheye/blackspotted rockfish to the proposed 2015 OFL and ABC limits (2015 limits are slightly lower than 2016 limits so these values were chosen). In hindsight, the stock has exceeded the 2015 OFL and experienced overfishing since 2008 during the time series (Figure 4-7). The 2007 catch also slightly exceeded the 2015 ABC.

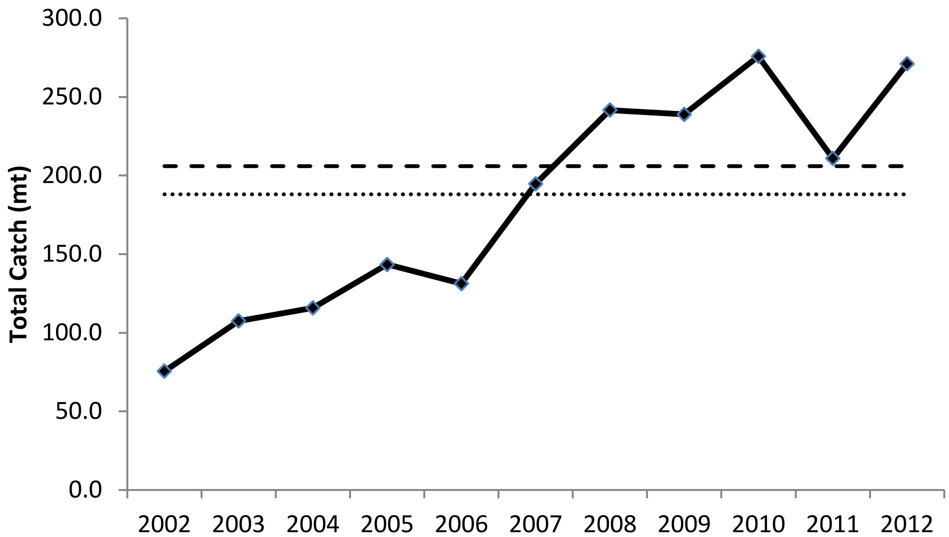

Figure 4-11. Estimated total catch of rougheye/blackspotted rockfish, 2002-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ABC contribution (lower dotted line).

The cumulative coastwide catch of rougheye/blackspotted rockfish in 2002-2012 was 97% of the cumulative 2015 OFL (the 2015 OFL times the number of years in the analysis (11)); however, the cumulative catch since 2008 was 120.2% of the cumulative OFL for that period. This indicates there may be a concern for maintaining the observed harvest levels since 2008. Notwithstanding the recent catches, the average 2015-2024 catch predicted to stabilize the population at the proxy B_{MSY} level of $B_{40\%}$ is 266 mt (Table 4-16) or 145.8% and 107.4% of the average 2002-2012 and 2008-2012 catches, respectively. The 2015-2024 equilibrium yield catch assumes the F_{MSY} harvest rate estimated in the 2013 assessment (SPR = 29.6%). To the extent the actual F_{MSY} harvest rate for the stock is closer to or over the estimated F_{MSY} harvest rate in the 2013 assessment, the risk of future overfishing under status quo management is lessened.

Since 2011, slope rockfish targeting in the bottom trawl fishery has decreased dramatically (only 17% of the 2011 quota of the northern slope rockfish was attained) under IFQ management. The 2011 catch levels are more likely than those preceding implementation of trawl rationalization. Higher than normal catch of rougheye in the 2011 catcher-processor (CP) sector occurred because the CP sector fished much later in the year and concentrated effort more than usual off northern Washington where large numbers of hake were aggregated. This is not typical behavior as evidenced by highly variable catch and effort distribution in the CP sector.

The center of distributions for rougheye and blackspotted rockfish is the Gulf of Alaska and these species are at the fringe of their distributions on the U.S. west coast. The 2013 assessment of the rougheye-blackspotted rockfish complex in the Gulf of Alaska estimated an age 3+ biomass of almost 43,000 mt and predicted an increasing trend in that biomass (Shotwell and Hanselman 2013). The recommended 2015 OFL for Gulf of Alaska fisheries is 1,518 mt (ABC = 1,262 mt). It is likely the small proportion of removals in west coast fisheries will have little effect on overall stock status.

Considerations for restructuring the slope rockfish complexes to either manage rougheye/blackspotted in a coastwide management unit or in a coastwide rougheye/blackspotted/shortraker complex will also reduce risk of future overfishing but could disrupt limited entry trawl and fixed gear fisheries. Risk of future overfishing may also be mitigated by establishing an HG for rougheye/blackspotted rockfish, which would establish a sorting requirement and aid in inseason catch monitoring. Fishermen would have to carefully track their catches to avoid rougheye and blackspotted rockfish or risk an inseason action to close areas where these species are caught. The HG could be allocated by sector, but the contention associated with this would likely require more process and time than available in the 2015-2016 specifications decision-making cycle. A shared HG would put industry on notice and allow them to devise strategies for reducing impacts on rougheye/blackspotted rockfish with less immediate disruption of the fishery. Risk of overfishing could be evaluated in the next management cycle before slope rockfish restructuring and sector allocations are considered necessary.

Table 4-15. Estimated total catch of rougheye/blackspotted rockfish by sector, 2002-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Total estimated Rougheye/Blackspotted Rockfish coastwide catches by sector, 2002-2012.												
Set-Aside	**9.3**	**16.7**	**18.5**	**21.5**	**21.4**	**24.0**	**19.5**	**36.4**	**18.9**	**18.8**	**15.9**	**220.9**
Incidental	2.4	5.0	2.6	1.5	0.5	2.0	1.0	2.2	0.5	0.3	0.7	18.7
Pink Shrimp	0.0	0.0	1.7	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.0
Tribal At-Sea Hake	0.0	0.0	0.0	0.0	0.0	0.1	2.9	0.6	0.0	2.4	0.0	6.0
Tribal Shoreside	6.9	11.6	14.3	19.8	20.9	21.8	15.7	33.6	18.4	16.1	15.2	194.2
Non-Trawl	**21.5**	**13.3**	**24.2**	**37.3**	**42.2**	**47.0**	**62.1**	**71.6**	**86.2**	**41.3**	**84.7**	**531.3**
Nearshore Fixed Gear	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Non-nearshore Fixed Gear	21.5	13.1	24.2	36.6	42.1	47.0	62.1	71.6	86.2	41.3	84.6	530.4
Trawl	**44.8**	**77.6**	**73.1**	**84.6**	**67.7**	**123.7**	**160.0**	**130.9**	**170.7**	**150.9**	**170.5**	**1,254.4**
Limited Entry Trawl Permit - Fixed Gear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	21.7	36.7
Limited Entry Trawl Permit - Trawl Gear	44.1	75.4	58.5	45.6	61.1	92.9	86.9	120.7	144.0	53.1	47.9	830.2
Catcher-Processor	0.3	2.0	13.7	30.5	6.0	27.2	69.4	8.3	17.0	74.4	42.0	290.8
Mothership	0.4	0.2	0.0	8.3	0.6	1.7	3.1	0.4	4.6	4.0	11.8	35.1
Shoreside Hake	0.0	0.0	0.8	0.2	0.0	1.9	0.6	1.6	5.1	4.2	47.1	61.6
Grand Total	**75.6**	**107.5**	**115.8**	**143.4**	**131.2**	**194.7**	**241.7**	**238.9**	**275.8**	**210.9**	**271.1**	**2,006.6**

Table 4-16. Summary table of 12-year projections of rougheye/blackspotted rockfish beginning in 2015 for alternate states of nature based on the axis of uncertainty. Total catches in 2013 and 2014 are determined from 5 year averages of the landings for each fleet (trawl, hook & line, and at-sea), and are also used as status quo catches. Table from Hicks et al., 2013.

			State of nature					
			Low $M = 0.037$		Base case M estimated at 0.042		High $M = 0.047$	
Relative probability of ln(SB_2013)			0.25		0.5		0.25	
Management decision	Year	Catch (mt)	Spawning biomass (mt)	Depletion	Spawning biomass (mt)	Depletion	Spawning biomass (mt)	Depletion
ABC (σ = 0.72; P* = 0.45)	2015	188	1,855	39%	2,653	49%	3,779	60%
	2016	192	1,888	39%	2,706	50%	3,859	61%
	2017	197	1,918	40%	2,755	51%	3,932	62%
	2018	201	1,942	40%	2,797	52%	3,993	63%
	2019	204	1,959	41%	2,829	52%	4,042	64%
	2020	206	1,969	41%	2,851	53%	4,077	64%
	2021	208	1,972	41%	2,864	53%	4,100	65%
	2022	209	1,968	41%	2,868	53%	4,111	65%
	2023	209	1,958	41%	2,865	53%	4,112	65%
	2024	208	1,945	41%	2,856	53%	4,106	65%
Recent 5-year average catches	2015	189	1,855	39%	2,653	49%	3,779	60%
	2016	189	1,888	39%	2,706	50%	3,859	61%
	2017	189	1,919	40%	2,756	51%	3,933	62%
	2018	189	1,946	41%	2,801	52%	3,997	63%
	2019	189	1,968	41%	2,837	53%	4,051	64%
	2020	189	1,983	41%	2,865	53%	4,091	65%
	2021	189	1,992	42%	2,884	53%	4,120	65%
	2022	189	1,995	42%	2,895	54%	4,138	65%
	2023	189	1,993	42%	2,900	54%	4,147	65%
	2024	189	1,987	41%	2,899	54%	4,148	65%
Catch that stabilizes equilibrium depletion at 40% in the base model	2015	258	1,855	39%	2,653	49%	3,779	60%
	2016	261	1,862	39%	2,680	50%	3,833	61%
	2017	265	1,867	39%	2,704	50%	3,880	61%
	2018	267	1,866	39%	2,720	50%	3,917	62%
	2019	269	1,859	39%	2,728	51%	3,942	62%
	2020	270	1,844	38%	2,726	51%	3,954	62%
	2021	270	1,823	38%	2,715	50%	3,953	62%
	2022	269	1,796	37%	2,697	50%	3,942	62%
	2023	267	1,764	37%	2,673	50%	3,923	62%
	2024	264	1,730	36%	2,644	49%	3,897	62%

4.1.4.6 Shortraker Rockfish

Shortraker rockfish (*Sebastes borealis*) is an unassessed category 3 stock on the U.S. west coast. This is one of the largest rockfish species with a broad distribution throughout the North Pacific, from Japan, the Okhotsk Sea, and southeastern Kamchatka to the Bering Sea and Aleutian Islands south to Point Conception (Love, *et al.* 2002). They are common from at least eastern Kamchatka to British Columbia, and are considered at the fringe of their population on the U.S. west coast.

Shortraker are caught in both trawl and fixed gear fisheries on the slope (Table 4-17), almost exclusively off Washington. Total catch of shortraker rockfish has been estimated to be at or above the 2015 OFL contribution in 9 of the 11 years analyzed (Figure 4-12). Trawl catches have been decreasing since the recent year high in 2007. However, the fixed gear fishery on the slope had a recent year high catch in 2012. It is unknown how much of this catch was targeted and how much was incidental to sablefish targeting. Given the large size and higher market value of shortraker, some targeting is likely. A reduction in cumulative landing limits for rougheye and shortraker could reduce some of this targeting and impacts in this sector. Such efforts appear to have been successful in reducing southern blackgill rockfish mortalities in 2013 in fixed gear fisheries that were targeting that stock.

The vast majority of the shortraker rockfish biomass and catch occurs north of the west coast EEZ in waters off British Columbia and Alaska. It is likely the small proportion of removals in west coast fisheries will have little effect on overall stock status.

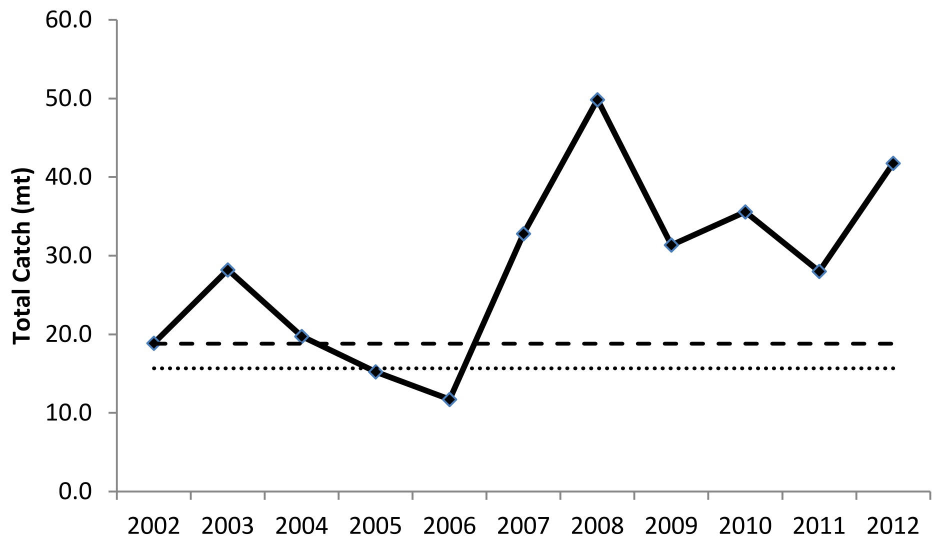

Figure 4-12. Estimated total catch of shortraker rockfish, 2002-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ABC contribution (lower dotted line).

Table 4-17. Estimated total catch of shortraker rockfish by sector, 2002-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**1.7**	**2.0**	**1.1**	**1.2**	**1.5**	**1.2**	**1.7**	**1.1**	**1.1**	**1.3**	**1.5**	**15.3**
Incidental	0.6	1.4	0.5	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.2	3.1
Pink Shrimp				0.2		0.0	0.1					0.3
Tribal At-Sea Hake						0.0		0.0	0.0			0.0
Tribal Shoreside	1.0	0.6	0.6	1.0	1.4	1.0	1.6	1.0	1.1	1.3	1.3	11.9
Non-Trawl	**1.8**	**0.9**	**3.2**	**4.2**	**1.9**	**1.7**	**18.9**	**2.9**	**5.5**	**3.0**	**20.0**	**64.0**
Nearshore Fixed Gear				0.1							0.0	0.1
Non-nearshore Fixed Gear	1.8	0.9	3.2	4.1	1.9	1.7	18.9	2.9	5.5	3.0	20.0	63.9
Trawl	**15.4**	**25.3**	**15.4**	**9.9**	**8.4**	**29.9**	**29.2**	**27.3**	**28.9**	**23.7**	**20.3**	**233.7**
Limited Entry Trawl Permit - Fixed Gear										0.4	1.3	1.7
Limited Entry Trawl Permit - Trawl Gear	15.4	25.2	14.3	9.4	8.0	28.3	28.7	27.0	27.2	20.7	12.7	216.9
Catcher-Processor Mothership	0.1	0.1	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.7	3.5
Shoreside Hake		0.0	0.6			1.2	0.2	0.1	1.4	2.4	5.6	11.6
Grand Total	**18.9**	**28.2**	**19.7**	**15.2**	**11.7**	**32.8**	**49.8**	**31.4**	**35.6**	**28.0**	**41.8**	**313.1**

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PROPOSED GROUNDFISH FMP AMENDMENT LANGUAGE FOR AMENDMENT 24

This document presents proposed Groundfish FMP amendment language being considered as Amendment 24. The 2015-16 and Beyond Biennial Harvest Specifications EIS, currently in development, describes the three alternatives under consideration in addition to the alternative of No Action. Under No Action the FMP is not amended. Amendment language consistent with the objectives of these alternatives is presented below. To aid the reader, relevant sections of the Groundfish FMP are excerpted and appended to this document.

- ~~Strikethrough~~ indicates text moved or deleted
- Underline indicates new text
- Double underline indicates moved text at its new location

Alternative 1 – Default HCRs Use a P* Value of 0.45

Under this alternative the Groundfish FMP is amended to describe the harvest control rule (HCR) framework, provide a decision framework for determining adequate progress on rebuilding plans, and establish new criteria for management measures that may be considered during the biennial process.

Default ACLs would be computed using the HCRs currently in place and used to compute ACLs for the previous biennial period except that, where applicable, a P* value of 0.45 would be used.

Amendment Language

FMP Section 5.1 (General Overview of the Harvest Specifications and Management Process) would be amended to add the following paragraphs after bullet #8 with some additional language relevant to the specifics of this alternative (underlined below):

> Notwithstanding the above, for any stock (or other management unit) the Council does not need to take explicit action if harvest specifications for the next biennial period use harvest control rules employing the pre-agreed elements described here. These pre-agreed methods, referred to as default harvest control rules, would use all the elements of the harvest control rule in place during the previous biennial period, except that the ABC would be calculated using a P* value of 0.45. These default harvest control rules are applied to the best available scientific information to determine the numerical values of the harvest specifications. For example, current F_{MSY} (or proxy value) is applied to the best current estimate of stock biomass to determine the OFL (as in bullet #1). The ABC is determined by applying the current uncertainty buffer (as in bullet #2) except that if the P* approach is used a value of 0.45 is applied. The ACL is determined as described in bullet #4 using the appropriate method for current stock status. Thus, if based on the best available science it is determined that stock status has changed from healthy to the precautionary zone, the methods outlined in Section 4.6.1 would be applied. If a stock has recovered such that stock size is now above the MSY biomass target, the default harvest control sets the ACL equal to the ABC using a P* value of 0.45, if applicable.
>
> For allocations not specified in the FMP, without explicit Council action the current allocations (expressed as a proportion of the fishery harvest guideline) will be used.

For any stock the Council may take explicit action to depart from the default harvest control rules described in the previous paragraph, after considering the harvest specifications thus computed or other relevant factors as long as such changes are consistent with the framework described in Chapter 4 of this FMP and the MSA.

Prior to final adoption of harvest specifications the Council will announce for which stocks they intend to take explicit action. Current harvest control rules (and related harvest policies as applicable) will be listed in an appendix to this FMP. The contents of this appendix can be changed through the biennial management process without an FMP amendment as a two-meeting process (see Section 5.4). Numerical values for these specifications will be presented to the Council and the public, usually by publication of the groundfish SAFE document (see Section 5.2).

Section 4.6.3.4 (Updating Key Rebuilding Parameters) would be revised as follows:

In addition to an initial specification in the FMP in Appendix F, the target year (T_{TARGET}) and the harvest control rule (type and numerical value) will also be specified in regulations. The target year is the year by which the stock would be rebuilt to its target biomass and the harvest control rule defines the corresponding exploitation rate. If new information indicates a need to change the value of either of these two parameters, such a change will be accomplished through full (notice and comment) rulemaking as described in Section 6.2 of this FMP and reflected in Appendix F.

¶The target year is the year by which the stock would be rebuilt to its target biomass. Therefore, if a subsequent analysis identifies an earlier target year for the current fishing mortality rate (based on the harvest control rule), there is no obligation to change in regulations either the target year (to the computed earlier year) or the harvest control rule (to delay rebuilding to the original target year). Stock assessments for overfished species are typically conducted every two years. Stock assessments and rebuilding analyses use mathematical models to predict a stock's current abundance, as well as project future abundance and recruitment. In any mathematical model that uses a variety of data sources, as the stock assessments do, model results tend to vary from one assessment to the next within some range of values.

¶This expected variation means that, when the Council and When the SSC reviews a new overfished species stock assessment and rebuilding model, they shall advise the Council on whether adequate progress toward ending overfishing and rebuilding the affected fish stock is being made. The SSC will consider the following factors in making their recommendation:

1. Therefore, iIf a subsequent rebuilding analysis identifies an earlier target year for the current fishing mortality rate (based on the harvest control rule), there is no obligation to change in regulations either the target year (to the computed earlier year) or the harvest control rule (to delay rebuilding to the original target year).

2. must also consider whether the result of that model or models show a rebuilding trajectory that varies from the previously predicted trajectory to a significant degree. If the variation difference in the rebuilding trajectory for a particular species (as indicated by the probability of rebuilding by the T_{TARGET} specified in the rebuilding plan) between the consecutive stock assessments and rebuilding analyses for a particular species does not a show significant differences in the rebuilding trajectory for that species (even if the probability has fallen below 0.5 in the second of two consecutive rebuilding analyses), they are mathematically considered to be essentially the same then it may be reasonable to conclude that adequate progress towards rebuilding the stock is still being made.

In th~~at~~ these circumstances, the Council will likely not need to revise the T_{TARGET} or harvest control rule for that ~~species~~ stock. Since the target year is the key rebuilding parameter, it should only be changed after careful deliberation. ~~For example,~~ Circumstances where the Council ~~might~~ may recommend that the target year be changed ~~if~~, based on new information about the status and/or biology of the stock, include:

1. ~~they determine that the existing~~ The current target year is later than the recomputed maximum rebuilding time (T_{MAX}) or if a recomputed harvest control rule would result in such a low optimum yield as to cause substantial socioeconomic impacts. These examples are not definitive: the Council may elect to change the target year because of other circumstances. However, any change to the target year or harvest control rule must be supported by commensurate analysis that demonstrates that the new target year is a target to rebuild the stock as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem.

Section 6.2 (General Procedures for Establishing and Adjusting Management Measures) would be revised as follows:

…

C. Management Measures Rulemaking For Actions Developed Through the Three-Council-Meeting Biennial Specifications Process and Two *Federal Register* Rules

~~These include (1) management action developed through~~ During the biennial specifications process the Council may propose: (~~2~~1) management measures ~~being~~ to be classified as routine the first time these measures are used; or (~~3~~2) adjustments to measures previously classified as routine, such as trip limits that vary by gear type, closed seasons or areas, and in the recreational fishery, bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements ~~the first time these measures are used. These also~~ ; or (3) new ~~include~~ management measures that are intended to have permanent effect and are discretionary, and for which the impacts have not been previously analyzed. Examples of new measures that may be proposed during the biennial process include: changes to or imposition of gear regulations; imposition of landings limits, frequency limits, or limits that differ by gear type; closed areas or seasons used for the first time on any species or species group or gear type.

~~The Council will develop and analyze the proposed management actions over the span of at least two Council meetings (usually April and June) and provide the public advance notice and opportunity to comment on both the proposals and the analysis prior to and at the second Council meeting. If a management measure is designated as routine under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by notice, as described in the previous paragraphs. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.~~

As described elsewhere in this FMP, the three-Council-meeting biennial specifications process refers to ~~two~~ the following decision-making schedule: ~~meetings.~~

1. The Council will develop proposed harvest specifications during the first meeting (usually November). They will finish drafting harvest specifications and develop the management measures during the second meeting (usually April).

2. The Council will develop and analyze the proposed management actions over the span of at least two Council meetings (usually April and June) and provide the public advance notice and

opportunity to comment on both the proposals and the analysis prior to and at the second Council meeting.

3. Finally, at the third meeting, the Council will make final recommendations to the Secretary on the complete harvest specifications and management measures biennial management package (usually June). For the Council to have adequate information to identify proposed management measures for public comment at the first management measures meeting, the identification of issues and the development of proposals normally must begin at a prior Council meeting.

If a management measure is designated as routine under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by notice, as described in the previous paragraphs. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

D. Full Rulemaking For Actions Normally Requiring at Least Two Council Meetings and Two *Federal Register* Rules (Regulatory Amendment)

These include any proposed new management measures to be classified as routine or intended to have a permanent effect (as described in C, above), including those considered ~~that is~~ highly controversial, or any measure that directly allocates the resource. ~~These also include management measures that are intended to have permanent effect and are discretionary, and for which the impacts have not been previously analyzed.~~ These ~~Full~~ full rulemakings will normally use a two-Council-meeting process, although additional meetings may be required to fully develop the Council's recommendations on a full rulemaking issue. Regulatory measures to implement an FMP amendment will be developed through the full rulemaking process. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

Alternative 2 – Default HCRs Use a P* Value of 0.25

Under this alternative the Groundfish FMP is amended to describe the HCR framework, provide a decision framework for determining adequate progress on rebuilding plans, and establish new criteria for management measures that may be considered during the biennial process.

Default ACLs would be computed using the HCRs currently in place and used to compute ACLs for the previous biennial period except that, where applicable, a P* value of 0.25 would be used.

Amendment Language

Section 5.1 of the FMP would be amended in the same way as under Alternative 1, except that a value of 0.25 would be substituted for the references to a P* value of 0.45 in the first paragraph

The same revisions to Section 4.6.3.4 (Updating Key Rebuilding Parameters) described above for Alternative 1 would be made under Alternative 2.

The same revisions to Section 6.2 (General Procedures for Establishing and Adjusting Management Measures) described above for Alternative 1 would be made under Alternative 2.

Alternative 3 (Preliminary Preferred Alternative) – Use the HCRs in Place in the Previous Period as the Defaults

Under this alternative the Groundfish FMP is amended to describe the HCR framework, provide a decision framework for determining adequate progress on rebuilding plans, and establish new criteria for management measures that may be considered during the biennial process.

Default HCRs would be those in place during the previous biennial period.

Amendment Language

Section 5.1 of the FMP would be amended to add the following paragraphs after bullet #8:

> Notwithstanding the above, for any stock (or other management unit) the Council does not need to take explicit action if they wish to continue the current harvest policy. In these cases the current harvest control rule (i.e., those used in the previous biennial period) is applied to the best available scientific information to determine the numerical values of the harvest specifications for each stock. These pre-agreed methods, referred to as default harvest control rules, would use all the elements of the harvest control rule in place during the previous biennial period. For example, current F_{MSY} (or proxy value) is applied to the best current estimate of stock biomass to determine the OFL (as in bullet #1). The ABC is determined by applying the current uncertainty buffer (as in bullet #2). The ACL is determined as described in bullet #4 using the appropriate method for current stock status. Thus, if based on the best available science it is determined that stock status has changed from healthy to the precautionary zone, the methods outlined in Section 4.6.1 would be applied. If a stock has recovered such that stock size is now above the MSY biomass target, the default harvest control sets the ACL equal to the ABC using the current P* value, if applicable.
>
> For allocations not specified in the FMP, without explicit Council action the current allocations (expressed as a proportion of the fishery harvest guideline) will be used.
>
> For any stock the Council may take explicit action to depart from the default harvest control rules described in the previous paragraph, after considering the harvest specifications thus computed or other relevant factors as long as such changes are consistent with the framework described in Chapter 4 of this FMP and the MSA.
>
> Prior to final adoption of harvest specifications the Council will announce for which stocks they intend to take explicit action. Current harvest control rules (and related harvest policies as applicable) will be listed in an appendix to this FMP. The contents of this appendix can be changed through the biennial management process without an FMP amendment as a two-meeting process (see Section 5.4). Numerical values for these specifications will be presented to the Council and the public, usually by publication of the groundfish SAFE document (see Section 5.2).

The same revisions to Section 4.6.3.4 (Updating Key Rebuilding Parameters) described above for Alternative 1 would be made under Alternative 3.

The same revisions to Section 6.2 (General Procedures for Establishing and Adjusting Management Measures) described above for Alternative 1 would be made under Alternative 3.

Current FMP (May 2013): Relevant Sections Excerpted

5.1 General Overview of the Harvest Specifications and Management Process

The specifications and management process, in general terms, occurs as follows:

1. The Council will determine the MSY or MSY proxy and OFL for each major stock. Typically, the MSY proxy will be in terms of a fishing mortality rate ($F_{x\%}$,) and OFL will be the $F_{x\%}$ applied to the current biomass estimate. The MSY is the maximum long-term average yield expected from annual application of the MSY (or proxy) harvest policy under prevailing ecological and environmental conditions.

2. The Council and SSC will determine an appropriate scientific uncertainty buffer to set the ABC below the OFL. The ABC accommodates the uncertainty in estimating the OFL and may be determined using either a straight percentage reduction of the OFL as recommended by the SSC or by the P* approach.

3. Every species will either have its own designated ACL or be included in a multispecies ACL. Species which are included in a multispecies ACL may also have individual ACLs, have individual HGs, or be included in a HG for a subgroup of the multispecies ACL.

4. To determine the ACL for each stock, the Council will determine the best estimate of current abundance and its relation to its precautionary and overfished thresholds. If the abundance is above the precautionary threshold, the ACL will be equal to or less than the ABC. If abundance falls below the precautionary threshold, the ACL will be reduced according to the harvest control rule for that stock. If abundance falls below the overfished/rebuilding threshold, the ACL will be set according to the interim rebuilding rule until the Council develops a formal rebuilding plan for that species.

5. For any stock or stock complex where the Secretary identifies that overfishing is occurring, the Council will take remedial action to end overfishing and prevent the stock or stock complex from falling below the minimum stock size threshold. For any stock the Secretary has declared overfished or approaching the overfished condition, or for any stock the Council determines is in need of rebuilding, the Council will implement such periodic management measures as are necessary to rebuild the stock by controlling harvest mortality, habitat impacts, or other effects of fishing activities that are subject to regulation under this biennial process. These management measures will be consistent with any approved rebuilding plan.

6. The Council may reserve and deduct a portion of the ACL of any stock to provide for compensation for vessels conducting scientific research authorized by NMFS. Prior to the research activities, the Council will authorize amounts to be made available to a research reserve. However, the deduction from the ACL will be made in the year after the “compensation fishing”; the amounts deducted from the ACL will reflect the actual catch during compensation fishing activities.

7. The Council will identify stocks which are likely to be fully harvested (i.e., the ACL or ACT/HG achieved) in the absence of specific management measures and for which allocation between LE and open access sectors of the fishery is appropriate.

8. The groundfish resource is fully utilized by U.S. fishing vessels and seafood processors. The Council may entertain applications for foreign or joint venture fishing or processing at any time, but fishing opportunities may be established only through amendment to this FMP. This section supersedes other provisions of this FMP relating to foreign and joint venture fishing.

4.3.6.4 Updating Key Rebuilding Parameters

In addition to an initial specification in the FMP in Appendix F, the target year (T_{TARGET}) and the harvest control rule (type and numerical value) will also be specified in regulations. If new information indicates a need to change the value of either of these two parameters, such a change will be accomplished through full (notice and comment) rulemaking as described in Section 6.2 of this FMP and reflected in Appendix F. The target year is the year by which the stock would be rebuilt to its target biomass. Therefore, if a subsequent analysis identifies an earlier target year for the current fishing mortality rate (based on the harvest control rule), there is no obligation to change in regulations either the target year (to the computed earlier year) or the harvest control rule (to delay rebuilding to the original target year). Stock assessments for overfished species are typically conducted every two years. Stock assessments and rebuilding analyses use mathematical models to predict a stock's current abundance, as well as project future abundance and recruitment. In any mathematical model that uses a variety of data sources, as the stock assessments do, model results tend to vary from one assessment to the next within some range of values. This expected variation means that, when the Council and SSC review a new overfished species stock assessment and rebuilding model, they must also consider whether the result of that model or models show a rebuilding trajectory that varies from the previously-predicted trajectory to a significant degree. If the variation between the stock assessments and rebuilding analyses for a particular species do not show significant differences in the rebuilding trajectory for that species, they are mathematically considered to be essentially the same. In that circumstance, the Council will likely not need to revise the T_{TARGET} or harvest control rule for that species. Since the target year is the key rebuilding parameter, it should only be changed after careful deliberation. For example, the Council might recommend that the target year be changed if, based on new information about the status and/or biology of the stock, they determine that the existing target year is later than the recomputed maximum rebuilding time (T_{MAX}) or if a recomputed harvest control rule would result in such a low optimum yield as to cause substantial socioeconomic impacts. These examples are not definitive: the Council may elect to change the target year because of other circumstances. However, any change to the target year or harvest control rule must be supported by commensurate analysis that demonstrates that the new target year is a target to rebuild the stock as soon as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem.

6.2 General Procedures for Establishing and Adjusting Management Measures

This FMP establishes three framework procedures through which the Council is able to recommend the establishment and adjustment of specific management measures for the Pacific Coast groundfish fishery. The *points of concern framework* allows the Council to develop management measures that respond to resource conservation issues; the *socioeconomic framework* allows the Council to develop management measures in response to social, economic, and ecological issues that affect fishing communities. The *habitat conservation framework* allows the Council to modify the number, extent, and location of areas closed to bottom trawling in order to protect EFH. Criteria associated with each framework form the basis for Council recommendations, and Council recommendations will be consistent with them. The process for developing and implementing management measures normally will occur over the span of at least two Council meetings, with an exception that provides for more timely Council consideration under certain specific conditions.

The time required to take action under any framework will vary depending on the nature of the action, its impacts on the fishing industry, resource, and environment, and review of these impacts by interested parties. This depends on the range of biological, social, and economic impacts that may need to be considered at the time a particular change in regulations is proposed. Furthermore, other applicable law (e.g., the National Environmental Policy Act, Administrative Procedures Act, Regulatory Flexibility Act, relevant Executive Orders, etc.) may require additional analysis and public comment before measures may be implemented by the Secretary.

The Secretary will develop management measures recommended by the Council for review and public comment as publications in the *Federal Register*, either as notices or regulations. Generally, management measures of broad applicability and permanent effectiveness should be published as regulations. More narrowly applicable measures, which may only apply for short duration (one biennium or less) and may also require frequent adjustment, should be published as notices.

Management measures are normally imposed, adjusted, or removed at the beginning of the biennial fishing period, but may, if the Council determines it necessary, be imposed, adjusted, or removed at any time during the period. Management measures may be imposed for habitat protection, resource conservation, or social or economic reasons consistent with the criteria, procedures, goals, and objectives set forth in the FMP.

The NMFS Regional Administrator will review the Council's recommendation, supporting rationale, public comments, and other relevant information and determine whether to approve, disapprove, or partially approve the Council's recommendation. If the recommendation is approved, NMFS will implement the recommendation through regulation or notice, as appropriate. NMFS will explain any disapproval or partial disapproval of the recommendation to the Council in writing.

The procedures specified in this chapter do not affect the authority of the Secretary to take emergency regulatory action as provided for in Section 305(c) of the Magnuson-Stevens Act if an emergency exists involving any groundfish resource, or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the Magnuson-Stevens Act.

Four different categories of management actions are authorized by this FMP, each of which requires a slightly different process. Management measures may be established, adjusted, or removed using any of the four procedures. The four basic categories of management actions are described below.

A. Automatic Actions

The NMFS Regional Administrator may initiate automatic management actions without prior public notice, opportunity to comment, or a Council meeting. These actions are nondiscretionary, and the impacts must be reasonably accountable, based on previous application of the action or past analysis. Examples include fishery, season, or gear type closures when a quota has been projected to have been attained. The Secretary will publish a single notice in the *Federal Register* making the action effective.

B. Notice Actions Requiring at Least One Council Meeting and One *Federal Register* Notice

These include all management actions other than automatic actions. Notice actions may be nondiscretionary; they may be actions for which the scope of probable impacts has been previously analyzed.

These actions are intended to have temporary effect, and the expectation is that they will need frequent adjustment. They may be recommended at a single Council meeting, although the Council will provide as much advance information to the public as possible concerning the issues it will be considering at its decision meeting. The primary examples are those inseason management actions defined as routine according to the criteria in Section **Error! Reference source not found.**. These include, but are not limited to, trip landing and frequency limits and size limits for all commercial gear types and closed seasons for any groundfish species in cases where protection of an overfished or depleted stock is required and bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements for all recreational fisheries. Previous analysis must have been specific as to species and gear type before a management measure can be defined as routine and acted on at a single Council meeting. If the recommendations are approved, the Secretary may waive for good cause the requirement for prior notice and comment in the *Federal Register* and will publish a single notice in the *Federal Register* making the action effective. This category of actions presumes the Secretary will find that the need for swift implementation and the extensive notice and opportunity for comment on these types of measures, along with the Council already having analyzed the scope of their impacts, will serve as good cause to waive the need for additional prior notice and comment in the *Federal Register*.

C. Management Measures Rulemaking For Actions Developed Through the Three-Council-Meeting Biennial Specifications Process and Two *Federal Register* Rules

These include (1) management action developed through the biennial specifications process; (2) management measures being classified as routine; or (3) trip limits that vary by gear type, closed seasons or areas, and in the recreational fishery, bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements the first time these measures are used. Examples include: changes to or imposition of gear regulations; imposition of landings limits, frequency limits, or limits that differ by gear type; closed areas or seasons used for the first time on any species or species group or gear type. The Council will develop and analyze the proposed management actions over the span of at least two Council meetings (usually April and June) and provide the public advance notice and opportunity to comment on both the proposals and the analysis prior to and at the second Council meeting. If a management measure is designated as routine under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by notice, as described in the previous paragraphs. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

The three-Council-meeting process refers to two decision meetings. The Council will develop proposed harvest specifications during the first meeting (usually November). They will finish drafting harvest specifications and develop the management measures during the second meeting (usually April). Finally, at the third meeting, the Council will make final recommendations to the Secretary on the complete harvest specifications and management measures biennial management package (usually June). For the Council to have adequate information to identify proposed management measures for public comment at the first management measures meeting, the identification of issues and the development of proposals normally must begin at a prior Council meeting.

D. Full Rulemaking For Actions Normally Requiring at Least Two Council Meetings and Two *Federal Register* Rules (Regulatory Amendment)

These include any proposed management measure that is highly controversial or any measure that directly allocates the resource. These also include management measures that are intended to have permanent effect and are discretionary, and for which the impacts have not been previously analyzed. Full rulemakings will normally use a two-Council-meeting process, although additional meetings may be required to fully develop the Council's recommendations on a full rulemaking issue. Regulatory measures to implement an FMP amendment will be developed through the full rulemaking process. The

Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

1.1 Description and Status of Groundfish Stocks

There are over 90 stocks managed under the Pacific Coast Groundfish Fishery Management Plan (FMP). The actual number of FMP stocks is equivocal since all endemic species of the genus *Sebastes* are included and new species of this diverse genus are periodically described in the literature providing results of genetic/taxonomic research. These species include over 64 species of rockfish in the family *Scorpaenidae,* 7 roundfish species, 12 flatfish species, assorted shark, skate, and a few miscellaneous bottom-dwelling marine fish species. Table 1 depicts the latitudinal and depth distributions of groundfish species managed under the groundfish FMP, and Figure 1 depicts management area divisions.

The following sections contain information on the life histories of a subset of the groundfish managed under the groundfish FMP. While reading these sections, it is important to keep in mind how certain life history traits of the species have important implications on how the stocks are sustainably managed.

In contrast to the highly variable, and often volatile, population cycles of many coastal pelagic and invertebrate populations in the California Current, many of the resident groundfish in the California Current have evolved entirely different life history approaches to coping with environmental variability. Sablefish, Dover sole, spiny dogfish and a large number of rockfish (*Sebastes* and *Sebastolobus*) species have life spans that typically span decades, and in some extreme examples may reach ages of 100 or greater (Beamish, *et al.* 2006; Love, *et al.* 2002). Although large initial catches of many rockfish had given the impression that these stocks were also highly productive, a growing body of scientific evidence soon made it clear that many of these species were incapable of sustaining high intensity fishing pressure using modern fishing methods (Francis 1986; Gunderson 1977; Gunderson 1984; Leaman and Beamish 1984).

Among the concerns raised in some of the early research and analyses were that the large standing stocks of older individuals were simply maintaining themselves within the dynamic bounds of their ecosystem, and that the failure to consider the role of such longevity in Northeast Pacific groundfish could lead to management challenges. Factors such as extreme longevity, low natural mortality, increasing fecundity with age, and infrequent reproductive success (recruitment) were explicitly considered when initial harvest rate strategies were developed for the Council (Clark 1991). However, the paucity of data and magnitude of some of these factors as related to the low productivity of many species were not fully appreciated in many early studies, and are now known to be important considerations in developing harvest rate guidelines and management policies (Clark 2002; Dorn 2002b)Dorn, 2002 #490}. Consequently, harvest rates for many species have been reduced repeatedly in recent years to account for the improved knowledge regarding the overall productivity of these stocks. As new information continues to emerge regarding the significance of diverse age structures and other factors in sustaining groundfish resources (Berkeley 2004; Berkeley, *et al.* 2004; Bobko and Berkeley 2004), such information continues to be evaluated and incorporated into the stock assessment and assessment review processes that provide the scientific basis upon which management decisions are made.

Management of these groundfish species is based on principles outlined in the Magnuson-Stevens Fishery Management and Conservation Act (MSA), groundfish FMP, and National Standard Guidelines, which provide guidance on the 10 national standards in the MSA. Stock assessments are based on resource surveys, catch trends in west coast fisheries, and other data sources.

Table 1. Latitudinal and depth distributions of groundfish species (adults) managed under the Pacific Coast Groundfish Fishery Management Plan. [a/]

Common name	Scientific name	Latitudinal Distribution		Depth Distribution (fm)	
		Overall	Highest Density	Overall	Highest Density
Flatfish Species					
Arrowtooth flounder	*Atheresthes stomias*	N 34º N lat.	N 40º N lat.	10-400	27-270
Butter sole	*Isopsetta isolepis*	N 34º N lat.	N 34º N lat.	0-200	0-100
Curlfin sole	*Pleuronichthys decurrens*	Coastwide	Coastwide	4-291	4-50
Dover sole	*Microstomus pacificus*	Coastwide	Coastwide	10-500	110-270
English sole	*Parophrys vetulus*	Coastwide	Coastwide	0-300	40-200
Flathead sole	*Hippoglossoides elassodon*	N 38º N lat.	N 40º N lat.	3-300	100-200
Pacific sanddab	*Citharichthys sordidus*	Coastwide	Coastwide	0-300	0-82
Petrale sole	*Eopsetta jordani*	Coastwide	Coastwide	10-250	160-250
Rex sole	*Glyptocephalus zachirus*	Coastwide	Coastwide	10-350	27-250
Rock sole	*Lepidopsetta bilineata*	Coastwide	N 32º30' N lat.	0-200	summer 10-44 winter 70-150
Sand sole	*Psettichthys melanostictus*	Coastwide	N 33º50' N lat.	0-100	0-44
Starry flounder	*Platichthys stellatus*	Coastwide	N 34º20' N lat.	0-150	0-82
Rockfish Species [b/]					
Aurora rockfish	*Sebastes aurora*	Coastwide	Coastwide	100-420	82-270
Bank rockfish	*Sebastes rufus*	S. 39º30' N lat.	S. 39º30' N lat.	17-135	115-140
Black rockfish	*Sebastes melanops*	N 34º N lat.	N 34º N lat.	0-200	0-30
Black-and-yellow rockfish	*Sebastes chrysomelas*	S. 40º N lat.	S. 40º N lat.	0-20	0-10
Blackgill rockfish	*Sebastes melanostomus*	Coastwide	S. 40º N lat.	48-420	125-300
Blackspotted rockfish	*Sebastes melanostictus*	Coastwide	N 40º N lat.	27-400	27-250
Blue rockfish	*Sebastes mystinus*	Coastwide	Coastwide	0-300	13-21
Bocaccio [c/]	*Sebastes paucispinis*	Coastwide	S. 40º N lat., N 48º N lat.	15-180	54-82
Bronzespotted rockfish	*Sebastes gilli*	S. 37º N lat.	S. 37º N lat.	41-205	110-160
Brown rockfish	*Sebastes auriculatus*	Coastwide	S. 40º N lat.	0-70	0-50
Calico rockfish	*Sebastes dallii*	S. 38º N lat.	S. 33º N lat.	10-140	33-50
California scorpionfish	*Scorpaena gutatta*	S. 37º N lat.	S. 34º27' N lat.	0-100	0-100
Canary rockfish	*Sebastes pinniger*	Coastwide	Coastwide	27-460	50-100
Chameleon rockfish	*Sebastes phillipsi*	37º-33º N lat.	37º-33º N lat.	95-150	95-150
Chilipepper rockfish	*Sebastes goodei*	Coastwide	34º-40º N lat.	27-190	27-190
China rockfish	*Sebastes nebulosus*	N 34º N lat.	N 35º N lat.	0-70	2-50

Common name	Scientific name	Latitudinal Distribution		Depth Distribution (fm)	
		Overall	Highest Density	Overall	Highest Density
Copper rockfish	*Sebastes caurinus*	Coastwide	S. 40º N lat.	0-100	0-100
Cowcod	*Sebastes levis*	S. 40º N lat.	S. 34º27' N lat	22-270	100-130
Darkblotched rockfish	*Sebastes crameri*	N 33º N lat.	N 38º N lat.	16-300	96-220
Dusky rockfish [d/]	*Sebastes ciliatus*	N 55º N lat.	N 55º N lat.	0-150	0-150
Dwarf-Red rockfish	*Sebastes rufinanus*	33º N lat.	33º N lat.	>100	>100
Flag rockfish	*Sebastes rubrivinctus*	S. 38º N lat.	S. 37º N lat.	17-100	shallow
Freckled rockfish	*Sebastes lentignosus*	S. 33º N lat.	S. 33º N lat.	22-92	22-92
Gopher rockfish	*Sebastes carnatus*	S. 40º N lat.	S. 40º N lat.	0-30	0-16
Grass rockfish	*Sebastes rastrelliger*	S. 44º40' N lat.	S. 40º N lat.	0-25	0-8
Greenblotched rockfish	*Sebastes rosenblatti*	S. 38º N lat.	S. 38º N lat.	33-217	115-130
Greenspotted rockfish	*Sebastes chlorostictus*	S. 47º N lat.	S. 40º N lat.	27-110	50-100
Greenstriped rockfish	*Sebastes elongatus*	Coastwide	Coastwide	33-220	27-136
Halfbanded rockfish	*Sebastes semicinctus*	S. 36º40' N lat.	S. 36º40' N lat.	32-220	32-220
Harlequin rockfish [e/]	*Sebastes variegatus*	N 40 º N lat.	N 51º N lat.	38-167	38-167
Honeycomb rockfish	*Sebastes umbrosus*	S. 36º40' N lat.	S. 34º27' N lat.	16-65	16-38
Kelp rockfish	*Sebastes atrovirens*	S. 39º N lat.	S. 37º N lat.	0-25	3-4
Longspine thornyhead	*Sebastolobus altivelis*	Coastwide	Coastwide	167->833	320-550
Mexican rockfish	*Sebastes macdonaldi*	S. 36º20' N lat.	S. 36º20' N lat.	50-140	50-140
Olive rockfish	*Sebastes serranoides*	S. 41º20' N lat.	S. 40º N lat.	0-80	0-16
Pacific ocean perch	*Sebastes alutus*	Coastwide	N 42º N lat.	30-350	110-220
Pink rockfish	*Sebastes eos*	S. 37º N lat.	S. 35º N lat.	40-200	40-200
Pinkrose rockfish	*Sebastes simulator*	S. 34º N lat.	S. 34º N lat.	54-160	108
Puget Sound rockfish	*Sebastes emphaeus*	N 40º N lat.	N 40º N lat.	6-200	6-200
Pygmy rockfish	*Sebastes wilsoni*	N 32º30' N lat.	N 32º30' N lat.	17-150	17-150
Quillback rockfish	*Sebastes maliger*	N 36º20' N lat.	N 40º N lat.	0-150	22-33
Redbanded rockfish	*Sebastes babcocki*	Coastwide	N 37º N lat.	50-260	82-245
Redstripe rockfish	*Sebastes proriger*	N 37º N lat.	N 37º N lat.	7-190	55-190
Rosethorn rockfish	*Sebastes helvomaculatus*	Coastwide	N 38º N lat.	65-300	55-190
Rosy rockfish	*Sebastes rosaceus*	S. 42º N lat.	S. 40º N lat.	8-70	30-58
Rougheye rockfish	*Sebastes aleutianus*	Coastwide	N 40º N lat.	27-400	27-250
Semaphore rockfish	*Sebastes melanosema*	S. 34º27' N lat.	S. 34º27' N lat.	75-100	75-100
Sharpchin rockfish	*Sebastes zacentrus*	Coastwide	Coastwide	50-175	50-175
Shortbelly rockfish	*Sebastes jordani*	Coastwide	S. 46º N lat.	50-175	50-155

Common name	Scientific name	Latitudinal Distribution		Depth Distribution (fm)	
		Overall	Highest Density	Overall	Highest Density
Shortraker rockfish	*Sebastes borealis*	N 39º30' N lat.	N 44º N lat.	110-220	110-220
Shortspine thornyhead	*Sebastolobus alascanus*	Coastwide	Coastwide	14->833	55-550
Silvergray rockfish	*Sebastes brevispinis*	Coastwide	N 40º N lat.	17-200	55-160
Speckled rockfish	*Sebastes ovalis*	S. 38º N lat.	S. 37º N lat.	17-200	41-83
Splitnose rockfish	*Sebastes diploproa*	Coastwide	Coastwide	50-317	55-250
Squarespot rockfish	*Sebastes hopkinsi*	S. 38º N lat.	S. 36º N lat.	10-100	10-100
Starry rockfish	*Sebastes constellatus*	S. 38º N lat.	S. 37º N lat.	13-150	13-150
Stripetail rockfish	*Sebastes saxicola*	Coastwide	Coastwide	5-230	5-190
Swordspine rockfish	*Sebastes ensifer*	S. 38º N lat.	S. 38º N lat.	38-237	38-237
Tiger rockfish	*Sebastes nigrocinctus*	N 35º N lat.	N 35º N lat.	30-170	35-170
Treefish	*Sebastes serriceps*	S. 38º N lat.	S. 34º27' N lat.	0-25	3-16
Vermilion rockfish	*Sebastes miniatus*	Coastwide	Coastwide	0-150	4-130
Widow rockfish	*Sebastes entomelas*	Coastwide	N 37º N lat.	13-200	55-160
Yelloweye rockfish	*Sebastes ruberrimus*	Coastwide	N 36º N lat.	25-300	27-220
Yellowmouth rockfish	*Sebastes reedi*	N 40º N lat.	N 40º N lat.	77-200	150-200
Yellowtail rockfish	*Sebastes flavidus*	Coastwide	N 37º N lat.	27-300	27-160
Roundfish Species					
Cabezon	*Scorpaenichthys marmoratus*	Coastwide	Coastwide	0-42	0-27
Kelp greenling	*Hexagrammos decagrammus*	Coastwide	N 40º N lat.	0-25	0-10
Lingcod	*Ophiodon elongatus*	Coastwide	Coastwide	0-233	0-40
Pacific cod	*Gadus macrocephalus*	N 34º N lat.	N 40º N lat.	7-300	27-160
Pacific whiting	*Merluccius productus*	Coastwide	Coastwide	20-500	27-270
Sablefish	*Anoplopoma fimbria*	Coastwide	Coastwide	27->1,000	110-550
Shark and Skate Species					
Big skate	*Raja binoculata*	Coastwide	S. 46º N lat.	2-110	27-110
California skate	*Raja inornata*	Coastwide	S. 39º N lat.	0-367	0-10
Leopard shark	*Triakis semifasciata*	S. 46º N lat.	S. 46º N lat.	0-50	0-2
Longnose skate	*Raja rhina*	Coastwide	N 46º N lat.	30-410	30-340
Soupfin shark	*Galeorhinus zyopterus*	Coastwide	Coastwide	0-225	0-225
Spiny dogfish	*Squalus acanthias*	Coastwide	Coastwide	0->640	0-190

Common name	Scientific name	Latitudinal Distribution		Depth Distribution (fm)	
		Overall	Highest Density	Overall	Highest Density
Other Species					
Finescale codling	*Antimora microlepis*	Coastwide	N 38º N lat.	190-1,588	190-470
Pacific rattail	*Coryphaenoides acrolepis*	Coastwide	N 38º N lat.	85-1,350	500-1,350
Ratfish	Hydrolagus colliei	Coastwide	Coastwide	0-499	55-82

a/ Data from (Casillas, *et al.* 1998), (Eschmeyer, *et al.* 1983), (Hart 1988), (Miller and Lea 1972), (Love, *et al.* 2002), and NMFS survey data. Depth distributions refer to offshore distributions, not vertical distributions in the water column.
b/ The category "rockfish" includes all genera and species of the family Scorpaenidae, even if not listed, that occur in the Washington, Oregon, and California area.
c/ Only the southern stock of bocaccio south of 40º 10' N lat. is listed as overfished.
d/ Only two occurrences of harlequin rockfish south of 51º N lat. (off Newport, OR and La Push, WA; (Casillas, *et al.* 1998)).

Figure 1. Fishery management lines on the U.S. west coast.

The passage of the Sustainable Fisheries Act in 1996 and the reauthorization of the MSA in 2006[1] incorporated the current conservation and rebuilding mandates into the MSA. These mandates—including abundance-based standard reference points for declaring the status of a stock (overfished; in a "precautionary" status; or at levels that can support maximum sustainable yield (MSY) (healthy or "rebuilt"))—were subsequently incorporated in the groundfish FMP with adoption of Amendments 11, 12, and 23. These reference points are determined relative to an estimate of "virgin" or unexploited spawning biomass of the stock, denoted as $B_{0,}$ which is defined as the average equilibrium abundance of a stock's spawning biomass before it is affected by fishing-related mortality.[2] B_0 is then used to estimate MSY, as identified in the MSA and National Standard Guidelines. MSY represents a theoretical maximum surplus production from a population of constant size; National Standard Guidelines define it as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions." For a given population and set of ecological conditions, there is a biomass that produces MSY (denoted as B_{MSY}), which is less than the equilibrium size in the absence of fishing (B_0). (Generally, population sizes above B_{MSY} are assumed to be less productive because of competition for resources or other density dependent factors.) The harvest rate used to achieve or sustain B_{MSY} is referred to as the Maximum Fishing Mortality Threshold (MFMT, denoted as F_{MSY}). Three harvest specification reference points, defined in the groundfish FMP, provide guidance in setting the harvest rate: an overfishing limit (OFL), an acceptable biological catch (ABC), and an annual catch limit (ACL) (see section 1.2 for more information on harvest specifications). The Council identifies the ACL as the management target for each species or species complex. When the stock biomass is determined to be lower than $B_{MSY,}$ the ACL is set to an adequately low level to rebuild the stock to a healthy level in a timely fashion.

The biomass level that produces MSY (i.e., B_{MSY}) is generally unknown and assumed to be variable over time due to long-term fluctuations in ocean conditions, so that no single value is appropriate. Furthermore, F_{MSY} is tightly linked to an assumed level of density dependence in recruitment, and there is insufficient information to determine that level for many west coast groundfish stocks. Therefore, the use of approximations or proxies is necessary; absent a more accurate determination of $F_{MSY,}$ the Council applies default MSY proxies (see section 1.1.1 for more details). The Council adopts management actions aimed to maintain abundance of each stock at or above the specified B_{MSY} target. The threshold for declaring a stock overfished is when the stock's spawning biomass declines to less than the specified Minimum Stock Size Threshold or MSST (i.e., 12.5% of B_0 or $B_{12.5\%}$ for assessed flatfish stocks and $B_{25\%}$ for all other groundfish stocks). A rebuilding plan that specifies how total fishing-related mortality is constrained to achieve an MSY abundance level within the legally allowed time is required by the MSA and groundfish FMP when a stock is declared overfished.

Of the more than 90 species managed under the groundfish FMP, only a portion are individually managed. Thus, the remaining species are managed and accounted for in groupings or stock complexes (see section 1.1.5) because individually they comprise a small part of the landed catch and, in general, insufficient information exists to develop the stock assessments necessary to set harvest specifications based on yield estimates. The Council has also decided to continue to manage some assessed stocks in complexes to avoid management complications such as disruption to the trawl rationalization program. Catch-based methods described in section 1.1.1 are used to set OFLs for unassessed stocks. Additionally, there is a category of stocks that are incidentally caught in groundfish fisheries for which

[1] The Magnuson-Stevens Act is again up for reauthorization in 2014.

[2] The current abundance of a stock relative to its unfished level is commonly written as a percentage or a proportion; this value represents the stock's depletion level. In addition to using a comparison between current spawning biomass and unfished spawning biomass to determine this reference point, some stock assessment authors compare current and unfished levels of spawning output or of total stock biomass, depending on the information that is available.

no harvest limits are specified. This category of stocks, termed Ecosystem Component (EC) species, are not considered to be in the fishery and are neither targeted nor generally retained for sale or personal use. EC species are determined not to likely become subject to overfishing or to be overfished in the absence of conservation and management measures. There is a monitoring requirement for species designated as EC to the extent that any new pertinent scientific information becomes available (e.g., catch trends, vulnerability, etc.) to determine changes in their status or their vulnerability to the fishery. The Council is proposing an EC designation for some species currently managed in the FMP, as well as other non-FMP species (see section 1.1.6).

1.1.1 Productivity and Susceptibility Assessment of Stocks to Overfishing

The vulnerability to potential overfishing of a stock to the fishery for each groundfish stock in the FMP was defined as a first step in assisting with two specific tasks set forth in the FMP: 1) to define species as either "in the fishery" or as an "ecosystem component," and 2) identify stock complexes. In addition, the vulnerability scores were considered when prioritizing stock assessments and determining data collection needs.

The Productivity-Susceptibility Assessment (PSA) approach of Patrick et al. (2009) was used to characterize vulnerability and has two components: 1) productivity as defined by life histories traits, and 2) susceptibility to current fishing practices. Each vulnerability component is comprised of several attributes (10 productivity and 12 susceptibility attributes) and the weighted mean score of all attributes defines the overall productivity and susceptibility score. Table 2 includes the vulnerability scores for all species in the FMP relative to the current fishery. Table 2 shows the vulnerability scores for currently overfished rockfish species relative to the fishery circa 1998. Scores are presented in two-dimensions, with productivity on the x-axis and susceptibility on the y-axis (Figure 2). Cope et al. (2011) established vulnerability reference points of unassessed west coast groundfish stocks to determine vulnerability groups as follows:

- V ≥2.2 indicate species of major concern.
- 2.0≤V<2.2 indicate species of high concern.
- 1.8≤V<2.0 indicate species of medium concern.
- V <1.8 indicate species of low concern.

Rockfish and elasmobranches showed the highest vulnerabilities (>2.0), with the deepest-residing members of those groups often the most vulnerable, though there were several species of nearshore rockfish (China, quillback, and copper rockfish) with some of the highest scored vulnerabilities. Flatfishes in general showed the lowest vulnerabilities.

In addition to scoring each productivity and susceptibility attribute, the quality of the data used for each score was also recorded (Table 2, Table 3, and Figure 3). Data quality is scored for each productivity and susceptibility attribute, with the overall data quality score calculated as the weighted mean of all attributes. A scoring scale of 1-5 was used, with the best data score being 5.

Recording the data quality can highlight vulnerability scores that can be improved with additional data or that should be interpreted with caution because of questionable data contribution. Data quality scores can also be used to justify future data collection on particular attributes.

In general, susceptibility was harder to score (lower data quality) than productivity. Flatfishes as a group had the least informed species, but elasmobranches and several rockfish species also showed low-quality data informing vulnerability scores (Table 2).

PSA analyses are anticipated to be re-done every biennial specifications cycle. Productivity scores are not expected to vary much over time since they are based on life history traits. However, susceptibility scores may vary based on changes in fishing practices and/or management, and an updated understanding of the stock's interaction with the fishery. As susceptibility scores change, so do the vulnerability scores.

Table 2. Overall scores and results of the Productivity and Susceptibility Assessment (PSA) ranked from most to least vulnerable to overfishing relative to the current west coast fishery based on the GMT's scoring.

Stock ID	Stock Name	Productivity	Susceptibility	Vulnerability
21	Copper rockfish	1.95	1.60	2.27
67	Rougheye rockfish	1.17	2.33	2.27
72	Shortraker rockfish	1.22	2.38	2.25
20	China rockfish	1.33	2.29	2.23
58	Quillback rockfish	1.31	2.43	2.22
61	Redstripe rockfish	1.31	2.33	2.16
22	Cowcod	1.25	2.00	2.13
77	Spiny dogfish	1.11	1.98	2.13
10	Bronzespotted rockfish	1.37	2.14	2.12
16	California skate	1.33	2.00	2.12
35	Greenblotched rockfish	1.28	2.24	2.12
2	Aurora rockfish	1.89	2.29	2.10
76	Speckled rockfish	1.33	2.29	2.10
65	Rosethorn rockfish	1.19	2.05	2.09
81	Starry rockfish	1.25	2.14	2.09
7	Blackgill rockfish	1.22	2.08	2.08
84	Tiger rockfish	1.25	2.10	2.06
70	Sharpchin rockfish	1.36	2.24	2.05
86	Vermilion rockfish	1.22	2.02	2.05
87	Widow rockfish	1.31	2.16	2.05
18	Chameleon rockfish	1.39	2.20	2.03
3	Bank rockfish	1.28	1.88	2.02
55	Pink rockfish	1.33	2.14	2.02
60	Redbanded rockfish	1.28	2.05	2.02
74	Silvergray rockfish	1.22	1.95	2.02
75	Soupfin shark	1.11	1.71	2.02
8	Blue rockfish	1.22	2.16	2.01
17	Canary rockfish	1.61	2.43	2.01
43	Leopard shark	1.26	2.00	2.00
88	Yelloweye rockfish	1.22	1.92	2.00
4	Big skate	2.45	2.05	1.99
11	Brown rockfish	1.72	2.08	1.99
26	Dusky rockfish	1.75	1.76	1.99
36	Greenspotted rockfish	1.39	2.14	1.98

Stock ID	Stock Name	Productivity	Susceptibility	Vulnerability
30	Flag rockfish	1.83	1.80	1.97
40	Honeycomb rockfish	1.36	2.10	1.97
89	Yellowmouth rockfish	1.61	2.38	1.96
5	Black rockfish	1.21	2.14	1.94
39	Harlequin rockfish	1.31	1.95	1.94
54	Petrale sole	1.70	2.44	1.94
83	Swordspine rockfish	1.33	2.00	1.94
9	Bocaccio	1.28	2.04	1.93
24	Darkblotched rockfish	1.39	2.24	1.92
34	Grass rockfish	1.61	2.29	1.89
66	Rosy rockfish	1.61	2.29	1.89
37	Greenstriped rockfish	1.28	1.76	1.88
90	Yellowtail rockfish	1.33	1.88	1.88
48	Olive rockfish	1.69	2.33	1.87
79	Squarespot rockfish	1.61	2.24	1.86
51	Pacific grenadier	1.44	1.95	1.82
56	Pinkrose rockfish	1.31	1.67	1.82
78	Splitnose rockfish	1.28	1.60	1.82
47	Mexican rockfish	1.50	2.00	1.80
73	Shortspine thornyhead	1.33	1.68	1.80
82	Stripetail rockfish	1.39	1.81	1.80
63	Rock greenling	1.78	2.29	1.77
33	Gopher rockfish	1.56	2.00	1.76
85	Treefish	1.67	2.10	1.73
59	Ratfish	1.63	2.05	1.72
6	Black-and-yellow rockfish	1.83	1.68	1.70
50	Pacific ocean perch	1.44	1.67	1.69
53	Pacific whiting	2.00	2.36	1.69
13	Cabezon	1.33	2.48	1.68
45	Longnose skate	1.53	1.80	1.68
68	Sablefish	1.61	1.88	1.64
42	Kelp rockfish	1.83	2.12	1.62
41	Kelp greenling	1.83	2.04	1.56
44	Lingcod	1.75	1.92	1.55
25	Dover sole	1.36	2.57	1.54
27	Dwarf-red rockfish	1.06	1.88	1.54
46	Longspine thornyhead	1.47	1.16	1.54
29	Finescale codling	2.45	2.10	1.48
14	Calico rockfish	1.39	2.04	1.46
32	Freckled rockfish	1.80	1.96	1.44
57	Pygmy rockfish	1.78	1.71	1.42
64	Rock sole	1.95	1.95	1.42
15	California scorpionfish	1.28	0.00	1.41
19	Chilipepper	1.83	0.00	1.35

Stock ID	Stock Name	Productivity	Susceptibility	Vulnerability
49	Pacific cod	2.11	2.00	1.34
62	Rex sole	2.05	1.86	1.28
31	Flathead sole	2.25	1.92	1.26
38	Halfbanded rockfish	2.00	1.76	1.26
52	Pacific sanddab	2.40	2.10	1.25
23	Curlfin sole	1.72	1.75	1.23
69	Sand sole	2.35	2.05	1.23
1	Arrowtooth flounder	1.33	2.05	1.21
28	English sole	2.30	2.05	1.19
12	Butter sole	1.78	1.76	1.18
71	Shortbelly rockfish	1.94	1.40	1.13
80	Starry flounder	2.15	1.60	1.04

Table 3. Retrospective Productivity and Susceptibility Assessment (PSA) vulnerability scores of currently overfished rockfish species ranked from most to least vulnerable to overfishing relative to stock status and the fishery circa 1998, based on the GMT's scoring.

Stock Name	Stock ID	Susceptibility	Vulnerability
Bocaccio	25_H	2.72	2.43
Canary	23_H	2.84	2.52
Cowcod	10_H	2.68	2.57
Darkblotched	51_H	2.76	2.39
POP	92_H	2.32	2.08
Yelloweye	18_H	2.80	2.53

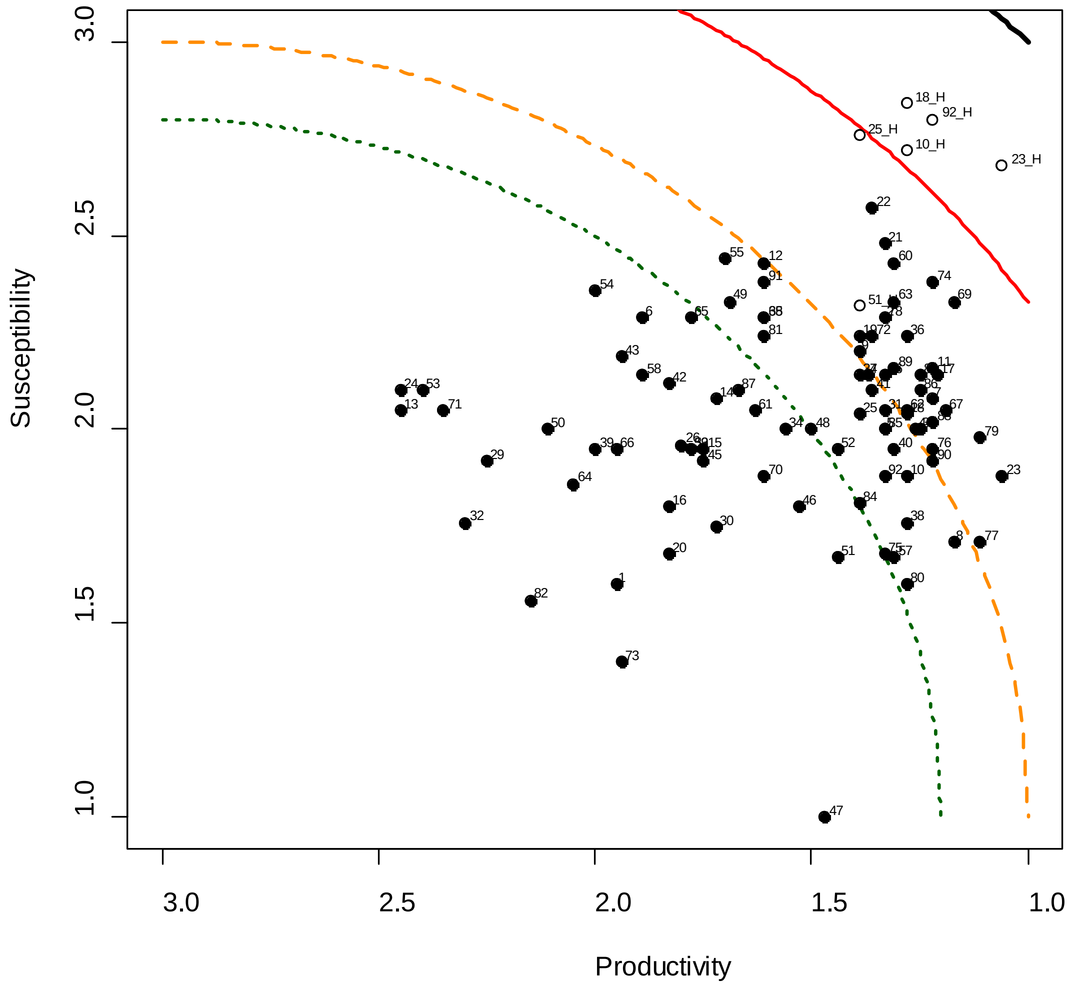

Figure 2. Productivity and Susceptibility Analysis (PSA) plot for species in the west coast groundfish FMP. Contours delineate areas of relative vulnerability (V, i.e. distance from the origin), with the highest vulnerability stocks above the solid red line (V = 2.2), high vulnerability above the orange broken line (V=2), medium vulnerability above the green dotted line (V=1.8) and the lowest vulnerability below the green dotted line. The maximum vulnerability (V=2.8) is indicated with the solid black line. Solid circles are based on current PSA scores. Open circles are based on PSA scores circa 1998. Numbers refer to the Stock ID in Table 2 and Table 3.

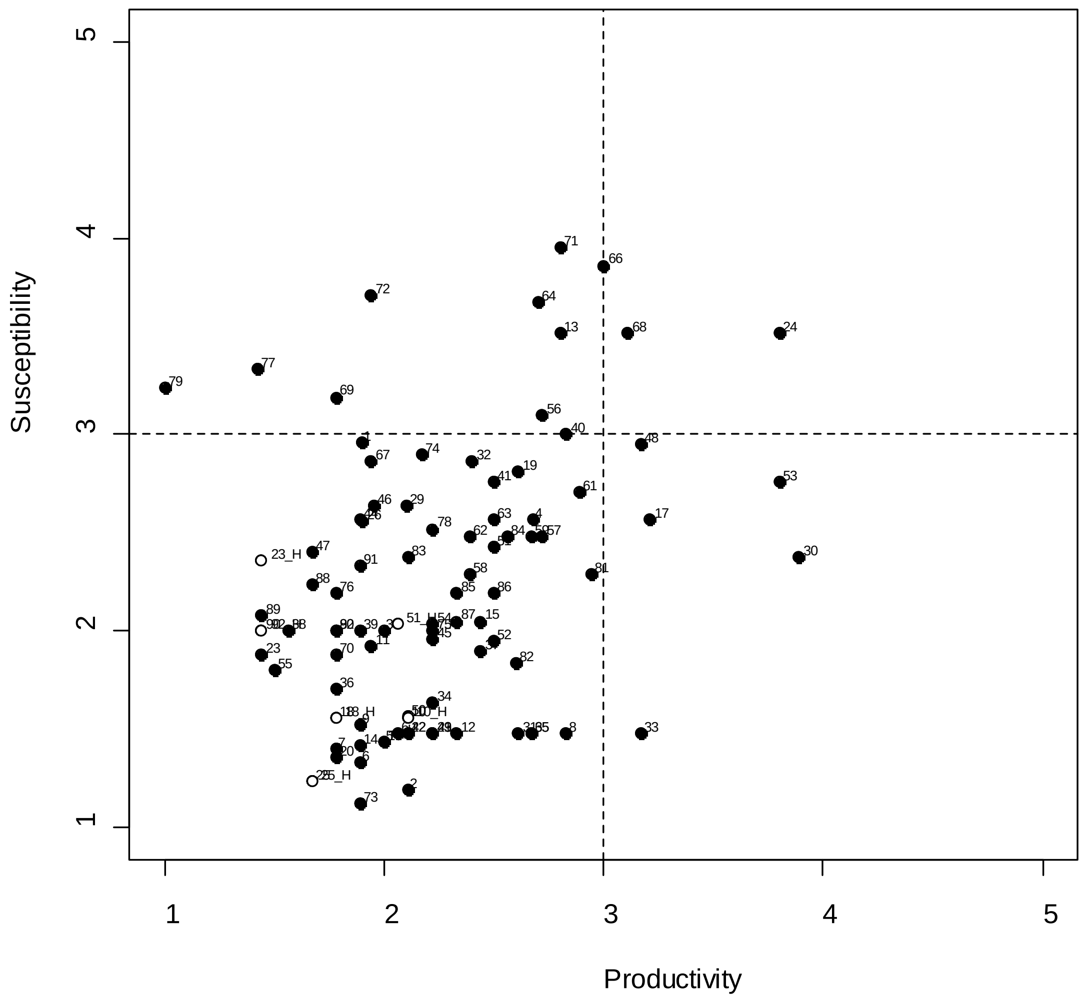

Figure 3. Data quality plots for the productivity and susceptibility scores in the PSA for each species (represented numerically in Table 2 and Table 3) in the west coast groundfish FMP. Higher scores indicate less data quality. Vertical and horizontal lines provide a general guide to relative data quality with values above 3 on either axis considered data-poor.

1.1.2 *Stock Assessments and Rebuilding Analyses Used to Estimate Stock Status and Inform Management Decisions*

Stock assessments are used for setting harvest specifications by providing estimates of MSY, OFL, the MFMT, the MSST, ABC, OY, and ACLs. Stock assessments are also used to determine the status of a fish population or subpopulation (stock) terms of estimating population size, reproductive status, fishing mortality, and sustainability. In the terms of the Groundfish FMP, stock assessments provide: 1) an estimate of the current biomass and reproductive potential, 2) an estimate of F_{MSY} (the harvest rate estimated to produce MSY) or proxy thereof translated into exploitation rate or spawning potential ratio (SPR; *cite section describing SPR*), 3) the estimated MSY biomass (B_{MSY}), or proxy thereof, 4) estimated unfished biomass (B_0), and 5) the estimated variance (e.g., confidence interval) for the current biomass estimate. With the exception of Pacific whiting, which is assessed annually as specified in the Agreement with Canada on Pacific Hake/Whiting, groundfish stock assessments are conducted on a two-year cycle. Given the large number of groundfish species and limited state and Federal resources, a subset of all groundfish stocks are assessed in each stock assessment cycle. Overfished species' stock assessments are typically conducted every two years, although a catch report can be substituted for an assessment to monitor compliance with adopted rebuilding plans. The process for setting groundfish specifications involves the adoption of new and updated stock assessments. During the biennial specification process, the SSC reviews stock assessments and rebuilding analyses for overfished species and makes recommendations to the Council relative to the standards of the best available science and the soundness of the scientific information relative to management decisions. The Council then approves all or a portion of the stock assessments, or recommends further analysis.

The perception of stock status and productivity for many stocks may change substantially between stock assessments. Such changes can result from technical changes in the model, including how a given assessment model is structured, the assumptions used to fix or estimate key parameters (i.e., whether parameters such as natural mortality and steepness are fixed, estimated freely, or estimated with an informative prior), and the evolution of methods for developing time series and estimates of uncertainty from different sources of raw data. The population dynamics of target species themselves are responsive to a mix of complex (and often poorly-understood) biological, oceanographic, and interspecies interactions. New data sources (e.g., new data, extensions of existing data sets, incorporation of environmental factors into assessments) can result in changes in parameter estimates and model outputs.

All stock assessments are subject to a peer review process, consistent with the MSA (§302(g)(1)(E)). The process considers components of the assessments starting with data collection and continuing through to scientific recommendations and information presented to the Council and its advisors. The terms of reference for the groundfish stock assessment process defines the expectations and responsibilities for various participants in the groundfish stock assessment review (STAR) process, and outlines the guidelines and procedures for a peer review process. The STAR process is a key element in an overall process designed to review the technical merits of stock assessments and other scientific information used by the SSC. This process allows the Council to make timely use of new fishery and survey data, to analyze and understand these data as completely as possible, to provide opportunity for public comment, and to assure that the results are as accurate and error-free as possible.

Harvest specifications, and the science used as the basis for management decision-making are derived from the most recent assessments and/or rebuilding analyses prepared for those stocks informed by an assessment. The newest assessments were those prepared and adopted in 2013 and the oldest assessments informing management decisions for fisheries in 2015 and beyond were prepared and adopted in 2005. Table 4 presents a summary of the management quantities estimated by base models of the most recent assessments informing management in 2015 and beyond. Table 5 lists life history parameters from the stocks assessed since 2005, excluding those done using XDB-SRA; steepness of the spawner-recruitment curve (h), recruitment variability (sigma-r), the von Bertalanffy Equation growth constant (k), and natural mortality (M) are each important contributors to the understanding of the productivity and resiliency of these stocks. Table 6 lists life history parameters from the stocks assessed in 2013 using XDB-SRA; B_{MSY}, F_{MSY}, M, B_{MSY}/B_0, and F_{MSY}/M inform the relative productivity and resiliency of these stocks.

All stock assessments, STAR panel reports, and rebuilding analyses used to inform management decisions on west coast groundfish stocks and fisheries can be found on the Council's web site at http://www.pcouncil.org/groundfish/stock-assessments/.

1.1.2.1 Types of Assessments Used in Managing Groundfish Stocks

The Council uses various types of assessments that range from data-rich full assessments (also known as benchmark assessments) to data-poor catch-based models used to only estimate an OFL. The Council decides which groundfish stocks will be assessed and, based on SSC recommendations, what type of assessment will be used (i.e., full, update, data-moderate) each cycle. These stock assessment priorities are decided in even years and assessments are conducted, reviewed, and adopted in odd years. Results from these assessments are used to inform management decisions for the following biennial cycle, which begins in the next odd year. The SSC reviews all assessments and recommends to the Council if they represent the best available science for the stock and whether and how they can be used to inform Council decisions.

The SSC categorizes stocks based on the type of assessment and the quality of data informing that assessment. The FMP harvest specification framework calls for increasing uncertainty buffers translated into lower ABCs (and ACLs) for stocks informed by less certain assessments (see section 1.2.2). Stock categories range from category 1, characterized by stocks informed by full assessments with reasonably good estimates of year class strength, to unassessed category 3 stocks where there is only a data-poor estimate of the OFL. A more detailed description of the assessment models used in current groundfish management follows.

Data-Poor Assessments

Data-poor assessments employ catch-based statistics to estimate an OFL for a stock. Since there are no survey or other abundance indices used in a data-poor assessment, stock status cannot be determined using these types of assessment. The most rudimentary data-poor assessment is simply average historical catch to estimate an OFL. However, there is great uncertainty whether that is a "true" OFL since the historical catch used to compute the average could have been unsustainably high. Therefore, the SSC categorizes stocks informed by a data-poor OFL as category 3 stocks, thus mandating a higher buffer to determine the ABC. While this category of data-poor methods are being characterized as "assessments" here, stocks with OFLs informed with data-poor methods are considered unassessed since there is no estimate of relative depletion or status. Other approved data-poor methods (DCAC and DB-SRA) more sophisticated than average catch are described below.

Depletion-Corrected Average Catch

The Depletion-Corrected Average Catch (DCAC) method provides an estimate of sustainable yield (the OFL) for data-poor stocks of uncertain status (MacCall 2009). DCAC adjusts historical average catch to account for one-time "windfall" catches that are the result of stock depletion, producing an estimate of yield that was likely to be sustainable over the same time period. Advantages of the DCAC approach for determining sustainable yield for data-poor stocks include: 1) minimal data requirements, 2) biologically-based adjustment to catch-based yield proxies with transparent assumptions about relative changes in abundance, and 3) simplicity in computing.

Depletion-Based Stock Reduction Analysis

The Depletion-Based Stock Reduction Analysis (DB-SRA) method extends the DCAC method by 1) restoring the temporal link between production and biomass, and 2) evaluating and integrating alternative hypotheses regarding changes in abundance during the historical catch period (Dick and MacCall 2011). This method combines DCAC's distributional assumptions regarding life history characteristics and stock status with the dynamic models and simulation approach of stochastic stock reduction analysis.

Data-Moderate Assessments

Data-moderate assessments are less complicated than full assessments and can therefore be reviewed more expeditiously. Unlike a full assessment, which is reviewed by a STAR panel and the SSC, only the SSC reviews a data-moderate assessment.

Data-moderate assessments combine catch-based methods with a time series of relative abundance estimates from one or more surveys or other types of abundance indices (e.g., CPUE time series). This type of assessment represents the minimal structure of an assessment used to determine stock status according to the NMFS National Stock Assessment Improvement plan (Mace, *et al.* 2001). These assessments exclude compositional age and length data, which are used to determine survey and/or fishery selectivities and to estimate other parameters in a full assessment model. The addition of compositional data complicates an assessment requiring more review time to understand what data are driving model results. Data-moderate assessments were therefore developed to increase the number of groundfish stocks assessed given the resources available to conduct and review assessments each cycle. There are two data-moderate assessment models in current use that have been reviewed and recommended by the SSC: Extended Simple Stock Synthesis (exSSS) and Extended Depletion-based Stock Reduction Analysis (XDB-SRA). These are described in more detail below.

Since data-moderate assessments are less informative than full assessments, the SSC categorizes stocks informed with such assessment as category 2 stocks.

Extended Simple Stock Synthesis

Extended Simple Stock Synthesis (exSSS) is based on sampling parameters (steepness, natural mortality and depletion) from prior distributions and using Stock Synthesis to solve for virgin recruitment (R0) given inputs for selectivity, growth, and fecundity. ExSSS extends Simple Stock Synthesis, originally a data-poor method reviewed by the SSC, by allowing index data (and potentially length and age data) to be used for parameter estimation using the Stock Synthesis platform. Parameter estimation for exSSS is either based on maximum likelihood or Bayesian (Markov chain Monte Carlo (MCMC)) methods. ExSSS assumes that recruitment is related deterministically to the stock-recruitment relationship. The outputs from exSSS include biomass trajectories, as well as estimates of (and measures of uncertainty for) the OFL. The prior for depletion is based on the results of a regression of depletion on the PSA vulnerability score (see section 1.1.1).

Extended Depletion-Based Stock Reduction Analysis

Extended Depletion-Based Stock Reduction Analysis (XDB-SRA), an extension of DB-SRA, is another model approved by the SSC for use in data-moderate assessments. XDB-SRA can be implemented within a Bayesian framework, with the priors for the parameters updated based on index data. The additional parameters in XDB-SRA compared with DB-SRA include the catchability coefficient (q), and the extent of observation variance additional to that inferred from sampling error (a). The priors for these parameters are a weakly informative log-normal and a uniform distribution, respectively.

Full Stock Assessments

Full, or benchmark, stock assessments are those where Stock Assessment Teams (STATs) can propose new models and explore new data to determine the status and dynamics of a fish stock. The Council has a rigorous process for first determining those stocks that will be assessed and, once determined, how they will be reviewed (the process is codified in the Stock Assessment and Review Terms of Reference, which is updated every other year; available at http://www.pcouncil.org/groundfish/stock-assessments/terms-of-reference/). Full assessments are more vigorously reviewed than other types of assessments since they are inherently more complicated. A week-long Stock Assessment Review (STAR) panel meeting occurs with STATs presenting assessment models to a panel of experts (typically comprised of one SSC Groundfish Subcommittee member who chairs the meeting, one west coast groundfish assessment expert, two independent reviewers from the Center of Independent Experts, one Groundfish Management Team advisor, one Groundfish Advisory Subpanel advisor, and a member of the Council staff). The STAR panel prepares a report recommending whether the assessment is robust enough to be used in management, along with other detailed recommendations on how to interpret assessment results and how to improve the assessment next time it is conducted. STAR panel reports also detail the model and data explorations that occurred during the review. The draft assessment and STAR panel report are then reviewed by the SSC. The assessment is only adopted for use in management decision-making if recommended by the SSC.

Stocks assessed with SSC-endorsed assessments are categorized either as category 1, category 2, or assigned a stock-specific category depending on the quality of data informing the assessment, relative uncertainty of model estimates, and/or whether individual year class strength (i.e., recruitment) is estimated.

Stock Synthesis

Most of the groundfish assessments on the U.S. west coast used to currently inform management decisions have been done in Stock Synthesis (SS). Stock Synthesis provides a statistical framework for calibration of a population dynamics model using a diversity of fishery and survey data. It is designed to accommodate both age and size structure in the population and with multiple stock sub-areas. Selectivity can be cast as age specific only, size-specific in the observations only, or size-specific with the ability to capture the major effect of size-specific survivorship. The overall model contains subcomponents which simulate the population dynamics of the stock and fisheries, derive the expected values for the various observed data, and quantify the magnitude of difference between observed and expected data. Some SS features include ageing error, growth estimation, spawner-recruitment relationship, movement between areas. SS is most flexible in its ability to utilize a wide diversity of age, size, and aggregate data from fisheries and surveys. The ADMB C++ software in which SS is written searches for the set of parameter values that maximize the goodness-of-fit, then calculates the variance of these parameters using inverse Hessian and MCMC methods. A management layer is also included in the model allowing uncertainty in estimated parameters to be propagated to the management quantities, thus facilitating a description of the risk of various possible management scenarios, including forecasts of possible annual catch limits. The structure of Stock Synthesis allows for building of simple to complex models depending upon the data available. The latest version of SS used in most of the assessments done in 2013 is version 3.24f (download available at http://nft.nefsc.noaa.gov/SS3.html).

Extended Depletion-Based Stock Reduction Analysis

XDB-SRA, described above, was used in the 2013 full assessment of cowcod in the Southern California Bight (see section 1.1.3.3). While XDB-SRA is an approved data-moderate assessment model, it can also be parameterized to incorporate compositional data[3].

Updated Assessments

An update assessment uses the model structure of the stock's last full, SSC-endorsed assessment, but is generally restricted to the addition of new data that have become available since the last full assessment. It must carry forward the fundamental structure of the last full assessment reviewed and endorsed by a STAR panel, the SSC, and the Council. Assessment structure here refers to the population dynamics model, data sources used as inputs to the model, the statistical platform used to fit model to the data, and how the management quantities used to set harvest specifications are calculated. Particularly, when an update assessment is developed, no substantial changes should be made to 1) the particular sources of data used, 2) the software used in programming the assessment, 3) the assumptions and structure of the population dynamics model underlying the stock assessment, 4) the statistical framework for fitting the model to the data and determining goodness of fit, and 5) the analytical treatment of model outputs in determining management reference points.

Major changes to the assessment should be postponed until the next full assessment. Minor alterations to the input data and the assessment can be considered as long as the update assessment clearly documents and justifies the need for such changes. A step-by-step transition (via sensitivity analysis) from the last full assessment to an update assessment under review should be provided. Minor alterations can be considered under only two circumstances: first, when the addition of new data reveals an unanticipated sensitivity of the model, and second, when there are clear and straightforward improvements in the input data and how it is processed and analyzed for use in the model. Examples of minor alterations include: 1) changes in how compositional data are pooled across sampling strata, 2) the weighting of the various data components (including the use of methods for tuning the variances of the data components), 3) changes in the time periods for the selectivity blocks, 4) correcting data entry errors, and 5) bug fixes in software programming. This list is not meant to be exhaustive, and other alterations can be considered if warranted. Ideally, improved data or methods used to process and analyze data would be reviewed by the SSC prior to being used in assessments.

The SSC reviews all updated assessments; a STAR panel review is not needed since the assessment only updates the last full, STAR panel-reviewed assessment.

1.1.2.2 Rebuilding Analyses

Rebuilding analyses use the results of stock assessments and project stock rebuilding periods under alternative harvest control rules in a stochastic fashion. In other words, a rebuilding analysis involves projecting the status of the overfished resource into the future under a variety of alternative harvest strategies to determine the probability of recovery to B_{MSY} (or its proxy) within a pre-specified time-frame. Rebuilding analyses are used to develop new rebuilding plans or in consideration for modifying existing rebuilding plans; rebuilding plans dictate the target year to rebuild a stock, the harvest control rules for rebuilding the stock, and any other special management measures designed to foster rebuilding. Rebuilding analyses also are used to determine the OFLs and ACLs for overfished stocks.

[3] Note that the 2013 cowcod assessment excluded compositional data within the model. However, the model was subject of the two-step (i.e., STAR panel and SSC) review process defined for full assessments.

The steps when conducting a rebuilding analysis are 1) estimation of B_0 (and hence B_{MSY} or its proxy), 2) selection of a method to generate future recruitment, 3) specification of the mean generation time (defined as the predicted time it would take for a mature female in the population to replace herself), 4) calculation of the minimum and maximum times to recovery, and 5) identification and analysis of alternative harvest strategies and rebuilding times. Most rebuilding analyses are done using software developed by Dr. André Punt from the University of Washington (informally termed the Puntalyzer; available at http://fish.washington.edu/people/punt/software.html).

The Puntalyzer uses "Monte Carlo simulation" to derive a probability estimate for a given rebuilding strategy. This method projects population growth many times in separate simulations. It accounts for possible variability by randomly choosing the value of a key variable, in this case total recruitment or recruits per spawner from a range of values. These values can be specified empirically, by listing some set of historical values, or by a relationship based on a model. The SSC recommends that the rebuilding analyses use historical values. Because of this variability in a key input value, each simulation will show a different pattern of population growth. As a result, a modeled population may reach the target biomass that defines a rebuilt stock (B_{MSY}) in a different year in each of the simulations.

This technique is first used to calculate minimal time to rebuild a stock given its level of depletion and productivity from the time of implementing the first rebuilding plan (T_{MIN}) in probabilistic terms, which is defined as the time needed to reach the target biomass in the absence of fishing with a 50 percent probability. In other words, in half the simulations the target biomass was reached in some year up to and including the computed T_{MIN}. Given T_{MIN}, the maximum legal time to rebuild (T_{MAX}) is computed as 10 years or by adding the value of one mean generation time to T_{MIN}, if T_{MIN} is greater than or equal to 10 years. In cases, where there is consideration for modifying an existing rebuilding plan, the shortest time to rebuild is calculated as the biological limit for the stock to rebuild in the absence of fishing beginning in the year the modified rebuilding plan is implemented; this limit is denoted, "$T_{F=0}$".

A target rebuilding year, T_{TARGET}, is set as a year at T_{MIN} (or $T_{F=0}$) or greater, which does not exceed T_{MAX} ,and which is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem. Prior to Amendment 16-4, the Council set T_{TARGET} in part by considering the probability of rebuilding the stock by T_{MAX}. The Council may continue to review the probability of rebuilding the stock by T_{MAX} given differing harvest control rules, a reference parameter known as "P_{MAX}." The Magnuson-Stevens Act, however, simply requires that rebuilding periods be as short as possible, taking into account:

- the status and biology of any overfished stocks of fish;
- the needs of fishing communities;
- recommendations by international organizations in which the United States participates; and
- the interaction of the overfished stock of fish within the marine ecosystem (§304(e)(4)(A)(i)).

It is important to recognize that some of the terms introduced and described above represent policy decisions at the national level and the Council **does not have a choice** in setting their values. The dates for T_{MIN} and T_{MAX} are determined based on guidelines established at the national level. Mean generation time is a biological characteristic that cannot be chosen by policymakers. Thus, the Council cannot choose these values and then use them as a basis for management. Defined in national guidelines, T_{MIN} is a consequence of the productivity of the fish stock and is calculated by fishery biologists based on information they get from a particular stock. Similarly, T_{MAX}, which is calculated from T_{MIN}, does not represent a Council choice.

Policy flexibility comes into play in determining T_{TARGET}, or the time by which the stock is projected to rebuild. As explained earlier, the time to rebuild must be as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem. When developing a management strategy the Council can choose a fishing mortality rate and corresponding annual level of fishing. However, when rebuilding overfished species, the choice of the harvest control rule is based on the value of T_{TARGET}, keeping in mind that these values cannot be chosen independently of one another. In other words, the Council may choose one value and derive the other from it, but they cannot choose these values independently of the other.

The current groundfish rebuilding plan parameters are depicted in Table 7.

Table 4. Management quantities estimated from the most recent stock assessments informing management in 2015 and beyond.

Insert table here

Table 5. Parameters estimated and/or assumed in base models in the most recent west coast groundfish stock assessments, excluding those done using XDB-SRA.

Stock	ln(R0)	Steepness (h)		Sigma-r	von-Bertalanffy Growth Coefficient (K)		Natural Mortality (M)		
		value	est.?		females	males	females	males	est.?
Arrowtooth flounder	10.26	0.90	N	0.8	0.17	0.39	0.166	0.274	N
Aurora rockfish	6.64	0.78	N	0.5	0.09	0.09	0.035	0.037	a/
Black rockfish (S of Cape Falcon)	8.97	0.60	N	0.5	0.17	0.26	0.160 < 10 yrs 0.240 > 15 yrs	0.160	N
Black rockfish (N of Cape Falcon)	8.04	0.60	N	0.35	0.164	0.194	0.200	0.160	Y
Blackgill rockfish	7.73	0.65	N	0.5	0.028	0.047	0.063	0.065	N
Blue rockfish	8.08	0.58	N	0.5	0.147	0.295	0.100	0.120	N
Bocaccio	8.55	0.61	Y	1.0	0.22	0.27	0.150	0.150	N
Cabezon (CA N of Pt. Con.)	6.78	0.70	N	0.5	0.149	0.269	0.250	0.300	N
Cabezon (CA S of Pt. Con.)	5.33	0.70	N	0.7	0.130	0.230	0.250	0.300	N
Cabezon (OR)	5.27	0.70	N	0.5	0.190	0.178	0.250	0.300	N
California scorpionfish	7.63	0.70	N	1.0	0.13	0.12	0.250	0.250	N
Canary rockfish	8.12	0.51	N	0.5	0.125	0.162	0.060 < 6 yrs 0.092 ≥ 6 yrs	0.060	Y
Chilipepper rockfish	19.45	0.57	N	1.0	0.2 - 0.32 b/	0.2 - 0.32 b/	0.160	0.200	N
Darkblotched rockfish	7.84	0.78	N	0.75	0.2	0.26	0.050	0.067	a/
Dover sole	12.85	0.80	N	0.35	0.150	0.171	0.117	0.142	Y
English sole	11.62	0.80	N	0.8	0.393	0.480	0.260	0.260	N
Gopher rockfish	7.92	0.65	N	0.5	0.186	0.186	0.200	0.200	N
Greenspotted rockfish (CA N of Pt. Con.)	6.15	0.76	N	0.7	0.057	0.057	0.065	0.065	N
Greenspotted rockfish (CA S of Pt. Con.)	6.65	0.76	N	0.7	0.042	0.042	0.065	0.065	N
Greenstriped rockfish	9.62	0.69	N	0.84	0.11	0.15	0.080	0.080	N
Kelp greenling (OR)	7.02	0.70	N	1.0	0.3	0.4	0.260	0.260	N
Lingcod (WA & OR)	8.06	0.80	N	0.5	0.13	0.22	0.180	0.320	N
Lingcod (CA)	8.17	0.80	N	0.5	0.11	0.23	0.180	0.320	N

Stock	ln(R0)	Steepness (h)		Sigma-r	von-Bertalanffy Growth Coefficient (K)		Natural Mortality (M)		
		value	est.?		females	males	females	males	est.?
Longnose skate	9.65	0.40	N	c/	0.064	0.064	0.200	0.200	N
Longspine thornyhead	11.82	0.60	N	0.6	0.109	0.109	0.111	0.111	N
Pacific ocean perch	9.14	0.40	N	0.7	0.159	0.195	0.050	0.051	N
Pacific whiting	21.71	0.82	Y	1.4	d/	d/	0.224	0.224	Y
Petrale sole	9.72	0.86	Y	0.4	0.13	0.21	0.150	0.169	Y
Rex sole	9.97	0.80	N	0.8	0.388	0.388	0.200	0.190	Y
Rougheye/blackspotted rockfish	6.19	0.78	N	0.4	0.081	0.081	0.042	0.042	Y
Sablefish	10.01	0.60	N	0.6	0.335	0.419	0.080	0.065	Y
Sharpchin rockfish	9.16	0.95	Y	0.8	0.17	0.20	0.080	0.080	N
Shortbelly rockfish	12.64	0.65	N	1.0	0.198	0.200	0.260	0.260	N
Shortspine thornyhead	10.32	0.60	N	0.5	0.018	0.018	0.051	0.051	N
Spiny dogfish	10.07	0.28	e/	0.2	0.026	0.052	0.064	0.064	N
Splitnose rockfish	9.54	0.58	N	1.0	0.156	0.165	0.048	0.048	N
Starry flounder (OR & WA)	7.96	0.80	N	1.0	0.251	0.426	0.510	0.760	N
Starry flounder (CA)	7.23	0.80	N	1.0	0.251	0.426	0.510	0.760	N
Widow rockfish	10.06	0.76	N	0.65	0.209	0.233	0.120	0.129	Y
Yelloweye rockfish	5.43	0.44	Y	b/	0.047	0.047	0.046	0.045	Y
Yellowtail rockfish	10.28	0.95	Y	0.8	0.170	0.190	0.110	0.110	Y

a/ Female M was fixed and male M was estimated as an offset to female M.

b/The base case model allowed growth for each sex to differ between blocks of time, based on freely estimating the K parameter.

c/ Recruitment variability (sigma-r) not estimated.

d/ The 2013 Pacific whiting assessment uses weight-at-age, thus there is no estimate of growth. Weight-at-age varies between years; therefore, growth is time-varying.

e/ Steepness was a derived quantity from the 2011 assessment, not an estimated parameter from an alternative stock-recruitment relationship modeled in the assessment.

Table 6. Parameters estimated and/or assumed in base models in 2013 west coast groundfish stock assessments using XDB-SRA.

Stock	ln(R0)	Productivity Parameters				von-Bertalanffy Growth Coefficient (K)		Natural Mortality (M)		
		B_{MSY}	F_{MSY}	B_{MSY}/B_0	F_{MSY}/M	females	males	females	males	est.?
Brown rockfish		1,387.4	0.129	0.400	0.954	0.16	0.16	0.134	0.137	Y
China rockfish (N of 40º10' N lat.)		186.1	0.053	0.395	0.918	0.192	0.194	0.057	0.055	Y
China rockfish (S of 40º10' N lat.)		417.2	0.088	0.464	1.304	0.192	0.194	0.065	0.055	Y
Copper rockfish (N of Pt. Con.)		1,103.90	0.099	0.404	1.092	0.127	0.224	0.089	0.090	Y
Copper rockfish (S of Pt. Con.)		1,058.40	0.094	0.481	1.040	0.127	0.224	0.089	0.090	Y
Cowcod		1239.5	0.050	0.422	1.051	NA	NA	0.054	NA	Y

1.1.3 Overfished Groundfish Stocks

There are six overfished west coast rockfish stocks (i.e., bocaccio south of 40º10’ N lat., canary rockfish, cowcod south of 40º10’ N lat., darkblotched rockfish, Pacific ocean perch, and yelloweye rockfish) and one overfished flatfish stock (i.e., petrale sole) at the start of 2013. All seven of these stocks are rebuilding and three (i.e., bocaccio south of 40º10’ N lat., darkblotched rockfish, and petrale sole) are predicted to rebuild by the start of 2015. Descriptions of these overfished groundfish stocks follows.

Stock rebuilding parameters estimated from the most recent rebuilding analyses and current rebuilding parameters specified at the start of 2013 are provided in Table 7.

Table 7. Rebuilding parameters estimated in the most recent rebuilding analyses and specified in rebuilding plans for overfished groundfish stocks at the start of the 2013-2014 management cycle.

Stock	T_{MIN}	$T_{F=0}$	T_{MAX}	T_{TARGET}	Harvest Control Rule Specification
Bocaccio	2018	2018	2031	2022	SPR 77.7%
Canary	2027	2028	2050	2030	SPR 88.7%
Cowcod	2059	2060	2097	2068	SPR 82.7%
Darkblotched	2012	2016	2037	2025	SPR 64.9%
POP	2040	2043	2071	2051	SPR 86.4%
Petrale sole	2014	2014	2021	2016	25-5 Rule
Yelloweye	2044	2047	2089	2074	SPR 76%

1.1.3.1 Bocaccio

Distribution and Life History

Bocaccio (*Sebastes paucispinis*) is a rockfish species that ranges from Stepovak Bay on the Alaskan Peninsula (as well as Kodiak Island, Alaska) to Punta Blanca, Baja California, Mexico (Hart 1988; Miller and Lea 1972). Love, et al. (2002) and Thomas and MacCall (2001) describe bocaccio distribution and life history. Bocaccio are historically most abundant in waters off central and southern California. The southern bocaccio stock is most prevalent in the 54-82 fm depth zone (Casillas, *et al.* 1998).

Bocaccio are found in a wide variety of habitats, often on or near bottom features, but sometimes over muddy bottoms. They are found both nearshore and offshore (Sakuma and Ralston 1995). Larvae and small juveniles are pelagic (Garrison and Miller 1982) and are commonly found in the upper 100 m of the water column, often far from shore (MBC 1987). Large juveniles and adults are semi-demersal and are most often found in shallow coastal waters over rocky bottoms associated with algae (Sakuma and Ralston 1995). Adults are commonly found in eelgrass beds, or congregated around floating kelp beds love (Love, *et al.* 1990; Sakuma and Ralston 1995). Young and adult bocaccio also occur around artificial structures, such as piers and oil platforms (MBC 1987). Although juveniles and adults are usually found around vertical relief, adult aggregations also occur over firm sand-mud bottoms (MBC 1987). Bocaccio move into shallow waters during their first year of life hart (Hart 1988), then move into deeper water with increased size and age (Garrison and Miller 1982).

Bocaccio are ovoviviparous (live young are produced from eggs that hatch within the female’s body) (Garrison and Miller 1982; Hart 1988). Love et al. (1990) reported the spawning season to last nearly an entire year (>10 months). Parturition occurs during January to April off Washington, November to March off Northern and Central California, and October to March off Southern California (MBC 1987). Fecundity ranges from 20,000 to 2,300,000 eggs. In California, two or more broods may be born per year (Love, *et al*. 1990). The spawning season is not well known in northern waters. Males mature at three to seven years, with about half maturing in four to five years. Females mature at three to eight years, with about half maturing in four to six years (MBC 1987).

Maximum age of bocaccio was radiometrically determined to be at least 40 years, and perhaps more than 50 years. Bocaccio are difficult to age, and stock assessments used length measurement data and growth curves to estimate the age composition of the stock (Ralston and Ianelli 1998). Although recent assessments have described the true natural mortality rate as a key unknown for estimating stock status, recent assessments have used a value of 0.15 (which is associated with an 86 percent adult annual survival rate in the absence of fishing mortality).

Larval bocaccio eat diatoms, dinoflagellates, tintinnids, and cladocerans (Sumida and Moser 1984). Copepods and euphausiids of all life stages (adults, nauplii and egg masses) are common prey for juveniles (Sumida and Moser 1984). Both Phillips (1964) and Love et al. (2002) described bocaccio rockfish as almost exclusively piscivorous, and include other rockfish, Pacific whiting, sablefish, anchovy, mesopelagic fishes and squid as the key prey for large juvenile and adult bocaccio. Bocaccio are eaten by sharks, salmon, other rockfishes, lingcod, albacore, sea lions, porpoises, and whales (MBC 1987). Adult bocaccio are often caught with chilipepper rockfish and have been observed schooling with speckled, vermilion, widow, and yellowtail rockfish (Love, *et al.* 2002). As pelagic juveniles, they may compete with chilipepper, widow, yellowtail, shortbelly, and other pelagic juvenile rockfishes for both food and habitat (Reilly, *et al.* 1992).

Stock Status and Management History

Bocaccio are managed as two separate west coast populations. The southern stock exists south of Cape Mendocino and the northern stock north of Cape Mendocino (the northern stock density is limited south of 48° N lat. with increasing abundance off Cape Flattery, Washington and points north). It is unclear whether this stock separation implies stock structure. The distribution of the two populations and evidence of lack of genetic intermixing suggests stock structure, although MacCall (2002) reported some evidence for limited genetic mixing of the two populations. Nonetheless, assessment scientists and managers have treated the two populations as independent stocks north and south of Cape Mendocino.

Bocaccio have long been an important component of California rockfish fisheries. Catches increased to high levels in the 1970s and early 1980s as relatively strong year-classes recruited to the stock. The Council began to recommend increasingly restrictive regulations after an assessment of the southern stock in 1990 (Bence and Hightower 1990) indicated that fishing rates were too high. The southern stock suffered poor recruitment during the warm water conditions that prevailed off Southern California beginning in the late 1980s. The 1996 assessment (Ralston, *et al.* 1996) indicated the stock was in severe decline. NMFS formally declared the stock overfished in March 1999 after the groundfish FMP was amended to incorporate the tenets of the Sustainable Fisheries Act. MacCall et al. (1999) confirmed the overfished status of bocaccio and estimated spawning output of the southern stock to be 2.1 percent of its unfished biomass.

In the 2002 assessment (MacCall 2002) relative abundance increased slightly from the previous assessment (4.8 percent of unfished biomass), potential productivity (as evidenced from the steepness of the spawner/recruit relationship, which reflects the level of compensatory production at low stock sizes) appeared lower than previously thought, making for a more pessimistic outlook. Furthermore, the 2002 assessment revealed that although the 1999 year class was the strongest in several years, it was weak relative to the range of possibilities considered in the 1999 assessment. The 2002 rebuilding analysis (MacCall and He 2002) predicted the stock would not rebuild within maximum time legally possible (T_{MAX}) even with no fishing-related mortality. Total mortality in 2003 fisheries was restricted to less than 20 mt as a means of conserving the stock while minimizing adverse socioeconomic impacts to communities.

The 2003 bocaccio assessment (MacCall 2003b) estimated a higher stock biomass (7.4% depletion) relative to the 2002 assessment. The instantaneous rate of natural mortality was changed from 0.2 to 0.15. Additional CalCOFI data indicated an increasing abundance trend due to recruitment of the 1999 year class. This was corroborated by a dramatic increase in recreational CPUE, which was at a record high level in central California north of Pt. Conception. The 2003 rebuilding analysis suggested the stock could rebuild to B_{MSY} within 25 years while sustaining an OY of approximately 300 mt in 2004 (MacCall 2003a).

The 2003 assessment was updated in 2005 and 2007 (MacCall 2006b; MacCall 2008b) using the original 2003 base model (i.e., STATc) in SS1. These assessments were used to establish annual specifications and management measures consistent with a strategy of a higher OY than the impacts anticipated under the suite of management measures adopted. This strategy was designed to buffer the effects of a large recruitment event like that observed for the 1999 year class. Such effects include disruption to fisheries as experienced in previous years when fisheries closed early to avoid young bocaccio. This buffer strategy, which addressed the large, episodic recruitment pattern inherent in the stock's dynamics, became a tenet of the bocaccio rebuilding plan.

A bocaccio rebuilding plan was adopted by the Council in 2004 under Amendment 16-3 (PFMC 2004). The rebuilding plan established a target rebuilding year of 2023 and a harvest control rule of F = 0.0498 (with a rebuilding probability (P_{MAX}) of 70 percent). (It was later clarified in the 2005 rebuilding analysis (MacCall 2006a) that the target rebuilding year had been incorrectly stated in the rebuilding plan to be 2023 since the 2003 rebuilding analysis indicated that a 50 percent probability rebuilding would require 23 years, and that this assumed a beginning date of 2004 (the first simulated year). Therefore, the Council amended the rebuilding plan's target year to 2026.

A new rebuilding analysis was conducted in 2007 (MacCall 2008a) based on the results of the 2007 stock assessment (MacCall 2008b). The 2007 bocaccio rebuilding analysis showed a similar rebuilding trajectory to that adopted in Amendment 16-4 and the rebuilding plan was maintained for the 2009-2010 management cycle.

A new bocaccio assessment (Field, *et al.* 2009) and rebuilding analysis (Field and He 2009) were prepared in 2009. Field et al. (2009) extended the assessment north of Cape Mendocino to Cape Blanco, Oregon; the U.S. west coast stock north of this point has not been assessed. Indications of strong 2009 and 2010 year classes were projected to result in increased abundance. Depletion in 2011 was estimated at 26 percent (18.7 -33.1 percent), with the stock projected to be rebuilt by 2019. Based on these analyses, the Council changed the target year for rebuilding bocaccio from 2026 to 2022; the amended rebuilding plan was implemented in 2011.

A bocaccio stock assessment update (Field 2011b) and rebuilding analysis (Field 2011a) were prepared in 2011. The 2011 bocaccio assessment was originally scheduled to be an update of the 2009 full assessment; however, the STAT some limited changes in the 2009 model structure since a strict update estimated that the 2010 year class was extraordinarily and unrealistically strong, based on length frequency data collected in the 2010 NMFS trawl survey. The modified update was ultimately reviewed, endorsed by the SSC, and adopted for use in management decision-making. The 2011 bocaccio rebuilding analysis indicated rebuilding progress was well ahead of schedule with a predicted median year to rebuild of 2021 or one year earlier than the target rebuilding year (Field 2011a). The Council elected to maintain the revised rebuilding plan implemented in 2011.

An update of the 2011 bocaccio assessment model was prepared in 2013, which confirmed the 2009 and 2010 year classes were indeed strong (Field 2013). The assessment estimated a depletion of 31.4 percent at the start of 2013 (Figure 4) and predicted the stock would rebuild by 2015. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013.

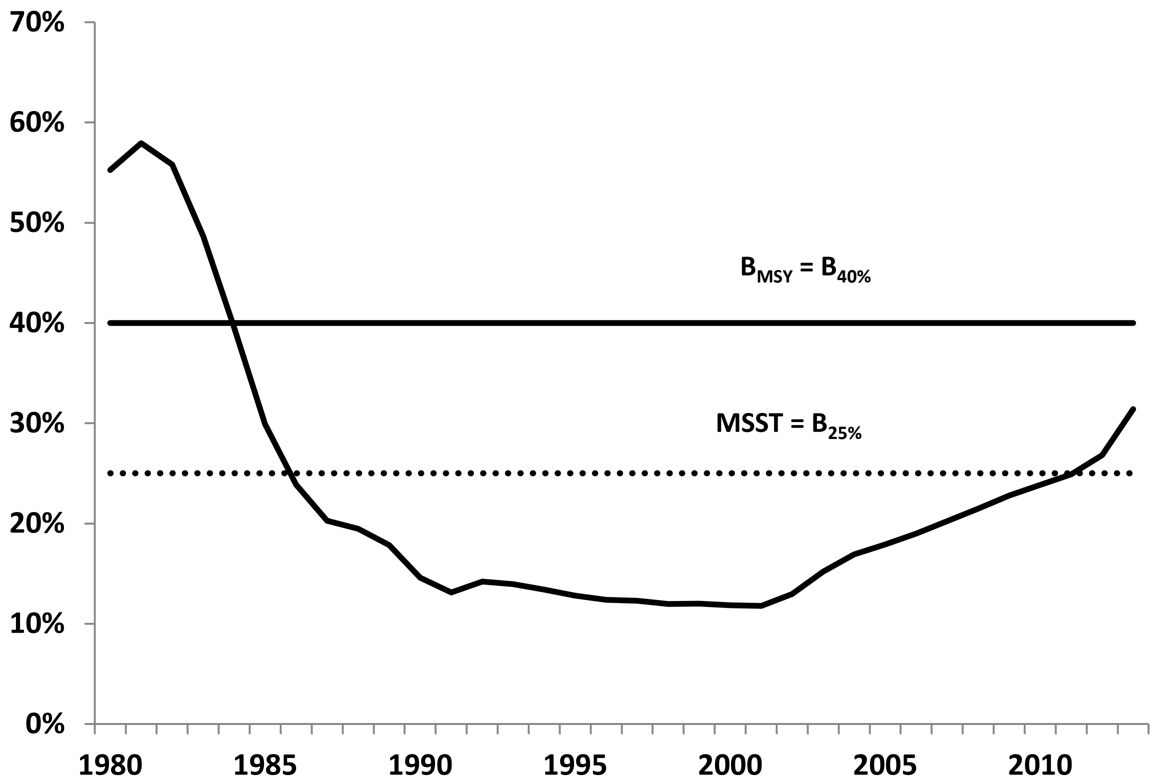

Figure 4. Relative depletion of bocaccio south of 40º10' N lat. from 1980 to 2013 based on the 2013 stock assessment update.

Stock Productivity Relative to Rebuilding Success

The 2013 bocaccio assessment produced a (very slightly) more optimistic estimation of steepness (from 0.595 to 0.614) relative to the 2011 model (the 2009 model had a point estimate of 0.573). Despite these modest changes, the overall trajectory of spawning output, relative spawning output, total biomass and recruitment are barely distinguishable as changed from the 2011 model, with the most important change being the relative strength of the 2010 year class. The strength of the 2010 year class is estimated with less uncertainty in the 2013 assessment.

Recruitment for bocaccio is highly variable, with a small number of year classes tending to dominate the catch in any given fishery or region. Adult abundance is highly variable even in the absence of fishing

(MacCall 2002). Recruitment appears to have been at very low levels throughout most of the 1990s, but the 1999 year class was the highest since 1988, and led to a substantive increase in abundance during the early 2000s. Several year classes of moderate strength (2003, 2005) occurred in the mid-2000s, and two recent very strong year classes (2009 and 2010) are now estimated to be comparable to (2009) and roughly double (2010) the size of the 1999 year class (Figure 5). These year classes were strongly evident in recreational length frequency data, in the NWFSC hook and line survey data (and length comps), and in the power plant impingement dataset modeled by Field (2013), as well as in an index (not included in the 2013 assessment update) of recreational CPUE. These strong year classes are already estimated to have resulted in an increase in abundance and spawning output, and should propel the stock spawning output to target levels by approximately 2015 as the 2010 year class continues to grow and mature. Preliminary estimates from the juvenile rockfish survey also indicate very strong abundance of young-of-the-year rockfish of many species (including bocaccio) in 2013, suggesting anecdotally that 2013 will also be a strong recruitment year for bocaccio, as well as for other species. However, these data are not incorporated in the 2013 update, which only includes data through 2012. Although poorly understood, the stock assessment suggests that recovery may be taking place more rapidly in the south, and recovery in the central/northern California region may be dependent on an influx of fish from the southern area.

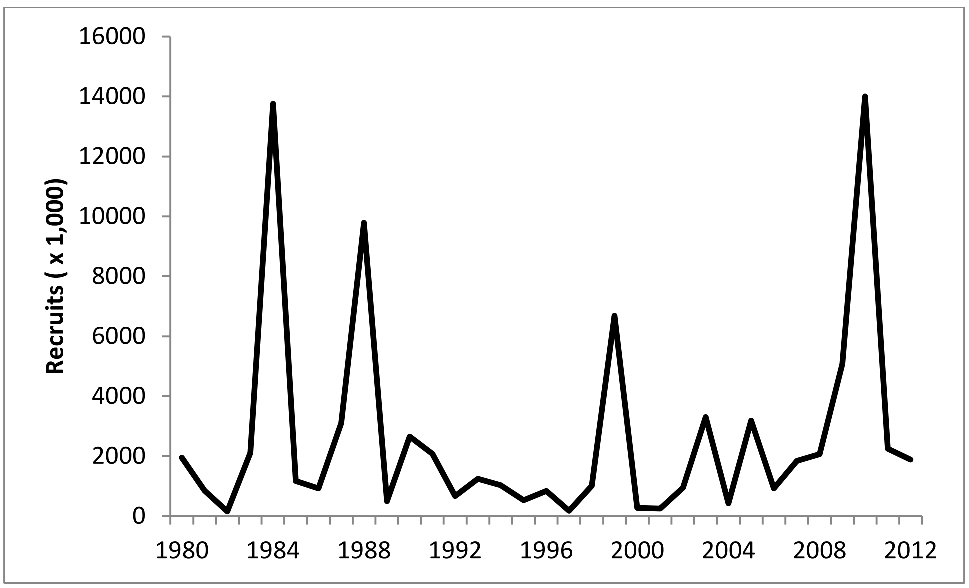

Figure 5. Estimated bocaccio recruitments, 1980-2012 (from Field 2013).

Fishing Mortality

The presence of a banner 2010 year class in the bocaccio stock is not entirely unexpected. Bocaccio stock production is characterized by high episodic recruitment and relatively rapid juvenile growth rates Field, et al. 2009. Juvenile bocaccio also recruit to shallow waters and are consequently caught in nearshore recreational fisheries as evidenced by dramatic spikes in both catch rates and the percentage of the total southern California rockfish catch that is bocaccio following strong recruitment events. Unlike most rockfish species where recruitment to fisheries usually takes several years due to low growth rates, juvenile bocaccio can recruit to nearshore fisheries in California within a year or two of parturition. Recruitment of the strong 1999 year class complicated management of California fisheries in 2001-2003, as this unpredictable event could not be reacted to in time given the lag in reconciling recreational catch estimates. Most species' rebuilding analyses are able to project recruitment into affected fisheries in time to decide and implement responsive management measures that will not compromise rebuilding plans.

However, the fast growth and unpredictable recruitment of bocaccio poses the unique problem of having to react to a large recruitment event in real time. This experience has led the Council to a strategy of adopting higher bocaccio OYs/ACLs and more conservative management measures that are predicted to result in catches much lower than these harvest limits. The rebuilding strategy has been formalized by deciding OYs/ACLs to determine rebuilding objectives and more stringent HGs for California. The buffer between the ACL (formerly the OY) and the HG accommodates the management uncertainty of an unforeseen recruitment event disrupting fisheries. Unlike an ACL, fisheries do not need to close upon attainment of an HG. The difference between the projected catch and the HG or ACL provides managers time to react to a strong recruitment to minimize mortality on bocaccio while minimizing disruptions to ongoing fisheries. This strategy has worked well to enhance bocaccio rebuilding while minimizing harm to California fishing communities.

Catch monitoring uncertainty is relatively high given the fact that a substantial amount of the total fishing mortality of bocaccio now occurs in the California recreational fishery, the sector with the largest bocaccio take in recent years. Recent recreational catch is estimated using the new California Recreational Fishing Survey (CRFS) program, which has been in existence since 2004. Prior to 2004, all recreational catch was estimated using the Marine Recreational Fisheries Statistical Survey (MRFSS) program, a survey methodology designed to understand long-term national trends in marine recreational catch and participation. The higher uncertainty in monitoring California recreational catches also translates into higher uncertainty in projecting recreational total mortalities. The fact that a substantial portion of the current take of bocaccio is in the California recreational fishery is another consideration for a relatively larger buffer between the predicted mortalities of bocaccio and the preferred ACLs.

Insert text and figure showing annual SPRs rel. to SPR of 77.7%

Rebuilding Duration and Probabilities

There is a high probability of successful bocaccio rebuilding by 2015 given the strength of recent year classes currently recruiting into the spawning population. The SSC has recommended a full assessment in 2015 to confirm this prediction.

1.1.3.2 Canary Rockfish

Distribution and Life History

Canary rockfish (*Sebastes pinniger*) are distributed in the northeastern Pacific Ocean from the western Gulf of Alaska to northern Baja California; however, the species is most abundant from British Columbia to central California (Hart 1988; Love, *et al.* 2002; Miller and Lea 1972). Adults are primarily found along the continental shelf shallower than 300 m, although they are occasionally observed in deeper waters. Juvenile canary rockfish are found in shallow and intertidal areas (Love, *et al.* 2002).

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

Adult canary rockfish primarily inhabit areas in and around rocky habitat. They form very dense schools, leading to an extremely patchy population distribution that is reflected in both fishery and survey encounter rates.

Canary rockfish are relatively long-lived, with a maximum observed age of 95 years, however only males are commonly observed above the age of 50, while females tend to be rare above age 30. The degree to which this pattern reflects behavioral differences translating to reduced availability to fishery and survey fishing gear, or an increase in relative mortality for older females has been the focus of much discussion and remains unclear. A similar pattern has been observed for yellowtail rockfish (*Sebastes flavidus*), a closely related, but more pelagic species with a similar distribution (Wallace and Lai 2006).

Canary rockfish off the west coast exhibit a protracted spawning period from September through March, probably peaking in December and January off Washington and Oregon (Hart 1988; Johnson, *et al.* 1982). Female canary rockfish reach sexual maturity at roughly eight years of age. Like many members of Sebastes, canary rockfish are ovoviviparous, whereby eggs are internally fertilized within females, and hatched eggs are released as live young bond 1979 (Bond 1979; Golden and Demory 1984; Kendall and Lenarz 1986). Canary rockfish are a relatively fecund species, with egg production being correlated with size (e.g., a 49-cm female can produce roughly 0.8 million eggs, and a female that has realized maximum length (approximately 60 cm) produces approximately 1.5 million eggs (Gunderson 1971).

Very little is known about the early life history strategies of canary rockfish. The limited research that has been conducted indicates that larvae are strictly pelagic (near the ocean surface) for a short period of time and begin to migrate to demersal waters during the summer of their first year of life. Larvae develop into juveniles around nearshore rocky reefs, where they may congregate for up to three years (Boehlert 1980; Sampson 1996) . Evaluations of length distributions by depth demonstrate an increasing trend in mean size of fish with depth (Methot and Stewart 2006). Since 1990, stock assessments have assumed a base natural mortality rate of 0.06 (94 percent adult annual survival when there is no fishing mortality). Due to the rarity of old females in both survey and catch data, female canary rockfish have long been assumed to have increasing natural mortality rates with age (Golden and Wood 1990).

Little is known about ecological relationships between canary rockfish and other organisms. Adult canary rockfish are often caught with bocaccio, sharpchin, yelloweye, and yellowtail rockfishes, and lingcod. Researchers have also observed canary rockfish associated with silvergray and widow rockfish. Young-of-the-year feed on copepods, amphipods, and young stages of euphausiids. Adult canary rockfish feed primarily on euphausiids, as well as pelagic shrimp, cephalopods, mesopelagic fishes and other prey (Brodeur and Percy 1984; Lee 2002; Phillips 1964). Small canary rockfish are consumed by seabirds, Chinook salmon, lingcod, and marine mammals.

Stock Status and Management History

Canary rockfish have long been an important component of rockfish fisheries. The Council began to recommend increasingly restrictive regulations after an assessment in 1994 (Sampson and Stewart 1994) indicated that fishing rates were too high. Wallace and Cope (2011) estimated that the abundance of the canary rockfish stock dropped below B_{MSY} ($B_{40\%}$) in 1983 and below the MSST in 1990, at which time the annual catch was more than double the current estimate of the MSY level. Harvest rates in excess of the current fishing mortality target for rockfish (SPR = 50%) is estimated to have begun in the late 1970s and persisted through 1999. Recent management actions appear to have curtailed the rate of removal such that overfishing has not occurred since 1999, and recent SPR values are in excess of 90 percent.

A 1999 stock assessment showed the stock had declined to 6.6 percent of unfished biomass in the northern area (Columbia and U.S. Vancouver management areas) (Crone, *et al.* 1999) and in the southern area (Conception, Monterey, and Eureka areas) (Williams, *et al.* 1999). The stock was declared overfished in January 2000. The first rebuilding analysis (Methot 2000) used results from the northern area assessment to project rates of potential stock recovery. The stock was found to have extremely low productivity, defined as production of recruits in excess of the level necessary to maintain the stock at its current, low level. Rates of recovery were highly dependent upon the level of recent recruitment, which could not be estimated with high certainty. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50 percent probability of rebuilding by the year 2057, a medium level for these recent recruitments, and maintaining a constant annual catch of 93 mt through 2002.

A coastwide 2002 canary rockfish assessment estimated stock depletion to be 7.9 percent at the start of 2002 (Methot and Piner 2002b). A canary rockfish rebuilding plan was adopted in 2003 under Amendment 16-2 based on the results of the 2002 rebuilding analysis (Methot and Piner 2002a). The rebuilding plan established a target rebuilding year of 2074 and the harvest control rule of F = 0.022 (with a P_{MAX} of 60 percent).

A full canary rockfish assessment was done in 2005 indicating a stock depletion of 9.0 percent at the start of 2005 (Methot and Stewart 2006). The assessment was based on two equally plausible models; one with differential male and female gear selectivities and one without gender-specific selectivities. A critical uncertainty in canary rockfish assessments was the lack of older, mature females in surveys and other assessment indices. There were two competing explanations for this observation. Older females could have a higher natural mortality rate, resulting in their disproportionate disappearance from the population. Alternatively, survey and fishing gears may be less effective at catching them, perhaps because older females are associated with habitat inaccessible to most trawl gear. If this is the case, then these fish (which, because of their higher spawning output, may make an important contribution to future recruitment) are part of the population, but remain poorly sampled. Methot and Stewart (2006) assumed a linear increase in female natural mortality from 0.06 at age 6 to approximately 0.09 at age 14. In the base model (differential male-female selectivity) B_0 was estimated to be 34,798 mt, resulting in a depletion level of 5.7 percent. In the alternate model (no difference in selectivity) B_0 was estimated to be 33,872 mt, with a depletion level of 11.3 percent. The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, was estimated to be 0.33 in the base model, and 0.45 in the alternate model. The approved canary rockfish rebuilding analysis (Methot 2006) blended the two models by alternately re-sampling between the two input parameter sets.

The 2005 canary rebuilding analysis (Methot 2006) was used to inform the revised canary rebuilding plan adopted under Amendment 16-4, which specified a target rebuilding year of 2063 and a constant harvest strategy (SPR = 88.7%). Amendment 16-4 rebuilding plans were implemented in 2007.

The 2007 canary assessment estimated relative depletion level was 32.4 percent at the start of 2007 (Stewart 2008b). This was a significant departure from the previous assessment and largely driven by a higher assumed steepness (h = 0.51) relative to past assessments. The 2007 canary rebuilding analysis (Stewart 2008a) predicted the SPR harvest rate in the rebuilding plan (88.7%) would rebuild 42 years earlier (2021) than the originally estimated rebuilding schedule (2063). A modification of the Amendment 16-4 canary rockfish rebuilding plan specifying a target rebuilding year of 2021 while maintaining the SPR harvest rate of 88.7% was implemented in 2009.

The 2009 canary assessment (Stewart 2009c), an update of the 2007 assessment, estimated stock depletion at 23.7% at the start of 2009. This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical California catches from a formal reconstruction of 1916-1980 California catch data (Ralston, *et al.* 2010). The 2009 canary rebuilding analysis (Stewart 2009a) predicted the stock would not rebuild to the target year of 2021 with at least a 50% probability even in the absence of fishing-related mortality starting in 2011 ($T_{F=0}$). The rebuilding plan was revised by changing the target to rebuild the stock to 2027 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2011.

Another update assessment was prepared in 2011 (Wallace and Cope 2011), which estimated stock depletion was 23.2 percent at the start of 2011 (Figure 6). This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical Oregon catches from a formal reconstruction of Oregon catch data. For the period 2000-2011, the spawning biomass was estimated to have increased from 11.2 percent to 23.2 percent of the unfished biomass level.

The 2011 canary rebuilding analysis (Wallace 2011) predicted the stock would not rebuild to the target year of 2027 with at least a 50% probability. The rebuilding plan was revised slightly by changing the target to rebuild the stock to 2030 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2013.

A canary catch report was provided in 2013 (Agenda Item F.5.a, Attachment 9, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

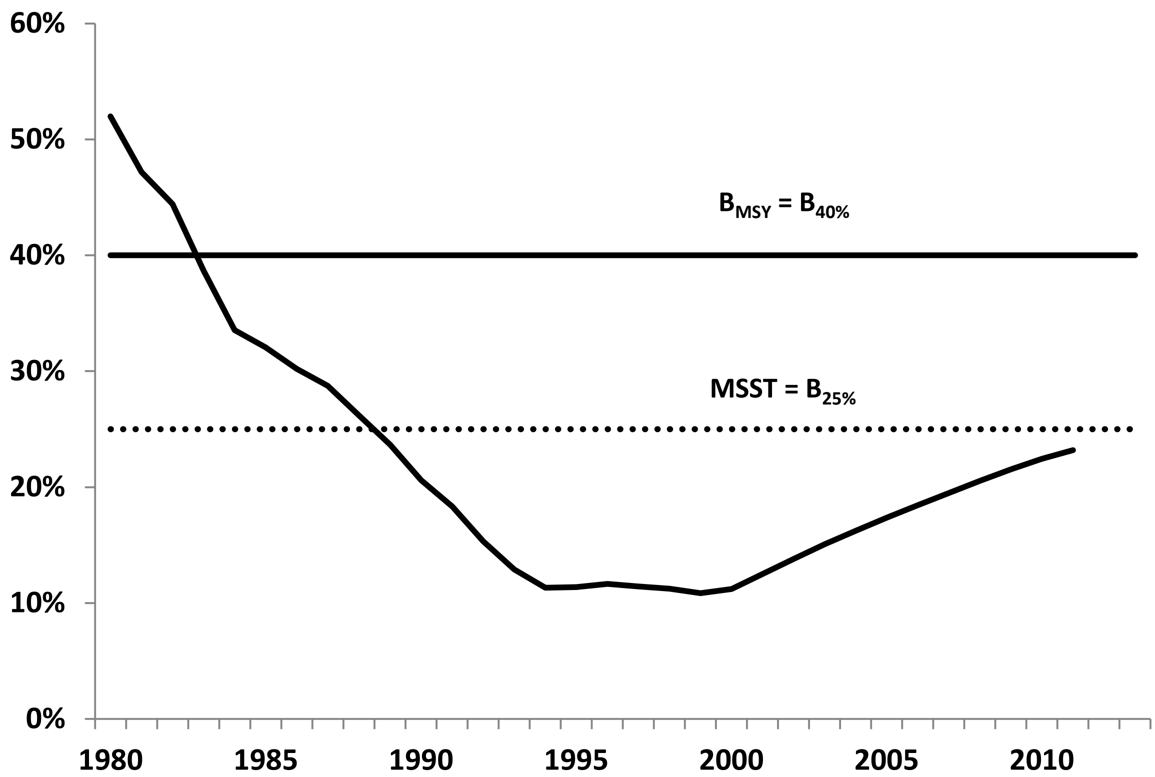

Figure 6. Relative depletion of canary rockfish from 1980 to 2011 based on the 2011 stock assessment update.

Stock Productivity Relative to Rebuilding Success

Steepness is assumed to be 0.511 in the latest full assessment (Stewart 2008b) and the subsequent updates to that assessment (Stewart 2009c; Wallace and Cope 2011). This is a moderate to relatively low value of steepness for rockfish, as compares to the prior mean steepness (0.779) derived from meta-analysis of west coast rockfish stocks used in 2013 assessments (e.g., darkblotched rockfish, see section 1.1.3.4).

Lower steepness implies a greater dependence on the size of the spawning population. The projected increase in the canary rockfish biomass from the 2011 assessment is very sensitive to the value for steepness and was projected to slow as below average recruitments begin to contribute to the spawning biomass.

Steepness is a difficult parameter to estimate and canary rockfish assessments are especially uninformative of steepness. The assumed canary steepness of 0.511 used in the last three assessments was based on the Dorn (2002b; Dorn 2002a) meta-analysis of west coast rockfish stocks The value used in many 2013 assessments was based on an update of the Dorn (2002b) analysis (J. Thorson, pers. comm.).

Wallace and Cope (2011) estimated canary rockfish recruitment deviations based on the data. After a period of above average recruitments, recent year-class strengths (1997-2010) have generally been low, with only 2 of the 10 years (2001 and 2007) producing large estimated recruitments (Figure 7). The strength of the 2007 year class is subject to greater uncertainty than other strong recruitment events in the last 30 years because of the limited number of years in which it has been observed. As the larger recruitments from the late 1980s and early 1990s move through the population in future projections, the effects of recent poor recruitment may tend to slow the rate of recovery.

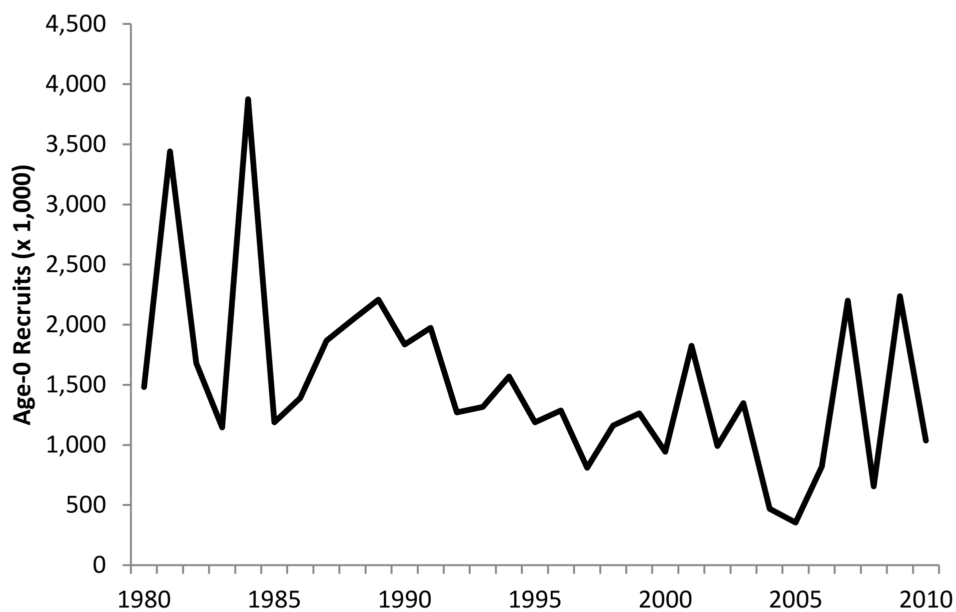

Figure 7. Estimated canary rockfish recruitments, 1980-2010 (from Wallace and Cope 2011).

Fishing Mortality

Fishing mortality rates for canary rockfish in excess of the current proxy F_{MSY} harvest rates for rockfish (SPR = 50%) are estimated to have begun in the late 1970s and persisted through 1999. Figure 8 depicts estimated annual harvest rates relative to the overfishing limit (F_{MSY}) and the current SPR harvest rate limit specified in the rebuilding plan. Recent management actions appear to have curtailed the rate of removal such that overfishing has not occurred since before 1999 and maintained harvest rates below the current rebuilding SPR since 2005. Relative exploitation rates (catch/biomass of age-5 and older fish) are estimated to have been less than 1% since 2001.

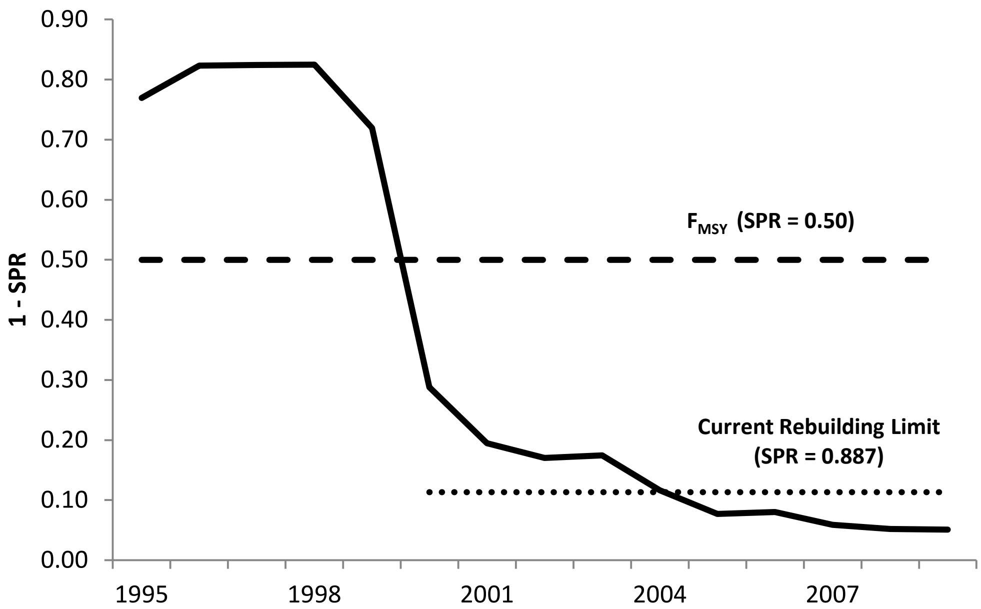

Figure 8. Estimated spawning potential ratio (SPR) of canary rockfish relative to the current F_{MSY} and rebuilding harvest rates, 1995-2010. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis.

Rebuilding Duration and Probabilities

Wallace 2013 estimated the canary rebuilding probability (P_{MAX}) under the current SPR harvest rate of 88.7% is 75 percent. There is a 50 percent probability of recovering by the current target year of 2030.

1.1.3.3 Cowcod

Distribution and Life History

Cowcod (*Sebastes levis*) is a species of large rockfish with a distribution from Newport, Oregon, to central Baja California, Mexico (Love et al., 2002). They are most common from Cape Mendocino (California) to northern Baja California, in depths from 50-300 m. Hess et al. (submitted) recently used genetic and otolith microchemistry tools to study cowcod population structure from California to Oregon. Specifically, they tested the hypothesis that a phylogeographic boundary exists at Point Conception. Their results supported a hypothesis of two primary lineages with a geographic boundary falling south of, rather than at Point Conception. Both lineages co-occur in the Southern California Bight (SCB), with no clear pattern of depth stratification or spatial structure within the Bight. Within lineages, there is evidence for considerable gene flow across the Point Conception boundary. Cowcod found north of Point Conception consist primarily of a single lineage, also found in northern areas of the SCB.

Cowcod are easily identified at all life stages, including larvae. Adults are piscivorous, with a diet consisting mainly of fishes, squids, and octopi. Cowcod are considered to be parademersal (transitional between a midwater pelagic and benthic species). Larvae develop into a pelagic juvenile stage, settling to benthic habitats after about 3 months. Juvenile cowcod were once thought to associate primarily with soft sediments, but Love and Yoklavich (Love and Yoklavich 2008), using visual surveys, found juveniles mainly associate with low-relief, hard substrate. Young-of-the-year were observed over a wide depth range (52-277 m), with juveniles slightly deeper, and adults mainly deeper than 150 m. Larger juveniles increasingly associate with high-relief, complex rocky substrate, the primary habitat for adult cowcod. Adult cowcod are generally solitary, but occasionally aggregate (Love, *et al.* 1990). Although cowcod are generally not migratory, they may move, to some extent, to follow food (Love 1996).

Cowcod are a long-lived, slow-growing species that require a decade or more to reach sexual maturity. Fertilization is internal, with females giving birth to planktonic larvae mainly during winter months. Spawning peaks in January in the Southern California Bight (MacGregor 1986) and large females may produce up to three broods per season (Love, *et al.* 1990). Larvae emerge at about 5.0 mm (MacGregor 1986).

Cowcod are a highly fecund species, with large females producing 2 million eggs (fecundity is dependent on size and ranges from 181,000 to 1,925,000 eggs) (Love, *et al.* 2002). Dick et al. (2009) found no evidence of increasing weight-specific fecundity (i.e., spawning output is roughly proportional to spawning biomass).

Maximum observed age for cowcod is 55 years (Love, *et al.* 2002). Dick et al. (2007) estimated the natural mortality rate (M) using three methods, reporting a range of values from 0.027 to 0.064 based on Beverton's (1992) method, a range of total mortality (Z) estimates from 0.038 to 0.072 based on catch curve analysis, and Hoenig's geometric mean regression. Females reach 90 percent of their maximum expected size by 42 years.

Little is known about ecological relationships between cowcod and other organisms. Small cowcod feed on planktonic organisms such as copepods. Juveniles eat shrimp and crabs, and adults eat fish, octopus, and squid (Allen 1982). Adults consume a wide range of prey items, but are primarily piscivorous (Love, *et al.* 2002).

Stock Status and Management History

While cowcod are not a major component of the groundfish fishery, they are highly desired by both recreational and commercial fishers because of their bright color and large size. The cowcod stock in the Conception area was first assessed in 1998 (Butler, *et al.* 1999b). Abundance indices decreased approximately tenfold between the 1960s and the 1990s, based on commercial passenger fishing vessel (CPFV) logs (Butler, *et al.* 1999b). Recreational and commercial catch also declined substantially from peaks in the 1970s and 1980s, respectively.

NMFS declared cowcod in the Conception and Monterey management areas overfished in January 2000, after Butler et al. (1999b) estimated the 1998 spawning biomass to be at 7 percent of B_0, well below the 25 percent overfishing threshold. Because cowcod is a fairly sedentary species, closed areas were established in 2002 to reduce cowcod mortality. Two Cowcod Conservation Areas (CCAs), in the Southern California Bight, were selected due to their high density of cowcod. The larger of the two areas (CCA West) is a 4200 square mile area west of Santa Catalina and San Clemente Islands. A smaller area (CCA East) is about 40 miles offshore of San Diego, and covers about 100 square miles. Bottom fishing is prohibited deeper than 20 fm within the CCAs.

A cowcod rebuilding analysis was completed in 2003 which validated the assumption that non-retention regulations and area closures had been effective in constraining cowcod fishing mortality (Butler, *et al.* 2003). These encouraging results were based on cowcod fishery-related landings in recreational and commercial fisheries, although the assessment included discard information only with respect to CPFV observations (which indicated negligible discards in that sector). This rebuilding review pointed out a common problem among the analyses of overfished species: reliance on landings (fishery-dependent) data for providing relative abundance values becomes increasingly difficult as the allowable catch is decreased and fishery observer data remains low. Monitoring stock status and recovery thus becomes increasingly difficult in the absence of fishery-independent surveys.

As in the 1999 assessment, the 2005 cowcod assessment (Piner, *et al.* 2006) considered only the cowcod population in Southern California Bight (from the US-Mexico border north to Point Conception) population, as this is the area in which cowcod are most abundant, adult habitat is most common, and catches are highest.. The 2005 assessment used only two data sources, the CPFV time series and the visual survey estimate data (Yoklavich, *et al.* 2007). The model was developed in Stock Synthesis 2, and although the base model estimated only three parameters (two of which were "nuisance parameters," the other was equilibrium recruitment), the STAR Panel determined that this simplicity was appropriate given the paucity of data. The assessment provided a set of results corresponding to three different values for assumed steepness (h), the key parameter in the stock-recruitment relationship (h=0.4, 0.5, and 0.6) and one the key uncertainties in the assessment. The assessment estimated that the 2005 spawning biomass was 18 percent of unfished levels and within a range of 14 to 21 percent depending on the value assumed for steepness, a considerably more optimistic result than the 1999 assessment. The corresponding 2005 cowcod rebuilding analysis (Piner 2006) was used to develop the cowcod rebuilding plan adopted in the groundfish FMP under Amendment 16-4. The rebuilding plan established a target rebuilding year of 2039 and an SPR of 90%.

A full cowcod assessment was conducted in 2007, which estimated spawning biomass to be 3.8 percent of its unfished level at the start of 2007 (Dick, *et al.* 2007). The 2007 cowcod assessment was an age-structured production model assuming a Beverton-Holt stock-recruitment function with deterministic recruitment, fit to the aggregated CPFV logbook index and the 2002 visual survey biomass estimate (Yoklavich, *et al.* 2007). Productivity parameters were fixed (steepness = 0.6, natural mortality = 0.055), leaving only virgin recruitment (R_0) to be estimated. Spawning biomass in 2007 was estimated to be between 3.4 percent and 16.3 percent of the unfished level. The poor precision of this estimate was due to 1) a lack of data to inform estimates of stock productivity, and 2) conflicting information from fishery-dependent and fishery–independent data. However, even the most optimistic model, which assumed a high-productivity stock and ignored declines in CPFV catch rates, suggested that spawning biomass was below 25 percent since 1980. Since retention of cowcod was prohibited and bycatch was thought to be minimal, it was considered unlikely that overfishing was an issue. It is likely that the 2007 base model underestimated the uncertainty about stock status given steepness and the natural mortality rate were treated as fixed and known in the model.

The 2007 assessment was originally prepared as an "update" stock assessment; however, while preparing the update, an error was discovered in the previous assessment's specification of the selectivity curve. Several revisions were proposed, including new estimates of historical landings, a corrected growth curve, and a two-fishery model. The 2007 assessment used Stock Synthesis 2, revised estimates of historical commercial catch, contained corrections to gear selectivity curves, utilized a revised growth curve, and separated the catch into commercial (all gears) and recreational fisheries rather than a single fishery. Recreational catches in the 2007 assessment were identical to those in the previous assessment, but estimates of commercial catches had been updated to reflect three additional data sources: 1) recovered port samples from Southern California (1983-1985), 2) regional summaries of total rockfish landings (1928-1968) provided by the NMFS SWFSC Environmental Research Division, and 3) California rockfish landings by region (1916-1927), published in CDF&G Fish Bulletin No. 105 (1958).

The 2007 rebuilding analysis (Dick and Ralston 2007) estimated a new T_{MAX} of 2098, 24 years later than the date estimated by Piner (2006), due in part to the corrections described above, but only 1 year earlier than the 2099 date estimated previously (Butler, *et al.* 2003). It was noted in the rebuilding analysis that rebuilding scenarios were extremely uncertain for this data-poor species, particularly with respect to steepness. Moreover, there was widespread concern about the ability to monitor the stock, and consequently to evaluate progress towards rebuilding in the future. The 2007 rebuilding analysis projections indicated that it would not be possible to rebuild the cowcod stock by 2039, even if all the catches are eliminated, and the estimated time to rebuild under the current harvest rate (SPR = 90%) was 26 years greater than the target year of 2039 adopted under Amendment 16-4. Therefore, a modification of the Amendment 16-4 cowcod rebuilding plan was implemented in 2007 which prescribed a target year of 2072 and an SPR harvest rate of 82.1%.

The 2007 cowcod assessment was updated in 2009, with stock depletion estimated to be 4.5 percent of its unfished level at the start of 2009 (Dick, *et al*. 2009). Estimates of female spawning stock biomass in 2009 were highly uncertain. Spawning biomass had declined from an unfished biomass of 2,101-2,461 mt to 93-441 mt in 2009. The 2009 cowcod rebuilding analysis (Dick, *et al.* 2009) was used to reconsider the cowcod rebuilding plan adopted under Amendment 16-4 as mandated in a legal challenge (*NRDC v. Locke*). The revised rebuilding plan, implemented in 2011, prescribed a target year of 2068 and an SPR harvest rate 82.7%.

A new cowcod assessment of the stock in the Southern California Bight was conducted in 2013 (Dick and MacCall 2013b), which estimated stock depletion to be 33.9 percent of unfished spawning biomass at the start of 2013 (Figure 9). The 2013 assessment suggested that cowcod in the Southern California Bight constitute a smaller, but more productive stock than was estimated from previous assessments. Median unfished and 2013 spawning biomasses were estimated to be 1,549 mt and 524 mt, respectively (Table 4).

The 2013 assessment used the XDB-SRA modeling platform to estimate stock status, scale, and productivity. Dick et al. (2013b) fit five fishery-independent data sources: four time series of relative abundance (CalCOFI larval abundance survey, Sanitation District trawl surveys, NWFSC trawl survey, and NWFSC hook-and-line survey), and the 2002 Yoklavich et al. (2007) visual survey estimate of absolute abundance.

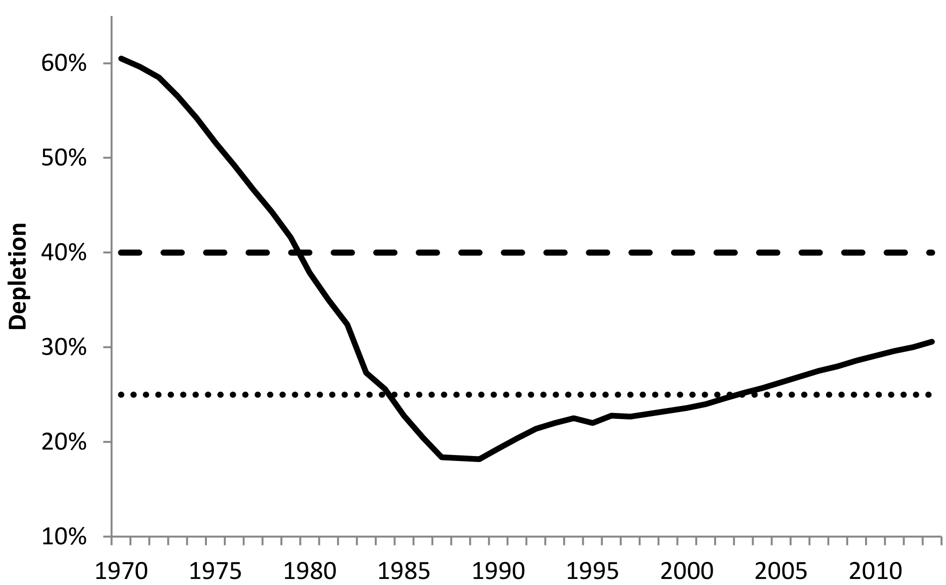

Figure 9. Relative depletion of cowcod south of 40°10' N lat. from 1970 to 2013 based on the 2013 stock assessment. *Data from Table 38 – NOTE: different trajectory than Figure 94*

Stock Productivity Relative to Rebuilding Success

As in the previous assessment, production in the 2013 assessment is assumed to be a deterministic function of spawning biomass. Recruitment pulses may be evident in the abundance indices, but insufficient information is available to reliably estimate the relative strength of individual year classes.

Insert figure of B_{MSY}/B_0 & F_{MSY}/M?

Fishing Mortality

Estimated harvest rates for cowcod were highest during the mid-1980s (Figure 10). Retention of cowcod was prohibited from January 2001 to present. Dick and MacCall 2013 estimated that removals of cowcod have been less than 0.2% of vulnerable biomass since 2003. The estimated harvest rate that produces long term MSY (5.5%) is nearly twice the proxy (SPR = 50%) harvest rate from the last assessment (2.7%). Unlike previous assessments, the recent increasing trends in fishery-independent surveys allow the model to estimate the rate of increase in stock size. However, the 95% posterior interval for the MSY harvest rate (2.2% - 12.6%) reflects uncertainty in the data regarding overall productivity of the stock.

Median harvest rates around 1930 were near the MSY rate, then declined due to shifts in fishing effort and WWII (Figure 10). Following the war, catch rates slowly increased until about 1970, then rose quickly to a maximum of approximately 54% of vulnerable biomass in the mid-1980s. The MSY harvest rate estimated in the 2013 assessment is 5.5%, similar to the proxy ($B_{40\%}$) harvest rate of 5%, but higher than the SPR harvest rate in the 2009 assessment (2.7%). Median harvest rates were roughly 8-10 times the median MSY harvest rate in the mid-1980s, then declined to near zero after 2000, followed by steady increases in stock biomass.

Under the current SPR harvest rate specified in the rebuilding plan (82.7%), the median time to rebuild is 2020 (Dick and MacCall 2013a). This SPR harvest rate is equivalent to an exploitation rate (catch over age 11+ biomass) of 0.007 based on the 2009 assessment.

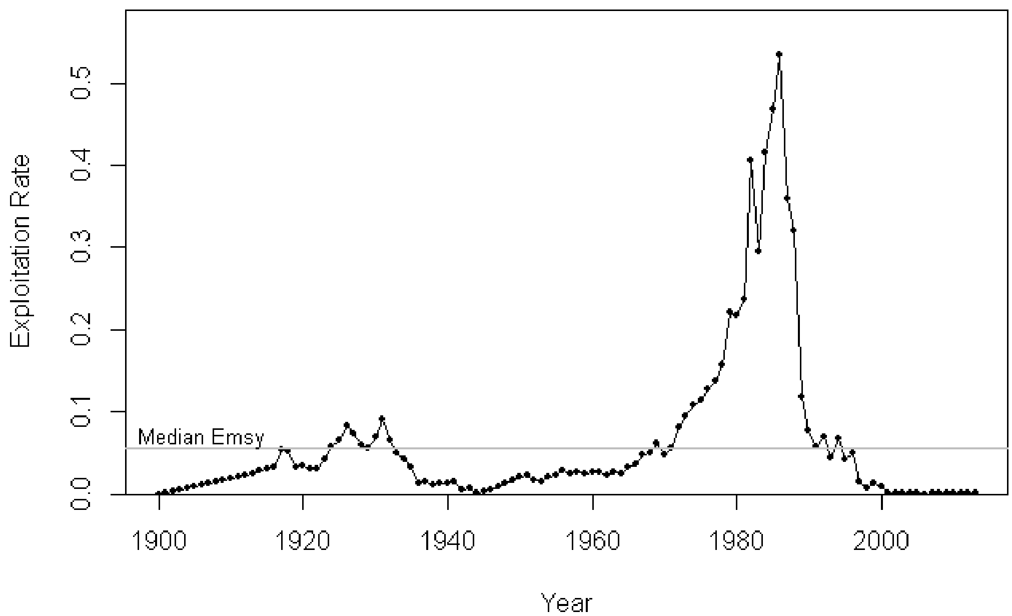

Figure 10. Time series of median harvest rates (total catch divided by age-11 and older biomass) from the base model in the 2013 cowcod assessment. The gray line is the estimated median harvest rate producing MSY.

Rebuilding Duration and Probabilities

The 2013 rebuilding analysis (Dick and MacCall 2013a) was unique in that the Punt rebuilding program (Punt 2005) was not used given its incompatibility with XDB-SRA. In each rebuilding model run, 15,000 simulated trajectories were generated using draws from the joint posterior distribution. Since the XDB-SRA platform is not compatible with spawning potential ratios, harvest control rules were translated into exploitation rates (E) calculated as catch/estimated age 11+ biomass. Similar to the previous cowcod rebuilding analysis, variability in future recruitment was expressed as a weighted set of different states of nature (parameter values), rather than random deviations from an average stock-recruitment relationship. While the previous rebuilding analysis accounted only for uncertainty in the Beverton-Holt steepness parameter, the current analysis accounts for uncertainty in all estimated model parameters. Estimates of total cowcod mortality have not exceeded the ACL (or OY) in any year since 2003. The estimate of median time to rebuild under the current harvest rate (2020) is 48 years earlier than the current target year of 2068.

1.1.3.4 Darkblotched Rockfish

Distribution and Life History

Darkblotched rockfish (*Sebastes crameri*) are found from Santa Catalina Island off Southern California to the Bering Sea (Miller and Lea 1972; Richardson and Laroche 1979). They are most abundant from Oregon to British Columbia. Darkblotched primarily occur on the outer shelf and upper slope off Oregon, Washington, and British Columbia (Richardson and Laroche 1979). Based upon genetic information and the absence of large scale gaps in catches, there are no clear stock delineations for darkblotched rockfish in U.S. waters. This does not mean there are not more fine scale groupings to be found, and in fact, darkblotched catches are characterized by infrequent large tows of larger fish. Distinct population groups have been found off the Oregon coast between 44°30' N lat. and 45°20' N lat. (Richardson and Laroche 1979). This species co-occurs with an assemblage of slope rockfish, including Pacific ocean perch (*Sebastes alutus*), splitnose rockfish (*Sebastes diploproa*), yellowmouth rockfish (*Sebastes reedi*), and sharpchin rockfish (*Sebastes zacentrus*).

Darkblotched rockfish mate from August to December, eggs are fertilized from October through March, and larvae are released from November through April love (Love, *et al.* 2002). Older larvae and pelagic juvenile darkblotched rockfish are found closer to the surface than many other rockfish species. Pelagic juvenile settle at 4 to 6 cm in length in about 55 to 200 m (Love, *et al.* 2002). As many other Sebastes, this species exhibits ontogenetic movement, with fish migrating to deeper waters as they mature and increase in size and age (Lenarz 1993; Nichol 1990).

Darkblotched rockfish are among the longer living rockfish; the data used in the most recent assessment (Gertseva and Thorson 2013) includes individuals that have been aged to be 98 years old. The maximum reported age of darkblotched rockfish is 105 years (Love, *et al.* 2002). As with many other *Sebastes* species, darkblotched rockfish exhibit sexually dimorphic growth; females reach larger sizes than males, while males attain maximum length earlier than females (Love, *et al.* 2002; Nichol 1990; Rogers, *et al.* 2000).

Darkblotched rockfish are ovoviviparous (Nichol and Pikitch 1994). Insemination of female darkblotched rockfish occurs from August to December, and fertilization and parturition occur from December to March off Oregon and California, and primarily in February off Oregon and Washington (Hart 1988; Nichol and Pikitch 1994; Richardson and Laroche 1979). Fecundity is dependent on size and ranges from 20,000 to 610,000 eggs.

Little is known about ecological relationships between darkblotched rockfish and other organisms. Pelagic juveniles feed on planktonic organisms such as copepods. Adults are often caught with other fish such as Pacific ocean perch and splitnose rockfish. Midwater animals such as euphausiids and amphipods dominate the diet of adult fish. Albacore and Chinook salmon consume pelagic juveniles (Hart 1988). Little is known about predation of adults.

Stock Status and Management History

Darkblotched rockfish are primarily with commercial trawl gear, as part of a complex of slope rockfish, which includes Pacific ocean perch (*Sebastes alutus*), splitnose rockfish (*Sebastes diploproa*), yellowmouth rockfish (*Sebastes reedi*), and sharpchin rockfish (*Sebastes zacentrus*). Catches of darkblotched rockfish first became significant in the mid-to-late 1940s due to increased demand for fish protein during World War II. During the mid-1960s to mid-1970s darkblotched rockfish were caught by both domestic and foreign fleets (Rogers 2003b). Domestic landings rose from late 1970s until the late 1980s, although limits on rockfish catch were first instituted in 1983, when darkblotched was rockfish managed as part of a group of around 50 species (designated as the Sebastes complex) (Rogers, *et al.* 2000). During the 2000s, progressive steps have been taken to reduce the catch of darkblotched rockfish, following the declaration of its overfished status in 2001.

The first full assessment of the darkblotched rockfish stock was conducted in 2000, which estimated stock depletion at 14–31 percent of its unfished level, depending on assumptions regarding the historic catch of darkblotched rockfish in the foreign fishery from 1965-1978 (Rogers, *et al.* 2000). The base model assumed 10 percent of foreign catch was comprised of darkblotched, leading to the conclusion that the spawning stock biomass was at 22 percent of its unfished level. NMFS declared darkblotched rockfish to be overfished in 2001 based on these results.

The 2001 rebuilding analysis for the stock (Methot and Rogers 2001) incorporated results of the 2000 Alaska Fishery Science Center triennial slope trawl survey and modeled a more recent time series of recruitments. Incorporating these data resulted in a downward revision of the estimated recruitment and abundance throughout the time series compared to what had been used in the Rogers et al. (2000) assessment. This led to a revised estimate of spawning stock biomass at the beginning of 2002 of 14 percent of its unfished level and a longer projected rebuilding period.

A 2003 assessment and rebuilding update for darkblotched rockfish (Rogers 2003a) estimated a lower depletion ($B_{11\%}$), but provided evidence of strong recent recruitment not yet recruited to the spawning population. This analysis was used to inform the darkblotched rockfish rebuilding plan adopted under Amendment 16-2, which established a target rebuilding year of 2030 and a fishing mortality rate of F = 0.027. A revised darkblotched rebuilding plan was implemented in 2004 that specified a higher harvest rate (F = 0.032) to avoid negative socioeconomic impacts.

The 2005 full darkblotched assessment estimated a spawning stock depletion of 16 percent of unfished biomass at the start of 2005 (Rogers 2005a). The assessment estimated strong recruitment of the 1999 and 2000 year classes. The 2005 rebuilding analysis (Rogers 2005b) was used to inform a revised rebuilding plan adopted under Amendment 16-4 and implemented in 2007. The revised rebuilding plan specified a target year of 2011 and a constant harvest rate strategy (SPR = 60.7%).

The 2007 darkblotched rockfish assessment estimated a stock depletion of 22.7 percent at the start of 2007 (Hamel 2008c). The 2007 darkblotched rebuilding analysis (Hamel 2008a) predicted the median time to rebuild would be 19 years later than the target year of 2011 under the SPR harvest rate adopted under Amendment 16-4. The Council revised the Amendment 16-4 rebuilding plan by specifying a target year to rebuild the stock of 2028 and decreasing the harvest rate (SPR = 62.1%).

The 2007 darkblotched assessment was updated in 2009 and 2011. The 2009 stock assessment update estimated a stock depletion of 27.5 percent at the start of 2009 (Wallace and Hamel 2009). The 2009 darkblotched rebuilding analysis (Wallace 2009) was used to inform a revised rebuilding plan, which was implemented in 2011 The revised rebuilding plan specified a target year to rebuild the stock of 2025 and decreased the harvest rate to SPR = 64.9%. The 2011 stock assessment update estimated a stock depletion of 30.2 percent at the start of 2009 (Stephens, *et al.* 2011). No revisions to the rebuilding plan were made based on the 2011 assessment update and accompanying rebuilding plan (Stephens 2011).

A full darkblotched stock assessment in 2013 (Gertseva and Thorson 2013) estimated a stock depletion of 36 percent at the start of 2013 (Figure 11). The assessment also predicts the stock will be rebuilt by the start of 2015. The improved stock status and rebuilding outlook were largely attributed to 1) reduced fishing mortality under the rebuilding program; 2) inferences that follow from more favorable perceptions of steepness, fecundity, and age at maturity of the stock; and 3) length and age data indicating relatively large recruitments in 1999, 2000, and 2008. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013.

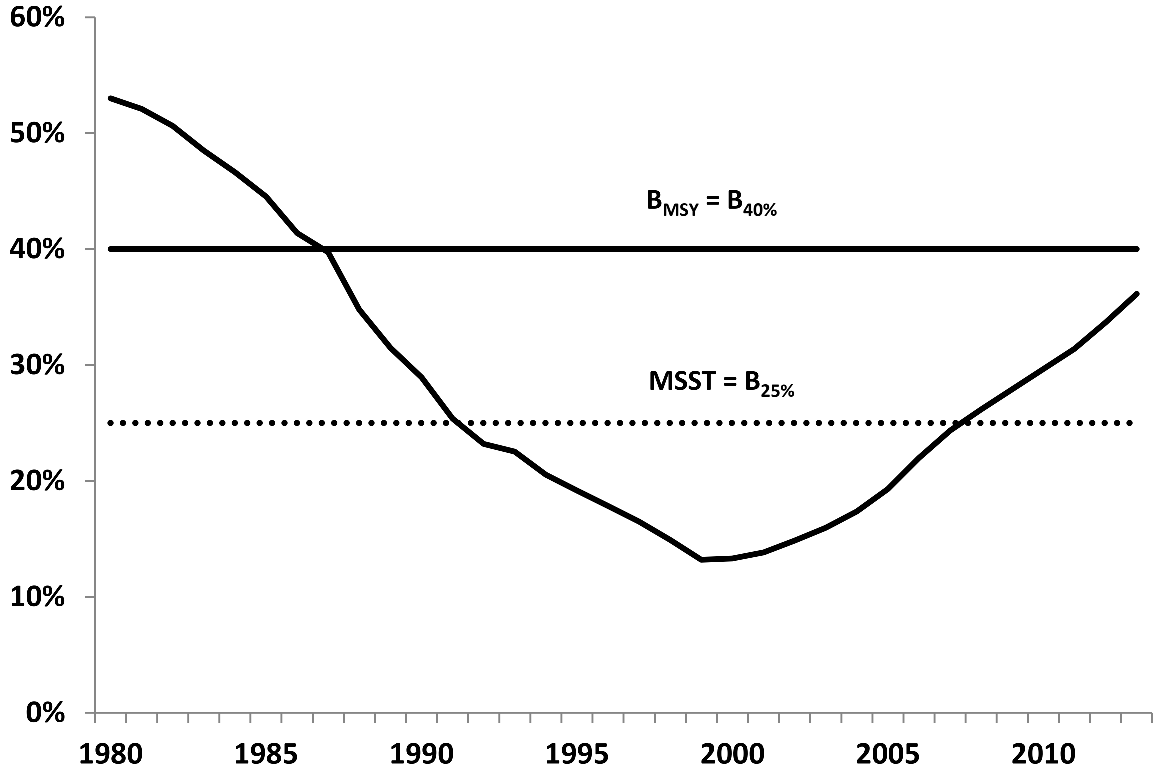

Figure 11. Relative depletion of darkblotched rockfish from 1980 to 2013 based on the 2013 stock assessment.

Stock Productivity Relative to Rebuilding Success

Gertseva and Thorson (2013) fixed steepness at its prior mean of 0.779. This prior was estimated using a likelihood profile approximation to a maximum marginal likelihood mixed-effect model for steepness from ten category 1 rockfish species off the U.S. west coast (Pacific ocean perch, bocaccio, canary, chilipepper, black, darkblotched, gopher, splitnose, widow, and yellowtail rockfish). Both northern and southern assessments of black rockfish were used, although the log-likelihood for each was given a 0.5 weighting, to ensure that the together these two assessments had an equal weighting to the other species. This likelihood profile model is intended to synthesize observation-level data from assessed species, while avoiding the use of model output and thus improving upon previous meta-analyses (Dorn 2002b; Forrest, *et al.* 2010). This methodology has been simulation tested, and has been recommended by the SSC for use in stock assessments.

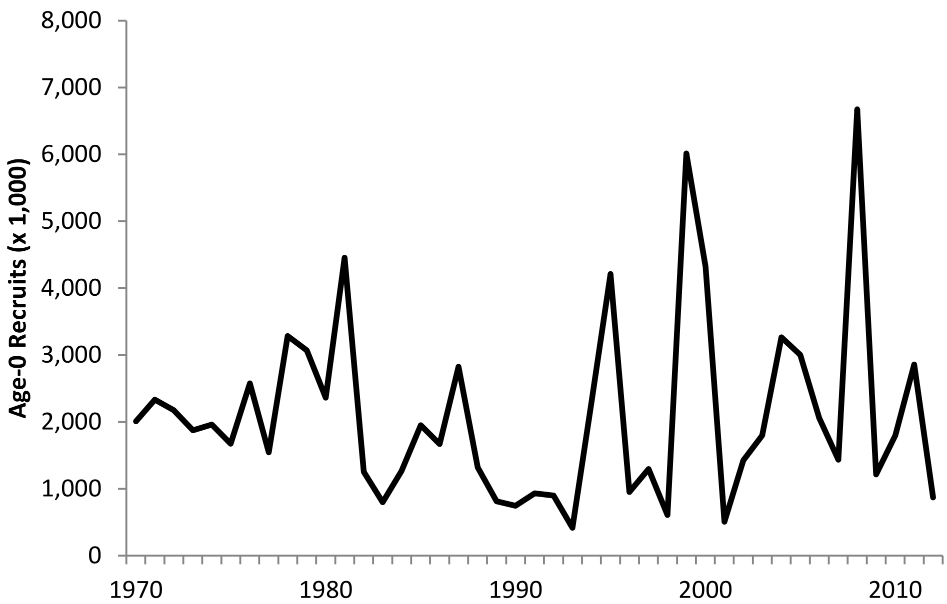

Figure 12. Estimated recruitments of darkblotched rockfish, 1970-2012.

Fishing Mortality

Historically, the spawning output of darkblotched rockfish dropped below the B_{MSY} target for the first time in 1987, as a result of intense fishing by foreign and domestic fleets. It continued to decline and reached the level of 13 percent of its unfished output in 1999. Since 2000, when the stock was declared overfished, the spawning output slowly increased primarily due to management regulations implemented for the stock.

Overfishing for darkblotched has not occurred in the last 10 years (Gertseva and Thorson 2013). Historically, the darkblotched rockfish has experienced overfishing in the 1980s and 1990s, during the peak years of the Pacific ocean perch fishery, as well as in the mid-1960s when foreign trawl fleets were targeting groundfish off the west coast. Exploitation rates were effectively decreased after the stock was declared overfished in 2000 and rebuilding measures were implemented.

Rebuilding Duration and Probabilities

The 2013 darkblotched assessment predicts the stock will be rebuilt by 2015. Therefore, rebuilding probabilities (both P_{MAX} and P_{TARGET}) are high for darkblotched under the harvest control rule in the rebuilding plan. The SSC is recommending a new assessment be done in 2015 to confirm that prediction.

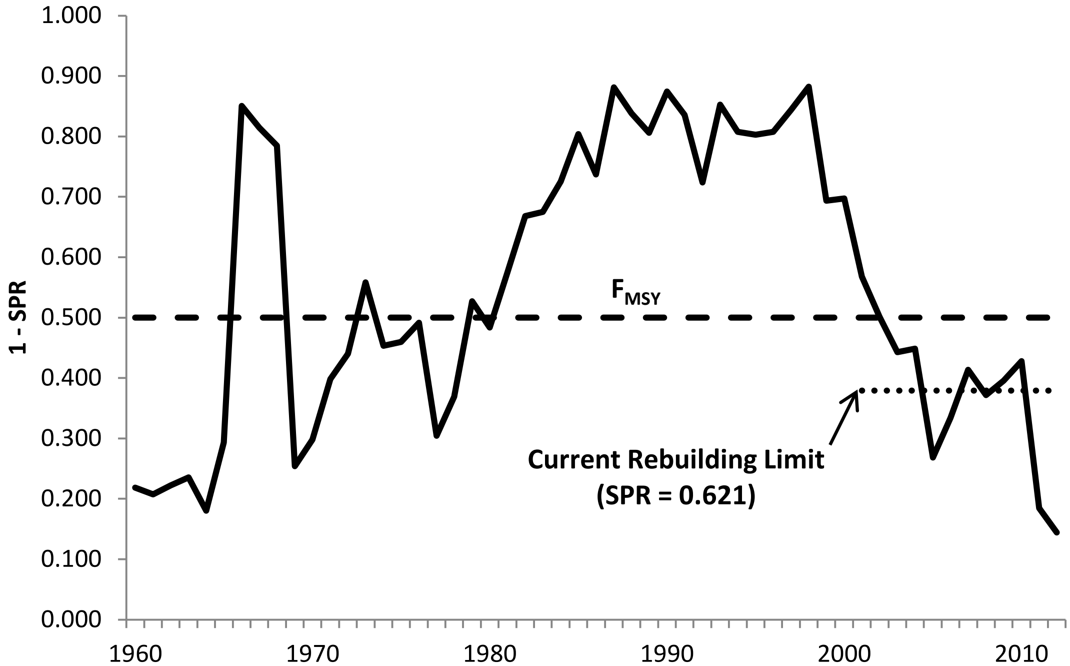

Figure 13. Time series of estimated SPR harvest rates of darkblotched rockfish, 1960-2012. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis.

1.1.3.5 Pacific Ocean Perch

Distribution and Life History

Pacific ocean perch (POP, *Sebastes alutus*) are most abundant in the Gulf of Alaska, and have been observed off of Japan, in the Bering Sea, and south to Baja California, although they are sparse south of Oregon and rare in southern California. (Eschmeyer, *et al.* 1983; Gunderson 1971; Miller and Lea 1972). They primarily inhabit waters of the upper continental slope (Dark and Wilkins 1994) and are found along the edge of the continental shelf (Archibald, *et al.* 1983). Pacific ocean perch occur as deep as 825 m, but usually are at 100 m to 450 m and along submarine canyons and depressions (NOAA 1990). Throughout their range, POP are generally associated with gravel, rocky, or boulder type substrate (Ito, *et al.* 1986). Larvae and juveniles are pelagic; subadults and adults are benthopelagic (living and feeding on the bottom and in the water column). Adults form large schools 30 m wide, to 80 m deep, and as much as 1,300 m long (NOAA 1990). They also form spawning schools (Gunderson 1971). Juvenile POP form ball-shaped schools near the surface or hide in rocks (NOAA 1990).

Pacific ocean perch winter and spawn in deeper water (>275 m). In the summer (June through August) they move to feeding grounds in shallower water (180 m to 220 m) to allow gonads to ripen (Archibald, *et al.* 1983; Gunderson 1971; NOAA 1990). They are slow-growing and long-lived; the maximum age has been estimated at about 98 years (Heifetz, *et al.* 2000). The can grow up to about 54 cm and 2 kg (Archibald, *et al.* 1983; Beamish 1979; Gunderson 1971; Ito, *et al.* 1986; Mulligan and Leaman 1992; NOAA 1990). POP are carnivorous. Larvae eat small zooplankton. Small juveniles eat copepods, and larger juveniles feed on euphausiids (krill). Adults eat euphausiids, shrimps, squids, and small fish. Immature fish feed throughout the year, but adults feed only seasonally, mostly April through August (NOAA 1990). POP predators include sablefish and Pacific halibut.

Stock Status and Management History

POP were harvested exclusively by U.S. and Canadian vessels in the Columbia and Vancouver INPFC areas prior to 1966. Large Soviet and Japanese factory trawlers began fishing for POP in 1965 in the Vancouver area and in the Columbia area a year later. Intense fishing pressure by these foreign fleets occurred from 1966 to 1975. The mandates of the MSA, passed by Congress in 1976, eventually ended foreign fishing within 200 miles of the United States coast.

The POP resource off the west coast was overfished before implementation of the groundfish FMP in 1982, and Council actions to conserve the resource likewise predate the FMP. Large removals of POP in the foreign trawl fishery, followed by significant declines in catch and abundance, led the Council to limit harvest beginning in 1979. A 20–year rebuilding plan for POP was adopted in 1981. Rebuilding under this original plan was largely influenced by a cohort analysis of 1966-1976 catch and age composition data (Gunderson 1979), updated with 1977-1980 data (Gunderson 1981), and an evaluation of trip limits as a management tool (Tagart, *et al.* 1980). This was the first time trip limits were used by the Council to discourage targeting and overharvest of an overfished stock, and it remains a management strategy in use today in the west coast groundfish fishery. In addition to trip limits, the Council significantly lowered the OY for POP. After twenty years of rebuilding under the original plan, the stock stabilized at a lower equilibrium than estimated in the pre-fishing condition. While continuing stock decline was abated, rebuilding was not achieved as the stock failed to increase in abundance to B_{MSY}.

Ianelli and Zimmerman (1998) estimated POP female spawning biomass in 1997 to be at 13 percent of its unfished level, thereby confirming that the stock was overfished. NMFS formally declared POP overfished in March 1999 after the groundfish FMP was amended to incorporate the tenets of the Sustainable Fisheries Act. The Council adopted and NMFS enacted more conservative management measures in 1999 as part of a redoubled rebuilding effort.

A 2000 POP assessment suggested the stock was more productive than originally thought (Ianelli, *et al.* 2000). A revised POP rebuilding analysis was completed and adopted by the Council in 2001 (Punt and Ianelli 2001). This analysis estimated a T_{MIN} of 12 years and a T_{MAX} of 42 years. It was noted in the rebuilding analysis that the ongoing retrospective analysis of historic foreign fleet catches was likely to change projections of POP rebuilding.

The 2003 POP assessment (Hamel, *et al.* 2003) incorporating updated survey and fishery data including the retrospective of foreign fleet catches (Rogers 2003b). The assessment covered areas from southern Oregon to the U.S. border with Canada, the southern extent of POP distribution. The overall conclusion was that the stock was relatively stable at approximately 28 percent of its unfished biomass ($B_{28\%}$). Of all the changes and additions to the data, the historical catch estimates had the greatest effect, resulting in lower estimates of both equilibrium unfished biomass (B_0) and MSY.

A POP rebuilding plan was adopted in 2003 under Amendment 16-2. The rebuilding plan was informed by a revised rebuilding analysis based on the 2000 assessment and conducted in 2001 (Punt and Ianelli 2001). The rebuilding plan established a target rebuilding year of 2027 and a harvest control rule of F = 0.0082 (with a P_{MAX} of 70 percent).

The 2003 assessment estimated a stock depletion of 28 percent at the start of 2003 (Hamel, *et al.* 2003). The 2003 rebuilding analysis (Punt, *et al.* 2003) was used to amend the harvest control rule and set annual POP OYs for the 2004-2006 period. The amended harvest control rule was F = 0.0257.

The 2003 POP assessment was updated in 2005, 2007, and 2009. The 2005 update assessment estimated a stock depletion of 23.4 percent of its unfished level at the start of 2005 (Hamel 2006b). The 2005 POP rebuilding analysis (Hamel 2006a) was used to inform revisions to the POP rebuilding plan. The revised rebuilding plan, which was adopted under Amendment 16-4, specified a target rebuilding year of 2017 and a constant harvest rate strategy (SPR = 86.4%).

The 2007 POP assessment update estimated a stock depletion of 27.5 percent at the start of 2007 (Hamel 2008d). The 2007 rebuilding analysis indicated rebuilding was progressing ahead of schedule (Hamel 2008b). No modifications to the rebuilding plan were made.

The 2009 POP assessment estimated a stock depletion of 28.6 percent at the start of 2009 (Hamel 2009b). The 2009 POP rebuilding analysis (Hamel 2009a) predicted rebuilding would not occur by the target year of 2017 with at least a 50% probability even in the absence of fishing-related mortality beginning in 2011 (i.e., $T_{F=0}$). Therefore the rebuilding plan was revised by changing the target rebuilding year to 2020 while maintaining the constant SPR harvest rate of 86.4%.

A full assessment in 2011 estimated a stock depletion of 19.1 percent at the start of 2011 (Hamel and Ono 2011). The significant decrease in the estimated depletion of the stock was largely due to a much higher estimate of initial, unfished biomass (B_0). Previous assessments assumed a large recruitment in the late 1950s provided the higher biomass to support the estimated removals by the foreign fleets without any data to support that assumption. The assumption in the 2011 assessment is that the large foreign fleet catch fished the biomass down to critical levels, thus resulting in a substantially larger B_0 estimate. The 2011 assessment also estimated a longer sequence of higher recruitment based on fitting to the data available for early years of the assessment period. The 2011 rebuilding analysis (Hamel 2011) predicted rebuilding would not occur by the target year of 2020 with at least a 50% probability even in the absence of fishing-related mortality beginning in 2013 (i.e., $T_{F=0}$). Therefore the rebuilding plan was revised by changing the target rebuilding year to 2051 while maintaining the constant SPR harvest rate of 86.4%.

A POP catch report was provided in 2013 (Agenda Item F.5.a, Attachment 10, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

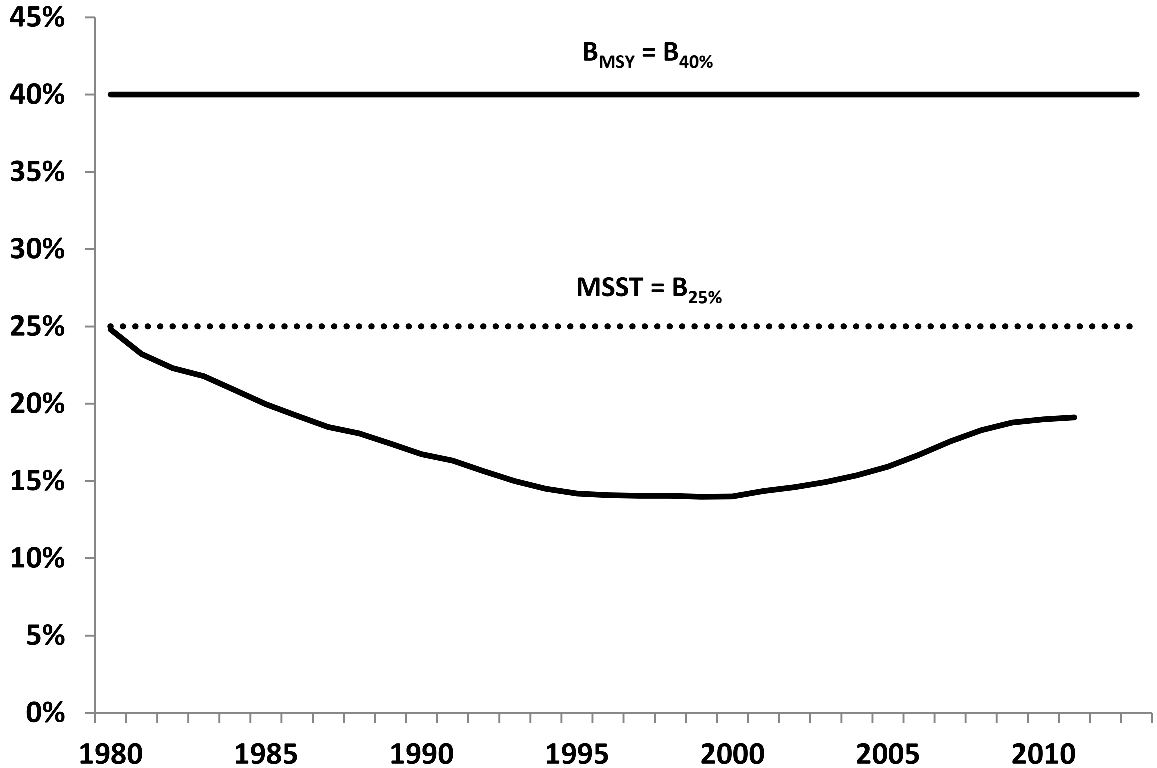

Figure 14. Relative depletion of Pacific ocean perch from 1980 to 2011 based on the 2011 stock assessment.

Stock Productivity Relative to Rebuilding Success

Stock-recruitment steepness was estimated external to the 2011 POP stock assessment base model at 0.4 (and then fixed in the model), which is low compared to steepness estimates from POP assessments conducted off Canada and Alaska. The 2011 assessment assumes no connectivity with the other assessed POP stocks in Canada and Alaska. POP off the U.S. west coast (mostly Washington and Oregon) are at the southern end of the range where there are enough POP to be commercially important, and the numbers seen are likely related to movement across the Canadian border, as well as reproductive success (recruitment) and fishing mortality north of the border. Given there is no evidence of stock structure in the meta-population of POP in the northeast Pacific and larval distribution of slope rockfish tends to be geographically widespread, this assumption of no connectivity with northern stocks is questionable. It is plausible that steepness is higher than determined in the 2011 assessment, which would tend to estimate a less depleted and more productive stock. The major axis of uncertainty in the assessment is steepness, with states of nature ranging from a low steepness of 0.35 to a higher value of 0.55. If steepness was as high as 0.55, the POP stock would be on the verge of being rebuilt at the start of 2011 (depletion = 39.9 percent) and projected to be rebuilt at the start of 2012. Under the base case model with a steepness of 0.4 and continuing to manage POP using the 86.4 percent SPR harvest rate in the current rebuilding plan, the stock is projected to be rebuilt by 2051.

Recruitment trends estimated in the 2011 POP assessment indicate that, like most assessed rockfish, recruitment has been relatively lower in the last few decades compared to the 1950s and 1960s. However, the 1999 and 2000 year classes are estimated to be above average and the 2008 year class recruitment, while uncertain, appears to be the largest in at least the past 50 years (Figure 15).

Fishing practices are unlikely to have any effect on stock productivity, given the low fishing mortality implemented under the rebuilding plan limits. There is no indication that fishing operations are likely to substantially interfere with or disturb reproductive behavior or juvenile survival.

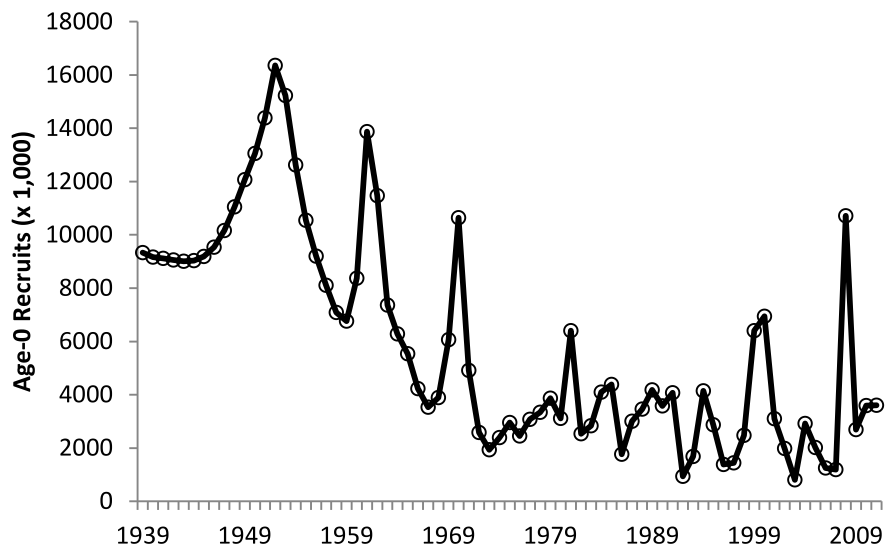

Figure 15. Time series of estimated (age-0) POP recruitments.

Fishing Mortality

POP are caught almost exclusively by groundfish trawl gear and predominantly bottom trawls operating on the outer continental shelf and slope north of 43º N lat. POP are distributed from 30-350 fm, with the core distribution between 110-220 fm.

According to the base model in the 2011 assessment, the fishing level has been below the proxy $F_{50\%}$ F_{MSY} harvest rate for the past 12 years (Figure 16), during which period the stock has begun to rebuild (Figure 14). The point estimates of summary (age 3+) biomass also show an upward trend over the past decade, increasing approximately 50 percent in that time.

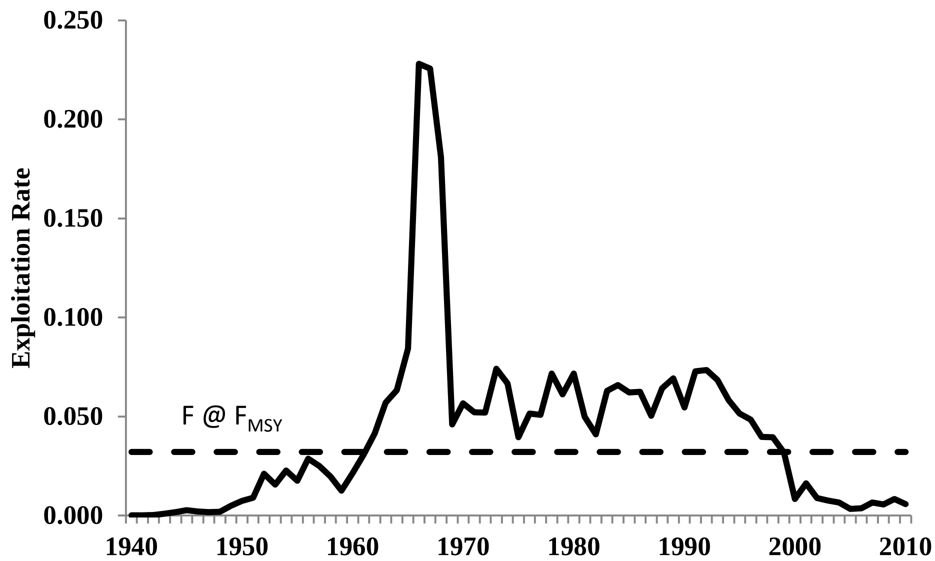

Figure 16. Time series of POP exploitation rates (catch/summary biomass), 1940-2010.

Rebuilding Duration and Probabilities

Hamel (2011) estimated a probability of rebuilding in the maximum time allowable (P_{MAX}) under the SPR harvest rate specified in the rebuilding plan of 72.3%. There is a 50% probability of rebuilding by the target year of 2051.

1.1.3.6 Petrale Sole

Distribution and Life History

Petrale sole (*Eopsetta jordani*) is a right-eyed flounder in the family Pleuronectidae ranging from the western Gulf of Alaska to the Coronado Islands, northern Baja California, (Hart 1988; Kramer and O'Connell 1995; Love, *et al.* 2002) with a preference for soft substrates at depths ranging from 0-550 m (Love, *et al.* 2002). In northern and central California petrale sole are dominant on the middle and outer continental shelf (Allen, *et al.* 2006).

There is little information regarding the stock structure of petrale sole off the U.S. Pacific coast. Tagging studies show adult petrale sole can move up to 350 - 390 miles, having the ability to be highly migratory with the possibility for homing ability (Alverson and Chatwin 1957; MBC 1987). Juveniles show little coastwide or bathymetric movement while studies suggest that adults generally move inshore and northward onto the continental shelf during the spring and summer to feeding grounds and offshore and southward during the fall and winter to deep water spawning grounds (Hart 1988; Love 1996; MBC 1987). Adult petrale sole can tolerate a wide range of bottom temperatures (Perry, *et al.* 1994).

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

Island, 1 fish) (D. Thomas, California Department of Fish and Game, Menlo Park, CA, cited by Samson and Lee (1999)).

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

Petrale sole spawn during the winter at several discrete deepwater sites (270-460 m) off the U.S. west coast, from November to April, with peak spawning taking place from December to February (Best 1960; Casillas, *et al.* 1998; Castillo 1995; Castillo, *et al.* 1993; Garrison and Miller 1982; Gregory and Jow 1976; Harry 1959; Love 1996; Moser 1996; Reilly, *et al.* 1994). Females spawn once each year and fecundity varies with fish size, with one large female laying as many as 1.5 million eggs (Porter 1964). Petrale sole eggs are planktonic, ranging in size from 1.2 to 1.3 mm, and are found in deep water habitats at water temperatures of 4–10 degrees C and salinities of 25–30 ppt (Alderdice and Forrester 1971; Best 1960; Gregory and Jow 1976; Ketchen and Forrester 1966). The duration of the egg stage can range from approximately 6 to 14 days (Alderdice and Forrester 1971; Casillas, *et al.* 1998; Hart 1988; Love 1996).

Petrale sole larvae are planktonic, ranging in size from approximately 3 to 20 mm, and are found up to 150 km offshore foraging upon copepod eggs and nauplii (Casillas, *et al.* 1998; Hart 1988; MBC 1987; Moser 1996). The larval duration, including the egg stage, spans approximately 6 months with larvae settling at about 2.2 cm in length on the inner continental shelf (Pearcy, *et al.* 1977). Juveniles are benthic and found on sandy or sand-mud bottoms (Eschmeyer, *et al.* 1983; MBC 1987) and range in size from approximately 2.2 cm to the size at maturity, 50% of the population is mature at approximately 38 cm and 41 cm for males and females, respectively (Casillas, *et al.* 1998). No specific areas have been identified as nursery grounds for juvenile petrale sole. In the waters off British Columbia, Canada larvae are usually found in the upper 50 m far offshore, juveniles at 19–82 m and large juveniles at 25–125 m (Starr and Fargo 2004).

Adult petrale sole achieve a maximum size of around 50 cm and 63 cm for males and females, respectively (Best 1963; Pedersen 1975). The maximum length reported for petrale sole is 70 cm (Eschmeyer, *et al.* 1983; Hart 1988; Love, *et al.* 2002) while the maximum observed break and burn age is 31 years (Haltuch, *et al.* 2013).

Petrale sole juveniles are carnivorous, foraging on annelid worms, clams, brittle star, mysids, sculpin, amphipods, and other juvenile flatfish (Casillas, *et al.* 1998; Ford 1965; Pearsall and Fargo 2007). Predators on juvenile petrale sole include adult petrale sole as well as other larger fish (Casillas, *et al.* 1998; Ford 1965) while adults are preyed upon by marine mammals, sharks, and larger fishes (Casillas, *et al.* 1998; Love 1996; Trumble 1995).

One of the ambushing flatfishes, adult petrale sole have diverse diets that become more piscivorous at larger sizes (Allen, *et al.* 2006). Adult petrale sole are found on sandy and sand-mud bottoms (Eschmeyer, *et al.* 1983) foraging for a variety of invertebrates including, crab, octopi, squid, euphausiids, and shrimp, as well as anchovies. hake, herring, sand lance, and other smaller rockfish and flatfish (Birtwell, *et al.* 1984; Casillas, *et al.* 1998; Ford 1965; Kravitz, *et al.* 1977; Love 1996; Pearsall and Fargo 2007; Reilly, *et al.* 1994). On the continental shelf petrale sole generally co-occur with English sole, rex sole, Pacific sanddab, and rock sole (Kravitz, *et al.* 1977).

Castillo (1992) and Castillo et al. (1995) suggest that density-independent survival of early life stages is low and show that offshore Ekman transportation of eggs and larvae may be an important source of variation in year class strength in the Columbia INPFC area. The effects of the Pacific Decadal Oscillation (PDO) on California current temperature and productivity (Mantua, *et al.* 1997) may also contribute to non-stationary recruitment dynamics for petrale sole. The prevalence of a strong late 1990s year class for many west coast groundfish species suggests that environmentally driven recruitment variation may be correlated among species with relatively diverse life history strategies.

Stock Status and Management History

Petrale sole were lightly exploited during the early 1900s. By the 1950s the petrale sole fishery was well-developed and showing clear signs of depletion and declines in catches and biomass. Haltuch et al. (2013) estimated petrale sole biomass on the U.S. west coast dropped below the $B_{25\%}$ management target during the 1960s and generally stayed there through 2013. The stock declined below the $B_{12.5\%}$ overfished threshold from the early1980s until the early 2000s (Figure 7). Since 2000 the stock has increased, reaching a peak of 14.2% of unfished biomass in 2005, followed by a decreasing trend through 2010. The petrale sole biomass currently shows an increasing trend with recent above-average year classes recruiting into the spawning biomass. The estimated relative depletion level in 2013 is 22.3 percent.

Early stock assessments only assessed petrale sole in the combined U.S.-Vancouver and Columbia INPFC areas (i.e., petrale in these areas were treated as a unit stock, using time series of data that began during the 1970s) (Demory 1984; Turnock, *et al.* 1993). The first assessment used stock reduction analysis and the second assessment used the length-based Stock Synthesis model. The third petrale sole assessment utilized the hybrid length-and-age-based Stock Synthesis 1 model, using data from 1977–1998 (Sampson and Lee 1999). Sampson and Lee (1999) estimated petrale sole stock depletion at 42 percent of unfished biomass at the start of 1999.

The 2005 petrale sole assessment (Lai, *et al.* 2006) was conducted assuming two separate stocks: the northern stock encompassing the U.S. Vancouver and Columbia INPFC areas and the southern stock including the Eureka, Monterey and Conception INPFC areas. Petrale sole in the north was estimated to be at 34 percent of unfished spawning stock biomass in 2005. In the south, the stock was estimated to be at 29 percent of unfished spawning stock biomass. Biomass trends were qualitatively similar in both areas, and also showed consistency with petrale sole trends in Canadian waters. Both stocks were estimated to have been below the Council's MSST of $B_{25\%}$[4] from the mid-1970s until very recently. Estimated harvest rates were in excess of the target fishing mortality rate of $F_{40\%}$[5] during this period as well. Petrale sole in both areas showed large recent increases in stock size, which was consistent with the strong upward trend in the shelf survey biomass index. In 2005, the STAR panel noted that the petrale sole stock trends were similar in both northern and southern areas in spite of the different modeling choices made for each area, and that a single coastwide assessment should be considered (Dorn, *et al.* 2006).

The 2009 petrale assessment estimated a stock depletion of 11.6 percent of its unfished biomass at the start of 2009 (Haltuch and Hicks 2009b). That result compelled NMFS to declare the stock overfished in 2010. The 2009 assessment treated petrale sole as a single coastwide stock, with the fleets and landings structured by state (WA, OR, CA) area of catch. Historical catches were extended back to 1876, the first year of estimated exploitation for the stock.

New proxy management reference points used to manage FMP flatfish stocks, such as petrale sole, were implemented in 2011 under FMP Amendment 16-5 (also referred to as Secretarial Amendment 1) in 2011 (PFMC and NMFS 2011). The proxy F_{MSY} harvest rate or MFMT of $F_{40\%}$, which is applied to the

[4] $B_{25\%}$ was the MSST or overfished threshold for all groundfish stocks from the implementation of Amendment 12 in 1998 through 2010.
[5] $F_{40\%}$ was the F_{MSY} proxy harvest rate for all flatfish stocks prior to 2011.

estimated exploitable biomass to determine the OFL, was changed to $F_{30\%}$; the B_{MSY} target of $B_{40\%}$ was changed to $B_{25\%}$; and the MSST of $B_{25\%}$, was changed to $B_{12.5\%}$. The SSC recommended these new proxy reference points to manage flatfish stocks based on a meta-analysis of the relative productivity of assessed west coast flatfish species and other assessed Pleuronectid species internationally. The precautionary ACL harvest control rule, referred to as the 25-5 rule and analogous to the 40-10 rule for other groundfish stocks (see Figure 35 and section 1.2.3 for more detail on these ACL harvest control rules), was also adopted for flatfish stocks under Amendment 16-5.

The 2009 rebuilding analysis (Haltuch and Hicks 2009a) was used to consider a petrale sole rebuilding plan for petrale sole, which was implemented under FMP Amendment 16-5. The rebuilding plan specified a target year of 2016 and the strategy of using the 25-5 harvest control rule after 2011 to set harvest levels (the 2011 ACL was set equal to the ABC to avoid unnecessary negative socioeconomic impacts). An emergency rule was implemented to reduce the 2010 petrale OY to 1,200 mt.

The 2011 petrale assessment estimated a stock depletion of 18 percent of its unfished biomass at the start of 2011 (Haltuch, *et al.* 2011). The assessment indicated an increasing spawning biomass trend with above average year classes recruiting into the spawning biomass. The 2011 rebuilding analysis (Haltuch 2011) indicated rebuilding was ahead of schedule and predicted spawning biomass would likely attain the B_{MSY} target of $B_{25\%}$ by the start of 2013. No modifications were made to the rebuilding plan based on this result.

The 2013 petrale assessment (Haltuch, *et al.* 2013) estimated a stock depletion of 22.3 percent of its unfished biomass at the start of 2013 and short of the prediction from the 2011 rebuilding analysis; spawning biomass is predicted to reach the B_{MSY} target by the start of 2014. The 2013 stock assessment continued with the coastwide stock assessment, but was restructured to summarize petrale sole landings by the port of landing and combined Washington and Oregon into a single fleet. The down-weighting of the trawl CPUE index used in the 2011 assessment was largely responsible for the more pessimistic result and the one year lag in rebuilding relative to the previous assessment. However, the estimation of recent recruitments indicated two very strong year classes (2007 and 2008; Figure 18) recruiting into the spawning population, which increases the likelihood of imminent success in rebuilding this stock.

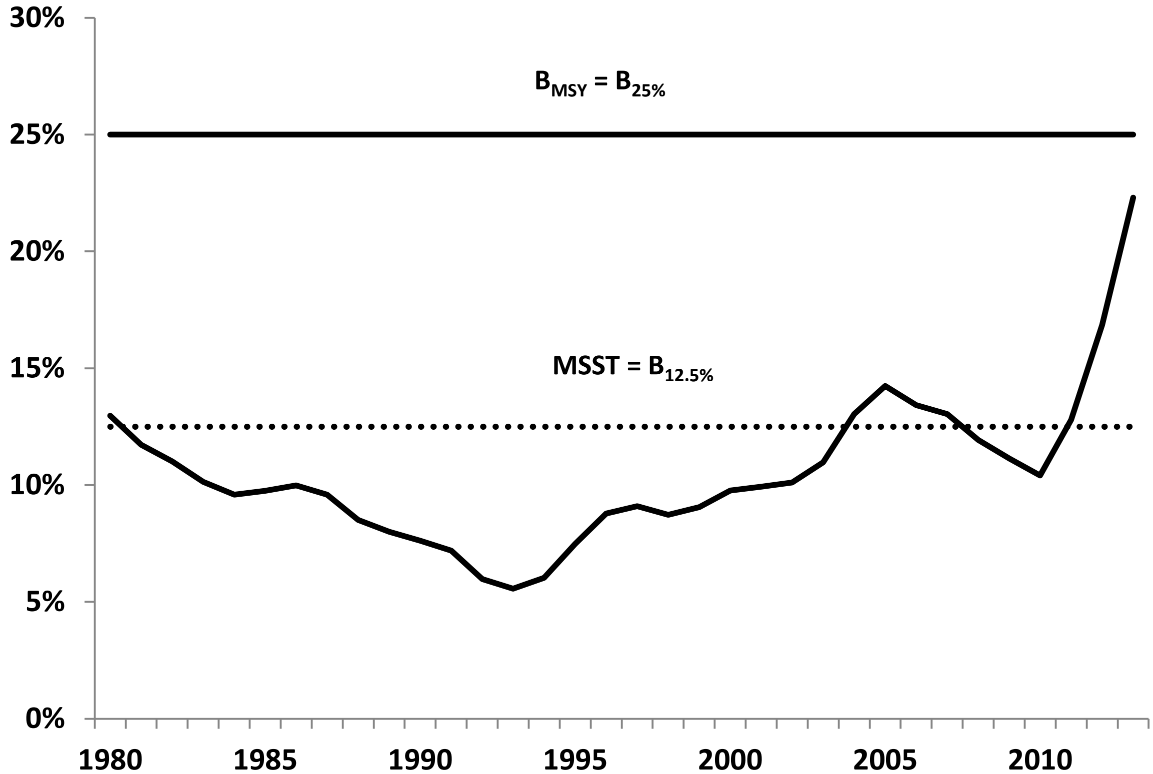

Figure 17. Relative depletion trend from 1980 to 2013 for petrale sole based on the 2013 stock assessment.

Stock Productivity Relative to Rebuilding Success

Petrale have high stock productivity with an estimated stock-recruitment steepness of 0.86 (Haltuch, *et al.* 2013); the prior for this estimate was based on a meta-analysis of flatfish species in the family *Pleuronectidae (Myers, et al. 1999)*. The time series of estimated recruitments shows a relationship with the decline in spawning biomass, punctuated by larger recruitments. The five weakest recruitments since 1934 are estimated to be from 1986, 1987, 1992, 1995, and 2001, while the five strongest recruitments since 1934 are estimated to be from 1939, 1966, 1998, 2007, and 2008. The 2007 and 2008 recruitments were the third and second largest estimated, respectively, behind only the record 1966 recruitment event (Figure 18). Until 2007, the most recent large recruitment event is estimated to be in 2006, which was smaller than the 1998 recruitment event.

The high stock productivity and the large recent recruitments contribute to a predicted quick recovery of the petrale sole stock. The 2013 petrale assessment predicts the stock will be successfully rebuilt by the start of 2014, with an estimated depletion of 26 percent.

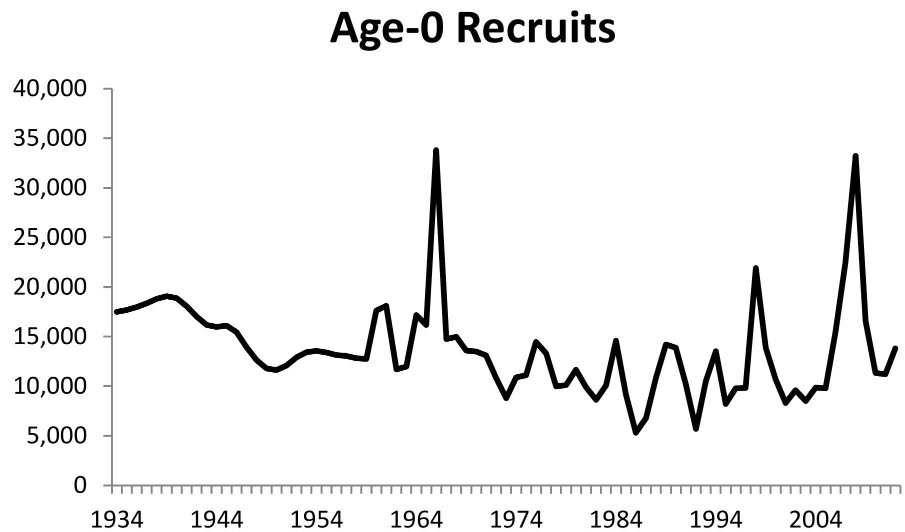

Figure 18. Time series of estimated (age 0) petrale sole recruitments, 1934-2012 (from Haltuch, *et al.* 2013).

Fishing Mortality

Most of the petrale sole catch is made by deep-water demersal trawls at depths of 164-252 fm. Recent petrale sole catch statistics exhibit marked seasonal variation, with substantial portions of the annual harvest taken from the spawning grounds in December and January. From the inception of the fishery in 1876 through the mid-1940s, the vast majority of catches occurred between March and October (the summer fishery), when the stock is dispersed over the continental shelf. The post-World War II period witnessed a steady decline in the amount and proportion of annual catches occurring during the summer months (March-October). Conversely, petrale catch during the winter season (November–February), when the fishery targets spawning aggregations, has exhibited a steadily increasing trend since the 1940s. Since the mid-1980s, catches during the winter months have been roughly equivalent to or exceeded catches throughout the remainder of the year. In 2009, catches of petrale sole began to be restricted due to declining stock size.

Petrale sole exhibit distinct seasonal depth migrations with higher abundance on the shelf during summer months and higher abundance in distinct spawning areas during winter months. Hence, RCA structures for this species could vary seasonally if RCA management is needed to control fishing mortality. The general pattern for petrale sole is a shallower depth distribution during the summer months (periods 3 and 4) and a deeper depth distribution during the winter months (periods 1 and 6). Petrale sole are typically in transition as they migrate between shallow and deeper depths during periods 2 and 5.

Petrale sole is a trawl-dominant species. Therefore, the uncertainty in catch monitoring and accounting is low, given the mandatory 100 percent observer coverage and near real-time reporting of total catches in the rationalized trawl fisheries.

Prior to 2010, when interim rebuilding measures were implemented, harvest rates were in excess of what is now considered the F_{MSY} limit of $F_{30\%}$ (i.e., SPR = 30%). Management measures implemented since 2010 have resulted in harvest rates below the F_{MSY} limit.

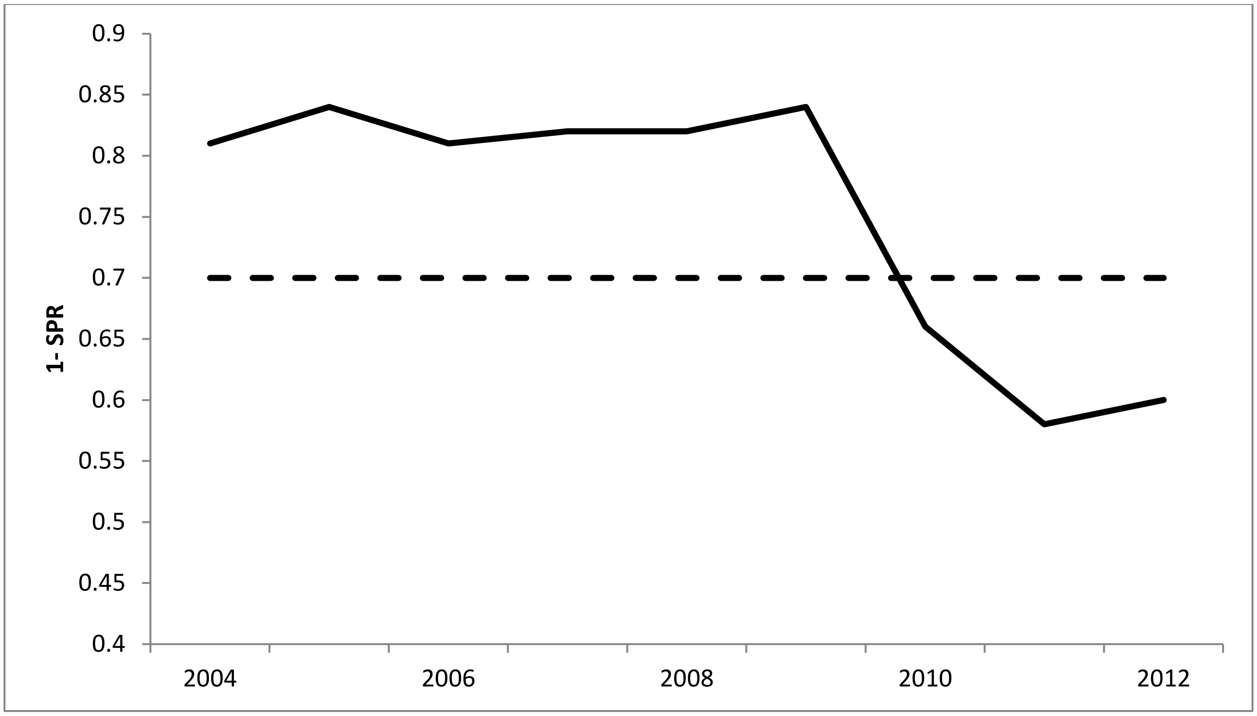

Figure 19. Estimated spawning potential ratio (SPR) of petrale sole, 2004-2012. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis. The management target is plotted as a dashed horizontal line and values above this reflect harvests in excess of the overfishing proxy based on the F_{MSY} harvest rate (SPR = 30%).

Rebuilding Duration and Probabilities

The 2013 petrale assessment predicts the stock will be rebuilt by 2014. Therefore, rebuilding probabilities (both P_{MAX} and P_{TARGET}) are high for petrale sole under the harvest control rule in the rebuilding plan. The SSC is recommending a new assessment be done in 2015 to confirm that prediction.

1.1.3.7 Yelloweye Rockfish

Distribution and Life History

Yelloweye rockfish (*Sebastes ruberrimus*) range from the Aleutian Islands, Alaska, to northern Baja California, Mexico, and are common from Central California northward to the Gulf of Alaska (Eschmeyer, *et al.* 1983; Hart 1988; Love, *et al.* 2002; Miller and Lea 1972; O'Connell and Funk 1986). Yelloweye rockfish occur in water 25 m to 550 m deep with 95 percent of survey catches occurring from 50 m to 400 m (Allen and Smith 1988). Yelloweye rockfish are bottom dwelling, generally solitary, rocky reef fish, found either on or just over reefs (Eschmeyer, *et al.* 1983; Hart 1988; Love, *et al.* 2002; Miller and Lea 1972; O'Connell and Funk 1986) . Boulder areas in deep water (>180 m) are the most densely populated habitat type, and juveniles prefer shallow-zone broken-rock habitat (O'Connell and Carlile 1993). They also reportedly occur around steep cliffs and offshore pinnacles (Rosenthal, *et al.* 1982). The presence of refuge spaces is an important factor affecting their occurrence (O'Connell and Carlile 1993).

Yelloweye rockfish are ovoviviparous and give birth to live young in June off Washington (Hart 1988). The age of first maturity is estimated at six years and all are estimated to be mature by eight years (Wyllie

Echeverria 1987). They can grow to 91 cm (Eschmeyer, *et al.* 1983; Hart 1988) and males and females probably grow at the same rates (Love 1996; O'Connell and Funk 1986). The growth rate levels off at approximately 30 years of age (O'Connell and Funk 1986) but they can live to be 118 years old (Love, *et al.* 2002). Yelloweye rockfish are a large predatory reef fish that usually feeds close to the bottom (Rosenthal, *et al.* 1982). They have a widely varied diet, including fish, crabs, shrimps and snails, rockfish, cods, sand lances, and herring (Love, *et al.* 2002). Yelloweye rockfish have been observed underwater capturing smaller rockfish with rapid bursts of speed and agility. Off Oregon the major food items of the yelloweye rockfish include cancroid crabs, cottids, righteye flounders, adult rockfishes, and pandalid shrimps (Steiner 1978). Quillback and yelloweye rockfish have many trophic features in common (Rosenthal, *et al.* 1982).

Stock Status and Management History

The first yelloweye rockfish stock assessment on the U.S. west coast was conducted in 2001 (Wallace 2002). This assessment incorporated two area assessments: one from Northern California using CPUE indices constructed from Marine Recreational Fisheries Statistical Survey (MRFSS) sample data and CDFG data collected on board commercial passenger fishing vessels, and the other from Oregon using Oregon Department of Fish and Wildlife (ODFW) sampling data. The assessment concluded yelloweye rockfish stock biomass in 2001 was at about 7 percent of unexploited biomass in Northern California and 13 percent of unexploited biomass in Oregon. The assessment revealed a thirty-year declining biomass trend in both areas with the last above average recruitment occurring in the late 1980s. The assessment's conclusion that yelloweye rockfish biomass was well below the 25 percent of unexploited biomass threshold for overfished stocks led to this stock being declared overfished in 2002. Until 2002, yelloweye rockfish were listed in the "remaining rockfish" complex on the shelf in the Vancouver, Columbia, and Eureka INPFC areas and the "other rockfish" complex on the shelf in the Monterey and Conception areas. As with the other overfished stocks, yelloweye rockfish harvest is now tracked separately and managed against a species-specific ACL.

In June 2002 the SSC recommended that managers should conduct a new assessment incorporating Washington catch and age data. This recommendation was based on evidence that the biomass distribution of yelloweye rockfish on the west coast was centered in waters off Washington and that useable data from Washington were available. Based on that testimony, the Council recommended completing a new assessment in the summer of 2002, before a final decision was made on 2003 management measures. Methot et al. (Methot, *et al.* 2003) did the assessment, which confirmed the overfished status (24 percent of unfished biomass) and provided evidence of higher stock productivity than originally assumed. The assessment also treated the stock as a coastwide assemblage. The 2002 rebuilding analysis (Methot and Piner 2002a) informed the yelloweye rockfish rebuilding plan adopted under FMP Amendment 16-3 in 2004. The rebuilding plan established a target rebuilding year of 2058 and a harvest control rule of F = 0.0153.

A coastwide 2006 yelloweye rockfish assessment estimated a stock depletion of 17.7 percent of the unfished level at the start of 2006 (Wallace, *et al.* 2006). New data sources in the assessment included WDFW 2002 submersible survey and the International Pacific Halibut Commission annual longline survey. Further revisions in the assessment included reducing natural mortality from 0.045 to 0.036 and increasing steepness from 0.437 to 0.45.

The 2006 rebuilding analysis (Tsou and Wallace 2006) was used to inform a revision of the yelloweye rebuilding plan under FMP Amendment 16-4. Given the significant negative socioeconomic impacts associated with the projected OYs under the constant harvest rate modeled in the rebuilding analysis, the Council elected to gradually ramp down the harvest rate beginning in 2007 before resuming a constant harvest rate rebuilding strategy in 2011. The harvest rate ramp-down strategy, which projected annual

OYs of 23 mt, 20 mt, 17 mt, and 14 mt, respectively in 2007-2011, was projected to extend rebuilding by less than one year relative to the more conservative constant harvest rate strategy analyzed. The ramp-down strategy afforded more time to consider new Yelloweye Rockfish Conservation Areas and other management measures designed to reduce the harvest rate to prescribed levels. Therefore, the Amendment 16-4 rebuilding plan incorporated the ramp-down strategy before resuming a constant harvest rate (SPR = 71.9%) in 2011. The rebuilding plan also specified a target rebuilding year of 2084.

The 2007 updated stock assessment for yelloweye rockfish estimated a stock depletion of 16.4 percent of initial, unfished biomass (Wallace 2008a). The long-term biomass trajectory in the 2007 updated assessment was very similar to that in the 2006 assessment. The 2007 rebuilding analysis (Wallace 2008b) indicated rebuilding progress was on track under the ramp-down strategy; therefore, no revisions were made to the rebuilding plan.

The benchmark 2009 yelloweye assessment estimated a stock depletion of 20.3 percent of initial, unfished biomass at the start of 2009 (Stewart, *et al*. 2009). The resource was modeled as a single stock, but with three explicit spatial areas: Washington, Oregon and California. Each area was modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial), with the stocks linked via a common stock-recruit relationship with negligible adult movement among areas. The assumed level of historical removals and estimated steepness were identified as the main axes of uncertainty.

The 2009 yelloweye rebuilding analysis (Stewart 2009b) was used to inform a revised rebuilding plan that was implemented under FMP Amendment 16-5. The revised rebuilding plan implemented in 2011 specified a constant harvest rate (SPR = 76%) strategy (the ramp-down strategy was abandoned) and a target year to rebuild the stock of 2074.

The 2011 yelloweye assessment (Taylor and Wetzel 2011), an update of the 2009 assessment, estimated stock depletion at 21.4 percent of initial, unfished biomass at the start of 2011 (Figure 20). The update assessment results were very similar to those in the previous assessment. The 2011 yelloweye rebuilding analysis (Taylor 2011) indicated rebuilding progress was on schedule and no revisions were made to the rebuilding plan.

A yelloweye catch report was provided in 2013 (Agenda Item F.5.a, Attachment 11, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

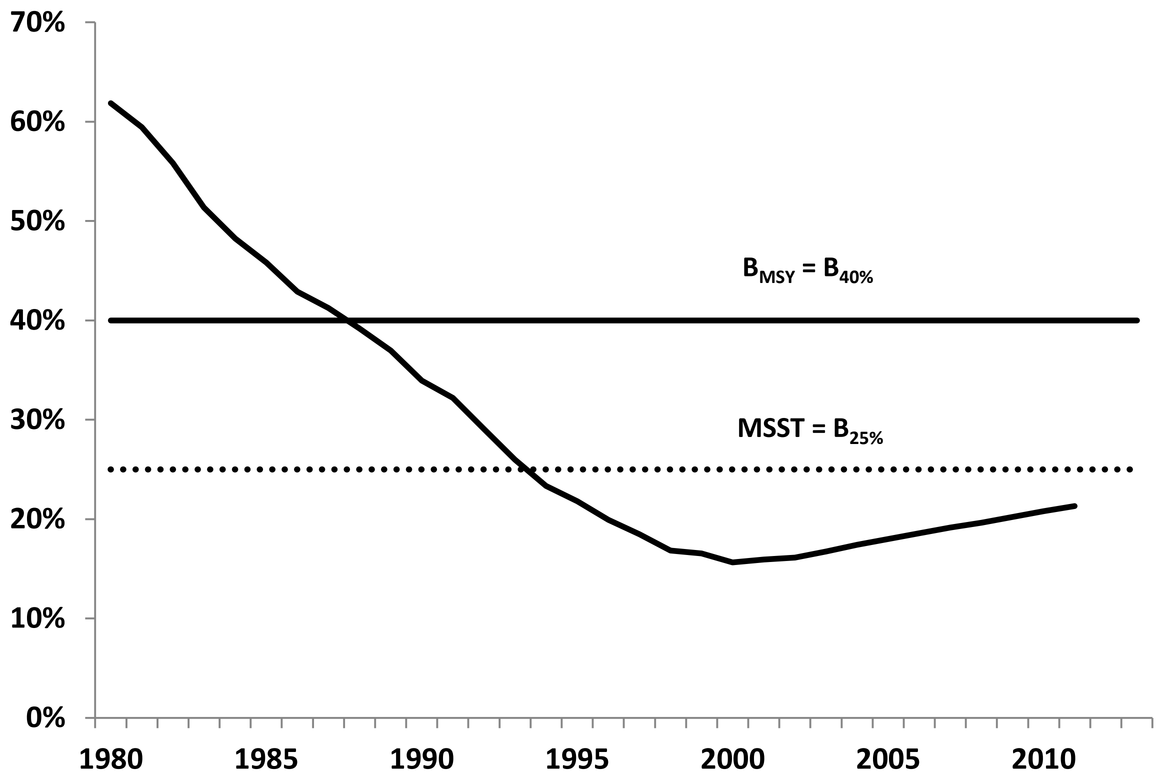

Figure 20. Relative depletion of yelloweye rockfish from 1980 to 2011 based on the 2011 stock assessment update.

Stock Productivity Relative to Rebuilding Success

Yelloweye year class strength is modeled as a deterministic process in the 2011 assessment with no estimation of the size of individual year classes. Therefore, the decline in estimated recruitment tracks closely to that of the spawning output (Figure 21). The decline is especially pronounced given the low (and likely imprecise) estimate for steepness of the stock-recruit relationship in the base-case model (0.441). The low estimated steepness in the assessment results in a prediction of very little surplus production and consequently estimates of low yields at B_{MSY} (MSY is estimated to be 58 mt under the F_{MSY} proxy SPR harvest rate of 50 percent). This relatively low stock productivity also predicts a long mean generation time of 46 years and a slow recovery rate under the very low harvest rate specified in the yelloweye rebuilding plan.

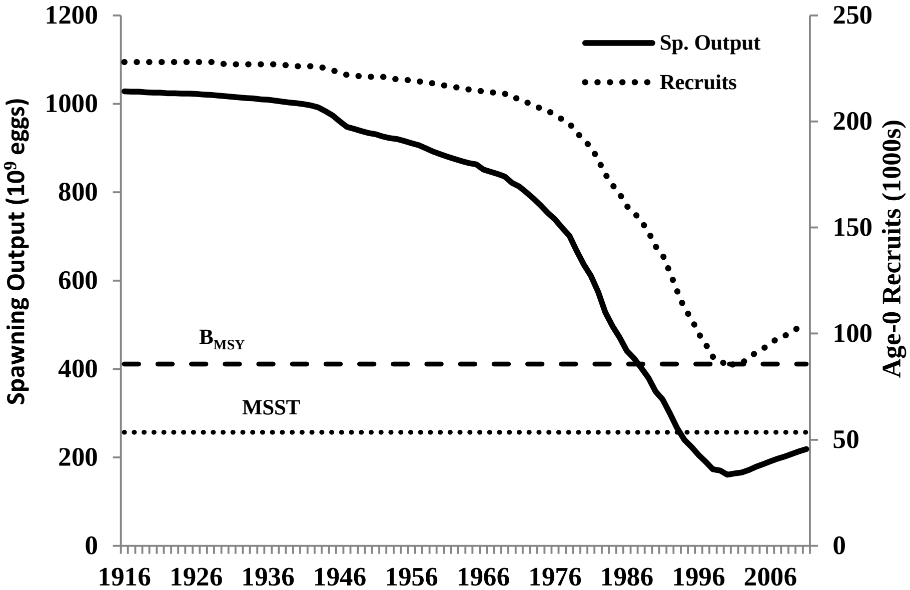

Figure 21. Time series of estimated yelloweye rockfish spawning output and recruitments for the base-case model in the 2011 assessment (Taylor and Wetzel 2011).

Fishing Mortality

Yelloweye rockfish are caught coastwide in all sectors of the fishery. Yelloweye are particularly vulnerable to hook-and-line gears, which are effective in the high relief habitats yelloweye reside. The current non-trawl RCA and the recreational depth closures are primarily configured based on yelloweye distribution and projected impacts in these hook-and-line fisheries. Small footrope trawls, including selective flatfish trawls, do not have the rollers and anti-chafing protection needed to fish in the high relief habitats yelloweye are found. Mandating these gears for trawl efforts on the shelf shoreward of the trawl RCA, the configuration of the trawl RCA, and a small IFQ allocation of yelloweye are the primary strategies currently used to minimize trawl impacts on yelloweye. Yelloweye are also a bycatch species in the Pacific halibut fishery (Love, *et al.* 2002).

Yelloweye rockfish are mostly encountered north of 36º N lat. Yelloweye occur in depths from 25 to 475 m and are most commonly found at depths from 91 to 180 m (Love, *et al.* 2002).

Fishing mortality rates estimated in the 2011 assessment have been in excess of the current F_{MSY} harvest rate for rockfish (SPR = 50 percent) from 1976 through 1999 (Figure 22). Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have peaked at 12.7 percent in 1992, but have been at or less than 1.1 percent after 2001. The F_{MSY} exploitation rate assuming the proxy SPR of 50 percent is 2.2 percent. Annual yelloweye harvest rates in the 1976-1999 period averaged over five times the estimated F_{MSY} and spawning biomass declined rapidly during that period.

The commercial RCAs substantially reduce yelloweye impacts. North of 40º10’ N lat., the highest bycatch rates of yelloweye rockfish occur in waters less than 100 fm. Yelloweye rockfish have a patchy distribution and as such, using fleetwide bycatch rates over a large area (north and south of 40º10’ N lat.) may misrepresent actual catch rates. North of Cape Alava, yelloweye bycatch rates are lowest inside of the 60 fm line; bycatch rates would increase substantially if shoreward RCAs were moved from the 60 fm line to the 75 fm line. The seaward boundary of the non-trawl RCA extends out to 150 fm year round south of 40º10’ N lat. The seaward boundary of the non-trawl RCA north of 40º10’ N lat. is at 100 fm year round with a few exceptions where the seaward boundary is at 125 fm. Between 45º03.83’ to 43º N lat. the seaward is at 125 fm year round.

Area closures and a prohibition on retention are the main strategies used to minimize recreational yelloweye impacts. The California recreational fishery is subject to depth restrictions that are more restrictive in the northern management areas where yelloweye are more prevalent. CDFG evaluated and has available four potential YRCAs which include habitat in both state and Federal waters where high yelloweye encounter rates have been documented. If implemented, YRCAs are anticipated to reduce yelloweye impacts during the open fishing seasons in both the Northern Groundfish Management Area and the North-Central North of Pt. Arena Groundfish Management Area, possibly allowing for a longer fishing season. To date, these YRCAs have not been implemented but would remain available management measures that can be routinely implemented inseason if needed. Depth management is the main tool used for controlling yelloweye rockfish fishing mortality in the Washington and Oregon recreational fisheries.

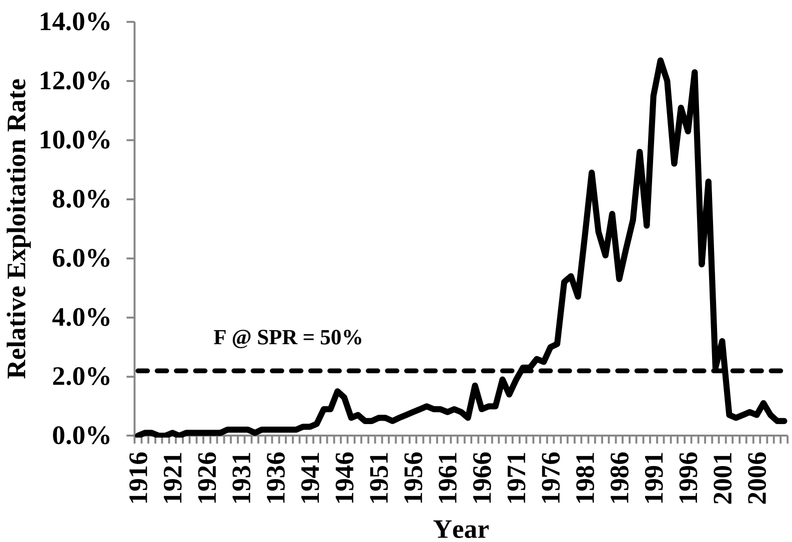

Figure 22. Time series of estimated relative exploitation rates (catch/biomass of age 8+ fish) of yelloweye rockfish, 1916-2010 (Taylor and Wetzel 2011).

Catch monitoring uncertainty is high given the relatively small contribution of yelloweye to rockfish market categories and the relatively large scale of recreational removals. In addition, since 2001, management restrictions have required nearly all yelloweye rockfish caught by recreational and commercial fishermen to be discarded at sea. Precisely tracking recreational catch inseason, especially in the California recreational fishery, has been a challenge.

Rebuilding Duration and Probabilities

Rebuilding under the SPR harvest rate specified in the rebuilding plan has a predicted P_{MAX} of 72.9 percent and a probability of rebuilding by the target year of 2074 of 62.1 percent.

1.1.4 Non-Overfished Groundfish Stocks

1.1.4.1 Arrowtooth Flounder

Distribution and Life History

Arrowtooth flounder (*Atheresthes stomias*) range from the southern coast of Kamchatka to the northwest Bering Sea and Aleutian Islands to San Simeon, California. Arrowtooth flounder is the dominant flounder species on the outer continental shelf from the western Gulf of Alaska to Oregon. They are members of the family Pleuronectidae, the right eyed flounders. Arrowtooth reach sizes of nearly 90 cm and can live to 27 years. Eggs and larvae are pelagic; juveniles and adults are demersal (Garrison and Miller 1982; NOAA 1990). Juveniles and adults are most commonly found on sand or sandy gravel substrates, but occasionally occur over low-relief rock-sponge bottoms. Arrowtooth flounder exhibit a strong migration from shallow water summer feeding grounds on the continental shelf to deep water spawning grounds over the continental slope (NOAA 1990). Depth distribution may vary from as little as 50 m in summer to more than 500 m in the winter (Garrison and Miller 1982; NOAA 1990; Rickey 1995).

Arrowtooth flounder are oviparous with external fertilization and eggs are about 2.5 mm in diameter. Spawning may occur deeper than 500 m off Washington (Rickey 1995). Arrowtooth are batch spawners (Rickey 1995). They spawn in the deeper continental shelf waters (>200 m) in the late fall through early spring and appear to move inshore during the summer (Zimmerman and Goddard 1996). The larvae spend approximately four weeks in the upper 100 m of the water column (Fargo and Starr 2001) and settle to the bottom in the late winter and early spring. Larvae eat copepods, their eggs, and copepod nauplii (Yang 1995; Yang and Livingston 1985). Juveniles and adults feed on crustaceans (mainly ocean pink shrimp and krill) and fish (mainly gadids, herring, and pollock) (Hart 1988; NOAA 1990).

Arrowtooth flounder exhibit two feeding peaks, at noon and midnight. Arrowtooth are piscivorous, but they also eat shrimp, worms, and euphausiids (Love 1996). Buckley et al. (1999) analyzed 380 arrowtooth stomachs that were collected in 1989 and 1992 from Oregon and Washington and found that hake (*Merluccius productus*) and unidentified gadids dominate their stomach contents (45 percent and 22 percent respectively) followed by herring (19 percent; *Clupea pallasi*), mesopelagics (0.5 percent), rex sole (1 percent; *Glyptocephalus zachirus*), slender sole (*Lyopsetta exilis*) and other small flatfish (3 percent), other arrowtooth (1.5 percent), other unidentified flatfish (1 percent), pandalid shrimp (~3 percent), and euphausiids (3 percent). Yang (1995) analyzed 1,144 stomachs from arrowtooth collected in the Gulf of Alaska, and found that walleye pollock (*Theragra chalcogramma*) composed 66 percent of the arrowtooth diet, although arrowtooth smaller than 40 cm primarily feed on capelin (*Mallotus villosus*), herring, and shrimp. Gotshall (1969) examined 425 arrowtooth stomachs from northern California throughout the 1960s and found that pandalid shrimp made up nearly 40 percent of the prey by volume, along with other shrimps, crabs, euphausiids, Pacific sanddabs (*Citharichthys sordidus*), and slender sole. However, Gotshall's samples were taken directly from shrimp beds, so higher concentrations of shrimp would be expected. It is clear that arrowtooth have a broad diet, consuming most of the common fish and invertebrates found on soft bottom substrate and in the water column.

Predators of juvenile arrowtooth include skates, dogfish, shortspine thornyhead, halibut, coastal sharks, orcas, toothed whales, and harbor seals (Field, *et al.* 2006). Adult arrowtooth are likely to be vulnerable only to the largest of these predators.

Female arrowtooth off Oregon reach 50 percent maturity at 8 years of age, and males at four years (Hosie 1976). Rickey (1995) found that the arrowtooth reach 50 percent maturity at lengths of 36.8 cm for females and 28 cm for males off Washington, and 44 cm for females and 29 cm for males off Oregon. As a comparison, female length at 50 percent maturity is 47 cm in the Gulf of Alaska (Turnock, *et al.* 2005) and 38 cm in British Columbia (Fargo and Starr 2001).

Stock Status and Management History

Arrowtooth are commonly caught by trawl fleets off Washington and Oregon, but they are frequently discarded due to low flesh quality. For this reason, the market for arrowtooth has been fairly limited over the last 50 years. It is likely that the stock off the U.S. west coast is linked to the population off British Columbia and, possibly, to the stock in the Gulf of Alaska. However, for assessment purposes it is assumed that the U.S. west coast population is a unit stock.

The west coast stock of arrowtooth flounder was assessed in 1993 (Rickey 1993), and a full stock assessment was done in 2007 (Kaplan and Helser 2008). Three components of the arrowtooth fishery were used in modeling: the mink food fishery in the 1950s-1970s; a targeted fillet/headed-and-gutted fishery that began around 1981; and a "bycatch fleet" that represents west coast trawl effort with arrowtooth bycatch, but no landings. Estimates of historical catch are highly uncertain. The model contains assumed fixed values for natural mortality and steepness of the stock-recruitment relationship. Likelihood profiles suggest that the estimates of biomass and depletion are not sensitive to values of steepness. Assumed values of natural mortality have a small effect on estimated depletion, but strongly influence the estimates of absolute biomass.

The base model shows a period of moderate depletion through the 1950s and 1960s, followed by a rebuilding of the stock beginning in the late 1970s. Strong year classes, in particular the 1999 year class, have led to an increase in the stock since the late 1990s. The spawning biomass at the beginning of 2007 was estimated to be 63,302 mt and 79 percent of the estimated unfished spawning biomass. Total biomass at the start of 2007 was estimated to be 85,175 mt. The 2007 stock assessment estimated that the arrowtooth stock has never fallen below the overfished threshold.

Stock Productivity

Arrowtooth flounder are a very productive stock with high growth rates, high natural mortality rates, and a high stock-recruitment steepness. A mean flatfish steepness of 0.8 was determined in a 2010 meta-analysis conducted by the SSC and described in the 2011-2012 specifications FEIS (PFMC and NMFS 2011). A steepness of 0.902 was assumed in the 2007 arrowtooth flounder assessment based on a flatfish meta-analysis conducted by Dorn (2002b). Arrowtooth received a relatively high productivity score of 1.95 in the PSA analysis (Table 2).

The 2007 assessment estimated strong recruitments for most years between 1998 and 2007, with a particularly strong recruitment of the 1999 year class. That year class has dominated the population and fishery for the last ten years but is now diminished through high natural mortality. However, the 2007 assessment projects a very healthy stock through 2018 under catch streams much higher than has been realized since then.

Fishing Mortality

The target F_{MSY} SPR harvest rate for arrowtooth is 30 percent. The 2007 assessment estimated annual SPR harvest rates between 1997 and 2006 of 49-75 percent, substantially lower than the target. The arrowtooth ACL/OY has never been exceeded.

Arrowtooth flounder are a trawl-dominant species and are not particularly valuable. Given that arrowtooth are caught on the northern shelf where Pacific halibut, darkblotched rockfish, and yelloweye rockfish are caught incidentally to arrowtooth, this is not a species with a high attainment since valuable quota for these highly constraining species would have to be invested to target arrowtooth. About 20 percent of the arrowtooth quota was attained in the 2012 fishery (cite). Management uncertainty is low with the 100 percent observer coverage for the trawl fleet under trawl rationalization. The PSA vulnerability score of 1.21 indicates a low concern of overfishing.

1.1.4.2 Black Rockfish off California and Oregon

Distribution and Life History

Black rockfish (*Sebastes melanops*) are found from Southern California (San Miguel Island) to the Aleutian Islands (Amchitka Island) and they occur most commonly from San Francisco northward (Hart 1988; Miller and Lea 1972; Phillips 1957; Stein and Hassler 1989). Black rockfish occur from the surface to greater than 366 m; however, they are most abundant at depths less than 54 m (Stein and Hassler 1989). Off California, black rockfish are found along with the blue, olive, kelp, black-and-yellow, and gopher rockfishes (Hallacher and Roberts 1985). The abundance of black rockfish in shallow water declines in the winter and increases in the summer (Stein and Hassler 1989). Densities of black rockfish decrease with depth during both the upwelling and non-upwelling seasons (Hallacher and Roberts 1985). Off Oregon, larger fish seem to be found in deeper water (20 m to 50 m) (Stein and Hassler 1989). Black rockfish off the northern Washington coast and outer Strait of Juan de Fuca exhibit no significant movement. However, fish appear to move from the central Washington coast southward to the Columbia River, but not into waters off Oregon. Movement displayed by black rockfish off the northern Oregon coast is primarily northward to the Columbia River (Culver 1986). Black rockfish form mixed sex, midwater schools, especially in shallow water (Hart 1988; Stein and Hassler 1989). Black rockfish larvae and young juveniles (<40 mm to 50 mm) are pelagic, but are benthic at larger sizes (Laroche and Richardson 1980).

Black rockfish have internal fertilization and annual spawning (Stein and Hassler 1989). Parturition occurs from February through April off British Columbia, January through March off Oregon, and January through May off California (Stein and Hassler 1989). Spawning areas are unknown, but spawning may occur in offshore waters because gravid (egg-carrying) females have been caught well offshore (Dunn and Hitz 1969; Hart 1988; Stein and Hassler 1989). Black rockfish can live to be more than 20 years in age. The maximum length attained by the black rockfish is 60 cm (Hart 1988; Stein and Hassler 1989). Off Oregon, black rockfish primarily prey on pelagic nekton (anchovies and smelt) and zooplankton such as salps, mysids, and crab megalops. Off Central California, juveniles eat copepods and zoea, while adults prey on juvenile rockfish, euphausiids, and amphipods during upwelling periods. During periods without upwelling they primarily consume invertebrates. Black rockfish feed almost exclusively in the water column (Culver 1986). Black rockfish are known to be eaten by lingcod and yelloweye rockfish (Stein and Hassler 1989).

Stock Status and Management History

A black rockfish assessment was completed in 2003 and pertained to the portion of the coastwide stock occurring off the coasts of Oregon and California (Ralston and Dick 2003) or the southern stock unit. Alternative harvest levels in the 2003 assessment were ranged to capture the major uncertainty of historical landings prior to 1978. Black rockfish catches prior to 1945 were assumed to be zero in the assessment. Many gaps in historical landings of black rockfish since 1945 were evident, and these landings were reconstructed using a variety of data sources. The base model assumed cumulative landings of black rockfish from all fisheries was 17,100 mt from 1945 to 1977. The 2003 assessment concluded the southern California-Oregon stock of black rockfish was in healthy condition with a 2002 spawning output estimated to be at 49 percent of its unexploited level.

The southern stock of black rockfish was again assessed in 2007 (Sampson 2008) using a similar approach and structure as the 2003 assessment. The 2007 assessment estimated the southern stock was at 70 percent of its unfished level at the start of 2007. The 2007 assessment was structured into six fisheries: a set of trawl, commercial non-trawl, and recreational fisheries for Oregon and California, respectively. The fisheries for each state were based on fish capture location rather than where they were landed and therefore represented separate geographic areas. The model in the 2007 assessment did not include any underlying spatial structure in the population dynamics. Like the previous southern stock assessment, abundance indices for tuning the assessment were based on recreational CPUE data with two independent indices available for each state. The standard research trawl surveys along the U.S. 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 2007 assessment had 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 2007 assessment for the southern stock of black rockfish 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.

Stock Productivity

The 2007 southern black rockfish assessment assumed a steepness of 0.6 based on the Dorn meta-analysis of rockfish steepness done at that time. The revised rockfish steepness meta-analysis now predicts a mean steepness of 0.779. The PSA productivity score of 1.33 indicates a stock of moderate productivity.

The 2007 assessment estimated above-average recruitments in the 1990s (with particularly strong recruitments in 1994 and 1999), 2000, 2001, and 2007; and below-average recruitments during 2002-2006. These recruitments are projected to keep the stock healthy under the 1,000 mt constant catch strategy implemented in 2009.

Fishing Mortality

The nearshore commercial and recreational fisheries that take black rockfish are managed well in California and Oregon, and ACLs/OYs have not been exceeded. The PSA vulnerability score of 1.94 indicates a stock of medium concern for overfishing.

Over most of the stock's history the fishing rate has been less than the 50% SPR target fishing rate. The estimated spawning output has been above the target level during all years except 1991 to 1998, and has never dropped below the overfished level. The southern stock of black rockfish is estimated to be well above the overfished level.

1.1.4.3 Black Rockfish off Washington

Distribution and Life History

See the description of black rockfish distribution and life history in section 1.1.4.2.

Stock Status and Management History

The black rockfish stock found between Cape Falcon, Oregon and the U.S. Canadian border was first assessed in 1994 (Wallace and Tagart 1994). Estimated biomass was 60 percent of the unfished level and female egg production was estimated to be 43 percent of the unfished level. A harvest guideline of 517 mt for this area was specified beginning in 1995 based on assessment results. Catches remained well below the harvest guideline in the years subsequent to the assessment.

The 1999 assessment of the black rockfish stock north of Cape Falcon, Oregon determined the stock was at 45 percent of the unfished level (Wallace, *et al*. 1999). The population was regarded as healthy and stock abundance was estimated to be slightly increasing after a period of low abundance in the late 1980s and early 1990s.

The most recent assessment of the northern stock was done in 2007, which estimated a depletion of 53.4 percent of the unfished level (Wallace, *et al*. 2008). The base model for the 2007 assessment assumed a female natural mortality rate to be age-specific using age at first and full maturity for inflections (10 and 15). A constant natural mortality rate of 0.16 was assumed for males and young females (< 10 years of age), and a rate of 0.2 was assumed for old females (>=15 years of age). Model sensitivity analysis showed that model configurations using higher natural mortality for older females provided better overall fits to the data. In the model, spawning biomass and age 3+ biomass reached the lowest levels in 1995, following poor recruitment and intense fishing in the late 1980s. The population trajectory remained just above minimum stock size threshold, and the model indicated that the stock is currently well above the management target of $B_{40\%}$.

Stock Productivity

The 2007 assessment assumed a steepness 0.6 in the stock-recruitment relationship of the northern black rockfish stock based on the Dorn prior (as was done in the southern black rockfish assessment). Steepness may be even higher based on the revised prior of 0.779. The PSA productivity score of 1.33 indicates a stock of moderate productivity.

The 2007 assessment estimated strong recruitments in the 1990s (including strong recruitments in 1994 and 1999 as also estimated in the southern assessment) and above-average recruitments from 2002-2006.

Fishing Mortality

Total mortality of black rockfish off Washington has consistently been well below established ACLs/OYs. The stock is targeted in the Washington recreational fishery; however, that fishery is tightly regulated to minimize canary and yelloweye rockfish impacts. There is also a relatively low tribal take of black rockfish off Washington. There are no commercial nearshore fisheries off Washington.

Exploitation of black rockfish reached a peak in 1988 of 13 percent of the age 3+ biomass and remained near that level for 7 years, dropping precipitously between 1995 and 2000. In recent years exploitation has been relatively low (4-6 percent). Exploitation rate relative to spawning biomass indicate that harvest rates exceeded management targets between the mid 1980s through the mid 1990s for the northern stock of black rockfish.

The PSA vulnerability score of 1.94 indicates a stock of medium concern for overfishing.

1.1.4.4 Cabezon off California

Distribution and Life History

Cabezon (*Scorpaenichthys marmoratus*) are distributed along the entire west coast of the continental United States. They range from central Baja California north to Sitka, Alaska (Love 1996; Miller and Lea 1972). Cabezon are primarily a nearshore species found intertidally and among jetty rocks, out to depths of greater than 100 m (Love 1996; Miller and Lea 1972).

Cabezon are known to spawn in recesses of natural and manmade objects, and males are reported to show nest-guarding behavior (Garrison and Miller 1982). Spawning is protracted, and there appears to be a seasonal progression of spawning that begins off California in winter and proceeds northward to Washington by spring. Spawning off California peaks in January and February (O'Connell 1953) while spawning in Puget Sound (Washington State) occurs for up to 10 months (November-August), peaking in March–April (Lauth 1987). Laid eggs are sticky and adhere to the surface where deposited. After hatching, the young of the year spend 3–4 months as pelagic larvae and juveniles. Settlement takes place after the young fish have attained 3–5 cm in length (Lauth 1987; O'Connell 1953). It is apparent that females lay multiple batches in different nests, but whether these eggs are temporally distinct enough to qualify for separate spawning events is not understood (Lauth 1987; O'Connell 1953).

Stock Status and Management History

Cabezon in California waters was first assessed in 2003 and it estimated a depletion of 34.7 percent at the start of 2003 (Cope, *et al.* 2004). The assessment delineated two stocks (north and south) at the Oregon-California border, a distinction based on differences in the catch history, CPUE trends and biological parameters (mainly growth) between the two areas. Due to the lack of data for the northern population, the assessment focused on only the southern population. As with most nearshore groundfish stocks, this assessment lacked a fishery-independent index of abundance, and consequently relied on recreational CPUE indices and information about larval abundance.

The 2005 assessment modeled two California substocks north and south of Point Conception (Cope and Punt 2006). Historically, the recreational fishery had been the primary source of removals of cabezon in California; however, commercial catches had become a major source of removals in the ten years preceding the assessment because of the developing live-fish fishery. Removals were reconstructed back to 1916, when the commercial fishery began. The estimated stock depletions of the northern and southern substocks of cabezon at the start of 2005 were 40.1 percent and 28.3 percent, respectively.

The most recent cabezon assessment for cabezon occurring in waters off California, done in 2009, estimated a stock depletion of 48.3 percent of unfished biomass at the start of 2009 (Cope and Key 2009). The 2009 assessment modeled two California substocks, and also evaluated the population as a coastwide California stock. The SSC recommended combining the results of the area models for the two California substocks of cabezon for use in deciding statewide harvest specifications.

Stock Productivity

The 2009 cabezon assessment assumed a steepness of 0.7 for all models. The PSA productivity score of 1.72 indicates a stock of relatively high productivity.

Recruitment deviations were estimated from 1970-2006 for both of the assessed substocks. Recruitment patterns are distinctly different for the substocks occurring north and south of Pt. Conception at 34º27’ N lat. Large recruitment events in the 1970s and 1990s in the north and the south have increased spawning biomass to healthy levels. Interannual variation in recruitment is greater in the north. The large increase in biomass in the south was driven by a large 1999 recruitment, the largest seen in the time series. Large recruitments in the southern substock were estimated immediately after major El Niño events (e.g., 1984 and 1994 recruitments). Recruitment events for the northern substock appear to lag large recruitments in the south by a year.

Fishing Mortality

Exploitation of the southern cabezon substock began in the 1960s and caused a substantial decline in stock biomass. The large recruitments discussed above and a reduction in exploitation rates in the late 1990s and 2000s caused the substock to rebound to healthy levels. Exploitation in the north also increased in the 1960s, although fishing pressure was not as great. The spawning biomass of the northern substock declined, although not as dramatically as in the south. The stock rebounded with good recruitment and a reduction in fishing pressure.

The cabezon stock(s) off California were first assessed in 2003, and OYs were first specified in 2004. Specified OYs were exceeded in each year through 2006, but a reduction in cumulative landing limits adequately reduced fishing mortality starting in 2007. The percent of OY attainment ranged from 56 to 74 percent in the 2007-2010 period.

The PSA vulnerability score of 1.68 indicates a low risk of overfishing.

1.1.4.5 Cabezon off Oregon

Distribution and Life History

See the description of cabezon distribution and life history in section 1.1.4.4.

Stock Status and Management History

The 2009 assessment of the Oregon substock of cabezon (Cope and Key 2009) was the first for cabezon in Oregon waters; the assessment indicated a healthy stock status for Oregon cabezon at 52.4 percent depletion at the start of 2009. Only one index of abundance was used for modeling the Oregon cabezon substock (the Oregon Recreational Boat Survey or ORBS CPUE index). The Oregon model was robust to almost all data and parameter manipulation trials except the removal of the ORBS survey. Removal of the only abundance index causes the population to drop sharply below the overfished level and absolute biomass to be much smaller than in the base case. Unlike the assessments for the California substocks, the assessment of the Oregon cabezon substock does not show recent increases in spawning biomass. While the uncertainty in the estimated depletion level of the Oregon substock is generally low, uncertainty in the estimated spawning biomass is high.

Stock Productivity

Steepness in the 2009 assessment of the Oregon substock of cabezon was assumed to be 0.7. Recruitment in the Oregon substock of cabezon was estimated to be less dynamic than that for the California substocks. The PSA productivity score of 1.72 indicates a stock of relatively high productivity.

The assessment estimates large recruitments in 1999 and 2004. Uncertainty in estimating recruitment for the Oregon substock is less than the uncertainty in recruitment estimation for the California substocks.

Fishing Mortality

Cabezon exploitation in Oregon started in the 1970s and caused the biomass to decline. However, exploitation was not excessive and the estimated spawning biomass has always been above the B_{MSY} target.

The PSA vulnerability score of 1.68 indicates a low risk of overfishing.

1.1.4.6 California Scorpionfish

Distribution and Life History

California scorpionfish (*Scorpaena guttata*), also known locally as sculpin, is a generally benthic species found from central California to the Gulf of California in depths between the inter-tidal and about 170 m (Eschmeyer, *et al.* 1983; Love, *et al.* 1987). California scorpionfish generally inhabits rocky reefs, but in certain areas and seasons they aggregate over sandy or muddy substrate (Frey 1971; Love, *et al.* 1987). Catch rate analysis and tagging studies show that most, but not all, California scorpionfish migrate to deeper water to spawn during May-September (Love, *et al.* 1987). Tagging data suggest that they return to the same spawning site (Love, *et al.* 1987), but information is not available on non-spawning season site fidelity. California scorpionfish are quite mobile and may not be permanently tied to a particular reef (Love, *et al.* 1987).

California scorpionfish spawn from May through August, peaking in July (Love, *et al.* 1987). The species is oviparous, producing floating, gelatinous egg masses in which the eggs are embedded in a single layer (Orton 1955). California scorpionfish utilize the “explosive breeding assemblage” reproductive mode in which fish migrate to, and aggregate at traditional spawning sites for brief periods (Love, *et al.* 1987). These spawning aggregations have been targeted by fishermen. Few California scorpionfish are mature at one year of age, but over 50 percent are mature by age two and most are mature by age three (Love, *et al.* 1987).

The species feeds on a wide variety of foods, including crabs, fishes, octopi, isopods and shrimp, but juvenile Cancer crabs are the most important prey (Limbaugh 1955; Love, *et al.* 1987).

Stock Status and Management History

California scorpionfish were assessed in 2005 (Maunder, *et al.* 2006) in the southern California Bight south of Point Conception at 34º27’ N lat. to the U.S.-Mexico border. The stock assessment indicated the California scorpionfish stock was healthy with an estimated spawning stock biomass of 79.8 percent of its initial, unfished biomass in 2005.

In most years, 99 percent or more of the landings occur in the southern California ports. The California nearshore FMP includes California scorpionfish. The stock is managed by the state under provisions for improved fishery monitoring and research data collection.

Stock Productivity

A steepness value of 0.7 was assumed for California scorpionfish in the 2005 assessment. The PSA productivity score of 1.83 indicates a stock of relatively high productivity, especially for a rockfish.

The assessment noted a high recruitment variation in the stock and recruitments in the 1990s and early 2000s were estimated to be substantially above average. Relatively large recruitment events were estimated starting in 1984.

Fishing Mortality

A substantial but unknown portion of the stock occurs in Mexican waters. The exploitation of the stock in Mexican waters is unknown and the connectivity of that stock with the U.S. stock in the Southern California Bight is also unknown.

Commercial catch records for scorpionfish were available beginning in 1928. Commercial catches were the dominant removals until the 1990s when the recreational catch became dominant. High catches and low recruitments in the 1950s and 1960s precipitated a decline in biomass. Stock biomass has been on an increasing trend since the mid 1970s.

The PSA vulnerability score of 1.41 indicates a low risk of overfishing.

1.1.4.7 Chilipepper Rockfish South of 40º10' N Lat.

Distribution and Life History

Chilipepper rockfish (*Sebastes goodei*) are found from Magdalena Bay, Baja California, Mexico, to as far north as the northwest coast of Vancouver Island, British Columbia (Allen 1982; Hart 1988; Miller and Lea 1972). The region of greatest abundance is found between Point Conception and Cape Mendocino, California. Chilipepper have been taken as deep as 425 m, but nearly all in survey catches were taken between 50 and 350 m (Allen and Smith 1988). Adults and older juveniles usually occur over the shelf and slope; larvae and small juveniles are generally found near the surface. In California, chilipepper are most commonly found associated with deep, high relief rocky areas and along cliff drop-offs (Love, *et al.* 1990), as well as on sand and mud bottoms (MBC 1987). They are occasionally found over flat, hard substrates (Love, *et al.* 1990). Love (1996) does not consider this to be a migratory species. Chilipepper may travel as far as 45 m off the bottom during the day to feed (Love 1996). Chilipepper rockfish are described as an elongate fish with reduced head spines similar in appearance to both shortbelly rockfish (at smaller sizes, although shortbelly tend to be slimmer) and bocaccio rockfish (bocaccio tend to have larger mouths).

Chilipeppers are ovoviviparous and eggs are fertilized internally (Reilly, et al. 1992). Chilipepper school by sex just prior to spawning (MBC 1987). In California, fertilization of eggs begins in October and spawning occurs from September to April (Oda 1992) with the peak occurring during December to January (Love, *et al.* 2002). Chilipepper may spawn multiple broods in a single season (Love, *et al.* 2002). Females of the species are significantly larger, reaching lengths of up to 56 cm (Hart 1988). Males are usually smaller than 40 cm (Dark and Wilkins 1994). Males mature at two years to six years of age, and 50 percent are mature at three years to four years. Females mature at two years to five years with 50 percent mature at three years to four years (MBC 1987). Females may attain an age of about 27 years, whereas the maximum age for males is about 12 years (MBC 1987).

Larval and juvenile chilipepper eat all life stages of copepods and euphausiids, and are considered to be somewhat opportunistic feeders (Reilly, *et al.* 1992). In California, adults prey on large euphausiids, squid, and small fishes such as anchovies, lanternfish, and young Pacific whiting (Hart 1988; Love, *et al.* 2002). Chilipepper are found with widow rockfish, greenspotted rockfish, and swordspine rockfish (Love, *et al.* 2002). Juvenile chilipepper compete for food with bocaccio, yellowtail rockfish, and shortbelly rockfish (Reilly, *et al.* 1992). Pelagic juveniles are preyed upon by a wide range of predators, including seabirds, salmon, lingcod and marine mammals. Larger piscivorous fishes, marine mammals, and in recent years jumbo squid are among the predators of larger adults.

Stock Status and Management History

Chilipepper have been one of the most important commercial target species in California waters since the 1880s and were historically an important recreational target in Southern California waters. With the exception of excluding foreign fishing effort from the U.S. EEZ in the late 1970s, management actions were modest (and usually general to all rockfish and other groundfish) prior to the implementation of the Groundfish FMP in 1982. When the FMP was implemented, management for the groundfish trawl fishery was based on individual vessel trip limits, which were set at 40,000 lbs per trip on the Sebastes (all rockfish species) complex. These limits were maintained until 1991, when they were reduced to 25,000; in 1993 the trip limit system was revised from daily to biweekly trip limits, which were set at 50,000 lbs (south of Cape Mendocino). The trip limit regime continued to evolve in their absolute amounts and temporal duration (monthly, bimonthly) throughout the 1990s, with a general trend towards lower limits as conservation concerns arose for other rockfish species (particularly bocaccio rockfish in the region south of Mendocino). The chilipepper catch in the bottom trawl fishery has been managed under an IFQ system since 2011.

Chilipepper rockfish were assessed in 1998 (Ralston, *et al.* 1998), at which time the stock south of 40º10' N lat. was estimated to be at 46 percent to 61 percent of unfished biomass.

A full chilipepper assessment was conducted in 2007 (Field 2008). The 2007 assessment estimated a substantial increase in the spawning biomass of chilipepper rockfish in recent years, due to a strong 1999 year class as well as greatly reduced harvest rates in commercial and recreational fisheries. The 2007 assessment's base model result suggests a spawning biomass of 23,889 tons in 2006, corresponding to approximately 70 percent of the unfished spawning biomass of 33,390 tons and representing a near tripling of spawning biomass from the estimated low of 8,696 mt (26 percent of unfished) in 1999. The strong 1999 year class represents the largest estimated historical recruitment, and is the primary cause for the current population trajectory. There are no obvious signs of strong year classes since 1999, and coastwide pelagic juvenile surveys suggested average to low recruitment in years immediately preceding the assessment, suggesting that the stock may dip slightly in the near term.

The 2007 assessment was first used in 2008 to decide 2009 and 2010 chilipepper harvest specifications. The Council consideration for 2011 and 2012 was whether or not to remove chilipepper rockfish from the Shelf Rockfish North complex and manage it coastwide. Chilipepper rockfish are predominantly found south of 40°10' N lat. Prior to 2007 they were only assessed in the area south of 40°10' N lat. To date, chilipepper rockfish have been managed with stock-specific harvest specifications south of 40°10' N lat. and within the Shelf Rockfish North complex north of 40°10' N lat. When the stock assessment area was extended for the 2007 chilipepper stock assessment, it was extended to the stock's entire west coast range through waters off Oregon (chilipepper rockfish are not believed to occur in waters off Washington). However, it was decided to continue to manage chilipepper rockfish south of 40º10' N lat. with stock-specific harvest specifications and as part of the Shelf Rockfish complex north of 40°10' N lat.

Stock Productivity

Steepness in the 2007 assessment was fixed at 0.57, which was the mean of the prior probability distribution in the base model. Since steepness was thought to be poorly specified in the model, this parameter was chosen as the major axis of uncertainty. The decision table projected outcomes for a low productivity and a high productivity model using steepness values of 0.34 and 0.81, respectively. The PSA productivity score of 1.83 indicates a stock of relatively high productivity, especially for a rockfish.

There have been strong recruitments estimated for the stock in the late 1960s, early 1970s, and very strong recruitments in 1984 and 1999. The 1999 year class was the biggest recruitment event in the assessment time series, causing spawning biomass to increase substantially in the ten years preceding the assessment.

Fishing Mortality

Chilipepper rockfish have been one of the most important commercial target species in California since the late 1800s and was also a recreational target in southern California waters. Catches and exploitation rate has declined substantially since the early 1990s. While chilipepper has always been an important target species in California, the exploitation rate has rarely exceeded the F_{MSY} target of a 50 percent SPR. Exploitation rates declined substantially since the late 1990s with the implementation of more restrictive management measures to rebuild depleted stocks.

Throughout most of the past three decades, domestic landings have ranged between approximately 2,000 and 3,000 mt; however, since 2002 landings have averaged less than 100 mt per year. The highest exploitation rates occurred from the late 1980s through the mid 1990s, when they were above target levels and the stock was approaching its lowest estimated historical levels. From the late 1990s through the present, exploitation rates have been declining significantly down to incidental levels, as a result of management measures implemented to rebuild co-occurring depleted rockfish species (particularly bocaccio, but including canary, widow, cowcod and yelloweye). Discards are assumed to be negligible in the historical period; however, regulatory discards have been substantial in recent years, more than doubling the total catch relative to landings since 2002.

The PSA vulnerability score of 1.35 indicates a low risk of overfishing.

1.1.4.8 Dover Sole

Distribution and Life History

Dover sole (*Microstomus pacificus*) are distributed from the Navarin Canyon in the northwest Bering Sea and westernmost Aleutian Islands to San Cristobal Bay, Baja California, Mexico (Hagerman 1952; Hart 1988; NOAA 1990). Dover sole are a dominant flatfish on the continental shelf and slope from Washington to Southern California. Adults are demersal and are found from 9 m to 1,450 m, with highest abundance below 200 m to 300 m (Allen and Smith 1988). Adults and juveniles show a high affinity toward soft bottoms of fine sand and mud. Juveniles are often found in deep nearshore waters. Dover sole are considered to be a migratory species. In the summer and fall, mature adults and juveniles can be found in shallow feeding grounds, as shallow as 55 m off British Columbia (Westrheim and Morgan 1963). By late fall, Dover sole begin moving offshore into deep waters (400 m or more) to spawn. Although there is an inshore-offshore seasonal migration, little north-south coastal migration occurs (Westrheim and Morgan 1963).

Spawning occurs from November through April off Oregon and California in waters 80 m to 550 m depth at or near the bottom (Hagerman 1952; Hart 1988; NOAA 1990; Pearcy, *et al.* 1977). Dover sole are oviparous and fertilization is external. Larvae are planktonic and are transported to offshore nursery areas by ocean currents and winds for up to two years. Settlement to benthic living occurs mid-autumn to early spring off Oregon, and February through July off California (Markle, *et al.* 1992). Juvenile fish move into deeper water with age and begin seasonal spawning and feeding migrations upon reaching maturity.

Dover sole larvae eat copepods, eggs, and nauplii, as well as other plankton. Juveniles and adults eat polychaetes, bivalves, brittlestars, and small benthic crustaceans. Dover sole feed diurnally by sight and smell (Dark and Wilkins 1994; Gabriel and Pearcy 1981; Hart 1988; NOAA 1990). Dover sole larvae are eaten by pelagic fishes like albacore, jack mackerel and tuna, as well as sea birds. Juveniles and adults are preyed upon by sharks, demersally feeding marine mammals, and to some extent by sablefish (NOAA 1990). Dover sole compete with various eelpout species, rex sole, English sole, and other fishes of the mixed species flatfish assemblage (NOAA 1990).

Stock Status and Management History

Dover sole have been the target of trawl operations along the west coast of North America since World War II and were almost certainly caught prior to the war as incidental take in directed fisheries for English sole and petrale sole. Almost all of the harvests have been taken by groundfish trawl, and in particular as part of the Dover sole, shortspine thornyhead, longspine thornyhead, and sablefish (DTS) trawl fishery. Annual landings from U.S. waters averaged 6,700 mt during the 1960s, 12,800 mt during the 1970s, 18,400 mt during the 1980s, 12,400 mt during the 1990s, and 7,200 mt since 2000.

The 1997 Dover sole stock assessment (Brodziak, *et al.* 1997) treated the entire population from the Monterey area through the U.S.-Vancouver area as a single stock based on research addressing the genetic structure of the population. Under a range of harvest policies and recruitment scenarios, the 1997 model projected that spawning biomass would increase from the estimated year-end level in 1997 through the year 2000 due to growth of the exceptionally large 1991 year class and to the lower catches observed in the fishery since 1991.

Dover sole were next assessed in 2001, resulting in an estimated spawning stock size of 29 percent of the unexploited biomass (Sampson and Wood 2001). Although there was no clear trend in abundance, stocks steadily declined from the 1950s until the mid-1990s. The 1991 year class was the last strong one, consistent with the 1997 assessment.

The 2005 Dover sole assessment indicated the stock was above target levels and had an increasing abundance trend (Sampson 2005). The final base model estimated the unexploited spawning stock biomass to be slightly less than 300,000 mt and spawning biomass at the start of 2005 was estimated to be about 189,000 mt, equivalent to 63 percent of the unexploited level. Spawning biomass and age 5+ biomass (roughly corresponding to the exploitable biomass) were estimated to have reached their lowest points in the mid-1990s and rose steadily since. The estimated increases in biomass since the mid-1990s was due primarily to strong year classes in 1990 and 1991, and exceptionally strong year classes in 1997 and 2000.

A new Dover sole assessment was done in 2011, which indicated the stock was healthy with a 2011 spawning stock biomass depletion of 83.7 percent of unfished biomass (Hicks and Wetzel 2011).

Stock Productivity

Steepness in the 2011 Dover sole assessment was fixed at 0.8, the mean steepness estimated in the SSC's 2010 meta-analysis of flatfish productivity (PFMC and NMFS 2011). While the 2011 assessment was considered data-rich, estimates of steepness are uncertain partly because the stock has not been fished to low levels to understand potential recruitment at low spawning biomass. The PSA productivity score of 1.8 indicates a stock of relatively high productivity.

There is little information regarding recruitment prior to 1960. Estimates of recruitment appear to oscillate between periods of low recruitment and periods of high recruitment. The five largest recruitments were predicted in the years 2000, 1992, 1988, 1965, and 1991. The five smallest recruitments were predicted in 2003, 2002, 2004, 2006, and 1974.

Larger than average recruitments in the early 1960s resulted in an increase in the Dover sole spawning biomass. A period of smaller than average recruitments in the late 1970s and early 1980s, along with the highest catches on record caused a decline in spawning biomass throughout the 1980s. More recently, spawning biomass has been increasing. However, a recent increase in Dover sole catches and low estimated recruitment in the early 2000s seem to be resulting in a slight downward trend in spawning biomass.

Fishing Mortality

The spawning biomass of Dover sole reached a low in the mid-1990s before beginning to increase throughout the last decade. The estimated depletion has remained above the 25 percent biomass target and it is unlikely that the stock has ever fallen below this threshold. Throughout the 1970s, 1980s, and 1990s the exploitation rate and SPR generally increased, but never exceeded the SPR 30 percent F_{MSY} target. Recent exploitation rates on Dover sole have been much lower than F_{MSY}, even after management increased catch levels in 2007.

Given the productivity of the stock and constraints on fishing, projections assuming a 25,000 mt constant annual catch predict the stock would remain above the target B_{MSY} level in the next ten years even under the more pessimistic and less likely low state of nature in the assessment decision table. Higher ACLs than the preferred No Action ACL were initially considered but rejected from more detailed analysis since the current market is projected to limit the take of Dover sole in the next management cycle to less than 25,000 mt. Higher ACLs are predicted to be sustainable; future mortalities as high as the OFL (above the allowable ACL maximum of the ABC) would maintain the stock above the target level of $B_{25\%}$ under the most likely base case model in the 2011 assessment. The effective limit of Dover sole in the 2013 and 2014 shorebased IFQ fishery is likely to be driven by the sablefish allocation, which is decreasing relative to No Action. Sablefish quota is needed to target Dover sole and the other DTS species using trawl gear. Sablefish IFQ quota is also used in a single-species target fishery using fixed gears. The competition and price for sablefish quota is affected by Asian sablefish demand and supply from north Pacific fisheries outside the west coast EEZ (e.g., BC and the Gulf of Alaska fisheries). It may be the case that the supply and demand of west coast Dover sole will remain limited until there is an increased harvestable surplus of sablefish above the levels provided under the No Action and preferred ACLs.

Dover sole is a trawl-dominant species managed using IFQs in the rationalized fishery. Despite Dover sole being an important target species, only 35 percent of the 2011 quota was attained in the IFQ fishery.

The PSA vulnerability score of 1.54 indicates a low risk of overfishing.

1.1.4.9 English Sole

Distribution and Life History

English sole (*Parophrys vetulus*) are found from Nunivak Island in the southeast Bering Sea and Agattu Island in the Aleutian Islands, to San Cristobal Bay, Baja California Sur, Mexico (Allen and Smith 1988). In research survey data, nearly all occurred at depths greater than 250 m (Allen and Smith 1988). Adults and juveniles prefer soft bottoms composed of fine sands and mud (Ketchen 1956), but also occur in eelgrass habitats (Pearson and Owen 1992). English sole use nearshore coastal and estuarine waters as nursery areas (Krygier and Pearcy 1986; Rogers, *et al.* 1988). Adults make limited migrations. Those off Washington show a northward post-spawning migration in the spring on their way to summer feeding grounds and a southerly movement in the fall (Garrison and Miller 1982). Tagging studies have identified separate stocks based on this species' limited movements and meristic characteristics (Jow 1969).

Spawning occurs over soft-bottom mud substrates (Ketchen 1956) from winter to early spring, depending on the stock. Eggs are neritic and buoyant, but sink just before hatching (Hart 1988); juveniles and adults are demersal (Garrison and Miller 1982). Small juveniles settle in the estuarine and shallow nearshore areas all along the coast, but are less common in southerly areas, particularly south of Point Conception. Large juveniles commonly occur up to depths of 150 m. Although many postlarvae may settle outside of estuaries, most will enter estuaries during some part of their first year of life (Gunderson, et al. 1990). Some females mature as three-year-olds (26 cm), but all females over 35 cm long are mature. Males mature at two years (21 cm).

Larvae are planktivorous. Juveniles and adults are carnivorous, eating copepods, amphipods, cumaceans, mysids, polychaetes, small bivalves, clam siphons, and other benthic invertebrates (Allen 1982; Becker 1984; Hogue and Carey 1982; Simenstad, *et al.* 1979). English sole feed primarily by day, using sight and smell, and sometimes dig for prey (Allen 1982; Hulberg and Oliver 1979). A juvenile English sole's main predators are probably piscivorous birds such as great blue heron (*Ardia herodias*), larger fishes, and marine mammals. Adults may be eaten by marine mammals, sharks, and other large fishes.

Stock Status and Management History

English sole have been captured by the bottom trawl fishery operating off the western coast of North America for over a century. Stewart (2006) found that peak catches from the southern area occurred in the 1920s with a maximum of 3,976 mt of English sole landed in 1929, and peak catches from the northern area occurred in the 1940s to the 1960s with a maximum of 4,008 mt landed in 1948. Landings from both areas have generally declined since the mid-1960s and have been at nearly historical lows in recent years

The most recent stock assessment of English sole prior the current 2005 assessment was performed in 1993 (Sampson and Stewart 1993). That assessment considered the female portion of the stock off Oregon and Washington during the years 1977-1993. The English sole spawning biomass was found to be increasing and it was concluded that the fishery was sustainable at (then) contemporary harvest levels.

The 2005 assessment of English sole (Stewart 2006) modeled a single coastwide stock, although both commercial and fishery independent data sources were treated separately for a southern (INPFC Conception and Monterey) and a northern (INPFC Eureka, Columbia and U.S. Vancouver) area. The assessment found that English sole spawning biomass had increased rapidly over the last decade after a period of poor recruitments from the mid-1970s to the mid-1990s, which left the stock at nearly historically low levels. Strong year classes were estimated for 1995, 1996, and 1999. The data indicated that the 1999 year class may be the largest in the time-series. There was substantial uncertainty related to certain parameters in the assessment, specifically biomass, recruitment, and relative depletion, as indicated by the wide confidence intervals for those parameters. Nevertheless, sensitivity analyses indicated that the conclusion that current spawning biomass exceeds the target level ($B_{40\%}$) was robust to all three of these sources of uncertainty. The spawning biomass at the beginning of 2005 was estimated to be 31,379 mt, which corresponds to 91.5 percent of the unexploited equilibrium level. Total catches for 2004 were estimated to be 1,341 mt, of which 950 mt were landed.

The 2007 update assessment (Stewart 2008c) confirmed the magnitude of increased biomass through a large quantity of age data through 2006, which became available. The 2007 assessment also included data on fishery length and age (primarily from Washington) that was previously unavailable. These new data provided substantially improved information regarding recent year class strengths and current stock status. The spawning biomass at the beginning of 2007 was estimated to be 41,906 mt, which corresponded to 116 percent of the unexploited equilibrium level.

Cope et al. (2013) assessed English sole using the data-moderate exSSS model platform.

Stock Productivity

There is little evidence for a strong stock-recruitment relationship, with some of the largest recruitments occurring at moderate levels of spawning biomass. This corresponds to the relatively high estimate of steepness of 0.80 in the assessment. In general, recruitment deviations are well-informed by the data between 1940 and 2000.

Following two decades of low recruitments, strong year classes were estimated for 1995, 1998-2000, and 2002. The data indicate that the 1999 year class was the largest in the time-series.

The PSA productivity score of 2.25 indicates a very productive stock, which is true for most nearshore and shelf flatfishes.

Fishing Mortality

The estimated SPR for English sole has never been below the proxy target of 30 percent for flatfish. Exploitation rates were highest from the late 1940s to the early 1990s. Since 1992, the intensity of exploitation has been substantially less, resulting in higher SPR levels. This corresponds to a relative exploitation rate (catch/biomass of age 3 and older fish) history that is high from the late 1940s to the early 1990s, and steadily declining to very low levels over the last 15 years.

English sole are a trawl-dominant species. Management uncertainty is low with the 100 percent observer coverage for the trawl fleet under trawl rationalization. Very small amounts of English sole were landed in the 2011 IFQ fishery with only 1 percent of the quota attained. This is due to low trawl effort on the shelf since such efforts require investment of limited quota for Pacific halibut, darkblotched rockfish, and yelloweye rockfish.

The PSA vulnerability score of 1.19 shows a very low concern of overfishing on the stock.

1.1.4.10 Lingcod North and South of 40º10' N Lat.

Distribution and Life History

Lingcod (*Ophiodon elongatus*), a top order predator of the family Hexagrammidae, ranges from Baja California, Mexico, to Kodiak Island in the Gulf of Alaska. Lingcod are demersal at all life stages (Allen and Smith 1988; NOAA 1990; Shaw and Hassler 1989). Adult lingcod prefer two main habitat types: slopes of submerged banks 10 m to 70 m below the surface with seaweed, kelp, and eelgrass beds and channels with swift currents that flow around rocky reefs (Emmett, *et al.* 1991; Giorgi and Congleton 1984; NOAA 1990; Shaw and Hassler 1989). Juveniles prefer sandy substrates in estuaries and shallow subtidal zones (Emmett, *et al.* 1991; Hart 1988; NOAA 1990). As the juveniles grow they move to deeper waters. Adult lingcod are considered a relatively sedentary species, but there are reports of migrations of greater than 100 km by sexually immature fish (Jagielo 1990; Mathews and LaRiviere 1987; Matthews 1992; Smith, *et al.* 1990).

Mature females live in deeper water than males and move from deep water to shallow water in the winter to spawn (Forrester 1969; Hart 1988; Jagielo 1990; LaRiviere, *et al.* 1980; Mathews and LaRiviere 1987;

Matthews 1992; Smith, *et al.* 1990). Mature males may live their whole lives associated with a single rock reef, possibly out of fidelity to a prime spawning or feeding area (Allen and Smith 1988; LaRiviere, *et al.* 1980; Shaw and Hassler 1989). Spawning generally occurs over rocky reefs in areas of swift current (Adams 1986; Adams and Hardwick 1992; Giorgi and Congleton 1984; LaRiviere, *et al.* 1980). After the females leave the spawning grounds, the males remain in nearshore areas to guard the nests until the eggs hatch. Hatching occurs in April off Washington, but as early as January and as late as June at the geographic extremes of the lingcod range. Males begin maturing at about two years (50 cm), whereas females mature at three plus years (76 cm). In the northern extent of their range, fish mature at an older age and larger size (Emmett, *et al.* 1991 Adams, 1992 #438; Hart 1988; Mathews and LaRiviere 1987; Miller and Geibel 1973; Shaw and Hassler 1989). The maximum age for lingcod is about 20 years (Adams and Hardwick 1992).

Lingcod are a visual predator, feeding primarily by day. Larvae are zooplanktivores (NOAA 1990). Small demersal juveniles prey upon copepods, shrimps, and other small crustaceans. Larger juveniles shift to clupeids and other small fishes (Emmett, *et al.* 1991; NOAA 1990). Adults feed primarily on demersal fishes (including smaller lingcod), squids, octopi, and crabs (Hart 1988; Miller and Geibel 1973; Shaw and Hassler 1989). Lingcod eggs are eaten by gastropods, crabs, echinoderms, spiny dogfish, and cabezon. Juveniles and adults are eaten by marine mammals, sharks, and larger lingcod (Miller and Geibel 1973; NOAA 1990).

Stock Status and Management History

Lingcod have been a target of commercial fisheries since the early 1900s in California, and since the late 1930s in Oregon and Washington waters. Recreational fishermen have targeted lingcod since the 1920s in California. A smaller recreational fishery has taken place in Washington and Oregon since at least the 1970s. Although historically the catches of lingcod have been greater in the commercial sector than in the recreational sector, this pattern has been reversed since the late 1990s.

In 1997, Jagielo, et al. (1997) assessed the size and condition of the portion of the stock in the Columbia and Vancouver areas (including the Canadian portion of the Vancouver management area), and concluded the stock had fallen to below ten percent of its unfished size at 8.8 percent of its unfished biomass. The Council responded by imposing substantial harvest reductions coastwide, reducing the harvest targets for the Eureka, Monterey, and Conception areas by the same percentage as in the north.

In 1999, Adams, et al. (1999) assessed the southern portion of the stock and concluded the condition of the southern stock was similar to the northern stock with a depletion of $B_{15\%}$, thus confirming the Council had taken appropriate action to reduce harvest coastwide. Based on these assessments, the lingcod stock was declared overfished in 1999. A rebuilding plan establishing a target year of 2009 and harvest rates of $F = 0.0531$ and $F = 0.0610$ for fisheries in the northern and southern areas, respectively was adopted and implemented in 2000.

Jagielo et al. (2000) conducted a coastwide lingcod assessment and determined the total biomass increased from 6,500 mt in the mid-1990s to about 8,900 mt in 2000. In the south, the population had also increased slightly from 5,600 mt in 1998 to 6,200 mt in 2000. In addition, the assessment concluded previous aging methods portrayed an older population; whereas new aging efforts showed the stock to be younger and more productive. Therefore, the ABC and OY were increased in 2001 on the basis of the new assessment. A revised rebuilding analysis of coastwide lingcod (Jagielo and Hastie 2001) confirmed the major conclusions of the 2000 assessment and rebuilding analysis, but slightly modified recruitment projections to stay on the rebuilding trajectory to reach target biomass in 2009.

The lingcod rebuilding plan was formally adopted by the Council and incorporated into the FMP under Amendment 16-2. The rebuilding plan established a target rebuilding year of 2009 and the harvest control rule of F = 0.0531 for fisheries in the northern areas and F = 0.0610 for fisheries in the southern areas (with a P_{MAX} of 60 percent). Depth-based restrictions and a winter season fishing closure to protect nest-guarding males were also implemented as part of the rebuilding plan.

Jagielo et al. (2004) conducted a coastwide assessment for lingcod in 2003 that indicated the lingcod stock had achieved the rebuilding objective of $B_{40\%}$ in the north with a 68 percent depletion, but was at a 31 percent depletion in the south. The Council's SSC, working in concert with the lead assessment author, recalculated the coastwide lingcod stock status in March 2004 using actual 2003 harvests (the assessment, which was completed during 2003, assumed harvest would be equal to the specified OY in 2003). Their calculations indicated that the spawning biomass at the start of 2004 was within 99.3 percent of B_{MSY} ($B_{40\%}$) on a coastwide basis. The harvest control rule was recalculated to be F = 0.17 for fisheries in the northern areas and F = 0.15 for fisheries in the southern areas.

The 2005 coastwide assessment (Jagielo and Wallace 2006) again modeled two populations of lingcod north and south of 40º10’ N. lat. On a coastwide basis, the lingcod population was concluded to be fully rebuilt, with the spawning biomass in 2005 estimated to be 64 percent of its unfished level. Within the separate area models current biomass was estimated to be closer to unfished biomass in the north ($B_{87\%}$) than in the south ($B_{24\%}$). Given that the lingcod stock is managed on a coastwide basis, the Council announced the lingcod stock to be fully rebuilt in 2005, which is four years earlier than the target rebuilding year established in the rebuilding plan.

The 2009 lingcod assessment modeled two populations north and south of the California-Oregon border at 42º N. lat. (Hamel, *et al.* 2009). Both populations were healthy with stock depletion estimated at 62 and 74 percent for the north and south, respectively.

The Council and NMFS elected to maintain the management line for lingcod at 40º10’ N lat. by specifying separate ACLs north and south of that line. This action was intended to not overly encumber the commercial fishing industry, which is required to fish within a single management area within one trip. Specifying the lingcod management line at 42º N lat. would create two management areas stratified at 40º10’ N lat. and 42º N lat. This would especially burden vessels home ported out of Brookings, Crescent City, Eureka, and Ft. Bragg, since they would have to restructure their current fishing practices to avoid a violation of the management line crossover provisions. It is stated in the 2009 assessment that a management break at Cape Mendocino would be likely more biologically accurate than stratifying the assessment north and south of 42º N lat. In general, given the crossover provisions and the other regulations that foster area management strategies, the fewer latitudinal management lines there are, the less burdened the offshore commercial fishery will be. Two major biogeographic breaks occur on the west coast at Pt. Conception at 34º27’ N lat. and Cape Mendocino approximately at 40º10’ N lat., and many stocks show differences north and south of these latitudes. These biogeographic breaks are probably the more appropriate latitudes to specify management lines, given how north-south physical processes such as current patterns tend to be different, creating stock differences for species affected by these different physical processes.

The lingcod STAT evaluated the swept area biomass estimates calculated annually (2003-2010) from the NMFS NWFSC trawl survey, which indicated that 48 percent of the lingcod biomass for the stock south of 42º N lat. occurred between 40º10’ N lat. and 42º N lat. Therefore, 48 percent of the 2013 and 2014 OFLs projected in the 2009 lingcod assessment for the southern lingcod stock were added to OFLs proposed for the stock north of 40º10’ N lat. Likewise, 48 percent of the projected OFLs for the southern stock were subtracted from the OFLs proposed for the stock south of 40º10’ N lat. Given that the trawl survey is the main fishery-independent tuning index of biomass in the assessment, using swept area biomass from the trawl survey to estimate relative biomass north and south of 40º10’ N lat. was considered appropriate.

Stock Productivity

Steepness was fixed at 0.8 in the 2009 assessment. The PSA productivity score of 1.75 indicates a stock of relatively high productivity.

Recruitments in the north were estimated from 1928-2007, with bias correction ramping in from 1950 to 1964 as data became informative. The base model indicated a very strong recruitment event in 1964, a secondary event in 1970, and recent relatively strong recruitments in 1999-2002, with fairly high recruitment in 2006 as well. Recruitments in the south were estimated from 1928-2007, with bias correction ramping in from 1960 to 1974 as data became informative. The base model indicated relatively strong recruitment events in 1976, 1983, and 1999-2003, similar to the period of increased recruitment in the north, with a very high but uncertain recruitment in 2007.

Fishing Mortality

Lingcod exploitation coastwide was above the target rate for most of the 1970s through the 1990s, driving the stock below the MSST and into an overfished condition. The stock was successfully rebuilt by 2006 based on good recruitments and very low fishing mortality rates. The SPR for northern lingcod has been above the proxy target of 45 percent since 1998, and in recent years has been far above that level. The SPR for the southern lingcod stock has been above the proxy target of 45 percent since 2001, and in recent years has been far above that level.

The PSA vulnerability score for lingcod is 1.55, indicating a low risk of overfishing of the stock.

1.1.4.11 Longnose Skate

Distribution and Life History

Skates are the largest and most widely distributed group of batoid fish with approximately 245 species ascribed to two families (Ebert and Compagno 2007; McEachran 1990). Skates are benthic fish that are found in all coastal waters but are most common in cold temperatures and polar waters (Ebert and Compagno 2007).

There are about eleven species of skates from either of three genera (Amblyraja, Bathyraja, and Raja) present in the Northeast Pacific Ocean off California, Oregon and Washington (Ebert 2003). Of that number, just three species (longnose skate *Raja rhina*, big skate *Raja binoculata*, and sandpaper skate *Bathyraja interrupta*) make up over 95 percent of survey catches in terms of biomass and numbers, with the longnose skate leading in both categories (62% of biomass and 56% of numbers). Species compositions of fishery landings also show that longnose skate are the predominant skates in commercial catches. On average, longnose skate represents 75 percent of total skate landings in Oregon for the last 20 years and 45 percent in Washington for the last 10 years. There are no species composition data available for commercial landings in California, but anecdotal evidence suggests that the majority of skates landed there are longnose skates.

The distribution of the longnose skate is limited to the eastern Pacific Ocean. It is found from the southeastern Bering Sea to just below Punta San Juanico, southern Baja California, and Gulf of California at depths of 9-1,069 m (Love, *et al.* 2005). Longnose skates do not exhibit a size-specific pattern in distribution relative to bottom depth; average fish size does not vary greatly with depth.

Currently, there is no information available that indicates the existence of multiple breeding units in the Northeast Pacific Ocean. Several tagging studies have found that elasmobranchs, such as sharks and skates, can undertake extensive migrations within their geographic range (Martin and Zorzi 1993; McFarlane and King 2003). This behavior suggests the likelihood that there is a high degree of genetic mixing within the population, across its range. As a result, the longnose skate population off California, Oregon and Washington is modeled in this assessment as a single stock.

The life history of skates is characterized by late maturity, low fecundity and slow growth to large body size (King and McFarlane 2003; Moyle and Cech 1996; Walker and Hislop 1998). Skates invest considerable energy in developing a few large, well-protected embryos. These characteristics are associated with a K-type reproductive strategy, as opposed to r-type strategy, wherein reproductive success is achieved by high productivity and early maturity (Hoenig and Gruber 1990).

The longnose skate is oviparous. After fertilization, the female forms tough, but permeable egg cases that surround eggs and then deposits these egg cases onto the sea floor at daily to weekly intervals for a period of several months or longer (Hamlett and Koob 1999). The eggs within egg cases incubate for several months in a benthic habitat. Inside the egg cases, the embryos develop with nourishment provided by yolk. The longnose skate is known to have only a single embryo per egg case (David Ebert, Moss Landing Marine Laboratories, pers. com. as cited by Gertseva and Schirripa (2008)). When the yolk is depleted and the juvenile is fully formed, it exits in the egg case. Once hatched, the young skate is similar in appearance to an adult, but smaller in size. Upon reaching maturity, skates enter the reproductive stage, which lasts for the remainder of their lives (Frisk, *et al.* 2002; Pratt and Casey 1990). On average off the continental US Pacific Coast, female longnose skates mature between 11-18 years, which corresponds to 75-125 cm in total length (Thompson 2006). The life span of the longnose skate is not well known, although individuals up to 23 years of age have been found (Thompson 2006). Longnose skates attain a maximum length of about 145 cm, although individuals as large as 180 cm have been reported off the U.S. west coast (Thompson 2006).

The reproductive cycle of oviparous skates has been observed for a few species but not for longnose skate. These studies indicate that egg production generally occurs throughout the year although there have been some instances where seasonality in egg laying was observed (Hamlett and Koob 1999). Information on fecundity of longnose skate is extremely limited. Holden (1974) found that species of the family Rajidae are the most fecund of all elasmobranches and can lay 100 egg cases per year, although eggs may not be produced every year. Frisk et al. (2002) estimated that annual fecundity for skates similar in size with longnose may be less than 50 eggs per year; however, those eggs exhibit high survival rates due to the large parental investment. Overall, little is known about breeding frequency, egg survival, hatching success and other early life history characteristics of longnose skate.

Stock Status and Management History

Longnose skate was managed in a complex of dissimilar species, the Other Fish complex, from 1982, when the Groundfish FMP was implemented through 2008. In 2009, longnose skate was removed from the Other Fish complex and managed with stock-specific harvest specifications.

Gertseva and Schirripa (2008) assessed the west coast longnose skate stock in 2007. The spawning stock biomass was estimated to be at 66 percent of its unfished biomass at the start of 2007. Based on that assessment, a constant catch strategy (OY = 1,349 mt) was implemented in 2009 based on a 50 percent increase in the average 2004-2006 landings and discard mortality. The constant catch strategy was revised in 2013 by implementing an ACL of 2,000 mt to provide greater access to the stock and to limit disruption of current fisheries. This level of harvest was projected to maintain the population at a healthy level as projected in the 10-year forecast for longnose skate in the 2007 assessment (Gertseva and Schirripa 2008).

The SSC recommended changing the proxy F_{MSY} rate for longnose skate and other elasmobranchs from an SPR of 45% to an SPR of 50% beginning in 2015. This recommendation, driven primarily by conservation concerns for spiny dogfish (see section 1.1.4.18), was heeded by the Council when they adopted 2015 and 2016 OFLs consistent with this lower harvest rate.

Stock Productivity

Steepness of the stock-recruitment curve was fixed at a value of 0.4 in the 2007 assessment to reflect the K-type reproductive strategy of the longnose skate. Recruitments were deterministically provided using this steepness value and a Beverton-Holt stock-recruitment relationship since the data in the 2007 assessment was not informative of relative year-class strength. In general, elasmobranchs have relatively low productivity given the K-type reproductive strategy of producing few eggs per female with a significant parental energy investment to increase survival of those few eggs (e.g., production of egg cases and relatively large yolk masses).

Fishing Mortality

Historically, skates in general, and longnose skate in particular, have not been high-priced fishery products. They are taken mostly as bycatch in other commercially important fisheries (Bonfil 1994). Although skates are caught in almost all demersal fisheries and areas off the U.S. west coast, the vast majority (almost 97%) are caught with trawl gear.

Landing records indicate that skates have been retained on the U.S. Pacific Coast at least since 1916 (Martin and Zorzi 1993). Little is known about the species composition of west coast skate fisheries, particularly prior to 1990. With few exceptions, longnose skate landings have been reported, along with other skate species, under the market category “unspecified skates”, until 2009 when a sorting requirement for longnose skate was required.

Historically, only the skinned pectoral fins or “wings” were sold, although a small portion of catch would be marketed in the round (whole). The wings were cut onboard the boat and the remainder discarded. Currently, west coast skates are marketed both whole and as wings. Skates wings are sold fresh or fresh-frozen, as well as dried or salted and dehydrated, for sale predominantly in Asian markets (Bonfil 1994; Martin and Zorzi 1993). It appears that the demand for whole skates did increase greatly during the mid-1990s, as evidenced by the increase in the number of trips where skates were landed. While skates were encountered predominantly as bycatch previously, landings data from this period reveal greater targeting of skates by some vessels. After a few years, the whole-skate market cooled due to downturns in Asian financial markets (Peter Leipzig, Fishermen's Marketing Association, pers. com. as cited by Gertseva and Schirripa (2008).

Historically, the exploitation rate for the longnose skate has been low. It reached its maximum level of 4.02% in 1981 (Gertseva and Schirripa 2008). An exploitation rate of 1.25% was estimated in 2006.

A vulnerability score of 1.68 indicates a low concern for overfishing the stock.

1.1.4.12 Longspine Thornyhead

Distribution and Life History

Longspine thornyhead occur from the southern tip of Baja, California, to the Aleutian Islands (Jacobson and Vetter 1996; Orr, *et al*. 1998). There appears to be no distinct geographic breaks in stock abundance along the west coast (Fay 2006; Rogers, *et al.* 1997). Adult longspine thornyhead are bottom dwellers, and inhabit the deep waters of the continental slope throughout their range.

Longspine occur at depths greater between 201 and 1,756 m, most typically between 500 and 1,300 m (Love, *et al*. 2002), and a peak in abundance and spawning biomass in the oxygen minimum zone (OMZ) at about 1,000 m depth (Jacobson and Vetter 1996; Wakefield 1990). Longspine are better adapted to deep water than shortspine (Siebenaller 1978; Siebenaller and Somero 1982). Wakefield (Wakefield 1990) estimated that in Central California, 83% of the longspine population resides within an area of the continental slope bounded by 600 and 1,000 m depth.

Unlike shortspine thornyhead, the mean size of longspines is similar throughout the depth range of the species (Jacobson and Vetter 1996). Camera sled observations indicate that longspines do not school or aggregate, and are distributed relatively evenly over soft sediments (Wakefield 1990). Differences in density of individuals at depth do occur with latitude, with higher densities of longspine in deep water (1,000-1,400 m) off Oregon than off central California (Jacobson and Vetter 1996).

The strong relationship between depth and size found in shortspine thornyhead (Jacobson and Vetter 1996 is not observed for longspines, with the distribution of longspines being relatively uniform with depth {Rogers, 1997 #271). Unlike shortspines, longspine do not undergo an ontogenetic migration to deeper waters (Wakefield 1990).

Longspine thornyheads prefer muddy or soft sand bottoms in deep-water environments characterized by high pressure and low oxygen concentrations. These are low productivity (Vetter and Lynn 1997) and low diversity (Haigh and Schnute 2003) habitats where food availability is limited. Longspines have adapted to this environment with an extremely slow metabolism that allows it to wait up to 180 days between feedings (Vetter and Lynn 1997). They are not territorial, and do not school. They have no swim bladders; instead oil in the bones and spines provides floatation. Video observations from submersibles and ROVs indicate that thornyhead are sit-and-wait predators that rest on the bottom and remain motionless for extended periods (John Butler, NOAA Fisheries, Southwest Fisheries Science Center, CA, as cited in Jacobson and Vetter (1996)).

The spawning season for longspine thornyheads appears to be extended, and occurs over several months during February, March and April (Best 1964; Moser 1974; Pearcy 1962; Wakefield and Smith 1990). Both thornyhead species produce a bi- lobed jellied egg mass that is fertilized at depth and which then floats to the surface where final development and hatching occur (Pearcy 1962). An extended larval and pelagic juvenile phase follows, which is thought to be 18-20 months long (Jacobson and Vetter 1996; Moser 1974; Wakefield 1990). Juvenile longspine settle on the continental slope at depths between 600 and 1,200 m (Wakefield 1990). Moser (1974) reports a mean length at settlement of 4.2-6.0 cm, although pelagic juveniles up to 69 mm in length have been collected in midwater trawls off Oregon (J. Siebenaller unpublished data, as cited in Wakefield and Smith (1990)).

Following settlement, longspine thornyhead are strictly benthic (Jacobson and Vetter 1996). No apparent pulse in recruitment during the year was observed by Wakefield and Smith (1990), perhaps due to the long (4-5 months) spawning season, variation in growth rates, and variation in the duration of the pelagic period (Wakefield and Smith 1990). There is potential for cannibalism because juveniles settle directly on to the adult habitat (Jacobson and Vetter 1996).

Adult females release between 20,000 and 450,000 eggs over a 4-5 month period (Best 1964; Moser 1974). Wakefield (1990) and Cooper et al. (2005) both found linear relationships between fecundity and somatic weight. The data analyzed by Cooper et al. (2005) indicated that fecundity of longspine between 20 and 30 cm in length ranged from 20,000 to 50,000 eggs.

There is considerable uncertainty regarding age and growth of thornyheads (Jacobson and Vetter 1996), although data indicate that longspine thornyhead are long lived. Age estimates of over 40 years have been obtained from otoliths using thin-section and break- and-burn techniques (Ianelli, *et al.* 1994). High frequencies of large longspine thornyheads may be due to a strongly asymptotic growth pattern, with accumulation of many age groups in the largest size-classes (Jacobson and Vetter 1996).

Size-at-age data (Ianelli, *et al.* 1994) indicate that longspine grow to a maximum size of about 30cm TL at ages of about 25-45 years, with little or no sexual dimorphism in length at age – longspines in British Columbia, Canada also display no sexual dimorphism (Starr and Haigh 2000). Orr et al. (1998) report a maximum length for longspines of 38 cm, although individuals of this size are rare in both trawl surveys and commercial landings. Growth increments on otoliths suggest that juveniles reach 80 mm after 1 year of life as demersal juveniles {Wakefield unpublished data, as cited in Wakefield and Smith, \1990 #462}, which would correspond to an age of 2.5 - 3 years old.

Longspine thornyhead are ambush predators (Jacobson and Vetter 1996). They consume fish fragments, crustaceans, bivalves, and polychaetes and occupy a tertiary consumer level in the food web. Pelagic juveniles prey largely on herbivorous euphausiids and occupy a secondary consumer level in the food web (Love 1996; Smith and Brown 1983). Cannibalism in newly settled longspine thornyhead may occur, because juveniles settle directly onto adult habitat (Jacobson and Vetter 1996). Sablefish commonly prey on longspine thornyhead. Sablefish and shortspine thornyhead commonly prey on longspine thornyhead (Buckley, *et al.* 1999).

Stock Status and Management History

Longspine thornyhead are exploited in the limited entry deep-water trawl fishery operating on the continental slope that also targets shortspine thornyhead, Dover sole and sablefish (i.e., the DTS fishery). A very small proportion of longspine landings is due to non-trawl gears (gillnets, hook and line). Longspine and shortspine thornyhead make up a single market category; however, they were managed under separate harvest specifications since 1992. Beginning in 2011, trawl catches of longspine north of 34º27’ N lat. have been managed using individual fishing quotas.

The thornyhead fishery developed in Northern California during the 1960s. The fishery then expanded north and south, and the majority of the landings of longspine thornyhead have since been in the Monterey, Eureka, and Columbia INPFC areas, with some increase in landings from the Conception (southern CA) and Vancouver (northern WA) INPFC areas in recent years (Fay 2006).

The most recent stock assessment of west coast longspine thornyhead was done in 2013. This was the fifth assessment done for longspines, but only the second in which it was assessed individually (earlier assessments were of longspine and shortspine thornyheads in combination). Previous assessments were conducted by Jacobson (Jacobson 1990; 1991), Ianelli et al. (1994), Rogers et al. (1997), and Fay (2006). The 1990 and 1991 assessments were very similar. Important features included reviews of available biological data, and analyses of trends in mean lengths from port samples and catch rates calculated from logbook data. Swept-area and video biomass estimates were used to estimate average biomass levels and exploitation rates in the Monterey to US-Vancouver management areas. The available data were used to conduct per-recruit analyses of yield, revenue, and spawning biomass, and to develop estimates of the then target level of $F_{35\%}$.

Ianelli et al. (1994) assessed the coastwide abundance of longspine and shortspine thornyheads based on slope survey data, an updated analysis of the logbook data, and fishery length-composition data to estimate the parameters of length-based Stock Synthesis models, under different assumptions regarding discarding practices.

The Rogers et al. (1997) assessment used a length-based version of Stock Synthesis 1 to fit an age-structured model to data for the Monterey, Eureka, Columbia and Vancouver INPFC areas. Models were fitted to biomass estimates and length data from the AFSC slope surveys (1988-1996), a logbook CPUE index, discarded proportions by year, and length composition data from California and Oregon. Sensitivity to discard rates based on changes in prices and minimum size were explored.

The 2005 assessment of longspine thornyhead estimated spawning biomass in 2005 was approximately 71 percent of unfished spawning biomass (Fay 2006). The model assumed one coastwide stock with one coastwide trawl fishery. Results from the base model suggested that the length compositions from the slope surveys were influencing recruitment in the model, such that the model estimated slightly higher recruitment in the early 1990s, which then declined in the mid to late 1990s.

The 2013 longspine thornyhead assessment indicated a stock depletion of 75 percent at the start of 2013 (Stephens and Taylor 2013).

Stock Productivity

Stephens and Taylor (2013) estimated annual longspine recruitment using a Beverton-Holt stock-recruitment function and assuming a steepness value of 0.6. Most 2013 rockfish assessments used a steepness prior of 0.779, estimated from a meta-analysis of rockfish assessment results. This value might be expected in the 2013 longspine assessment; however, rockfish ecology and reproduction are quite different from those of thornyheads, which (for example) do not give birth to live young but rather spawn floating egg masses.

Steepness in the shortspine thornyhead assessment was fixed at 0.6 both in the 2005 and 2013 models (Hamel 2006c; Taylor and Stephens 2013). This value was justified based on consistency between the modeling approach and management targets, in addition to being within a range of biologically reasonable values. For consistency, therefore, steepness for the longspine model was also fixed at 0.6.

Annual deviations about this stock-recruitment curve were estimated for the years 1944 through 2012. Estimated recruitments do not show high variability, and the uncertainty in each estimate is greater than the variability between estimates. The 2013 longspine assessment is relatively uninformative of relative year class strength since ages were not used in the model (thornyheads are notoriously difficult to age). Therefore, a length-based assessment with an assumed steepness is used to determine recruitment.

Fishing Mortality

The estimated exploitation rate of longspine thornyheads was above the current F_{MSY} harvest rate through much of the 1990s and, in hindsight, given the current target harvest rate, overfishing was occurring. However, stock biomass was estimated to have never dropped below the target B_{MSY} level. There is very little risk of overexploitation of longspines given their deep distribution beyond the 700 fm limit to west coast bottom trawling implemented under Amendment 19.

The PSA vulnerability score of 1.54 for longspine thornyheads also indicates a low concern for potential overfishing of the stock.

1.1.4.13 Pacific Cod

Distribution and Life History

Stock Status and Management History

The west coast population of Pacific cod has never been formally assessed. Targetable amounts of Pacific cod occur off northern Washington infrequently since the west coast EEZ is at the southern limit of their distribution. The Pacific cod OFL has been set at the highest annual historical catch observed for the stock and ACLs/OYs have been set at half that amount.

Pacific cod is the only unassessed, data-poor groundfish stock currently managed with stock-specific harvest specifications on the west coast.

Stock Productivity

The PSA vulnerability score of 1.34 for Pacific cod indicates a low concern for potential overfishing of the stock.

Fishing Mortality

1.1.4.14 Pacific Whiting

Distribution and Life History

Stock Status and Management History

Stock Productivity

Fishing Mortality

Pacific whiting is managed consistent with the Agreement with Canada on Pacific Hake/Whiting. OYs, now called TACs (total allowable catches), for Pacific whiting are adopted on an annual basis after a stock assessment is completed just prior to the Council's March meeting . The most recent assessment was conducted in 2013 Hicks 2013 and was used to determine stock status and 2013 harvest specifications.

1.1.4.15 Sablefish

Distribution and Life History

Sablefish, or black cod, (*Anoplopoma fimbria*) are distributed in the northeastern Pacific ocean from the southern tip of Baja California, northward to the north-central Bering Sea and in the Northwestern Pacific ocean from Kamchatka, southward to the northeastern coast of Japan. Although few studies have critically evaluated issues regarding the stock structure of this species, it appears there may exist at least three different stocks of sablefish along the west coast of North America: (1) a stock that exhibits relatively slow growth and small maximum size that is found south of Monterey Bay (Cailliet, *et al.* 1988; Phillips and Inamura 1954); (2) a stock that is characterized by moderately fast growth and large maximum size that occurs from northern California to Washington; and (3) a stock that grows very quickly and contains individuals that reach the largest maximum size of all sablefish in the northeastern Pacific ocean, distributed off British Columbia, Canada and in the Gulf of Alaska (Mason, *et al.* 1983; McFarlane and Beamish 1983a). Large adults are uncommon south of Point Conception (Hart 1988; Love 1996; McFarlane and Beamish 1983b; NOAA 1990). Adults are found as deep as 1,900 m, but are most abundant between 200 m and 1,000 m (Beamish and McFarlane 1988; Kendall and Matarese 1987; Mason, *et al.* 1983). Off southern California, sablefish are abundant to depths of 1,500 m (MBC 1987). Adults and large juveniles commonly occur over sand and mud (McFarlane and Beamish 1983a; NOAA 1990) in deep marine waters. They were also reported on hard-packed mud and clay bottoms in the vicinity of submarine canyons (MBC 1987).

Spawning occurs annually in the late fall through winter in waters greater than 300 m (Hart 1988; NOAA 1990). Sablefish are oviparous with external fertilization (NOAA 1990). Eggs hatch in about 15 days (Mason, *et al.* 1983; NOAA 1990) and are demersal until the yolk sac is absorbed (Mason, *et al.* 1983). Age-zero juveniles become pelagic after the yolk sac is absorbed. Older juveniles and adults are benthopelagic. Larvae and small juveniles move inshore after spawning and may rear for up to four years (Boehlert and Yoklavich 1985; Mason, *et al.* 1983). Older juveniles and adults inhabit progressively deeper waters. Estimates indicate that 50 percent of females are mature at five years to six years (24 inches) and 50 percent of males are mature at five years (20 inches).

Sablefish larvae prey on copepods and copepod nauplii. Pelagic juveniles feed on small fishes and cephalopods—mainly squids (Hart 1988; Mason, *et al.* 1983). Demersal juveniles eat small demersal fishes, amphipods, and krill (NOAA 1990). Adult sablefish feed on fishes like rockfishes and octopus (Hart 1988; McFarlane and Beamish 1983a). Larvae and pelagic juvenile sablefish are heavily preyed upon by seabirds and pelagic fishes. Juveniles are eaten by Pacific cod, Pacific halibut, lingcod, spiny dogfish, and marine mammals, such as Orca whales (Cailliet, *et al.* 1988; Hart 1988; Love 1996; Mason, *et al.* 1983; NOAA 1990). Sablefish compete with many other co-occurring species for food, mainly Pacific cod and spiny dogfish (Allen 1982).

Stock Status and Management History

Formal stock assessments of sablefish began in 1984. The first coastwide assessment established regulations on the sablefish fishery off the U.S. Pacific coast which were implemented as trip limits in October 1982. Since 1982, the sablefish fishery has been managed intensively, with limited entry and open access programs used in various manners to limit catches.

In 2001, two assessments were completed and reviewed by a STAR Panel: one by NMFS (Schirripa and Methot 2001) and one by the Pacific Groundfish Conservation Trust (Hilborn, *et al.* 2001). The two assessments were in agreement, and the Council adopted the NMFS assessment for management purposes. Schirripa and Methot (2001) focused on evaluating the sensitivity of the model and the outcomes to changes in the survey data. These changes included the combining of the AFSC slope survey data and the NWFSC Industry Co-operative Survey data using a statistical Generalized Linear Models (GLM) procedure. This analysis made it possible to extend the southern boundary of the assessment south to Point Conception at 34°27' N lat. rather than 36° N lat., used in previous assessments. The assessment indicated a normal decline in biomass since the late 1970s due to the fishing down of the unfished stock and an unexpected decline in recruitment during the early 1990s. It introduced for the first time, the possibility that sablefish recruitment may be linked to environmental factors. A seemingly meaningful relationship was demonstrated between changes in northern and southern copepod abundances and sablefish recruitment. Conditions and projections in the model considered two competing “states of nature” to calculate the mean virgin recruitment: a “density-dependent” state that used the average of 1975-1991 recruitments, and a “regime shift” state that used the 1975-2000 recruitments. To account for this uncertainty, the Council adopted a 2002 ABC based on the proxy harvest rate ($F_{45\%}$) adjusted to reflect the distribution north and south of 36° N latitude. This was done because a plan amendment would be needed to change the management area since Groundfish FMP Amendment 14 specified only the area north of 36° N lat.

The Council also wanted to verify industry reports of a large abundance of juvenile sablefish, an observation that was confirmed to some extent by preliminary results from the 2001 NMFS slope survey. Based on these considerations, the Council recommended a new expedited assessment be done in 2002. This update assessment (Schirripa 2002), by definition, sought to document changes in the estimates of the status of the stock by only considering newly available data for 2001 while not considering any new changes in the model structure or model assumptions. The expedited assessment confirmed fishermen’s anecdotal reports of a large 1999 year class, which was also apparent in the preliminary results of the 2001 slope survey.

The 2005 sablefish assessment estimated stock depletion at 34.3 percent of unfished biomass (Schirripa and Colbert 2006). The assessment fit a relationship between sea level and recruitment deviations for the period 1973-2003 and used that relationship to hindcast recruitment variability back to 1925. The 2005 assessment found that spawning stock biomass had steadily declined since 1900 and suggested that there was little evidence that recruitment from 2001-2005 was as high as that for the strong 1999 and 2000 year classes. As a result, the assessment’s biomass projections indicate a short-term increase, followed by a continued decline.

The 2007 updated sablefish assessment estimated spawning depletion to be 38.3 percent of unfished biomass at the start of 2007 (Schirripa 2008). This increase from 2005 was attributed in part to the continued recruitment of the strong 1999 and 2000 year classes into the spawning stock biomass. The assessment also estimated a series of poor recruitments in the mid- to late-1990s, and if fished at the full OY level, depletion was forecasted to decrease for the next five years.

The 2011 sablefish assessment estimated spawning stock biomass to be at 33 percent of its unfished biomass at the beginning of 2011 (Stewart, *et al.* 2011). The resource was modeled as a single stock; however, there is some dispersal to and from offshore seamounts and along the coastal waters of the continental U.S., Canada, Alaska, and across the Aleutian Islands to the western Pacific which was not explicitly accounted for in this analysis. Environmental time-series including both sea-surface height (used in previous sablefish assessments) and zooplankton abundance were also investigated. These environmental indices were not used in the 2011 assessment in the interest of parsimony since they did not affect results.

Stock Productivity

It was not possible to estimate the steepness parameter of the Beverton-Holt stock-recruitment relationship in the 2011 sablefish assessment, so this quantity was fixed at a value of 0.6 and explored via sensitivity analyses.

Stewart et al. (2011) estimated sablefish were exploited at a modest level through the first half of the 20th century. Following a period of above-average recruitments, the spawning stock biomass increased to nearly unexploited levels. Large harvests in the 1970s and 1980s were believed to have caused the stock biomass to decline. Estimates of the stock's productivity were highly uncertain due to lack of information on mortality, absolute stock size, and productivity. Sablefish recruitment was estimated to be variable over the historical record, with substantial uncertainty in individual recruitment events. Recruitments during the 1980s were, on average, roughly an order of magnitude higher than the very poor recent cohorts estimated between 2002 and 2007.

Fishing Mortality

The sablefish fishery has been managed with a rich history of seasons, size-limits, trip-limits, and a complex permit system. Coastwide yield targets have been divided among the different gears (hook-and-line, pot and trawl), fishery sectors (including both limited entry and open access) as well as north and south of 36º N lat. Peak catches occurred in the late 1970s just prior to the imposition of the first catch limits. Since 2001, the total estimated dead catch has been only 79 percent of the sum of the OFLs (ABCs at the time) and 87 percent of the ACLs (OYs at the time). In only one year of the last 10, 2008, did the estimated dead catch exceed the ACL (and OFL) by 5% (3%).

The PSA vulnerability score of 1.64 indicates a relatively low concern for potential overfishing.

1.1.4.16 Shortbelly Rockfish

Distribution and Life History

Shortbelly rockfish (*Sebastes jordani*) range from Punta Baja in Baja California (Klingbeil 1976) as far north as La Perouse Bank off of British Columbia, and as far west as the Cobb seamount off the southern Washington coast (Pearson, *et al.* 1993). However, they are most abundant along the continental shelf break between the northern end of Monterey Bay and Point Reyes, California (particularly in the regions of Ascension Canyon and the Farallon Islands), and around the Channel Islands in the Southern California Bight (Love, *et al.* 2002; Moser, *et al.* 2000; Pearson, *et al.* 1991; Phillips 1964). Although stock structure is poorly understood, genetic analysis of fish collected between San Diego and Cape Mendocino suggest a single coastwide stock, with slight differences in allele frequencies across Point Conception (Constable 2006). The shortbelly rockfish is one of the most abundant rockfish species in the California Current and is a key forage species for many piscivorous fish, birds, and marine mammals.

Shortbelly rockfish feed primarily on juvenile and adult euphausiids, and are an important prey item to a wide range of piscivorous fishes, seabirds and marine mammals (Chess, *et al*. 1988; Lowry and Carretta 1999; Sydeman, *et al*. 2001). Merkel (1957) reported that juvenile shortbelly rockfish were important prey of Chinook salmon along the central California coast in late spring and summer, accounting for more than 60% of those identified to species. For many breeding California seabirds, as much as 90% of their diet is comprised of pelagic stages of juvenile (age 0) rockfish during the late spring and early summer breeding seasons, and unexploited species (such as shortbelly) generally account for more than two thirds of the juvenile rockfish identified (Ainley, *et al.* 1993; Miller and Sydeman 2004; Sydeman, *et al*. 2001). However there is considerable interannual and interdecadal variability in the frequency of rockfish in seabird diets. Throughout the 1990s, foraging rates on juvenile rockfish by central California seabirds declined for both exploited and unexploited rockfish species primarily in response to changes in ocean conditions associated with poor recruitment for rockfish (Miller and Sydeman 2004; Mills, *et al.* 2007; Sydeman, *et al*. 2001). Although rockfish have rarely been identified to the species level in the diets of many California Current marine mammals (Antonelis and Fiscus 1980; Morejohn, *et al.* 1978; Perez and Bigg 1986; Stroud, *et al.* 1981), shortbelly were among the five most significant prey items for California sea lion (*Zalophus californianus*) in the Channel Islands (Lowry and Carretta 1999) and are frequently encountered in sea lion food habits samples off of Central California (Weise and Harvey 2005). Shortbelly rockfish are also described as important prey to thresher sharks (Preti, *et al.* 2004), longnose skate (Robinson, *et al.* 2007), and jumbo squid (Field, *et al.* 2007), among others. Consequently, shortbelly rockfish are an important forage species to a wide range of predators throughout the California Current ecosystem, and generally have a trophic position and life history traits more similar to forage fishes than most other *Sebastes*.

Stock Status and Management History

The expectation of eventual development of a domestic commercial fishery (Kato 1981) led to past efforts to estimate stock abundance and productivity (Lenarz 1980, Pearson et al. 1989, Pearson et al. 1991) as well as evaluations of commercial potential. The first ABC for shortbelly rockfish was set by the Council at 10,000 mt for 1983 through 1989. A stock assessment by Pearson et al. (Pearson, *et al.* 1991) estimated that allowable catches for shortbelly might range from 13,900 to 47,000 mt per year, based on life history data and hydroacoustic survey estimates of abundance. Subsequently, the Council established an ABC of 23,500 mt, which was reduced to 13,900 mt in 2001 based on observations of poor recruitment throughout the 1990s and the continued lack of a targeted fishery. Yet despite several attempts to develop a commercial fishery for shortbelly, domestic fishery landings have never exceeded 80 mt per year along the west coast.

A shortbelly rockfish assessment was done as an academic exercise in 2007 to understand the potential environmental determinants of fluctuations in the recruitment and abundance of an unexploited rockfish population in the California Current ecosystem (Field, *et al.* 2008). The results of the assessment indicated the shortbelly stock was healthy with an estimated spawning stock biomass of 67 percent of its unfished biomass in 2005.

Shortbelly rockfish is an abundant species that is not targeted in any commercial or recreational fisheries or caught in substantial amounts. However, shortbelly rockfish is a valuable forage fish species in the California Current ecosystem with fluctuations in stock recruitment and biomass driven by environmental conditions. The consequence of fisheries, including high and low estimates of plausible discards, were estimated to be negligible ($P<0.01$) in all years with the exception of the foreign fisheries of the mid-1960s (Field, *et al.* 2008). Shortbelly rockfish were initially considered for an Ecosystem Component (EC) species categorization under Amendment 23. Rather than classifying shortbelly rockfish as an EC species, the Council chose to recommend a very restrictive ACL of 50 mt for 2011 and beyond. This ACL is a level of harvest meant to accommodate unavoidable incidental bycatch of shortbelly rockfish while allowing most of the harvestable surplus of the stock to be available as forage for species in the California Current ecosystem. Such ecological considerations are made when setting ACLs for west coast groundfish species.

Stock Productivity

Field et al. (Field, *et al.* 2008) assumed a steepness of 0.65 in a Mace-Doonan stock-recruitment relationship (Mace and Doonan 1988) in the 2007 shortbelly assessment. The data in the assessment model were insufficient for estimating steepness; therefore, an assumed value was used based on the Dorn (2002a) meta-analysis of rockfish steepness available at the time the assessment was conducted.

Recruitment deviations of shortbelly from 1960-2005 were estimated in the 2007 assessment; however, there was greater confidence in relative year class strength from 1975-2005. The model suggested a long period of poor recruitment through most of the 1990s, associated with a significant decline in biomass. The interesting conclusion of the 2007 shortbelly assessment was how apparent environmental determinants of shortbelly recruitment and not fishing mortality affected biomass and stock status.

Fishing Mortality

Shortbelly rockfish are not targeted in any west coast fisheries and are incidentally caught in very small amounts. Love et al. (2002) reported that shortbelly rockfish were commonly caught incidentally with trawl gear in the San Francisco-Monterey region during the development of the trawl fishery in the 1930s and 1940s when they were often referred to as steamer rockcod, as they tended to be common in the steamer lanes south of San Francisco. However, as a result of the small size and poor marketability, only modest domestic landings (1 to 65 mt per year) have been reported in the last 25 years. Historical landings were almost certainly less. Phillips (1939) reported that *S. jordani* accounted for 1 lb out of 332,630 lbs examined in Monterey wholesale fish markets between 1937 and 1938. Nitsos (1965) reported trace amounts (approximately 1,000 lbs out of 1,920,000 lbs landed) of *S. jordani* landed in Monterey ports from trawlers in 1962-1963, but none were reported from ports other than Monterey. There was historically a short period in which large numbers of shortbelly were caught during the foreign fisheries of the 1960s and 1970s (Rogers 2003b). These landings (nearly 15,000 mt through 1976, over half of which was taken in 1966) were presumably incidental to the targeting of other rockfish and Pacific hake. Only in the early days of the foreign fisheries (the mid-1960s) were Pacific hake pursued in large numbers south of Cape Mendocino, which is when the bulk of documented historical landings of shortbelly occurred. Since the early 1970s the Pacific hake fishery has been prosecuted primarily off of Oregon and Washington, and to a lesser extent off of Northern California (generally north of Cape Mendocino).

The available data for historical bycatch rates of shortbelly rockfish are extremely sparse. Shortbelly have been caught incidentally, at times in large numbers, by trawlers targeting other semi-pelagic rockfish (usually chilipepper and widow rockfish). As large hauls of shortbelly are not marketable but occasionally foul the mesh of typical groundfish trawls, more experienced fishermen generally recognize shortbelly sign (as well as habitat preferences) on their acoustics, and work to actively avoid schools. Bycatch monitoring programs conducted north of Cape Mendocino in the mid-1980s suggested very negligible levels of bycatch, such that shortbelly were less than 0.25% of total catches in all fishing strategies (which included nearshore flatfish, bottom rockfish, midwater rockfish and whiting, shrimp and the deepwater complex), including less than 0.05% for midwater trawl whiting and rockfish (Pikitch 1988). Very little contemporary information is available for the region south of Mendocino. However, all of these data were collected far north of the usual range of shortbelly. Data processed from the West Coast Groundfish Observer Program suggests that approximately one mt of shortbelly rockfish were caught and discarded in trawl fisheries south of Mendocino. As regulatory measures have closed the vast majority of habitat optimal to adult shortbelly, such trace landings are to be expected in recent years, and comparable data prior to these closures does not exist.

Field et al. (2007) acknowledged the uncertain historical estimates of shortbelly bycatch and therefore explored higher and lower bycatch streams in the 2007 assessment. Varying the historical catch assumptions in the assessment did not result in meaningful deviations from the base model results; therefore, they concluded it was unlikely fishing mortality had any substantive impact on the stock since the days of the foreign fisheries.

1.1.4.17 Shortspine Thornyhead

Distribution and Life History

Shortspine thornyhead (*Sebastolobus alascanus*) are found in the waters off of the West Coast of the United States from northern Baja California to the Bering Sea. They are found from 20 to over 1,500 m in depth. The majority of the spawning biomass occurs in the oxygen minimum zone between 600 and 1,400 m, where longspine thornyheads are most abundant (Bradburn, *et al.* 2011; Jacobson and Vetter 1996). The distribution of the smallest shortspine thornyheads suggests that they tend to settle at around 100–400 m and are believed to have ontogenetic migration down the slope, although large individuals are found across the depth range.

Shortspine thornyhead do not appear to be distributed evenly across the west coast, with higher densities of thornyheads in shallower areas (under 500 m) off of Oregon and Washington, and higher densities in deeper areas off of California. The mean latitude of the largest shortspine is slightly further north than of the medium sizes, suggesting the possibility of either a J-shaped migration, differential patterns of recruitment, or regional differences in exploitation history.

Although their densities vary, shortspine thornyheads are present in almost all trawlable areas below 500 m. They are caught in 91% of the trawl survey hauls below 500 m and 94% of the commercial bottom trawl hauls below 500 m. In camera tows, thornyheads are seen to be spaced randomly across the sea floor (Wakefield 1990), indicating a lack both of schooling and territoriality.

Genetic studies of stock structure do not suggest separate stocks along the west coast. Siebenaller (1978) and Stepien (1995) found few genetic differences among shortspine thornyheads along the Pacific coast. Stepien (1995), however, did suggest that there may be a separate population of shortspine thornyhead in the isolated area around Cortes Bank off San Diego, California. Stepien (1995) also suggested that juvenile dispersion might be limited in the area where the Alaska and California currents split. This occurs towards the northern boundary of the assessment area, near 48° N lat.

Stepien et al. (2000), using a more discerning genetic material (mtDNA), found evidence of a pattern of genetic divergence corresponding to geographic distance. However, this study, which included samples collected from southern California to Alaska, did not identify a clear difference between stocks even at the extremes of the range. No such pattern was seen in longspine thornyhead, which suggests that the shorter pelagic stage (~1 yr vs. ~2 yrs) of shortspine may contribute to an increased genetic separation with distance.

Shortspine thornyheads along the west coast spawn pelagic, gelatinous masses between December and May (Erickson and Pikitch 1993; Pearson and Gunderson 2003; Wakefield 1990). Juveniles settle at around 1 year of age (22- 27 mm in length), likely in the range of 100-200 m (Vetter and Lynn 1997), and migrate down the slope with age and size, although large individuals are found across the depth range.

Shortspine thornyhead grow very slowly, but may continue growing throughout their lives, reaching maximum lengths of over 70 cm. Females appear to reach larger sizes than do males. Maturity in females has been estimated as occurring near 18 cm, at 8-10 years of age (Pearson and Gunderson 2003), although new information suggests that patterns of maturity may be more complex.

Shortspine and longspine thornyheads have historically been caught with each other and with Dover sole and sablefish, making up the DTS fishery. Other groundfish species that frequently co-occur in these deep waters include a complex of slope rockfishes, rex sole, longnose skate, roughtail skate, Pacific grenadier, giant grenadier, Pacific flatnose as well as non-groundfish species such as Pacific hagfish and a diverse complex of eelpouts. Shortspine thornyheads typically occur in shallower water than the shallowest longspine thornyheads, and migrate to deeper water as they age. When shortspines have reached a depth where they overlap with longspines, they are typically larger than the largest longspines. Shortspine thornyhead stomachs have been found to include longspine thornyheads, suggesting a predator-prey linkage between the two species.

Thornyheads spawn gelatinous masses of eggs which float to the surface. This may represent a significant portion of the upward movement of organic carbon from the deep ocean (Wakefield 1990). Thornyheads have been observed in towed cameras beyond the 1,280 m limit of the current fishery and survey, but their distribution, abundance, and ecosystem interactions in these deep waters are relatively unknown.

Stock Status and Management History

Beginning in 1989, both thornyhead species were managed as part of the deepwater complex with sablefish and Dover sole (DTS). In 1991, the Council first adopted separate ABC levels for thornyheads and catch limits were imposed on the thornyhead group. Harvest guidelines (HGs) were instituted in 1992 along with an increase in the minimum mesh size for bottom trawl fisheries. In 1995 separate landing limits were placed on shortspine and longspine thornyheads and trip limits became more restrictive. Trip limits (predominantly 2-month limits on cumulative vessel landings) have often been adjusted during the year since 1995 in order to not exceed the HG or OY for that year. At first, the HG for shortspine thornyhead was set higher than the ABC (1,500 vs. 1,000 mt in 1995-1997) in order to allow a greater catch of longspine thornyhead, which was considered a relatively underutilized and healthy stock. In 1999 the OY was set at less than 1,000 mt and remained close to that level through 2006. As a result of the 2005 shortspine assessment, catch limits increased to about 2,000 mt per year and have remained near that level to the present.

Since early 2011, trawl harvest of each thornyhead species has been managed under the PFMC's catch share, or individual fishing quota (IFQ), program. Whereas the trip limits previously used to limit harvest restricted only the amount of fish each vessel could land, individual vessels fishing under the catch-share program are now held accountable for all of the quota-share species they catch.

The most recent stock assessment of west coast longspine thornyhead was done in 2013. This was the fifth assessment done for longspines, but only the second in which it was assessed individually (earlier assessments were of longspine and shortspine thornyheads in combination). Previous assessments were conducted by Jacobson (Jacobson 1990; 1991), Ianelli et al. (1994), Rogers et al. (1997), and Fay (2006). The 1990 and 1991 assessments were very similar. Important features included reviews of available biological data, and analyses of trends in mean lengths from port samples and catch rates calculated from logbook data. Swept-area and video biomass estimates were used to estimate average biomass levels and exploitation rates in the Monterey to US-Vancouver management areas. The available data were used to conduct per-recruit analyses of yield, revenue, and spawning biomass, and to develop estimates of the then target level of $F_{35\%}$.

Ianelli et al. (Ianelli, *et al.* 1994) assessed the coastwide abundance of longspine and shortspine thornyheads based on slope survey data, an updated analysis of the logbook data, and fishery length-composition data to estimate the parameters of length-based Stock Synthesis models, under different assumptions regarding discarding practices.

The assessment of thornyheads in 1997 covered the area from Central California at 36° N lat. to the U.S.-Canada border (Rogers, *et al.* 1997). The STAR Panel expressed concern that management requires more detailed information on thornyheads than could be obtained from the available data. In 1998, two separate stock assessments covering the area north of 36° N lat. were prepared and accepted by the Council (NMFS and OT 1998; Rogers, *et al.* 1998). A synthesis of these two assessments was used to set the harvest specifications 1999 and 2000. Given that the synthesis estimated 1999 depletion at 32 percent of virgin biomass, the Council used the precautionary 40-10 policy to set the OYs for those two years.

There were a range of uncertainties in the 2001 assessment of shortspine thornyhead, in 2001, not the least of which was the estimated biomass (Piner and Methot 2001). The assessment was extended south to Point Conception (in contrast to past surveys, which were limited to stocks north of the 36° N latitude management area boundary). The authors concluded the 2001 spawning biomass ranged between 25 percent and 50 percent of unexploited spawning biomass. As was also the case in the 1998 assessment, the uncertainty in abundance largely revolved around the uncertainty in recruitment and survey q, or catchability, of shortspine thornyhead in slope surveys. The authors also concluded that the trend in stock biomass was increasing and the stock was not depleted. Based on estimated biomass and application of the GMT-recommended F=0.75M principle (which approximated an $F_{50\%}$ proxy harvest rate for shortspine thornyhead), the assessment authors and GMT recommended a slight increase in the ABC and OY for 2002. They also recommended that the harvest specifications be set for two areas divided by Point Conception at 34º27’ N lat., rather than the previous policy to separate the management areas at the Conception-Monterey border (36º N lat.). Despite the uncertainty in biomass estimates and determination of whether shortspine thornyhead should be treated as a “precautionary zone” stock, these recommendations did treat the stock as such by applying the 40-10 adjustment.

The 2005 stock assessment estimated the shortspine thornyhead spawning stock biomass to be at 62.9 percent of its initial, unfished biomass in 2005 (Hamel 2006c). The 2005 assessment extended the southern border of the assessment area from Point Conception to the Mexican border (32.5º N latitude). Including the entire Conception area resulted in a larger basis for unfished biomass, given that this area was estimated to contain nearly half of the stock’s total west coast biomass. It was noted that there could be regional management concerns with this stock because while the assessment OY was coastwide, there are differences in historic exploitation rates north and south of Point Conception. It was also noted the biomass estimate south of Pt. Conception was more uncertain than that in the north.

The 2013 stock assessment estimated the shortspine thornyhead spawning stock biomass to be at 74.2 percent of its initial, unfished biomass in 2013 (Taylor and Stephens 2013). A longer time series of the coastwide NWFSC trawl survey biomass estimates were included in this assessment relative to the 2005 assessment. Therefore, the STAT concluded there was no greater uncertainty in the biomass south of Pt. Conception relative to estimates for the rest of the coast. As in the previous assessment, no age data were used in the 2013 assessment and growth parameters were fixed at the same values used in 2005.

Stock Productivity

Taylor and Stephens (2013) estimated annual shortspine recruitment using a Beverton-Holt stock-recruitment function and assuming a steepness value of 0.6. Most 2013 rockfish assessments used a steepness prior of 0.779, estimated from a meta-analysis of rockfish assessment results. This value might be expected in the 2013 longspine assessment; however, rockfish ecology and reproduction are quite different from those of thornyheads, which (for example) do not give birth to live young but rather spawn floating egg masses.

Steepness in the shortspine thornyhead assessment was fixed at 0.6 both in the 2005 and 2013 models (Hamel 2006c; Taylor and Stephens 2013). This value was justified based on consistency between the modeling approach and management targets, in addition to being within a range of biologically reasonable values.

Annual deviations about this stock-recruitment curve were estimated for the years 1944 through 2012. Estimated recruitments do not show high variability, and the uncertainty in each estimate is greater than the variability between estimates. The 2013 shortspine assessment is relatively uninformative of relative year class strength since ages were not used in the model (thornyheads are notoriously difficult to age). Therefore, a length-based assessment with an assumed steepness is used to determine recruitment.

Fishing Mortality

Landings of shortspine were estimated to have risen to a peak of 4,815 mt in 1989, followed by a sharp decline during a period of trip limits and other management measures imposed in the 1990s. Since the institution of separate trip limits for shortspine and longspine thornyheads, the fishery had more moderate removals of between 1,000 and 2,000 mt per year from 1995 through 1998. Landings fell below 1,000 mt per year from 1999 through 2006, then rose to 1,531 in 2009 and have declined since that time.

Exploitation rates in terms of spawning potential ratio indicates that the exploitation slightly exceeded the F_{MSY} target for a single year in 1985 and then for the period 1989-1994. However, the stock status is estimated to have never fallen below the $B_{40\%}$ management target.

1.1.4.18 Spiny Dogfish

Distribution and Life History

In the Northeast Pacific, spiny dogfish (*Squalus suckleyi*) occur from the Gulf of Alaska, with isolated individuals found in the Bering Sea, southward to San Martin Island, in southern Baja California. They are extremely abundant in waters off British Columbia and Washington, but decline in abundance southward along the Oregon and California coasts (Ebert 2003; Ebert, *et al.* 2010).

The U.S. west coast spiny dogfish stock likely has interaction and overlap with dogfish observed off British Columbia. About 1,300 dogfish were tagged along the coast of Washington from 1942-1946, during the period of the strong directed fishery for dogfish. Only 50 of these fish were recaptured and had tags returned (4%), of which 54% were recaptured within U.S. coastal waters, while 32% were recaptured in coastal Canada and 12% in the inside waters of Puget Sound and the Strait of Georgia. One fish was recaptured in coastal Japanese waters (7 years after being tagged). Because many of the releases were close to the U.S.-Canada border, and the fractions do not take into account the relative fishing pressure within each area, this study is of limited use in providing reliable information about dogfish movement rates.

A spatial population dynamics model (Taylor 2008), which included these tagging data (along with much larger tagging experiments conducted in Canada and inside U.S. waters of Puget Sound) estimated movement rates of about 5% per year between the U.S. coastal sub-population of dogfish and that found along the west coast of Vancouver Island in Canada. The model also estimated movement rates of less than 1% per year between the U.S. coastal sub-population of dogfish and that in the Puget Sound.

These sharks appear to prefer areas in which the water temperature ranges from 5 to 15° C, often making latitudinal and depth migrations to follow this optimal temperature gradient (Brodeur, *et al.* 2009). There is also evidence of seasonal movement along the coast based on both tagging data and timing of historical fisheries (Ketchen 1986). One estimate of the seasonal movement along the Pacific coast is a North-South shift of about 600 km from winter to summer (Taylor 2008). This seasonal pattern is not as extreme as that found among spiny dogfish in Atlantic waters of the U.S., which are likely due to larger fluctuations in temperature. Dogfish have also been captured in high-seas salmon gillnets across the North Pacific between about 40° and 50° N lat. (Nakano and Nagasawa 1996), but the extent of these wide-ranging pelagic movements is poorly understood.

The biology and life history of spiny dogfish are relatively well studied (Campana, *et al.* 2009; Di Giacomo, *et al.* 2009; Taylor 2008; Tribuzio 2009; Tribuzio, *et al.* 2009; Tribuzio, *et al.* 2010; Vega, *et al.* 2009). This species is an opportunistic feeder that consumes a wide range of prey (whatever is abundant). Schooling pelagic fish, such as herring, make up the majority of its diet. They also feed on invertebrates such as shrimp, crab and squid. In turn, dogfish are preyed upon by larger cod, hake, and other spiny dogfish (Beamish, *et al.* 1992; Brodeur, *et al.* 2009; Tanasichuk, *et al.* 1991). Larger species of sharks, as well as seals and killer whales, also feed on dogfish.

Spiny dogfish have internal fertilization and ovoviviparous development. The internal development takes place over 22-24 months, the longest gestation period known for sharks. The number of pups in each litter ranges between 5 and 15 individuals depending on the size of the female (larger females bearing more pups). The size at birth is generally between 20 and 30 cm for both genders. Male spiny dogfish are reported to grow faster than females, but females reach larger sizes. This species is the latest maturing (with 50% female maturity reported at 35.5 years) and longest lived of all elasmobranchs (Cortes 2002; Saunders and McFarlane 1993; Smith, *et al.* 1998; Taylor 2008). Life history traits of spiny dogfish make the species highly susceptible to overfishing and slow to recover from stock depletion since its slow growth, late maturation, and low fecundity are directly related to recruitment and spawning stock biomass (Holden 1974; King and McFarlane 2003).

Stock Status and Management History

Spiny dogfish on the U.S. west coast have been utilized for almost a thousand years, with those in Puget Sound first used by Native Americans (Bargmann 2009). The exploitation of spiny dogfish in coastal waters, however, started in the 20th century. Even though the history of spiny dogfish utilization on the U.S. west coast included a brief but intense commercial fishery in the 1940s, in general this species is not highly prized and is mostly taken as bycatch in other fisheries.

Prior to 1936, coastal catches of spiny dogfish were extremely minimal, but in 1936, shortly after it was discovered that livers of spiny dogfish have high level of vitamin A, a large scale fishery for dogfish developed in the Pacific Northwest. Before World War II, Northeast Pacific dogfish livers could not compete with the cheaper and more potent sources of vitamin A from Europe. But when World War II started and European supplies were cut, dogfish shark livers became the major source of vitamin A in the United States, and the spiny dogfish fishery grew rapidly along the Pacific coast. The processed liver oils were used in pharmaceuticals, food processing, and animal feed (Bargmann 2009; Ketchen 1986).

During the liver fishery, dogfish were targeted by three major gear groups, including setlines, set nets, and bottom trawls. The timing of the dogfish liver fishery coincided with the development of bottom trawling in the U.S. Northwest, and though at the onset of the fishery the catches by trawl were low, by the mid-1940s trawling was the dominant type of fishing for dogfish.

In 1945, a sharp decline in spiny dogfish catches began. This decline occurred despite continued strong demand for vitamin A and high prices for dogfish livers, but because of decreased availability of the species in the Northeast Pacific (Bargmann 2009; Ketchen 1986). In 1950, with the advent of synthetic vitamins, demand for spiny dogfish livers declined and catches in the Northeast Pacific virtually ended.

Between 1950 and 1974, the landings of spiny dogfish remained minimal. By the late 1950s it was reported that species availability had increased. Also, in the late 1950s-early 1960s, dogfish earned a bad reputation among fishermen. They were blamed for driving off commercially valuable species such as herring and mackerel, while consuming large numbers of them. Spiny dogfish have also been observed biting through nets to get to their fish prey, releasing many of them and damaging fishing gear in the process. They were also reported damaging gear when become entangled in commercial nets. As a result, fishermen were trying to avoid areas with higher chances of dogfish catches (such as soft bottoms, for example) to prevent encountering dogfish and potentially damaging their gear.

A market opportunity for dogfish developed in the mid-1970s. In Europe, spiny dogfish has long been used an inexpensive source of human food, for fish and chips in particular. A decline in the European dogfish supply provided an opportunity for developing an export dogfish food fishery on the U.S. west coast. Also, during the late 1970s, shark cartilage started to be used in cancer treatment, and a portion of spiny dogfish catches have since been sold for medical research and treatment (Gregory Lippert, WDFW, pers. com. as cited by Gertseva and Taylor (2011)). As before, three types of gear were involved in catching dogfish (bottom trawl, setlines, and sunken gill nets), but since the mid-1980s catches by gillnets have been minimal.

Spiny dogfish is a common bycatch species, often caught in other fisheries and largely discarded. For instance, it has long been incidentally caught in the hake fishery, which is almost exclusively conducted with mid-water trawls. Large-scale harvesting of Pacific hake in the U.S. began in 1966, when factory trawlers from the Soviet Union and other countries began targeting this stock. After the 200-mile U.S. EEZ was declared in 1977, a joint-venture fishery was initiated between U.S. trawlers and Soviet factory trawlers acting as motherships (larger, slower ships for fish processing and storage while at sea). By 1989 the U.S. fleet capacity had grown to a level sufficient to harvest the entire quota, and no further foreign fishing was allowed. The Pacific hake fishery is currently 100% observed at sea and data on bycatch species, including spiny dogfish, is being routinely collected.

Spiny dogfish on the U.S. west coast has been managed under the Other Fish complex since implementation of the Groundfish FMP by the Council in 1982. In 2005, reduction in the Other Fish ABC was implemented due to removal of the California substock of cabezon from the Other Fish complex. The same year, a 50% precautionary OY reduction was implemented to accommodate uncertainty associated with managing unassessed stocks. In 2006, a trip limit for spiny dogfish was imposed for U.S. west coast waters which varied between 45 and 91 mt per two months for all gears. In 2009, another ABC reduction was implemented due to removal of longnose skate from the Other Fish complex and the 50% OY reduction was maintained.

In 2011, reduction in the Other Fish OFL was implemented due to removal of the Oregon substock of cabezon from the Other Fish complex. The 50% precautionary reduction to the ACL was maintained; however, a scientific uncertainty buffer was specified as an ABC of 7,742 mt under the Amendment 23 framework.

Gertseva and Taylor (2011) estimated the spawning stock output of spiny dogfish to be 44,660 thousands of fish (95% confidence interval: 8,937-80,383), which represents 63% of the unfished spawning output level. While this depletion level indicates the stock is currently healthy, fishing at the target SPR of 45% is expected to severely reduce the spawning output over the long term because of the extremely low productivity and other reproductive characteristics of the stock. The Council partially addressed this by setting a more conservative spiny dogfish ABC for 2013 by specifying a P* of 0.3.

The Council further decided to manage spiny dogfish with stock-specific harvest specifications beginning in 2015. The SSC also investigated establishing a more conservative F_{MSY} harvest rate for spiny dogfish and other elasmobranchs in recognition of their lower productivity. The SSC recommended and the Council adopted a more conservative proxy 50% SPR harvest rate as an interim measure for elasmobranchs. The 50% SPR was based on an SSC meta-analysis of Chondrichthyes species using the posterior distribution for F_{MSY}/M values as reported by Zhou et al. (2012). The SSC said they may further investigate sustainable harvest rates for Council-managed elasmobranchs as more information becomes available in the future.

Stock Productivity

Spiny dogfish have a relatively low stock productivity due to slow growth, late maturation, and low fecundity. The fecundity of dogfish in the Northeast Pacific Ocean has been well studied, with pregnant females having relatively few pups per litter (5 to 15), and with relatively little variability among individuals. Unlike fish producing millions of eggs, the low fecundity of dogfish suggests both low productivity in general and a more direct connection between spawning output and recruitment than for many species.

Gertseva and Taylor (2011) modeled the spiny dogfish spawner-recruit relationship using a new functional form that was recently added to the Stock Synthesis platform, which allowed a more explicit modeling of pre-recruit survival between the stage during which embryos can be counted in pregnant females to their recruitment as age 0 dogfish. This new method may be useful for a variety of low fecund species, as well as providing additional flexibility in the spawner-recruit relationship that may be explored for any stock. The method is an expansion and improvement on similar approaches previously applied to dogfish (Taylor 2008; Wood, *et al.* 1979), which assumed a linear decline in age 0 survival as a function of population density. While steepness was not estimated or assumed in the conventional sense of a Beverton-Holt stock-recruitment relationship, a value for steepness can be calculated using a formula provided by Gertseva and Taylor (2011). The calculated value of steepness is 0.28, indicating a great degree of compensation or density-dependent recruitment.

Fishing Mortality

During the last 10 years, relative exploitation rates (catch/summary biomass) are estimated to have hovered around 1% and SPR is estimated to be well above pre-2015 management target of SPR 45%. The 2011 assessment identified a period during the vitamin A fishery in the 1940s when the exploitation rate exceeded the current F_{MSY} proxy harvest rate.

1.1.4.19 Splitnose Rockfish South of 40°10’ N Lat.

Distribution and Life History

Splitnose rockfish (*Sebastes diploproa*) are distributed from the northern Gulf of Alaska (Prince William Sound) to central Baja California and occur at depths between 91-795 meters. Adults are the most abundant between British Columbia and southern California at depths from 215 to 350 meters (Alverson, *et al.* 1964; Gunderson and Sample 1980; Love, *et al.* 2002). The species is distinguished by having a deeply notched upper jaw, which inspired its Greek name diploproa, meaning "double prow". Splitnose rockfish are commonly seen on low-relief mud fields of the continental shelf and upper slope, often near isolated rock, cobble or shell debris. Solitary individuals are often found resting on the seafloor, although they occasionally form schools that move more than 100 meters in the water column (Love, *et al.* 2002; Rogers 1994).

Splitnose rockfish co-occur with an assemblage of slope rockfish, including Pacific ocean perch (*Sebastes alutus*), darkblotched rockfish (*Sebastes crameri*), yellowmouth rockfish (*Sebastes reedi*), and sharpchin rockfish (*Sebastes zacentrus*) off Washington and Oregon, and stripetail rockfish (*Sebastes saxicola*), darkblotched rockfish and shortspine thornyhead (*Sebastolobus alascanus*) off central California. Pacific ocean perch and darkblotched rockfish are the most abundant members of that assemblage off the coasts of Oregon and Washington, but splitnose rockfish and darkblotched rockfish dominate off the northern coast of California. Lesser amounts of splitnose have also been noted in the deepwater DTS assemblage and with shrimp catch (Rogers 1994; Rogers and Pikitch 1992; Weinberg 1994).

There are no clear stock delineations for splitnose rockfish in the U.S. waters. No molecular markers have yet been developed for this species, and no genetic data are currently available to suggest the presence of several stocks (Waples, *et al.* 2008). No distinct breaks are seen in the fishery landings and catch distributions. Survey catches imply a continuous distribution. The spatial dynamic cluster analysis of the Northwest Fisheries Science Center (NWFSC) survey abundance indices (Cope and Punt 2009) provided no evidence of spatial stock structure for splitnose rockfish off Washington, Oregon, and California.

Splitnose rockfish are documented in the literature to live to at least 86 years (Bennett, *et al.* 1982), although a fish encountered in a NMFS survey was aged at 103 years old. This is a small species – the maximum size reported in the literature is 46 cm (Love, *et al.* 2002); the vast majority of individuals caught in NMFS surveys were under 44 cm in fork length, although a few fish larger than this were caught.

Splitnose rockfish exhibit sexual dimorphism in growth. Although the males grow to their maximum lengths earlier than females, females reach larger sizes than males (Boehlert 1980; Love, *et al.* 2002). It was hypothesized that life history characteristics may vary with latitude, but that is uncertain. Boehlert and Kappenman (1980) detected greater size-at-age with increasing latitude and suggested more rapid growth of fish in the northern end of their range. Analysis of the NWFSC shelf-slope survey data did not show a distinct gradient in growth rate between north and south, although the asymptotic length (Linf) exhibits a latitudinal gradient (Gertseva, *et al.* 2009). Growth of splitnose rockfish was found to correlate with climate and environmental variables, including sea surface temperature, the El Niño Southern Oscillation (ENSO) index, and the Pacific Decadal Oscillation (PDO) (Black 2009; Black, *et al.* 2008); more information is needed to develop climate-growth relationships for stock assessment purposes.

Female splitnose rockfish off California mature at 6-9 years old (18-23 cm long) (Echeverria 1987), and their fecundity increases with size (Phillips 1964). Splitnose rockfish mature somewhat later off British Columbia - both males and females reach 50% maturity at size of 27 cm (Westrheim 1975). Like other rockfishes, splitnose utilize internal fertilization and bear live young (Love, *et al.* 2002). This species can exhibit a long reproductive season, with young larvae found in all months off southern California, from January to September off central California, from March to September in Oregon, and in July off Washington (Love, *et al.* 2002; Moser, *et al.* 2000).

Young juveniles live at the surface for several months, then go through a transitory midwater residence, and finally settle to benthic habitats near the end of their first year of life (Love, *et al.* 2002). During their first year, splitnose have been found living among drifting vegetation in Puget Sound and southern California, and under floating objects in Queen Charlotte Sound, British Columbia (Shaffer, *et al.* 1995). Pelagic juvenile splitnose feed on calanoid copepods and amphipods (Shaffer, *et al.* 1995), while benthic juveniles and adults eat krill, copepods, sergestid shrimps and amphipods. Splitnose are prey of Steller sea lions and other pinnipeds (Love, *et al.* 2002).

Size-composition data for splitnose rockfish show a strong gradient of body size with depth, with smaller fish in shallow waters, suggesting ontogenetic movements of splitnose rockfish to deeper waters with increasing size and age, a common phenomenon in the genus *Sebastes* (Boehlert 1980).

Stock Status and Management History

Limits on domestic rockfish catches were first instituted in 1983, with splitnose rockfish managed as a part of the *Sebastes* complex, which included around 50 species. The ABC for the *Sebastes* complex was estimated for each International North Pacific Fisheries Council (INPFC) area along the coast based on historic landings. In 1994, the *Sebastes* complex was divided into southern and northern management areas, and harvest guidelines were established for the complex in each area. The southern area included Conception, Monterey and Eureka INPFC areas, and the northern area included Columbia and U.S.-Vancouver INPFC areas.

In response to a concern that deepwater species off Oregon and Washington might have been overharvested, Rogers (1994) conducted a preliminary assessment of splitnose rockfish, which focused on compiling and reviewing the available data. However, since the data were sparse and no evident trends in biomass or mean size were detected, the results were inconclusive. In 1996 the status of several rockfish species, which were part of the *Sebastes* complex, were assessed (Rogers, *et al.* 1996), and ABCs for splitnose rockfish in the southern area were calculated to be 868 mt for the southern management area and 274 mt for the northern management area. These amounts were not specified individually, but included in the total ABCs for the *Sebastes* complex.

In 1998, unusually high splitnose rockfish landings drove *Sebastes* complex harvests in the southern management area sharply upward. In 1999, for the first time, splitnose rockfish were individually separated from the southern *Sebastes* complex. Individual ABCs and OYs for splitnose rockfish in that area have been specified along with splitnose-specific trip limits since then. The ABC for the southern management area was set at 868 mt, as estimated in the 1996 assessment of the remaining rockfish in the *Sebastes* complex (Rogers, *et al.* 1996).

Additionally in 1999, the general *Sebastes* complex was divided into nearshore, shelf, and slope assemblages, and the dividing line between the northern and southern management areas was shifted southward to 40º10’ N lat., near Cape Mendocino. Since that time, in the northern area, splitnose has been managed under trip limits for minor slope rockfish. In 2000, harvest specifications for splitnose rockfish were set for the Conception and Monterey areas only, and 48 mt for the Eureka area were added to the northern minor rockfish ABC. Also, a precautionary adjustment of the OY (reduced from the ABC by 25%) was specified to account for the limited nature of the assessment. In 2000, the ABC and OY for splitnose rockfish south of 40º10’ N lat. were reduced based on the revised F_{MSY} harvest rate policy. During the last 10 years, the coastwide landings and total catch of splitnose rockfish were relatively low, and the limits established for the area south of 40º10’ N lat. have not been exceeded.

Gertseva et al. (2009) assessed splitnose rockfish coastwide and determined the stock was healthy with a depletion of 66 percent at the start of 2009. Since 1999, the splitnose spawning output was estimated to have been increasing in response to below-average removals and above-average recruitment during the last decade. At the beginning of 2009 the estimated spawning stock output was 8,426 million eggs. Uncertainty in the model was explored though asymptotic variance estimates and sensitivity analyses. Asymptotic confidence intervals were estimated within the model and reported throughout the assessment for key model parameters and management quantities. Uncertainty in recent recruitment was used to define alternative states of nature and develop the decision table.

Stock Productivity

Steepness of the stock-recruitment curve was fixed at a value of 0.58 in the 2009 splitnose rockfish assessment, as estimated by a meta-analysis for unassessed rockfish. Recruitment deviations were estimated for each year between 1960 and 2006, which was the period best informed by the data based on evaluation of the variance of the recruitment deviations. Prior to 1960 and after 2006, recruits were taken deterministically from the stock-recruit curve. The model estimated above-average recruitments in the most recent years beginning 1999 (), which along with low catches during the last decade determine a population increase in recent and early forecast years. Uncertainty in recent recruitment was used to define alternative states of nature and develop the decision table.

Fishing Mortality

Splitnose rockfish have been taken incidentally in fisheries such as the trawl fisheries targeting POP, mixed slope rockfish, and other deepwater targets, but have not been a commercial target species. Splitnose rockfish were lightly exploited until the 1940s, when the trawl fishery for rockfish first became important. With the development of the POP fishery (a species with which splitnose rockfish co-occur), spawning output of splitnose rockfish began to decline. A sharp drop in the 1960s was associated with large harvests of POP by foreign trawl fleets operating in the U.S. EEZ. Another drop occurred in 1998 when the increased availability of splitnose rockfish led to high removals off California. Since 1999, the splitnose spawning output was estimated to have been increasing in response to below-average removals and above-average recruitment during the last decade.

It was decided to continue management of splitnose rockfish with stock-specific specifications south of 40°10’ N lat. and under the Slope Rockfish complex north of 40°10’ N lat. when the coastwide splitnose rockfish assessment was first used to inform management in 2011. A north-south apportionment based on the average 1916-2008 assessed area catch resulting in 64.2 percent stock-specific specification in the southern area and 35.8 percent for the contribution of splitnose rockfish to the Slope Rockfish North complex was used to apportion harvest specifications since 2011. The Council recommended continuing this management strategy largely due to the implications of determining the uncertain catch history by trawl permit to initially allocate trawl splitnose quota shares (QS) under Amendment 20. Since splitnose rockfish are not targeted and predominantly discarded at sea, little data would be available to determine catch history.

1.1.4.20 Starry Flounder

Distribution and Life History

Starry flounder (*Platichthys stellatus*) have a very broad geographic distribution around the rim of the North Pacific Ocean and have been recorded from Los Angeles to the Aleutian Islands, although they are rare south of Point Conception (Kramer and O'Connell 1995; Orcutt 1950). Off the U.S. west coast starry flounder are found commonly in nearshore waters, especially in the vicinity of estuaries (Baxter 1999; Kimmerer 2002; NOAA 1990; Orcutt 1950; Pearson 1989; Sopher 1974). It has quite a shallow bathymetric distribution, with most individuals occurring in waters less than 80 m, although specimens have been collected off the continental shelf in excess of 350 m (Kramer and O'Connell 1995; Orcutt 1950). They are most often found on gravel, clean shifting sand, hard stable sand, and mud substrates.

Spawning occurs primarily during the winter months of December and January, at least in central California (Orcutt 1950); it may occur somewhat later in the year (February-April) off British Columbia and Washington (Hart 1988; Love 1996). Egg/larval development apparently takes about 2-3 months to occur. Offspring principally remain within the estuaries until age two, when many have migrated to the adjacent ocean habitats (Baxter 1999; Kimmerer 2002; Orcutt 1950). Reproductive maturity occurs at age two years for males and age three years for females, when the fish are 28 cm and 35 cm, respectively. Tagging studies have shown that fish are relatively sedentary and move little during their adult lives (Love 1996); however, there is little information on regional variation in stock structure.

Starry flounder consume crabs, shrimps, worms, clams and clam siphons, other small mollusks, small fish, nemertean worms, and brittle stars (Hart 1988).

Stock Status and Management History

The U.S. west coast starry flounder stock was assessed in 2005 (Ralston 2006). The assessment was based on the assumption of separate biological populations north and south of the California-Oregon border. The assessment used catch data, relative abundance indices derived from trawl logbook data, and an index of age-1 abundance from trawl surveys in the San Francisco Bay and Sacramento-San Joaquin River estuary. Unlike most other groundfish stock assessments, no age- or length-composition data were directly used in the assessment. Both the northern and southern populations were estimated to be above the target level of 40 percent of virgin spawning biomass (44 percent in Washington-Oregon and 62 percent in California), although the status of this data-poor species remained fairly uncertain compared to that of many other groundfish species. One of the most significant areas of uncertainty in the assessment was the estimate of natural mortality rate, which was quite high (0.30 for females and 0.45 for males).

Starry flounder were managed in the Other Flatfish complex until 2007, when the stock was removed from the complex and managed with stock-specific specifications determined from the assessment. Starry flounder have never been overfished or subject to overfishing.

Stock Productivity

Recruitment deviations were estimated in both the northern and southern starry flounder assessment models, although selectivity patterns were fixed external to the model after analysis of trawl length composition information from the PacFIN-BDS data base and sport length composition information from the RecFIN data base. Growth and other life history parameters were also fixed, largely based on a detailed study of starry flounder by Orcutt (1950). Finally, spawner-recruit steepness ($h = 0.80$) and recruitment variability ($\sigma r = 1.00$) were also held constant.

Starry flounder is a relatively productive stock with a PSA productivity score of 2.15. They are also not vulnerable to potential overfishing ($V = 1.04$).

Fishing Mortality

Starry flounder are mostly caught in nearshore recreational fisheries. Historically, they were also caught in nearshore trawl efforts; however, this catch is rare today given that Washington and California have closed their state nearshore waters to trawling. Both the northern and southern stocks were estimated to be well above the $B_{25\%}$ B_{MSY} threshold ($B_{44\%}$ in Washington-Oregon and $B_{62\%}$ in California). In addition, recent exploitation rates have been well below the F_{MSY} proxy for flatfish. Recent landings in both areas have been less than 20% of the calculated ABC/OFL.

1.1.4.21 Widow Rockfish

Distribution and Life History

Widow rockfish (*Sebastes entomelas*) range from Albatross Bank off Kodiak Island to Todos Santos Bay, Baja California, Mexico (Eschmeyer, *et al.* 1983; Miller and Lea 1972; NOAA 1990). They occur over hard bottoms along the continental shelf (NOAA 1990) and prefer rocky banks, seamounts, ridges near canyons, headlands, and muddy bottoms near rocks. Large widow rockfish concentrations occur off headlands such as Cape Blanco, Cape Mendocino, Point Reyes, and Point Sur. Adults form dense, irregular, midwater and semi-demersal schools deeper than 100 m at night and disperse during the day (Eschmeyer, *et al.* 1983; NOAA 1990; Wilkins 1986). All life stages are pelagic, but older juveniles and adults are often associated with the bottom (NOAA 1990). All life stages are fairly common from Washington to California (NOAA 1990). Pelagic larvae and juveniles co-occur with yellowtail rockfish, chilipepper, shortbelly rockfish, and bocaccio larvae and juveniles off Central California (Reilly, *et al.* 1992).

Widow rockfish are ovoviviparous, have internal fertilization, and brood their eggs until released as larvae (NOAA 1990; Reilly, *et al.* 1992). Mating occurs from late fall-early winter. Larval release occurs from December through February off California, and from February through March off Oregon. Juveniles are 21 mm to 31 mm at metamorphosis, and they grow to 25 cm to 26 cm over three years. Age and size at sexual maturity varies by region and sex, generally increasing northward and at older ages and larger sizes for females. Some mature in three years (25 cm to 26 cm), 50 percent are mature by four years to five years (25 cm to 35 cm), and most are mature in eight years (39 cm to 40 cm) (NOAA 1990). The maximum age of widow rockfish is 28 years, but rarely over 20 years for females and 15 years for males (NOAA 1990). The largest size is 53 cm and about 2.1 kg (Eschmeyer, *et al.* 1983; NOAA 1990).

Widow rockfish are carnivorous. Adults feed on small pelagic crustaceans, midwater fishes (such as age-one or younger Pacific whiting), salps, caridean shrimp, and small squids (Adams 1987; NOAA 1990). During spring, the most important prey item is salps, during the fall fish are more important, and during the winter widow rockfish primarily eat sergestid shrimp (Adams 1987). Feeding is most intense in the spring after spawning (NOAA 1990). Pelagic juveniles are opportunistic feeders, and their prey consists of various life stages of calanoid copepods, and euphausiids (Reilly, *et al.* 1992).

Stock Status and Management History

Widow rockfish are an important commercial species from British Columbia to central California, particularly since 1979, when Oregon trawl fisherman demonstrated the ability to make large catches at night using midwater trawl gear. Many more participants have entered the fishery since that time, and landings of widow rockfish have increased rapidly (Love, *et al.* 2002). Widow rockfish are a minor component of the recreational groundfish fisheries.

Williams et al. (2000) assessed the coastwide stock of widow rockfish in 2000. The spawning output level (8,223 mt eggs), based on that assessment and a revised rebuilding analysis (Punt and MacCall 2002) adopted by the Council in June 2001, was at 23.6 percent of the unfished level (33,490 mt eggs) in 1999. The widow rockfish stock was declared overfished in 2001 based on this assessment result.

It was concluded in the 2003 assessment (He, *et al.* 2003) that the widow rockfish stock size was at 24.7 percent of the unfished biomass and that stock productivity was considerably lower than previously thought. Data sparseness was a significant problem in this widow rockfish assessment. Results from the 2003 widow rockfish rebuilding analysis were used to develop the first widow rockfish rebuilding plan, which was adopted in April 2004 under Amendment 16-3 to the groundfish FMP. The rebuilding plan established a target rebuilding year of 2038 and a harvest control rule of F = 0.0093 (with a P_{MAX} of 60 percent).

A full assessment was completed in 2005 for widow rockfish (He, *et al.* 2006a). In addition to including the new data from 2003 to 2004, this assessment added an index of relative abundance based on the triennial survey data and estimated the power coefficient of the midwater juvenile survey index instead of using a fixed value. The base model estimated that spawning biomass declined steadily since the early 1980s and that spawning output in 2004 was 31 percent of the unexploited level, above the Council's overfished threshold. Further, spawning output in the base model was estimated to have never dropped below the 25 percent overfished threshold. Alternative model runs, which were considered to be only slightly less plausible than the base model, however, indicated that the stock had been below $B_{25\%}$. The 2005 rebuilding analysis indicated that the stock was much closer to reaching a rebuilt biomass than previously estimated: under the 2005 rebuilding analysis (He, *et al.* 2006b), T_{MIN} was estimated to be 2013, compared to a T_{MIN} of 2026 in the 2003 analysis (He, *et al.* 2003). This rebuilding analysis was used to modify the widow rockfish rebuilding plan, which was adopted under Amendment 16-4 in 2006. The target rebuilding year under the modified rebuilding plan was 2015 and the harvest control rule was an SPR harvest rate of 95 percent.

An updated assessment was done in 2007 (He, *et al.* 2008) using the same age-based model (written in ADMB) and data compiling procedures used in the previous assessment. New data from 2005 and 2006, including catches, age composition, and a CPUE time series, were included in the 2007 assessment. Sources of uncertainty include a questionable source of information (Oregon bottom trawl logbook data); the validity of the fixed natural mortality rate used; the estimation of stock-recruitment relationships, which also led to uncertainty in the rebuilding analysis; the appropriateness of using the Santa Cruz juvenile survey data; and stock structure issues including relationship to the Canadian stock. The estimated total biomass in 2006 was 120,132 mt and the estimated 2006 spawning biomass was 47,478 mt. Spawning biomass in the 2007 assessment is higher than in the 2005 assessment primarily because of the relatively strong recruitment in 2003 by the 2000 cohort. The estimated current depletion rate is 35.5 percent of the unfished spawning output. The ABC for 2007 is 5,334 mt and the harvest guideline is 368 mt. It is estimated that the population will recover to the target in 2009, which is six years earlier than the target year in the rebuilding plan. Based on these results, the SSC recommended no changes to the rebuilding plan.

Future research needs include reliable abundance indices, continue the long-term recruitment index and midwater juvenile trawl survey, ability to infer direct and indirect estimates of year class strengths, better understand the relationship between environmental conditions in the California Current Ecosystem, improve short-term forecasts of productivity, biomass levels and allowable catches from stock assessments, new discard data, evaluate the utility of hydro-acoustic surveys, increase age-collection programs to increase sample size, and determination of age-composition for the triennial survey.

A full assessment of widow rockfish was conducted in 2011 (He, *et al.* 2011), which indicated the spawning stock biomass was successfully rebuilt with a depletion of 51 percent at the start of 2011. However, there is considerable uncertainty regarding the new stock assessment’s finding that the stock has rebuilt. Productivity and status of this stock are highly uncertain because the available biomass indices are not informative. Nonetheless, the SSC considered the base model of the new widow rockfish assessment to be the best available science.

Stock Productivity

The major axis of uncertainty in the new widow rockfish assessment is steepness, which defines the relative productivity of the stock. The SSC recommended fixing the steepness parameter at 0.76 in the assessment, due to the lack of information to reliably estimate steepness. The steepness parameter of 0.76 is the median value in the distribution of steepness parameters of assessed rockfish species in the Dorn (2002a) meta-analysis. The decision table in the assessment was developed to bracket model uncertainty in widow rockfish productivity with alternative values of steepness. The 12.5 percent and 87.5 percent quantiles from the prior distribution on h translate into steepness values of 0.54 and 0.95, respectively. This range was considered reasonable to account for the uncertainty associated with steepness. It was, however, agreed by the STAT and the SSC to shift this range to a lower steepness value to (a) take account of the data which, while not greatly informative, did provide some evidence for a lower steepness value, and (b) provide continuity by considering the value of steepness used in the 2009 assessment (0.41). As a result, steepness values of 0.41 and 0.90 were used for the low and high states of nature in the assessment decision table.

The high uncertainty in the steepness of the stock-recruitment relationship and the lack of recent strong recruitments compels a precautionary approach to managing widow rockfish. If the pessimistic state of nature is correct (h = 0.41), then annual constant catches of up to 1,500 mt are projected to maintain spawning stock biomass above the MSST during the 10-year projection period (i.e., 2013-2022).

The base model in the 2011 widow assessment estimated a time series of recruitment of age-0 fish from 1948 to 2009. The highest recruitment occurred in 1970 (Figure 23). Recruitments remained generally low in the early 1990s and have been very low since 2001, as compared to the long-term average. As in the past widow assessments, uncertainties in estimation of recruitment remain high.

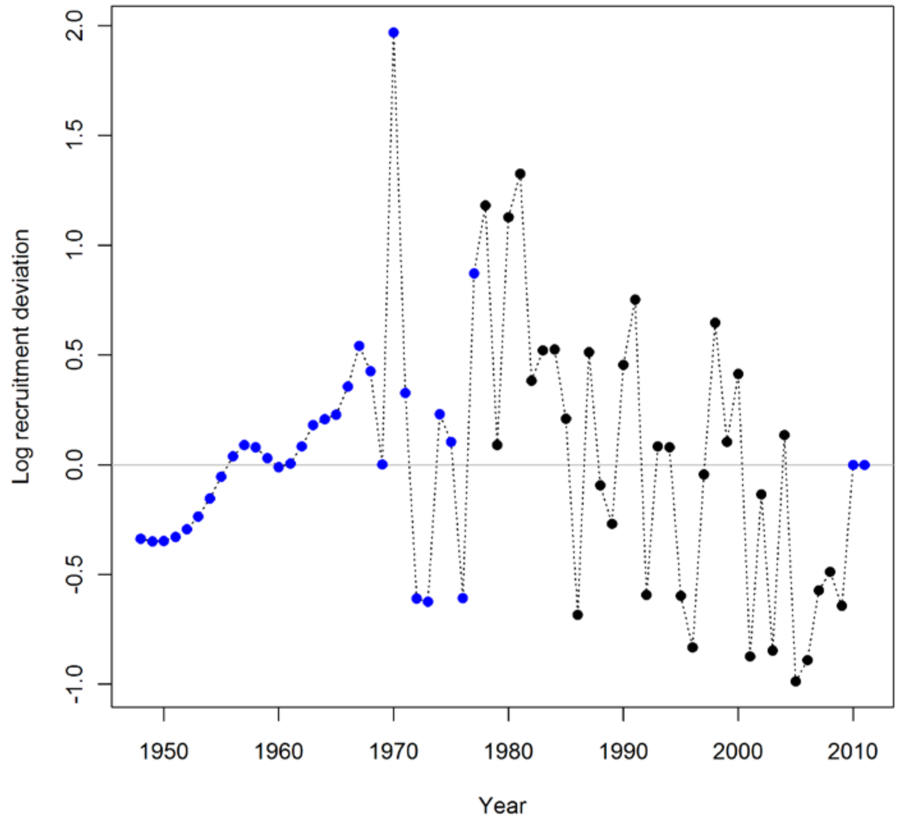

Figure 23. Time series of estimated recruitments from the base model in the 2011 widow rockfish assessment.

Fishing Mortality

Widow rockfish are caught mostly in midwater trawls used to target Pacific whiting and, before 2002, used to target widow and yellowtail rockfish. The exploitation rate was above the target SPR of 50 percent (i.e., $F<F_{MSY}$) until the late 1970s when trawl catches in the target midwater fishery increased to rates beyond the target. This continued until the stock was declared overfished and managed under a rebuilding plan. Harvest declined dramatically and the estimated SPR harvest rates increased rapidly above target F_{MSY}. The increase in biomass during the past decade was the result of reduced catches rather than strong year-classes.

Lower OYs specified in 2005-2010 were not exceeded as the fishery was managed to avoid widow bycatch and the percent of OY attainment decreased with time during that period. The percent attainment of the 2011 IFQ allocation was 40 percent. The at-sea whiting sectors have been better able to avoid widow rockfish in recent years with the lowest bycatch rates (widow catch/whiting catch) observed in the past couple of years.

Management uncertainty is low since widow rockfish is a trawl-dominant species and there is mandatory 100 percent observer coverage in trawl fisheries.

1.1.4.22 Yellowtail Rockfish North of 40º10' N lat.

Distribution and Life History

Yellowtail rockfish (*Sebastes flavidus*) range from San Diego, California, to Kodiak Island, Alaska (Fraidenburg 1980; Gotshall 1981; Lorz, *et al.* 1983; Love, *et al.* 2002; Miller and Lea 1972; Norton and MacFarlane 1995). The center of yellowtail rockfish abundance is from Oregon to British Columbia (Fraidenburg 1980). Yellowtail rockfish are a common, demersal species abundant over the middle shelf (Carlson and Haight 1972; Fraidenburg 1980; Tagart 1991; Weinberg 1994). Yellowtail rockfish are most common near the bottom, but not on the bottom (Love, *et al.* 2002; Stanley, *et al.* 1994). Yellowtail rockfish adults are considered semi-pelagic (Stanley, *et al.* 1994; Stein, *et al.* 1992) or pelagic, which allows them to range over wider areas than benthic rockfish (Pearcy 1992). Adult yellowtail rockfish occur along steeply sloping shores or above rocky reefs (Love, *et al.* 2002). They can be found above mud with cobble, boulder and rock ridges, and sand habitats; they are not, however, found on mud, mud with boulder, or flat rock (Love, *et al.* 2002; Stein, *et al.* 1992). Yellowtail rockfish form large (sometimes greater than 1,000 fish) schools and can be found alone or in association with other rockfishes (Love, *et al.* 2002; Pearcy 1992; Rosenthal, *et al.* 1982; Stein, *et al.* 1992; Tagart 1991). These schools may persist at the same location for many years (Pearcy 1992).

Yellowtail rockfish are viviparous (Norton and MacFarlane 1995) and mate from October to December. Parturition peaks in February and March and from November to March off California (Westrheim 1975). Young-of-the-year pelagic juveniles often appear in kelp beds beginning in April and live in and around kelp in midwater during the day, descending to the bottom at night (Love, *et al.* 2002; Tagart 1991). Male yellowtail rockfish are 34 cm to 41 cm in length (five years to nine years) at 50 percent maturity, females are 37 cm to 45 cm (six years to ten years) (Tagart 1991). Yellowtail rockfish are long-lived and slow-growing; the oldest recorded individual was 64 years old (Fraidenburg 1980; Tagart 1991). Yellowtail rockfish have a high growth rate relative to other rockfish species (Tagart 1991). They reach a maximum size of about 55 cm in approximately 15 years (Tagart 1991). Yellowtail rockfish feed mainly on pelagic animals, but are opportunistic, occasionally eating benthic animals as well (Lorz, *et al.* 1983). Large juveniles and adults eat fish (small Pacific whiting, Pacific herring, smelt, anchovies, lanternfishes, and others), along with squid, krill, and other planktonic organisms (euphausiids, salps, and pyrosomes) (Love, *et al.* 2002; Phillips 1964; Rosenthal, *et al.* 1982; Tagart 1991).

Stock Status and Management History

Until the late 1990s, yellowtail rockfish were harvested as part of a directed midwater trawl fishery. Yellowtail rockfish are common in both commercial and recreational fisheries throughout its range and commonly occur with canary and widow rockfishes (Cope and Haltuch 2012). Despite historically large removals and its popularity in commercial and recreational fisheries, its association with those highly regulated species has greatly decreased removals over the last decade. From the end of 2002 through 2010, implementation of the RCAs and small landings limits designed to only accommodate incidental bycatch eliminated directed mid-water fishing opportunities for yellowtail rockfish in non-tribal trawl fisheries. A limited opportunity to target yellowtail rockfish in the trawl fishery has been available since 2011 under the trawl rationalization program, yet low quotas for widow rockfish, canary rockfish, and for other constraining stocks has continued to limit mid-water targeting of yellowtail rockfish.

Yellowtail rockfish are currently managed with stock-specific harvest specifications north of 40º10' N lat. and within the southern Shelf Rockfish complex south of 40º10' N lat. There has never been an assessment of the southern stock and the OFL contribution of yellowtail rockfish to the southern Shelf Rockfish complex is based on a DB-SRA estimate.

Yellowtail rockfish on the U.S. west coast north of 40º10' N lat. were assessed in 1984 (Weinberg, *et al.* 1984), 1986 (Coleman 1986), 1988 (Tagart 1988), 1993 (Tagart 1993), 1996 (Tagart and Wallace 1996), and 1997 (Tagart, *et al.* 1997) to determine harvest specifications for the stock. A full assessment in 2000 (Tagart, *et al.* 2000) was the first that estimated stock status with an estimated depletion of 60.5% at the start of 2000. Lai et al. (2003) updated the 2000 assessment and estimated stock depletion was 46% at the start of 2003. Another assessment update was prepared in 2005 (Wallace and Lai 2006) with an estimated depletion of 55% at the start of 2005.

A new data-moderate assessment of yellowtail rockfish north of 40º10' N lat. was conducted in 2013 (Cope and Dick 2014). The estimated depletion at the start of 2013 was 69% and the spawning biomass was estimated to be 38,168 mt. This was a large biomass increase relative to previous estimates and largely due to low removals in the last 10 years.

Stock Productivity

The posterior median estimate of steepness in the 2013 yellowtail rockfish assessment is 0.79, indicating a relatively productive stock. However, this estimate may not be as informative of relative stock productivity. Due to the low susceptibility of yellowtail rockfish to fisheries removals, the vulnerability to overfishing of yellowtail rockfish is relatively low (V = 1.88), though the productivity of this species is also relatively low (P = 1.33) based on other life history traits, including a longevity to almost 70 years.

Fishing Mortality

Fishing mortality of yellowtail rockfish north of 40º10' N lat. was relatively high in the 1980s and 1990s with direct targeting by mid-water trawl gear of yellowtail and widow rockfish. The elimination of that fishery in 2003 to reduce impacts on widow rockfish (and canary rockfish to some degree), coupled with RCA implementation, significantly reduced fishing mortality of yellowtail rockfish. The decision table in the 2013 assessment predicts the stock will keep building under the average annual catch estimated in the assessment (1,376 mt) and would remain at a healthy level in the next 10 years (i.e., above B_{MSY}) at catch levels over 4 times that amount.

1.1.5 Groundfish Stock Complexes

There are eight stock complexes for which ACLs were specified through the 2013-2014 management cycle. These complexes are the Nearshore, Shelf, and Slope Rockfish complexes north and south of 40°10' N lat., the Other Flatfish, and the Other Fish complexes.

Most of the component stocks comprising the stock complexes are unassessed category 3 stocks with OFLs that are determined using data-poor methods such as DBSRA, DCAC, or average historical catch (see Section 1.1.1). In cases where assessments were used to inform OFLs for component stocks managed in stock complexes, the OFLs were projected from those assessments using proxy F_{MSY} harvest rates. A more detailed description of the assessed stocks managed in stock complexes follows.

1.1.5.1 Nearshore Rockfish North and South of 40°10' N Lat.

The nearshore rockfish complexes north and south of 40º10' N lat. are comprised of both assessed and unassessed species. Of the stocks managed in the nearshore rockfish complexes, only blue rockfish in California north of Pt. Conception, brown rockfish, China rockfish, copper rockfish, and gopher rockfish in California north of Pt. Conception have been assessed. The following section defines these complexes in terms of their component stocks and provides further detail on those component stocks that have been assessed.

The Nearshore Rockfish complex north of 40°10' N lat. is composed of the following species: black and yellow rockfish (*Sebastes 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 treefish (*S. serriceps*). These stocks are all unassessed with the exception of brown rockfish, blue rockfish in California, China rockfish, and copper rockfish.

The Nearshore Rockfish complex south of 40°10' N lat. is further subdivided into the following management categories: 1) shallow nearshore rockfish [comprised of black and yellow rockfish (*Sebastes chrysomelas*), China rockfish (*S. nebulosus*), gopher rockfish (*S. carnatus*), grass rockfish (*S. rastrelliger*), and kelp rockfish (*S. atrovirens*)], and 2) deeper nearshore rockfish [comprised of black rockfish (*S. melanops*), 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*)]. With the exception of the blue rockfish stock occurring in waters off California north of Point Conception (i.e., 34°27’ N lat. to 40°10’ N lat.) and gopher rockfish north of Point Conception (34°27’ N lat.), all of the Nearshore Rockfish South stocks are unassessed. The blue rockfish stock was estimated to be at 29.7 percent of its unfished biomass in 2007; therefore, the stock is considered to be in the precautionary zone. Spawning biomass depletion of gopher rockfish north of Point Conception was estimated to be at 97 percent of its unfished biomass in 2005.

Blue Rockfish in California

Distribution and Life History

Stock Status and Management History

During the 2009 and 2010 biennial specifications process, the Council contemplated removing blue rockfish from the Nearshore Rockfish complexes. Blue rockfish was managed within the Nearshore Rockfish complexes because of scientific uncertainty and management needs, given the interaction of blue rockfish with other nearshore species. When blue rockfish occur offshore they can be targeted separately from other nearshore rockfish, but those that occur inshore mix with other nearshore rockfish stocks. Blue rockfish are managed under the California nearshore management plan which has mandatory sorting requirements for landed catch. Landings are routinely tracked and monitored, thereby reducing management uncertainty. For more efficient state management, blue rockfish remains a component stock within the Nearshore Rockfish complexes. The OFL contribution of blue rockfish is projected from the 2007 assessment Key, MacCall et al. 2008 using the proxy $F_{50\%}$ F_{MSY} harvest rate and apportioning 87.3 percent of the OFL based on average catches of the assessed stock south of 40°10’ N lat. The OFL contribution of blue rockfish south of 34º27’ N lat. is based on DCAC. The assessed portion of the blue rockfish stock is categorized as a category 2 stock, and the unassessed portion south of 34º27’ N lat. is categorized as a category 3 stock.

Stock Productivity

Fishing Mortality

Brown Rockfish

Distribution and Life History

Stock Status and Management History

Stock Productivity

Fishing Mortality

China Rockfish

Distribution and Life History

Stock Status and Management History

Stock Productivity

Fishing Mortality

Copper Rockfish

Distribution and Life History

Stock Status and Management History

Stock Productivity

Fishing Mortality

Gopher Rockfish

Distribution and Life History

Stock Status and Management History

During the 2007-2008 biennial specifications process, the Council decided to continue managing gopher rockfish within the Nearshore Rockfish South complex since there was adequate resource protection under the California nearshore management plan and managing gopher rockfish with stock-specific harvest specifications could disrupt that plan. The OFL contribution of gopher rockfish north of 34º27' N lat. is projected from the 2005 assessment Key, MacCall et al. 2006 using the proxy $F_{50\%}$ F_{MSY} harvest rate. The OFL contribution of gopher rockfish south of 34º27' N lat. is based on DCAC. The assessed portion of the gopher rockfish stock is categorized as a category 1 stock and the unassessed portion south of 34º27' N lat. is categorized as a category 3 stock.

Stock Productivity

Fishing Mortality

1.1.5.2 Shelf Rockfish North and South of 40°10' N Lat.

The shelf rockfish complexes north and south of 40º10' N lat. are comprised of both assessed and unassessed species. Of the stocks managed in the shelf rockfish complexes, chilipepper rockfish north of 40º10' N lat. (the assessment for the northern stock only covers the area from 40º10' N lat. to Cape Blanco, OR at 43º N lat. – see section 1.1.4.7 for more details), greenspotted rockfish, greenstriped rockfish, and stripetail rockfish have been assessed. The following section defines these complexes in terms of their component stocks and provides further detail on those component stocks that have been assessed.

The Shelf Rockfish complex north of 40°10' N lat. is comprised of the following species: bronzespotted rockfish (*Sebastes gilli*); bocaccio (*Sebastes paucispinis*); chameleon rockfish (*S. phillipsi*); 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. hopkinsi*); starry rockfish (*S. constellatus*); stripetail rockfish (*S. saxicola*); swordspine rockfish (*S. ensifer*); tiger rockfish (*S. nigrocinctus*); and vermilion rockfish (*S. miniatus*).

The Shelf Rockfish complex south of 40°10' N lat. is composed of the following species: bronzespotted rockfish (*Sebastes 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 rockfish (*S. ensifer*); tiger rockfish (*S. nigrocinctus*); vermilion rockfish (*S. miniatus*); and yellowtail rockfish (*S. flavidus*).

Greenspotted Rockfish

<u>Distribution and Life History</u>

Greenspotted rockfish (*Sebastes chlorostictus*) are found in waters off the west coast of North America, ranging from Copalis Head, Washington to Isla Cedros, Baja California (approximately 25º to 47º N lat.). Abundance of this species is greatest from northern Baja California to Mendocino County in California. Greenspotted rockfish associate with several benthic habitat types between depths of 30-363 m, although adults are most common between 60 and 240 m (Love, *et al.* 2002).

Greenspotted rockfish are a long-lived and slow growing species, with sedentary adults associating with a wide variety of benthic habitats. Maximum reported age is 51 years (Benet et al., 2009). Estimates of maximum length for greenspotted rockfish are in the vicinity of 50 cm. Benet et al. (2009) report maximum fork length as 48 cm for central California. Miller and Gotshall (1965) report 51 cm total length for the same area, but did not attempt to distinguish between greenspotted rockfish and pink rockfish (*Sebastes eos*), which grow to 56 cm (Love, *et al.* 2002). Commercial port samplers in California have reported individuals larger than 50 cm fork length (up to 57 cm), although fish of this size appear to be rare (CALCOM, 2011). In southern California, Love et al. (1990) report maximum length as 50 cm total length. Sexual dimorphism is not apparent in greenspotted rockfish (Lenarz and Echeverria, 1991; Mason, 1998; Benet et al., 2009), although latitudinal differences in weight-at-length, length-at-age, and size-at-maturity have been observed.

Seasonal maturation and size at maturity vary with latitude, a trend commonly seen in rockfishes (Love et al., 1990; Benet et al., 2009). In central and northern California, spawning months have been reported from March to September, with peak parturition from April to June (Wyllie Echeverria, 1987; Benet et al., 2009). In southern California spawning months begin in February and extend through July, with peak parturition in April (Love et al., 1990). Benet et al. (2009) estimate length at 50% maturity for female greenspotted as 26 cm, consistent with a previous estimate of 27 cm (Wyllie Echeverria, 1987) based on females from the same area. In southern California, Love et al. (1990) report length at 50% maturity as 22 cm (converted to fork length from total length). Love et al. (1990) detected evidence of multiple broods in females from southern California (ovaries containing eyed larvae and large numbers of fertilized or unfertilized eggs). No evidence of multiple broods was found in studies of greenspotted rockfish north of Point Conception (Wyllie Echeverria, 1987; Benet et al., 2009).

Several studies have reported on habitat associations for greenspotted rockfish. Yoklavich et al. (2000) quantified deep, rocky habitat in Monterey Bay. They observed smaller greenspotted rockfish in shallow depths (75-174 m), and reported strong associations with heterogeneous habitats (cobble-mud, mud-boulder, rock-mud, and rock-ridge). Laidig et al. (2009) studied habitat associations of demersal fishes from a manned submersible in central California, observing 809 greenspotted rockfish. They mainly encountered immature individuals (86% of greenspotted were <25 cm), identifying positive associations with all habitat types (boulder, brachiopod beds, cobble) other than mud. The predominance of juvenile rockfish in the study area suggests that the areas and depths surveyed may be nursery grounds for juvenile rockfish and/or transitional zones as individuals move toward adult habitats (Laidig et al., 2009). Juvenile greenspotted rockfish are commonly seen in traps targeting spot prawn in Monterey Bay, usually in low-relief habitats (Dick et al., 2011).

Adult greenspotted rockfish are generally sedentary, and associate with a wide range of habitat types. Yoklavich et al. (2000) observed 426 greenspotted rockfish (fourth highest abundance of observed species) in Monterey Bay, noting that adults were common near rocky outcrops, ridges, caves, and overhangs. Anderson et al. (2009) described greenspotted rockfish as characteristic of transition zones between hard and soft sediments, based on in situ observations across Cordell Bank in central California. They classified habitat for greenspotted rockfish over a range of spatial scales. At the finest scale (1-10s of m), greenspotted were found to have weak associations with four of five possible categories: mud, boulders, cobbles, and rock (sand being the fifth category). At intermediate scales (10-100s of m) Anderson et al. (2009) characterized greenspotted habitat as depths between 100-300m and soft and mixed sediment types.

Movements of greenspotted rockfish have been monitored using acoustic tagging experiments. Starr et al. (2002) implanted acoustic tags in six adults in Monterey Bay, finding that adults exhibit limited horizontal movement and almost no vertical movement. They also identified two movement patterns. In the first pattern, 94% of time was spent within a 0.58 km2 area. The second pattern involved larger movements, with excursions up to 3 km, but 60% of time was spent within the 1.6 km^2 study area. Lowe et al. (2009) monitored 4 adult greenspotted rockfish near oil platforms in southern California using acoustic tags. Probabilities of detection near the release sites dropped by 14% in one year of monitoring. Two individuals returned to their release sites after a 7-month absence.

Williams and Ralston (2002) studied the distribution and co-occurrence of rockfishes over continental shelf and slope habitats using fishery-independent trawl survey data. Greenspotted rockfish were consistently caught (>80% co-occurrence) with bocaccio, chilipepper, stripetail (*S. saxicola*), and shortbelly rockfish. Williams and Ralston (2002) proposed species assemblages for management purposes, including greenspotted in a "southern shelf" assemblage along with bocaccio, chilipepper, shortbelly, stripetail, greenstriped, and cowcod. Since greenspotted rockfish is not a primary target of commercial fisheries, its association with other desirable shelf rockfish species (e.g., bocaccio and chilipepper) is likely a driving force behind historical exploitation of this species.

Molecular systematic studies (Hyde and Vetter, 2007) report that greenspotted rockfish are closely related to pink rockfish and greenblotched rockfish (*S. rosenblatti*). Greenspotted rockfish can be distinguished from pink and greenblotched rockfishes by a smooth lower jaw, lacking scales found on the lower mandibles of the other two species (Love, *et al.* 2002).

Stock Status and Management History

The 2011 greenspotted rockfish assessment conducted for the portion of the stock off California was modeled as two area assessments north and south of Point Conception at 34º27' N lat. The assessment indicates the stock is in the precautionary zone with spawning biomass depletions of 30.6 percent and 37.4 percent for the stocks north and south of Point Conception, respectively. The stocks have shown substantial biomass increases since implementation of the RCAs in 2003. Shelf rockfish are particularly well protected by the RCAs, and greenspotted rockfish catches have been negligible since 2003. The Council recommends continuing to manage greenspotted rockfish within the Shelf Rockfish complexes since catch histories are too uncertain to allocate QS in the IFQ fishery. The OFL contribution of greenspotted rockfish to the Shelf Rockfish North complex was based on apportioning 22.2 percent of the projected OFLs from the assessment for the stock north of Point Conception, which is the average estimated catch proportion in the assessment for the stock occurring in the area between 40°10' N lat. and the California-Oregon border at 42° N lat. The OFL contribution for the portion of the stock occurring north of 42° N lat. was derived using DBSRA. The SSC categorized the assessed portion of the stock as a category 2 stock since recruitments were not estimated. The unassessed portion of the stock was categorized as a category 3 stock.

Stock Productivity

Fishing Mortality

Greenspotted rockfish are not usually a primary target of commercial or recreational fisheries. Regulations affecting this species are typically intended to alter fishing mortality of primary targets and/or overfished species. For example, implementation of RCAs statewide and CCAs in southern California has greatly reduced fishing mortality for greenspotted rockfish in the past decade.

Greenstriped Rockfish

Distribution and Life History

Stock Status and Management History

The greenstriped assessment was a coastwide assessment, and the harvest specifications were apportioned using the mean of the 2003-2008 swept area biomass estimates north of 40°10' N lat. (84.5 percent) from the NMFS trawl survey. This stock has continued to be managed within the Shelf Rockfish complexes due to the complications associated with managing this species with IFQs. Species pulled out of a complex managed with IFQs must be converted into an IFQ management unit under the Amendment 20 rules. Greenstriped rockfish is a trawl-dominant bycatch species that is rarely landed due to their diminutive size and low market desirability. An initial allocation of quota share for greenstriped would be less than straightforward given the unreliable catch history. The SSC rated the greenstriped stock as category 2 on the basis of the very uncertain catch history in the 2009 assessment that prevented the estimation of discrete year classes.

Stock Productivity

Fishing Mortality

Stripetail Rockfish

Distribution and Life History

Stock Status and Management History

Stock Productivity

Fishing Mortality

1.1.5.3 Slope Rockfish North and South of 40°10' N Lat.

The slope rockfish complexes north and south of 40º10' N lat. are comprised of both assessed and unassessed species. Of the stocks managed in the slope rockfish complexes, aurora rockfish, blackgill rockfish south of 40º10' N lat., rougheye rockfish (and blackspotted rockfish), and sharpchin rockfish have been assessed. There is an older assessment of bank rockfish that was done in 2000 (Piner, *et al.* 2000) that was limited in area and is not used in current management. The following section defines these complexes in terms of their component stocks and provides further detail on those component stocks that have been assessed.

The Slope Rockfish complex north of 40°10' N lat. is comprised of the following species: aurora rockfish (*Sebastes aurora*); bank rockfish (*S. rufus*); blackgill rockfish (*S. melanostomus*); blackspotted rockfish (*S. melanostictus*); 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 Slope Rockfish complex south of 40°10' N lat. is composed of the following species: aurora rockfish (*Sebastes aurora*), bank rockfish (*S. rufus*), blackgill rockfish (*S. melanostomus*), POP (*S. alutus*), redbanded rockfish (*S. babcocki*), rougheye rockfish (*S. aleutianus*), sharpchin rockfish (*S. zacentrus*), shortraker rockfish (*S. borealis*), and yellowmouth rockfish (*S. reedi*).

Aurora Rockfish

Distribution and Life History

Aurora rockfish (*Sebastes aurora*) are encountered between the Queen Charlotte Islands (British Columbia, Canada) south to mid-Baja California (Mexico). Off of the United States, they are common from northern Oregon to southern California, and are most abundant in the area around Point Conception, California. They occur at depths from 200 to 700 m (~100 to 400 fm) with the median depth increasing to the south, such that they are most abundant from 350 to 550 m in the north and 400 to 600 m in the south.

While there are areas of greater abundance off of northern Oregon and especially off of Point Conception, California, the population appears continuous over the entire coast, so that there is no clear point for stock delineation. Survey catches exhibit a continuous distribution along the entire coast, though with areas of higher and lower abundances along the coast.

Aurora rockfish is a long-lived rockfish species, with maximum observed age of 125 years on the U.S. west coast based upon otoliths aged in the 2013 assessment (Hamel, *et al*. 2013). This is slightly greater than the maximum of 118 years seen by Thompson and Hannah (2010) and consistent with a maximum age greater than 75 as reported by Love et al. (2002). As with many rockfish species, aurora rockfish exhibit both spatially varying and sexually dimorphic growth, with females reaching a slightly larger size than males. Off of Oregon, females reached an asymptotic length of 36.9 cm, while males reached only 33.6 cm (Thompson and Hannah 2010). Asymptotic size and size at age decreases with latitude, and since the bulk of the stock is south of Oregon, the average asymptotic lengths are quite a bit lower than those reported above.

Thompson and Hannah (2010) found the age at 50% maturity for female aurora rockfish to be 12.56 years and the length at 50% maturity to be 25.54 cm. Maturity data collected coastwide during the 2012 NWFSC trawl survey found similar values, though with more evidence of atresia in older and larger fish than observed in the Thomson and Hannah study.

Aurora rockfish larvae have been collected off of California in months ranging from November to August, with abundance peaking in May and June, corresponding to the observation of females with developed embryos from March to May off of California and in May in Oregon (Love, *et al*. 2002). Thompson and Hannah (2010) also found that parturition peaked in May off of Oregon. Auroras settle on the bottom when they reach a length of about 3.3 cm (Love, *et al*. 2002).

Aurora rockfish display ontogenetic movement, with smaller fish found in shallower waters (below 400-450 m). They are distributed over both hard and soft substrates (Love, *et al*. 2002).

Aurora rockfish co-occurs with many prominent groundfish targets such as Dover sole, sablefish, thornyheads and hake, though are most reported in the catch of splitnose rockfish. Aurora rockfish contributes to the overall California Current ecosystem as both predator on crustaceans and small fishes, and as prey to larger fishes, marine mammals, and large squid. Juvenile aurora rockfishes are preyed on by salmon, birds, and other fishes (Love 2011).

Several aspects of aurora rockfish population biology are affected by the ecosystem. The recruitment of many species of rockfish appears to be high in 1999, suggesting that environmental conditions influence the spawning success and survival of larvae and juvenile rockfish, including aurora rockfish. The mechanism behind this observation is not well understood, but zooplankton abundance, changes in water temperature and currents, distribution of prey and predators, and amount and timing of upwelling are all possible linkages. Changes in the environment may also directly influence age-at-maturity, fecundity, growth, and survival, which can affect stock status determination and its susceptibility to fishing. Thompson and Hannah (2010) found variations in growth corresponding to individual years based upon dendrochronological techniques and otoliths, and found a correlation between an observed growth anomaly in otoliths and sea level in individual years.

Stock Status and Management History

Aurora rockfish reside in deep waters below 200 m. The primary gear type that has been used to catch aurora rockfish and other deepwater rockfish has been trawl gear. The use of trawls off the west coast of the United States dates to the late 1800s, though there was little fishery expansion until the availability of the otter trawl and the diesel engine in the mid-1920s (Douglas 1998). Trawl fisheries were mainly conducted on the shelf and became more established during World War II when demand increased for groundfish. Mink farms were also a major destination of groundfish removals in the 1940s and 1950s (Jones and Harry 1960). Foreign fleets began fishing for rockfish, including deeper waters of the slope, in the mid-1960s, with declining participation until the 200-mile EEZ was implemented in 1977 (Rogers 2003b). Peaks in the foreign catch have typically been seen in the mid-1960s for rockfishes, but for aurora rockfish, the largest catches were taken in the early 1970s. Foreign fishing was limited in the northern regions by 1970, shifting effort southward and more into aurora rockfish habitat. After 1977, domestic landings of rockfish increased rapidly until about 1990. Subsequent declines in rockfish landings were driven by declining biomass levels and implementation of new, more restrictive management practices, particularly between 1997 and 2002.

Documented and estimated removals of aurora rockfish do not reach consistently large levels until the 1980s. Aurora rockfish are and have been historically most commonly taken from central California to Oregon, tightly coupled with catches of splitnose rockfish. The term “rosefish” was often used to describe either splitnose or aurora rockfish and has been used as a reporting category in California since 1982. Aurora rockfish remains largely a non-targeted member of the slope rockfish complexes.

Limits on select rockfishes, which included the co-occurring species splitnose, were established in 1982. The first imposed catch limits on a coastwide *Sebastes* complex (aurora being one of the 50 rockfishes in the complex) were instituted in 1983. This complex was divided into two management areas north and south of 43º N lat. (separating the Eureka and Columbia INPFC areas) in 1994. Ongoing concern that shelf and slope rockfishes may be undergoing overfishing led the attempt by Rogers et al. (1996) to describe the status of most rockfishes contained in the *Sebastes* complex. Aurora rockfish information content was low, so only estimates of exploitation rates were provided, indicating the stock was undergoing very high exploitation rates relative to biomass estimates in both management areas.

The *Sebastes* complex was subsequently divided into nearshore, shelf, and slope complexes effective in the year 2000, and the dividing line between the northern and southern management areas was shifted to 40º10’ N. lat. Aurora rockfish has been managed under trip limits for the minor slope rockfish complex in both the north and south management areas from 2000-2010. Beginning in 2011, bottom trawl catches of slope rockfish north and south of 40º10’ N lat. have been managed under an IFQ system.

The first assessment of the west coast stock of aurora rockfish was conducted in 2013 (Hamel, *et al.* 2013); the assessment estimated stock depletion was at 64 percent of its unfished equilibrium at the start of 2013 and had never dropped below its B_{MSY} target (Figure 24). The assessment was a length-based full assessment with natural mortality identified as the major axis of uncertainty. The SSC categorized aurora rockfish as a category 1 stock based on the assessment. However, the uncertainty in estimated biomass in the 2013 assessment was greater than for other category 1 assessments resulting in a higher sigma value for defining the ABC buffer (see section 1.2.2 for more details).

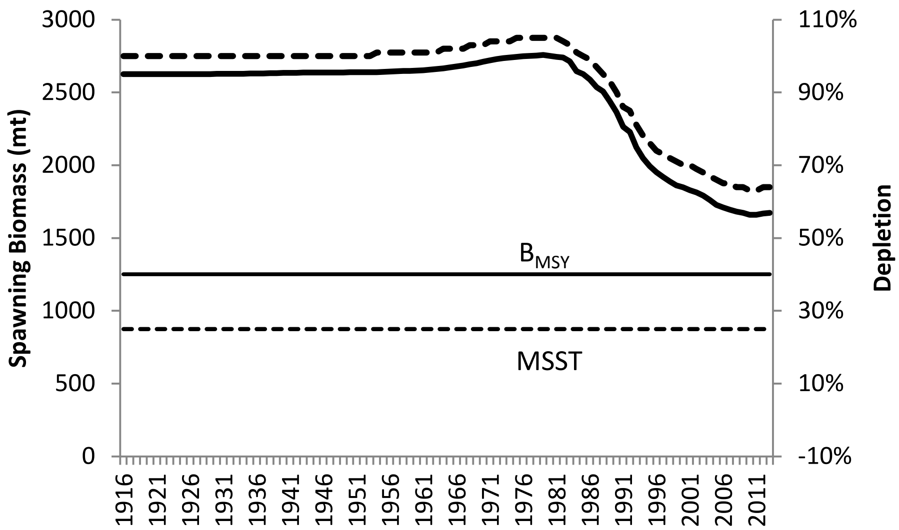

Figure 24. Time series of estimated spawning biomass and depletion of aurora rockfish, 1916-2013.

Stock Productivity

Steepness was fixed to the mean of the most recent rockfish steepness prior (h = 0.779; Thorson, 2013) in the 2013 assessment. Recruitment deviations were estimated from 1916 (the beginning of the modeling period), with a ramp towards bias correction beginning in 1962, full-bias adjustment beginning in 1970 and ending in 2008, and a ramping back down to no bias correction in 2012. Two of the largest contemporary recruitment events are found in 1999 and 2007 (Figure 25). Despite the inclusion of estimated ageing error, discerning individual year classes remains difficult and significant correlation exists between the estimated strength of adjacent year classes, which may be primarily due to ageing error rather than actual correlation in recruitment strength.

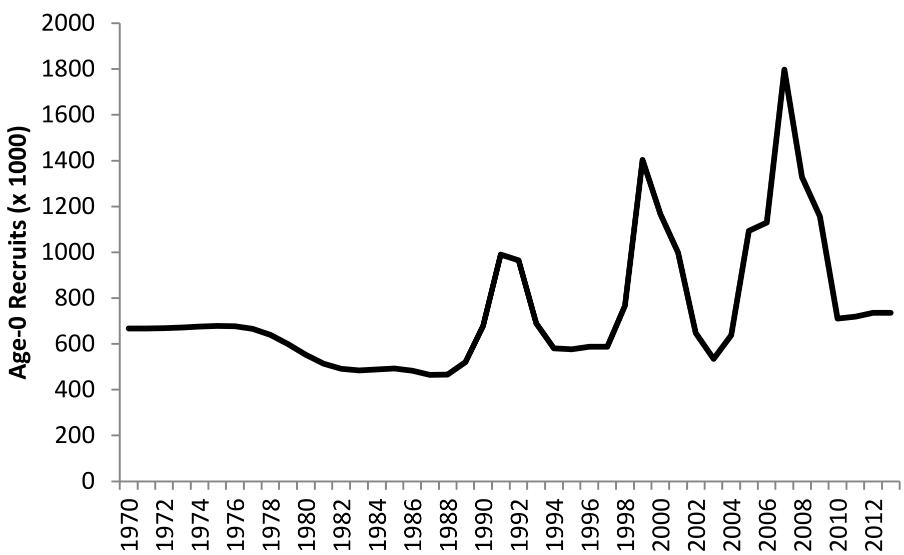

Figure 25. Time series of estimated age-0 recruits of aurora rockfish on the U.S. west coast, 1970-2013.

Fishing Mortality

The 2013 estimates that exploitation of aurora rockfish has been relatively low, with total catch estimated to have exceeded the current management harvest-rate limits in only 2 years, during the early peak in trawl catch (1990 and 1992) (Figure 26). Recent levels of removals have remained moderate. There seems to be very low risk that current removals are causing overfishing.

While stock-specific OFLs/ABCs were not historically set for aurora rockfish specifically, the reauthorized Magnuson-Stevens Act of 2006 and FMP Amendment 23 required OFLs for all species in a management plan, including those managed in stock complexes. The first OFL contributions were calculated using DB-SRA and provided in 2011. The 2015 and beyond OFLs are projected from the 2013 assessment. Recent catches since 2002 have been below the new 2015 OFL and ABC (Figure 27).

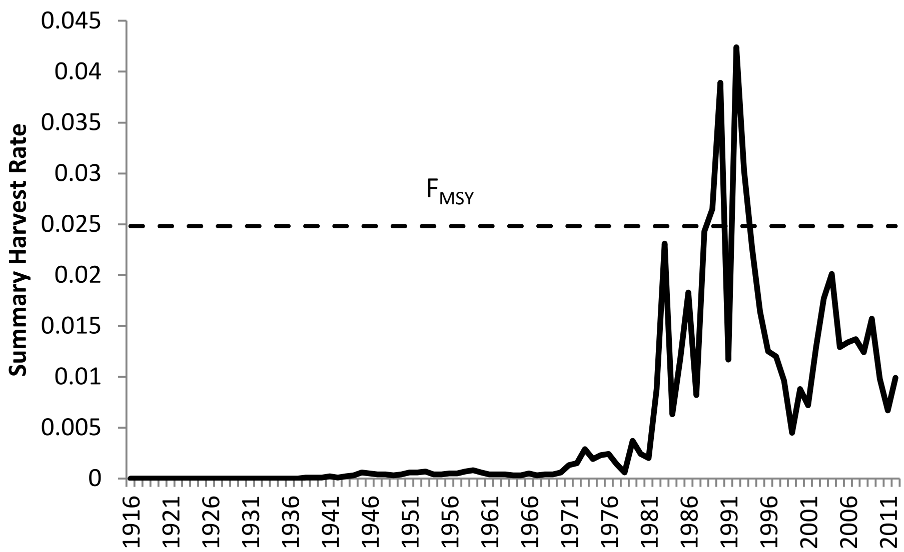

Figure 26. Time-series of estimated summary harvest rate for the west coast stock of aurora rockfish, 1916-2012. The dashed line is the harvest rate at the overfishing F_{MSY} proxy.

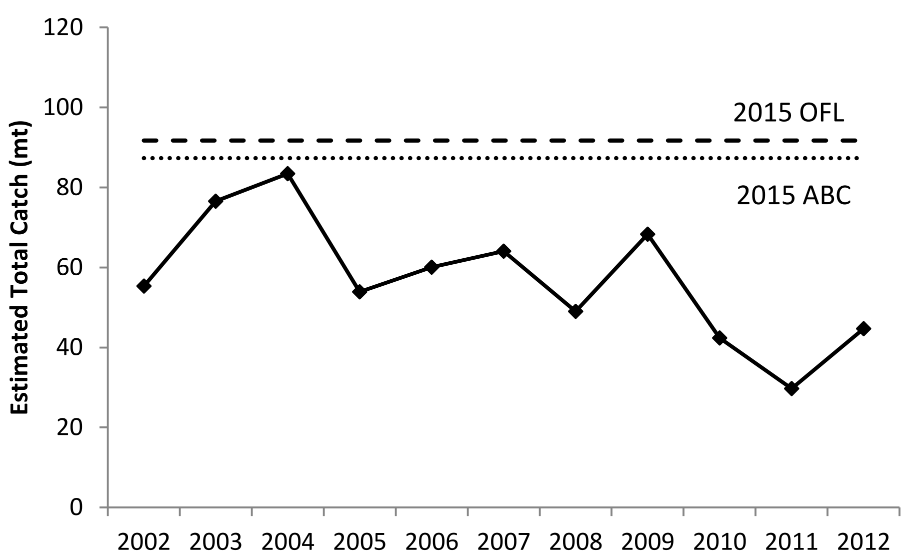

Figure 27. Estimated coastwide total annual catch of aurora rockfish in 2002-2012 relative to the proposed 2015 OFLs and 2015 ABCs (summed north and south of 40°10' N lat. to compare to coastwide catches).

Blackgill Rockfish

<u>Distribution and Life History</u>

Blackgill rockfish (*Sebastes melanostomus*), also known at times as blackmouth rockfish or deepsea rockfish, range from at least central Vancouver Island to central Baja California (Love, *et al.* 2002). However, the species is relatively uncommon north of Cape Mendocino and occurs in the greatest densities in the Southern California Bight (SCB). The name very accurately describes the most identifying characteristic of adult blackgill rockfish, in that they have black pigmentation on the rear edge of their gill cover, as well as in the fold above the upper jaw and inside of the mouth. The rest of the fish appears pink with brown and white blotches underwater, or reddish with distinct brown saddles upon capture. It is a medium-sized (to about 62 cm maximum length) and deep bodied species. Additional descriptions and meristics can be found in Love et al. (2002) for adults and Moser (1996) for larvae and juveniles.

Hyde and Vetter (2007) did not find any evidence for close molecular or evolutionary relationships between blackgill and other rockfish species. Blackgill were found to be moderately related with several other slope or deep shelf species (*S. aurora*, *S. phillipsi*, *S. gilli*, *S. diploproa*, and *S. melanosema*) as well to a suite of mostly rare and poorly known species from the Gulf of California (*S. sinensis*, *S. peduncularis*, and *S. cortezi*) or southern California.

Blackgill are a slope rockfish species, and are generally rare in waters less than 100 meters and most abundant in waters between 300 and 500 meters depth. Love et al. (2002) report a depth distribution of 87 to 768 meters; however, from ten years of data from the NWFSC combined trawl survey, only one haul greater than 600 meters encountered blackgill (that tow was at 647 meters) and the shallowest fish was encountered at 133 meters. Survey data suggest that smaller fish tend to be encountered in shallower water and larger fish in deeper water; survey data also suggest few small fish in waters north of Cape Mendocino. Juveniles are often seen over soft bottom habitats with low relief. Adults are usually associated with high relief rocky outcrops, canyons or deep rock pinnacles, although fishermen often report taking them in midwater (Kronman 1999; Love, *et al.* 2002).

Little is known about the population structure of blackgill rockfish. Like most rockfish, larvae and juveniles circulate in the plankton for 3-4 months. Love et al. (2002) report that some juveniles may be pelagic for up to 7 months; however, this may be atypical. Thus, like most shelf and slope species, blackgill likely disperse over fairly long distances before settling to the bottom. Abundance south of the U.S./Mexico border is uncertain, but there appear to be substantial numbers and catches of blackgill in many areas, and pelagic juveniles have been found as far south as Punta Abreojos, in southern Baja California (Moser and Ahlstrom 1978). The CalCOFI Ichthyoplankton survey has been used to develop or explore indices of relative abundance for several rockfish species for which larvae can be morphologically identified to species (Moser, *et al.* 2000), and such indices have been used as relative abundance indices for assessments of bocaccio (Field, *et al.* 2009) and shortbelly rockfish (Field, *et al.* 2008) as well as northern anchovy (Jacobson and Lo 1994), Pacific sardine (Hill, *et al.* 2008), and California sheephead (Alonzo, *et al.* 2008). Unfortunately, blackgill rockfish are not among the species that have been historically sorted to the species level using morphological methods, although recent developments have led to the potential to use genetic methods to identify historical and contemporary Sebastes from the ichythyoplankton archives (e.g., Taylor et al. 2004, J. Hyde, FRD/SWFSC, unpublished data). Thus, it is possible that these collections could provide relative abundance information from past and contemporary monitoring programs.

Moser and Ahlstrom also found that blackgill represented approximately 16% of the total number of rockfish specimens encountered in a series of midwater trawls for late larvae and juvenile stage rockfish done in the early 1970s (prior to most historical exploitation). By contrast, from ongoing pelagic juvenile surveys run by the Fisheries Ecology Division used to develop juvenile (pre-recruit) indices for some species (see Sakuma et al. 2006 for methods), we found that blackgill rockfish comprised only about 3% of juveniles collected from the southern California region from 2004 through 2010 (K. Sakuma and J. Field, unpublished data as cited in Field and Pearson (2011)). However, these results are not likely to be comparable unless seasonal and depth of survey efforts are accounted for; the Moser and Ahlstrom (1978) study in particular fished depths ranging from 0 to 600 meters using an Isaacs-Kidd midwater trawl, while the FED survey uses a considerably larger (modified Cobb) midwater trawl and typically only fishes at 30 meters headrope depth. There is at least some potential to consider relative abundance indices of age-0 juveniles from the FED/SWFSC survey in the future, although given the very slow growth and difficulty in ageing of blackgill rockfish, it is unlikely that validation of survey indices or improved understandings of high frequency variation in year class strength will be of substantial near term benefit to the model.

Nearly 2/3rds of all U.S. landings are from waters south of Point Conception, for which blackgill accounted for as much as 20 to 30% of total *Sebastes* landings in the SCB during the 1980s, when deep water fixed gear fisheries rapidly expanded (more details in catch history section). Nearly all of the remaining landings took place between Conception and Cape Mendocino, such that less than 1.3% of historical California landings have come from waters north of Cape Mendocino. Landings in Oregon waters are even less, and only trace landings of blackgill are reported from Washington waters. Trawl survey abundance data (discussed later in the document) are consistent with these results, although they represent the period following the greatest extent of exploitation: surveys that took place from the 1970s through the late 1990s had virtually no coverage in southern waters where blackgill are the most abundant.

Blackgill rockfish have among the deepest distribution of all of the California Current *Sebastes* (although the three *Sebastolobus* species are common at considerably greater depths), and live at the edge of the low oxygen (hypoxic) conditions that characterize the slope waters of the California Current. Below these depths, species diversity declines to a smaller suite of species that have adapted to cope with low oxygen waters, notably the DTS complex species (Dover sole, thornyheads and sablefish), which have evolved a range of adaptive strategies including metabolic suppression, slow growth rates, late ages at maturity, and ambush (rather than active searching) predation methods (Childress and Seibel 1998; Jacobson and Vetter 1996; Koslow, *et al.* 2000; Vetter and Lynn 1997). These low oxygen waters, known as the oxygen minimum zone (OMZ), are a natural feature of the Eastern Pacific Rim and other regions characterized by high surface productivity and/or the upwelling of oxygen-poor source waters (Helly and Levin 2004). The California Current has a relatively deeper OMZ than the Equatorial Eastern Tropical Pacific (ETP) or the Humboldt Current (Helly and Levin 2004), with the zone starting at approximately 500 to 600 meters depth in the waters off of southern and central California. The observation that blackgill are likely the most deeply distributed medium-size Sebastes (at least in southern California Current waters) suggests that they have adapted to live on the edge of the OMZ, where oxygen availability is rapidly declining relative to shelf waters, although no Sebastes species appears able to tolerate the very low oxygen conditions within the OMZ itself.

Seibel (2011) describes two oxygen thresholds that are temperature dependent (as opposed to species or situation-specific), one in which virtually all species are capable are of physiologically adjusting or adapting to declining oxygen availability, and a second for which no further adjustment or adaptation in aerobic O2 utilization is possible. Seibel (2011) describes this latter threshold as one at which "organisms that are not specifically adapted to low O2 will suffer physiological stress and eventual death." Importantly, this threshold falls just below the currently observed oxygen levels throughout the slope waters of much of the California Current, inferring that any expansion of the OMZ in this region is likely to have tremendous impacts on the vertical distribution of populations and the species composition of ecosystems. Equally importantly, there is already some evidence of a shoaling (shallowing) of the depth of the OMZ throughout the California Current (Bograd, *et al.* 2008; Whitney, *et al.* 2007), with Bograd et al. (2008) reporting oxygen declines of 20-30% at depths of approximately 300 to 500 meters in the waters of the Southern California Bight, the region in which most of the blackgill biomass resides. A shoaling of the OMZ has been predicted to be a likely or plausible response to global climate change due to the fact that oxygen is less soluble in warmer waters, and warming is also expected to increase stratification in the upper ocean, which will both reduce oxygen supply and increase oxygen demand at depth (Keeling, *et al.* 2010; Sarmiento, *et al.* 1998; Seibel 2011).

For blackgill rockfish, it is the shoaling of the OMZ at depth that is likely to be the greatest long-term threat, as such a shoaling would likely represent a severe compression of the available habitat for this species. McClatchie et al. (2010) evaluated potential scenarios for hypoxia to impact the habitat of cowcod (Sebastes levis), a rebuilding shelf species that is a focus of management in the SCB. They found that as much as 37% of deep (240-350 m) cowcod habitat is currently affected by hypoxia, but that if the current trends of a shoaling OMZ continue for 20 years, this could increase to 55% of deep habitat, as well as an additional 18% of habitat in the 180 to 240 m depth range. These numbers would presumably differ substantially for blackgill rockfish, which have a very different (considerably deeper) distribution; due to their proximity to the OMZ, they may be at considerably greater risk to the longer-term impacts of shoaling. Moreover, changes in the characteristics and dynamics of the OMZ could lead to changes in the forage base for blackgill, which are described as foraging primarily on mesopelagic fishes which undergo dial migrations from the edge of the OMZ to surface waters in order to feed.

As previously mentioned, blackgill have been described as having a strong affinity for deep water habitat, particularly around offshore banks, canyons and areas of high depth gradients. They have been described as feeding on small mesopelagic fishes, such as myctophids and bathylagids (Love, *et al.* 2002). Isaacs and Schwartzlose (1965), Genin et al. (1988), Koslow (2000) and Genin (2004) describe the mechanisms by which vertical migrants, such as zooplankton and mesopelagic fishes, become trapped by topographic features. High densities of deepwater adapted resident species are consequently found in the relatively small, confined areas where these diurnally-migrating prey become aggregated. Such observations are consistent with the reports by fishermen of isolated deep banks, pinnacles or other habitat features often hosting very large numbers of fish over a relatively small spatial range, such that vertical hook and line gear (which can be more precisely targeted at small habitat features) is the gear of choice for targeting these species (as opposed to horizontal, or set, hook and line gear often used to target species in deeper slope waters, such as sablefish and thornyheads, which tend to be more widely dispersed).

With respect to predators and predation mortality, it is likely that sablefish and shortspine thornyheads are among the most important predators of blackgill rockfish. Both species are large (up to 100 and 75 cm, respectively, although individuals greater than 80 or 65 cm of either species are uncommon) and largely piscivorous ambush predators that are typically (along with longspine thornyhead and Dover sole) the most abundant and commercially important groundfish in the continental slope ecosystem (Lauth 2000). Food habits information for adult sablefish found that *Sebastolobus* and *Sebastes* species, particularly Sebastolobus altivelis, are key prey items, representing 15% to 30% of total prey by volume (Buckley, *et al.* 1999; Laidig, *et al.* 1997). Similarly, shortspine thornyhead preyed heavily on S. altivelis, unidentified *Sebastes*, and other fishes (Buckley, *et al.* 1999). Although no *S. melanostomus* were conclusively identified in either study, other slope rockfish species (*S. crameri*, *S. diploproa*, and *S. alutus*) were. The lack of specimens is likely due to both studies' focused sampling in northern California, Oregon and Washington slope waters, rather than the south-central and southern California waters in which *S. melanostomus* are most abundant.

Length data for both of these predators (sablefish and shortspine thornyheads) and their prey suggest that predation is low on fishes smaller than 5 cm, high on fishes ranging from 5 cm through 20 cm, and drops off notably for larger prey. However, the diet data summarized here were largely of smaller (40-60 cm) predators, and larger predators likely consume (or consumed) a broader range of prey. In the most recent stock assessment for longspine thornyhead (Sebastolobus altivelis), the base model suggested a declining or stable population (Fay 2006); however, it was noted that an ecosystem model of the northern California Current indicated that abundance of longspines should be increasing due to declines in predation mortality associated with declines in their primary predators (Field, *et al.* 2006). Survey biomass trends for longspine thornyheads, while limited to a relatively narrow time period and associated with considerable uncertainty, also suggested an increasing biomass trend. These observations led to exploration of both time and age-varying natural mortality rates for *S. altivelis* as informed by changes in predator biomass and estimates of predator consumption (Fay and Field, unpublished data as cited in Field and Pearson (2011)). Results suggest that, for this species, predation-related factors should be taken into account for future single-species stock assessments. Comparable evaluations could, and probably should, be done for blackgill rockfish and other slope species, for which their likely most important sources of predation mortality have themselves undergone significant changes in abundance.

Stock Status and Management History

Blackgill rockfish have historically represented a minor part of California rockfish landings north of Point Conception, but a substantial fraction of landings occur south of Conception. Based on consultations with fishery participants, Butler et al. (1998) and Kronman (1999) defined the southern California targeted fishery for blackgill rockfish as being a relatively recent phenomenon. Although longline fishing had long been the primary means of catching rockfish in southern California waters, increased participation and declines in the catches of many highly desired shelf species (such as vermilion rockfish and cowcod) contributed to a gradual shift in effort towards deeper and more offshore waters. Moreover, improvements in technology and gear (such as loran, affordable acoustic systems, electric line haulers) helped ease the difficulties of fishing (and relocating good fishing sites) in deeper waters. Additionally, set nets (gillnets) also began to be deployed at a larger scale in southern California in the 1970s and 1980s, often targeting deep reefs for large bocaccio, cowcod, blackgill, bank and other rockfish species.

Such developments seem to have been associated with a geographic expansion of the regions fished, such that fishing locations were sequentially depleted and new fishing locations discovered and developed over time. The first stock assessment for blackgill rockfish (Butler, *et al.* 1999a) noted that there was significant evidence for sequential depletion of blackgill rockfish in localized areas. This included reports from fishery participants that many pinnacles or other fishing sites that routinely yielded 20,000 pounds of blackgill per trip in the early days of the fishery were now only yielding 500 or so pounds per trip and were often covered with lost gear. Similarly, in a review of historical southern California fisheries, Kronman (1999) also documented the rapid growth and development of the blackgill fishery specifically as one in which fishermen would often "completely decimate" rockfish spots with deep fishing vertical line gear, based on the accounts of the participants themselves. Consequently, there was an ongoing shift to newer fishing spots, generally further offshore and to greater depths, as well as greater experimentation with alternative gears and target species.

These observations suggest the potential for a situation in which the stock may have undergone the "sequential depletion" of biomass from available habitat patches. If so, this would suggest that a traditional (non-spatial) stock assessment assumption of evenly distributed fishing mortality across space is substantially flawed. In fact, if the fishery were sequentially depleting specific areas, the length frequency information would not be likely to suggest a shift to smaller fish over time as the length frequencies could essentially reflect "unfished" population structure for the duration over which the new habitats were discovered and exploited. The consequences of failing to recognize such patterns can lead to overexploitation and collapse, and such processes have been described for several marine invertebrate populations (Karpov et al. 2000, Orensanz et al. 2000) as well as temperate water reef fishes (Epperly and Dodrill 1995, Rudershausen et al. 2008). Ongoing efforts to analyze historical block summary data have the potential to identify such shifts and consider whether such factors are likely to be important for west coast groundfish species such as blackgill, as well as to determine whether there is sufficient data to estimate spatial effects or develop spatially-explicit models more capable of accounting for such factors.

Management of blackgill rockfish has generally not been to the species level, but rather as part of the "*Sebastes* complex" in the Pacific Fishery Management Council era (prior to which management was under the direction of the California Department of Fish and Game). The PFMC allowable biological catches (ABC) of blackgill have historically been grouped together with eleven other species of minor rockfishes called "remaining rockfish" and all "other" rockfish. The PFMC historically used trip limits, and later cumulative trip limits (over set time periods), to slow the pace of harvest based on allowable biological catch and to promote a year-round fishery. For all commercial gear types, the limits were initiated in 1983 when the PFMC imposed a monthly limit of 40,000 pounds per trip for the entire coastwide *Sebastes* complex, a limit that stayed in place through 1990. After recognizing the differential spatial distribution of the remaining rockfishes and the fisheries that target them, harvest limits on both open access and limited entry fisheries were divided between the northern and southern *Sebastes* complexes, and trip limits began to be implemented at variable levels over both time (month and year) and space (north and south of Mendocino), often with species-specific limits in addition to the overall limit on *Sebastes* catches. Although early limits applied to both trawl and fixed gears, beginning in 1995 fixed gear limits (hook and line and pot, primarily, as gill nets were phased out through the 1990s) were set to 10,000 lbs of *Sebastes* per trip, which persisted through the 1990s.

Consequently, prior to 1999 cumulative trip limits had been historically high relative to landings of blackgill rockfish from individual trips, and unlikely to have impacted fishing for blackgill and catches. Limits were dramatically reduced in 1999 for the southern *Sebastes* complex; 2-month cumulative limit of 3,500 pounds for limited entry and 3,600 pounds per month for open access. Since 2000, blackgill has been managed as part of the Minor Slope Rockfish sub-group, with limits ranging from 3,000-50,000 pounds per 2 months; Tables 1-3 show the trip limits implemented since 2000 for this complex for the limited entry trawl, limited entry fixed gear and open access fixed gear fisheries. Table 4 shows the total estimated catches of blackgill (including discards) south of 40° 10' for the period since 2001, during which time catches have typically ranged well below allowable levels.

In 2001 the Cowcod Conservation area was established outside of 20 fathoms and directly excludes directed groundfish fishing from an expansive area in the Conception and southern Monterey INPFC areas.[6] This regulation has had a tremendous impact on the southern fixed gear fleet that targets blackgill, as the deep offshore banks and features that characterize the CCAs in deep water are optimal habitat for this species. By contrast, the shelf closures (rockfish conservation areas) implemented to protect rebuilding shelf species (such as bocaccio, cowcod, canary and widow rockfish) have presumably had a negligible direct effect, as the depths closed in the RCAs do not encompass the depths at which most blackgill are encountered. Such measures may have had an indirect effect, by virtue of shifting trawl effort to deeper waters, although for much of California the overall effect has been a sharp decline in active participation in the trawl fishery more generally.

The first assessment for blackgill rockfish was conducted in 1998 and estimated stock depletion was between 40 and 54 percent of its unfished equilibrium at the start of 1998 (Butler, *et al.* 1999a). That assessment assumed a unit stock in southern and central California (Conception INPFC area) and was

6 As the current trawl survey also excludes this region from trawl gear impacts, the area of the CCAs is shown in later maps of survey CPUE for blackgill rockfish, in Figure 13

based on a stock reduction analysis assuming constant recruitment. The dynamics of the simple model were tuned to average mortality rates from catch curves and landings data. Fishery selectivity was assumed to mirror maturity at size/age; trends in fishable/mature biomass were then estimated.

A second blackgill rockfish stock assessment was completed in 2005 indicating a stock depletion of 52 percent (Helser 2006). This assessment expanded the geographic range of that in Butler et al. (1999a), including both the Monterey and Conception INPFC areas, where over 90 percent of the landings have occurred. The assessment was based on catch and length composition data from commercial fisheries and indices of relative abundance and size composition from the AFSC shelf trawl survey and the AFSC slope survey. The modeling approach included fishery and survey length compositions to explicitly estimate selectivity. The assumed natural mortality rate was identified as a key axis of uncertainty for this stock.

The most recent blackgill rockfish assessment, conducted in 2011 for the stock south of 40º10' N lat. (Field and Pearson 2011), estimated the stock was below target with a depletion of 30 percent of its unfished biomass at the start of 2011 (Figure 28). The spawning output of blackgill rockfish was at high levels in the mid-1970s, but began to decline steeply in the late 1970s through the 1980s, consistent with the rapid development and growth of the targeted fishery. The biomass reached a low of approximately 18 percent of the unfished level in the mid-1990s. Since that time, catches have declined and spawning output has increased. The estimated depletion level in 2011 is 30.2 percent.

Catch data used in the assessment are generally reliable throughout the time period, although there is a lot of uncertainty in catch data prior to the early 1980s. Ageing is very difficult for this species, which appears to have highly variable size at age, as well as apparent regional differences in growth rates and potentially other life history traits. The lack of a reliable, long-term, fishery-independent survey index that reflects abundance from the entire range of the stock is problematic. In general, natural mortality and growth parameters comprised the greatest contribution to model uncertainty.

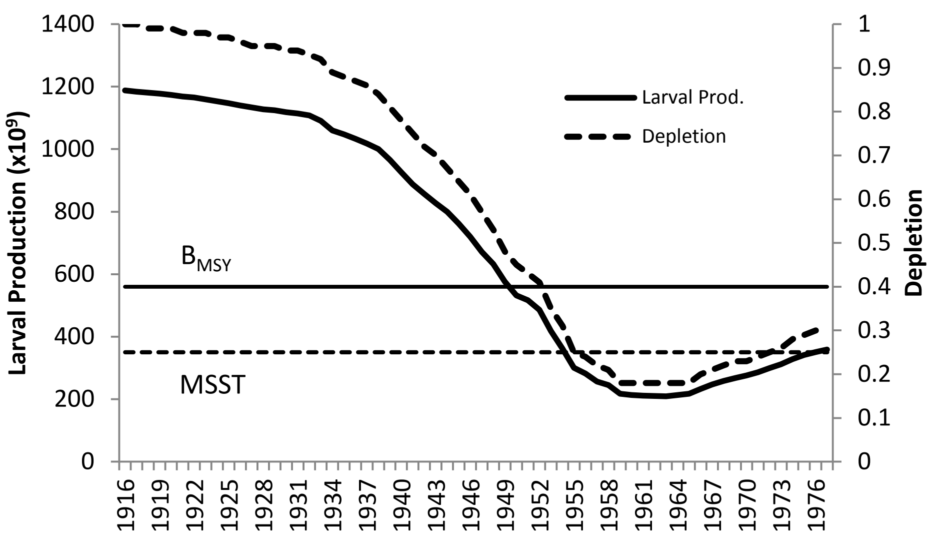

Figure 28. Time series of estimated spawning output and depletion of blackgill rockfish south of 40º10' N lat., 1950-2011.

Stock Productivity

In the 2013 assessment, the Beverton-Holt model was used to describe the stock-recruitment relationship. The log of the unexploited recruitment level was treated as an estimated parameter; recruits were taken deterministically from the stock-recruit curve. Recruitment deviations were not estimated, as the lack of obvious cohorts in either age or length data and the high degree of ageing uncertainty make plausible estimates unlikely. The estimated recruitment is projected to be at relatively high levels due to the fixed value of steepness (h = 0.76); this trend, however, is consistent with the trends from the survey data.

Blackgill rockfish have a relatively high potential vulnerability to overfishing (V = 2.08) driven by a combination of low productivity (P = 1.22) and relatively high susceptibility to being caught in the fishery (Table 2). The low productivity is due to the stock being long-lived (max. age = 90 yrs; (Love, *et al.* 2002)), with late maturation, and relatively low natural mortality (Table 5).

Fishing Mortality

Catches of blackgill rockfish primarily occur in the Southern California Bight south of Point Conception (34º27' N. lat.) where the species is caught in both directed fixed gear (hook-and-line) and historically, gillnet fisheries. Landings of this species are estimated to have risen slowly from very low levels (approximately 20-30 mt) in the 1950s, and then climbed rapidly in the 1970s and 1980s as improvements in technology and declines in other target species led fishermen to target blackgill rockfish in deeper and more offshore waters. Landings peaked in the mid-1980s at just over 1,000 mt, but have declined to approximately 100 mt to 150 mt in recent years.

The 2011 depletion estimate indicated the stock was in the precautionary zone compelling the Council to reduce impacts to prevent overfishing and allow the stock to rebuild back to its target biomass. The Council and NMFS implemented stringent harvest guidelines of 106 and 110 mt for 2013 and 2014, respectively corresponding to calculated 40-0 reductions. Specifying HGs created a sorting requirement for the stock allowing better inseason catch monitoring. The Council further established an apportionment of the non-trawl allocation of 60 percent to limited entry and 40 percent to open access fixed gears, which reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005-2010. Non-trawl landing limits for blackgill south of 40º10’ N lat. were reduced beginning in 2013 to prevent targeting of the stock. Cumulative landing limits for blackgill south of 40º10’ N lat. were reduced from 40,000 lbs/2 months for slope rockfish including blackgill to 40,000 lbs/ 2 months with a sublimit of 1,375 lbs/2 months for blackgill for the limited entry fixed gear sector. Open access cumulative landing limits south of 40º10’ N lat. were reduced from 10,000 lbs/2 months for slope rockfish including blackgill to 10,000 lbs/ 2 months with a sublimit 475 lbs/2 months for blackgill. While final catch accounting of groundfish in 2013 groundfish fisheries will not be available until the end of 2014, landed catch of blackgill has been reduced significantly and fishermen report blackgill targeting is no longer occurring.

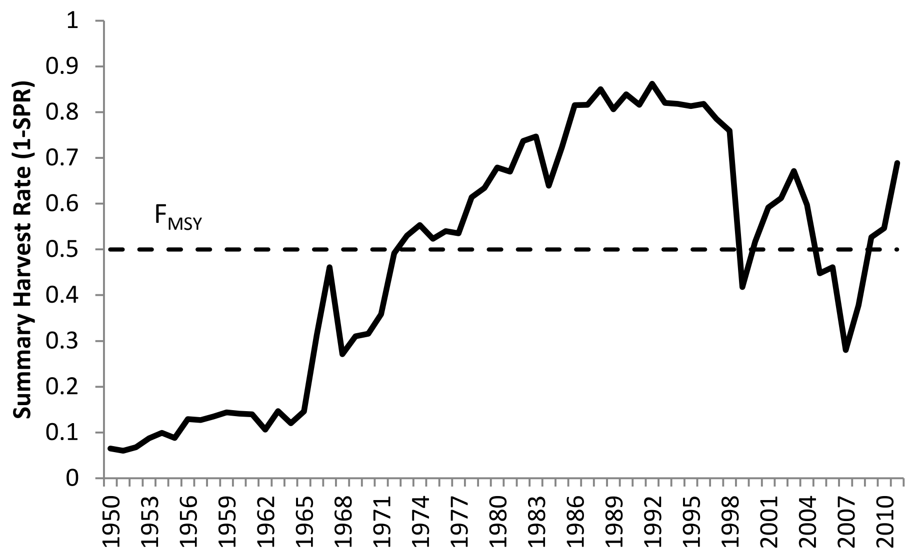

Figure 29. Time series of estimated summary harvest rate for the blackgill rockfish south of 40º10' N lat., 1950-2011. The dashed line is the harvest rate at the overfishing F_{MSY} proxy.

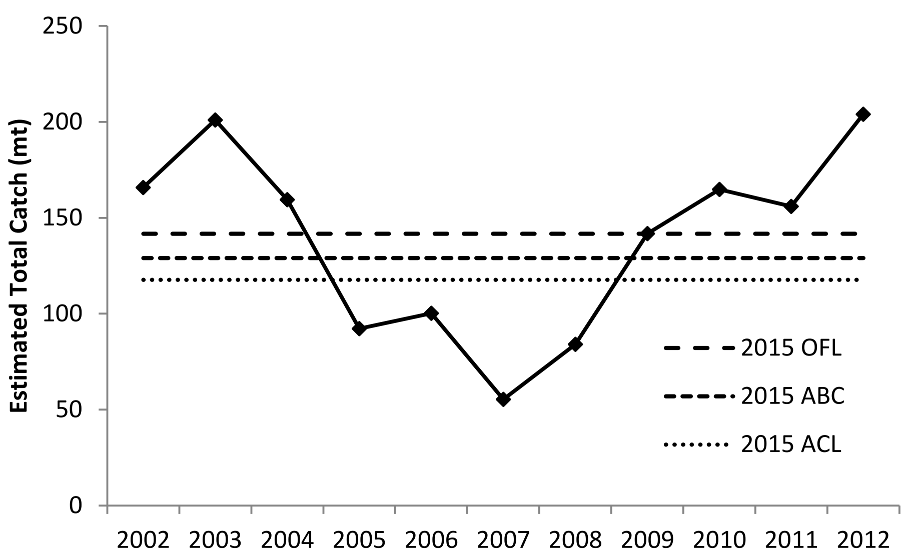

Figure 30. Estimated coastwide total annual catch of blackgill rockfish in 2002-2012 relative to the proposed 2015 OFLs, 2015 ABCs, and 2015 ACLs (summed north and south of 40º10' N lat. to compare to coastwide catches).

Rougheye/Blackspotted Rockfish

<u>Distribution and Life History</u>

Rougheye rockfish (*Sebastes aleutianus*) and blackspotted rockfish (*S. melanostictus*) are slope rockfish that share broad overlap in their depth and geographic distributions from the Eastern Aleutian Islands along the North American continental margin to southern Oregon, with blackspotted rockfish's range extending east beyond the Aleutian chain to the Pacific Coast of Japan (Gharrett, *et al.* 2005; Hawkins, *et al.* 2005; Orr and Hawkins 2008). It is very difficult to visually distinguish between the two species and they have been persistently confused in surveys and catches. It has only been from recent genetic studies in the early 2000s that the two separate species have been identified and described (Orr and Hawkins 2008).

Both species are encountered at depths shallower than 100 m to at least 439 m, however, blackspotted rockfish tend to be more prevalent in deeper waters (Hawkins et al. 2005, Orr and Hawkins 2008). Genetic information is not available to provide positive species identification in historical survey and landings information, but these data indicate that density of the nominal rougheye rockfish complex decreases sharply south of the Oregon-California border at 42° N lat. Studies suggest that rougheye rockfish account for a greater proportion of the species complex along the coast of Washington and Oregon than in Alaskan waters (Gharrett, *et al.* 2005; Hawkins, *et al.* 2005; Orr and Hawkins 2008). Recent discussions with port samplers in southern Oregon suggest that both rougheye and blackspotted rockfish are encountered with some regularity in the commercial trawl and fixed-gear landings in Charleston, Port Orford, and Brookings, with blackspotted rockfish composing approximately one third to one half of identified specimens (C. Good and N. Wilsman, ODFW, pers. comm. as cited in Hicks et al. 2013).

The west coast of the U.S. is the southern portion of the range of rougheye rockfish, and it is likely that the population north of the U.S.-Canada border is not a separate stock. The connectivity of rougheye populations throughout its range is unknown.

Compared with other rockfish species on the west coast of the U.S., rougheye rockfish life-history is poorly described and the recent resurrection of two species (rougheye and blackspotted rockfishes) has further complicated the understanding of life-history characteristics. Rougheye rockfish are often associated with boulders and steep habitats, and are typically found alone or in small aggregations (Love, *et al.* 2002). Younger fish may school and are often found in shallower waters on the shelf, and larger fish may form larger aggregations in the Pacific Northwest during the autumn and winter.

Rougheye rockfish give birth to live young with larvae released between February and June and at lengths between 4.5-5.3 mm (Love, *et al.* 2002). There are no studies on the fecundity of rougheye rockfish on the west coast of the U.S.

A wide range of prey items make up the diet of rougheye rockfish. Crangid and pandalid shrimps make up the majority of their diets, and larger individuals, greater than 30 cm, feeding upon other fishes (Love 2011). They are also known to feed upon gammarid amphipods; mysids, crabs, polychaetes, and octopuses (Love 2011; Love, *et al.* 2002).

Stock Status and Management History

Rougheye and blackspotted rockfish (henceforth denoted as rougheye) are landed as part of the minor slope rockfish complexes north and south of 40º10’ N lat.; however, they are rarely caught in the south. The historical reconstruction of landings for rougheye rockfish suggests that fixed gear fisheries have caught rougheye rockfish since the turn of the 20th century and landings in the trawl fishery are estimated to have increased into the 1940s. Landings remained relatively constant throughout the 1950s and into the 1960s before the foreign trawl fleet increased catches into the 1970s. The declaration of the EEZ resulted in the buildup of a domestic fleet and landings increased rapidly into the late 1980s and early 1990s. Subsequently, landings declined in the late 1990s and have been between 100 and 200 mt in recent years. Trawl, longline, and Pacific whiting at-sea trawl fisheries make up the majority of the catch.

Rougheye rockfish are a desirable market species and discarding has been low, historically. However, management restrictions (e.g., trip limits) have resulted in increased discarding since 2000. Trawl rationalization was introduced in 2011, and since then very little discarding of rougheye rockfish has occurred.

Hicks et al. (2013) conducted the first assessment of the U.S. west coast stock of rougheye and blackspotted rockfish as a complex of two species. The coastwide population was modeled assuming parameters for combined sexes (a single-sex model) and assuming removals beginning in 1916. The predicted spawning biomass from the base model generally showed a slight decline over the entire time series with a period of steeper decline during the 1980s and 1990s. Since 2000, the spawning biomass has stabilized and possibly increased because of reduced catches and above average recruitment in 1999. The 2013 spawning biomass relative to unfished equilibrium spawning biomass was estimated to be 47 percent of its unfished equilibrium at the start of 2013. The stock has been estimated to be healthy throughout the time series in the new assessment (Figure 31).

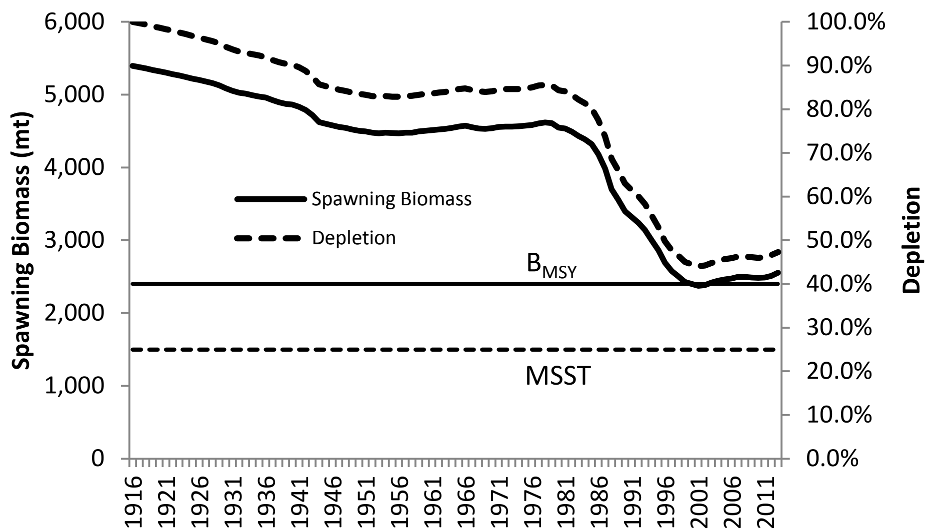

Figure 31. Time series of estimated spawning biomass and depletion of rougheye/blackspotted rockfish, 1916-2013 (from Hicks et al. 2013).

<u>Stock Productivity</u>

A steepness parameter was fixed at 0.779 in the 2013 assessment based on a steepness meta-analysis for west coast rockfishes (Jim Thorson, NWFSC). There is little information regarding recruitment prior to 1980, and the uncertainty in these estimates is expressed in the assessment. Estimates of recruitment appear to oscillate between periods of low and high recruitment. The four largest recruitments were estimated in 1999, 1998, 2001, and 1988, and the four smallest recruitments were estimated in 2002, 2006, 2005, and 1995 (Figure 32).

Rougheye rockfish have the highest potential vulnerability to overfishing (V = 2.27) driven by a combination of low productivity (P = 1.17) and relatively high susceptibility to being caught in the fishery (Table 2). The low productivity is due to the stock being long-lived (max. age = 205 yrs; (Love, *et al.* 2002)), with late maturation, and relatively low natural mortality (Table 5).

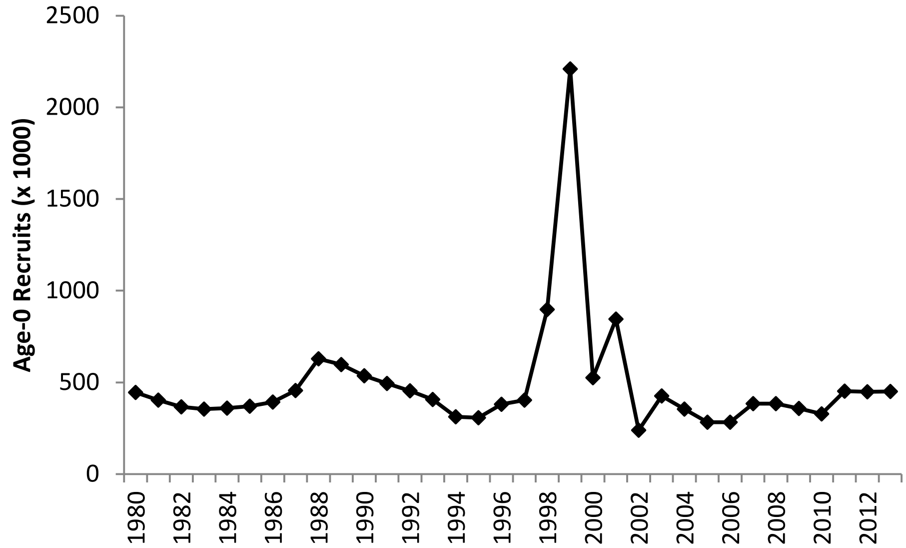

Figure 32. Time series of estimated age-0 recruits of rougheye/blackspotted rockfish on the U.S. west coast, 1980-2013(from Hicks et al. 2013).

Fishing Mortality

Rougheye rockfish are not often targeted by a specific fishery, but are desirable and marketable, thus are typically retained when captured. They are often captured in bottom trawl, mid-water trawl, and longline fisheries. Small numbers have been observed in pot, shrimp, and recreational fisheries.

After many attempts to start trawl fisheries off the west coast of the United States in the late 1800s, the availability of the otter trawl and the diesel engine in the mid-1920s helped the trawl fisheries expand (Douglas 1998). Trawl fisheries really became established during World War II when demand increased for shark livers and bottomfish. A mink food fishery also developed during World War II (Jones and Harry 1960). Foreign fleets began fishing for rockfish in the mid-1960s until the EEZ was implemented in 1977 (Rogers 2003b). Since 1977, landings of rockfish were high until management restrictions were implemented in 2000. Longline catches of rougheye rockfish are present from the turn of the century and continue in recent years, targeting sablefish and halibut.

A long-term directed fishery has not occurred for rougheye rockfish and historical discarding practices are not well known. Rougheye rockfish inhabit deeper water as adults, which were fished less often historically.

Throughout the 1980s and 1990s exploitation rates (1-SPR) were mostly above target levels (Figure 33). Recent exploitation rates on rougheye rockfish were predicted to be near target levels.

While stock-specific OFLs/ABCs were not historically set for rougheye rockfish specifically, the reauthorized Magnuson-Stevens Act of 2006 and FMP Amendment 23 required OFLs for all species in a management plan, including those managed in stock complexes. The first OFL contributions were calculated using DB-SRA and provided in 2011. The 2015 and beyond OFLs are projected from the 2013 assessment. Recent catches since 2002 have been above the new 2015 OFL since 2008 (Figure 34).

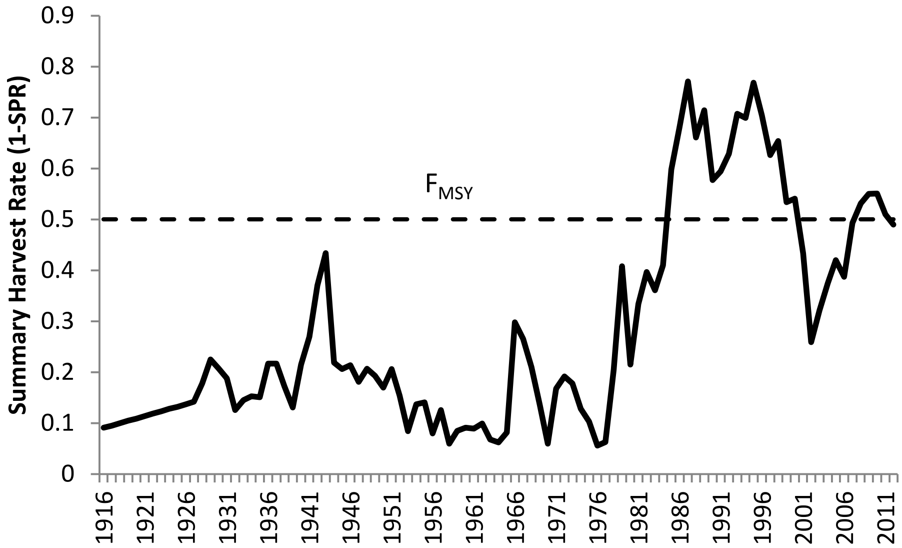

Figure 33. Time-series of estimated summary harvest rate for the west coast stocks of rougheye and blackspotted rockfish, 1916-2012. The dotted line is the harvest rate at the overfishing F_{MSY} proxy.

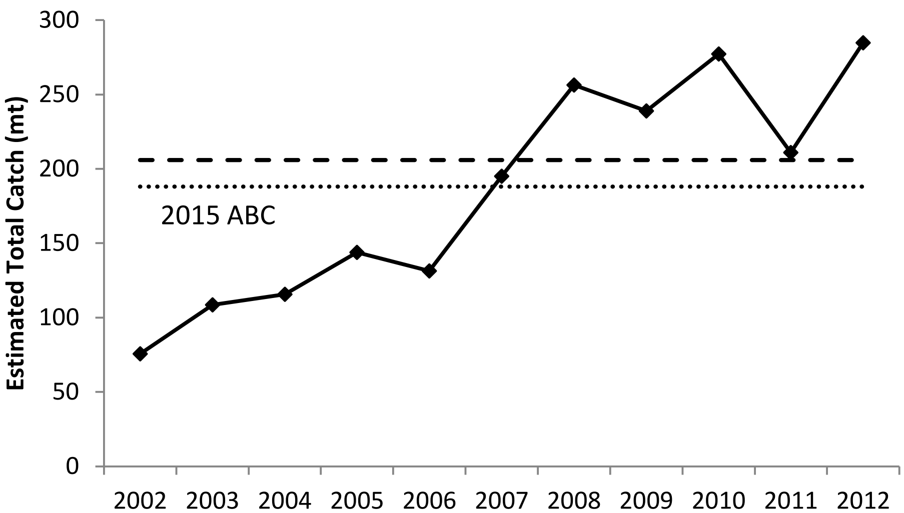

Figure 34. Estimated coastwide total annual catch of rougheye and blackspotted rockfish in 2002-2012 relative to the proposed 2015 OFLs and 2015 ABCs (summed north and south of 40º10' N lat. to compare to coastwide catches).

Sharpchin Rockfish

Distribution and Life History

Stock Status and Management History

<u>Stock Productivity</u>

<u>Fishing Mortality</u>

1.1.5.4 Other Flatfish

The Other Flatfish complex contains most of the flatfish species managed in the Groundfish FMP (with the exception of arrowtooth flounder, Dover sole, English sole, petrale sole, and starry founder). These species 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*).

Pacific Sanddabs

<u>Distribution and Life History</u>

<u>Stock Status and Management History</u>

<u>Stock Productivity</u>

<u>Fishing Mortality</u>

Rex Sole

<u>Distribution and Life History</u>

<u>Stock Status and Management History</u>

<u>Stock Productivity</u>

<u>Fishing Mortality</u>

1.1.5.5 Other Fish

The Other Fish stock complex contains all the unassessed groundfish FMP species that are neither rockfish (family *Scorpaenidae*) nor flatfish, except for spiny dogfish which was newly assessed in 2011. These species include big skate (*Raja binoculata*), California skate (*Raja inornata*), leopard shark (*Triakis semifasciata*), soupfin shark (*Galeorhinus zyopterus*), spiny dogfish (*Squalus acanthias*), finescale codling (*Antimora microlepis*), Pacific grenadier (*Coryphaenoides acrolepis*), ratfish (*Hydrolagus colliei*), cabezon (*Scorpaenichthys marmoratus*) (off Washington), and kelp greenling (*Hexagrammos decagrammus*).

A new assessment of spiny dogfish was done in 2011 indicating a healthy status with a spawning biomass depletion of 63 percent of its unfished biomass in 2011 (Gertseva and Taylor 2011). The spiny dogfish contribution to the complex 2013 and 2014 OFLs were projected from the new assessment using the proxy $F_{45\%}$ F_{MSY} harvest rate. The SSC categorized the stock as a category 2 stock since recruitments were not estimated.

The Other Fish complex is an aggregation of species with different life history characteristics and depth distributions. The historical catch of many of the component stocks is poorly understood with some stocks missing any record of landings on the west coast. The SSC recommended re-evaluating the formation of this complex for the next management cycle and giving consideration to adding new species related to the component species of the complex into the FMP and re-grouping species with similar vulnerabilities, ecological interactions, and distributions.

1.1.6 Ecosystem Component Species

1.2 The Groundfish Harvest Specification Framework and Harvest Specifications for Fisheries in 2015 and Beyond

West coast groundfish stocks are managed under a harvest specification framework that considers scientific and management uncertainties. The first specification decided is the overfishing limit (OFL), which is the maximum sustainable yield (MSY) estimated for the stock and the legal harvest limit beyond which constitutes overfishing. The OFL is determined either by applying the harvest rate estimated to result in a biomass capable of sustaining MSY (i.e., F_{MSY}) recommended by the Council's Scientific and Statistical Committee (SSC) to an estimate of exploitable biomass in the case of assessed stocks or through an approved data-poor method (e.g., depletion-corrected average catch (DCAC) or depletion-based stock reduction analysis (DBSRA)) in the case of unassessed stocks. Regardless of the method or data informing the calculation of an OFL, there is scientific uncertainty in the estimation of an OFL. The Pacific Coast Groundfish Fishery Management Plan (FMP) mandates a precautionary buffer to address this uncertainty by prescribing an acceptable biological catch (ABC) harvest level that is less than the OFL. A further reduction from the ABC can be specified when setting an annual catch limit (ACL) that accounts for management uncertainty, socioeconomic considerations, ecological considerations, conservation objectives, and/or other considerations the Council and NMFS wish to address. Since the ACL can be set equal to the ABC, the ABC is the highest harvest level that can be considered for west coast groundfish stocks.

The following sections describe in detail the science informing 2015 and 2016 harvest specification decisions. Table 8 summarizes the 2014, 2015, and 2016 harvest specifications for west coast groundfish stocks.

Table 8. Status quo 2014 harvest specifications and final preferred overfishing limits (OFLs in mt), acceptable biological catches (ABCs in mt), ecosystem component species, and preliminary preferred alternative (PPA) annual catch limits (ACLs in mt) for west coast groundfish stocks and stock complexes in 2015 and 2016 (stocks with new assessments in bold).

Stock	2014			2015			2016		
	OFL	ABC	ACL	OFL	ABC	ACL	OFL	ABC	ACL
OVERFISHED STOCKS									
BOCACCIO S. of 40⁰10'	**881**	**842**	**337**	**1,444**	**1,380**	**349**	**1,351**	**1,291**	**362**
CANARY	741	709	119	733	701	122	729	697	125
COWCOD S. of 40⁰10'	**12**	**9**	**3**	**67**	**60**	**3 - 10 (10 PPA)**	**66**	**59**	**3 - 10 (10 PPA)**
DARKBLOTCHED	**553**	**529**	**330**	**574**	**549**	**338**	**580**	**554**	**346**
PACIFIC OCEAN PERCH	838	801	153	842	805	158	850	813	164
PETRALE SOLE	**2,774**	**2,652**	**2,652**	**2,946**	**2,816**	**2,816**	**3,044**	**2,910**	**2,910**
YELLOWEYE	51	43	18	52	47	18	52	47	19
NON-OVERFISHED STOCKS									
Arrowtooth Flounder	6,912	5,758	5,758	6,599	5,497	5,497	6,396	5,328	5,328
Black Rockfish (OR-CA)	1,166	1,115	1,000	1,176	1,124	1,000	1,183	1,131	1,000
Black Rockfish (WA)	428	409	409	421	402	402	423	404	404
Cabezon (CA)	165	158	158	161	154	154	158	151	151
Cabezon (OR)	49	47	47	49	47	47	49	47	47
California scorpionfish	122	117	117	119	114	114	117	111	111
Chilipepper S. of 40º10'	1,722	1,647	1,647	1,703	1,628	1,628	1,694	1,619	1,619
Dover Sole	77,774	74,352	25,000	66,871	63,929	25,000 - 50,000	59,221	56,615	25,000 - 50,000
English Sole	**5,906**	**5,646**	**5,646**	**12,092**	**11,040**	**11,040**	**8,493**	**7,754**	**7,754**
Lingcod N of 40º10'	3,162	2,878	2,878	3,010	2,830	2,830	2,891	2,719	2,719
Lingcod S. of 40º10'	1,276	1,063	1,063	1,205	1,004	1,004	1,136	946	946
Longnose skate	2,816	2,692	2,000	2,449	2,341	2,000	2,405	2,299	2,000
Longspine Thornyhead (coastwide)	**3,304**	**2,752**	**NA**	**5,007**	**4,171**	**NA**	**4,763**	**3,968**	**NA**
Longspine Thornyhead N of 34°27'	**NA**	**NA**	**1,958**	**NA**	**NA**	**3,170**	**NA**	**NA**	**3,015**
Longspine Thornyhead S. of 34°27'	**NA**	**NA**	**347**	**NA**	**NA**	**1,001**	**NA**	**NA**	**952**
Pacific Cod	3,200	2,221	1,600	3,200	2,221	1,600	3,200	2,221	1,600

Stock	2014			2015			2016		
	OFL	ABC	ACL	OFL	ABC	ACL	OFL	ABC	ACL
Sablefish (coastwide)	7,158	6,535	NA	7,857	7,173	NA	8,526	7,784	NA
Sablefish N of 36°	NA	NA	4,349	NA	NA	4,793	NA	NA	5,241
Sablefish S. of 36°	NA	NA	1,560	NA	NA	1,719	NA	NA	1,880
Shortbelly	6,950	5,789	50	6,950	5,789	50	6,950	5,789	50
Shortspine Thornyhead (coastwide)	**2,310**	**2,208**	**NA**	**3,203**	**2,668**	**NA**	**3,169**	**2,640**	**NA**
Shortspine Thornyhead N of 34°27'	**NA**	**NA**	**1,525**	**NA**	**NA**	**1,745**	**NA**	**NA**	**1,726**
Shortspine Thornyhead S. of 34°27'	**NA**	**NA**	**393**	**NA**	**NA**	**923**	**NA**	**NA**	**913**
Spiny dogfish	2,950	2,024	NA	2,523	1,912	1,912	2,503	1,897	1,897
Splitnose S. of 40°10’	1,747	1,670	1,670	1,794	1,715	1,715	1,826	1,746	1,746
Starry Flounder	1,834	1,528	1,528	1,841	1,534	1,534	1,847	1,539	1,539
Widow	4,435	4,212	1,500	4,137	3,929	1,500 - 3,000	3,990	3,790	1,500 - 3,000
Yellowtail N of 40°10’	**4,584**	**4,382**	**4,382**	**12,281**	**11,213**	**11,213**	**11,647**	**10,634**	**10,634**
STOCK COMPLEXES									
Nearshore Rockfish North	110	94	94	90	79	69	90	79	69
Shelf Rockfish North	2,195	1,932	968	2,208	1,943	1,944	2,217	1,952	1,952
Slope Rockfish North a/	1,553	1,414	1,160	1,804	1,669	1,669	1,818	1,683	1,683
Nearshore Rockfish South	1,160	1,001	990	1,309	1,165	1,114	1,317	1,163	1,006
Shelf Rockfish South	1,913	1,620	714	1,914	1,621	1,624	1,915	1,622	1,625
Slope Rockfish South a/	685	622	622	806	698	687	807	699	689
Other Flatfish	10,060	6,982	4,884	11,298	8,620	8,620	9,948	7,496	7,496
Other Fish	6,802	4,697	4,697	This complex no longer exists					
Cabezon (WA) b/	*c/*	*c/*	*c/*	*4.5*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Kelp greenling (CA) b/	*118.9*	*82.5*	*NA*	*118.9*	*99.2*	*99.2*	*118.9*	*99.2*	*99.2*
Kelp greenling (OR) b/	*c/*	*c/*	*c/*	*14.0*	*11.7*	*11.7*	*16.6*	*12.9*	*12.9*
Kelp greenling (WA) b/	*c/*	*c/*	*c/*	*31.4*	*21.8*	*21.8*	*28.4*	*19.7*	*19.7*
Leopard shark b/	*167.1*	*139.4*	*139.4*	*167.1*	*139.4*	*139.4*	*167.1*	*139.4*	*139.4*

Stock	2014			2015			2016		
	OFL	ABC	ACL	OFL	ABC	ACL	OFL	ABC	ACL
ECOSYSTEM COMPONENT SPECIES									
Big skate	*458.0*	*317.9*	*NA*	No harvest specifications for an EC species					
California skate	*86.0*	*59.7*	*NA*	No harvest specifications for an EC species					
Aleutian skate	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
Roughtail/black skate	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
Bering/sandpaper skate	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
All other skates	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
Pacific grenadier	*1,519.0*	*1,054.2*	*NA*	No harvest specifications for an EC species					
Giant grenadier	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
All other grenadiers	*d/*	*d/*	*d/*	No harvest specifications for an EC species					
Ratfish	*1,441.0*	*1,000.1*	*NA*	No harvest specifications for an EC species					
Soupfin shark	*61.6*	*42.8*	*NA*	No harvest specifications for an EC species					
Finescale codling	*c/*	*c/*	*c/*	No harvest specifications for an EC species					

a/ 2015 and 2016 harvest specifications assume the status quo stock complex structure. See "Slope RF" worksheet for stock complex alternatives.

b/ These stocks have been managed in the Other Fish complex and are contemplated for individual stock management or in a new shallow roundfish stock complex in 2015-2016.

c/ No OFL or ABC contribution for these stocks given the lack of an approved method.

d/ No harvest specifications adopted since these species are not currently managed in the FMP.

1.2.1 Overfishing Limits

The OFL is the MSY harvest level associated with the current stock abundance and is the estimated or proxy MSY harvest level, which is the harvest threshold above which overfishing occurs. The methods for determining OFL are based on the best available science and the recommendation of the SSC; therefore, alternatives are not developed for this reference point.

Amendment 23, which was adopted in December 2010 and implemented in 2011, revised the descriptions of species categories used in the development of harvest specifications. The first category (category 1) includes those species with relatively data-rich quantitative stock assessments that are developed on the basis of catch-at-age, catch-at-length, or other data. Recruitments are estimated for category 1 stocks. OFLs and overfished/rebuilding thresholds can generally be calculated for these species. The second category (category 2) includes species for which some biological indicators are available yet data informing an assessment are limited. Category 2 assessments include a new class of data-moderate assessments where catch data and one or more indices of abundance inform the status and estimated biomass of the stock, but age and length compositional data are excluded. This type of assessment allows for a more expeditious assessment review than the category 1 benchmark assessments, which require a rigorous review process[7], thus enabling more stocks to be assessed in an assessment cycle. Two data-moderate assessment models were approved for the 2013 assessment cycle (which informs management decision-making for 2015 and beyond): extended depletion-based stock reduction analysis (XDBSRA) and extended simple stock synthesis (exSSS). The third category (category 3) includes minor species which are caught and where the only available information is catch-based data. When setting the 2015 and 2016 OFLs for category 1 or 2 species, the F_{MSY} harvest rate or a proxy was applied to the estimated exploitable biomass. A policy of using a default harvest rate as a proxy for the fishing mortality rate that is expected to achieve MSY is also referred to as the F_{MSY} control rule or maximum fishing mortality threshold (MFMT) harvest rate. Catch-based methods are generally used to determine the OFL for category 3 species.

New stock assessments, stock assessment updates and rebuilding analyses recommended by the SSC as the "best available science" and suitable for use in setting biennial harvest specifications were approved by the Council for setting the 2015 and 2016 biennial harvest specifications. Eight full stock assessments, eight data-moderate stock assessments, and one stock assessment update were prepared to inform the 2015 and 2016 harvest specifications. Full stock assessments, those that consider the appropriateness of the assessment model and that revise the model as necessary, were prepared for the following stocks: aurora rockfish, cowcod south of 34º27' N lat., darkblotched rockfish, longspine thornyhead, petrale sole, Pacific sanddabs, rougheye/blackspotted rockfish (analyzed as a complex of two stocks), and shortspine thornyhead. These were the first west coast assessments for aurora rockfish, rougheye/blackspotted rockfish, and Pacific sanddabs. OFLs were estimated for seven of these eight stocks; the exception being Pacific sanddabs where the assessment was recommended to inform stock status but not estimates of current biomass or OFL. Eight stocks were assessed using the approved data-moderate models: brown rockfish, China rockfish, copper rockfish, English sole, rex sole, sharpchin rockfish, stripetail rockfish, and yellowtail rockfish north of 40º10' N lat. OFLs were estimated for seven of these eight stocks; the exception being stripetail rockfish where the assessment was recommended to inform stock status but not estimates of current biomass or OFL. A stock assessment update, which incorporates new data through existing models without changing the model, was prepared for bocaccio. For stocks that did not have new assessments or an update prepared, the Council considered OFLs projected in the most recent stock assessment or update or estimated using historical landings data.

[7] The review process for new benchmark assessments includes a Stock Assessment Review (STAR) panel review and a subsequent review by the Council's Scientific and Statistical Committee (SSC). Only those assessments that are endorsed by the SSC are considered for formal adoption in the Council process.

Two data-poor methods, depletion-corrected average catch (DCAC) and depletion-based stock reduction analysis (DBSRA), used to determine most of the category 3 OFLs since 2011 were recommended for use in determining 2015 and 2016 OFLs for unassessed stocks, where there was enough harvest data to use these methods. Average historical catch was used to determine OFLs for stocks where the historical catches were too sparse to use DCAC or DBSRA methods.

For 2015 and 2016, default harvest rates were used as a proxy for the fishing mortality rate that is expected to achieve the MSY (F_{MSY}). A proxy is used because there is insufficient information for most Pacific Coast groundfish stocks to establish a species-specific F_{MSY}. In 2015 and 2016, the following default harvest rate proxies, based on SSC recommendations, were used: $F_{30\%}$ for assessed flatfish, $F_{40\%}$ for Pacific whiting, $F_{50\%}$ for rockfish (including thornyheads), $F_{50\%}$ for spiny dogfish, and $F_{45\%}$ for other groundfish such as sablefish and lingcod. The FMP allows default harvest rate proxies to be modified as scientific knowledge improves for a particular species.

Table 9 compares the 2015 and 2016 OFLs with the 2014 OFL for stocks managed with stock-specific harvest specifications. The OFLs are specified for all the stocks and stock complexes actively managed in the fishery, as required by the FMP. The 2014 OFLs in Table 9 were projected from stock assessments done in 2011 or earlier. The 2015 and 2016 OFLs in Table 9 include the results of stock assessments done in 2013. The OFL contributions for the cowcod stock south of 40º10’ N lat. are shown as area-specific OFL contributions because they were derived using different methodologies. The Conception area OFLs for cowcod were projected from the 2013 rebuilding analysis Dick and MacCall 2013 and the Monterey area OFLs were derived using DBSRA. Although the area-specific OFL contributions for cowcod are displayed in Table 9, the OFL is specified for the entire stock south of 40°10’ N lat. and not for each area. The 2014 OFL and 2015 and 2016 OFL contributions of individual stocks within the Minor Rockfish, Other Flatfish, and the Shallow Roundfish complexes are shown in italics in Table 10. The OFL contributions for the individual stocks were summed to derive the complex OFLs. Table 10 assumes the status quo stock complex structure for the slope rockfish complexes. However, the Council is contemplating a restructuring of these complexes. The Council also recommended restructuring the status quo Other Fish complex by removing spiny dogfish and managing that stock with stock-specific harvest specifications (Table 9), designating the skates, Pacific grenadier, finescale codling, and ratfish stocks as Ecosystem Component species, and managing kelp greenling, the Washington stock of cabezon, and leopard shark in a new Shallow Roundfish complex (there is also an alternative to manage these stocks individually with stock-specific harvest specifications).

The preferred 2015 and 2016 OFLs for west coast groundfish stocks and stock complexes used the same policies (e.g., F_{MSY} harvest rates and methodologies) used to determine the 2014 OFLs (i.e., No Action) with the following exceptions:

- The spiny dogfish F_{MSY} proxy harvest rate was changed from $F_{45\%}$ to $F_{50\%}$;
- Spiny dogfish is recommended to be removed from the Other Fish complex and managed with stock-specific harvest specifications;
- The skates, Pacific grenadier, finescale codling, soupfin shark, and ratfish stocks are removed from the Other Fish complex and designated as Ecosystem Component species;
- Those endemic skate and grenadier species not previously managed in the FMP are recommended to be added to the FMP and designated as Ecosystem Component species; and
- Kelp greenling, the Washington stock of cabezon, and leopard shark are recommended for management in a new Shallow Roundfish complex (there is also an alternative to manage these stocks individually with stock-specific harvest specifications).

Table 9. Specified 2014 OFLs (i.e., No Action alternative) (mt) and preferred 2015 and 2016 OFLs (mt) for stocks managed with stock-specific harvest specifications (overfished stocks in CAPS, stocks with new assessments in bold, substock contributions to a stock OFL in italics (i.e., cowcod)).

Stock	2014 OFL	2015 OFL	2016 OFL
OVERFISHED STOCKS			
BOCACCIO S. of 40°10' N lat.	**881**	**1,444**	**1,351**
CANARY	741	733	729
COWCOD S. of 40°10' N lat.	12	**66.6**	**66.1**
COWCOD (Conception)	**7**	***55.0***	***54.1***
COWCOD (Monterey)	5	*11.6*	*12.0*
DARKBLOTCHED	**553**	**574**	**580**
PACIFIC OCEAN PERCH	838	842	850
PETRALE SOLE	**2,774**	**2,946**	**3,044**
YELLOWEYE	51	52	52
NON-OVERFISHED STOCKS			
Arrowtooth Flounder	6,912	6,599	6,396
Black Rockfish (OR-CA)	1,166	1,176	1,183
Black Rockfish (WA)	428	421	423
Cabezon (CA)	165	161	158
Cabezon (OR)	49	49	49
California scorpionfish	122	119	117
Chilipepper S. of 40°10' N lat.	1,722	1,703	1,694
Dover Sole	77,774	66,871	59,221
English Sole	**5,906**	**12,092**	**8,493**
Lingcod N of 40º10' N lat.	3,162	3,010	2,891
Lingcod S. of 40º10' N lat.	1,276	1,205	1,136
Longnose skate	2,816	2,449	2,405
Longspine Thornyhead (coastwide)	**3,304**	**5,007**	**4,763**
Pacific Cod	3,200	3,200	3,200
Sablefish (coastwide)	7,158	7,857	8,526
Shortbelly	6,950	6,950	6,950
Shortspine Thornyhead (coastwide)	2,310	**3,203**	**3,169**
Spiny dogfish	2,950	2,523	2,503
Splitnose S. of 40°10' N lat.	1,747	1,794	1,826
Starry Flounder	1,834	1,841	1,847
Widow	4,435	4,137	3,990
Yellowtail N of 40°10' N lat.	**4,584**	**12,281**	**11,647**

Table 10. Specified 2014 OFLs (i.e., No Action alternative) (mt) and preferred 2015 and 2016 OFLs (mt) for stock complexes (species contributions to a stock complex specification in italics, stocks with new assessments in bold). Status quo rockfish complex structures are assumed.

Stock	2014 OFL	Category	2015 OFL	2016 OFL
OVERFISHED STOCKS				
BOCACCIO S. of 40⁰10' N lat.	**881**	**1**	**1,444**	**1,351**
CANARY	741	1	733	729
COWCOD S. of 40⁰10' N lat.	12		**66.6**	**66.1**
COWCOD (Conception)	**7**	**2**	***55.0***	***54.1***
COWCOD (Monterey)	5	3	*11.6*	*12.0*
DARKBLOTCHED	**553**	**1**	**574**	**580**
PACIFIC OCEAN PERCH	838	1	842	850
PETRALE SOLE	**2,774**	**1**	**2,946**	**3,044**
YELLOWEYE	51	2	52	52
NON-OVERFISHED STOCKS				
Arrowtooth Flounder	6,912	2	6,599	6,396
Black Rockfish (OR-CA)	1,166	1	1,176	1,183
Black Rockfish (WA)	428	1	421	423
Cabezon (CA)	165	1	161	158
Cabezon (OR)	49	1	49	49
California scorpionfish	122	1	119	117
Chilipepper S. of 40⁰10' N lat.	1,722	1	1,703	1,694
Dover Sole	77,774	1	66,871	59,221
English Sole	**5,906**	**2**	**12,092**	**8,493**
Lingcod N of 42º N lat. (OR & WA)	1,984	1	1,898	1,842
Lingcod S. of 42º N lat. (CA)	2,454	2	2,317	2,185
Lingcod N of 40º10' N lat.	3,162	1	3,010	2,891
Lingcod S. of 40º10' N lat.	1,276	2	1,205	1,136
Longnose skate	2,816	1	2,449	2,405
Longspine Thornyhead (coastwide)	**3,304**	**2**	**5,007**	**4,763**
Pacific Cod	3,200	3	3,200	3,200
Sablefish (coastwide)	7,158	1	7,857	8,526
Shortbelly	6,950	2	6,950	6,950
Shortspine Thornyhead (coastwide)	2,310	**2**	**3,203**	**3,169**
Spiny dogfish	2,950	2	2,523	2,503
Splitnose S. of 40⁰10' N lat.	1,747	1	1,794	1,826
Starry Flounder	1,834	2	1,841	1,847
Widow	4,435	1	4,137	3,990
Yellowtail N of 40⁰10' N lat.	**4,584**	**2**	**12,281**	**11,647**
STOCK COMPLEXES				
Nearshore Rockfish North	110		90	90
Black and yellow	*0.01*	3	*0.01*	*0.01*
Blue (CA)	*27.4*	2	*27.4*	*27.7*
Blue (OR & WA)	*32.3*	3	*32.3*	*32.3*
Brown	***5.5***	**2**	***2.0***	***2.0***
Calico	-	3	-	-
China	***9.8***	**2**	***8.2***	***8.0***
Copper	***26.0***	**2**	***11.0***	***11.4***
Gopher	-	3	-	-
Grass	*0.7*	3	*0.7*	*0.7*

Stock	2014 OFL	Category	2015 OFL	2016 OFL
Kelp	*0.01*	3	*0.01*	*0.01*
Olive	*0.3*	3	*0.3*	*0.3*
Quillback	*7.4*	3	*7.4*	*7.4*
Treefish	*0.2*	3	*0.2*	*0.2*
Shelf Rockfish North	2,195		2,208	2,217
Bronzespotted	-	3	-	-
Bocaccio	*284.0*	3	*284.0*	*284.0*
Chameleon	-	3	-	-
Chilipepper	*129.6*	3	*128.2*	*127.5*
Cowcod	-	3	*0.4*	*0.4*
Flag	*0.1*	3	*0.1*	*0.1*
Freckled	-	3	-	-
Greenblotched	*1.3*	3	*1.3*	*1.3*
Greenspotted 40°10' to 42° N lat.	*9.4*	2	*9.3*	*9.3*
Greenspotted N of 42 N lat. (OR & WA)	*6.1*	3	*6.1*	*6.1*
Greenstriped	*1,268.3*	2	*1,281.9*	*1,292.0*
Halfbanded	-	3	-	-
Harlequin	-	3	-	-
Honeycomb	-	3	-	-
Mexican	-	3	-	-
Pink	*0.004*	3	*0.004*	*0.004*
Pinkrose	-	3	-	-
Puget Sound	-	3	-	-
Pygmy	-	3	-	-
Redstripe	*269.9*	3	*269.9*	*269.9*
Rosethorn	*12.9*	3	*12.9*	*12.9*
Rosy	*3.0*	3	*3.0*	*3.0*
Silvergray	*159.4*	3	*159.4*	*159.4*
Speckled	*0.2*	3	*0.2*	*0.2*
Squarespot	*0.2*	3	*0.2*	*0.2*
Starry	*0.004*	3	*0.004*	*0.004*
Stripetail	*40.4*	3	*40.4*	*40.4*
Swordspine	*0.0001*	3	*0.0001*	*0.0001*
Tiger	*1.0*	3	*1.0*	*1.0*
Vermilion	*9.7*	3	*9.7*	*9.7*
Slope Rockfish North	1,553		1,804	1,818
Aurora	***15.4***	**1**	***17.4***	***17.5***
Bank	*17.2*	3	*17.2*	*17.2*
Blackgill	*4.7*	3	*4.7*	*4.7*
Redbanded	*45.3*	3	*45.3*	*45.3*
Rougheye/Blackspotted	***71.1***	**2**	***201.9***	***206.8***
Sharpchin	***214.5***	**2**	***305.6***	***297.6***
Shortraker	*18.7*	3	*18.7*	*18.7*
Splitnose	*974.1*	1	*1,000.6*	*1,018.2*
Yellowmouth	*192.4*	3	*192.4*	*192.4*
Nearshore Rockfish South	1,160		1,309	1,317
Shallow Nearshore Species	NA	NA	NA	NA
Black and yellow	*27.5*	3	*27.5*	*27.5*
China	***16.6***	**2**	***51.6***	***52.4***
Gopher (N of Pt. Conception)	*153.0*	1	*148.0*	*144.0*

Stock	2014 OFL	Category	2015 OFL	2016 OFL
Gopher (S of Pt. Conception)	*25.6*	3	*25.6*	*25.6*
Grass	*59.6*	3	*59.6*	*59.6*
Kelp	*27.7*	3	*27.7*	*27.7*
Deeper Nearshore Species	NA	NA	NA	NA
Blue (assessed area)	*187.8*	2	*188.6*	*190.3*
Blue (S of 34 ^{o}27' N lat.)	*72.9*	3	*72.9*	*72.9*
Brown	***204.6***	**2**	***171.2***	***175.3***
Calico	-	3	-	-
Copper	***141.5***	**2**	***292.7***	***298.3***
Olive	*224.6*	3	*224.6*	*224.6*
Quillback	*5.4*	3	*5.4*	*5.4*
Treefish	*13.2*	3	*13.2*	*13.2*
Shelf Rockfish South	1,912.9		1,914.1	1,915.4
Bronzespotted	*3.6*	3	*3.6*	*3.6*
Chameleon	-	3	-	-
Flag	*23.4*	3	*23.4*	*23.4*
Freckled	-	3	-	-
Greenblotched	*23.1*	3	*23.1*	*23.1*
Greenspotted	*80.3*	2	*79.0*	*78.4*
Greenstriped	*232.7*	2	*235.1*	*237.0*
Halfbanded	-	3	-	-
Harlequin	-	3	-	-
Honeycomb	*9.9*	3	*9.9*	*9.9*
Mexican	*5.1*	3	*5.1*	*5.1*
Pink	*2.5*	3	*2.5*	*2.5*
Pinkrose	-	3	-	-
Pygmy	-	3	-	-
Redstripe	*0.5*	3	*0.5*	*0.5*
Rosethorn	*2.1*	3	*2.1*	*2.1*
Rosy	*44.5*	3	*44.5*	*44.5*
Silvergray	*0.5*	3	*0.5*	*0.5*
Speckled	*39.4*	3	*39.4*	*39.4*
Squarespot	*11.1*	3	*11.1*	*11.1*
Starry	*62.6*	3	*62.6*	*62.6*
Stripetail	*23.6*	3	*23.6*	*23.6*
Swordspine	*14.2*	3	*14.2*	*14.2*
Tiger	*0.04*	3	*0.04*	*0.04*
Vermilion	*269.3*	3	*269.3*	*269.3*
Yellowtail	*1,064.4*	3	*1,064.4*	*1,064.4*
Slope Rockfish South	685		806	807
Aurora	***26.1***	**1**	***74.3***	***74.3***
Bank	*503.2*	3	*503.2*	*503.2*
Blackgill	*134.0*	2	*137.0*	*140.0*
Pacific ocean perch	-	3	-	-
Redbanded	*10.4*	3	*10.4*	*10.4*
Rougheye/Blackspotted	***0.4***	**2**	***4.1***	***4.2***
Sharpchin	***9.8***	**2**	***76.4***	***74.4***
Shortraker	*0.1*	3	*0.1*	*0.1*
Yellowmouth	*0.8*	3	*0.8*	*0.8*

Stock	2014 OFL	Category	2015 OFL	2016 OFL
Other Flatfish	10,060		11,298	9,948
Butter sole	*4.6*	3	*4.6*	*4.6*
Curlfin sole	*8.2*	3	*8.2*	*8.2*
Flathead sole	*35.0*	3	*35.0*	*35.0*
Pacific sanddab	*4,801.0*	**3**	*4,801.0*	*4,801.0*
Rex sole	***4,371.5***	**2**	***5,609.0***	***4,259.0***
Rock sole	*66.7*	3	*66.7*	*66.7*
Sand sole	*773.2*	3	*773.2*	*773.2*

1.2.2 Acceptable Biological Catches

Scientific uncertainty in stock assessments is taken into consideration when setting harvest specifications. The ABC is an annual catch specification that is the stock or stock complex's OFL reduced by an amount associated with scientific uncertainty in estimating the OFL, which is calculated as the estimated exploitable biomass multiplied by FMSY. The SSC considers the uncertainty in estimating stock biomass and provided recommendations to the Council for quantifying this source of scientific uncertainty in groundfish stock assessments. A conceptual framework that factors in scientific uncertainty for stocks with quantitative assessments was implemented under Amendment 23. Under the framework, scientific uncertainty associated with estimating an OFL (sigma (σ)) is quantified by the SSC, and the percentage reduction that defines the scientific uncertainty buffer and the ABC can be determined by translating the estimated σ to a range of overfishing probability (P*) values. Each P* value is then mapped to its corresponding buffer fraction. The Council then determines the preferred level of risk aversion by selecting an appropriate P* value, accordingly. In cases where the P* approach is used, the upper limit of P* values considered is 0.45.

The 2014, 2015, and 2016 ABCs are annual catch specifications that are the stock or stock complex's OFL reduced by an amount associated with the scientific uncertainty in estimating the OFL. Under the FMP harvest specification framework, scientific advice that is relatively uncertain will result in ABCs that are relatively lower, all other things being equal (i.e., a precautionary reduction in catch will occur due purely to scientific uncertainty in estimating the OFL). The ABC is the catch level that ACLs may not exceed. As explained in more detail below, the SSC recommended a two-step approach referred to as the P* approach for determining ABCs. In the P* approach, the SSC determines the amount of scientific uncertainty associated with estimating the OFL in stock assessments, referred to as the sigma (σ) value. Since the OFL is estimated by applying the harvest rate estimated or assumed to produce MSY (i.e., F_{MSY}) to the exploitable biomass and since assumed proxy F_{MSY} harvest rates by taxa are currently used to estimate the OFL, the variance in estimating biomass is the metric used for determining sigma. The Council chooses its preferred level of risk of overfishing, which is designated as the overfishing probability[8] (P*) (see Section 1.2.2.1). The scientists then apply the P* value to the sigma value to determine the amount by which the OFL is reduced to establish the ABC. The SSC's recommendations for sigma and the reductions from OFL associated with different P* values are science-based recommendations; therefore, alternatives to these values are not analyzed.

The SSC assigned each species in the groundfish fishery to one of three categories based on the level of information available about the species. Table 11 shows the criteria used by the SSC to categorize stocks. The SSC's recommended sigma value for category 1 stocks is based on a statistical analysis of the variance within and among stock assessments. The meta-analysis used stock assessments from 17 data-rich stocks to determine the proxy sigma value for category 1 stocks. The general methodology used by the SSC subcommittees to assess among-assessment uncertainty was to compare previous stock assessments and stock assessment updates[9], and consider the logarithms of the ratios of the biomass estimates for each pair of assessments and their reciprocals using the last 20 years from an assessment. This provides a distribution of stock size differences in log-space and, if this variation is averaged over species, provides a general view of total biomass variation (represented as sigma - σ) that emerges among

[8] The overfishing probability (P*) is the probability of overfishing a stock or stock complex (i.e., exceeding the specified OFL) based solely on the scientific uncertainty in estimating the OFL.

[9] Stock assessment updates were excluded from the meta-analysis unless they were the most recent assessment conducted (in which case the original full assessment upon which the update was based was excluded from the meta-analysis) because of constraints imposed by the Terms of Reference for groundfish stock assessments on how much update assessments could change from the last full assessment.

repeat assessments of stocks, while embracing a wide range of factors that affect variability in results. The SSC indicated that biomass is most likely the dominant source of uncertainty; however, it is anticipated that other factors will need to be considered in the future.

Table 11. Criteria used by the SSC to categorize stocks based on the quantity and quality of data informing the estimate of OFL. Stock categories are used in deciding 2015 and 2016 ABCs that accommodate the uncertainty in estimating OFLs.

Category	Sub-category	Criteria
Category 1 - Data rich stocks. OFL based on F_{MSY} or F_{MSY} proxy from model output. ABC based on P* buffer.		
1	a	Reliable compositional (age and/or size) data sufficient to resolve year-class strength and growth characteristics. Only fishery-dependent trend information available. Age/size structured assessment model.
1	b	As in 3a, but trend information also available from surveys. Age/size structured assessment model.
1	c	Age/size structured assessment model with reliable estimation of the stock-recruit relationship.
Category 2 - Data moderate. OFL derived from model output (or natural mortality).		
2	a	M*survey biomass assessment (as in Rogers 1996).
2	b	Historical catches, fishery-dependent trend information only. An aggregate population model is fit to the available information.
2	c	Historical catches, survey trend information, or at least one absolute abundance estimate. An aggregate population model is fit to the available information.
2	d	Full age-structured assessment, but results are substantially more uncertain than assessments used in the calculation of the P* buffer. The SSC will provide a rationale for each stock placed in this category. Reasons could include that assessment results are very sensitive to model and data assumptions, or that the assessment has not been updated for many years.
Category 3 - Data poor. OFL derived from data-poor methods using historical catch.		
3	a	No reliable catch history. No basis for establishing OFL.
3	b	Reliable catch estimates only for recent years. OFL is average catch during a period when stock is considered to be stable and close to B_{MSY} equilibrium on the basis of expert judgment.
3	c	Reliable aggregate catches during period of fishery development and approximate values for natural mortality. Default analytical approach DCAC.
3	d	Reliable annual historical catches and approximate values for natural mortality and age at 50% maturity. Default analytical approach DBSRA.

Based on this analysis, the SSC recommended using the biomass variance statistic of $\sigma = 0.36$ for category 1 stocks. In cases where the stock biomass estimated in the most recent assessment has a variance greater than the variance estimated for that stock's category, the assessment's estimated biomass variance is used instead. The stock biomass estimated in the 2011 widow rockfish assessment was judged to have a greater variance than the sigma of 0.36 used for other category 1 stocks. In this case, the SSC recommended using a sigma value of 0.41 for deciding the widow rockfish ABC. Likewise, the 2013 assessment for aurora rockfish also indicated a greater variance than the sigma of 0.36 used for other category 1 stocks. In that case, a sigma value of 0.39 was chosen for deciding the aurora rockfish ABC. Each P* is mapped to its corresponding buffer fraction. The Council then recommends an appropriate P* value. When the P* approach is used, the upper limit of P* allowed by the FMP is 0.45.

Since there is greater scientific uncertainty for category 2 and 3 stocks relative to category 1 stocks, the scientific uncertainty buffer is generally greater than that recommended for category 1 stocks. The SSC recommended sigma values for category 2 and 3 stocks of 0.72 and 1.44, respectively (i.e., two and four times the sigma for category 1 stocks). The specific values of 0.72 and 1.44 were recommended by the SSC and considered to be the best available scientific information; however, the values are not based on a formal analysis of assessment outcomes and could change substantially when the SSC reviews additional analyses in future management cycles.

Table 12 shows the relationship between the values for sigma and the buffer for a range of values for P*.

1.2.2.1 Considerations for Deciding the Overfishing Probability (P*) When Specifying an Acceptable Biological Catch

The overfishing probability metric (P*) is technically defined as the probability of overfishing a stock based on the scientific uncertainty in estimating the OFL. This definition has generated much debate in the Council's harvest specification decision-making process. One side of the debate maintains the literal definition of the overfishing probability. The counter argument is that P* is the Council's level of risk tolerance that the OFL will be exceeded. Both arguments have merit but the latter argument is more tractable in the Council process and is a more accurate representation of how the P* value is decided.

The one problem with the literal definition of P* is that not all assessments are alike. The SSC recognizes this and has recommended a proxy value of sigma (0.36) for category 1 stocks, which are stocks that have assessments with estimated recruitment deviations (i.e., the strength of individual year classes is estimated). However, the SSC acknowledges that the proxy sigma for category 1 stocks may not represent the relative uncertainty of all category 1 stocks. For this reason, sigma is estimated in new category 1 assessments. If the estimated sigma is greater than the proxy value of 0.36, then the estimated sigma is used rather than the proxy value. However, the true scientific uncertainty is not estimated well in this process. Assessments vary greatly in the amount of uncertainty that is characterized in the assessment model. It is common that one or more parameters are either estimated outside the model or assumed based on the assessment scientist's best judgment. In such cases, the uncertainty associated with that parameter is also not estimated nor characterized in any way within the assessment. For instance, the 2011 sablefish assessment (Stewart, *et al.* 2011) appears to estimate current biomass with significant uncertainty. However, within that assessment many of the key parameters that affect the estimated biomass such as growth and natural mortality are explicitly estimated within the model[10]. The confidence interval associated with the ending year biomass estimate appears quite large relative to other assessments since the uncertainties associated with estimated growth and natural mortality are included within the overall assessment uncertainty. This compares to many other assessments, such as splitnose rockfish in 2009 (Gertseva, *et al.* 2009) or longspine thornyhead in 2013 (Stephens and Taylor 2013) where many parameters are assumed and fixed (e.g., natural mortality and steepness) and the estimated biomass variance appears smaller. However, this is not necessarily the case; more of the true uncertainty in estimated biomass is characterized in the sablefish assessment.

The spectrum of assessment approaches vary between fully Bayesian models with most key parameters estimated (e.g., sablefish in 2011) to deterministic models with most parameters fixed (e.g., longspine thornyhead in 2013). Within the spectrum are parameter estimations using informed or diffuse priors. Given this variety of approaches and the degree to which uncertainty is characterized, it is hard to pursue a formulaic approach where the P* decision hinges on the scientific uncertainty associated with estimating the OFL. For the most part, the relative uncertainty in estimating the OFL is addressed with the SSC's sigma specification. The Council's P* decision is therefore most appropriately considered as a risk assessment given many sources of uncertainty regarding the true state of nature for a stock.

1.2.2.2 Preferred 2015 and 2016 Acceptable Biological Catches

The ABCs for actively-managed stock complexes were determined by summing ABC values of the component stocks. Table 13 and Table 14 depict the potential alternative 2015 and 2016 ABCs, respectively for stocks and stock complexes across a range of P* values from 0.25 to 0.45. The Council

[10] Stock-recruitment steepness (h), another parameter that affects the estimate of biomass, is fixed at an assumed 0.6 in the 2011 sablefish assessment.

selected a P* value of 0.45 for most category 1 stocks. With a P* value of 0.45, a sigma value of 0.36 corresponds with a reduction of 4.4 percent from the OFL when deriving the ABC. For sablefish, the thornyheads, and assessed flatfish stocks, the Council selected a P* value of 0.4. The preferred 2015 and 2016 ABCs used the same policies (i.e., stock categories, sigma and P* values) used to determine the 2014 No Action ABCs with the following exceptions:

- Aurora rockfish was changed from a category 3 to a category 1 stock based on the new benchmark stock assessment adopted in 2013 (Hamel, *et al.* 2013). Therefore, the sigma of 1.44 for category 3 stocks was used to determine the 2014 ABC and a stock-specific sigma of 0.39 estimated for aurora rockfish was used to determine the 2015 and 2016 ABCs. The same P* of 0.45 was used to determine 2014, 2015, and 2016 ABCs;

- Rougheye/blackspotted rockfish was changed from a category 3 (for rougheye alone) to a category 2 stock based on the new benchmark stock assessment adopted in 2013 (Hicks, *et al.* 2013). The SSC decided to designate the rougheye/blackspotted assemblage of stocks as category 2 since the assessment was for the complex of these two hard to distinguish stocks;

- English sole and yellowtail rockfish north of 40º10’ N lat. were changed from category 1 to category 2 stocks based on their new data-moderate assessments;

- Brown rockfish, China rockfish, copper rockfish, rex sole, and sharpchin rockfish were changed from category 3 stocks to category 2 stocks based on new data-moderate assessments for these stocks in 2013; and

- Shortspine thornyhead was changed from a category 1 stock to a category 2 stock based on the lack of age data in the new benchmark assessment for this stock in 2013 (Taylor and Stephens 2013). The same P* value of 0.4 was used to determine the 2014, 2015, and 2016 ABCs.

Table 12. Relationship between P* and the percent reduction of the OFL for deciding the 2015 and 2016 ABCs for category 1, aurora rockfish, widow rockfish, category 2, and category 3 stocks based on σ values of 0.36, 0.39, 0.41, 0.72, and 1.44, respectively.

P*	Assessment Uncertainty (σ)				
	Cat. 1	Aurora	Widow	Cat. 2	Cat. 3
	0.36	0.39	0.41	0.72	1.44
0.5	0	0	0	0	0
0.45	4.4%	4.8%	5.0%	8.7%	16.6%
0.44	5.3%		6.0%	10.3%	19.5%
0.43	6.2%		7.0%	11.9%	22.4%
0.42	7.0%		7.9%	13.5%	25.2%
0.41	7.9%		8.9%	15.1%	27.9%
0.4	8.7%	9.4%	9.9%	16.7%	30.6%
0.39	9.6%		10.8%	18.2%	33.1%
0.38	10.4%		11.8%	19.7%	35.6%
0.37	11.3%		12.7%	21.3%	38.0%
0.36	12.1%		13.7%	22.7%	40.3%
0.35	13.0%	14.0%	14.6%	24.2%	42.6%
0.34	13.8%		15.6%	25.7%	44.8%
0.33	14.6%		16.5%	27.1%	46.9%
0.32	15.5%		17.4%	28.6%	49.0%
0.31	16.3%		18.4%	30.0%	51.0%
0.3	17.2%	18.5%	19.3%	31.4%	53.0%
0.29	18.1%		20.3%	32.9%	54.9%
0.28	18.9%		21.3%	34.3%	56.8%
0.27	19.8%		22.2%	35.7%	58.6%
0.26	20.7%		23.2%	37.1%	60.4%
0.25	21.6%	23.1%	24.2%	38.5%	62.1%
0.24	22.5%		25.1%	39.9%	63.8%
0.23	23.4%		26.1%	41.3%	65.5%
0.22	24.3%		27.1%	42.6%	67.1%
0.21	25.2%		28.2%	44.0%	68.7%
0.2	26.1%	28.0%	29.2%	45.4%	70.2%
0.19	27.1%		30.2%	46.9%	71.8%
0.18	28.1%		31.3%	48.3%	73.2%
0.17	29.1%		32.4%	49.7%	74.7%
0.16	30.1%		33.5%	51.1%	76.1%
0.15	31.1%	33.2%	34.6%	52.6%	77.5%
0.14	32.2%		35.8%	54.1%	78.9%
0.13	33.3%		37.0%	55.6%	80.2%
0.12	34.5%		38.2%	57.1%	81.6%
0.11	35.7%		39.5%	58.7%	82.9%
0.1	37.0%	39.3%	40.9%	60.3%	84.2%
0.09	38.3%		42.3%	61.9%	85.5%
0.08	39.7%		43.8%	63.6%	86.8%
0.07	41.2%		45.4%	65.4%	88.1%
0.06	42.9%		47.1%	67.4%	89.3%
0.05	44.7%	47.3%	49.1%	69.4%	90.6%

Table 13. 2014 ABCs (mt) and a range of alternative 2015 ABCs (mt) varied by the probability of overfishing (P*) for west coast groundfish stocks (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in stock complexes in italics).

Stock	Status Quo 2014 ABC	Range of Alternative 2015 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
OVERFISHED STOCKS						
BOCACCIO S. of 40⁰10' N lat.	842	**1,380**	**1,318**	**1,256**	**1,195**	**1,132**
CANARY	709	701	669	638	607	575
COWCOD S. of 40⁰10' N lat.	9	60	60	60	60	60
COWCOD (Conception)	*6*	***50***	***50***	***50***	***50***	***50***
COWCOD (Monterey)	*3*	*10*	*10*	*10*	*10*	*10*
DARKBLOTCHED	529	**549**	**524**	**499**	**475**	**450**
PACIFIC OCEAN PERCH	801	805	769	733	697	660
PETRALE SOLE	2,652	**2,816**	**2,690**	**2,563**	**2,439**	**2,310**
YELLOWEYE	43	47	43	39	35	32
NON-OVERFISHED STOCKS						
Arrowtooth Flounder	5,758	6,025	5,497	5,002	4,527	4,058
Black Rockfish (OR-CA)	1,115	1,124	1,074	1,023	974	922
Black Rockfish (WA)	409	402	384	366	349	330
Cabezon (CA)	158	154	147	140	133	126
Cabezon (OR)	47	47	45	43	41	38
California scorpionfish	117	114	109	104	99	93
Chilipepper S. of 40⁰10' N lat.	1,647	1,628	1,555	1,482	1,410	1,335
Dover Sole	74,352	63,929	61,053	58,178	55,369	52,427
English Sole	5,646	**11,040**	**10,073**	**9,166**	**8,295**	**7,437**
Lingcod N of 42º N lat. (OR & WA)	1,897	1,814	1,733	1,651	1,572	1,488
Lingcod S. of 42º N lat. (CA)	2,044	2,115	1,930	1,756	1,589	1,425
Lingcod N of 40º10' N lat.	2,878	2,830	2,659	2,494	2,334	2,172
Lingcod S. of 40º10' N lat.	1,063	1,100	1,004	913	827	741
Longnose skate	2,692	2,341	2,236	2,130	2,027	1,920
Longspine Thornyhead (coastwide)	2,752	**4,571**	**4,171**	**3,795**	**3,435**	**3,079**
Pacific Cod	2,221	2,669	2,221	1,837	1,504	1,213
Sablefish (coastwide)	6,535	7,511	7,173	6,836	6,506	6,160
Shortbelly	5,789	6,345	5,789	5,268	4,768	4,274
Shortspine Thornyhead (coastwide)	2,208	**2,924**	**2,668**	**2,428**	**2,197**	**1,970**
Spiny dogfish	2,024	2,303.2	2,101.4	1,912.2	1,730.6	1,551.5
Splitnose S. of 40⁰10' N lat.	1,670	1,715	1,638	1,561	1,485	1,406
Starry Flounder	1,528	1,681	1,534	1,395	1,263	1,132
Widow	4,212	3,929	3,729	3,532	3,337	3,138
Yellowtail N of 40⁰10' N lat.	4,382	**11,213**	**10,230**	**9,309**	**8,425**	**7,553**

Stock	Status Quo 2014 ABC	Range of Alternative 2015 ABCs Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
STOCK COMPLEXES						
Nearshore Rockfish North	94	79	69	60	53	45
Black and yellow	*0.0*	*0.011*	*0.009*	*0.008*	*0.006*	*0.005*
Blue (CA)	*25.0*	*25.0*	*22.9*	*20.8*	*18.8*	*16.9*
Blue (OR & WA)	*26.9*	*26.9*	*22.4*	*18.5*	*15.2*	*12.2*
Brown	***4.6***	***1.8***	***1.7***	***1.5***	***1.4***	***1.2***
Calico	*0.0*	-	-	-	-	-
China	***8.2***	***7.5***	***6.8***	***6.2***	***5.6***	***5.0***
Copper	***21.6***	***10.1***	***9.2***	***8.4***	***7.6***	***6.8***
Gopher	*0.0*	-	-	-	-	-
Grass	*0.5*	*0.5*	*0.5*	*0.4*	*0.3*	*0.2*
Kelp	*0.0*	*0.008*	*0.006*	*0.005*	*0.004*	*0.003*
Olive	*0.3*	*0.3*	*0.2*	*0.2*	*0.1*	*0.1*
Quillback	*6.2*	*6.2*	*5.1*	*4.2*	*3.5*	*2.8*
Treefish	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
Shelf Rockfish North	1,932	1,943	1,712	1,505	1,317	1,142
Bronzespotted	*0.0*	-	-	-	-	-
Bocaccio	*236.9*	*236.9*	*197.1*	*163.0*	*133.5*	*107.6*
Chameleon	*0.0*	-	-	-	-	-
Chilipepper	*108.1*	*106.9*	*88.9*	*73.6*	*60.2*	*48.6*
Cowcod	*0.0*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*
Flag	*0.1*	*0.06*	*0.05*	*0.04*	*0.03*	*0.03*
Freckled	*0.0*	-	-	-	-	-
Greenblotched	*1.1*	*1.1*	*0.9*	*0.7*	*0.6*	*0.5*
Greenspotted 40°10’ to 42° N lat.	*9*	*8.5*	*7.7*	*7.0*	*6.4*	*5.7*
Greenspotted N of 42 N lat. (OR & WA)	*5.1*	*5.1*	*4.2*	*3.5*	*2.9*	*2.3*
Greenstriped	*1,158*	*1,170.3*	*1,067.8*	*971.7*	*879.4*	*788.3*
Halfbanded	*0.0*	-	-	-	-	-
Harlequin	*0.0*	-	-	-	-	-
Honeycomb	*0.0*	-	-	-	-	-
Mexican	*0.0*	-	-	-	-	-
Pink	*0.0*	*0.003*	*0.003*	*0.002*	*0.002*	*0.001*
Pinkrose	*0.0*	-	-	-	-	-
Puget Sound	*0.0*	-	-	-	-	-
Pygmy	*0.0*	-	-	-	-	-
Redstripe	*225.1*	*225.1*	*187.3*	*154.9*	*126.9*	*102.3*
Rosethorn	*10.8*	*10.8*	*9.0*	*7.4*	*6.1*	*4.9*
Rosy	*2.5*	*2.5*	*2.1*	*1.7*	*1.4*	*1.1*
Silvergray	*133.0*	*133.0*	*110.6*	*91.5*	*74.9*	*60.4*
Speckled	*0.1*	*0.14*	*0.12*	*0.10*	*0.08*	*0.06*
Squarespot	*0.1*	*0.14*	*0.12*	*0.10*	*0.08*	*0.07*
Starry	*0.0*	*0.003*	*0.003*	*0.002*	*0.002*	*0.001*
Stripetail	*33.7*	*33.7*	*28.0*	*23.2*	*19.0*	*15.3*
Swordspine	*0.0*	*0.00008*	*0.00007*	*0.00006*	*0.00005*	*0.00004*

Stock	Status Quo 2014 ABC	Range of Alternative 2015 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
Tiger	*0.8*	*0.8*	*0.7*	*0.6*	*0.5*	*0.4*
Vermilion	*8.1*	*8.1*	*6.7*	*5.6*	*4.6*	*3.7*
Slope Rockfish North	1,414	1,669	1,545	1,430	1,322	1,215
Aurora	*12.8*	***16.6***	***15.8***	***15.0***	***14.2***	***13.4***
Bank	*14.4*	*14.4*	*12.0*	*9.9*	*8.1*	*6.5*
Blackgill	*3.9*	*3.9*	*3.3*	*2.7*	*2.2*	*1.8*
Redbanded	*37.7*	*37.7*	*31.4*	*26.0*	*21.3*	*17.2*
Rougheye/Blackspotted	*59.3*	***184***	***168***	***153***	***138***	***124***
Sharpchin	*178.9*	***279.0***	***254.6***	***231.6***	***209.6***	***187.9***
Shortraker	*15.6*	*15.6*	*13.0*	*10.7*	*8.8*	*7.1*
Splitnose	*931.3*	*956.6*	*913.6*	*870.5*	*828.5*	*784.5*
Yellowmouth	*160.5*	*160.5*	*133.6*	*110.5*	*90.4*	*72.9*
Nearshore Rockfish South	1,001	1,165	1,038	924	820	722
Shallow Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Black and yellow	*23.0*	*23.0*	*19.1*	*15.8*	*12.9*	*10.4*
China	*13.8*	***47.1***	***43.0***	***39.1***	***35.4***	***31.7***
Gopher (N of Pt. Conception)	*146.3*	*141.5*	*135.1*	*128.8*	*122.5*	*116.0*
Gopher (S of Pt. Conception)	*21.4*	*21.4*	*17.8*	*14.7*	*12.0*	*9.7*
Grass	*49.7*	*49.7*	*41.4*	*34.2*	*28.0*	*22.6*
Kelp	*23.1*	*23.1*	*19.2*	*15.9*	*13.0*	*10.5*
Deeper Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Blue (assessed area)	*171.4*	*172.2*	*157.1*	*142.9*	*129.4*	*116.0*
Blue (S of 34° 27' N lat.)	*60.8*	*60.8*	*50.6*	*41.8*	*34.3*	*27.6*
Brown	***170.6***	***156.3***	***142.6***	***129.8***	***117.4***	***105.3***
Calico	*0.0*	-	-	-	-	-
Copper	***118.0***	***267.2***	***243.8***	***221.8***	***200.8***	***180.0***
Olive	*187.4*	*187.4*	*155.9*	*128.9*	*105.6*	*85.1*
Quillback	*4.5*	*4.5*	*3.7*	*3.1*	*2.5*	*2.0*
Treefish	*11.0*	*11.0*	*9.2*	*7.6*	*6.2*	*5.0*
Shelf Rockfish South	1,620	1,621	1,372	1,156	967	800
Bronzespotted	*3.0*	*3.0*	*2.5*	*2.1*	*1.7*	*1.4*
Chameleon	*0.0*	-	-	-	-	-
Flag	*19.5*	*19.5*	*16.3*	*13.4*	*11.0*	*8.9*
Freckled	*0.0*	-	-	-	-	-
Greenblotched	*19.3*	*19.3*	*16.1*	*13.3*	*10.9*	*8.8*
Greenspotted	*73.3*	*72.1*	*65.8*	*59.9*	*54.2*	*48.6*
Greenstriped	*212.4*	*214.7*	*195.9*	*178.2*	*161.3*	*144.6*
Halfbanded	*0.0*	-	-	-	-	-
Harlequin	*0.0*	-	-	-	-	-
Honeycomb	*8.2*	*8.2*	*6.8*	*5.7*	*4.6*	*3.7*
Mexican	*4.2*	*4.2*	*3.5*	*2.9*	*2.4*	*1.9*
Pink	*2.1*	*2.1*	*1.8*	*1.5*	*1.2*	*1.0*
Pinkrose	*0.0*	-	-	-	-	-
Pygmy	*0.0*	-	-	-	-	-

Stock	Status Quo 2014 ABC	Range of Alternative 2015 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
Redstripe	*0.4*	*0.4*	*0.3*	*0.3*	*0.2*	*0.2*
Rosethorn	*1.8*	*1.8*	*1.5*	*1.2*	*1.0*	*0.8*
Rosy	*37.1*	*37.1*	*30.9*	*25.5*	*20.9*	*16.9*
Silvergray	*0.4*	*0.4*	*0.4*	*0.3*	*0.3*	*0.2*
Speckled	*32.8*	*32.8*	*27.3*	*22.6*	*18.5*	*14.9*
Squarespot	*9.2*	*9.2*	*7.7*	*6.4*	*5.2*	*4.2*
Starry	*52.2*	*52.2*	*43.4*	*35.9*	*29.4*	*23.7*
Stripetail	*19.7*	*19.7*	*16.4*	*13.6*	*11.1*	*9.0*
Swordspine	*11.9*	*11.9*	*9.9*	*8.2*	*6.7*	*5.4*
Tiger	*0.0*	*0.03*	*0.03*	*0.02*	*0.02*	*0.02*
Vermilion	*224.6*	*224.6*	*186.9*	*154.6*	*126.6*	*102.1*
Yellowtail	*887.7*	*887.7*	*738.7*	*611.0*	*500.3*	*403.4*
Slope Rockfish South	622	698	606	524	452	386
Aurora	*21.7*	***70.7***	***67.3***	***63.9***	***60.6***	***57.1***
Bank	*459.4*	*419.7*	*349.2*	*288.8*	*236.5*	*190.7*
Blackgill	*122.3*	*125.1*	*114.1*	*103.8*	*94.0*	*84.3*
Pacific ocean perch	*0.0*	-	-	-	-	-
Redbanded	*8.7*	*8.7*	*7.2*	*6.0*	*4.9*	*3.9*
Rougheye/Blackspotted	*0.3*	***3.8***	***3.4***	***3.1***	***2.8***	***2.5***
Sharpchin	*8.2*	***69.8***	***63.6***	***57.9***	***52.4***	***47.0***
Shortraker	*0.1*	*0.09*	*0.07*	*0.06*	*0.05*	*0.04*
Yellowmouth	*0.7*	*0.7*	*0.6*	*0.5*	*0.4*	*0.3*
Other Flatfish	6,982	9,865	8,620	7,517	6,521	5,606
Butter sole	*3.2*	*3.9*	*3.2*	*2.7*	*2.2*	*1.8*
Curlfin sole	*5.7*	*6.9*	*5.7*	*4.7*	*3.9*	*3.1*
Flathead sole	*24.3*	*29.2*	*24.3*	*20.1*	*16.5*	*13.3*
Pacific sanddab	*3,331.9*	*4,004.0*	*3,331.9*	*2,755.8*	*2,256.5*	*1,819.6*
Rex sole	*3,033.8*	***5,121.0***	***4,672.3***	***4,251.6***	***3,847.8***	***3,449.5***
Rock sole	*46.3*	*55.6*	*46.3*	*38.3*	*31.3*	*25.3*
Sand sole	*536.6*	*644.8*	*536.6*	*443.8*	*363.4*	*293.0*

Table 14. 2014 ABCs (mt) and a range of alternative 2016 ABCs (mt) varied by the probability of overfishing (P*) for west coast groundfish stocks (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in stock complexes in italics).

Stock	Status Quo 2014 ABC	Range of Alternative 2016 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
OVERFISHED STOCKS						
BOCACCIO S. of 40°10' N lat.	842	**1,291**	**1,233**	**1,175**	**1,118**	**1,059**
CANARY	709	697	666	634	604	572
COWCOD S. of 40°10' N lat.	9	59	59	59	59	59
COWCOD (Conception)	*6*	***49***	***49***	***49***	***49***	***49***
COWCOD (Monterey)	*3*	*10*	*10*	*10*	*10*	*10*
DARKBLOTCHED	529	**554**	**530**	**505**	**480**	**455**
PACIFIC OCEAN PERCH	801	813	776	740	704	666
PETRALE SOLE	2,652	**2,910**	**2,779**	**2,648**	**2,520**	**2,386**
YELLOWEYE	43	47	43	39	35	32
NON-OVERFISHED STOCKS						
Arrowtooth Flounder	5,758	5,840	5,328	4,848	4,388	3,934
Black Rockfish (OR-CA)	1,115	1,131	1,080	1,029	980	927
Black Rockfish (WA)	409	404	386	368	350	332
Cabezon (CA)	158	151	144	137	131	124
Cabezon (OR)	47	47	45	43	41	38
California scorpionfish	117	111	106	101	97	91
Chilipepper S. of 40°10' N lat.	1,647	1,619	1,547	1,474	1,403	1,328
Dover Sole	74,352	56,615	54,069	51,522	49,035	46,429
English Sole	5,646	**7,754**	**7,075**	**6,438**	**5,826**	**5,223**
Lingcod N of 42º N lat. (OR & WA)	1,897	1,761	1,682	1,603	1,525	1,444
Lingcod S. of 42º N lat. (CA)	2,044	1,995	1,820	1,656	1,499	1,344
Lingcod N of 40º10' N lat.	2,878	2,719	2,555	2,398	2,245	2,089
Lingcod S. of 40º10' N lat.	1,063	1,037	946	861	779	699
Longnose skate	2,692	2,299	2,196	2,092	1,991	1,885
Longspine Thornyhead (coastwide)	2,752	**4,349**	**3,968**	**3,610**	**3,267**	**2,929**
Pacific Cod	2,221	2,669	2,221	1,837	1,504	1,213
Sablefish (coastwide)	6,535	8,151	7,784	7,418	7,060	6,684
Shortbelly	5,789	6,345	5,789	5,268	4,768	4,274
Shortspine Thornyhead (coastwide)	2,208	**2,893**	**2,640**	**2,402**	**2,174**	**1,949**
Spiny dogfish	2,024	2,285.5	2,085.2	1,897.5	1,717.2	1,539.5
Splitnose S. of 40°10' N lat.	1,670	1,746	1,667	1,589	1,512	1,432
Starry Flounder	1,528	1,686	1,539	1,400	1,267	1,136
Widow	4,212	3,790	3,596	3,407	3,218	3,026
Yellowtail N of 40°10' N lat.	4,382	**10,634**	**9,702**	**8,828**	**7,990**	**7,163**

Stock	Status Quo 2014 ABC	Range of Alternative 2016 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
STOCK COMPLEXES						
Nearshore Rockfish North	94	79	69	61	53	46
Black and yellow	*0.0*	*0.011*	*0.009*	*0.008*	*0.006*	*0.005*
Blue (CA)	*25.0*	*25.3*	*23.1*	*21.0*	*19.0*	*17.0*
Blue (OR & WA)	*26.9*	*26.9*	*22.4*	*18.5*	*15.2*	*12.2*
Brown	***4.6***	***1.8***	***1.7***	***1.5***	***1.4***	***1.2***
Calico	*0.0*	-	-	-	-	-
China	***8.2***	***7.5***	***6.8***	***6.2***	***5.6***	***5.0***
Copper	***21.6***	***10.1***	***9.2***	***8.4***	***7.6***	***6.8***
Gopher	*0.0*	-	-	-	-	-
Grass	*0.5*	*0.5*	*0.5*	*0.4*	*0.3*	*0.2*
Kelp	*0.0*	*0.008*	*0.006*	*0.005*	*0.004*	*0.003*
Olive	*0.3*	*0.26*	*0.22*	*0.18*	*0.15*	*0.12*
Quillback	*6.2*	*6.2*	*5.1*	*4.2*	*3.5*	*2.8*
Treefish	*0.2*	*0.18*	*0.15*	*0.12*	*0.10*	*0.08*
Shelf Rockfish North	1,932	1,952	1,720	1,512	1,323	1,148
Bronzespotted	*0.0*	-	-	-	-	-
Bocaccio	*236.9*	*236.9*	*197.1*	*163.0*	*133.5*	*107.6*
Chameleon	*0.0*	-	-	-	-	-
Chilipepper	*108.1*	*106.4*	*88.5*	*73.2*	*59.9*	*48.3*
Cowcod	*0.0*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*
Flag	*0.1*	*0.06*	*0.05*	*0.04*	*0.03*	*0.03*
Freckled	*0.0*	-	-	-	-	-
Greenblotched	*1.1*	*1.1*	*0.9*	*0.7*	*0.6*	*0.5*
Greenspotted 40°10’ to 42° N lat.	9	*8.5*	*7.7*	*7.0*	*6.4*	*5.7*
Greenspotted N of 42 N lat. (OR & WA)	*5.1*	*5.1*	*4.2*	*3.5*	*2.9*	*2.3*
Greenstriped	*1,158*	*1,179.6*	*1,076.2*	*979.3*	*886.3*	*794.6*
Halfbanded	*0.0*	-	-	-	-	-
Harlequin	*0.0*	-	-	-	-	-
Honeycomb	*0.0*	-	-	-	-	-
Mexican	*0.0*	-	-	-	-	-
Pink	*0.0*	*0.003*	*0.003*	*0.002*	*0.002*	*0.001*
Pinkrose	*0.0*	-	-	-	-	-
Puget Sound	*0.0*	-	-	-	-	-
Pygmy	*0.0*	-	-	-	-	-
Redstripe	*225.1*	*225.1*	*187.3*	*154.9*	*126.9*	*102.3*
Rosethorn	*10.8*	*10.8*	*9.0*	*7.4*	*6.1*	*4.9*
Rosy	*2.5*	*2.5*	*2.1*	*1.7*	*1.4*	*1.1*
Silvergray	*133.0*	*133.0*	*110.6*	*91.5*	*74.9*	*60.4*
Speckled	*0.1*	*0.14*	*0.12*	*0.10*	*0.08*	*0.06*
Squarespot	*0.1*	*0.14*	*0.12*	*0.10*	*0.08*	*0.07*
Starry	*0.0*	*0.003*	*0.003*	*0.002*	*0.002*	*0.001*
Stripetail	*33.7*	***33.7***	***28.0***	***23.2***	***19.0***	***15.3***
Swordspine	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Stock	Status Quo 2014 ABC	Range of Alternative 2016 ABCs Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
Tiger	*0.8*	*0.8*	*0.7*	*0.6*	*0.5*	*0.4*
Vermilion	*8.1*	*8.1*	*6.7*	*5.6*	*4.6*	*3.7*
Slope Rockfish North	1,414	1,683	1,559	1,443	1,334	1,227
Aurora	*12.8*	***16.7***	***15.9***	***15.1***	***14.3***	***13.5***
Bank	*14.4*	*14.4*	*12.0*	*9.9*	*8.1*	*6.5*
Blackgill	*3.9*	*3.9*	*3.3*	*2.7*	*2.2*	*1.8*
Redbanded	*37.7*	*37.7*	*31.4*	*26.0*	*21.3*	*17.2*
Rougheye/Blackspotted	*59.3*	***189***	***172***	***157***	***142***	***127***
Sharpchin	*178.9*	***271.7***	***247.9***	***225.6***	***204.2***	***183.0***
Shortraker	*15.6*	*15.6*	*13.0*	*10.7*	*8.8*	*7.1*
Splitnose	*931.3*	*973.4*	*929.6*	*885.8*	*843.0*	*798.2*
Yellowmouth	*160.5*	*160.5*	*133.6*	*110.5*	*90.4*	*72.9*
Nearshore Rockfish South	1,001	1,163	1,036	922	818	720
Shallow Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Black and yellow	*23.0*	*23.0*	*19.1*	*15.8*	*12.9*	*10.4*
China	*13.8*	*47.1*	*43.0*	*39.1*	*35.4*	*31.7*
Gopher (N of Pt. Conception)	*146.3*	*137.7*	*131.5*	*125.3*	*119.2*	*112.9*
Gopher (S of Pt. Conception)	*21.4*	*21.4*	*17.8*	*14.7*	*12.0*	*9.7*
Grass	*49.7*	*49.7*	*41.4*	*34.2*	*28.0*	*22.6*
Kelp	*23.1*	*23.1*	*19.2*	*15.9*	*13.0*	*10.5*
Deeper Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Blue (assessed area)	*171.4*	*173.8*	*158.5*	*144.3*	*130.6*	*117.0*
Blue (S of 34° 27' N lat.)	*60.8*	*60.8*	*50.6*	*41.8*	*34.3*	*27.6*
Brown	***170.6***	***156.3***	***142.6***	***129.8***	***117.4***	***105.3***
Calico	*0.0*	-	-	-	-	-
Copper	***118.0***	***267.2***	***243.8***	***221.8***	***200.8***	***180.0***
Olive	*187.4*	*187.4*	*155.9*	*128.9*	*105.6*	*85.1*
Quillback	*4.5*	*4.5*	*3.7*	*3.1*	*2.5*	*2.0*
Treefish	*11.0*	*11.0*	*9.2*	*7.6*	*6.2*	*5.0*
Shelf Rockfish South	1,620	1,622	1,373	1,157	968	800
Bronzespotted	*3.0*	*3.0*	*2.5*	*2.1*	*1.7*	*1.4*
Chameleon	*0.0*	-	-	-	-	-
Flag	*19.5*	*19.5*	*16.3*	*13.4*	*11.0*	*8.9*
Freckled	*0.0*	-	-	-	-	-
Greenblotched	*19.3*	*19.3*	*16.1*	*13.3*	*10.9*	*8.8*
Greenspotted	*73.3*	*71.6*	*65.3*	*59.5*	*53.8*	*48.2*
Greenstriped	*212.4*	*216.4*	*197.4*	*179.6*	*162.6*	*145.8*
Halfbanded	*0.0*	-	-	-	-	-
Harlequin	*0.0*	-	-	-	-	-
Honeycomb	*8.2*	*8.2*	*6.8*	*5.7*	*4.6*	*3.7*
Mexican	*4.2*	*4.2*	*3.5*	*2.9*	*2.4*	*1.9*
Pink	*2.1*	*2.1*	*1.8*	*1.5*	*1.2*	*1.0*
Pinkrose	*0.0*	-	-	-	-	-
Pygmy	*0.0*	-	-	-	-	-

Stock	Status Quo 2014 ABC	Range of Alternative 2016 ABCs				
		Overfishing Probability (P*)				
		0.45	0.40	0.35	0.30	0.25
Redstripe	*0.4*	*0.4*	*0.3*	*0.3*	*0.2*	*0.2*
Rosethorn	*1.8*	*1.8*	*1.5*	*1.2*	*1.0*	*0.8*
Rosy	*37.1*	*37.1*	*30.9*	*25.5*	*20.9*	*16.9*
Silvergray	*0.4*	*0.4*	*0.4*	*0.3*	*0.3*	*0.2*
Speckled	*32.8*	*32.8*	*27.3*	*22.6*	*18.5*	*14.9*
Squarespot	*9.2*	*9.2*	*7.7*	*6.4*	*5.2*	*4.2*
Starry	*52.2*	*52.2*	*43.4*	*35.9*	*29.4*	*23.7*
Stripetail	*19.7*	*19.7*	*16.4*	*13.6*	*11.1*	*9.0*
Swordspine	*11.9*	*11.9*	*9.9*	*8.2*	*6.7*	*5.4*
Tiger	*0.0*	*0.03*	*0.03*	*0.02*	*0.02*	*0.02*
Vermilion	*224.6*	*224.6*	*186.9*	*154.6*	*126.6*	*102.1*
Yellowtail	*887.7*	*887.7*	*738.7*	*611.0*	*500.3*	*403.4*
Slope Rockfish South	622	699	607	525	452	387
Aurora	*21.7*	***70.7***	***67.3***	***63.9***	***60.6***	***57.1***
Bank	*459.4*	*419.7*	*349.2*	*288.8*	*236.5*	*190.7*
Blackgill	*122.3*	*127.8*	*116.6*	*106.1*	*96.0*	*86.1*
Pacific ocean perch	*0.0*	-	-	-	-	-
Redbanded	*8.7*	*8.7*	*7.2*	*6.0*	*4.9*	*3.9*
Rougheye/Blackspotted	*0.3*	***4***	***4***	***3***	***3***	***3***
Sharpchin	*8.2*	***67.9***	***62.0***	***56.4***	***51.0***	***45.8***
Shortraker	*0.1*	*0.09*	*0.07*	*0.06*	*0.05*	*0.04*
Yellowmouth	*0.7*	*0.7*	*0.6*	*0.5*	*0.4*	*0.3*
Other Flatfish	6,982	8,633	7,496	6,494	5,595	4,775
Butter sole	*3.2*	*3.9*	*3.2*	*2.7*	*2.2*	*1.8*
Curlfin sole	*5.7*	*6.9*	*5.7*	*4.7*	*3.9*	*3.1*
Flathead sole	*24.3*	*29.2*	*24.3*	*20.1*	*16.5*	*13.3*
Pacific sanddab	*3,331.9*	*4,004.0*	*3,331.9*	*2,755.8*	*2,256.5*	*1,819.6*
Rex sole	*3,033.8*	***3,888.5***	***3,547.7***	***3,228.3***	***2,921.7***	***2,619.3***
Rock sole	*46.3*	*55.6*	*46.3*	*38.3*	*31.3*	*25.3*
Sand sole	*536.6*	*644.8*	*536.6*	*443.8*	*363.4*	*293.0*

1.2.3 Annual Catch Limits

Annual catch limits (ACLs) are specified for each stock and stock complex that is "in the fishery" as specified under the FMP framework. An ACL is a harvest specification set equal to the ABC or below the ABC in consideration of conservation objectives, management uncertainty, socioeconomic considerations, ecological considerations, and other factors (e.g. rebuilding considerations) needed to meet management objectives. Sector-specific ACLs may be specified in cases where a sector has a formal, long-term allocation of the harvestable surplus of a stock or stock complex. The ACL counts all sources of fishing-related mortality including landed catch, discard mortalities, research catches, and set-asides for exempted fishing permits (EFPs).

Under the FMP, the biomass level that produces MSY (B_{MSY}) is defined as the precautionary threshold. When the biomass for an assessed category 1 or 2 stock falls below the precautionary threshold, the harvest rate will be reduced to help the stock return to the B_{MSY} level, which is the management target for groundfish stocks. If a stock biomass is larger than B_{MSY}, the ACL may be set equal to or less than ABC. Because B_{MSY} is a long-term average, the true biomass could be below B_{MSY} in some years and above B_{MSY} in other years. Even in the absence of overfishing, biomass may decline to levels below B_{MSY} due to natural fluctuations in recruitment. The minimum stock size threshold (MSST) is the biomass threshold for declaring a stock overfished. When spawning stock biomass falls below the MSST, a rebuilding plan must be developed that determines the strategy for rebuilding the stock in the shortest time possible while considering impacts to fishing-dependent communities and other factors. When spawning stock biomass is below B_{MSY} yet above the MSST, the stock is considered to be in the precautionary zone. The current proxy B_{MSY} and MSST reference points for west coast groundfish stocks are as follows:

- Assessed flatfish stocks: B_{MSY} = 25 percent of initial biomass or $B_{25\%}$; MSST = 12.5 percent of initial biomass or $B_{12.5\%}$ (PFMC and NMFS 2011); and
- All other assessed groundfish stocks: B_{MSY} = 40 percent of initial biomass or $B_{40\%}$; MSST = 25 percent of initial biomass or $B_{25\%}$.

These reference points are only used to manage assessed stocks since they require estimates of spawning stock biomass.

West coast groundfish stocks are managed with harvest control rules that calculate ACLs below the ABCs when spawning biomass is estimated to be in the precautionary zone. These harvest control rules are designed to prevent a stock from becoming overfished. The FMP defines the 40-10 harvest control rule for stocks with a B_{MSY} proxy of $B_{40\%}$ that are in the precautionary zone. The analogous harvest control rule for assessed flatfish stocks is the 25-5 harvest control rule. Both ACL harvest control rules are applied after the ABC deduction is made. The further the stock biomass is below the precautionary threshold, the greater the reduction in ACL relative to the ABC, until at $B_{10\%}$ for a stock with a B_{MSY} proxy of $B_{40\%}$ or $B_{5\%}$ for a stock with a B_{MSY} proxy of $B_{25\%}$, the ACL would be set at zero[11] (Figure 35). These harvest policies foster a quicker return to the B_{MSY} level and serve as an interim rebuilding policy for stocks that are below the MSST. The Council may recommend setting the ACL higher than what the default ACL harvest control rule specifies as long as the ACL does not exceed the ABC, complies with the requirements of the MSA, and is consistent with the FMP and National Standard Guidelines. Additional precautionary adjustments may be made to an ACL if necessary to address management

[11] The lower $B_{10\%}$ and $B_{5\%}$ thresholds in the precautionary ACL harvest control rules are used to establish the slope of the ACL curve in Figure 2. These precautionary ACL control rules only apply for stocks in the precautionary zone (B_{MSY} > $B_{CURRENT}$ > MSST). A rebuilding plan governs the ACL harvest control rule for any stock that falls below the MSST and is designated as overfished.

uncertainty, conservation concerns, socioeconomic concerns, ecological considerations, and the other factors that are considered when setting ACLs.

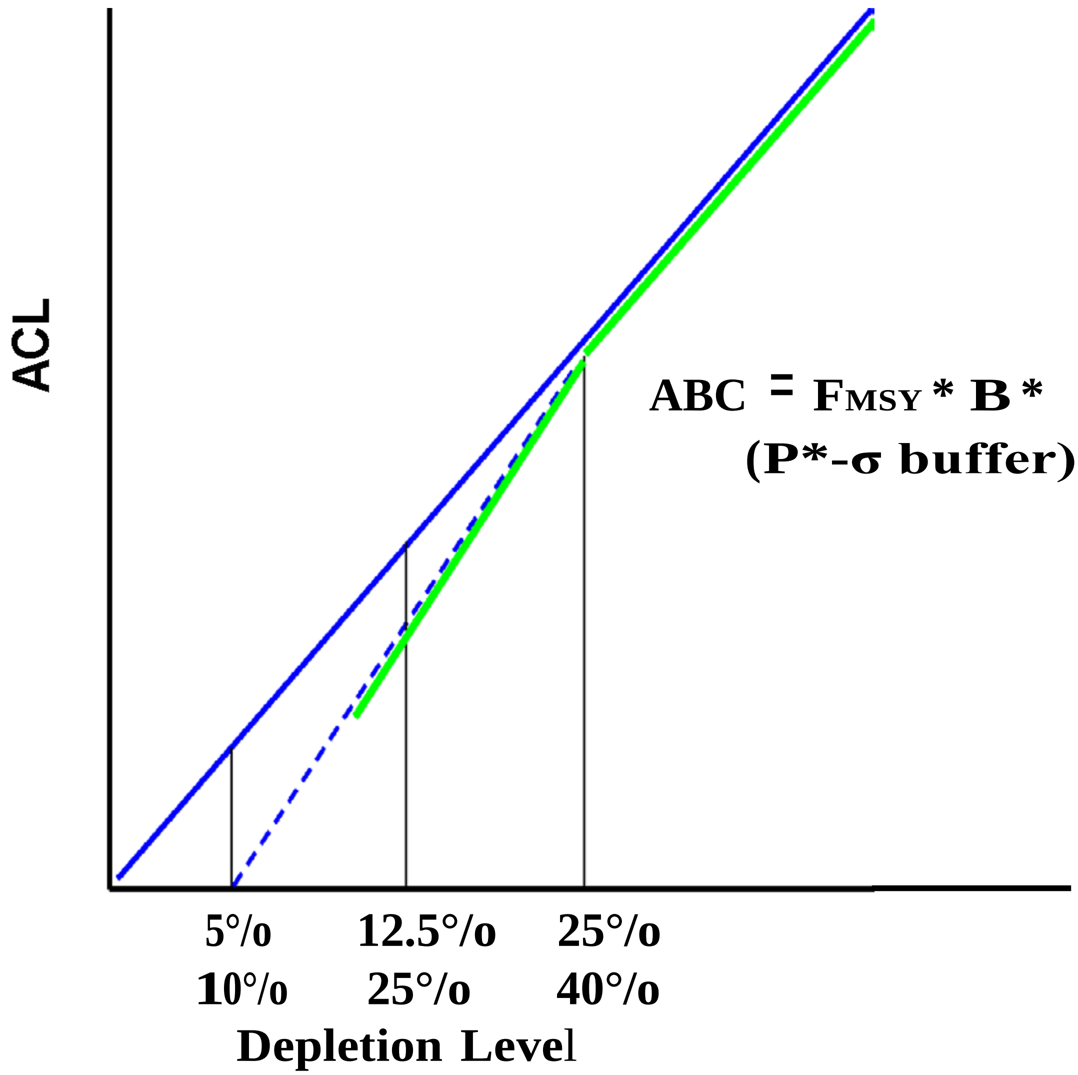

Figure 35. Conceptual diagram of the 25-5 and 40-10 ACL harvest control rules used to manage assessed west coast flatfish and other groundfish species, respectively, that are in the precautionary zone.

The ACL serves as the basis for invoking accountability measures (AMs), which are management measures or mechanisms used to address any management uncertainty that may result in exceeding an ACL. If ACLs are exceeded more often than 1 in 4 years, then AMs, such as catch monitoring and inseason adjustments to fisheries, need to improve or additional AMs may need to be implemented. Additional AMs may include setting an annual catch target (ACT), which is a specified level of harvest below the ACL. The use of ACTs may be especially important for a stock subject to highly uncertain inseason catch monitoring. A sector-specific ACT may serve as a harvest guideline (HG) for a sector or may be used strategically in a rebuilding plan to attempt to reduce mortality of an overfished stock more than the rebuilding plan limits prescribe.

The Council has the discretion to adjust the ACLs for uncertainty on a case-by-case basis. In cases where there is a high degree of uncertainty about the condition of the stock or stocks, the ACL may be reduced accordingly. Most category 3 species are managed in a stock complex (such as the minor rockfish complexes and the Other Flatfish complex) where harvest specifications are set for the complex in its entirety. For stock complexes, the ACL will be less than or equal to the sum of the individual component ABCs. The ACL may be adjusted below the sum of component ABCs as appropriate.

For most stocks and stock complexes, the Council elected to use the same general policies for deciding 2015 and 2016 ACLs as were used for deciding the 2014 ACLs (No Action). The No Action ACLs are the 2014 ACLs specified in Federal regulations.

Section 4.6.3 of the FMP states the Council's general policies on rebuilding overfished stocks. Section 4.6.3.1 of the FMP specifies the overall goals of rebuilding programs are to (1) achieve the population size and structure that will support the MSY within a specified time period that is as short as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock of fish within the marine ecosystem; (2) minimize, to the extent practicable, the adverse social and economic impacts associated with rebuilding, including adverse impacts on fishing communities; (3) fairly and equitably distribute both the conservation burdens (overfishing restrictions) and recovery benefits among commercial, recreational, and charter fishing sectors; (4) protect the quantity and quality of habitat necessary to support the stock at healthy levels in the future; and (5) promote widespread public awareness, understanding and support for the rebuilding program. These overall goals are derived from and consistent with the requirements of the MSA. The first goal embodies MSA National Standard 1 (NS1) and the requirements for rebuilding overfished stocks found at MSA section 304(e)(4)(A). The third goal is required by MSA section 304(e)(4)(B). The fourth and fifth goals represent additional policy preferences of the Council that recognize the importance of habitat protection to the rebuilding of some fish stocks and the desire for public outreach and education on the complexities—biological, economic, and social issues—involved with rebuilding overfished stocks. Overfished groundfish species are those with spawning biomasses that have dropped below the Council's MSST (i.e., 25 percent of initial spawning biomass or $B_{25\%}$ for all groundfish species other than flatfish where the MSST is $B_{12.5\%}$). The FMP requires these stocks to be rebuilt to a target biomass that supports MSY (i.e., B_{MSY} or $B_{40\%}$ for all groundfish species other than flatfish where the target is $B_{25\%}$).

Rebuilding plans are in place for six overfished rockfish species, as well as petrale sole, where assessments have indicated spawning biomass has declined to below the MSST. New full and updated assessments and rebuilding analyses were done in 2013 inform the 2015 and 2016 harvest specifications for many of the overfished species. New full assessments were conducted for cowcod, darkblotched rockfish, and petrale sole in 2013; however, a new rebuilding analysis was only prepared for cowcod. The results of the new assessments for darkblotched rockfish and petrale sole indicated those stocks would be rebuilt by 2015 and 2014, respectively. The SSC did not recommend new rebuilding analyses for these two stocks given their imminent rebuilding expectation. An update assessment for bocaccio was prepared in 2013. Like darkblotched, the stock is predicted to rebuild by 2015 and the SSC therefore recommended no new rebuilding analysis be prepared. Catch reports for canary rockfish, Pacific ocean perch, and yelloweye rockfish were prepared in 2013. These catch reports indicated total catches were within limits prescribed in these stocks' respective rebuilding plans.

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Agenda Item C.4.a
Attachment 6 (Electronic Only)
April 2014

GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES AND AMENDMENT 24: DRAFT ENVIRONMENTAL IMPACT STATEMENT

Evaluation of Harvest Specifications and Management Measures for the 2015-2016 Biennial Management Period and Biennial Periods Thereafter Including the Reorganization of Groundfish Stock Complexes and Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan Establishing a Process for Determining Default Harvest Specifications

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Executive Summary

Chapter 1 INTRODUCTION

1.1 How this Document is Organized

This document provides information about, and analyses of, setting groundfish harvest specifications and establishing related management measures for 2015 and subsequent years for fisheries covered by the Pacific Coast Groundfish Fishery Management Plan (FMP), which are developed by the Pacific Fishery Management Council (Council) in collaboration with the National Marine Fisheries Service (NMFS). Groundfish harvest specifications are set every 2 years for a 2-year period. In addition to harvest specifications and management measures for the 2015-16 biennial period, this document evaluates the impacts of setting harvest specifications and management measures over the long term. These actions must conform to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. The states manage their fisheries, including nearshore rockfish fisheries in the territorial sea, in a manner consistent with, or more restrictive than, the Groundfish FMP and Federal implementing regulations.

In addition to addressing MSA mandates, this document is an environmental impact statement (EIS), pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended. This document is organized so that it contains the analyses required under NEPA. The proposed action must also comply with other applicable laws, which are enumerated in Chapter 6. While this EIS provides supporting information, the procedural and analytical requirements for legal mandates other than NEPA (including findings made by NMFS) may be addressed in other documents (see Chapter 6).

The EIS is organized in the following chapters and appendices:

- Chapter 1 explains why the action is being considered for the groundfish fisheries in 2015-16 and subsequent biennial cycles, including revisions to established groundfish rebuilding plans. The purpose and need statement defines the scope of the subsequent analysis.

- Chapter 2 outlines the No Action and action alternatives that have been considered to address the defined purpose and need. The Council recommends a preferred alternative from among these alternatives, which provides the basis for establishing or revising the harvest specifications and management measure regulations governing groundfish fisheries in 2015–16. These alternatives also serve as the basis for evaluating the long-term impacts of setting harvest specifications and management measures.

- Chapter 3 describes the environmental components affected by the proposed action, which are groundfish and other marine fish, fishery sectors, fishing communities, protected species, essential fish habitat (EFH), and the marine ecosystem.

- Chapter 4 describes the direct, indirect, and cumulative effects of the proposed action, including the No Action and preferred alternatives, on the environmental components described in Chapter 3.

- Chapter 5 details how this action meets 10 National Standards set forth in the MSA (Section 301(a)) and groundfish FMP goals and objectives, as well as MSA-related scoping requirements and public meeting opportunities afforded through the Council process.

- Chapter 6 provides information on those laws and executive orders, in addition to the MSA, with which an action must be consistent. This chapter also describes in greater detail the NEPA process for this action, including all of the steps (Notice of Intent, scoping process under NEPA, etc.) required by the Council on Environmental Quality (CEQ) and NOAA Administrative Order (NAO) 216-6.

- Chapter 7 is the bibliography.

- Appendix A, Model Documentation, documents the models and methods used to estimate potential catches (harvest impacts) under the alternatives, and related effects on personal income and employment in fishing communities.

- Appendix B, FMP Amendment Language, contains changes to the Groundfish FMP proposed by the Council as part of the proposed action.

When implemented, the 2015-16 harvest specifications and management measures will succeed those established for the 2013-2014 biennial period.

1.2 Proposed Action, Purpose and Need

1.2.1 The Proposed Action

The proposed action has three components: 1) Establishing harvest specifications and management measures for the 2015-2016 biennial management period, 2) considering changes to groundfish stock complexes, and 3) amending the Groundfish FMP to describe how the Council would use default harvest control rules in their decision-making process and to clarify criteria for modifying overfished species rebuilding plans. This EIS includes an analysis of the long-term impacts of biennial harvest specifications and management measures to support decision-making in future biennial periods.

1.2.1.1.1 2015-2016 Biennial Harvest Specifications and Management Measures

Using the "best available scientific information," the proposed action is to establish harvest specifications every 2 years, including the overfishing limits (OFLs), acceptable biological catches (ABCs), and annual catch limits (ACLs) for each management unit[1], consistent with the policies and procedures the Council has established for these actions and the requirements of the Pacific Coast Groundfish Fishery Management Plan (Groundfish FMP); the Magnuson-Stevens Act (MSA)—particularly the 10 National Standards enumerated in §301(a) of the MSA; and other applicable law.

Seven Pacific Coast groundfish species are currently "overfished" and managed under rebuilding plans implemented by Secretarial amendment. Within the rebuilding plans, T_{TARGET} is the key rebuilding parameter. T_{TARGET} is the projected year by which an overfished species will be rebuilt. Any change to

[1] Management units are stocks occurring throughout the west coast EEZ ("coastwide"), geographic subdivisions of stocks in the EEZ, and geographically subdivided stock complexes composed of more than one managed species.

T_{TARGET} must be demonstrated by the need to rebuild the stock in as short a time as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem. Every 2 years the Council considers the best available scientific information (principally new or updated stock assessments) and determines whether it is necessary to adjust any of the existing harvest specifications or management measures necessary to achieve but not exceed ACLs. Adjustments to harvest specifications may involve changing the underlying harvest control rule. [2] These adjustments must be consistent with the MSA and the Groundfish FMP. The proposed action includes setting harvest specifications and management measures for the 2015-2016 biennial period and revising Federal regulations at 50 CFR 660, Subparts C through G accordingly.

1.2.1.1.2 Stock Complex Reorganization

The proposed action is also to change the organization of the Slope Rockfish and Other Fish stock complexes used to manage west coast groundfish fisheries. National Standard 1 Guidelines at 50 CFR 660.310(d)(8) describe stock complexes and reasons for using them in management. A stock complex is "a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar." Reasons for using a stock complex to manage fisheries include the inability of a fishery to target stocks independently, the inability to set separate harvest specifications for constituent stocks, or when it is difficult for harvesters and processors to distinguish component species in the catch.

1.2.1.1.3 Default Harvest Control Rules and Rebuilding Plan Revision Criteria

The proposed action includes Amendment 24 to the Pacific Groundfish FMP, which modifies the procedures described in the Plan so that, in the absence of explicit Council action, harvest specification values based on default harvest control rules for one or more stocks may be published in Federal regulations. During any biennial decision-making process the Council may depart from these default values by deciding to modify the harvest control rule for one or more management unit. Such changes would form the basis of the "action alternatives" in future impact analyses.

As part of Amendment 24, sections in the FMP describing criteria and procedures for revising rebuilding plans will be edited to better explain the circumstances under which such changes are warranted and the role that the Council's Scientific and Statistical Committee plays in advising the Council on such changes.

1.2.1.1.4 Evaluation of the Long-Term Impacts of Setting Biennial Harvest Specifications and Management Measures

To evaluate environmental impacts of these periodic changes over a longer time period, estimates of harvest specification values for a 10-year sample period (2015-24) are evaluated in Chapter 4. Because harvest specifications must be based on the best available science, and one or more new or updated stock assessments become available every 2 years, NMFS has determined that harvest specifications will be published in Federal regulations every 2 years for the subsequent 2-year period. However, the evaluation of the long-term impacts of setting harvest specifications and related management measures for the foreseeable future is intended to encompass the range of likely impacts that could occur over more than

[2] "Harvest control rule" means the methods adopted to determine harvest specifications, based on criteria in the MSA and Groundfish FMP. Harvest specifications are the numerical values determined by applying the harvest control rule (or harvest policy) to the best available scientific information about the status and characteristics of a stock or management unit.

just the next biennial management period (2015-16). Section 6.6 discusses the methods that will be use to evaluate unforeseen environmental impacts in future biennial periods (2017-18 and subsequent).

1.2.2 Purpose and Need

The purpose of the proposed action is to conserve and manage Pacific Coast groundfish fishery resources to prevent overfishing, to rebuild overfished stocks, to ensure conservation, to facilitate long-term protection of essential fish habitat (EFH), and to realize the full potential of the Nation's fishery resources (MSA §2(a)(6)). These harvest specifications are set consistent with the optimum yield (OY) harvest management framework described in Chapter 4 of the Groundfish FMP.

In addition to the above conservation objective, the use of default harvest control rules (Amendment 24) coupled with the evaluation of the long-term impacts of the action is needed to streamline the administrative and regulatory processes involved in setting specifications for the Pacific Coast groundfish fishery, while, at the same time, maintaining consistency with the MSA and other applicable law. Evaluating the environmental impacts of setting harvest specifications and apportionment of harvest levels (described in Groundfish FMP Chapter 5) and related fishery regulations (described in Groundfish FMP Section 6.2), as needed, over the long term will make the regulatory process more efficient and provide more information to stakeholders about the future status and management of fisheries. The initial evaluation of the range of impacts expected over the long term will be followed up with focused evaluation when regulations are periodically adjusted. This two tier approach to evaluating harvest specifications should meet the following objectives:

- Maintain or improve the timeliness of scientific input into the decision-making process.
- Articulate and apply adaptive management principles, which are embodied in the Groundfish FMP, when evaluating the effects of periodic changes.
- Build workload assessment and priority setting into the process for identifying and recommending management measures, consistent with administrative resources and conservation objectives.
- Incorporate guidance on preparing efficient and timely NEPA reviews, including tiering of environmental documents and incorporation by reference.[3]
- Include decision-making procedures for setting harvest specifications that allow reasonably accurate forecasts of impacts for a period longer than 2 years. This could involve the Council adopting default procedures for setting harvest specifications (which the Council could override if circumstances warrant).
- Present information to decision-makers and the public in an effective and usable format.
- Ensure a transparent process where decisions and their rationale are clearly explained to the public and the public has the opportunity to provide meaningful input.
- Build an administrative record that effectively explains the rationale for the decision.

To the degree possible, periodic adjustments to these harvest specifications should involve small changes from the harvest management objectives of the previous period so as to minimize socioeconomic disruption.

Reorganizing stock complexes needs to be considered to ensure that the species in each complex are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that management impacts are similar. This supports the objectives of the MSA described above. Stock complex harvest specifications are set consistent with the harvest management framework described in Chapter 4 of the Groundfish FMP.

[3] See the March 6, 2012 Memorandum from Nancy H. Sutley, Chair, Council on Environmental Quality, on this topic.

1.2.3 The Fishery Management Area

Federally-managed Pacific groundfish fisheries occurring within the EEZ off the coasts of Washington, Oregon, and California (WOC) establish the geographic context for the proposed action. West coast communities engaged in these fisheries are also part of the context (see Figure 1-1). Although this is the Federal fishery management area, the states manage the fisheries in the territorial sea to meet the goals and objectives of the Pacific Groundfish FMP.

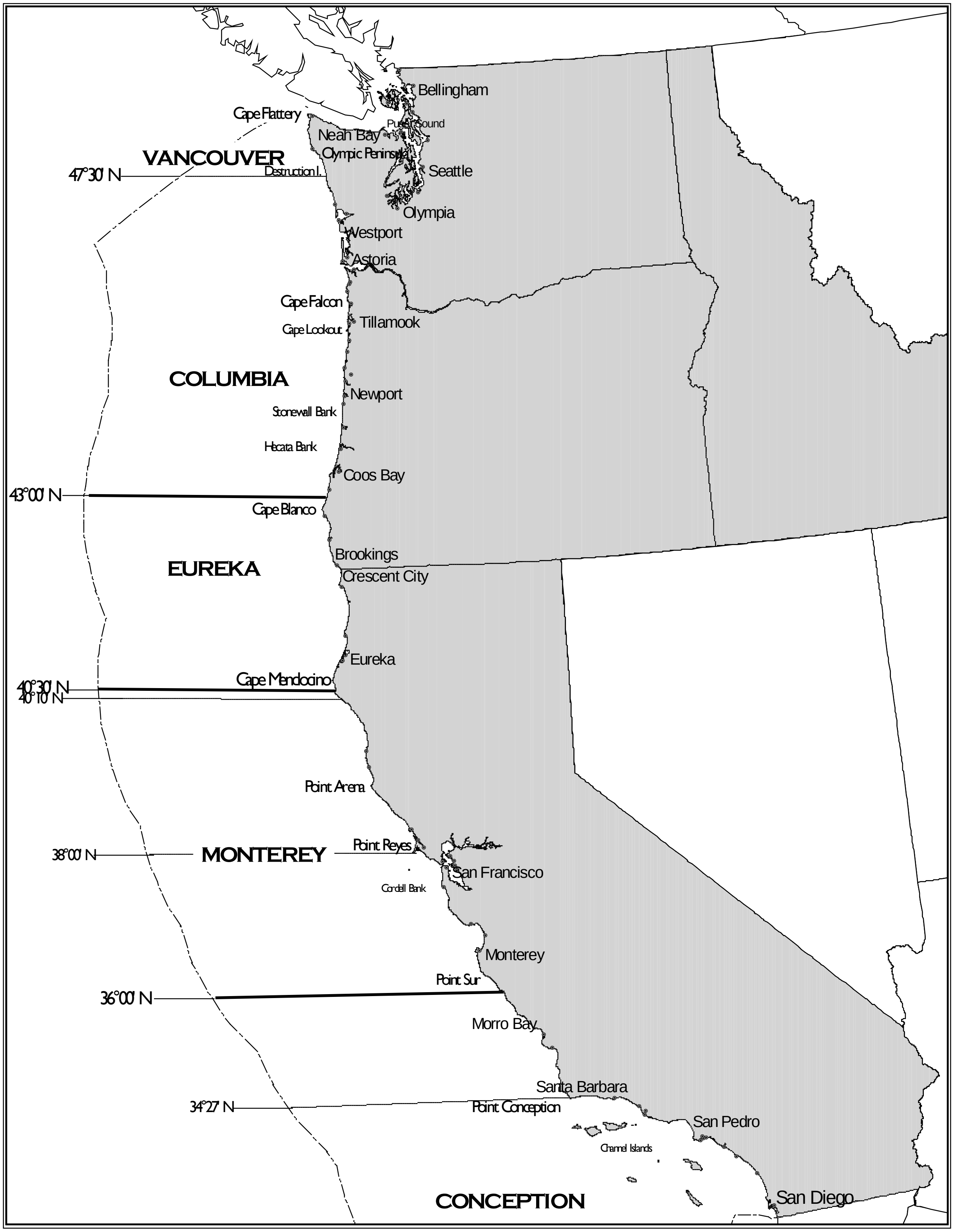


Figure 1-1.The action area, showing major coastal communities and groundfish management areas.

Chapter 2 ALTERNATIVES

The alternatives include five components:

1. Default Harvest Control Rules and annual catch limits (ACLs): Amending the Groundfish FMP to describe a default harvest control rule (HCR) framework that would be is used to calculate default ACLs. Default ACLs represent that a starting point for Council decision-making on catch limits for the next biennial period.
2. Revising Rebuilding Plans: Amending the Groundfish FMP to better describe how the Council determines whether adequate progress is being made under rebuilding plans for overfished species. If measures have not resulted in adequate progress toward ending overfishing and rebuilding the affected fish stocks, the Council (or the Secretary) will would identify additional necessary measures (see MSA sec. 304(e)(7)).
3. Management Measures Considered during the Biennial Decision Cycle: Amending the Groundfish FMP to better describe the types of management measures considered during the biennial management and regulatory amendment processes.
4. Harvest Specifications and Management Measures for the 2015-2016 Biennial Period: Recommending harvest specifications and management measures for the 2015-2016 biennial period, which would be published in Federal regulations and remain effective until changed.
5. Reorganizing the Other Fish and Slope Rockfish Complexes: Changing the composition of the Other Fish and Slope Rockfish stock complexes and creating new stock complexes for some current constituents of these complexes.

Table 2-1. Schematic of the elements of the alternatives.

Amendment 24				
Action Item	**No Action**	**Alternative 1**	**Alternative 2**	**Alternative 3**
A. (Default HCRs)	No Amendment	Default HCR with ABC based on p*=0.45	Default HCR with ABC based on p*=0.25	Default HCR with ABC based on current p*
B. (Rebuilding plan progress)	No Amendment	Amend Section 4.6.3.4 to describe SSC role	Amend Section 4.6.3.4 to describe SSC role	Amend Section 4.6.3.4 to describe SSC role
C. (New management measures)	No Amendment	Amend Section 6.2 to clarify “new” vs. “routine” measures	Amend Section 6.2 to clarify “new” vs. “routine” measures	Amend Section 6.2 to clarify “new” vs. “routine” measures
2015-16 harvest specifications and management measures				
	No Action	**Alternative 1**	**Alternative 2**	**Alternative 3**
D.	Rollover 2014 harvest specifications and management measures	Harvest specifications based on p*=0.45; adjust management measures as necessary	Harvest specifications based on p*=0.25; adjust management measures as necessary	Council preferred harvest specifications; adjust management measures as necessary
Shelf Rockfish Stock complex reorganization				

Element	No Action	Alternative 1	Alternative 2	Alternative 3
E.				

2.1 Alternatives for Using Default Harvest Control Rules to Compute ACLs (Amendment 24)

An HCR is used to determine the numerical value of an ACL based on a reduction from the overfishing limit (OFL). Chapter 4 in the Groundfish FMP describes the policies and procedures used to establish HCRs and determine the numerical values for harvest specifications (OFLs, ABCs, and ACLs).[4] HCRs include the following elements (although not all elements apply to all stocks):

- Harvest rate (unless a different ACL adjustment is used, see below)
- Reduction from the OFL to the ABC (P*-Sigma adjustment, precautionary reduction for stocks where biomass is below B_{MSY})
- ACL adjustment below the ABC based on overfished species rebuilding plans, fixed reductions from the overfishing limit, constant catch policies, etc. Table 2-2 summarizes the typical adjustments that are based on stock status

Table 2-2. Default harvest control rules framework for ACL reduction from ABC applied according to stock status.

Healthy Stocks (Biomass above the MSY proxy)	Precautionary Zone Stocks (Biomass below the MSY proxy but above the overfished threshold)	Overfished Stocks (Biomass below the overfished threshold)
ACL=ABC (no adjustment	For non-flatfish apply the 40-10[5] precautionary reduction from the ABC; For flatfish apply the 25-5[1] precautionary reduction	Implement rebuilding plan

Under the action alternatives for part of Amendment 24 require amending the Groundfish FMP to describe a "default harvest control rule (HCR) framework" used to determine default ACLs. Under this framework, unless the Council takes explicit action to change a default HCR, the ACL implemented for a stock is based on the default HCR applied to the best scientific information. In the event of a change in stock status, the HCR appropriate for the stock's new status would be applied as shown in Table 2-2. For stocks managed under the Groundfish FMP (the most recent stock assessment approved by the Council is usually considered the best (and most recent) scientific information. During the biennial harvest specifications process the November Council meeting usually serves as a cutoff point for introducing new scientific information into the decision-making process.

Under the action alternatives the default HCRs include a specified P* value used to compute default ACLs. Default ACLs are initially computed but the Council can then choose a harvest specification value different from the default value as long as the new value complies with the Groundfish FMP and the MSA, and the rationale for the change is sufficiently documented.

Table 2-1 summarizes the Amendment 24 alternatives described below.

[4] Annual catch targets (ACTs) and harvest guidelines (HGs) are used to identify harvest management objectives but are considered accountability (management) measures rather than specifications.

[5] Define 40-10 and 25-5 policies.

2.1.1 No Action – The Groundfish FMP is Not Amended

Under No Action the FMP is not amended to describe the default HCR framework, to provide a decision framework for determining adequate progress on rebuilding plans, or to establish a process for considering management measures not considered during the biennial process.

For the purpose of analysis, it is assumed that under no action management measures and harvest specifications in place on December 31, 2014, would remain in effect for the 2015-2016 period. For the evaluation of the long-term impacts of setting harvest specifications and management measures average catch from the recent past is used to approximate fishing mortality and revenue.

2.1.2 Alternative 1 – Default HCRs Use a P* Value of 0.45

Under this alternative the Groundfish FMP would be amended to describe the HCR framework, provide a decision framework for determining adequate progress on rebuilding plans, and better describe the types of management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be computed using P*=0.45. Default ACLs would be computed based on the HCR currently in place (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC) unless a new assessment shows that stock biomass has changed such that a different procedure is specified in the FMP and a different HCR applies (see Table 2-2). For example, if stock biomass has fallen below the MSY proxy, the appropriate precautionary adjustment would be applied (e.g., 40-10 or 25-5 rules applied to the ABC) to compute the default ACL or if stock biomass falls below the overfished/rebuilding threshold the interim rebuilding rule would be is used to determine the default ACL. Likewise, if an increase in stock biomass changes stock status the procedure for the updated status would be is used to compute the default ACL.

2.1.3 Alternative 2 – Default HCRs Use a P* Value of 0.25

Under this alternative the Groundfish FMP is amended to describe the HCR framework, provide a decision framework for determining adequate progress on rebuilding plans, and better describe the types of management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be computed using P*=0.25. Default ACLs would be computed based on the HCR currently in place (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC). Like Alternative 1, a change in stock status would trigger a change in the default ACL.

2.1.4 Alternative 3 (Preliminary Preferred Alternative) – Use the HCRs in Place in the Previous Period as the Defaults

Under this alternative the Groundfish FMP is amended to describe the HCR framework, provide a decision framework for determining adequate progress on rebuilding plans, and better describe the types of management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be computed using the current P*. Default ACLs would be computed based on the HCR currently in place (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC). Like Alternative 1, a change in stock status would trigger a change in the default ACL.

The Council will choose preferred harvest specifications for the 2015-2016 period at the April 2014 Council meeting (with the whole management action package finalized in June 2014). To analyze default harvest specifications under this alternative the Council's preferred 2015-16 harvest specifications will be used as a proxy. If this alternative is chosen as preferred, the HCRs used to determine 2015-16 harvest specifications would be the default HCRs for the next (2017-2018) biennial period.

2.2 Revising Rebuilding Plans (Amendment 24)

Groundfish FMP section 4.6.3.4 describes guidelines for revising rebuilding plans in response to new information about progress towards rebuilding. Under the action alternatives this section (through Amendment 24) will be revised to emphasize the following points:

- For each biennial management period the Scientific and Statistical Committee (SSC) would advise the Council on whether adequate progress is being made in rebuilding a stock based on the best available scientific information.
- If a stock is "ahead of schedule" the rebuilding plan would does not need to be revised. For example if the computed median rebuilding time (based on the rebuilding plan SPR harvest rate) is less than the rebuilding plan T_{TARGET}, the rebuilding plan wouldn'tdoes not need to be revised.
- If a stock is "behind schedule" (median year greater than T_{TARGET}) the SSC would advise the Council on whether the current trajectory represents "adequate progress" given scientific uncertainty about the true status of the stock.

SSC advice may be based on analyses bearing on scientific uncertainty about adequacy of progress. Currently Andre Punt of the SSC is developing an "overfished species management strategy evaluation" tool, which could help inform such decisions. This tool also may be used as part of the EIS analysis of the proposed action.

2.3 Management Measures Considered During the Biennial Decision Cycle (Amendment 24)

Section 6.2 in the Groundfish FMP describes the process for establishing and adjusting management measures. New management measures may be adopted during the biennial specifications process and may also be classified as routine measures. Routine management measures are those that the Council determines are likely to be adjusted on an annual or more frequent basis to effectively achieve the intended purpose. Routine management measures may be adjusted as part of the biennial decision-making process and "inseason" during any biennial management period.

There is an important procedural difference between new management measures and those that have already been classified as routine. All measures are "new" when first proposed. The need, impacts, and rationale for a new measure must be analyzed before it can be classified as routine. Once classified as routine, it is assumed that the effects of subsequent adjustments have been largely evaluated so the threshold for needing additional analysis when adjustments are made is set higher.

Evaluating the impacts of new management measures can add substantially to the overall workload associated with the biennial harvest specifications process. One way to streamline the harvest specification process would be to prioritize new management measures that the Council deems necessary for the next biennial cycle and those for which analysis and Council consideration could be deferred to a separate process. As part of this prioritization process the Council would consider whether the measure is necessary to meet conservation objectives for the next biennial cycle or these objectives can be achieved by adjusting routine measures. Section 6.2 in the Groundfish FMP describes the regulatory amendment process, which is a two-meeting process that can occur at any time according to Council discretion. A regulatory amendment process could occur periodically according to an agreed schedule outside those Council meetings devoted to the biennial process. After completing the biennial process, the Council could prioritize management measures proposed, but not taken up, during the biennial process for consideration under the upcoming regulatory amendment process.

Under Amendment 24 Section 6.2 in the FMP would be amended to better describe processes. In addition, the Council adopted Council Operation Procedure 9, better describing the biennial process.

2.4 Alternatives for the 2015-2016 Biennial Period

The components of the proposed action described above are long-term changes to the biennial decision-making process that will be incorporated into the Groundfish FMP by amendment. The Council must also adopt harvest specifications and management measures for the 2015-2016 biennial period.

This section describes four "integrated" alternatives, including the No Action alternative, that could be implemented to manage groundfish fisheries during the 2015-2016 period. They are integrated in the sense that each alternative includes a suite of harvest specifications and related management measures, thus comprising a complete management program. These measures are described in more detail in Chapter 4, because they are the mechanism by which harvest specifications and other Groundfish FMP policies are implemented. These management measures regulate the behavior of fishery participants, which determines the environmental impacts. In this sense they are part of the impact mechanism connecting the objectives of the action (described in Chapter 1) to the expected effects on the human environment.

These integrated alternatives are described in Sections 2.4.2 through 2.4.5. Each integrated alternative represents a complete management program for the 2015-16 biennial period by including harvest specifications, modifications of existing management measures, and the implementation of new management measures.

Harvest specifications include annual catch limits (ACLs) for all stocks and stock complexes managed under the Pacific Coast Groundfish FMP (PFMC 2011). Management measures are designed to keep the mortality for these stocks and stock complexes at or below the catch limits. Many Pacific Coast groundfish stocks are caught together in the fishery, and the MSA requires the Council and NMFS to rebuild overfished stocks in a time period "as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities … and the interaction of the overfished stock of fish within the marine ecosystem…" (MSA, sec. 304(e)(4)(A)). Given the nature of the fishery and this mandate, integrated alternatives, which describe the management program (i.e., harvest specifications and management measures), are used for the impact evaluation.

Harvest specifications comprise three metrics applied to all groundfish stocks and stock complexes using the best available scientific information:

- The overfishing limit (OFL), indicating a level of catch mortality above which overfishing is occurring;
- The acceptable biological catch (ABC) a reduction from the OFL to account for scientific uncertainty in estimates, based on Scientific and Statistical Committee (SSC) recommendations; and
- The ACL set at or below the ABC and the basis for managing catch mortality.

Existing management measures include deductions from the ACLs, also called set-asides, to account for tribal, recreational, and incidental catch in non-groundfish fisheries, which are fishing activities not subject to standard management measures; allocation of fishing opportunity to various components or "sectors" of the fishery (long-term formal allocations in the FMP or short-term two-year allocations); and various management measures that may be adjusted through regulatory action (described as part of No Action, see Section XREF). The Council is also proposing several new accountability measures to improve program performance and fishing opportunity, among other purposes.

The management programs represented by each of the integrated alternatives are assembled in step-wise fashion. The Council and NMFS first decide the harvest specifications and then management measures are proposed to keep total catch mortality within the ACLs specified for each alternative. The analysis of the integrated alternatives provides a better understanding of how the amount of allowable species harvest affects different fisheries and coastal fishing communities.

2.4.1 Harvest Specifications

The harvest specifications alternatives for 2015-16 are constructed to be consistent with the Amendment 24 alternatives described in Section 2.1:

- No Action: 2014 harvest specifications and management measures as of January 1, 2014.
- Alternative 1: Where applicable, ACLs determined based on a p-star value of 0.45. For ACLs equal to the ABC, the p-star value does not necessarily determine the ACL.
- Alternative 2: Where applicable, ACLs determined based on a p-star value of 0.25.
- Alternative 3: Council-preferred harvest specifications for 2015-16.

Under any of the default HCR frameworks considered for Amendment 24 (described in Alternative 1-3), the Council has the flexibility to choose ACLs that are different from the defaults for use in the next biennial period, as long as they are consistent with the framework in the Groundfish FMP and the MSA. This framework is described in Chapter 4 of the Groundfish FMP. Groundfish FMP Section 4.4 describes methods for determining the OFL and ABC values according to three categories related to the amount of information available for the stock. Groundfish FMP Sections 4.6 and 4.7 describe adjustments to the ABC to determine the ACL; the annual catch target (ACT), if used; and the application of the optimum yield concept. This includes the 25-5 and 40-10 precautionary reductions and procedures for developing and revising rebuilding plans for overfished species. Procedures for such adjustments vary according to the same three categories described in Section 4.4

2.4.2 No Action

Under the No Action alternative, the harvest specifications values in place on January 1, 2014, would remain in effect for the 2015-2016 period (Table 2-3). A detailed description of existing management measures and their associated impacts to groundfish stocks under No Action is presented by fishery in Section 4.x.

2.4.3 Alternative 1 Default HCRs use a P* Value of 0.45

Table 2-4 contains the harvest specifications under Alternative 1. Where applicable, ABCs are determined based on a p-star value of 0.45, and the ACL is set equal to the ABC. The rightmost column in Table 2-4 shows the HCR used to determine the ACL. For several stocks the ACL is set below the ABC and so the p-star value does not necessarily determine the ACL. Instances where the ACL is below the ACL include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and the use of the harvest rate specified in a rebuilding plan. The impacts of adjusting and implementing new management measures (described in Section 2.4.6) in response to the harvest specifications under Alternative 1 are presented by fishery in Section 4.x.

2.4.4 Alternative 2 – Default HCRs use a P* Value of 0.25

Table 2-5 contains the harvest specifications under Alternative 2. Where applicable, ACLs are determined based on a p-star value of 0.25. As described above for Alternative 1, ACLs may be set below the ABC, in which case the p-star value does necessarily determine the ACL. The impacts of adjusting and implementing new management measures (described in Section 2.4.6) in response to the harvest specifications under Alternative 2 are presented by fishery in Section 4.x.

2.4.5 Alternative 3 – Use HCRs in Place in the Previous Period as the Defaults

Table 2-6 contains the harvest specifications under Alternative 3. The ACLs for most species are determined based on a p-star value of 0.45. The ACLs for arrowtooth, lingcod south of 40°10 N. latitude, longspine thornyhead north and south of 34°27 N. latitude, sablefish north and south of 34°27 N. latitude, starry flounder, and shortspine thornyhead north and south of 34°27 N. latitude would be determined based on a p-star value of 0.40. The ACLs for spiny dogfish would be determined based on a p-star value of 0.35. As described above for Alternative 1, ACLs may be set below the ABC, in which case the p-star value does necessarily determine the ACL. The impacts of adjusting and implementing new management measures (described in Section 2.4.6) in response to the harvest specifications under Alternative 3 are presented by fishery in Section 4.x.

Table 2-3. Harvest specifications for stocks and stock complexes for 2015-2016 under No Action. The harvest control rule used to calculate the ACLs are shown in the right column.

Stock*	Area	OFL	ABC	ACL	ACL Harvest Control Rule
BOCACCIO	S of 40º10' N. lat.	881.0	842.0	337.0	SPR = 77.7%
CANARY	Coastwide	741.0	709.0	119.0	SPR = 88.7%
COWCOD	S of 40º10' N. lat.	12.0	9.0	3.0	SPR = 82.7% (F = 0.007); ACT =- 4 mt
DARKBLOTCHED	Coastwide	553.0	529.0	330.0	SPR = 64.9%
PACIFIC OCEAN PERCH	N of 40º10' N. lat.	838.0	801.0	153.0	SPR = 86.4%
PETRALE SOLE	Coastwide	2,774.0	2,652.0	2,652.0	25-5 rule (P* = 0.45)
YELLOWEYE	Coastwide	51.0	43.0	18.0	SPR = 76.0%
Arrowtooth flounder	Coastwide	6,912	5,758	5,758	ACL = ABC (P* = 0.4)
Black	N of 46º16' N. lat.	428	409	409	ACL = ABC (P* = 0.45)
Black	S of 46º16' N. lat.	1,166	1,115	1,000	1,000 mt constant catch
Cabezon	46º16' to 42º N. lat.	49	47	47	ACL = ABC (P* = 0.45)
Cabezon	S of 42º N. lat.	165	158	158	ACL = ABC (P* = 0.45)
California scorpionfish	S of 34°27' N. lat.	122	117	117	ACL = ABC (P* = 0.45)
Chilipepper	S of 40º10' N. lat.	1,722	1,647	1,647	ACL = ABC (P* = 0.45)
Dover sole	Coastwide	77,774	74,352	25,000	25,000 mt constant catch
English sole	Coastwide	5,906	5,646	5,646	ACL = ABC (P* = 0.45)
Lingcod	N of 40'10º N. lat.	3,162	2,878	2,878	ACL = ABC (P* = 0.45)
Lingcod	S of 40'10º N. lat.	1,276	1,063	1,063	ACL = ABC (P* = 0.45)
Longnose skate	Coastwide	2,816	2,692	2,000	2,000 mt constant catch
Longspine thornyhead	N of 34º27' N. lat.	3,304	2,752	1,958	ACL = prop. of coastwide ABC (P* = 0.4)
Longspine thornyhead	S of 34º27' N. lat.	3,304	2,752	347	ACL = prop. of coastwide ABC (P* = 0.4)
Pacific cod	Coastwide	3,200	2,221	1,600	1,600 mt constant catch
Pacific whiting	Coastwide	XXX	XXX	XXX	NA

Stock*	Area	OFL	ABC	ACL	ACL Harvest Control Rule
Sablefish	Coastwide	7,158	6,535	NA	NA
	N of 36º N. lat.	NA	NA	4,349	ACL = prop. of coastwide ABC (P* = 0.4)
	S of 36º N. lat.	NA	NA	1,560	ACL = prop. of coastwide ABC (P* = 0.4)
Shortbelly	Coastwide	6,950	5,789	50	50 mt constant catch
Shortspine thornyhead	Coastwide	2,310	2,208	NA	NA
	N of 34º27' N. lat.	NA	NA	1,525	ACL = prop. of coastwide ABC (P* = 0.45)
	S of 34º27' N. lat.	NA	NA	393	ACL = prop. of coastwide ABC (P* = 0.45)
Splitnose	S of 40º10' N. lat.	1,747	1,670	1,670	ACL = ABC (P* = 0.45)
Starry flounder	Coastwide	1,834	1,528	1,528	ACL = ABC (P* = 0.4)
Widow	Coastwide	4,435	4,212	1,500	1,500 mt constant catch
Yellowtail	N of 40º10' N. lat.	4,584	4,382	4,382	ACL = ABC (P* = 0.45)
Nearshore rockfish N.	N of 40º10' N. lat.	110	94	94	ACL = ABC (P* = 0.45); 40-10 adj. for blue in CA
Nearshore rockfish S	S of 40º10' N. lat.	1,160	1,001	990	ACL = ABC (P* = 0.45); 40-10 adj. for blue N of Pt. Con.
Other fish	Coastwide	6,802	4,697	4,697	ACL = ABC (P* = 0.4; P* = 0.3 for spiny dogfish)
Other flatfish	Coastwide	10,060	6,982	4,884	ACL = ABC (P* = 0.4)
Shelf rockfish N.	N of 40º10' N. lat.	2,195	1,932	968	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted in CA
Shelf rockfish S.	S of 40º10' N. lat.	1,913	1,620	714	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted N of Pt. Con.
Slope rockfish N.	N of 40º10' N. lat.	1,553	1,414	1,160	ACL = ABC (P* = 0.45)
Slope rockfish S.	S of 40º10' N. lat.	685	622	622	ACL = ABC (P* = 0.45); 40-10 adj. for blackgill

*Overfished species stocks in CAPs; stock complexes in *italics*.

Table 2-4. Harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 1. The harvest control rule used to calculate the ACLs are shown in the right column. Overfished stocks are designated in all caps.

Stock*	Area	2015			2016			ACL Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
BOCACCIO	S of 40º10' N. lat.	1,444	1,380	349	1,351	1,291	362	SPR = 77.7%
CANARY	Coastwide	733	701	122	729	697	125	SPR = 88.7%
COWCOD	S of 40º10' N. lat.	67	60	10	66	59	10	SPR = 82.7% (F = 0.007); ACT =- 4 mt
DARKBLOTCHED	Coastwide	574	549	338	580	554	346	SPR = 64.9%
POP	N of 40º10' N. lat.	842	805	158	850	813	164	SPR = 86.4%
PETRALE SOLE	Coastwide	2,946	2,816	2,816	3,044	2,910	2,910	25-5 rule (P* = 0.45)
YELLOWEYE	Coastwide	52	47	18	52	47	19	SPR = 76.0%
Arrowtooth flounder	Coastwide	6,599	6,025	6,025	6,396	5,840	5,840	ACL = ABC (P* = 0.45)
Black	WA	421	402	402	423	404	404	ACL = ABC (P* = 0.45)
Black	OR & CA	1,176	1,124	1,000	1,183	1,131	1,000	1,000 mt constant catch
Cabezon	OR.	49	47	47	49	47	47	ACL = ABC (P* = 0.45)
Cabezon	CA	161	154	154	158	151	151	ACL = ABC (P* = 0.45)
Cabezon	WA	4.0	3.3	3.3	4.4	3.7	3.7	ACL = ABC (P* = 0.45)
California scorpionfish	S of 34°27' N. lat.	119	114	114	117	111	111	ACL = ABC (P* = 0.45)
Chilipepper	S of 40º10' N. lat.	1,703	1,628	1,628	1,694	1,619	1,619	ACL = ABC (P* = 0.45)
Dover sole	Coastwide	66,871	63,929	25,000	59,221	56,615	25,000	25,000 mt constant catch
English sole	Coastwide	12,092	11,040	11,040	8,493	7,754	7,754	ACL = ABC (P* = 0.45)
Kelp Greenling	CA	118.9	99.2	99.2	118.9	99.2	99.2	ACL = ABC (P* = 0.45)
Kelp Greenling	OR	14.0	11.7	11.7	15.5	12.9	12.9	ACL = ABC (P* = 0.45)
Kelp Greenling	WA	31.4	26.2	26.2	27.7	23.1	23.1	ACL = ABC (P* = 0.45)
Leopard Shark	Coastwide	167.1	139.4	139.4	167.1	139.4	139.4	ACL = ABC (P* = 0.45)
Lingcod	N of 40'10º N. lat.	3,010	2,830	2,830	2,891	2,719	2,719	ACL = ABC (P* = 0.45)
Lingcod	S of 40'10º N. lat.	1,205	1,100	1,100	1,136	1,037	1,037	ACL = ABC (P* = 0.45)
Longnose skate	Coastwide	2,449	2,341	2,000	2,405	2,299	2,000	2,000 mt constant catch
Longspine thornyhead	Coastwide	5,007	4,571	NA	4,763	4,349	NA	NA
	N of 34º27' N. lat.	NA	NA	3,474	NA	NA	3,305	ACL = prop. of coastwide ABC (P* = 0.45)
	S of 34º27' N. lat.	NA	NA	1,097	NA	NA	1,044	ACL = prop. of coastwide ABC (P* = 0.45)
Pacific cod	Coastwide	3,200	2,669	1,600	3,200	2,669	1,600	1,600 constant catch
Pacific whiting a/	Coastwide	NA	NA	NA	NA	NA	NA	NA

Stock*	Area	2015			2016			ACL Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
Sablefish	Coastwide	7,857	7,511	NA	8,526	8,151	NA	NA
	N of 36º N. lat.	NA	NA	5,012	NA	NA	5,467	ACL = prop. of coastwide ABC (P* = 0.45)
	S of 36º N. lat.	NA	NA	1,798	NA	NA	1,961	ACL = prop. of coastwide ABC (P* = 0.45)
Shortbelly	Coastwide	6,950	6,345	50	6,950	6,345	50	50 mt constant catch
Shortspine thornyhead	Coastwide	3,203	2,924	NA	3,169	2,893	NA	NA
	N of 34º27' N. lat.	NA	NA	1,913	NA	NA	1,892	ACL = prop. of coastwide ABC (P* = 0.45)
	S of 34º27' N. lat.	NA	NA	1,012	NA	NA	1,001	ACL = prop. of coastwide ABC (P* = 0.45)
Spiny Dogfish	Coastwide	2,523	2,303	2,303	2,503	2,285.5	2,285	ACL = ABC (P* = 0.45)
Splitnose	S of 40º10' N. lat.	1,794	1,715	1,715	1,826	1,746	1,746	ACL = ABC (P* = 0.45)
Starry flounder	Coastwide	1,841	1,681	1,681	1,847	1,686	1,686	ACL = ABC (P* = 0.45)
Widow	Coastwide	4,137	3,929	1,500	3,990	3,790	1,500	1,500 mt constant catch
Yellowtail	N of 40º10' N. lat.	12,281	11,213	11,213	11,647	10,634	10,634	ACL = ABC (P* = 0.45)
Nearshore rockfish N.	N of 40º10' N. lat.	90	79	69	90	79	69	ACL = ABC (P* = 0.45); 40-10 adj. for blue in CA + China
Nearshore rockfish S.	S of 40º10' N. lat.	1,309	1,165	1,049	1,317	1,163	1,048	ACL = ABC (P* = 0.45); 40-10 adj. for blue N of Pt. Con.
Shelf rockfish N.	N of 40º10' N. lat.	2,208	1,943	XXX	2,217	1,952	XXX	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted in CA
Shelf rockfish S.	S of 40º10' N. lat.	1,914	1,621	XXX	1,915	1,622	XXX	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted N of Pt. Con.
Slope rockfish N.	N of 40º10' N. lat.	1,804	1,669	1,669	1,818	1,683	1,683	ACL = ABC (P* = 0.45)
Slope rockfish S.	S of 40º10' N. lat.	806	687	687	807	689	689	ACL = ABC (P* = 0.45); 40-10 adj. for blackgill
Other flatfish	Coastwide	11,298	9,865	9,865	9,948	8,633	8,633	ACL = ABC (P* = 0.45)

*Overfished species stocks in CAPs; stock complexes in *italics*.
a/ The 2013 Pacific whiting TAC was analyzed under Alternative 1.

Table 2-5. Harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 2. The harvest control rule used to calculate the ACLs are shown in the right column.

Stock*	Area	2015			2016			ACL Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
BOCACCIO	S of 40º10' N. lat.	1,444	1,132	349	1,351	1,059	362	SPR = 77.7%
CANARY	Coastwide	733	575	122	729	572	125	SPR = 88.7%
COWCOD	S of 40º10' N. lat.	67	60	10	66	59	10	SPR = 82.7% (F = 0.007); ACT =- 4 mt
DARKBLOTCHED	Coastwide	574	450	338	580	455	346	SPR = 64.9%
POP	N of 40º10' N. lat.	842	660	158	850	666	164	SPR = 86.4%
PETRALE SOLE	Coastwide	2,946	2,310	2,310	3,044	2,386	2,386	25-5 rule (P* = 0.25)
YELLOWEYE	Coastwide	52	32	18	52	32	19	SPR = 76.0%
Arrowtooth flounder	Coastwide	6,599	4,058	4,058	6,396	3,934	3,934	ACL = ABC (P* = 0.25)
Black	WA	421	922	330	423	332	332	ACL = ABC (P* = 0.25)
Black	OR & CA	1,176	330	922	1,183	927	927	ACL = ABC (P* = 0.25)
Cabezon	OR	49	38	38	49	38	38	ACL = ABC (P* = 0.25)
Cabezon	CA	161	126	126	158	124	124	ACL = ABC (P* = 0.25)
Cabezon	WA	4.0	1.5	1.5	4.7	1.8	1.8	ACL = ABC (P* = 0.25)
California scorpionfish	S of 34°27' N. lat.	119	93	93	117	91	91	ACL = ABC (P* = 0.25)
Chilipepper	S of 40º10' N. lat.	1,703	1,335	1,335	1,694	1,328	1,328	ACL = ABC (P* = 0.25)
Dover sole	Coastwide	66,871	52,427	25,000	59,221	46,429	25,000	25,000 mt constant catch
English sole	Coastwide	12,092	7,437	7,437	8,493	5,223	5,223	ACL = ABC (P* = 0.25)
Kelp Greenling	CA	118.9	45.1	45.1	118.9	45.1	45.1	ACL = ABC (P* = 0.25)
Kelp Greenling	OR	14.0	5.3	5.3	16.6	6.3	6.3	ACL = ABC (P* = 0.25)
Kelp Greenling	WA	31.4	11.9	11.9	30.0	11.4	11.4	ACL = ABC (P* = 0.25)
Leopard Shark	Coastwide	167.1	63.3	63.3	167.1	63.3	63.3	ACL = ABC (P* = 0.25)
Lingcod	N of 40'10º N. lat.	3,010	2,172	2,172	2,891	2,089	2,089	ACL = ABC (P* = 0.25)
Lingcod	S of 40'10º N. lat.	1,205	741	741	1,136	699	699	ACL = ABC (P* = 0.25)
Longnose skate	Coastwide	2,449	1,920	1,920	2,405	1,885	1,885	2,000 mt constant catch
Longspine thornyhead	Coastwide	5,007	3,079	NA	4,763	2,929	NA	NA
	N of 34º27' N. lat.	NA	NA	2,340	NA	NA	2,226	ACL = prop. of coastwide ABC (P* = 0.25)
	S of 34º27' N. lat.	NA	NA	739	NA	NA	703	ACL = prop. of coastwide ABC (P* = 0.25)
Pacific cod	Coastwide	3,200	1,213	1,213	3,200	1,213	1,213	1,600 constant catch

Stock*	Area	2015			2016			ACL Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
Pacific whiting	Coastwide	NA	NA	NA	NA	NA	NA	NA
Sablefish	Coastwide	7,857	6,160	NA	8,526	6,684	NA	NA
	N of 36º N. lat.	NA	NA	4,114	NA	NA	4,540	ACL = prop. of coastwide ABC (P* = 0.25)
	S of 36º N. lat.	NA	NA	1,475	NA	NA	1,629	ACL = prop. of coastwide ABC (P* = 0.25)
Shortbelly	Coastwide	6,950	4,274	50	6,950	4,274	50	50 mt constant catch
Shortspine thornyhead	Coastwide	3,203	1,970	NA	3,169	1,949	NA	NA
	N of 34º27' N. lat.	NA	NA	1,288	NA	NA	1,275	ACL = prop. of coastwide ABC (P* = 0.25)
	S of 34º27' N. lat.	NA	NA	682	NA	NA	674	ACL = prop. of coastwide ABC (P* = 0.25)
Spiny Dogfish	Coastwide	2,523	1,552	1,552	2,503	1,540	1,540	ACL = ABC (P* = 0.25)
Splitnose	S of 40º10' N. lat.	1,794	1,406	1,406	1,826	4,132	1,432	ACL = ABC (P* = 0.25)
Starry flounder	Coastwide	1,841	1,132	1,132	1,847	1,136	1,136	ACL = ABC (P* = 0.25)
Widow	Coastwide	4,137	3,138	1,500	3,990	3,026	1,500	1,500 mt constant catch
Yellowtail	N of 40º10' N. lat.	12,281	7,553	7,553	11,647	7,163	7,163	ACL = ABC (P* = 0.25)
Nearshore rockfish N.	N of 40º10' N. lat.	90	45	40	90	46	XXX	ACL = ABC (P* = 0.25); 40-10 adj. for blue in CA + China
Nearshore rockfish S.	S of 40º10' N. lat.	1,309	722	693	1,317	720	694	ACL = ABC (P* = 0.25); 40-10 adj. for blue N of Pt. Con.
Shelf rockfish N.	N of 40º10' N. lat.	2,208	1,142	XXX	2,217	1,148	XXX	ACL = ABC (P* = 0.25); 40-10 adj. for greenspotted in CA
Shelf rockfish S.	S of 40º10' N. lat.	1,914	800	XXX	1,915	800	XXX	ACL = ABC (P* = 0.25); 40-10 adj. for greenspotted N of Pt. Con.
Slope rockfish N.	N of 40º10' N. lat.	1,804	1,215	1,215	1,818	1,227	1,227	ACL = ABC (P* = 0.25)
Slope rockfish S.	S of 40º10' N. lat.	806	386	384	807	387	386	ACL = ABC (P* = 0.25); 40-10 adj. for blackgill
Other flatfish	Coastwide	11,298	5,606	5,606	9,948	4,775	4,775	ACL = ABC (P* = 0.25)

*Overfished species stocks in CAPs; stock complexes in *italics*.

Table 2-6. Preferred harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 3. The harvest control rule used to calculate the ABCs and ACLs are shown in the right column.

Species*	Area	2015			2016			Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
BOCACCIO	S of 40º10' N. lat.	1,444	1,380	349	1,351	1,291	362	SPR = 77.7%
CANARY	Coastwide	733	701	122	729	697	125	SPR = 88.7%
COWCOD	S of 40º10' N. lat.	67	60	16	66	59	16	SPR = 82.7% (F = 0.007); ACT =- 4 mt
DARKBLOTCHED	Coastwide	574	549	338	580	554	346	SPR = 64.9%
POP	N of 40º10' N. lat.	842	805	158	850	813	164	SPR = 86.4%
PETRALE SOLE	Coastwide	2,946	2,816	2,816	3,044	2,910	2,910	25-5 rule (P* = 0.45)
YELLOWEYE	Coastwide	52	47	18	52	47	19	SPR = 76.0%
Arrowtooth flounder	Coastwide	6,599	5,497	5,497	6,396	5,328	5,328	ACL = ABC (P* = 0.4)
Black	WA	421	402	402	423	404	404	ACL = ABC (P* = 0.45)
Black	OR & CA	1,176	1,124	1,000	1,183	1,131	1,000	1,000 mt constant catch
Cabezon	OR	49	47	47	49	47	47	ACL = ABC (P* = 0.45)
Cabezon	CA	161	154	154	158	151	151	ACL = ABC (P* = 0.45)
Cabezon	WA							ACL = ABC (P* = 0.45)
California scorpionfish	S of 34°27' N. lat.	119	114	114	117	111	111	ACL = ABC (P* = 0.45)
Chilipepper	S of 40º10' N. lat.	1,703	1,628	1,628	1,694	1,619	1,619	ACL = ABC (P* = 0.45)
Dover sole	Coastwide	66,871	63,929	25,000	59,221	56,615	25,000	25,000 mt constant catch
English sole	Coastwide	12,092	11,040	11,040	8,493	7,754	7,754	ACL = ABC (P* = 0.45)
Kelp Greenling	CA			99			99	ACL = ABC (P* = 0.45)
Kelp Greenling	OR							ACL = ABC (P* = 0.45)
Kelp Greenling	WA							ACL = ABC (P* = 0.45)
Leopard Shark	Coastwide			139			139	ACL = ABC (P* = 0.45)
Lingcod	N of 40'10º N. lat.	3,010	2,830	2,830	2,891	2,719	2,719	ACL = ABC (P* = 0.45)
Lingcod	S of 40'10º N. lat.	1,205	1,004	1,004	1,136	946	946	ACL = ABC (P* = 0.4)
Longnose skate	Coastwide	2,449	2,341	2,000	2,405	2,299	2,000	2,000 mt constant catch
Longspine thornyhead	Coastwide	5,007	4,171	NA	4,763	3,968	NA	NA
	N of 34º27' N. lat.	NA	NA	3,170	NA	NA	3,015	ACL = prop. of coastwide ABC (P* = 0.4)
	S of 34º27' N. lat.	NA	NA	1,001	NA	NA	952	ACL = prop. of coastwide ABC (P* = 0.4)
Pacific cod	Coastwide	3,200	2,221	1,600	3,200	2,221	1,600	1,600 constant catch

Species*	Area	2015			2016			Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
Pacific whiting	Coastwide	NA	NA	NA	NA	NA	NA	NA
Sablefish	Coastwide	7,857	7,173	NA	8,526	7,784	NA	NA
	N of 36º N. lat.	NA	NA	4,793	NA	NA	5,241	ACL = prop. of coastwide ABC (P* = 0.4)
	S of 36º N. lat.	NA	NA	1,719	NA	NA	1,880	ACL = prop. of coastwide ABC (P* = 0.4)
Shortbelly	Coastwide	6,950	5,789	50	6,950	5,789	50	50 mt constant catch
Shortspine thornyhead	Coastwide	3,203	2,668	NA	3,169	2,640	NA	NA
	N of 34º27' N. lat.	NA	NA	1,745	NA	NA	1,726	ACL = prop. of coastwide ABC (P* = 0.4)
	S of 34º27' N. lat.	NA	NA	923	NA	NA	913	ACL = prop. of coastwide ABC (P* = 0.4)
Spiny Dogfish	Coastwide	2,523	1,912	1,912	2,503	1,897	1,897	ACL = ABC (P* = 0.35)
Splitnose	S of 40º10' N. lat.	1,794	1,715	1,715	1,826	1,746	1,746	ACL = ABC (P* = 0.45)
Starry flounder	Coastwide	1,841	1,534	1,534	1,847	1,539	1,539	ACL = ABC (P* = 0.4)
Widow	Coastwide	4,137	3,929	1,500	3,990	3,790	1,500	1,500 mt constant catch
Yellowtail	N of 40º10' N. lat.	12,281	11,213	11,213	11,647	10,634	10,634	ACL = ABC (P* = 0.45)
Nearshore rockfish N.	N of 40º10' N. lat.	90	79	69	90	79	69	ACL = ABC (P* = 0.45); 40-10 adj. for blue in CA + China
Nearshore rockfish S.	S of 40º10' N. lat.	1,309	1,165	1,049	1,317	1,163	1,048	ACL = ABC (P* = 0.45); 40-10 adj. for blue N of Pt. Con.
Shelf rockfish N.	N of 40º10' N. lat.	2,208	1,943	XXX	2,217	1,952	XXX	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted in CA
Shelf rockfish S.	S of 40º10' N. lat.	1,914	1,621	XXX	1,915	1,622	XXX	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted N of Pt. Con.
Slope rockfish N.	N of 40º10' N. lat.	1,804	1,669	1,669	1,818	1,683	1,683	ACL = ABC (P* = 0.45)
Slope rockfish S.	S of 40º10' N. lat.	806	698	687	807	699	689	ACL = ABC (P* = 0.45); 40-10 adj. for blackgill
Other flatfish	Coastwide	11,298	8,620	8,620	9,948	7,496	7,496	ACL = ABC (P* = 0.45)

*Overfished species stocks in CAPs; stock complexes in *italics*.

2.4.6 Management Measures

Management measures considered as part of the biennial process fall into three broad categories: adjustments to and allocations of ACLs, adjustments to existing (or routine) management measures, and adoption of new management measures. Existing measures include:

- Limited entry permits which restrict the number of vessels that may use specified gear types to catch allocated groundfish. Limited entry permits define the groundfish trawl sector (further subdivided among vessels delivering catch shoreside, catcher vessels delivering Pacific whiting to at-sea mothership processors, and at-sea Pacific whiting catcher-processors) and the limited entry fixed gear sector, which uses longline and pot gear, mainly to catch sablefish.
- Groundfish closed areas, principally Rockfish Conservation Areas (RCAs) imposed to exclude fishing vessels from areas of high bycatch of species of concern, predominantly overfished species. Enforcement of these closed areas is supported by requirements for vessels to carry a vessel monitoring system (VMS) that transmits their position to enforcement officials.
- Catch control tools including IFQs in the shoreside trawl sector, co-ops and associated allocations in the at-sea whiting sectors, permit and vessel-specific sablefish allocations in the limited entry fixed gear sector (called “tier limits”), and 2-month cumulative landing limits used in all sectors for certain species and/or at certain times of the year. Recreational catch is primarily controlled by time/area closures and bag limits.

Several new management measures considered for implementation in 2015, designed to meet the goals and objectives specified in the FMP, were proposed for analysis. The following section provides an overview of the measures which are evaluated under all action alternatives. A focused evaluation of the performance and effects of the new management measures and range of options considered can be found in Appendix C.

2.4.6.1 Modifications to the Boundaries Defining RCAs

RCAs are large area closures intended to protect a complex of species, such as overfished shelf rockfish species. The boundaries for RCAs are defined by straight lines connecting a series of latitude and longitude coordinates that approximate depth contours. A set of coordinates are defined for each depth contour and the RCA structures are implemented by gear and/or fishery (e.g., trawl RCA, a non-trawl RCA, and recreational RCAs). Starting in 2015, changes to selected coordinates are proposed that more closely approximate the boundaries with depth contours based on the best available data. These modifications would maintain the intent of the RCAs by providing should provide improved and more efficient access to target species while minimizing interactions with overfished species.

Changes to the boundaries defining RCAs are proposed in Oregon and California. Starting on January 1, 2013 new waypoints, designed to better approximate depth, were established for the 200 fm line in Oregon. This resulted in some unintended consequences relative to the 200 fm line that is modified to provide greater access to petrale sole (referred to in regulation as the 200 fm modified line). Updated coordinates for the modified 200 fm line are proposed to resolve this problem. In California, adjustments are proposed off Del Mar (six waypoints) and San Diego (two waypoints) to better approximate depth contours.

2.4.6.2 New Groundfish Conservation Areas (GCAs)

Management measures designed to reduce the catch of rougheye rockfish for all commercial sectors are proposed under the action alternatives. A recent rougheye/blackspotted rockfish assessment indicates that the west coast stock is currently 47 percent of the unexploited biomass (above the B_{MSY} proxy of B40%).

Harvest rates of rougheye rockfish have been close to or above the F_{MSY} proxy of $F_{50\%}$ for rockfish since the mid-1980s, including four of the last 10 years. Groundfish closure areas (GCAs) may represent a viable management measure for reducing mortality of rougheye/blackspotted rockfish for one or more commercial sectors if other existing management measures prove ineffective.

Similarly, under the action alternatives, spiny dogfish is proposed to be removed from the Other Fish complex and managed with species-specific harvest specifications. Spiny dogfish mortality in some years has been greater than the proposed ACLs under the action alternatives. GCAs may represent a viable management measure for reducing mortality of spiny dogfish for one or more fishing sectors if other existing management measures prove ineffective.

2.4.6.3 Other Fish Stock Complex Restructuring

At the November 2013 Council meeting, the Council adopted a final preferred alternative for restructuring the Other Fish stock complexes as follows: 1) remove spiny dogfish from the Other fish complex and manage with stock-specific specifications and 2) designate the following species as Ecosystem Component Species: finescale codling (aka Pacific flatnose), soupfin shark, spotted ratfish, all endemic skates except longnose skate, and all endemic grenadiers. Correspondingly, the action alternatives analyze the impacts of this decision.

The Council assigned further analysis of alternatives for managing kelp greenling and the Washington stock of cabezon. The action alternatives contemplate individual species management for kelp greenling, cabezon, and leopard shark (preliminary-preferred) or managing these stocks together in a Shallow Roundfish complex.

2.4.6.4 Allow Retention of Lingcod by Fixed Gear Vessels in Periods 1, 2, and 6

Since the 1990s, lingcod retention has been prohibited in Periods 1, 2, and 6 for both limited entry and open access fixed gears to reduce catch of male lingcod during the nest-guarding season. There is no lingcod closed season for the shorebased IFQ or Oregon recreational fisheries. Under the action alternatives, it is proposed that lingcod retention be allowed during Periods 1, 2, and 6 at a level which would reduce discarding but prevent targeting.

2.4.6.5 Modify or Remove Commercial Gear Restrictions fishing when Targeting Flatfish in the non-trawl RCAs, Cowcod Conservation Areas, Farallon Islands, and Cordell Banks.

In California, commercial vessels using a specific gear configuration designed to target flatfish species are authorized to fish in several GCAs, including the non-trawl RCA, Cowcod Conservation Area, Farallon Islands, and Cordell Banks. Under the action alternatives, it is proposed that the gear restrictions on flatfish are modified or removed for the California commercial fishery.

2.4.6.6 Rougheye Rockfish Excluder for Trawl Vessels Fishing Seaward of the RCA

As noted previously, the Council is exploring management measures designed to reduce the catch of rougheye rockfish for all commercial sectors. Under the action alternatives, the impacts of requiring excluder devices to reduce the catch of rougheye rockfish in whiting fisheries (i.e., Pacific whiting IFQ trips, catcher processor, and mothership trawl sectors) is considered.

2.4.6.7 Shorebased IFQ - Initial Issuance for Selected Species in the Slope Rockfish Complex

The Council is considering a range of action alternatives for restructuring the Slope Rockfish complex (see Section 2.4.6) for consistency with National Standard 1 Guidelines at 50 CFR 660.310(d)(8). To reduce the catch of some species, the issuance of shorebased IFQ may be needed. A stock complex is "a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar." The action would consider the issuance of shorebased IFQ to prevent or reduce the risk of overfishing component stocks currently managed in the slope rockfish complex.

2.4.6.8 Shorebased IFQ Surplus Carry-Over

Current regulations provide for a carry-over provision that allows a limited amount of surplus QP or IBQ pounds in a vessel account to be carried over from one year to the next or allows a deficit in a vessel account in one year to be covered with QP or IBQ pounds from a subsequent year, up to a carryover limit (50 CFR 660.140(e)(5)). The carry-over provision was designed to increase individual flexibility for harvesters, improve economic efficiency, and achieve optimum yield (OY) while preserving the conservation of stocks. This proposed measure would consider unused amounts that were set-aside for tribal, recreational and incidental catch in non-groundfish fisheries relative to the issuance of carryover for the trawl IFQ fishery, in the event the trawl allocation for a species has been exceeded, but there is surplus quota eligible for carryover.

2.4.6.9 Recreational Fisheries Canary Rockfish Bag Limit

Canary rockfish is an overfished species managed and under a rebuilding plan. For the recreational fisheries, canary retention is prohibited. A sub-bag limit for canary rockfish in the recreational fisheries is proposed to minimize discards of canary rockfish, while preventing targeting.

2.4.6.10 Washington and Oregon Recreational - Allow Retention of Bottom Fish during All-Depth Halibut Seasons

Retention of all groundfish, lingcod only, or flatfish only during the Pacific halibut fishery is currently allowed in both the halibut and groundfish regulations. This management measure would change the retention allowances by area.

2.4.6.11 Washington Recreational – Modify or Eliminate Boundaries for Lingcod Closures

Yelloweye rockfish is an overfished species currently managed under a rebuilding plan. In 2012, deep-water lingcod closures were implemented in Washington to reduce encounters with yelloweye rockfish in the South Coast (Marine Catch Area 2) and Columbia River (Marine Catch Area 1) management areas. Consideration of this management measure allows an exploration of the boundary lines to determine if more discrete areas might more effectively reduce encounters with yelloweye and canary rockfish and streamline regulations making them easier for anglers to understand.

2.4.6.12 Washington - New Yelloweye Rockfish Conservation Area

New yelloweye rockfish conservation areas (YRCA) are analyzed to reduce yelloweye rockfish mortality so total catch mortality does not exceed the Washington recreational HG for yelloweye rockfish.

2.4.6.13 Implement a 50 Fathom Management Line for Oregon Recreational Fisheries

Recreational fishing in Oregon is currently prohibited seaward of 40 fm from April 1 through September 30 in Federal regulations. The proposed measure will examine changing the depth restrictions from 40 fathoms to 50 fathoms to allow more fishing opportunity.

2.5 Slope Rockfish Stock Complex Reorganization Alternatives

See Agenda Item C.8.a, Attachment 1, April 2014.

2.6 Alternatives Considered but Rejected from Further Analysis

- P* less than .25 or greater than .45
- Alts for reorganizing shelf or nearshore complexes
- Liberalizing CCAs to allow groundfish targeting

Chapter 3 AFFECTED ENVIRONMENT

NMFS and Council staff scoped the range of environmental components that could be significantly affected by the proposed actions. This chapter describes the affected environment in terms of these components. The affected environment reflects conditions as they exist before the proposed actions are implemented and provides a baseline for considering effects. This chapter is organized into the following sections:

Section 3.1: Groundfish
Section 3.2: The socioeconomic environment
Section 3.3: The California Current Ecosystem
Section 3.4: Essential fish habitat
Section 3.5: Protected species
Section 3.6: Non-groundfish

3.1 Groundfish

More than 90 fish species are managed under the FMP. These groundfish include: 60-plus rockfish, including all genera and species from the family *Scorpaenidae* (*Sebastes*, *Scorpaena*, *Sebastolobus*, and *Scorpaenodes*) occurring in waters off Washington, Oregon, and California; 12 flatfish species, 6 roundfish species; and 6 miscellaneous fish species that include sharks, skates, grenadiers, rattails, and morids. Rockfish make up the majority of species managed under the FMP. Rockfish vary greatly in their morphological and behavioral traits, with some species being semi-pelagic and found in mid-water schools, and others leading solitary, sedentary, bottom-dwelling lives . Rockfish inhabit a wide range of depths, from nearshore kelp forests and rock outcrops to varied deepwater (greater than 150 fm) habitats on the continental slope. Despite the range of behaviors and habitats, most rockfish share general life history characteristics, which include slow growth rates, bearing live young, and large but infrequent recruitment events. These life history characteristics contribute to relatively low average productivity that may reduce their ability to withstand heavy exploitation , especially during periods of unfavorable environmental conditions.

Roundfish managed under the FMP include lingcod, cabezon, kelp greenling Pacific cod, sablefish and Pacific whiting. Adult lingcod are a relatively sedentary species found coastwide along the rocky shelf and in nearshore habitats. Lingcod grow rapidly; reaching 12 inches in the first year and having a maximum life span of 20 years. Cabezon is a coastwide species that is primarily found nearshore, in intertidal areas and among jetty rocks, out to 100 m . Cabezon may reach an age of more than 20 years . Kelp greenling are relatively common along the west coast, with the adults found in rocky reefs of shallow nearshore areas. Kelp greenling's estimated maximum age is 16 years . Pacific cod are widely distributed along the Pacific Coast from Alaska to Santa Monica, California ; . Although Pacific cod prefer shallow, soft bottom habitats in marine and estuarine environments , adults have been found associated with coarse sand and gravel substrates , . Compared to the other roundfish species, adult sablefish are a longer living species that is found in deeper waters, being most abundant between 200 and 1,000 m, and found as deep as 3,000 m . Adult sablefish commonly occur over sand and mud in deep marine waters, but have also been found over hard-packed mud and clay bottoms in the vicinity of submarine canyons . The coastal stock of Pacific whiting is semi-pelagic and is the most abundant single-species groundfish population in the California Current system . The stock is characterized by highly variable recruitment patterns and a relatively short lifespan. In general, the species referred to as roundfish share similar morphology, are faster growing with shorter life spans then many of the rockfish, and have external fertilization with some species having large and highly variable recruitment events.

Flatfish species from the order *Pleuronectiformes* have asymmetrical skulls with both eyes on the same side of the head. The 12 flatfish species in the FMP include species that have been assessed, such as arrowtooth flounder, Dover sole, English sole, petrale sole, and starry flounder, as well as those species that have not been assessed and are managed within the Other Flatfish complex (i.e., butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole). Most of the flatfish species are distributed coastwide in waters of the continental shelf with the exception of arrowtooth flounder, butter sole, and flathead sole, which are found on the shelf in waters north of central California. Flatfish species vary in deep distribution. The flatfish species primarily found in more nearshore areas include starry flounder, Pacific sanddab, butter sole, curlfin sole, sand sole and rock sole. Flatfish species found in deeper waters include Dover sole, flathead sole, and petrale sole. The remaining species show more variation in depth distribution. Many of the flatfish species migrate seasonally from shallow water summer feeding grounds on the continental shelf to deep water spawning grounds over the continental slope . Though there are variations between species, most of the flatfishes are found on soft bottom such as sand or sandy gravel substrates and mud; however, some are found in eelgrass habitats and, in the case of arrowtooth flounder, occasionally over low-relief rock-sponge bottoms .

The species managed under the FMP are distributed throughout the EEZ and occupy diverse habitats at all stages in their life history. In addition, many of the stocks have geographic ranges that extend beyond the U.S. EEZ into Canadian or Mexican waters. The life history traits of the groundfish species have important implications on stock assessment and how the stocks are managed. This is because fishing changes population abundance of the target species, as well as affects life-history traits and population dynamics and may also affect the yield. For each groundfish species, detailed information on habitat utilization patterns, fisheries that harvest the species, geographic range, migrations and movements, reproduction, growth and development, and trophic interactions are fully described in Appendix B2 to the final EIS titled "The Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts . Past groundfish harvest specification EISs also have detailed the life history, distribution, and status of groundfish stocks.

of the status of groundfish stocks are provided in the 2014 edition of the Stock Assessment and Fishery Evaluation (SAFE) document, available on the Council website at www.pcouncil.org, includes detailed descriptions the distribution and life history, stock status and management history, stock productivity, and fishing mortality attributes of each assessed stock are provided in the 2014 SAFE. Further, a description of stock assessment methods employed and the harvest specification framework, including methods used to determine these specifications are provided in the 2014 SAFE.

3.2 Socioeconomic Environment

Section 3.2 in the 2013-14 Groundfish Harvest Specifications FEIS (as well as EISs for earlier biennial periods) describes commercial fisheries targeting groundfish and characterizes west coast fishing communities with respect to groundfish fisheries. That information is a useful resource upon which the current description is based. The 2014 Groundfish SAFE document contains a series of tables summarizing landings and ex-vessel revenue in groundfish fisheries, landings and revenue by port, and indicators of fishery participation. These data may be summarized here to highlight current fishery trends. Both long-term historical landings, revenue, and price data (the full PacFIN database time series) and a recent a 10-year baseline period of 2003-2012 are used to characterize fisheries and communities.

3.2.1 Revenue Trends for Commercially Important Groundfish

Although more than 90 species are managed under the Groundfish FMP, the ten highest ranked species (or species groups[6]) accounted for 92% of nominal shoreside ex-vessel revenue during the baseline period, as seen in Figure 3-1. (The revenues used to produce the figure do not include Pacific whiting processed at-sea; if included, whiting would represent a larger share. These at-sea fisheries are described below.) Furthermore, just five species—sablefish, Pacific whiting, Dover sole, petrale sole, and shortspine thornyhead accounted for 84% of all revenue. For that reason, when considering commercial fisheries, the socioeconomic evaluation in this EIS will focus on these relatively few species and the major rockfish species groups (managed as stock complexes). There are other groundfish species that have greater value in recreational fisheries and are discussed below in section 3.2.4. Furthermore, other species may have greater economic importance within particular groundfish fisheries. In the summaries of trends in these fisheries, or “sectors,” below, these species with greater economic importance are highlighted.

Figure 3-2, Table 3-1, and Figure 3-3 provide an overview of ex-vessel revenue trends for these economically important species. Figure 3-2 shows the trend in inflation-adjusted revenue for all groundfish landings (including at-sea whiting) in terms of the deviation from the long-term mean (the shoreside data series goes back to 1981 while the at-sea series begins in 1997).[7] The panels in Figure 3-3 present trends in the same way for each of the 10 highest revenue earning species referenced above. Table 3-1 shows the long-term (1981-2012) and recent past (2003-2012) values for landings, revenue, and price-per-pound, and the ratio of recent past values and long-term values.

As seen in Table 3-1, the long-term trend in shoreside groundfish revenue shows a sharp decline in the 1990s into the early 2000s, principally in reaction to management measures imposed when several groundfish were declared overfished and put under rebuilding plans. The 2003-2012 baseline period represents an increasing trend from the low point (shown in terms of the deviation from the mean in Figure 3-2) in 2002. Average annual landings for all shoreside groundfish were about the same in the recent past (2003-2012) compared to the long-term, while the average revenue ratio is 77% due to declines in average price-per-pound (Table 3-1). Examining changes by groundfish species and groups shows a mix of trends. Perhaps the most significant long-term trend is the increasing importance of sablefish and Pacific whiting relative to total shoreside groundfish revenue. For example, in 1981 sablefish accounted for just 12% of shoreside revenue while in 2012 the share was 38%. The domestic Pacific whiting fishery did not develop until the early 1990s; in 1992 shoreside whiting had an 8% share, in 2012 it was 38%. (As noted above, this does not include at-sea whiting revenues, which are recorded in a different database. Adding revenues from those fisheries would boost whiting’s relative importance.) Other species, particularly rockfish, have substantially declined as a share of revenue. In total these species have fallen from a 48% share of revenue in 1981 to an 8% share in 2012 (2014 Groundfish SAFE, Table 2b).

Looking more closely at Table 3-1, four species show increases in revenue comparing the recent past to the long term: sablefish, Pacific whiting, nearshore rockfish, and black rockfish. Except for Pacific whiting, no species shows an increase in average annual landings, so revenue increases are driven by changes in price per pound. Revenues from sablefish show a spike in 2011. Japan is an important market for west coast sablefish; because the 2011 earthquake and tsunami disrupted Japanese domestic fisheries, increased demand for west coast product drove prices higher. Over the long-term (see the panel for

[6] Rockfish species comprising these groups may be found in [reference docs with PacFIN info].
[7] Shoreside data was obtained from the PacFIN vdrfd table while at-sea data compes from the npac4900_spcomp table.

sablefish in Figure 3-3) sablefish revenue has been somewhat volatile but an increasing trend since 2002 is apparent even without the 2011 revenue spike.

Table 3-2 shows the coefficient of variation (CV) for inflation-adjusted, annual ex-vessel revenue over the long-term (1981-2012) and the baseline period (2003-2012) for the highest revenue species and species groups. The coefficient of variation is simply the standard deviation divided by the mean and provides an indicator of inter-annual volatility in revenues. The right hand column shows the ratio of the baseline period CV to the long-term CV. Taken together, these metrics allow comparison among species and species groups of any trends in volatility. Because the CV values are usually smaller for the baseline period, these values may be more useful for comparisons between species rather than over time within a species. However, the ratio values present a relative measure of magnitude. A ratio close to one indicates about the same level of variation in the short term (baseline) as in the long term; values less than one suggest less variation in the short term compared to the long term. Only one species, petrale sole, has a ratio greater than one. This may be due to the sharp decline in catches resulting from its management under a rebuilding plan beginning in 2011. Comparing these values to the panels in Figure 3-3 suggests that some of the high CV values (otherwise interpreted as instances of “volatility”) are more likely driven by long-term declines in catch. Dover sole offers a good example of a long-term decline that has flattened during the baseline period, resulting in a relatively high CV value for the long term but a relatively low value in the short term.

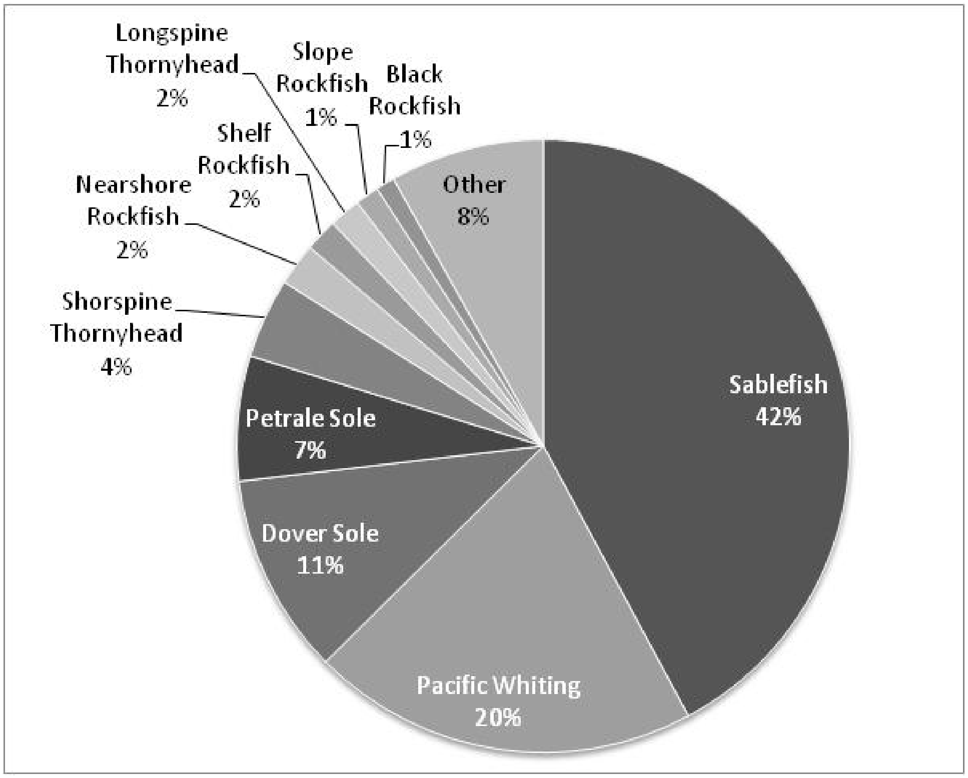


Figure 3-1. Proportion 2003-2012 nominal shoreside commercial and tribal groundfish ex-vessel revenue by species and species groups. Source: PacFIN vdrfd table, 8/7/13.

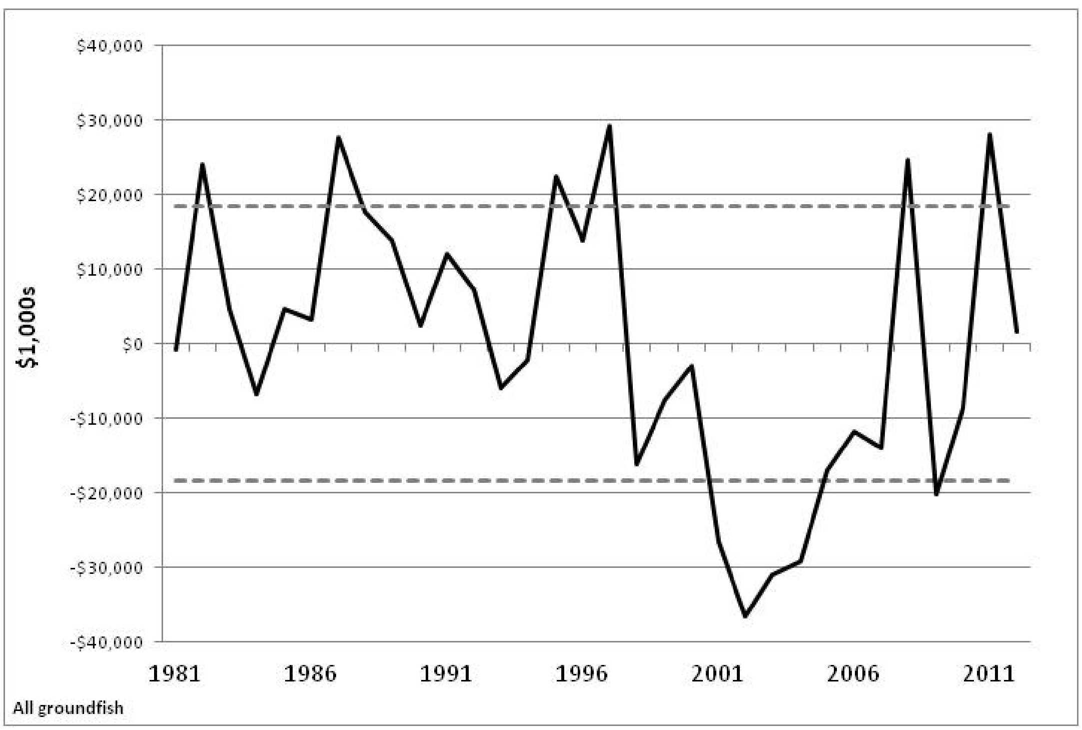


Figure 3-2. Deviation from long-term mean (1981-2012) for total groundfish ex-vessel revenue ($1,000s inflation adjusted, 2012). Dashed lines are +/- one standard deviation from the mean.

Table 3-1. Average annual landings (mt), ex-vessel revenue (inflation adjusted $1,000s, 2012), and price-per-pound (inflation adjusted, 2012) for 32-year and 10-year historical periods, and ratio of 10-year values to 32-year values. Source: PacFIN vdrfd, 8/7/2013.

	Sablefish	P. Whiting	Dover Sole	Petrale Sole	Shortspine Thornyhead	Nearshore Rockfish	Longspine Thornyhead	Slope Rockfish	Shelf Rockfish	Black Rockfish	All species
1981-2012 Annual Averages											
Metric tons	8,581	52,876	12,525	1,851	1,829	238	2,038	2,828	6,829	266	110,581
Revenue	$23,609	$7,631	$12,253	$5,092	$3,472	$1,418	$3,729	$3,459	$8,449	$515	$90,159
Price	$1.46	$0.09	$0.44	$1.26	$1.04	$3.46	$0.71	$0.59	$0.59	$1.06	$0.38
2003-2012 Annual Averages											
Metric tons	6,038	83,070	8,448	1,845	1,012	113	1,003	602	866	168	110,236
Revenue	$28,969	$13,982	$7,345	$4,647	$2,929	$1,555	$1,180	$880	$1,173	$692	$69,064
Price	$2.16	$0.08	$0.40	$1.18	$1.36	$6.24	$0.54	$0.66	$0.64	$1.89	$0.29
Ratios											
Metric tons	0.70	1.57	0.67	1.00	0.55	0.47	0.49	0.21	0.13	0.63	1.00
Revenue	1.23	1.83	0.60	0.91	0.84	1.10	0.32	0.25	0.14	1.34	0.77
Price	1.48	0.90	0.92	0.94	1.31	1.80	0.76	1.13	1.08	1.77	0.77

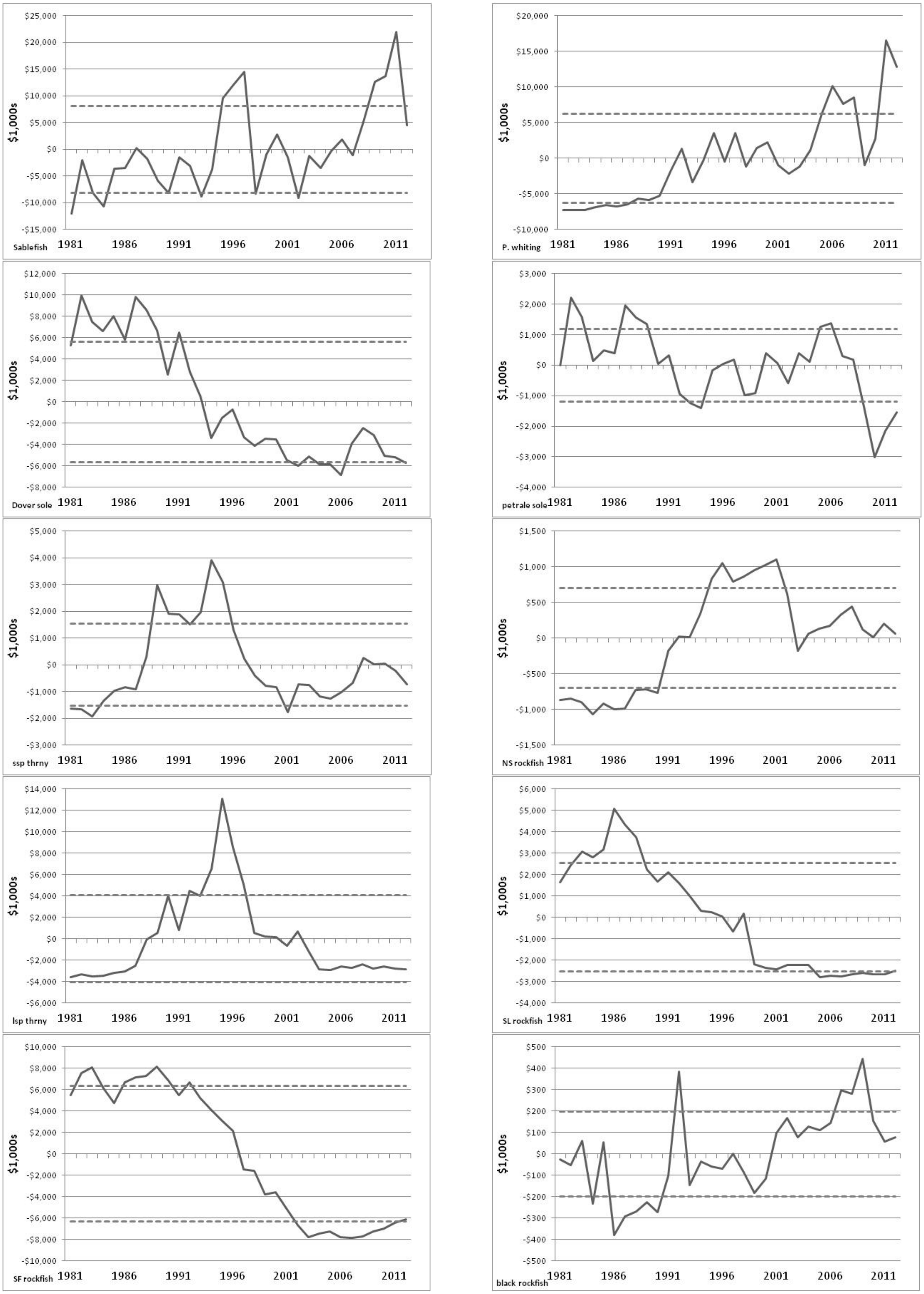


Figure 3-3. Deviation from long-term mean (1981-2012) of ex-vessel revenue ($1,000s inflation adjusted, 2012) for selected groundfish species and groups. Dashed lines are +/- one standard deviation from the mean.

Species/Sp. Group	A 1981-2012 (longterm)	B 2003-2012 (baseline)	B/A Ratio
Sablefish	0.341	0.268	0.788
P. whiting	0.805	0.402	0.500
Dover Sole	0.253	0.173	0.382
Petrale Sole	0.231	0.302	1.304
Shortspine Thornyhead	0.436	0.176	0.403
Nearshore Rockfish	0.486	0.105	0.215
Longspine Thornyhead	1.071	0.431	0.402
Slope Rockfish	0.721	0.218	0.303
Shelf Rockfish	0.738	0.473	0.640
Black Rockfish	0.380	0.171	0.250

Table 3-2. Coefficient of variation for inflation-adjusted ex-vessel revenue for selected species and species groups by two time periods.

3.2.2 Revenue Trends in Commercial Groundfish Fishery Sectors

Fishery managers frequently view groundfish fisheries in terms of fishery "sectors."[8] These sectors are defined by the permit status of participating vessels, gear type, target species, and various other historical factors. The Council allocates fishing opportunity (or the amount of fish vessels in a particular sector may harvest) either as part of the biennial process or through rules that have been established in the Groundfish FMP. Fishery sectors may receive a fixed allocation of the ACL for particular management units (stocks, geographic subdivisions of stocks, and stock complexes); in other cases fishery managers may identify a catch amount as a management objective (e.g., a harvest guideline, "HG") or simply as an accounting mechanism to prevent ACLs from being exceeded. Section 2.3 describes the allocation schemes under consideration as part of the proposed action.

The characterization of commercial groundfish fisheries here is presented in terms of the following fishery sectors:

- **Pacific whiting trawl** is composed of at-sea and shoreside fisheries. The at-sea sector is subdivided between mothership processing vessels accepting fish from catcher boats and catcher-processor vessels. The shoreside fishery deliverers to processing plants on land with Westport and Ilwaco, Washington, and Astoria, Oregon, being the principal ports for shoreside landings.
- **Non-whiting trawl/shoreside IFQ** catches a variety of other species, although sablefish and some flatfish are the main revenue earners. Beginning in 2011 this fishery has been managed under an individual fishing quota (IFQ) program. This fishery is now usually referred to as "shoreside IFQ," because an important feature of this management program is a relaxation on allowed gear types used by these permitted vessels. As a result, landings—particularly of sablefish—by gear types other than trawl have emerged as an important part of the revenue earned by permitted vessels in this sector. In addition, midwater trawl is being used to target non-whiting species.
- **Fixed gear (longline and pot) fisheries** are divided between "limited entry" and "open access" from a regulatory standpoint, but fishery managers more commonly characterize the "non

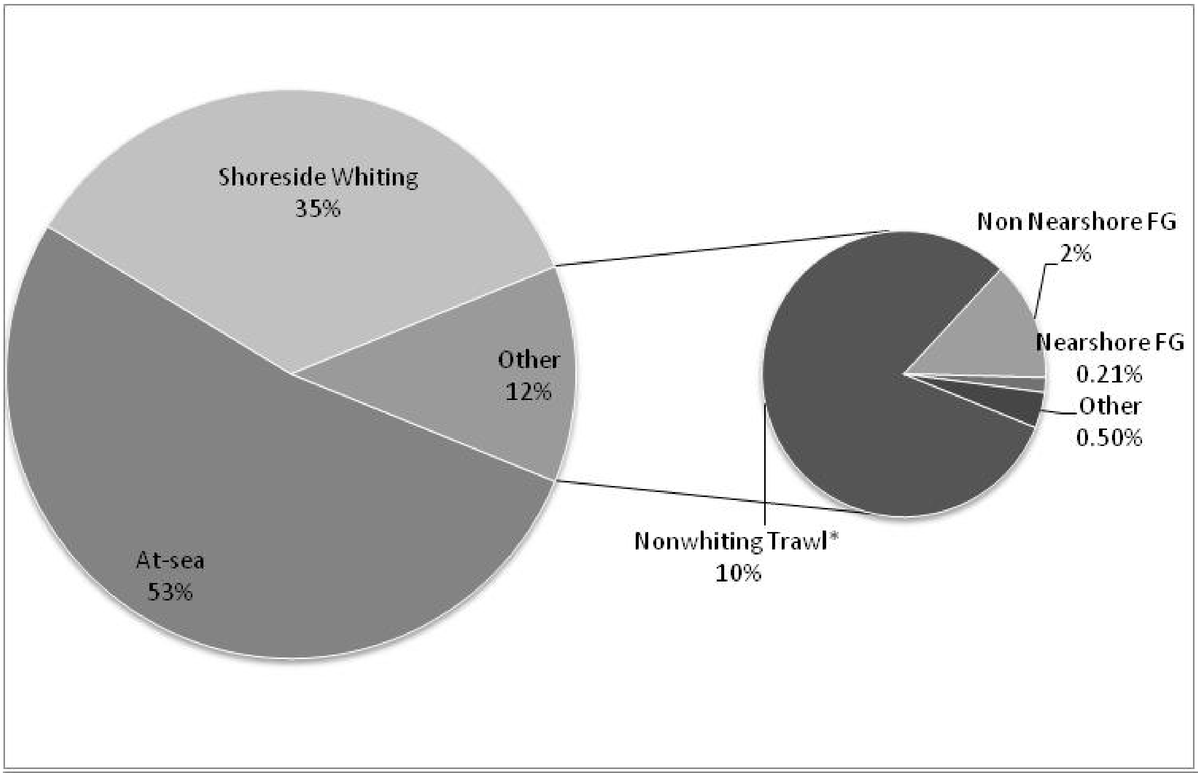
[8] Data presented in this section use sector definitions included in the PacFIN vdrfd table. The coding is based on data available within the database including gear type, species composition of landings, and Federal permit status. Global criteria for these sectors are landings from within the Pacific Council management area landed in west coast ports. Relatively small amounts of groundfish coming from other areas, such as Puget Sound, Canada or Alaska, but landed in a west coast port are thus not included in the landings figures for these sectors.

nearshore" sector—primarily targeting sablefish—and a "nearshore" sector targeting various nearshore groundfish species.

- A variety of other sectors have been characterized for the purpose of management and data presentation, but in aggregate they account for a very small proportion of landings and revenue.

Figure 3-4 shows the share of landings (top panel) and inflation-adjusted ex-vessel revenue (bottom panel) by groundfish fishery sector for the 2003-2012 baseline period. Pacific whiting fisheries dominate in terms of landings, accounting for 88% of the total. However, because whiting fetches a low price per pound, those sectors accounted for only 39% of inflation-adjusted ex-vessel revenue. Non-whiting trawl/shoreside IFQ accounts for the next largest share of landings and revenue, 10% and 34% respectively. Fixed gear landings fetch a relatively higher price so while those sectors accounted for only a little more than 2% of landings, they garnered a quarter of groundfish revenue, primarily in the non nearshore sector that targets sablefish.

Figure 3-5 shows revenue trends for groundfish sectors over the baseline period. Revenues have been more stable for non-whiting sectors compared to whiting. One way of assessing variability is the coefficient of variation (the standard deviation divided by the mean). The values for the sectors (over the baseline period) shown in the figure are as follows: non-whiting trawl (including non-trawl IFQ in 2011-2012): 0.131; shoreside whiting trawl: 0.584; non nearshore fixed gear: 0.269; nearshore fixed gear 0.074; at-sea catcher-processors: 0.503; at-sea mothership catcher vessels: 0.551.


Shoreside Whiting
35%
Other
12%
At-sea
53%
Non Nearshore FG
2%
Nearshore FG
0.21%
Other
0.50%
Nonwhiting Trawl*
10%

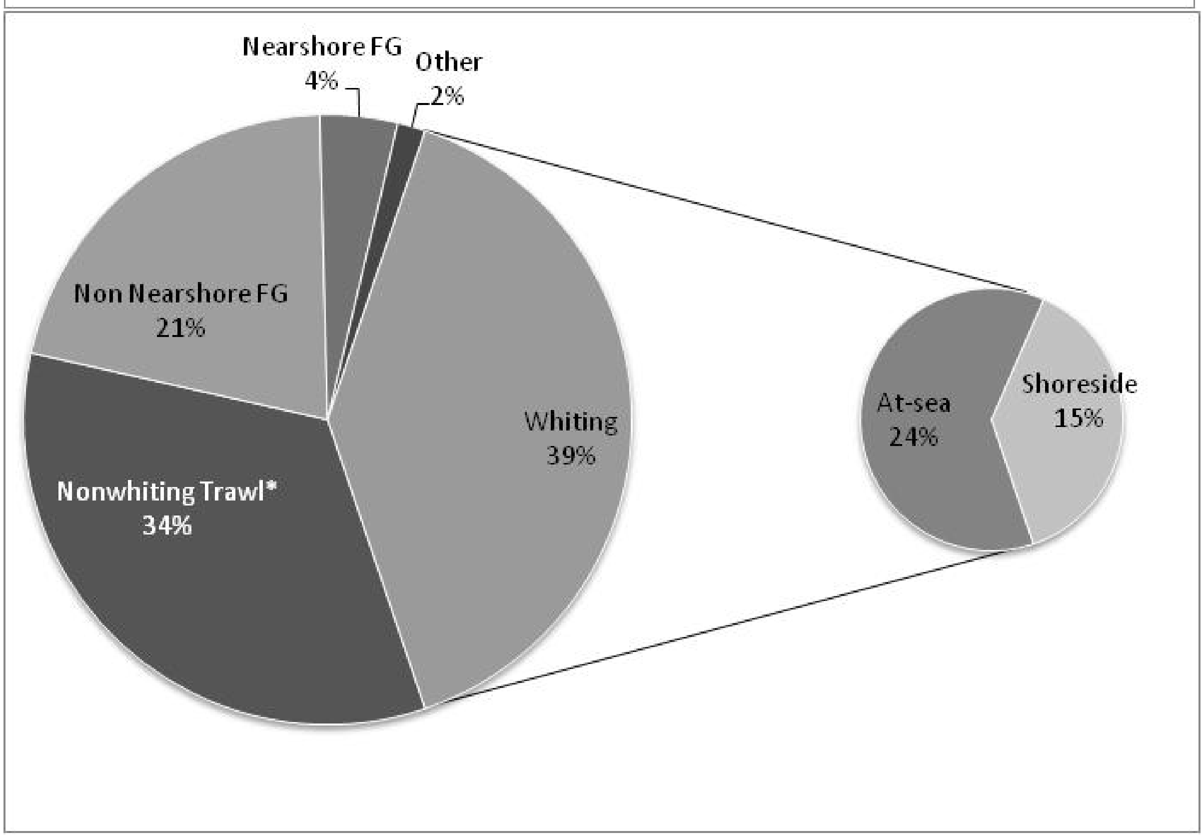

Nearshore FG
4%
Other
2%
Non Nearshore FG
21%
Whiting
39%
Nonwhiting Trawl*
34%
At-sea
24%
Shoreside
15%

Figure 3-4. Share of groundfish landings (top) and inflation adjusted ex-vessel revenue (bottom) by fishery sector, 2003-2012. Source: *2011-2012 non-whiting trawl includes IFQ non-trawl landings. SAFE Tables 12a-b and 14a-b.

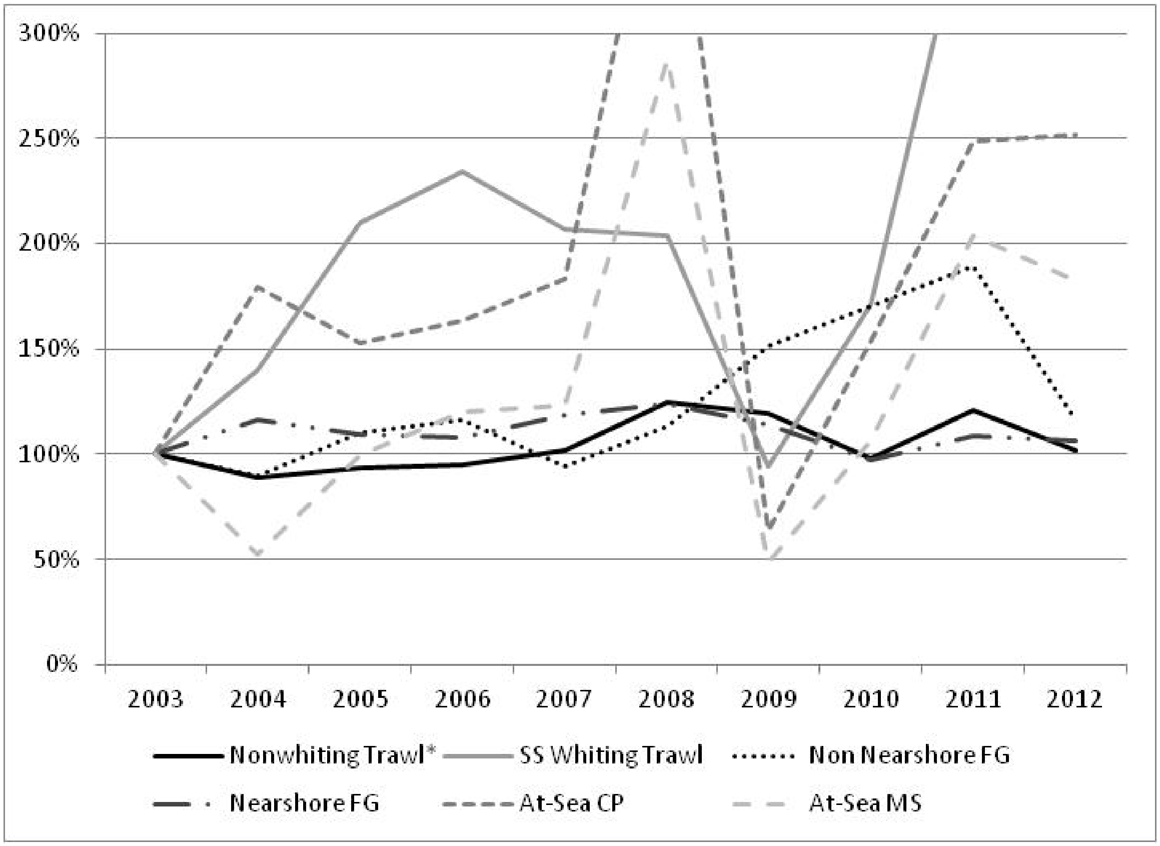


Figure 3-5. Ex-vessel revenue trends (inflation adjusted, 2012, from groundfish only) for groundfish fishery sectors, 2003-2013; 2003=100. *Non-whiting trawl includes non-trawl IFQ in 2011-2012. Value outside figure scale (>300%): 2008 at-sea CP whiting 408%, 2011shoreside whiting 342%. Source: SAFE Tables 12b and 14b.

3.2.2.1 Pacific Whiting Fisheries

As mentioned above, the Pacific whiting fishery is further subdivided into three sectors, two of which operate with at-sea processing operations and the other with trawl vessels delivering to shoreside processing plants.[9] The allocation of Pacific whiting among these sectors (after deductions from the ACL for tribal fisheries and other activities) is specified in the Groundfish FMP: 42% to shoreside catcher vessels, 34% to the catcher-processors, and 24% to mothership catcher vessels. Figure 3-6 shows the share of revenue among these sectors during the baseline period. There is a 4% difference between the allocation shares and revenue for catcher-processors and shoreside catcher vessels, indicating that catcher-processor vessels have on average commanded a higher price for whiting deliveries or else harvested relatively more of their allocation. However, catcher-processor whiting prices are imputed since there is no actual sale from catcher to processor in these integrated operations. Therefore, the revenue differences could be at least partly an artifact of this imputation.

[9] The at-sea sectors are distinguished by their operational characteristics. Because the shoreside segment of the Pacific whiting fishery includes vessels that participate in other trawl fisheries, a catch-based definition is used: trips where the landing is composed of at least 50% whiting are classified as part of the shoreside whiting fishery.

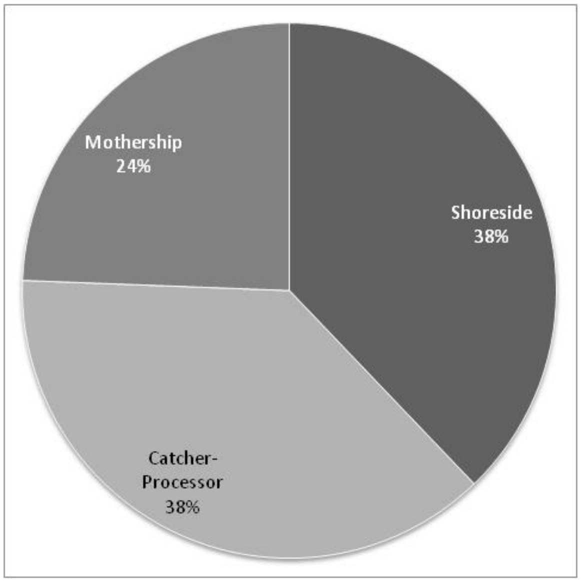


Figure 3-6. Share of inflation-adjusted (2012) ex-vessel revenue for unprocessed Pacific whiting by fishery sector, 2003-2012.

As noted above, whiting catch and revenue can be quite variable from year to year, mainly due to the underlying variation in stock productivity. The long-term trend is shown in Figure 3-3; Figure 3-7 shows revenue by whiting sector during the baseline period against the left vertical axis and annual catch limits (in metric tons) against the right vertical axis. This depiction shows that variation in catch limits has a major influence on revenue, which has been somewhat mitigated by increasing real prices for whiting. The average inflation-adjusted price per pound for shoreside deliveries was $0.06 in 2009 and $0.14 in 2012, which likely explains why the decline in revenues in 2012 was not as steep as in 2009 even though the catch limit in 2012 was below the average for the baseline period.

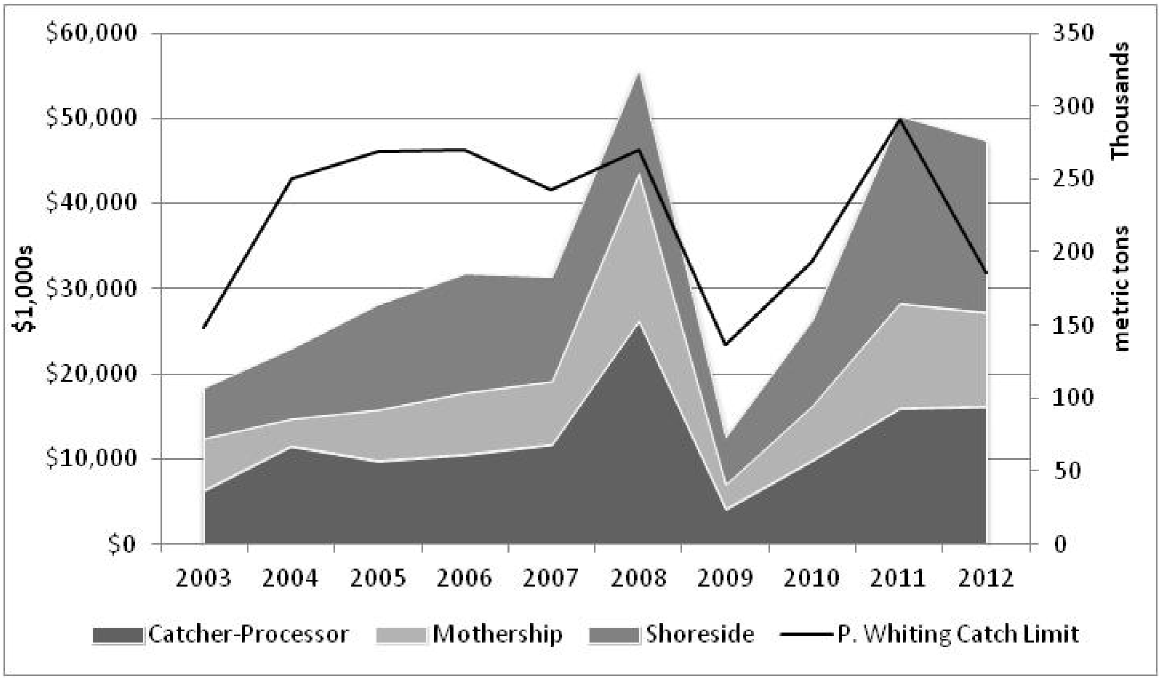


Figure 3-7. Inflation adjusted ex-vessel revenue by sectors ($1,000s, left vertical axis) and catch limits (metric tons 1,000s, right vertical axis) for Pacific whiting, 2003-2012. Source: SAFE Table 14b and various groundfish harvest specifications EISs.

3.2.2.2 Shoreside Non-whiting Trawl/IFQ Fishery

As discussed above, management of the shoreside non-whiting trawl fishery changed substantially in 2011 with the implementation of the IFQ program. Although quota trading was delayed until 2014 (partly a program feature and later extended due to litigation), trading in quota pounds—the annual allocation of "fishing opportunity"—was permitted from the outset. This allows individual harvesters to adjust their "IFQ portfolios" to better match the actual fishing strategies they wish to pursue, at least in the short term.

Table 3-3 compares ex-vessel revenue by species for the shoreside non-whiting trawl fishery prior to 2011 and the two segments of the IFQ fishery (trawl and non-trawl) that trawl permit holders have pursued in 2011 and 2012. The trawl segment has retained a similar pattern of landings, with revenue for the fishery as a whole dominated by sablefish, Dover sole, petrale sole, and thornyheads. Use of these categories to some extent masks specialist strategies that harvesters may pursue such as winter fishing on the continental slope for Dover sole, thornyheads and sablefish, and fishing in shallower depths for various flatfish and sablefish during summer months. The trawl segment pursues a more diverse set of strategies compared to the non-trawl segment, which targets sablefish exclusively.

Table 3-4 compares the two segments with respect to the top-earning species, sablefish, for the period 2009-2012, which brackets implementation of the shoreside IFQ program. As discussed above, 2011 was anomalous because of the historically high prices sablefish fetched. Perhaps partly due to this, in the latter two years the non-trawl segment has garnered 40% of the ex-vessel revenue from sablefish even though they represent only about a third of the vessels in the fishery (see Table 3-5). Another feature of the shoreside IFQ fishery highlighted by Table 3-5 is the specialization by gear type; only 4-5% of the participating vessels used both trawl and non-trawl in either 2011 or 2012.

Table 3-3. Average annual ex-vessel revenue (inflation adjusted $1,000s, 2012, and percent of total revenue from groundfish landings) for the shoreside non-whiting trawl fishery (2003-2010, 2011-2012) and IFQ non-trawl fishery (2011-2012). (For the non-trawl fishery Other Groundfish includes thornyheads.) Source: Groundfish SAFE Tables 4b and 5b.

	Trawl 2003-2010	Percent	Trawl IFQ 2011-2012	Percent	Non-trawl IFQ 2011-2012	Percent
Sablefish	$9,032	32.7%	$7,451	31.7%	$6,254	97.7%
Dover Sole	$7,269	26.3%	$6,666	28.4%		
Petrale Sole	$4,703	17.0%	$2,925	12.5%		
Thornyheads	$2,608	9.4%	$1,999	8.5%		
Rockfish	$843	3.0%	$1,397	5.9%		
Arrowtooth Flounder	$545	2.0%	$533	2.3%		
English Sole	$470	1.7%	$81	0.3%		
P. Cod	$444	1.6%	$421	1.8%		
Lingcod	$151	0.5%	$479	2.0%		
Other Groundfish	$1,567	5.7%	$1,540	6.6%	$150	2.3%

Table 3-4. Landings, nominal revenue, and price-per-pound for sablefish in the trawl and non-trawl segments of the shoreside IFQ fishery, 2011-2012. Source: PacFIN vdrfd 8/9/13

	2009	2010	2011	2012	Total
Landings (mt)					
Trawl	3,009	2,511	1,663	1,429	8,612
Non-trawl			1,116	923	2,039
Total Landings	**3,009**	**2,511**	**2,779**	**2,352**	**10,651**
Revenue ($1,000s)					
Trawl	$12,432	$10,727	$9,176	$5,569	$37,904
Non-trawl			$7,477	$4,898	$12,375
Total Revenue	**$12,432**	**$10,727**	**$16,653**	**$10,467**	**$50,279**
Price per Pound ($)					
Trawl	$1.87	$1.94	$2.50	$1.77	
Non-trawl			$3.04	$2.41	

Table 3-5. Number of vessels participating in the IFQ fishery by type of gear used, 2011-2012. Source: PacFIN vdrfd 8/9/13.

Gear	2011	2012
Both	5	4
Trawl only	67	63
Non-trawl only	26	23
Total	**98**	**90**

Fishery managers have noted an increase in vessels targeting widow and yellowtail rockfish with midwater trawl gear over the past few years. In the 1980s there was a large fishery employing this strategy, which effectively disappeared as in the need to rebuild overfished stocks resulted in increased management restrictions. Both the rebuilding of the widow rockfish stock and implementation of IFQ management has facilitated the reemergence of this fishery on a limited scale. For perspective, Figure 3-8 shows the historical trend for landings of widow and yellowtail rockfish by trawl gear.

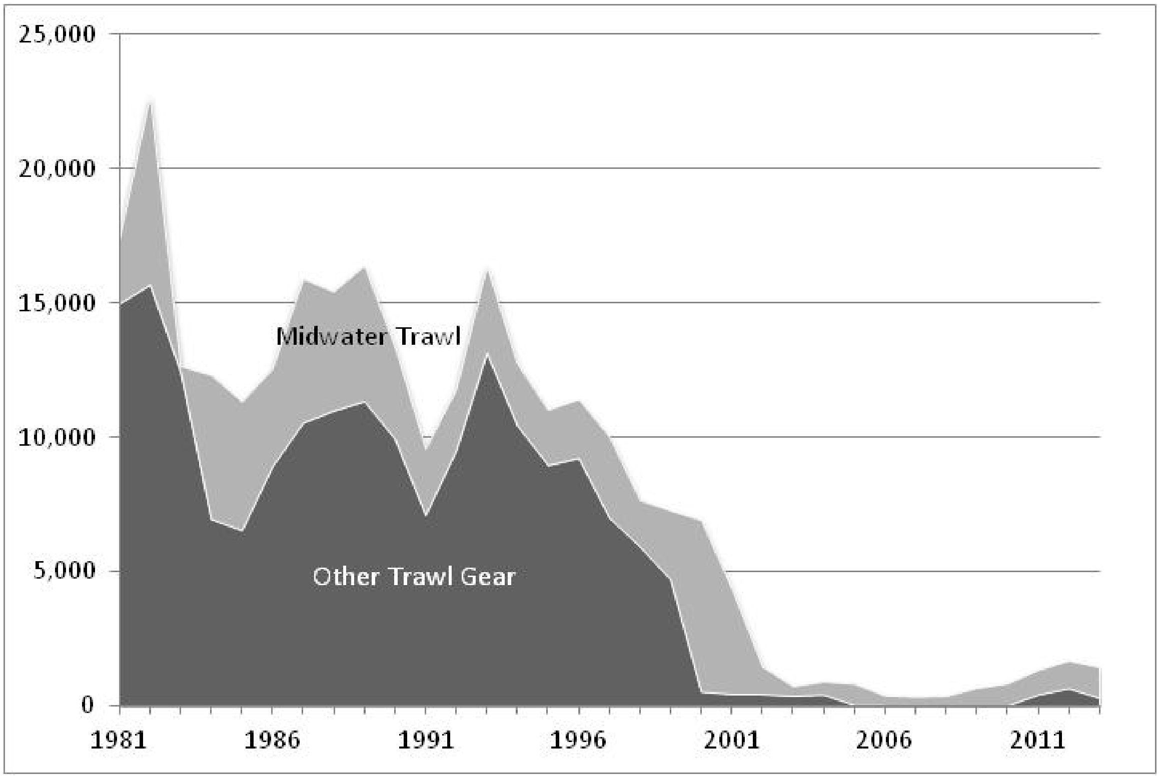


Figure 3-8. Landings of widow and yellowtail rockfish by trawl gear, 1981-2013

The figure indicates an uptick in landings of these species since 2009. Looking more closely at the midwater fishery, Table 3-6 shows landings and revenue from trips in the commercial fishery where widow and yellowtail rockfish made up at least 50% of the total landing by weight. This criterion is used as proxy for trips targeting these species. Surprisingly, the number of trips (estimated by counting fish ticket numbers) fell substantially after 2010; in 2010 there were 497 trips based on this estimate while there were 11, 67, and 74 trips in 2011-2013 respectively. However, overall landings and revenue from these two species in 2013 exceeded the summed amounts in previous years. Landings composition is used as a proxy for target strategy in compiling these data but it is impossible to determine whether the intended target and the landings composition correspond in all cases. In other words, some portion of these trips could represent instances where the intended target was Pacific whiting even though the majority of landing was made up of other species.

Table 3-6. Landings and inflation adjusted revenue for trips with midwater trawl gear targeting widow/yellowtail, 2010-2013. (Source: PacFIN vdrfd 3/18/2014)

	2010		2011		2012		2013	
Species	MT	Dollars	MT	Dollars	MT	Dollars	MT	Dollars
Widow	25	$19,929	12	$9,356	9	$9,265	214	$226,943
Yellowtail	166	$123,204	11	$12,581	239	$274,806	391	$415,777
P. Whiting	0	$0	11	$2,364	9	$1,253	11	$1
Other	24	$1,394	<1	$136	5	$2,529	5	$3,874

3.2.2.3 Non-nearshore Fixed Gear Fishery

The non-nearshore fixed gear fishery is composed of vessels with a gear-endorsed Federal limited access permit ("limited entry fixed gear") and vessels without such permits ("open access," although they may hold state limited entry permits). The limited entry portion of the fleet has more catch opportunity for the primary target species, sablefish, through vessel level catch limits (based on the associated permit "tier" status) and higher cumulative landing limits.[10] Vessels with Federal limited entry permits accounted for 77% of overall inflation-adjusted revenue from sablefish during the baseline period even though open-access vessels accounted for 68% of participating vessels during the baseline period.

Figure 3-9 shows the distribution of ex-vessel revenue by species during the baseline period for the non-nearshore fishery (including both the sablefish and non-sablefish portions). Sablefish accounts for the most revenue, both because of its share of landings and its high value, followed by thornyheads. A variety of other species, mainly rockfish, account for the remainder of groundfish landings and revenue.

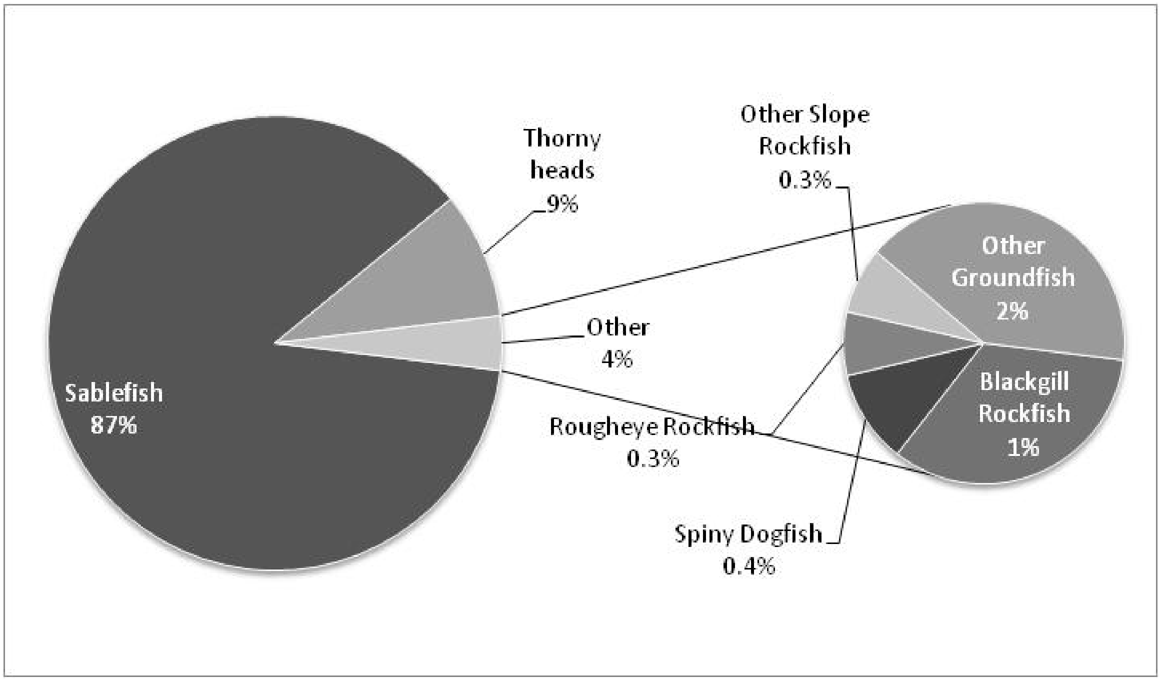


Figure 3-9. Non-nearshore fixed gear ex-vessel revenue by groundfish species or species group in inflation-adjusted (2012) dollars, $1,000s, 2003-2012. Source: PacFIN vdrfd 8/14/13.

Blackgill rockfish and spiny dogfish are of particular interest to fishery managers. Tables 8a and 8b in the 2014 Groundfish SAFE provide landings and revenue data for species important in the nonnearshore fishery, including these two species. Figure 3-10 presents these data graphically. Blackgill rockfish landings and inflation-adjusted revenue averaged 56 mt and $566,000 annually during the 2003 to 2012 baseline period while for spiny dogfish these figures were 77 mt and $41,300 out of total annual average landings and revenue of 331 mt and $17.3 million. In 2013 trip limits for blackgill rockfish were reduced. Preliminary PacFIN data (vdrfd table, 3/19/2014) show that 16 mt valued at $50,000 was landed in 2013, a substantial decline from the peak in the 2011.

[10] Although for data and management a distinction is made between trips targeting sablefish and trips where sablefish are not landed (implying some other target), during the baseline period 97% of revenue was earned on sablefish-targeted trips.

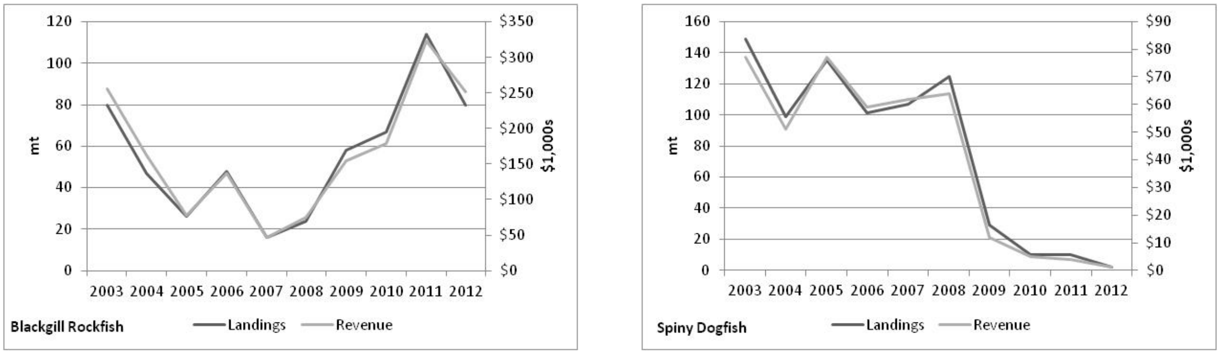


Figure 3-10. Landings and revenue (inflation adjusted, 2012) for blackgill rockfish (left) and spiny dogfish (right) in the nonnearshore fixed fishery.

3.2.2.4 Nearshore Fixed Gear Fishery

Although the nearshore fixed gear fishery accounted for less than 0.5% of coastwide groundfish landings during the baseline period, it garnered 5% of total revenue. Much of the fish from the fishery commands high ex-vessel and retail prices, with live fish markets catering to Asian communities in California as an important destination. Although a small portion of coastwide ex-vessel revenue, the nearshore fishery is regionally important, as discussed in section 3.2.7.

Figure 3-11 shows the distribution of revenue by species or species group during the baseline period. Although a relatively few species (cabezon, brown rockfish, gopher rockfish, blue rockfish, lingcod, and kelp greenling) account almost three-quarters of the revenue, a diverse array of other rockfish species are also caught and make up the balance of the landings. Table 3-7 shows the species included in "Other Nearshore Rockfish" category in SAFE Table 9b. Within this category, again just a few species account for a majority of landings but a wide range of rockfish species are landed as indicated by the long list of species names listed for the remaining 5%.[11]

[11] The names in this table are from the CNAME column associated with PacFIN species id codes (SPID), which include species and various market categories. Note that species composition adjustments are applied in generating the PacFIN vdrfd table.

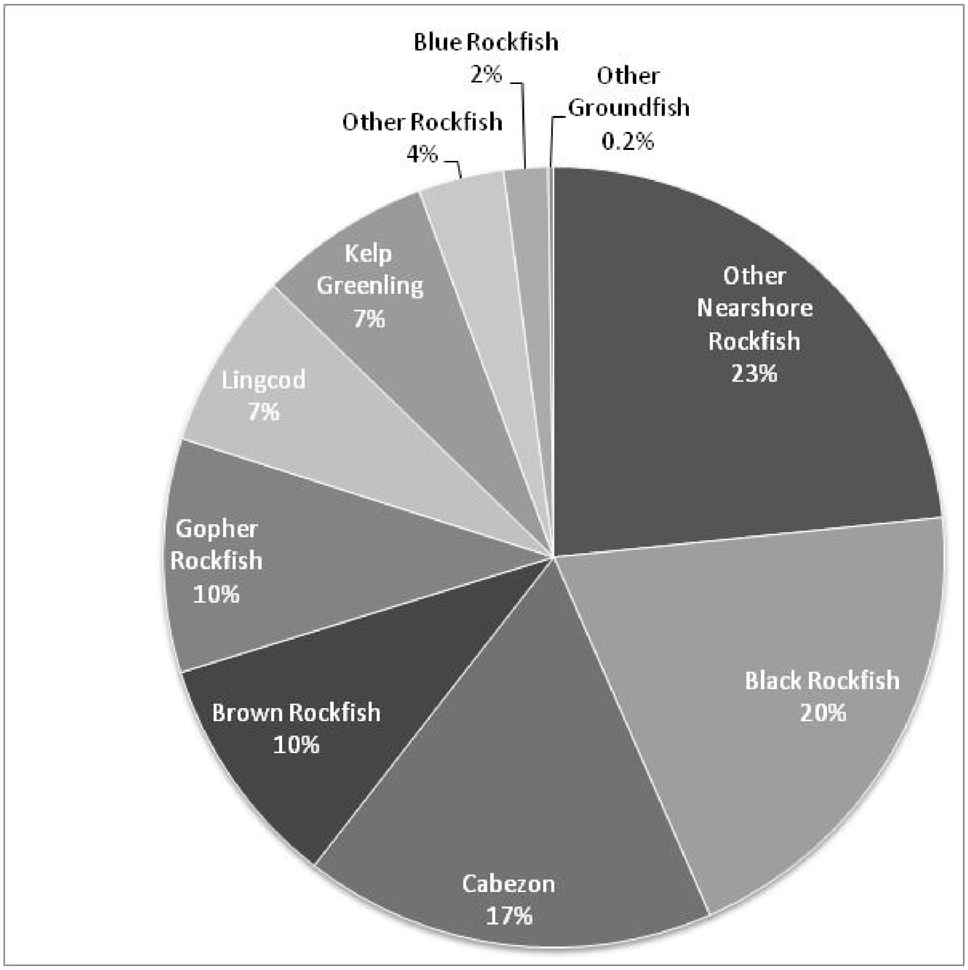


Figure 3-11. Nearshore fixed gear ex-vessel revenue by groundfish species or species group in inflation-adjusted (2012) dollars, $1,000s, 2003-2012. Source: SAFE Table 9b.

Table 3-7. Rockfish species within Other Nearshore Rockfish category in SAFE Table 9b and proportion of landings in this category, 2003-2012. Source: vdrfd 8/15/13, based on procedure for SAFE Table 9b.

PacFIN Species	Pct. Of Landings
Vermilion Rockfish	59.66%
California Scorpionfish	10.22%
Yellowtail Rockfish	8.71%
Bocaccio	4.28%
Unsp. Reds Rckfsh	4.14%
Blackgill Rockfish	3.55%
Unsp. Shelf Rockfish	2.48%
Tiger Rockfish	1.07%
Unsp. Rockfish	0.97%
Starry Rockfish, Chilipepper, Widow Rockfish, Darkblotched Rockfish, Flag Rockfish, Rosy Rockfish, Greenspotted Rockfish, Bank Rockfish, Greenblotched Rockfish, Unsp.	4.91%

Small Reds Rckfsh, Speckled Rockfish, Mexican Rockfish, Unsp. Slope Rockfish, Nor. Unsp. Shelf Rockfish, Splitnose Rockfish, Unsp. Rosefish Rckfsh, Unsp. POP Group, Yelloweye Rockfish, Canary Rockfish, Greenstriped Rockfish, Rosethorn Rockfish, Redbanded Rockfish, Freckled Rockfish, Shortbelly Rockfish, Blackspotted Rockfish, Squarespot Rockfish, Honeycomb Rockfish, Cowcod Rockfish, Bronzespotted Rockfish, Nor. Unsp. Slope Rockfish, Rougheye Rockfish, Pink Rockfish, Silvergrey Rockfish, Pinkrose Rockfish, Yellowmouth Rockfish, POP, Squarespot, Aurora Rockfish	
Total	**100%**

3.2.2.5 Other Commercial Fisheries Catching Groundfish

Groundfish are caught in a variety of other circumstances including by vessels targeting groundfish with gear types other than trawl or fixed gear, fisheries for species other than groundfish and catching groundfish incidentally (referred to by managers as the “incidental open access sector” and the “exempted trawl sector”), vessels targeting groundfish pursuant to an EFP, and research catches. (Tribal fisheries are considered separately and discussed below). Catches in these sectors are negligible from a socioeconomic standpoint, accounting for 2% of inflation-adjusted groundfish ex-vessel revenue during the baseline period. But this catch can be very important to fishery managers in terms of accounting for overfished species catch, because ACLs for some of these stocks tend to be very low, imposing constraints on target fisheries. Figure 3-12 shows the breakdown of revenue from these sectors for the baseline period. Figure 3-13 shows the proportion of ex-vessel revenue derived from various species and species groups for these miscellaneous sectors. About three-quarters of revenue come from species other than groundfish, which is expected since most of the sectors discussed here are not targeting groundfish.

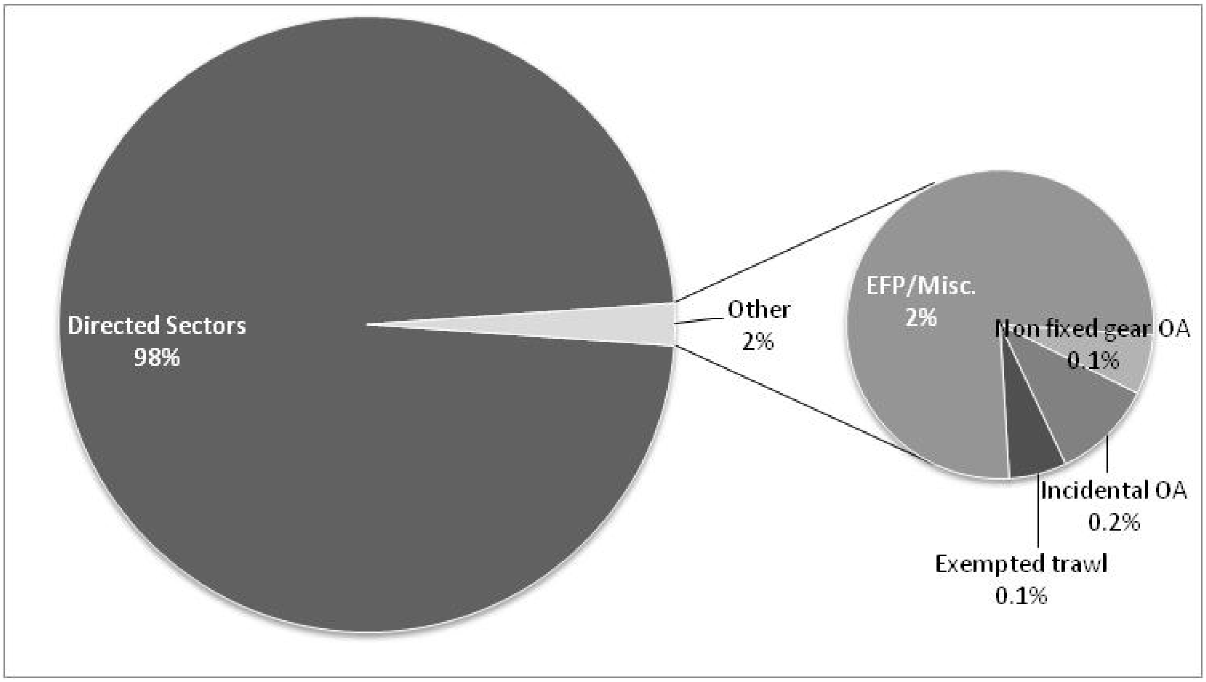


Figure 3-12. Share of inflation adjusted ex-vessel revenue (2012) from non-fixed gear open access incidental, and other minor sectors, 2003-2012. Source: vdrfd 8/15/13.

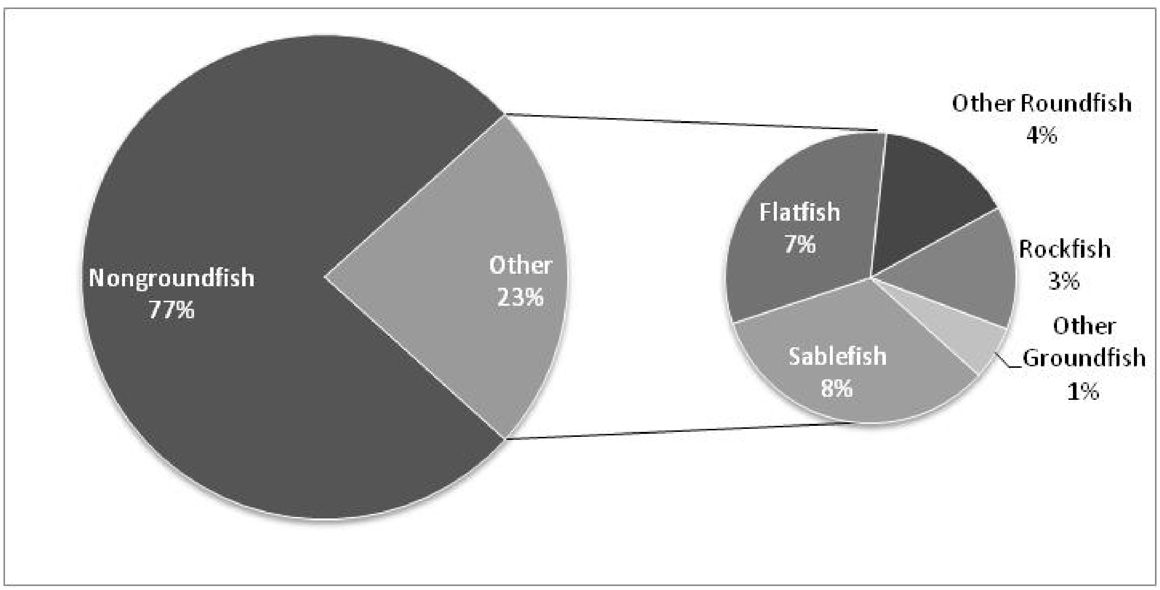


Figure 3-13. Inflation adjusted ex-vessel revenue by species composition from non-target and other miscellaneous groundfish sectors, 2003-2012. Source: vdrfd 8/23/13 based on procedure for Table 10a-b in Groundfish SAFE.

3.2.3 Tribal Groundfish Fisheries

Past Groundfish Harvest Specifications EISs, including the 2013-2014 FEIS, describe tribal fisheries and Section 6.2.5 in the Groundfish FMP describes the special status of these fisheries. Several Pacific Northwest Indian tribes have treaty rights to fish for groundfish in their usual and accustomed fishing grounds. The Federal government has accommodated these fisheries through a regulatory process described at 50 CFR 660.50. Tribal fishery management is coordinated through the Council process so catches can be accounted for when developing management measures. West coast treaty tribes in Washington State have formal allocations for sablefish, black rockfish, and Pacific whiting. For other species without formal allocations, the tribes propose trip limits to the Council, which the Council tries to accommodate while ensuring that catch limits are not exceeded. Whether formally allocated or not, tribal catches are accounted through set-asides, which are amounts taken “off the top” of the overall catch limit.

Because tribes have sovereign rights to manage their fisheries, the tribal sectors do not have an equivalent regulatory dimension like the commercial sectors discussed above. These sectors have been identified more for data presentation purposes, although they do relate to target strategy.

The Makah tribe participates in whiting fisheries with both a mothership and shorebased component. On average, the treaty fisheries have accounted for 12 percent of total whiting landings and at-sea deliveries since 2005, generating an average of about $4 million (inflation-adjusted) per year.

The Tribal non-whiting sector is defined by groundfish landings other than whiting and thus includes a variety of gear types. Hook-and-line gear represents by far the largest portion of average annual revenue for the 2003-2012 period at 70 percent, followed by bottom trawl, accounting for 28 percent (see SAFE Table 13b). In the hook-and-line fishery 97% of baseline period inflation-adjusted revenue comes from sablefish. This is similar to the commercial fixed gear sectors where sablefish is the most important component of baseline revenues. Trawl fishery landings are more diverse; the largest proportion of baseline revenue comes from rockfish, at 36%, followed by Pacific cod, petrale sole, Dover sole, and sablefish. Together these species accounted for 84% of baseline period Tribal non-whiting sector revenue for trawl gear.

While all four coastal tribes have longline fleets, only Makah currently has a trawl fleet. Note that, beginning in 2008, the tribes have been using their own Treaty Online Catch Accounting System (TOCAS) database to record fish ticket landings. [Rob Jones to provide updated TOCAS output.] Since 1999, Pacific whiting has comprised the vast bulk of tribal landings. It is also worth noting that overall groundfish landings and revenue have been reduced in recent years due to increasing restrictions designed to rebuild overfished rockfish. The Makah Tribe’s trawl fleet has reduced from 10 vessels to 5 active (8 eligible) vessels due in part to reduced markets. Buyers in Neah Bay have reduced the number of trucks taking fish to processors since the closure to limited entry trawl of the area shoreward of the RCA north of Cape Alava went into place.

3.2.4 Recreational Fisheries

Recreational fisheries are an important part of fishery-related economic activity. However, because recreational catch is not sold it is more difficult to impute the economic value of these fisheries. Past Groundfish Harvest Specifications EISs have characterized recreational fisheries in terms of fishing effort (angler trips) to quantify spatio-temporal differences in west coast recreational fisheries. Income impacts reported in Chapter 4 to evaluate short-term (2 year) effects of the proposed action do include estimated impacts from recreational fishing activities.

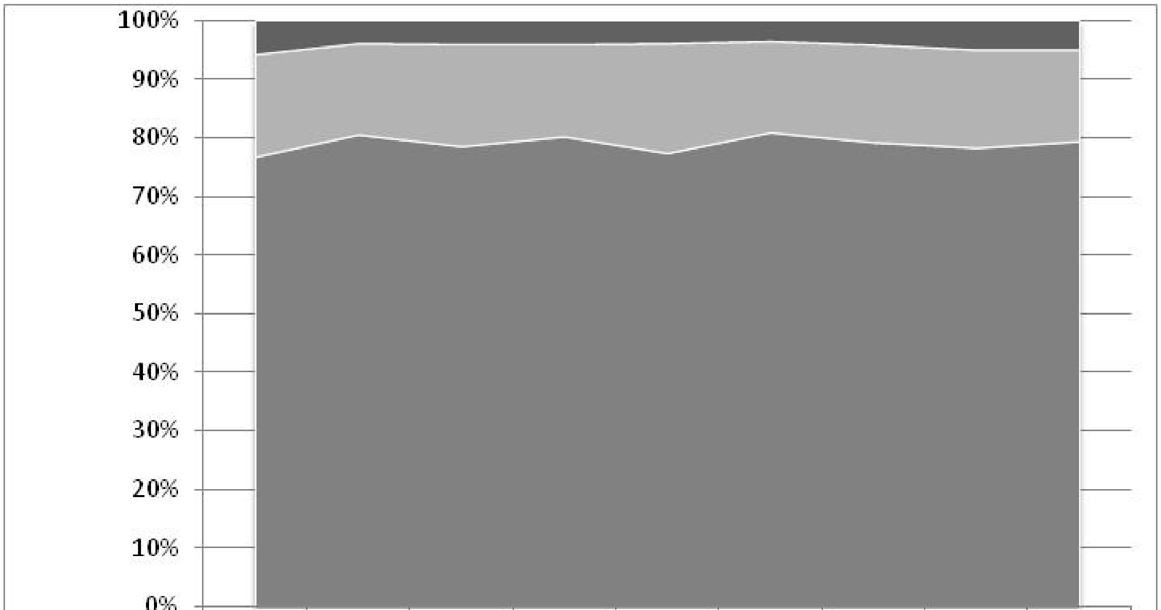
Recreational fisheries are broadly sub-divided between private anglers and commercial passenger fishing vessels (CPFVs), commonly referred to as charter vessels. Private anglers fish from shore or their own boats while charter vessels take paying passengers.

Table 3-8 shows bottomfish/halibut angler trips compared to trips targeting other species for.[12] Overall, private and charter trips, which are subject to management measures described in this EIS, comprise 19% of all trips. Figure 3-14 shows bottomfish/halibut trips by state and year and Figure 3-15 shows the distribution of these trips by port area. Overall, the number of angler trips has shown a 77% increase over the 2004-2012 period. California, and especially Southern California, accounts for the vast majority of angler trips due to its large coastal population and milder year round weather.

Table 3-8. Total Angler trips by type and mode, 2004-2012. (Source: GMT state reps)

Mode	Bottomfish/Halibut	Other	Total
Charter	3,253,463 (10.4%)	1,764,526 (5.7%)	5,017,989 (16.1%)
Private	2,580,419 (8.3%)	4,259,283 (13.6%)	6,839,702 (21.9%)
Man-made	1,579,756 (5.1%)	10,592,088 (33.9%)	12,171,844 (39.0%)
Beach/Bank	30,985 (0.1%)	7,148,962 (22.9%)	7,179,947 (23.0%)
Grand Total	7,444,623 (23.9%)	23,764,858 (76.1%)	31,209,482 (100.0%)

[12] Because it is hard to distinguish between trips targeting bottomfish and those targeting Pacific halibut these trip types are combined. The tables and graphs presented in this section use data 2004-2012, because 2003 data is incomplete.



	2004	2005	2006	2007	2008	2009	2010	2011	2012
Washington	10,074	11,270	11,004	11,087	10,416	10,653	12,758	15,193	15,469
Oregon	31,278	46,656	48,911	44,242	51,855	48,645	53,242	52,042	49,550
California	137,514	242,124	221,046	226,534	214,529	253,811	253,685	244,382	252,450

Figure 3-14. Groundfish/halibut angler trips by state, 2004-2012. (Source: GMT state reps)

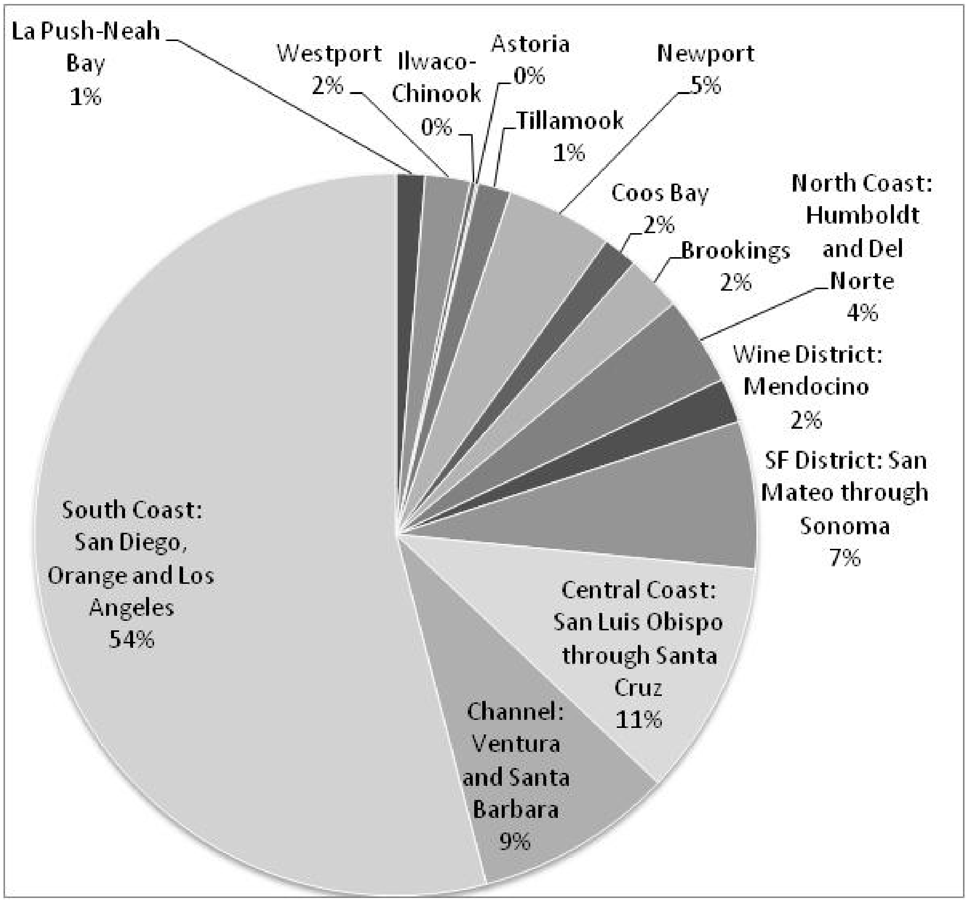
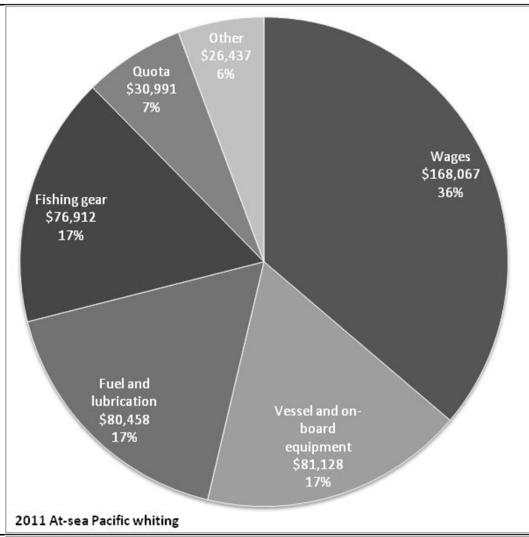
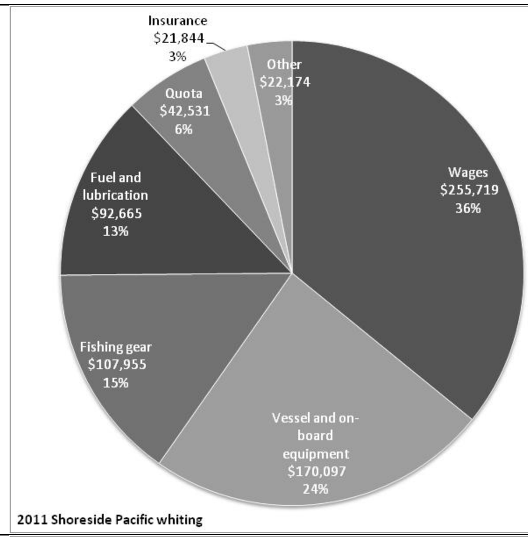


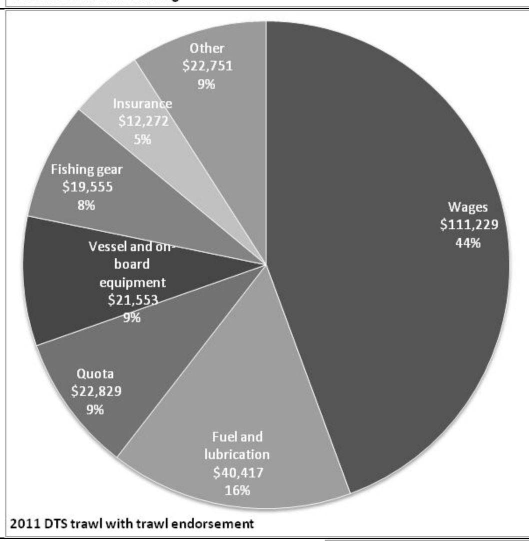
Figure 3-15. Recreational angler trips by reporting area, 2004-2012.

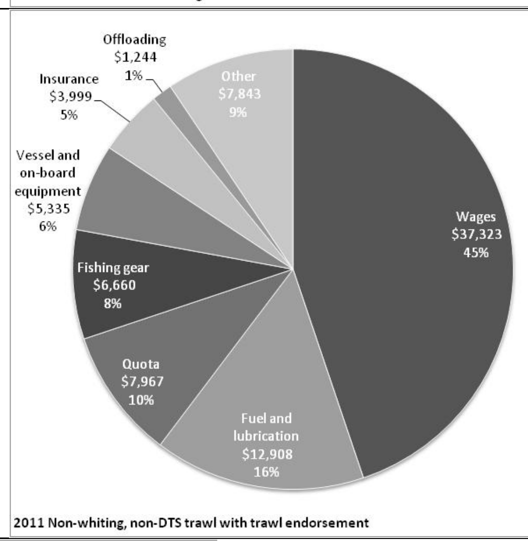
3.2.5 Costs in Commercial Groundfish Fisheries

Figure 3-16 presents estimates of the breakdown in costs for different segments of the groundfish trawl fishery provided by the Economic Data Collection (EDC) program, which was enacted to monitor the economic effects of the 2011 transition of the West Coast groundish trawl fishery to a catch share (IFQs, co-ops) program.


Other
$26,437
6%
Quota
$30,991
7%
Wages
$168,067
36%
Fishing gear
$76,912
17%
Fuel and
lubrication
$80,458
17%
Vessel and on-
board
equipment
$81,128
17%
2011 At-sea Pacific whiting


Insurance
$21,844
3%
Other
$22,174
3%
Quota
$42,531
6%
Fuel and
lubrication
$92,665
13%
Wages
$255,719
36%
Fishing gear
$107,955
15%
Vessel and on-
board
equipment
$170,097
24%
2011 Shoreside Pacific whiting


Other
$22,751
9%
Insurance
$12,272
5%
Fishing gear
$19,555
8%
Wages
$111,229
44%
Vessel and on-
board
equipment
$21,553
9%
Quota
$22,829
9%
Fuel and
lubrication
$40,417
16%
2011 DTS trawl with trawl endorsement


Offloading
$1,244
1%
Insurance
$3,999
5%
Other
$7,843
9%
Vessel and
on-board
equipment
$5,335
6%
Wages
$37,323
45%
Fishing gear
$6,660
8%
Quota
$7,967
10%
Fuel and
lubrication
$12,908
16%
2011 Non-whiting, non-DTS trawl with trawl endorsement

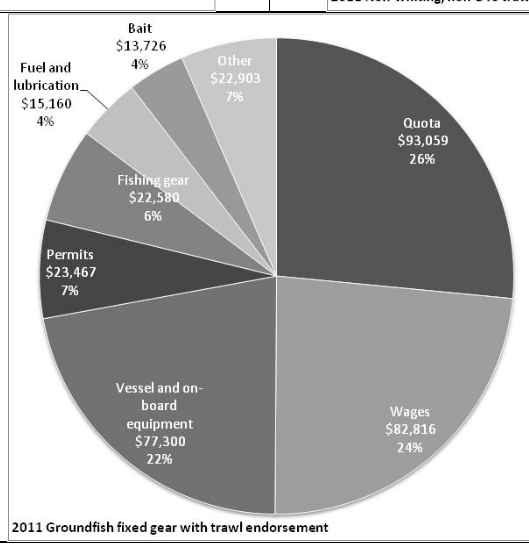

Bait
$13,726
4%
Fuel and
lubrication
$15,160
4%
Other
$22,903
7%
Quota
$93,059
26%
Fishing gear
$22,580
6%
Permits
$23,467
7%
Vessel and on-
board
equipment
$77,300
22%
Wages
$82,816
24%
2011 Groundfish fixed gear with trawl endorsement

Figure 3-16. Estimated costs in different segments of the trawl fishery.

3.2.6 Buyers and Processors

Table 3-9 and Table 3-10 show the geographic and sector distribution of first receivers based on the processor ID field in the PacFIN database. (Note that a single firm may own several entities with different IDs so these numbers may overstate the number of independent firms engaged in processing groundfish. A comparison to counts based on processor names stored in the database showed a negligible difference.) A first receiver may be an entity that both buys and processes fish or a buyer or transportation company serving as a middleman between purchasing locations and processing facilities. The count of first receivers (based on ID) has declined by about 20% both for those accepting groundfish and those accepting any species. From a sector perspective the largest declines have been the counts of first receivers accepting trawl caught groundfish from the shoreside sectors. This may represent consolidation within the buyer/processor sector.

Table 3-9. Count of first receivers (based on processor ID) that accepted groundfish and total number (accepting any species) by state and coastwide, 2003-2012. (Source: vdrfd 8/29/13.)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
California										
Groundfish	261	260	229	232	226	212	212	204	202	219
Total	663	638	572	548	517	492	481	442	447	493
Oregon										
Groundfish	81	83	78	71	75	68	81	79	71	74
All Species	254	211	202	210	226	183	243	221	194	203
Washington										
Groundfish	40	39	36	30	34	30	30	29	27	32
Total	137	124	119	129	129	117	123	123	127	121
Coastwide										
Groundfish	382	382	343	333	335	310	323	312	300	325
Total	1051	972	891	884	870	791	847	786	768	817

Table 3-11

Table 3-10. Count of first receivers (based on processor ID) that accepted groundfish, by major groundfish fishery sector, 2003-2012. (Source: vdrfd 8/29/13.)

Groundfish Fishery Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Shoreside IFQ Trawl (Whiting)	12	10	10	14	14	15	17	20	9	9
Non-whiting Trawl	65	57	52	49	49	47	45	36	26	25
Shoreside IFQ Non-trawl									20	19
Non Nearshore Fixed Gear	202	211	183	198	205	187	201	178	179	203
Nearshore Fixed Gear	133	153	142	140	131	132	145	124	120	121

Table 3-11 shows the distribution of first receivers of groundfish with respect to purchase amounts over the entire 2003-2012 baseline period. Note that the bin intervals are logarithmic, emphasizing the highly skewed distribution of purchases. While 91% of first receivers purchased $1,000 or less over the period, they accounted for less than 0.1% of total purchases during the baseline period. At the end of the scale, Only 5% of first receivers recorded total purchase amounts of $1 million or more but accounted for 94% of total purchases.

Table 3-11. Distribution of groundfish first receivers (by ID) by total purchase amount (nominal dollars), 2003-2012. (Source: vdrfd 3/19/2014)

Interval	Count	Percent	Purchases	Percent
<=$1,000	964	91%	$110,061	<0.1%
$1,001-$99,999	28	3%	$965,567	0.2%
$10,000-$999,999	10	1%	$7,703,195	1.2%
$100,000-$999,999	4	0.4%	$32,941,423	5.2%
>=$1,000,000	55	5%	$596,283,531	93.5%

3.2.7 Fishing Communities

As in the 2013-14 Groundfish Harvest Specifications EIS, fishing communities are described below in terms of landings by IOPAC port group. (See Table 9 in NOAA Technical Memorandum NMFS-NWFSC-111 for ports included in these port groups. The IOPAC Input-Output Model for Pacific Coast Fisheries is used to evaluate personal income impacts of proposed management measures.)

The 18 port groups used in IOPAC are:

Washington State:

1. Puget Sound
2. North Washington Coast
3. South and Central Washington Coast

Oregon:

4. Astoria (and other Columbia River ports in Oregon)
5. Tillamook
6. Newport
7. Coos Bay
8. Brookings

California: [13]

9. Crescent City (North Coast)
10. Eureka (North Coast)
11. Fort Bragg (North Coast)
12. Bodega Bay (North-Central Coast)
13. San Francisco (North-Central Coast)
14. Monterey (South-Central Coast)
15. Morro Bay (South-Central Coast)
16. Santa Barbara (South Coast)
17. Los Angeles (South Coast)
18. San Diego (South Coast)

These port groups are shown in Table 3-12 and Table 3-16. Port groups (and as applicable California recreational reporting regions) are also used to organize the evaluation of impacts to fishing communities in Chapter 4.

[13] The regions noted in parenthesis show the approximate correlation between port groups and California state reporting regions for recreational fisheries.

3.2.7.1 Dependence and Engagement in Groundfish Fisheries

Table 23 in the 2013 Groundfish SAFE document presents values for community engagement and dependence on commercial groundfish fisheries. Engagement is defined as groundfish ex-vessel revenue in the port as a percent of coastwide groundfish ex-vessel revenue for the 2003-2012 baseline period. Similarly, dependence is defined as groundfish ex-vessel revenue in the port as percent of total ex-vessel revenue in port during the baseline period. (For these calculations revenues are inflation-adjusted to 2012 dollar values.)

Engagement and dependence values can be developed for recreational fisheries using a similar methodology. For recreational fisheries the metric is the number of angler trips. Engagement is measured by dividing the number of groundfish directed angler trips in the port by the coastwide number of groundfish angler trips during the baseline period. Dependence is measured by dividing the number of groundfish directed angler trips in the port by the total number of angler trips in the port during the baseline period.

Table 3-12 presents summary information on commercial fishery engagement and dependence by port group as well as indicating the primary and secondary groundfish fishery sectors. The fishery sectors are identified based on the share of inflation-adjusted ex-vessel revenue the sector accounts for out of total groundfish revenue within the port.

In terms of engagement in commercial fisheries (share of coastwide revenue) South and Central Washington, Astoria, and Newport top the list. In contrast, ports with high dependence values are much more geographically dispersed with Morro Bay at the top of the rankings followed by Puget Sound and the North Washington Coast. These ports tend to be mid-ranking in terms of engagement. Southern California ports (Santa Barbara, Los Angeles, and San Diego) are neither highly engaged nor dependent on commercial groundfish fisheries.

Trawl fisheries (counting both the whiting and non-whiting segments) dominate the coast from the South and Central Washington Coast port group to Fort Bragg, California. The non-nearshore fixed gear fishery is important in Central and Southern California and the Puget Sound region. (Note that the North Washington Coast port group includes ports in the Straits of Juan de Fuca at the entrance to Puget Sound.)

Table 3-12. Commercial fishery engagement and dependence scores and rank, primary and secondary fisheries, for the 2003-2012 baseline period for each Port Group. Based on 2012 inflation-adjusted ex-vessel revenue.

Port Group	Engagement	Engagement Rank	Dependence	Dependence Rank	Primary Fishery	Secondary Fishery
Puget Sound	4.8%	9	43.6%	3	Non Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
North WA coast	6.6%	5	44.7%	2	Non Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
South and central WA coast	14.0%	3	14.2%	11	Shoreside Whiting Trawl	Non Nearshore Fixed Gear
Astoria	18.0%	1	37.2%	4	Shoreside Non-whiting Trawl*	Shoreside Whiting Trawl
Tillamook	0.3%	18	5.3%	15	Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
Newport	15.0%	2	30.1%	7	Shoreside Whiting Trawl	Shoreside Non-whiting Trawl*
Coos Bay	8.4%	4	21.8%	9	Shoreside Non-whiting Trawl*	Non Nearshore Fixed Gear
Brookings	5.3%	7	32.1%	6	Shoreside Non-whiting Trawl*	Non Nearshore Fixed Gear
Crescent City	2.4%	13	10.0%	13	Shoreside Non-whiting Trawl*	Nearshore Fixed Gear
Eureka	6.0%	6	26.2%	8	Shoreside Non-whiting Trawl*	Non Nearshore Fixed Gear
Fort Bragg	5.1%	8	36.4%	5	Shoreside Non-whiting Trawl*	Non Nearshore Fixed Gear
Bodega Bay	0.4%	17	3.7%	16	Non Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
San Francisco	2.5%	12	9.2%	14	Shoreside Non-whiting Trawl*	Non Nearshore Fixed Gear
Monterey	2.7%	11	16.0%	10	Non Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
Morro Bay	4.5%	10	64.7%	1	Non Nearshore Fixed Gear	Nearshore Fixed Gear
Santa Barbara	1.4%	15	2.7%	18	Non Nearshore Fixed Gear	Nearshore Fixed Gear
Los Angeles	1.5%	14	3.2%	17	Non Nearshore Fixed Gear	Nearshore Fixed Gear
San Diego	1.0%	16	10.1%	12	Non Nearshore Fixed Gear	Nearshore Fixed Gear

*Shoreside Non-whiting Trawl includes Non-trawl IFQ in 2011-2012.

Table 3-13. Recreational fishery engagement and dependence scores and rank for the 2003-2012 baseline period.

[Similar table for recreational fisheries / GMT data request]

Table 3-14. Top-ranked ports by groundfish fishery sector, based on inflation adjusted ex-vessel revenue 2003-2012. Percent share of coastwide sector revenue for the entire baseline period shown in parenthesis and total share accounted for by the three top-ranked ports in each category shown in the bottom row. Source: vdrfd 8/27/13 based on method used for data in Groundfish SAFE Table 20.

	Whiting Trawl	Non-whiting Trawl*	Non Nearshore	Nearshore
1	Newport (33%)	Astoria (28%)	Newport (15%)	Morro Bay (31%)
2	So. & Cent. WA Coast (31%)	Coos Bay (13%)	So. & Cent. WA Coast (11%)	Brookings (27%)
3	Astoria (30%)	Newport (12%)	Puget Sound (9%)	Crescent City (12%)
Total share:	94%	53%	35%	70%

*Includes non-trawl IFQ sector in 2011-2012.

Table 3-14 shows the top-ranked ports for each major groundfish fishery sector in terms of inflation adjusted ex-vessel revenue during the baseline period. Newport, Astoria, and the South and Central Washington Coast are in the top-three of the rankings for the trawl (whiting and non-whiting) and non nearshore fishery sectors. The nearshore fishery figures more prominently on the Oregon-California border and in the Morro Bay port group. (Note that non nearshore fixed gear fisheries are also important in these three ports as evidenced by the primary and secondary fisheries identified in Table 3-12.) Table 3-14 also shows the share of coastwide sector revenue accounted for by each port and the sum for the top-ranked ports. Revenue from whiting trawl and the nearshore sector are relatively concentrated in the top-ranked ports at 94% and 70% respectively (but note that for nearshore the top two ports alone account for 58% of coastwide sector revenue).

The rankings and shares shown in Table 3-14 are also consistent with the use of the Gini coefficient in the 2013-14 Groundfish Harvest Specifications EIS to summarize the uniformity of the distribution of groundfish ex-vessel revenue across sectors and ports.[14] Using this statistic, the shoreside whiting trawl sector is the most concentrated with respect to distribution across ports. (In fact, relatively few ports have any shoreside whiting sector landings at all.) The nearshore sector ranks second. Table 3-15 repeats the across-port evaluation included in the 2013-14 EIS using inflation-adjusted ex-vessel revenue for the baseline period and the fishery sectors listed in Table 3-14 (except that non-whiting trawl and non-trawl IFQ are not combined). Generally speaking, ports with lower overall groundfish revenue have a less uniform distribution among sectors, because fewer sectors operate out of those ports. This is most clearly evidenced by Southern California ports, which rank near the bottom in terms of engagement (share of coastwide groundfish revenue) and also have the least uniform distribution among sectors. Notable exceptions to this inverse correlation include the North Washington Coast (engagement rank of 5, Gini coefficient rank of 4), Crescent City (13 and 17), Bodega Bay (17 and 14), and Morro Bay (10 and 18).

[14]The Gini coefficient is a measure of the statistical dispersion of a data distribution, ranging between 0 and 1. A value of 0 indicates that all data points in a distribution are identical while a value of 1 indicates the maximum degree of diversity in the data set. This statistic is often used to measure national-level income distribution where a value of 0 indicates that everyone receives the same income, and a value of 1 would indicate that virtually all income goes to one individual. Its use in the 2013-2014 Harvest Specifications EIS was not intended to imply any particular policy objective (e.g., a more uniform distribution of ex-vessel revenue) but merely to describe the uniformity of the distribution of groundfish ex-vessel revenue among West Coast ports and between fisheries sectors within those ports.

Table 3-15. Distribution of ex-vessel revenue among commercial groundfish fishery sectors within port groups, 2003-2012, using Gini coefficient. Ranking is from least uniform (1) to most uniform (18) distribution.

Port Group	Gini Coefficient	Gini Coefficient Rank
Puget Sound	0.62175	8
North WA coast	0.70677	4
South and central WA coast	0.54597	12
Astoria	0.60903	11
Tillamook	0.63016	6
Newport	0.43195	16
Coos Bay	0.62709	7
Brookings	0.25685	15
Crescent City	0.42600	17
Eureka	0.67958	5
Fort Bragg	0.61146	9
Bodega Bay	0.50349	14
San Francisco	0.60921	10
Monterey	0.53330	13
Morro Bay	0.39445	18
Santa Barbara	0.71094	3
Los Angeles	0.78504	2
San Diego	0.79624	1

Figure 3-17 contains panels showing trends in top-ranked ports' share of revenue during the baseline period for each major fishery sector listed in Table 3-14. These figures are based on total revenue accounted for by the sector in the port as a share of coastwide revenue for that sector. These values are then shown in terms of percent change over the baseline period, starting in 2003. Values greater than 100% indicate the share is higher than in 2003 while values below 100% indicate the share is less than it was in 2003.

With the exception of the shoreside whiting trawl sector, the top-ranked port (represented by the solid line in each case) increased its share over the baseline period. For non-whiting trawl and non nearshore fixed gear the share of revenue for the second- and third-ranked ports is actually below what it was in 2003. For the nearshore sector the first- and second-ranked ports (Morro Bay and Brookings) are fairly stable in terms of changes in their revenue shares while the third-ranked port (Crescent City) shows a decline of more than 60% from its 2003 share of coastwide sector revenue. At 12% of coastwide nearshore sector revenue for the baseline period as a whole, Crescent City is a distant third compared to Morro Bay and Brookings.

The shoreside whiting fishery is concentrated in the top three port groups, which account for 94% of coastwide sector revenue. While Newport's share of revenue declined over the baseline period, Astoria and the South and Central Washington Coast (SCWC) (essentially, Westport and the port of Ilwaco) show an inverse correlation in revenue changes. For example, in 2009 Astoria's share increased while SCWC's share decreased, while in 2010 the reverse is true. These trends may be a function of processing capacity in these ports. When landings are lower, they may be more evenly distributed, because no ports meet their processing capacity limit. When landings are high, ports with surplus capacity could increase their share of landings. The top-ranked shoreside whiting ports are also unusual in that the second- and third-ranked ports, SCWC and Astoria, show increases in their revenue share from 2003 compared to first-ranked Newport; its share declined by about one fifth (from 40% of coastwide sector revenue in 2005 to 27% in 2007) and has stayed below its 2003 share since then.

There is a trend towards increasing concentration of ex-vessel revenue in major fishing ports. This may indicate a general trend toward agglomeration (the concentration of firms specializing in an activity, such as fish processors and shipyards, in a geographic area.) Figure 3-18 displays data used for Table 3-14 and Figure 3-17 to evaluate trends in concentration of revenue within ports over the baseline period. For all groundfish fisheries, the share of coastwide revenue flowing to the top-three ranked ports increased, especially after 2009. This trend appears to be driven primarily by landing patterns in the shoreside trawl/IFQ fishery. Conversely, the concentration of revenue from the nearshore fishery is fairly stable over time but highly concentrated, with the top-three ports accounting for about 70% of coastwide revenue.

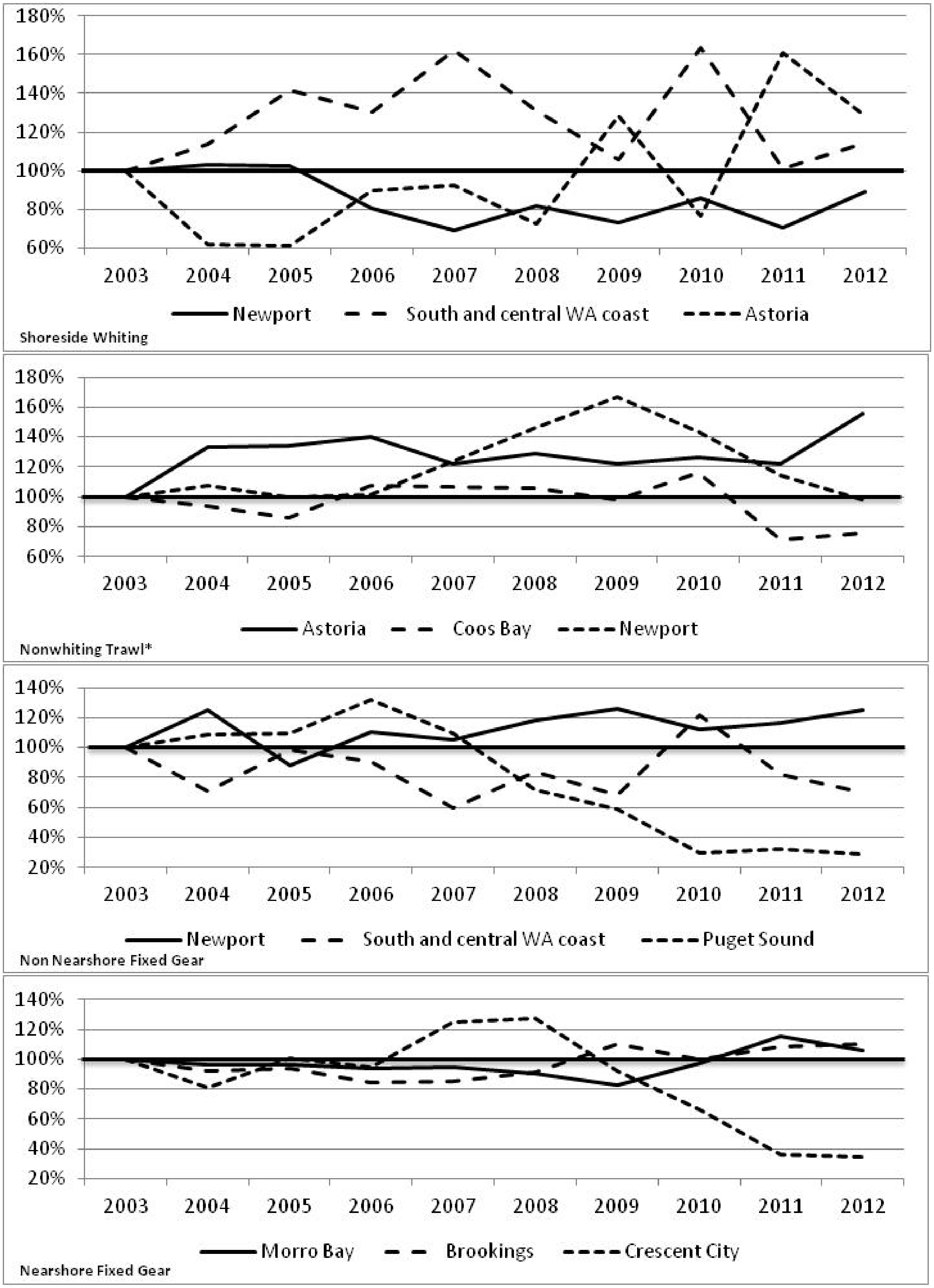


Figure 3-17. Trends in top-ranked ports' share of inflation-adjusted ex-vessel revenue by fishery sector. (2003=100%). *Non-whiting trawl includes non-trawl IFQ sector landings in 2011 and 2012.

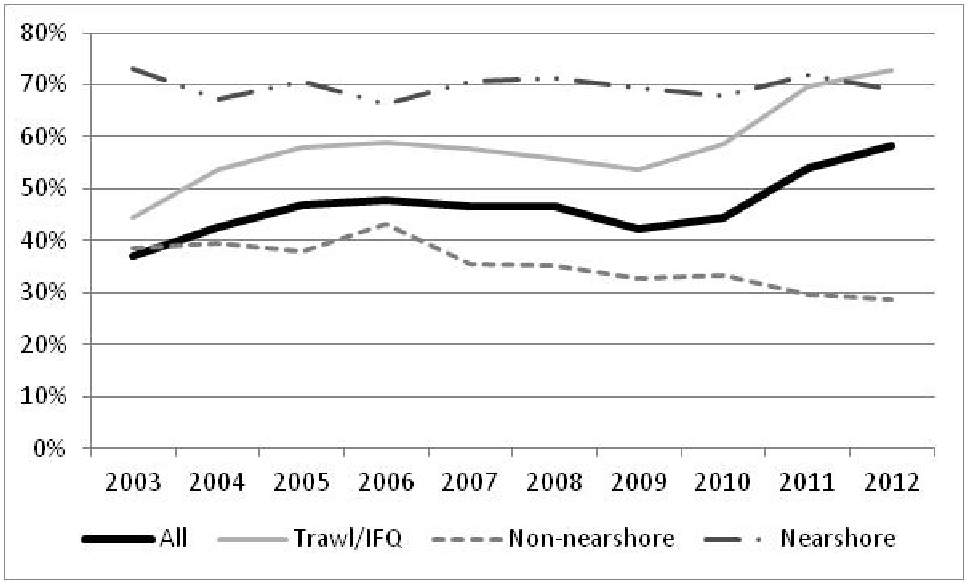


Figure 3-18. Share of inflation adjusted ex-vessel revenue for top three ranked ports for all sectors and selected fishery sectors, 2003-2012.

3.2.7.2 Community Vulnerability

Past Groundfish Harvest Specifications EISs have catalogued various demographic and fishery statistics to characterize west coast fishing communities with respect to their socioeconomic vulnerability to groundfish fishery management actions.[15] These methods combine the concepts of engagement in and dependence on groundfish fisheries with resilience to assess community vulnerability. Communities that may be disproportionately affected by adverse impacts can thus be identified. Vulnerability assessment is also a tool for determining whether measures to rebuild overfished species stocks address the MSA mandate that the time period for rebuilding an overfished species "be as short as possible, taking into account the status and biology of any overfished stocks of fish, *the needs of fishing communities*, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock within the marine ecosystem;…" (emphasis added).

Each vulnerability analysis conducted as part of the Groundfish Harvest Specifications impact evaluation (2007-2008, 2011-2012, 2013-2014, and this EIS for 2015-2016) has used different units of analysis and methods for scoring or rating a community's vulnerability. While the 2007-2008 EIS used ports, the 2011-2012 and 2013-2014 EIS analyses used counties as the unit of analysis.[16] Beginning with the 2013-2014 EIS a social vulnerability index prepared by the Hazards and Vulnerability Research Institute at the

[15] The 2007-2008 Harvest Specifications FEIS (see Appendix A) included a community vulnerability analysis based on fishery and demographic data at the individual port level. A similar analysis was repeated in the 2011-2012 Harvest Specifications FEIS at the county level (see Appendix E). Except for enumeration of basic population characteristics in the decennial census, U.S. Census Bureau demographic information is based on sample data. A statistical analysis conducted in conjunction with the 2011-2012 EIS exercise suggests that in many cases even at the county level there are not statistically meaningful differences in demographic characteristics (given the margin of error in sample data) between adjacent counties. Therefore, attempting a vulnerability analysis at a finer scale may be misleading.

[16] The SoVI Index contains both positive and negative values. To simplify calculation, the index values for each county were re-scaled to positive values (with the lowest value in the data set becoming zero). The index values were then multiplied by the fractional value of the county's population relative to the summed population value for the IOPAC port group. These values were then averaged to derive a score for port groups consisting of multiple counties.

University of South Carolina was used in place of resiliency scores developed specifically for the EIS analysis.[17] The use of this index is carried forward, using an updated version available from the Institute's website (the SoVI® 2006-10 Index).[18] The current analysis is also different in that it uses a weighted average (based on population) of the SoVI scores for counties within each of the 18 IOPAC port groups to derive a single vulnerability score for each port group.[19]

Each analysis has also differed somewhat in the methodology used to assign an overall vulnerability rating to the unit of analysis (port, county, port group). Generally speaking, these methods involved ranking communities by the various indicators and identifying communities as vulnerable if they rank near the top (top one-third, top quartile) for engagement or dependence and resilience/vulnerability. However, the 2013-2014 analysis only presented ratings for each component (engagement, dependence, vulnerability) in high, medium, and low categories without presenting an overall vulnerability assessment.

In the current analysis the engagement, dependence, and adjusted SoVI values for each IOPAC port group were scaled to values between 0 and 1. Commercial fishery engagement and dependence scores, shown in Table 3-16, are based on inflation-adjusted ex-vessel revenue during the 2003-2012 baseline period. Table 3-16 also shows the primary and secondary commercial groundfish fisheries in each port, defined as the fisheries accounting for the largest and second largest shares of groundfish ex-vessel revenue in the port. Table 3-17 shows the scores for recreational fisheries. Recreational data were only available for all port areas from 2004, so the data series is 1 year shorter than that used for commercial fisheries. A combined score was calculated by summing the charter and private recreational scores and rescaling the results between 0 and 1. Finally, these scores were summed and rescaled to derive an overall composite score, shown in Table 3-18 along with the scaled, population-adjusted SoVI scores.

[17] The 2011-2012 analyses, modeled after the original 2007-2008 analysis used the following metrics to score community resiliency: industry diversity, population density, unemployment rate, and percentage of the population living below the poverty line.

[18] According to the website (http://webra.cas.sc.edu/hvri/products/sovi.aspx) "SoVI® 2006-10 marks a change in the formulation of the SoVI® metric from earlier versions. New directions in the theory and practice of vulnerability science emphasize the constraints of family structure, language barriers, vehicle availability, medical disabilities, and healthcare access in the preparation for and response to disasters, thus necessitating the inclusion of such factors in SoVI®. Extensive testing of earlier conceptualizations of SoVI®, in addition to the introduction of the U.S. Census Bureau's five-year American Community Survey (ACS) estimates, warrants changes to the SoVI® recipe, resulting in a more robust metric. These changes, pioneered with the ACS-based SoVI® 2005-09 carry over to SoVI® 2006-10, which combines the best data available from both the 2010 U.S. Decennial Census and five-year estimates from the 2006-2010 ACS."

[19] The IOCPAC port groups are constructed to coincide with county boundaries, because the IOPAC model uses input data at that scale. Each port group encompasses one or more counties.

Table 3-16. Scaled engagement and dependence scores for commercial fisheries, based on inflation adjusted ex-vessel revenue, 2003-2012.

	Normalized Engagement	Engagement Rank	Normalized Dependence	Dependence Rank	Primary Fishery	Secondary Fishery
Puget Sound	0.266	9	0.033	17	Non Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
North WA coast	0.365	5	0.369	9	Non Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
South and central WA coast	0.776	3	0.073	15	Shoreside IFQ Trawl (Whiting)	Non Nearshore Fixed Gear
Astoria	1.000	1	0.701	5	Shoreside Nonwhiting IFQ*	Shoreside IFQ Trawl (Whiting)
Tillamook	0.015	18	0.740	4	Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
Newport	0.834	2	0.757	3	Shoreside IFQ Trawl (Whiting)	Shoreside Nonwhiting IFQ*
Coos Bay	0.467	4	0.211	10	Shoreside Nonwhiting IFQ*	Non Nearshore Fixed Gear
Brookings	0.294	7	0.935	2	Shoreside Nonwhiting IFQ*	Non Nearshore Fixed Gear
Crescent City	0.135	13	1.000	1	Shoreside Nonwhiting IFQ*	Nearshore Fixed Gear
Eureka	0.335	6	0.626	7	Shoreside Nonwhiting IFQ*	Non Nearshore Fixed Gear
Fort Bragg	0.283	8	0.666	6	Shoreside Nonwhiting IFQ*	Non Nearshore Fixed Gear
Bodega Bay	0.023	17	0.173	12	Non Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
San Francisco	0.140	12	0.031	18	Shoreside Nonwhiting IFQ*	Non Nearshore Fixed Gear
Monterey	0.148	11	0.051	16	Non Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
Morro Bay	0.252	10	0.436	8	Non Nearshore Fixed Gear	Nearshore Fixed Gear
Santa Barbara	0.077	15	0.138	13	Non Nearshore Fixed Gear	Nearshore Fixed Gear
Los Angeles	0.083	14	0.136	14	Non Nearshore Fixed Gear	Nearshore Fixed Gear
San Diego	0.056	16	0.194	11	Non Nearshore Fixed Gear	Nearshore Fixed Gear

*2011-12 only.

Table 3-17. Scaled scores for charter and private recreational fisheries and the combined score based on angler trips, 2004-2012.

	Charter Recreational		Private Recreational		Combined Scores		Combined Rankings	
	Normalized Engagement	Normalized Dependence	Normalized Engagement	Normalized Dependence	Normalized Engagement	Normalized Dependence	Engagement	Dependence
Puget Sound	0.011	0.586	0.115	0.845	0.054	0.684	14	9
North WA coast	0.105	0.484	0.024	0.177	0.072	0.368	10	16
South and central WA coast	0.008	0.077	0.012	0.035	0.010	0.061	17	18
Astoria	0.002	0.119	0.006	0.094	0.004	0.110	18	17
Tillamook	0.037	0.880	0.088	0.488	0.058	0.731	13	6
Newport	0.169	0.847	0.197	0.814	0.180	0.835	6	5
Coos Bay	0.036	0.814	0.098	0.458	0.061	0.679	12	10
Brookings	0.028	1.000	0.209	1.000	0.103	1.000	8	1
Crescent City	0.004	0.614	0.039	0.747	0.018	0.664	16	11
Eureka	0.017	0.614	0.181	0.747	0.085	0.664	9	11
Fort Bragg	0.018	0.338	0.132	0.655	0.065	0.458	11	15
Bodega Bay	0.028	0.623	0.044	0.637	0.034	0.628	15	13
San Francisco	0.153	0.623	0.245	0.637	0.191	0.628	5	13
Monterey	0.168	0.872	0.415	0.909	0.270	0.886	4	4
Morro Bay	0.067	0.872	0.166	0.909	0.108	0.886	7	3
Santa Barbara	0.298	0.876	0.241	0.914	0.275	0.890	3	2
Los Angeles	1.000	0.693	1.000	0.678	1.000	0.687	1	7
San Diego	0.408	0.693	0.408	0.678	0.408	0.687	2	7

Table 3-18. Scaled adjusted SoVI scores and composite vulnerability scores.

	Normalized SoVI Score	SoVI Rank	Composite Score	Composite Rank
Puget Sound	0.033	17	1.071	15
North WA coast	0.369	9	1.544	11
South and central WA coast	0.073	15	0.993	18
Astoria	0.701	5	2.515	4
Tillamook	0.740	4	2.285	6
Newport	0.757	3	3.363	1
Coos Bay	0.211	10	1.630	10
Brookings	0.935	2	3.267	2
Crescent City	1.000	1	2.817	3
Eureka	0.626	7	2.337	5
Fort Bragg	0.666	6	2.138	7
Bodega Bay	0.173	12	1.031	16
San Francisco	0.031	18	1.020	17
Monterey	0.051	16	1.405	14
Morro Bay	0.436	8	2.117	8
Santa Barbara	0.138	13	1.518	13
Los Angeles	0.136	14	2.042	9
San Diego	0.194	11	1.539	12

Figure 3-19 shows the component scores for each port in a stacked bar chart to aid in assessing the relatively level of vulnerability. These results can be interpreted in any number of ways to classify ports as vulnerable and, as in past analyses, "most vulnerable." Table 3-19 presents the results in a simple ranking (1 = highest composite score) and compares that to the results from previous vulnerability analyses. The top third ranked ports (1-6) are highlighted as one potential definition of vulnerable. These six port areas (Astoria, Tillamook, Newport, Brookings, Crescent City, and Eureka) were rated vulnerable in at least one of the previous analysis. These ports are geographically concentrated, comprising the entire Oregon coast except for Coos Bay, and Northern California. On the other hand, several port groups that may have qualified as vulnerable in past analyses are not in the top one-third of ranked ports in the current analysis.[20] These include the Washington Coast port groups, Coos Bay, Fort Bragg, Monterey, and Los Angeles. All these ports have summed composite scores greater than 2, as shown in Figure 3-19, along with Morro Bay, and Los Angeles. (Recreational engagement accounts for a large component of the Los Angeles summed value as seen in Table 3-17, indicating that it holds a dominate position in terms of recreational groundfish effort.)

Rather than considering a port group as either vulnerable or not vulnerable, the rankings for all the ports can be used as a factor in evaluating actions that may have concentrated regional effects rather than coastwide effects. Any such disproportionate effects are likely to be a function of the mix of fisheries in a port (if management measures will have a greater effect on a particular fishery sector compared to others) or the species targeted or incidentally caught by the fisheries in a port (if management measures will have a greater effect on the catch of a particular species or species group).

[20] The unit of analysis in first two analyses were counties, so the status of IOPAC port groups, the current unit of analysis was inferred as described in the table footnotes.

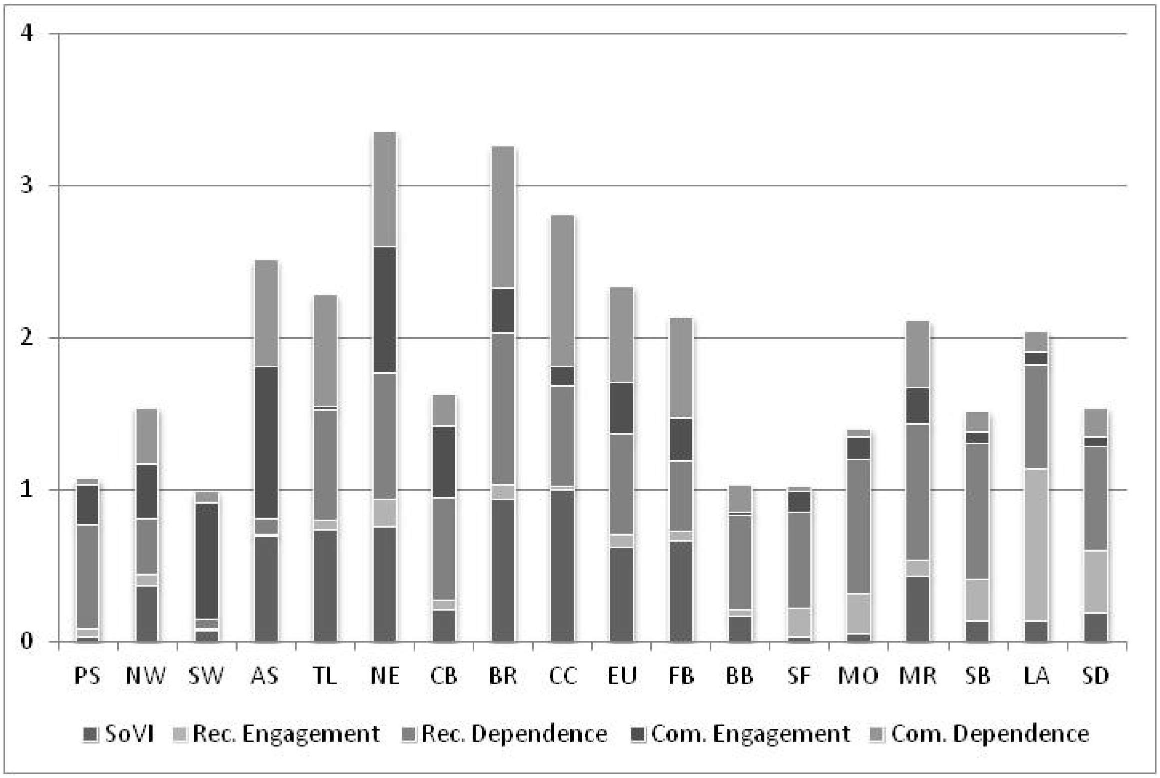


Figure 3-19. Visual representation of scaled scores. Key to port symbols: PS: Puget Sound / NW: North WA coast / SW: South and central WA coast / AS: Astoria / TL: Tillamook / NE: Newport / CB: Coos Bay / BR: Brookings / CC: Crescent City / EU: Eureka / FB: Fort Bragg / BB: Bodega Bay / SF: San Francisco / MO: Monterey / MR: Morro Bay / SB: Santa Barbara / LA: Los Angeles: SD: San Diego.

Table 3-19. Comparison of current vulnerability ratings inferred for IOPAC port groups to past analyses.

IOPAC Port Group	2007-08 EIS*	2011-12 EIS*	2013-14 EIS†	2015-16 Composite Rank‡
Puget Sound				15
North WA coast	Y		Y	11
South and central WA coast	Y	Y		18
Astoria	**Y**		**Y**	**4**
Tillamook		**Y**		**6**
Newport	**Y**	**Y**	**Y**	**1**
Coos Bay	Y	Y	Y	10
Brookings	**Y**	**Y**	**Y**	**2**
Crescent City	**Y**	**Y**		**3**
Eureka	**Y**	**Y**	**Y**	**5**
Fort Bragg	Y	Y		7
Bodega Bay				16
San Francisco				17
Monterey	Y			14
Morro Bay				8
Santa Barbara				13
Los Angeles	Y			9
San Diego				12

*One or more counties rated vulnerable/most vulnerable
†One or more counties rated high for engagement or dependence and vulnerability
‡Top one-third (1-6) bolded

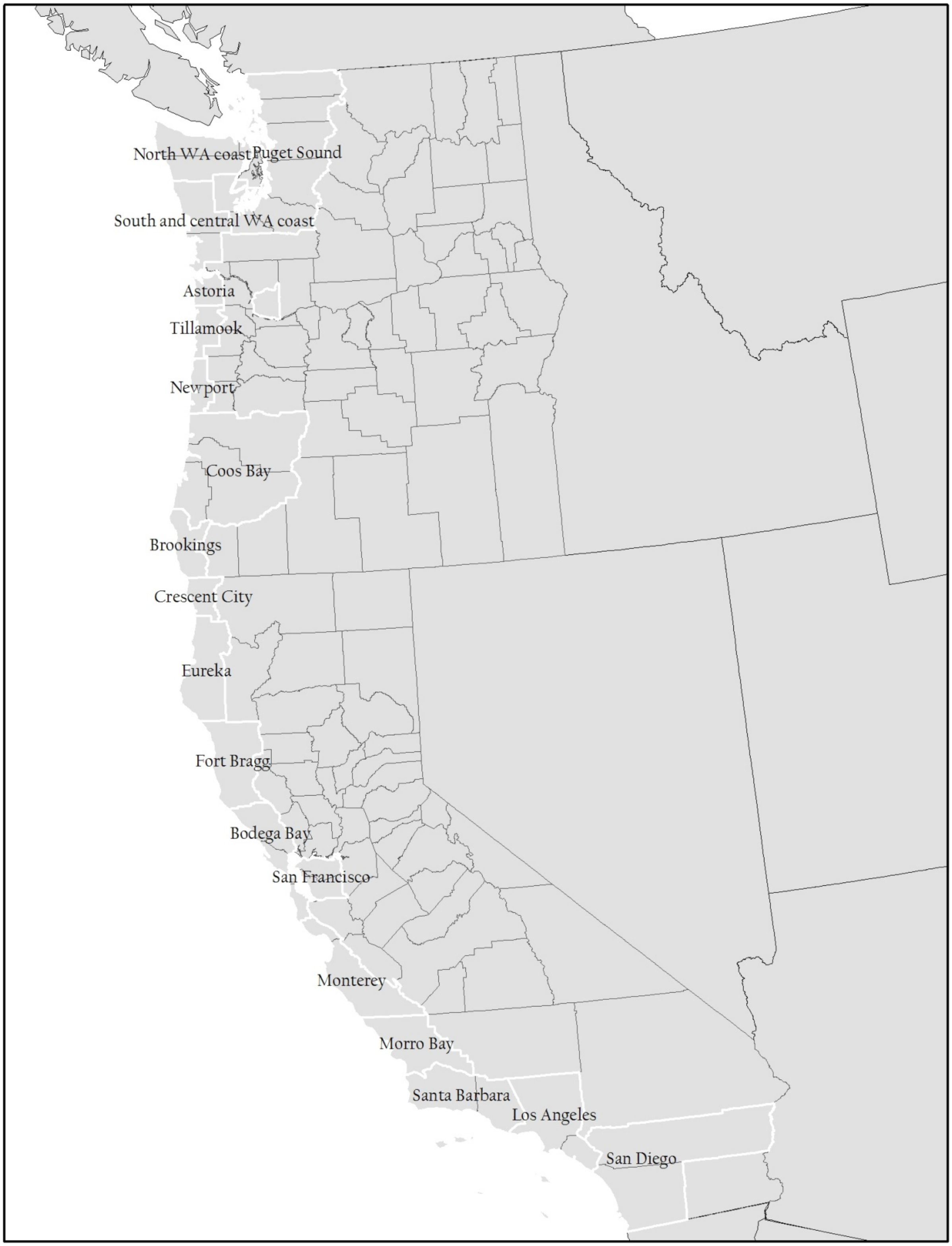


Figure 3-20. IOPac port group areas.

3.2 California Current Ecosystem

In April 2013 the Council adopted the Pacific Coast Fishery Ecosystem Plan for the U.S. Portion of the California Current Large Marine Ecosystem (PFMC 2013, Pacific Coast FEP). This document contains a wealth of information on characteristics of the California Current large marine ecosystem (CCE) where the groundfish fishery occurs and the types of impacts fisheries and other anthropogenic activities have on ecosystem dynamics and marine habitat. Information from this document is incorporated by reference. Previous EISs prepared for biennial harvest specifications also contain information about this ecosystem and fishery effects. The information in sections 3.2.1 and 3.2.2 is based on sections 3.1 and 3.2 in the Pacific Coast FEP.

Chapter 4 in the Pacific Coast FEP (PFMC 2013) describes the effects of human activities and climate on the CCE. Information from the FEP and other sources is summarized here to characterize impacts of groundfish and other fisheries (section 3.2.3), other human activities (section 3.2.4), and climate (section 3.2.5).

Coincident with the development of the Pacific Coast FEP, NMFS has been developing the Integrated Ecosystem Assessment (IEA) of the CCE. This is "a formal synthesis and quantitative analysis of all relevant scientific information—biological, geological, physical, economic, and social—in relation to ecosystem management objectives" (Levin and Schwing 2011b). The IEA includes the development of a suite of indicators used to periodically report on the status of the CCE. Section 3.2.6 summarizes recent IEA reports on CCE status using these indicators.

For the purpose of impact analysis, ecosystem is characterized as the web of trophic relationships within the system and how system structure (relative abundance of constituent organisms) may change in response to human activities, specifically fisheries targeting groundfish.[21]

3.2.1 Overview of California Current Large Marine Ecosystem

The California Current Ecosystem (CCE) is composed of a major eastern boundary current, the California Current, which is dominated by strong coastal upwelling, and is characterized by fluctuations in physical conditions and productivity over multiple time scales (Mann and Lazier 1996; Parrish, *et al.* 1981). Food webs in these types of ecosystems tend to be structured around coastal pelagic species that exhibit boom-bust cycles over decadal time scales (Bakun 1996; Checkley and Barth 2009; Fréon, *et al.* 2009). By contrast, the top trophic levels of such ecosystems are often dominated by highly migratory species such as salmon, tuna, billfish and marine mammals, whose dynamics may be partially or wholly driven by processes in entirely different ecosystems, even different hemispheres. Ecosystems analogous to the CCE include other shelf and coastal systems, such as the currents off the western coasts of South America and Spain.

The CCE contains a diverse array of species, most of which make a relatively modest contribution to the energy flow within the ecosystem (Field and Francis 2006). Because the flow of energy is more of a "food web" than a "food chain," the species of the CCE do not neatly divide into clearly delineated trophic levels (for example, an organism may eat a prey item and also eat items that its prey eats), except at the highest and lowest levels. Most CCE species do not occupy a single trophic level and may occupy multiple trophic levels, particularly when considering changes that occur over the course of their life as they change both their size and feeding preferences.

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[21] The *trophic level* of an organism is the position it occupies in a food chain or food web. Trophic relationships express the pattern of consumption and by extension the flow of energy through the system.

3.2.2 Role of Groundfish in the California Current Ecosystem

3.2.2.1 Groundfish Trophic Role

Groundfish occupy a range of trophic niches and habitats, but most species are considered to be at either middle or higher trophic levels. The following characterization is based on diet analysis contained in Dufault, et al. (2009):

- High trophic level carnivorous fish feeding largely on juvenile and adult stages of other groundfish, as well as forage fishes, mesopelagic fishes, and squid. These include large flatfish (arrowtooth flounder, Pacific halibut, petrale sole); deep, large rockfish (shortspine thornyhead, darkblotched rockfish, rougheye rockfish); sablefish; skates and rays (longnose, Bering, and big skates); soupfin shark; deep, small rockfish (longspine thornyhead, sharpchin and splitnose rockfish); Pacific grenadier; and lingcod (Dufault, *et al.* 2009, feeding guild H).
- Mid to high trophic level fish that feed on zooplankton. These include Pacific hake (whiting); canary rockfish; shallow large rockfish (redstripe, yelloweye, black and blue rockfish); mid-water rockfish (widow rockfish, Pacific Ocean perch, yellowtail rockfish); spiny dogfish; and spotted ratfish (Dufault, *et al.* 2009, feeding guilds B and G).
- Mid to high trophic level fish that feed on benthic invertebrates. These include shallow, small rockfish (rosethorn, greenstriped, and pygmy rockfish); English sole; and small flatfish (Dover sole, rex sole, Pacific sanddab, and deepsea sole) (Dufault, *et al.* 2009, feeding guild E).

Many species may have more varied diets than indicated by the above. For example, many species, including most rockfish, are omnivorous mid-trophic level predators that may be piscivorous at times but also feed on krill, gelatinous zooplankton, benthic invertebrates, and other prey. Pacific hake (whiting), the most abundant groundfish in the CCE, have different food habits at different life stages. Younger, smaller hake feed primarily on euphausiids and shrimps, switching to an increasing proportion of herring, anchovies and other fishes (as well as other hake) as they reach 45-55 cm length, and are almost exclusively piscivorous by 70-80 cm.

3.2.2.2 Trophic Role of Non-Groundfish Species that are the Prey of or that Prey upon Groundfish Species

This group of species is necessarily more broad and diverse than the groundfish species discussed above. Species discussed in this section include the higher trophic level piscivores that prey upon groundfish at varying life stages and sizes. Species discussed in this section also include the lower trophic level species that are eaten by groundfish. Some of these species are protected under the MMPA or ESA, some are themselves target species for other fisheries, and some are neither targeted nor protected. Most of these species are only directly affected by the fisheries when they are taken as bycatch with groundfish gear. Otherwise, these species are primarily indirectly affected by how each of the alternatives either increases or decreases their prey availability or the abundance of their predators.

Using the Dufault, et al. (2009) characterizations in combination with the large species group distinctions discussed in section 3.2 of the Pacific Coast FEP, non-groundfish species directly or indirectly affected by this action may be described by their trophic levels and prey groups. Dufault and colleagues did not have adequate data to include all CCE species in their diet analysis, particularly at the lower trophic levels. These broad species groups are intended to generally characterize the trophic roles of non-groundfish species that prey upon or that are the prey of groundfish:

- Piscivorous Marine Mammals and Seabirds: Includes all CCE pinnipeds, small cetaceans, and all toothed whales except Transient Killer Whales, which feed on other mammals. Includes all CCE seabirds, which are primarily or exclusively piscivorous (Dufault et al. 2009, feeding guilds C and I).

- High trophic level carnivorous fish: Chinook salmon, albacore, giant grenadier, and large demersal sharks (sixgill and sleeper sharks) (Dufault, et al. 2009, feeding guilds C, H, and I).
- Lower trophic level fish and invertebrates that are preyed upon by groundfish: northern anchovy; Pacific sardine; Pacific herring; shrimps (crangon and mysid); large zooplankton (euphausiids, chaetognaths, pelagic shrimp, pelagic polychaetes, pasiphaeids); deposit feeders (amphipods, isopods, small crustacean, snails, ghost shrimp, sea cucumbers, worms, sea slugs, barnacles, solenogaster, hermit crabs); megazoobenthos (Dungeness crab, tanner crab, spiny lobster, pinchbug crabs, red rock crab, graceful rock crab, spider crabs, grooved tanner crab, bairdi, scarlet king crab, and California king crab); deep vertical migrators (myctophids, blue lanternfish, California headlightfish, Pacific viperfish, northern lampfish, garnet lanternfish); miscellaneous nearshore fish (white croaker, sculpin, midshipman); and other benthic filter feeders (geoduck, barnacles, clams, scallops, and other bivalves, urchins).

3.2.3 Effects of Managing to BMSY

Fishery removals affect the relative abundance of different species. Broadly speaking, stock-specific management seeks to maximize yield based on compensatory growth resulting from reducing the population size (see Rose, *et al.* 2001, for an overview of compensatory processes). Notionally, yield is maximized (MSY) when stock size is about half its unfished size (although for individual stocks B_{MSY} may be somewhat larger or smaller relative to unfished size). Since fisheries catch a relatively small range of the different organisms within the CCE, this activity is likely to change the relative abundance of species. This results in a direct effect on the fished population (evaluated in other sections of this EIS mainly based on single species stock assessments).

The Pacific Coast FEP section 3.3.2 describes species interactions, which may be altered by changes in relative population size due to fishing. For example, reduction in a predator population may allow a prey population to increase. Density dependent interactions such as competition for habitat or parasitism may decrease as the population of one or both interacting species declines. These effects are proximate to the change in abundance but indirectly related to the action (fishing). Thus, while from an ecosystem perspective they may be considered direct effects, relative to the action evaluated in this EIS they are indirect. From this perspective the effects of fishing on the ecosystem are principally indirect and cumulative.

A specific example of an indirect effect is described in the Pacific Coast FEP. On unfished rocky reefs the abundance of larger, piscivorous rockfish species is higher relative to more abundant, smaller, fast-growing, and early-maturing rockfish species (Jagielo, *et al.* 2003; Yoklavich, *et al.* 2002; Yoklavich, *et al.* 2000). In contrast, the larger piscivorous rockfish are relatively less abundant on heavily fished rocky reefs. This may be due to a “depensatory” effect resulting from the smaller fish eating the larvae of the larger fish (MacCall 2002; Walters and Kitchell 2001). When the local population of the larger predatory fish is reduced the population of smaller fish increases and they in turn consume a greater share of the large fishes’ spawning output, limiting recruitment to the adult population. This demonstrates the structuring role of higher trophic level organisms that can be disrupted by fishing. Empirical and theoretical research suggests such effects could be more widespread in terms of species and habitats (Baskett, *et al.* 2006; Levin, *et al.* 2006).

Kaplan, et al. (2012) used the Atlantis ecosystem simulation model to assess the cumulative effects of fisheries on the CCE.[22] This work provides the most specific assessment of the effects of fishing by

[22] See Horne, et al. (2010) for a description of the structure and parameterization of the CCE implementation.

different fleets on various ecosystem components and indicators of ecosystem health. Their simulation starts with initial conditions approximating 2005-2008 and then projects forward 50 years. The authors compared the effects of 20 individual fishing fleets operating in the CCE and the combined effects of these fleets, using the unfished ecosystem (as determined by the model) as a comparative benchmark and "status quo" defined as all fisheries operating at constant fishing morality rates derived from recent catches.

Four major fleets were identified based on total catch and economic importance. In the simulations these fleets have large negative impacts on target and bycatch species (measured in terms of the change from status quo) along with indirect effects on other species:

- Bottom trawl indirectly affected small shallow rockfish and zooplankton (krill), with their populations increasing due to the reduction in predation. [23]
- Fixed gear indirectly affected mesozooplankton (copepods), which increased.
- Hake (whiting) trawl indirectly resulted in increases of small planktivores, large piscivorous flatfish, Dover sole, shortbelly rockfish, and shrimp.
- In contrast to the other three fleets, CPS purse seine had indirect effects throughout the food web. Reduction in squid (cephalopods) abundance resulted in a large increase in krill and microzooplankton. This in turn led to increases in planktivores such as salmon and myctophids (vertical migrators). Although CPS purse seine also targets small and large planktivores (sardine and mackerel), small planktivores showed almost no response to fishing while large planktivore biomass increased 2.65 times from the status quo level (all fisheries operating), because of increases in large zooplankton.

The authors also evaluate impacts in terms of nine ecosystem attributes based on those used for the CCE Integrated Ecosystem Assessment project (Levin and Schwing 2011a) and the IndiSeas project (Shin, *et al.* 2010). Fleets with the strongest negative impact on these attributes (based on the average value of the attribute scores for each fleet) were those described above plus pink shrimp trawl (with hake trawl considered separately in its at-sea and shoreside components because of differences in total removals). Figure 3-21, adapted from Kaplan, et al. (2012) Figure 3, shows the effect of these fleets on selected ecosystem attributes (chosen because they varied by ≥5% from status quo). As noted above, all fleets show negative impacts as measured by the targeted biomass/catch indicator. This attribute received the largest negative score among the nine attributes for all the major fleets shown in Figure 3-21 except for bottom trawl and non-nearshore fixed gear. For those two fleets the piscivore indicator received the largest negative score. Bottom trawl and CPS purse seine had notable (>5%) positive effects on the krill attribute and bottom trawl was the only fleet to have a negative effect on the healthy assessed stocks attribute.

[23] The model uses 60 functional groups, some containing single species and others species aggregations.

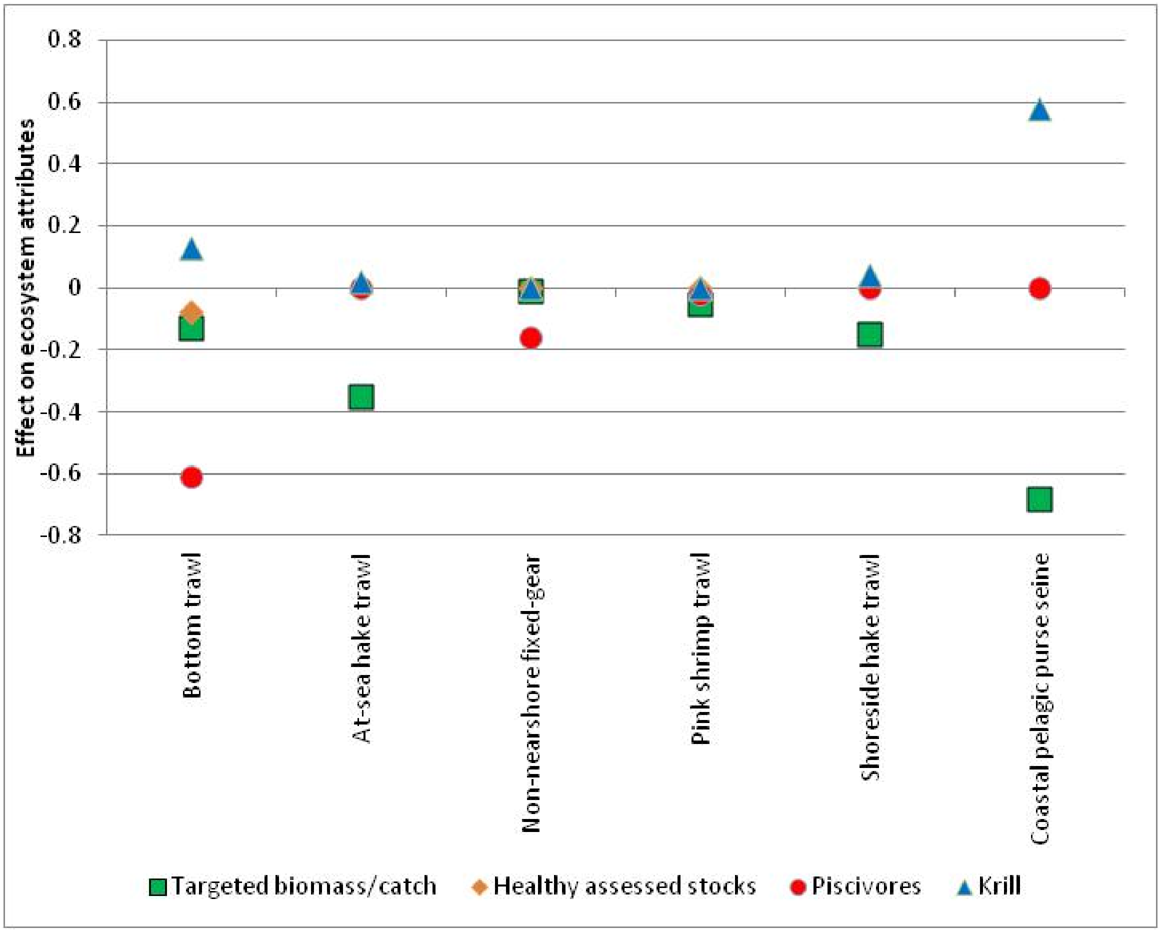


Figure 3-21. Effect of six individual fleets on four ecosystem attributes. Adapted from Kaplan et al. (2012), Figure 3. Values represent the proportional difference between a simulation at status quo (all fleets operating) and one in which the specified fleet was omitted. Zero represents no change from status quo.

Figure 3-22 represents the effect on ecosystem attributes of successively adding fleets, with fleets ordered by their negative impacts from most to least. (This figure appears in the supplement to Kaplan et al. with attribute scores rescaled between 1, the value in the unfished state, and 0, the lowest recorded value for the attribute. It is based on the data presented in Figure 4 in the paper.) The major fleets discussed above account for most of the impacts. Targeted biomass, mean trophic level of the catch, healthy assessed stocks, and piscivores show increasing negative impacts with the addition of fleets (with the exception of a slight increase in mean trophic level as additional fleets are added after the major fleets). Forage fish increases with each fleet addition and krill increases once CPS purse seine is added, which results in a corresponding increase in total biomass.

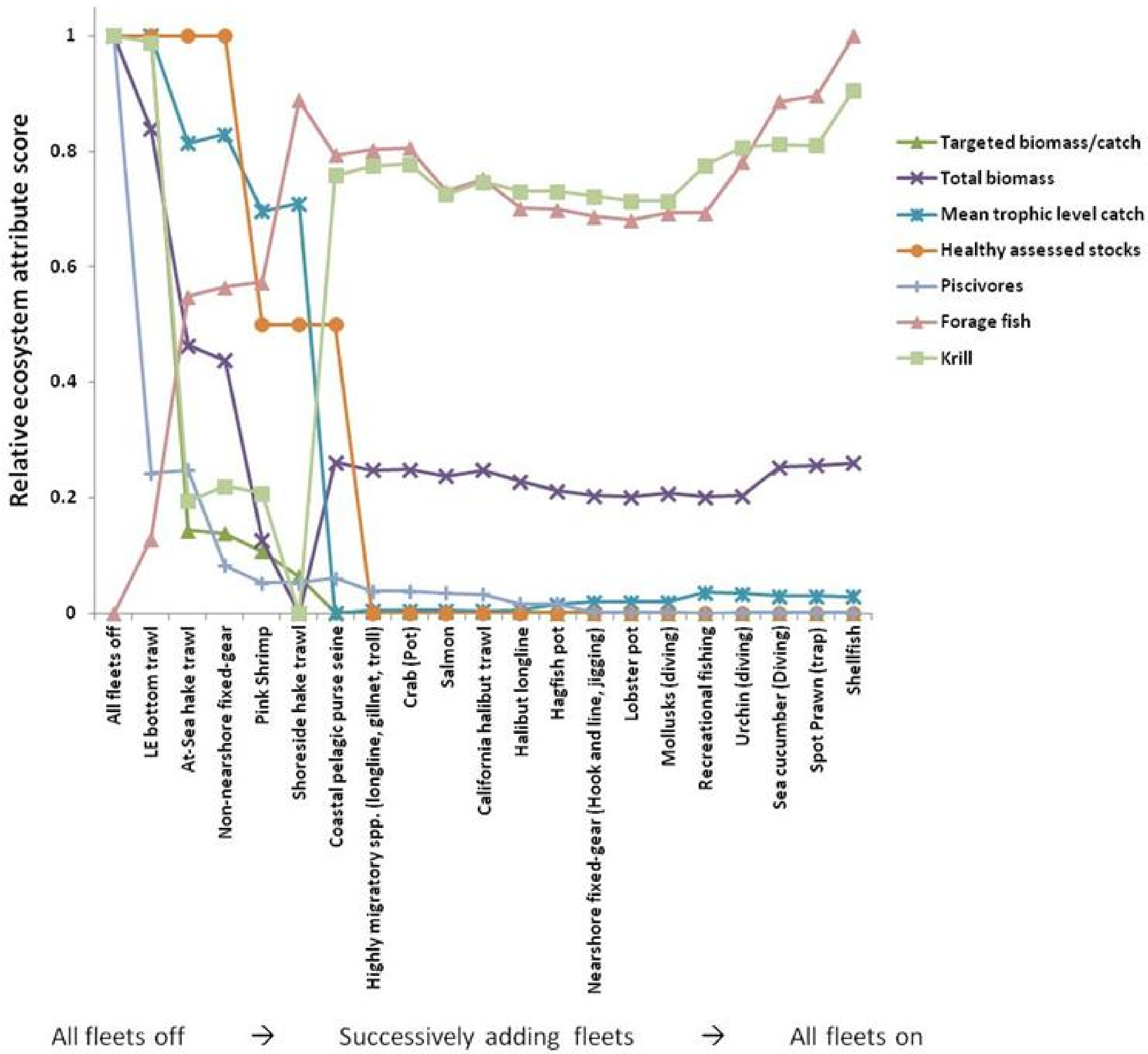


Figure 3-22. Ecosystem attributes, as affected by the successive addition of each fleet, ordered from the fleet with the strongest to the weakest negative impacts. Symbols indicate the value of each individual attribute. Ecosystem attribute scores (y-axis) are rescaled to be between 0 and 1. Values of 1 represent the highest or unfished value of the attribute, and 0 represents the lowest value of the attribute calculated for any combination of fleets. Source: Figure S1 in the Supplement to Kaplan, et al. (2012).

Finally, the authors evaluated the effects of fleet interactions. First, the effect of combinations of four major fleets (bottom trawl, fixed gear, hake fleets, and CPS purse seine) on change in the biomass of 60 functional species groups defined in the Atlantis CCE model was evaluated. Second, the effect of these fleet combinations on the ecosystem attributes discussed above was evaluated. These collective effects could be additive, the combined effect on an ecosystem attribute equals the sum of the effects measured by the attribute values for each of the individual fleets; positive, the combined effect results in an attribute value greater than the sum of individual effects; or negative, the combined effect results in an attribute value less than the sum of the individual effects.

Combined effects were by and large additive (equal to the sum of the individual fleet effects); 93% of interactions in the case of changes in the biomass of functional groups. Only 2% of the interactions were negative (biomass lower than the sum of biomasses resulting from modeling the individual fleets). For the ecosystem attributes there were no negative interactions and only two attributes involved in positive interactions.

In addition to the effects of changes in the relative abundance due to fishing, the age and size structure of fish populations may be altered (see pp. 138-139 in PFMC 2013). If sufficient information is available, size/age truncation (because fishing subjects larger/older fish to relatively higher mortality) can be accounted for in stock assessments. But indirect effects may remain unquantified. Larger/older females are not only relatively more fecund but produce more robust eggs, contributing to greater larval survival and potentially increased recruitment to the adult (or fished) population. Population behaviors, such as migration, may be affected by changes in population structure. Size/age truncation along with reduced population size may also reduce overall resiliency of the population to environmental shocks.

3.2.4 Activities other than Fishing

Other human activities, aside from fishing, that affect the CCE mostly occur in estuarine and freshwater habitats (the latter affecting the productivity of salmon and other species that enter streams and rivers to reproduce).[24]

The Annual State of the California Current Ecosystem Report presented to the Council in November 2012 (Agenda Item K.3.a, Supplemental Attachment 1, November 2012) identified several indicators to track non-fishing ecosystem impacts:

- Benthic structures, such as oil rigs, wells and associated anchorings, modifies or destroys marine habitat. But these structures also provide colonization sites for marine organisms and attract structure-associated fishes and invertebrates. Related activities can disturb epifaunal communities, which may provide feeding or shelter habitat for species of interest. Benthic organisms, especially prey species, may recolonize disturbed areas, but this may not occur if the composition of the substrate is drastically changed or if facilities are left in place after production ends.
- Commercial shipping vessels transit through the CCE, concentrating in approaches to major ports (e.g., Seattle, Los Angeles). Increased trade volume may lead to more ship strikes of protected species and underwater noise, which can affect fish spawning, migration, communication, and recruitment.
- Terrestrial runoff (nonpoint source pollution) increases nutrients in freshwater and estuarine areas. Excessive nutrients accelerate eutrophication, which produces a wide range of other impacts on aquatic ecosystems and fisheries, including: algae blooms; declines in aquatic vegetation; mass mortality of fish and invertebrates through poor water quality (e.g., via oxygen depletion and elevated ammonia levels); and alterations in long-term natural community dynamics.

[Update as appropriate with information from 2014 CCEA Report.]

[24] Human-induced climate change is discussed in the following section.

3.2.5 System Forcing and Climate Change

Climate encompasses a variety of physical forces affecting the input of energy into the CCE and the distribution of energy and material through the system through water movement. Climate change is a long-term trend over a time scale that makes it essentially unidirectional in relation to human activities.

The CCE is characterized by fluctuations in physical conditions over multiple time scales. This physical forcing in the CCE is correlated with changes in species' biomass and population productivity. Particular system states favor some species over others. Many of these fluctuations have been shown to be a consequence of larger scale changes in ocean conditions throughout the Pacific, including changes observed in the tropics (the El Niño/Southern Oscillation, ENSO) and changes in the north Pacific and subarctic (indexed by the Pacific Decadal Oscillation, PDO, and the North Pacific Gyre Oscillation, NGPO). ENSO is a higher-frequency inter-annual phenomenon while the PDO/NGPO fluctuate at lower frequency (years or decades). At a gross level there are two system states—a warm water regime and a cold water regime—precipitated by cyclical climate events and characterized by these and other indices and signals.

During the ENSO warm water phase (El Niño conditions):

> primary and secondary productivity (e.g., phytoplankton and zooplankton) [is lower], often leading to reduced recruitment of many groundfish species, lower survival of salmon smolts, and distributional shifts (to the north, as well as onshore from offshore waters) of most migratory species (such as coastal pelagics, HMS, and Pacific hake). For example market squid abundance (and catches) often decline to very low levels during El Niño events, and rebound strongly during strong La Niña [cold water] events. Highly migratory species such as tunas and billfish are also more frequently available to fishermen during El Niño events, and recreational fishing effort often shifts to those and other warm water targets, and away from rockfish and other cooler water species, particularly in the waters of the Southern California Bight. (Agenda Item K.3.a, Supplemental Attachment 1, November 2012)

The PDO is characterized by longer warm and cold regimes. Productivity is higher during cold regimes and lower during warm regimes. However, the PDO does not predict sea surface temperatures in the CCE as reliably as in more northerly regions. Thus while the cold regime is associated with higher productivity, the PDO does not explain all of the observed variability in the productivity of a population. The NGPO is linked to changes in salinity and chlorophyll-a (a remotely sensed indicator of primary production).

The introduction to section 4.5 in the Pacific Coast FEP provides the following concise assessment of the effects of climate change in the CCE:

> Climate change is expected to lead to substantial changes in physical characteristics and dynamics within the marine environment, with complex and interacting impacts to marine populations, fisheries and other ecosystem services (Doney, *et al.* 2012; Harley, *et al.* 2006; Scavia, *et al.* 2002). Three major aspects of future climate change that will have direct effects on the CCE are: ocean temperature, pH (acidity versus alkalinity) of ocean surface waters, and deep-water oxygen. Globally by 2050, ocean temperatures on average are expected to rise at least 1°C (by the most conservative estimates in IPCC 2007), while at the same time, ocean pH in the upper 500m has steadily been decreasing (becoming more acidic, aka "ocean acidification") at a rate of approximately -0.0017 pH per year (Byrne, *et al.* 2010). On a more regional basis within the CCE, deep-water oxygen levels have shown a steady and relatively rapid decrease since the mid 1980's (Bograd, *et al.* 2008; McClatchie, *et al.* 2010). These three factors are linked: ocean

> temperature affects ocean pH, ocean temperature and deep water oxygen levels both can be controlled by large scale circulation patterns, and primary production can affect both oxygen and pH (Gilly, *et al.* 2013). All three factors show long-term trends and decadal-scale variance similar to changes in the PDO (Mantua, *et al.* 1997) and North Pacific Gyre Oscillation (Di Lorenzo, *et al.* 2008) climate signals. In addition to these three large-scale aspects of climate change, some more immediate and localized aspects of climate change observed in coastal marine ecosystem include: intensification of upwelling (Bakun 1990; Schwing and Mendelssohn 1997), changes in phenology (phenology refers to the relationship between a periodic biological phenomenon and climatic conditions) (Bograd, *et al.* 2009), and changes in the frequency and intensity of existing interannual and interdecadal climate patterns (Yeh, *et al.* 2009, CCIEA 2012, and references therein). Substantial changes in weather and precipitation patterns will also affect snowpack, stream flow, river temperatures and other aspects of freshwater habitat, with tremendous real and potential consequences to the future productivity and sustainability of anadromous resources such as salmon (Crozier, *et al.* 2008; Mantua and Francis 2004). (page 165)

The following summarizes the effects of these changes as described in the Pacific Coast FEP (pages 165-169):

- Increasing water temperature is likely to cause northward shifts in the distribution of marine species in the CCE. This may result in the disappearance of some species from localities. Overall primary productivity due to thermal stratification of ocean waters is also likely. Seasonal upwelling of deep ocean waters, an important contributor to local productivity, could be disrupted.
- The ocean has absorbed about a quarter of the atmospheric carbon dioxide resulting from human activity; because of basic chemical processes this is making ocean waters more acidic (lowering the pH). Acidification is expected to affect shell-producing organisms, making it more difficult to form them, because shell material is composed of calcium carbonate, which degrades more quickly as water becomes more acidic. Although ongoing impacts resulting from acidification are highly uncertain (partly because the capacity for organisms to adapt to changes in pH is not fully understood), a major concern is that pH change could reduce plankton production, which, as the base of the food chain, would have far-reaching effects.
- Through various processes, dissolved oxygen levels in CCE waters could decline due to warming. This could increase the extent and duration of so-called “dead zones”: areas where upwelling of deeper low-dissolved-oxygen water moves into the continental shelf benthic zone. A decline in dissolved oxygen in deep ocean waters could result in more extensive effects. This has a direct effect, killing organisms trapped in the dead zone; over the long term particular species’ available habitat could be reduced.
- Intensified upwelling is a documented result of warming (Bakun 1990; Schwing and Mendelssohn 1997) due to stronger alongshore winds. Since upwelled water is more nutrient rich, this could lead to greater productivity.
- Changes in the frequency and duration of major climate patterns discussed above (ENSO, PDO, NGPO) may be linked to warming.
- The timing of seasonal upwelling seems to be changing with an earlier start in the south and later start in north as observed in the past 5 years {CCEIEA, 2012}. Along with changes in climate patterns, this could prompt changes in the phenology of physical and biological events (phenology refers to the relationship between a periodic biological phenomenon and climatic conditions).

(Other sources that may be consulted in the development of this section: Ainsworth, *et al.* 2011; Cheung, *et al.* 2013; King, *et al.* 2011; Pinsky and Fogarty 2012)

3.2.6 Baseline Status of the California Current Ecosystem

Andrews, et al. (2011) identified a suite of indicators as part of the development of the CCE IEA. For groundfish, salmon, and green sturgeon indicators focus on population size and structure; for ecosystem health indicators focus on community composition and material and energy flows. Hazen, et al. (2011) summarize five indices or signals used to measure low frequency climate forcing in the CCE. The Council's Ecosystem Plan Development Team provided a summary report on the status of the CCE in 2012 (Agenda Item K.3.a, Supplemental Attachment 1, November 2012) that uses selected indicators identified as part of the IEA {CCIEA 2012}. The IEA team has proposed providing an annual report to the Council on the current status of the CCE. These reports and indictors are used to briefly characterize the baseline status of the CCE here.

The most recent report was submitted to the Council at their March 2014 meeting. [To be completed.]

3.3 Essential Fish Habitat

The MSA (sec. 303(a)(7)) requires Councils to include in each FMP a description of essential fish habitat (EFH) for all managed species and measures to minimize to the extent practicable adverse effects on such habitat caused by fishing.[25] The Pacific Council has described EFH for all species managed under its four FMPs (Coastal Pelagic Species, Highly Migratory Species, Groundfish, and Salmon). EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (MSA sec. 3). Regulatory guidelines (50 CFR 600, Subpart J) elaborate that the words "essential" and "necessary" mean EFH should be sufficient to "support a population adequate to maintain a sustainable fishery and the managed species' contributions to a healthy ecosystem." Groundfish EFH is described in the FMP as:

- Depths less than or equal to 3,500 m (1,914 fm) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.
- Seamounts in depths greater than 3,500 m as mapped in the EFH assessment geographic information system (GIS).
- Areas designated as Habitat Areas of Particular Concern (HAPC) not already identified by the above criteria.

The regulatory guidelines also establish authority for Councils to designate HAPC based on the vulnerability and ecological value of specific habitat types. The Groundfish FMP identifies these HAPCs:

- Estuaries
- Canopy kelp
- Seagrass
- Rocky reefs
- Specified "areas of interest"

Chapter 7 in the Groundfish FMP describes groundfish EFH (Section 7.2) and HAPCs (Section 7.3). The current EFH and HAPC descriptions were incorporated into the FMP in 2006 through Amendment 19 to the FMP. The Council also established measures to mitigate the adverse impacts of fishing on groundfish

[25] A Federal agency authorizing, funding, or undertaking actions that may adversely affect EFH must consult with NMFS on measures to mitigate such impacts. Councils or Federal or state agencies may also advise NMFS on such actions.

EFH, which are described in FMP Chapter 6 (Management Measures). These mitigation measures include gear restrictions (Section 6.6), time/area closures (Section 6.8), and measures to control fishing capacity (Section 6.9). As acknowledged in Section 7.4 of the FMP, "Some of the management measures … have been implemented specifically to mitigate adverse impacts to EFH while others may have another primary purpose … but may have a corollary mitigating effect on adverse impacts to EFH."

The FEIS accompanying FMP Amendment 19 (NMFS 2005) included an evaluation of the adverse effects of fishing on groundfish EFH, and previous EISs for biennial harvest specifications and management measures (PFMC and NMFS 2011; PFMC and NMFS 2012) have assessed the effects on groundfish EFH of changes to catch limits and associated management measures. Changes to the Trawl RCA boundaries have come under increased scrutiny, because of their corollary mitigating effects; in 2014 NMFS prepared an environmental assessment (NMFS 2013b) for a Council-proposed change to the Trawl RCA that would open areas that had been closed to trawl fishing for several years. Information from these documents may be incorporated into the baseline description in this section with citation.

In 2010 the Council developed a process and scheduled for a 5-year review of "…the EFH description and identification, HAPC designations, and information on fishing impacts and nonfishing impacts…" as specified in Section 7.6 of the Groundfish FMP. This review began in 2011 under the auspices of the Council's Ad Hoc EFH Review Committee (EFHRC). During the first phase of the review the EFHRC and NMFS scientists updated and compiled available ecological, habitat, and fishing effort data, and used this information to develop a set of maps intended to support Council decision-making related to EFH (NMFS 2013a). A synthesis report based on these data was published in April 2013 (NMFS 2013a), completing the first phase. During the second phase, which is ongoing, the Council will consider proposals for potential modifications as described above.

3.3.1 Effects of Fishing on Groundfish EFH

Fishing gear principally affects groundfish EFH when it comes into contact with benthic habitat. The gear type and configuration and the vulnerability of particular habitat types factor into assessments of the adverse impacts of fishing, as was done in the Amendment 19 FEIS (NMFS 2005). Section 3.5 in that document is a comprehensive and detailed description of fishing gear that is, or has been, used in the fishery management area and how they interact with benthic habitat. Section 3.2.4 in the FEIS summarizes the relative impacts of gear types by habitat type with those conclusions further consolidated in Table 3-20 showing the range of recovery times by habitat category and gear type.[26] Generally, for a given habitat type dredge and trawl gear are likely to have a greater effect than other bottom contacting gear types (e.g., demersal longline and pot gear, demersal, or Scottish, seine), because the contact is more extensive. With respect to biogenic and hard bottom habitats, Section 3.2.3.1 notes that corals, anemones, sponges, sea pens, and sea whips are a highly sensitive habitat that may be substantially modified with relatively little fishing effort, and

> There have not been many studies of how these organisms recover from initial impact; however, growth rates of corals in particular suggest that recovery is in excess of seven years and likely to be much longer. The sensitivity and recovery indices prepared for the Risk Assessment should be interpreted with the caveat that very little science is available to understand the vulnerability of corals, anemones, sponges, sea pens, and sea whips to fishing impacts. It is plausible that the sensitivity and recovery times of corals, anemones, sponges, sea pens, and sea whips are underestimated and a precautionary approach may be warranted. (Page 3-15, internal citation omitted)

[26] See Appendix 10 to the Risk Assessment {MRAG Americas Inc., 2004 #431} for a full description of the methodology for the derivation of these recovery times.

The full phase one report {Groundfish Essential Fish Habitat Review Committee, 2012 #432, p. 60} cites more recent work that suggests recovery times on the order of 100 years for hard corals found off of Alaska.

Table 3-20. Average recovery times, in years, for constituent habitat types by habitat category and fishing gear type, based on Table 3-1 in Amendment 19 FEIS (NMFS 2005).

Habitat Category	Bottom Trawl	Dredge Gear	Hook and Line	Nets	Pots and Traps
Nearshore Biogenic	1.5 - 2	2.6 - 3	0 - 0.5	0.5 - 1	0 - 0.5
Nearshore Hard Bottom	1 - 2	1.5 - 2.5	0 - 0.5	0.5 - 1	0 - 0.5
Nearshore Unconsolidated Bottom	0.1 - 1	0.2 - 1.6	0 - 0.5	0 - 0.5	0 - 0.5
Offshore Biogenic	2.3 - 2.8	2.7 - 3	0.1 - 1.2	1.2 - 2.2	0.2 - 1.2
Offshore Hard Bottom	1.8 - 2.6	1.8 - 2.3	0.3 - 0.6	0.8 - 1.6	0.3 - 0.7
Offshore Unconsolidated Bottom	0.5 - 1.2	0.7 - 1.5	0.1 - 0.3	0.4 - 1.1	0.1 - 0.6

"Structure forming" benthic macroinvertebrates are of interest because of their potential role as groundfish habitat. Section 3.2.3.2 in the Amendment 19 FEIS notes the supporting role of corals in complex marine communities elsewhere in the world (e.g., reef forming hermatypic corals mostly occurring in the tropics) but based on available evidence reaches no conclusion about the importance of these macroinvertebrates as groundfish habitat. The synthesis report referenced above notes that kelp beds are known to be important habitat for many groundfish species, especially juveniles, but little new information about other biogenic areas has been collected since the Amendment 19 analysis (NMFS 2013a, p. 27).

Table 3-21 summarizes information from Table 4a.2 in the synthesis report on the distribution of fishing effort by habitat type.[27] For all gear types most fishing effort occurred on soft substrate on the upper slope, ranging from 77% for midwater trawl to 55% for fixed gear. Table 3-22 displays relative fishing effort. This metric was derived by dividing the amount of fishing effort in percent by area of each habitat type by percent and rescaling the values in percent (meaning the resulting values sum to 100% for each gear type). By this measure the biggest relative impact has been on mixed substrate on the upper slope. However, mixed substrate comprises only 1% of the total area by substrate type while soft substrate accounts for 91%. The lower slope is essentially unaffected, because, aside from the difficulty of fishing at greater depth, Amendment 19 included a mitigation measure prohibiting bottom trawling in depths greater than 700 fathoms, which for the depth zones used in the synthesis report constitutes the shoreward boundary of the lower slope. Fixed gear effort is more evenly distributed across habitat types; measured relative to habitat area, a larger proportion of the fixed gear effort / habitat area ratio occurs on hard substrate.

[27] The synthesis report includes the Salish Sea (Puget Sound region) in its summary; this region is excluded here because it is outside the fishery management area. Reported depth zones refer to the continental shelf and slope. The break between the shelf and slope, measured by depth, is 140 meters (Gross 1972). Bottom and midwater trawl fishing effort is measured by trawl distance in meters; fixed gear effort is measured in number of fishing events.

Table 3-21. Distribution of fishing effort, 2002-2010, (percent) by gear type and habitat type (substrate x depth zone) summarized from Tables A3a.5, A3a.6, and A3.a7 in NMFS (2013a).

	Depth Zone			
Substrate	**Shelf**	**Upper slope**	**Lower slope**	**All Depths**
Bottom Trawl				
Hard	0.3%	1.5%	0.0%	1.8%
Mixed	0.2%	1.9%	0.0%	2.1%
Soft	37.0%	59.0%	0.1%	96.1%
All Substrates	**37.6%**	**62.4%**	**0.1%**	**100.0%**
Midwater Trawl				
Hard	0.2%	3.1%	0.0%	3.3%
Mixed	1.2%	5.5%	0.0%	6.8%
Soft	12.6%	76.7%	0.6%	89.9%
All Substrates	**14.1%**	**85.2%**	**0.7%**	**100.0%**
Fixed Gear				
Hard	9.3%	6.5%	0.5%	16.3%
Mixed	3.4%	5.7%	0.5%	9.6%
Soft	19.0%	55.0%	0.1%	74.1%
All Substrates	**31.7%**	**67.3%**	**1.1%**	**100.0%**

Table 3-22. Relative fishing impact metric by gear type and habitat type derived from Table 2.1 (distribution of habitat types) and Tables A3a.5, A3a.6, and A3.a7 in NMFS (2013a).

	Depth Zone		
Substrate	**Shelf**	**Upper slope**	**Lower slope**
Bottom Trawl			
Hard	2.9%	7.3%	<0.1%
Mixed	6.0%	43.5%	0%
Soft	21.2%	18.9%	<0.1%
Midwater Trawl			
Hard	0.9%	7.1%	<0.1%
Mixed	15.3%	61.5%	0%
Soft	3.4%	11.6%	<0.1%
Fixed Gear			
Hard	23.0%	8.7%	0.4%
Mixed	24.0%	36.2%	*
Soft	3.0%	4.8%	<0.1%

*Fixed gear fishing events are reported for lower slope mixed substrate while the area of this habitat type is reported as zero. Therefore, fixed gear fishing effort in that habitat type is excluded from the calculation.

[Note effects of emerging non-whiting midwater trawl fishery]

3.3.2 Non-Fishing Impacts

Adverse effects from activities other than fishing are not part of the proposed action but contribute to cumulative effects. Appendix D to the Groundfish FMP incorporates a 2003 report prepared by NMFS cataloging the types of activities affecting groundfish EFH. Activities identified in the appendix include those onshore, such as non-point and point source discharge of pollutants and coastal construction, and those in the marine environment including dredging, dredge spoil disposal, and marine mining. Section 4.4 in the synthesis report (NMFS 2013a) updates information on non-fishing impacts based on spatially explicit data compiled by Halpern, et al. (2008). The main findings of the analysis are that these impacts are more intense in nearshore areas. Offshore impacts are more intense in the northern portion of the fishery management area compared to the southern area.

3.3.3 EFH Mitigation Measures

3.3.3.1 Gear Restrictions

Amendment 19 made permanent an existing prohibition on the use of bottom trawl gear with footropes larger than eight inches in diameter shoreward of a line approximating the 100 fathom depth contour, as described in Section 6.6.1.1 of the Groundfish FMP. These footrope restrictions were originally implemented to discourage trawling in areas where bycatch of overfished rockfish species are more abundant. Because these are generally areas of rocky habitat the prohibition also had an important mitigation effect for EFH. Amendment 19 also implemented prohibitions on dredge and beam trawl gear, because of their adverse impact on groundfish EFH.

Amendment 20 (“trawl rationalization”) established the individual fishing quota (IFQ) program for trawl-endorsed groundfish limited access permit holders. The program allows these permit holders to use any legal groundfish gear. As a consequence, since implementation in 2011, a portion of landings have been made with fixed gear. (See section 3.7.2.2 for more information.) In 2011-2012 fixed gear landings in the IFQ fishery accounted for about 40% of total landings by weight and 21% of trips measured by counting fish tickets, excluding trips targeting whiting. Although these measures do not correlate directly with fishing effort, they do suggest that some trawl effort has been substituted by fixed gear effort, and fixed gear has less adverse impacts on groundfish EFH (for example as measured by recovery time, shown in Table 3-20).

3.3.3.2 Time/Area Fishing Restrictions

As part of Amendment 19, 34 areas were closed to bottom trawl gear and 16 areas were closed to bottom contact commercial fishing gear other than demersal seine gear. (Section 6.8.5 in the Groundfish FMP enumerates these areas.) A bottom trawl footprint closure, covering all areas deeper than 700 fathoms, was also instituted (described in FMP section 6.8.6). These closures are designed specifically to mitigate the adverse impacts of fishing on EFH.

Marine protected areas (MPAs) may mitigate adverse impacts of fishing, although these areas may be established with a broader set of objectives. As noted in Groundfish FMP section 6.8.7, the closed areas implemented by Amendment 19 meet the definition for MPAs established by EO 13158. The Amendment 19 EIS [ref] catalogued extant MPAs at that time. Although most MPAs have been established by states in state waters there are also five Federal National Marine Sanctuaries on the west coast that meet the MPA definition.

Table 3-23 summarizes data from the National MPA Center’s MPA Inventory on the areas under MPA management off the west coast by government level and type of restriction. NMFS is shown separately from other Federal agencies, because the EFH closures account for a large proportion of the total area. Excluding closed areas implemented by NMFS, commercial fishing is prohibited in 3% of the remaining areas and fishing is restricted in 36%. Recreational fishing gear, which is predominantly hook-and-line, has modest adverse impacts on EFH.

Table 3-23. West coast MPA area (sq. km.) summarized by fishing restrictions. Source: National MPA Center, March 2013 MPA Inventory, http: //marineprotectedareas.noaa.gov/dataanalysis/mpainventory/.

	NMFS	Other Federal	State	Local	Partnership	Total
Commercial and Recreational Fishing Prohibited		23.2	1,149.5		0.2	1,173.0
Commercial and Recreational Fishing Restricted	14,166.4	8,846.1	1,761.6		26.2	24,800.4
Commercial Fishing Prohibited		1.8	15.8			17.7
Commercial Fishing Prohibited and Recreational Fishing Restricted		44.7	77.8			122.5
Commercial Fishing Restricted	372,170.1	3,828.4	8.9		3.9	376,011.2
Commercial Fishing Restricted and Recreational Fishing Prohibited			27.8			27.8
No Site Restrictions		20,858.7	3,515.7	0.1	49.4	24,423.9
Recreational Fishing Prohibited			1.6			1.6
Recreational Fishing Restricted	655.4		10.9			666.3
Restrictions Unknown		37.0	93.5			130.5
Total	386,991.9	33,640.0	6,663.0	0.1	79.8	427,374.8

The Council and NMFS have also implemented Groundfish Conservation Areas (GCAs) to prevent commercial and, in some cases, recreational vessels from targeting groundfish in areas where catch of overfished groundfish species is likely to be high. These areas do not have EFH mitigation as an objective, nor are they considered MPAs (and are not included in the MPA Inventory described above). However, as an ancillary effect they do mitigate the adverse effects on EFH by prohibiting fishing within their boundaries. The GCAs include two Cowcod Conservation Areas (CCAs) off Southern California and Rockfish Conservation Areas (RCAs) designated for specified gear types. The CCAs have had the same boundaries since they were implemented. Trawl RCA boundaries change periodically during the year and annually since first implemented in 2003. See section xx for a description of this management measure.

In March and April 2013 the Council developed and finalized a recommendation to move the shoreward trawl RCA boundary from 75 to 100 fm between 40°10' and 48°10' N. latitude for Period 2 (March-April). Although such changes are usually considered an “inseason action” that allows an abbreviated rulemaking process, in this case NMFS determined that more detailed analysis and a full (notice and comment) rulemaking was required. A major factor in making this determination was the that there was an area in the Council’s recommendation that would open fishing grounds that had been off limits for a long enough time so that they may have recovered from impacts caused by bottom trawl gear. NMFS provided a draft environmental assessment to the Council at its September 2013 meeting (see Agenda Item G.6.b). The EA evaluated the Council recommendation and a second alternative proposed by NMFS, which modified the recommendation.

3.3.3.3 Fishing Effort

Section 7.4 in the Groundfish FMP identifies reductions in fishing effort as another way to reduce adverse impacts. The assumption is that reduced fishing effort correlates with a decline in the frequency and extent of gear contact with benthic habitat constituting groundfish EFH. Section 7.4 cites various extant measures to limit capacity, "loosely defined as the number, size, and configuration of vessels participating in a fishery." These include state and Federal license limitation programs ("limited entry"), an industry/government permit and vessel buyback program for Federal trawl-endorsed permits implemented in 2003, and the trawl rationalization program, which implemented IFQ management in the shoreside trawl fishery and co-op management in the at-sea whiting fishery. Past Groundfish Harvest Specification EISs and the Amendment 20 EIS describe these programs in detail.

Table 3-24 shows annual counts of vessels landing at least one pound of groundfish by gear type. Coastwide, fixed gear vessel counts have varied between 889 and 744 with a slight downward trend; trawl vessel counts show a clear downward trend from a high of 206 in 2003 to a low of 85 in 2012. A big drop can be seen between 2003 and 2004 when the vessel buyback occurred and after 2010 when the IFQ program was implemented.

Table 3-24. Counts by year, state and coastwide, and gear type of vessels landing at least 1 lb of groundfish (PacFIN vdrfd 1/29/14 using dahl_sector field for groundfish trawl and fixed gear sectors not including at-sea whiting).

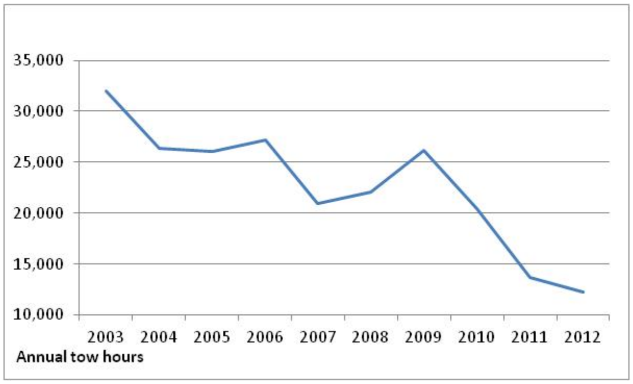
State	Gear Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Washington	Fixed Gear	108	89	112	124	91	68	74	70	84	63
	Trawl	28	19	23	27	25	19	16	19	14	12
Oregon	Fixed Gear	252	226	278	295	267	263	270	240	242	232
	Trawl	103	75	75	81	84	82	85	80	59	60
California	Fixed Gear	541	479	424	479	488	454	458	440	507	487
	Trawl	90	51	52	51	51	45	40	39	24	25
Coastwide	Fixed Gear	883	779	796	889	837	780	793	744	821	775
	Trawl	206	130	132	132	133	129	125	117	87	85

Figure 3-23 shows measures of fishing effort based on trawl tow set and retrieval times and locations recorded in trawl logbooks and available from the logbook subsystem on PacFIN.[28] Tow time (panel a) declined substantially over the time period while tow distance (panel b) shows more fluctuation with a decline in 2011 and 2012. However, CPUE, measured by dividing landings by tow distance, increased after implementation of IFQ management in 2011. It should be noted that some of the inter-annual variations could be based on incomplete reporting in logbooks.[29]

[28] No filters were applied on the records aside from the dates; thus, the totals cover a range of trawl strategies. Using the PacFIN_target field in the lbk_tow table, the most common targets (based on number of tows) are Dover sole, thornyheads, and sablefish individually or combined ("DTS") accounting for 43% of tows in the time period. The second most common strategy, at 15%, is "nearshore mixed," which covers vessels fishing shoreward of the RCA mainly for flatfish. Pacific whiting accounts for 8% of tows and 8% of tows had no target identified. California halibut and ridgeback prawn, nongroundfish targets, accounted for 4% of tows.

[29] An analysis of the tow location fields found that about 2% of the 205,328 tows made in the 2003-2012 period had a zero or null value in one or more of the location fields. An additional 2% or 3,683 records had the same values in the set and retrieval position fields resulting in a zero distance. Non reporting (zero or null values) declined steadily over the period from 4.6% in 2003 to 0.04% in 2012.

a.



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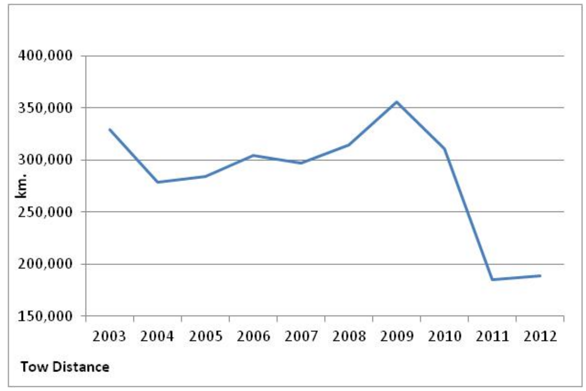

c.

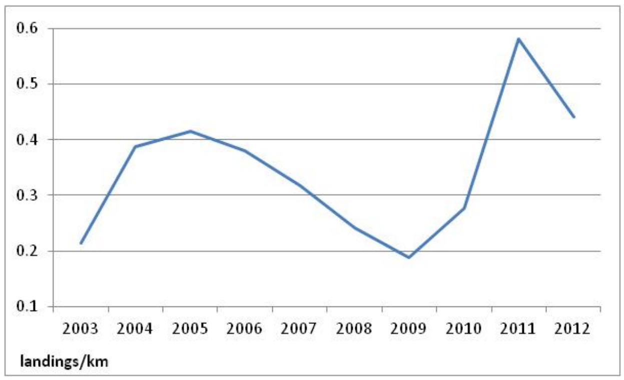

Figure 3-23. a. Total annual tow hours based on set and retrieval times in trawl logbooks. b. Total annual tow distance based on set and retrieval positions (longitude and latitude) in trawl logbooks. c. Annual catch-per-unit-effort in the shoreside groundfish trawl fishery based on tow distance and landings from Groundfish SAFE Table 4.a. (PacFIN, lbk_tow, 1/29/14)

3.6 Protected Species

The term protected species refers to organisms for which intentional or negligent killing, capture, or harm is prohibited under several Federal laws. Incidental *take* of these species in the course of their operations may be allowed under provisions of applicable law.[30] The laws, listed below, include procedures to determine whether these impacts are of sufficient magnitude to require regulatory action to reduce the impact. This section describes protected species that may be encountered in groundfish fisheries in the context of actions and standards pursuant to these laws.

3.6.1 Applicable Law

Protected species are species listed under the ESA, the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA), and EO 13186. See Chapter 6 for further discussion of these laws.

[30] Under the Endangered Species Act take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Take is defined under the Marine Mammal Protection Act as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal" (50 CFR 216.4).

- The ESA protects species in danger of extinction throughout all or a significant part of their range, and mandates the conservation of critical habitat. The ESA defines "species" as a species, a subspecies, or for vertebrates a distinct population. A species is listed as "endangered" if it is in danger of extinction throughout a significant portion of its range and "threatened" if it is likely to become an endangered species within the foreseeable future throughout all, or a significant part, of its range.
- The MMPA guides marine mammal protection and conservation. Stock assessments are conducted annually for strategic stocks and every three years for non-strategic stocks. "Strategic stocks" are those with a human-caused mortality and injury level that exceeds the potential biological removal level (defined as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population…") Marine mammal populations with an abundance that falls below its optimum sustainable level are listed as "depleted." All marine mammal species are protected under the MMPA, regardless of species or stock listings under the ESA.
- The MBTA implements treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the MBTA, it is unlawful to take, kill, or possess migratory birds. In addition, Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, directs Federal agencies to negotiate Memoranda of Understanding with the United States Fish and Wildlife Service (USFWS) that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. All migratory seabird species are protected under the MBTA and EO 13186, regardless of species or stock listings under the ESA.

3.6.2 Species Listed Under the Endangered Species Act

Past groundfish harvest specifications EISs (PFMC and NMFS 2011; PFMC and NMFS 2012) have described ESA-listed species that may be encountered in the Pacific Coast groundfish fishery. ESA-listed species are described in the sections below based on the consultation history for the groundfish fishery.

On December 7, 2012, NMFS released a biological opinion on the effects of the continued operation of the fishery (NMFS 2012) on certain marine species. On November 21, 2012, the U.S. Fish and Wildlife Service released a biological opinion covering the effects of the continued operation of the fishery on short-tailed albatross, marbled murrelet, California least tern, southern sea otter, and bull trout (USFWS 2012). The most recent consultation on the effects of the fishery on ESA-listed salmonids was completed in 2006 and remains current (NMFS 2006).[31] The information in these documents is incorporated by reference.

3.6.2.1 Salmonids Covered by the 2006 Biological Opinion

Table 3-10 in the 2013-2014 groundfish harvest specifications FEIS (PFMC and NMFS 2011; PFMC and NMFS 2012) lists species and evolutionarily significant units occurring in the action area and is reproduced below (**Error! Reference source not found.**). The FEIS also describes the evolutionary significant units (ESUs) potentially affected by the proposed action.

[31] On January 22, 2013, NMFS requested the reinitiation of the biological opinion for listed salmonids to address changes in the fishery, including the trawl rationalization program and the emerging midwater trawl fishery. This consultation is expected to be completed in late 2014 and include the effects of the biennial management process in its scope. At this time the biological opinion for this consultation is not available and its conclusions cannot be described in this EIS.

Table 3-25 Endangered Species Act Status of West Coast Salmon & Steelhead (highlighted ESUs are those subject to the 2006 consultation).

Species/	ESU	Status
Salmon		
Sockeye	Snake rive	Endangered
	Ozette Lake	Threatened
Chinook	**Sacramento River Winter-run**	Endangered
	Upper Columbia River Spring-run	Endangered
	Snake River Spring/Summer -run	Threatened
	Snake River Fall-run	Threatened
	Puget Sound	Threatened
	Lower Columbia River	Threatened
	Upper Willamette River	Threatened
	Central Valley Spring-run	Threatened
	California Coastal	Threatened
	Central Valley Fall and Late Fall-run	Species of Concern
Coho	Central California Coast	Endangered
	Southern Oregon/Northern California	Threatened
	Lower Columbia River	Threatened
	Oregon Coast	Threatened
	Puget Sound/Strait of Georgia	Species of Concern
Chum	Hood Canal Summer-run	Threatened
	Columbia River	Threatened
Steelhead	Southern California	Endangered
	Upper Columbia River	Threatened
	Central California Coast	Threatened
	South Central California Coast	Threatened
	Snake River Basin	Threatened
	Lower Columbia River	Threatened
	California Central Valley	Threatened
	Upper Willamette River	Threatened
	Middle Columbia River	Threatened
	Northern California	Threatened
	Puget Sound	Threatened
	Oregon Coast	Species of Concern

NMFS first consulted under the ESA on the effects of the fishery on listed salmonids in 1990 and reinitiated consultation several times thereafter. The 2006 biological opinion covers certain Chinook salmon ESUs most likely to be affected by the fishery, as listed in Table 3-25.[32] Although other salmon and steelhead species are taken in the fishery, consultations before 2006 determined that the amounts were limited such that further consultation was unnecessary.

The incidental take statement in a 1999 biological opinion identified an expected level of take of 11,000 Chinook salmon per year for the Pacific whiting fishery and 9,000 Chinook salmon for the bottom trawl fishery. Bycatch of other salmonid species is modest so no specified threshold was established for any other salmonid. Consultation under Section 7 of the ESA was reinitiated in 2006, because take exceeded

[32] "An ESU, or evolutionarily significant unit, is a Pacific salmon population or group of populations that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species. The ESU policy (56 FR 58612) for Pacific salmon defines the criteria for identifying a Pacific salmon population as a distinct population segment (DPS), which can be listed under the ESA." Source: http://www.nmfs.noaa.gov/pr/glossary.htm#esu

these estimates in 2005 for the whiting fishery and two out of three years between 2002 and 2004 for the bottom trawl fishery. This resulted in the 2006 supplemental biological opinion evaluating whether additional mitigation measures were needed to prevent the activity from jeopardizing the continued existence of the species (NMFS 2006).

Section 5.1 in the 2007-2008 groundfish harvest specifications FEIS includes a detailed summary of the information in the 2006 biological opinion. Since 2009 the West Coast Groundfish Observer Program has released reports estimating salmonid bycatch in groundfish fisheries. Table 3-26 and Table 3-27 provide summary information from the most recent report available (Al-Humadh, *et al.* 2012). Chinook salmon accounted for 91% of all salmonids caught in groundfish fisheries, 2002-2010. And the Pacific whiting (hake) fishery sectors caught two-thirds of the total. Table 3-28 shows annual catches by fishery sector of Chinook salmon and all other salmonids grouped. (As indicated in Table 3-28 pink salmon comprise almost two-thirds of the non-Chinook salmonids caught in the groundfish fishery.) Since 2005 when Chinook salmon bycatch in the whiting fisheries exceeded the 11,000 fish threshold to reinitiate the ESA Section 7 consultation neither of the incidental take statement levels in the 2006 biological opinion have been exceeded. The 2006 biological opinion expressed NMFS's intent to establish regulatory authority to close nearshore areas to fishing by the shoreside whiting sector as part of the 2007-2008 groundfish biennial harvest specifications. The at-sea whiting fishery employs voluntary measures to minimize Chinook salmon bycatch. Chinook salmon bycatch has fallen substantially over the 2002-2010 period as shown in Figure 3-24 and was 23% of the 2002 value in 2010.

As noted in the 2006 biological opinion, the Pacific whiting fishery sectors are fully observed, either through onboard observers in the at-sea sectors or dockside monitoring in shoreside sectors, where full retention of catch is required.[33] Other groundfish fishery sectors have not had full observer coverage and bycatch must be estimated. However, the groundfish bottom trawl fishery (or shoreside IFQ fishery) has been fully observed beginning in 2010. As noted in the WCGOP report (Al-Humadh, *et al.* 2012), "Point estimates of bycatch fluctuate due to a number of non-biological factors, including annual variation in observer coverage rates, fishing behavior, and various physical characteristics. Currently, it is not possible to fully quantify uncertainty for bycatch estimates presented in this report, as measures of the variability associated with all data sources are not available." And, as noted in the 2006 biological opinion, the distribution of salmon bycatch bycatch in the groundfish trawl fishery is highly skewed; a few tows account for a large fraction of total bycatch. With full observer coverage in the bottom trawl / shoreside IFQ fishery since 2011, uncertainty in bycatch estimates has been reduced. (Almost all bycatch occurs in trawl fisheries.)

Figure 3-25 shows Chinook salmon bycatch in the groundfish bottom trawl fishery by geographic area, season, and depth range for the years 2006-2010 based on data in Table 1 in Al-Humadh et al. (Al-Humadh, *et al.*). (That report presents bycatch estimates by strata that combine these dimensions.) Table 3-28 presents the average bycatch rates for these dimensions for the same period. The highest bycatch rates are for North of Cape Falcon, the winter season, and inside 125 fathoms. Looking at total estimated Chinook salmon bycatch for 2006-2010 by the strata presented in Al-Humadh et al. (2012), the following strata ranked in the top quartile and are listed in ascending order of bycatch here:

- Cape Falcon to Cape Blanco, winter, 125-250 fathoms
- North of Cape Falcon, winter, 125-250 fathoms
- Cape Blanco to Cape Mendocino, winter, 125-250 fathoms
- North of Cape Falcon, winter, 0-125 fathoms
- South of Cape Mendocino, summer, 0-125 fathoms

[33] See section 3.7 for descriptions of the fishery sectors discussed here.

- North of Cape Falcon, summer, 0-125 fathoms

Table 3-26. Summary from Table 5 in Al-Humadh et al. (Al-Humadh, *et al.*) of bycatch by species and fishery sector. (Table 5 caption: Estimated bycatch of salmon (no. of fish) in all U.S. west coast fisheries observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) from 2002-2010, as well as salmon bycatch in shoreside Pacific hake sectors.)

	Non-whiting	Whiting sectors	Total	Percent
Chinook	37,466	51,620	89,086	91%
Chum	51	735	786	1%
Coho	338	1,688	2,026	2%
Pink	2	4,982	4,984	5%
Sockeye	0	4	4	0%
Unspecified	178	351	529	1%
Total	38,037	59,380	97,417	100%
Percent	39%	61%	100%	

Table 3-27. Summary from Table 5 in Al-Humadh et al. (Al-Humadh, *et al.*) of annual bycatch of Chinook salmon and other salmonid species by fishery sector and percent of total bycatch for sector and species. (Table 5 caption: Estimated bycatch of salmon (no. of fish) in all U.S. west coast fisheries observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) from 2002-2010, as well as salmon bycatch in shoreside Pacific hake sectors.)

Species		Sector	Year 2002	2003	2004	2005	2006	2007	2008	2009	2010	Percent Total
Chinook	Non-hake sectors	Limited Entry Trawl	15,626	16,435	1,746	824	61	193	338	305	55	39.9%
		Limited Entry California Halibut	314	120	492	423	107	125	79	0	11	1.9%
		Limited Entry Sablefish Primary	0	0	0	0	0	0	0	0	0	0.0%
		Nearshore	--	62	21	81	20	0	0	24	6	0.2%
	Hake sectors	Non-Tribal Mothership *	713	2,060	388	2,207	1,095	585	226	297	457	9.0%
		Tribal Mothership *	1,010	3,436	3,701	3,909	669	714	158	826	650	16.9%
		Catcher Processor *	959	576	369	1,756	114	736	496	22	257	5.9%
		Shoreside - Tribal **	--	9	50	76	1,271	1,690	539	1,321	28	5.6%
		Shoreside - EFP **	1,062	425	4,206	4,018	839	2,462	1,962	279	2,997	20.5%
Salmonids other than Chinook	Non-hake sectors	Limited Entry Trawl	65	74	107	5	0	13	0	2	27	3.5%
		Limited Entry California Halibut	96	0	0	0	48	0	0	0	0	1.7%
		Limited Entry Sablefish Primary	0	3	0	2	0	4	0	0	0	0.1%
		Nearshore	0	0	29	0	0	4	13	23	54	1.5%
	Hake sectors	Non-Tribal Mothership *	90	198	28	94	106	251	35	55	8	10.4%
		Tribal Mothership *	75	3,968	227	738	27	9	0	19	6	60.8%
		Catcher Processor *	83	21	25	60	10	180	66	0	6	5.4%
		Shoreside - Tribal **	0	0	0	0	0	619	41	178	0	10.1%
		Shoreside - EFP **	0	0	0	0	0	301	38	172	26	6.4%

* = A-SHOP

** = numbers from annual NWR reports

Dashes (--) signify years when the fishery/sector was not observed, or data were not available. (Note that because the panel for salmonids other than Chinook sums original values for several species, instances of non-observation are not represented.)

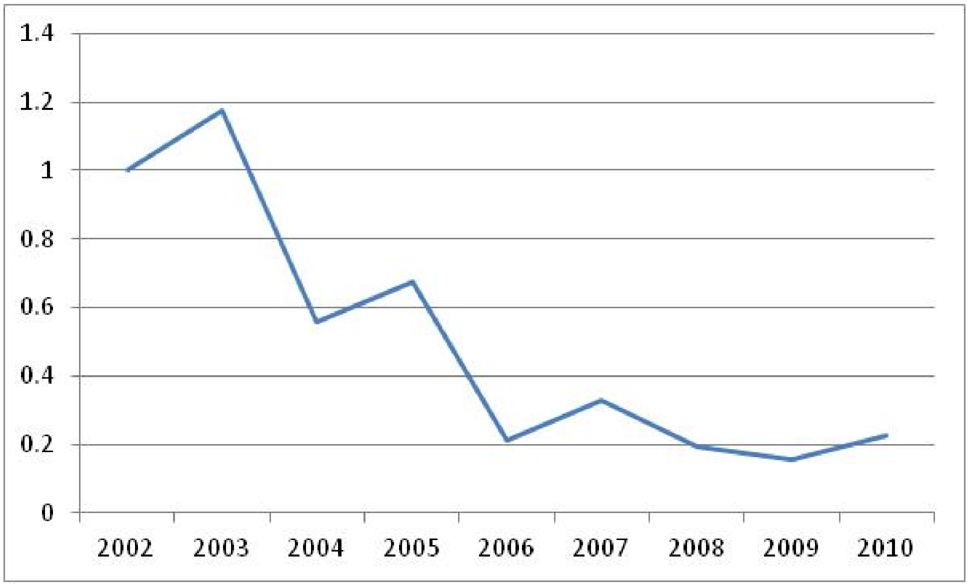

Figure 3-24. Relative change in Chinook salmon bycatch in groundfish fisheries, 2002-2010. 2002 = 1. (Source: Al-Humadh, *et al.*, Table 5)

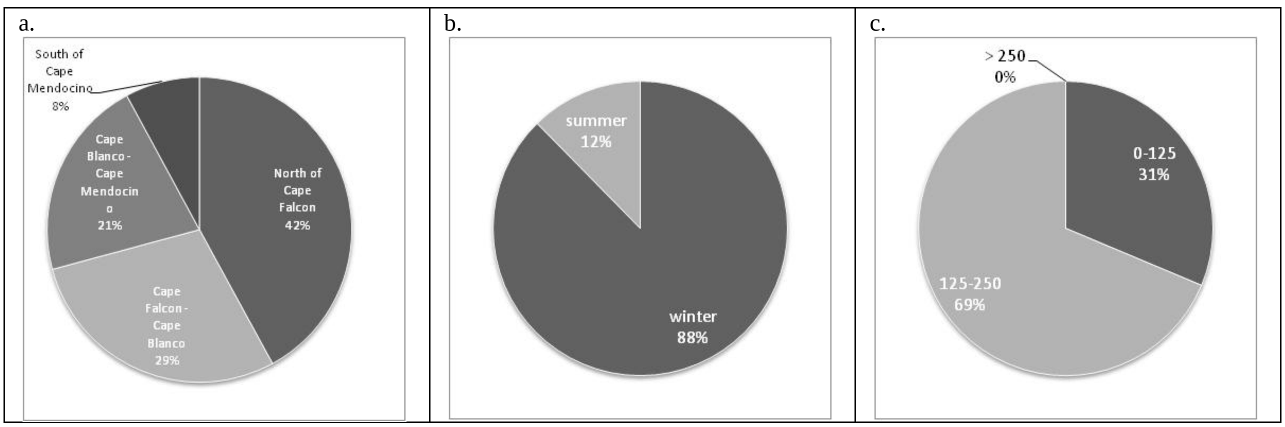

Figure 3-25. Chinook salmon bycatch in the groundfish bottom trawl fishery, 2006-2010, by a. geographic area, b. season, and c. depth (fathoms). (Source: Al-Humadh, *et al.*, Table 1)

Table 3-28. Average bycatch rate (no. fish / mt of observed groundfish) of Chinook salmon in the groundfish bottom trawl fishery by area, season, and depth (fathoms), 2006-2010. (Source: Al-Humadh, *et al.*, Table 1)

Area		Season		Depth	
North of Cape Falcon	0.037	winter	0.028	0-125	0.0361
Cape Falcon - Cape Blanco	0.007	summer	0.005	125-250	0.0130
Cape Blanco - Cape Mendocino	0.007			> 250	0
South of Cape Mendocino	0.015				

3.6.2.2 Species Covered by the 2012 NMFS Biological Opinion

Section 1.2 in the most recent biological opinion (NMFS 2012) describes the past ESA Section 7 consultations on the continued operation of the Pacific Coast groundfish fishery.[34] Among other sources, this biological opinion used a biological assessment completed in mid-2012 by NMFS NWR SFD {NMFS, 2012 biological assessment} and a risk assessment drafted by the NMFS NWFSC in early 2012 {NMFS, 2012, risk assessment}. Based on this information, and previous interactions observed in the Pacific Coast groundfish fishery, NMFS PRD determined that the fishery is likely to likely to adversely affect the following listed species and critical habitat:

- Eulachon (*Thaleichthys pacificus*)
- Green sturgeon (*Acipenser medirostris*) and their critical habitat
- Humpback whales (*Megaptera novaeangliae*)
- Steller sea lions (*Eumetopias jubatus*)[35]
- Leatherback sea turtles (*Dermochelys coriacea*) and their critical habitat

The following ESA-listed species occur in the fishery management area but NMFS SFD determined that the fishery is not likely to adversely affect them or their critical habitat:

- Green sea turtles (*Chelonia mydas*)
- Olive ridley sea turtles (*Lepidochelys olivacea*)
- Loggerhead sea turtles (*Caretta caretta*)
- Sei whales (*Balaenoptera borealis*)
- North Pacific right whales (*Eubalaena japonica*)
- Blue whales (*Balaenoptera musculus*)
- Fin whales (*Balaenoptera physalus*)
- Sperm whales (*Physter macrocephalus*)
- Southern Resident killer whales (*Orcinus orca*)
- Guadalupe fur seals (*Arctocephalus townsendi*)
- Critical habitat of Steller sea lions.

Section 3.1.4 in the 2013-14 Groundfish Harvest Specifications FEIS includes short descriptions of the adversely affected species and these descriptions are summarized below. Section 2.2 in the current biological opinion describes the status of species and critical habitat subject to the consultation. Section 2.11 describes the rationale for reaching a "not likely to adversely affect" determination for the species listed above.

Section 2.1 in the current biological opinion describes the methods used to determine the effects of the Pacific Coast groundfish fishery with respect to two standards found in the ESA: whether the fishery is likely to "jeopardize the continued existence of a listed species" or result in "destruction or adverse modification" of critical habitat. "To jeopardize…" is defined in regulations as "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival

[34] NMFS PRD also consulted on the operation of the fishery for 2012 only (PFMC and NMFS 2011). That biological opinion found effects consistent with those described in the current biological opinion.

[35] The eastern DPS of Stellar sea lions (the population segment occurring in the action area) was removed from the list of threatened species under the ESA on November 4, 2013 (78 FR 66140). Therefore, Federal agencies will no longer need to consult with NMFS under Section 7 of the ESA regarding actions that may affect the eastern DPS of Stellar sea lions. Protections under the MMPA would continue, however.

and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Destruction or adverse modification of critical habitat was evaluated based on provisions in the ESA as interpreted by the agency.[36] These methods were applied to eulachon, green sturgeon (and critical habitat), humpback whales, Stellar sea lions, and leatherback sea turtles (and critical habitat), the species and critical habitat where preliminary findings suggested that the proposed action is likely to have an adverse effect.

Based on the analysis, NMFS PRD documented the effects of continued operation of the Pacific Coast groundfish fishery on species and habitat. These finding are summarized below.

3.6.2.2.1 Eulachon – Southern DPS (Threatened)

Because catches are not concentrated in a particular area or population components, the fishery is not expected to "have a measureable effect on the species' structure or diversity." The action affects species abundance and potentially population productivity. Productivity is a concern, because of the substantial decline in spawner abundance over the last 20 years. The cumulative effect, as characterized in the biological opinion, of climate change and modification of freshwater habitat contribute to this decline. Based on conservative assumptions about species abundance, the fishery is expected to "take 0.0052 percent of the estimated eulachon population and overall [account for] less than 0.1 percent of the total bycatch from U.S. fisheries." In conclusion "The level of take expected for the proposed action is therefore so small that we do not anticipate it would have any notably deleterious effect on the species, nor would it add materially to the ongoing effects already occurring in the action area."

An informal consultation on eulachon was initiated on January 21, 2013. NMFS considered whether the 2012 opinion should be reconsidered for eulachon in light of new information from the 2011 fishery and the proposed chafing gear modifications and determined that information about the eulachon bycatch in 2011 and chafing gear regulations does not change the extent of effects of the action, or any other basis to require reinitiation of the December 7, 2012 biological opinion. Therefore, the December 7, 2012 biological opinion meets the requirements of section 7(a)(2) of the ESA and implementing regulations at 50 CFR 402 and no further consultation is required.

3.6.2.2.2 Green Sturgeon – Southern DPS (Threatened)

The biological opinion's assessment focuses on the Southern DPS of green sturgeon. The Pacific Coast groundfish fishery is not likely to further restrict the geographic distribution of green sturgeon along the coast or extent of spawning habitat in freshwater rivers. Southern DPS green sturgeon are at moderate to high risk of extinction because of the low estimated abundance of adults, and historically fisheries have been the primary source of mortality. Based on available data, fisheries other than the federally-managed groundfish fishery are estimated to incidentally capture 1,219 to 1,512 Southern DPS green sturgeon (adults and subadults) per year. This represents 20 to 69 percent of the total subadult and adult population, depending on the estimate of abundance used (2,188-6,250 subadults and adults, combined). It is estimated that fisheries for which no data are available account for the annual removal of an additional 1 to 4 percent of the population. Based on population models, these fisheries (excluding the Federal groundfish fishery) may be affecting the continued survival and recovery of Southern DPS green sturgeon. Green sturgeon take in the Pacific Coast groundfish fishery, when considered within the context of these sources of mortality and other cumulative effects, results in a comparatively small increase in the mortality imposed on the subadult and adult population. The majority of the green

[36] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

sturgeon incidentally caught in the fishery is expected to be released alive and to survive. In most years mortality due to the groundfish fishery would be low (0.03 to 0.09 percent of the total subadult and adult population). In the worst case (not expected to occur more than 2 years within a period of 9 years), mortalities would account for 0.1 to 0.3 percent of the total subadult and adult population. In summary, the lack of substantial impacts on the Southern DPS green sturgeon based on the low expected sublethal and lethal impacts of the fishery supports the conclusion that the proposed fishing will not appreciably reduce the likelihood of survival and recovery of the species.

With respect to critical habitat for green sturgeon, prey resources within the action area may be affected by non-point source and point source discharges, oil spills, dredged material disposal activities, renewable ocean energy installations, low oxygen “dead zones,” bottom-trawl fishing activities, and climate change. These activities and factors may also affect water quality and migratory corridors for green sturgeon. Although use of bottom-trawl gear may disturb benthic habitats and remove prey resources, existing gear restrictions provide a measure of protection for green sturgeon critical habitat. In addition, the expected effects of the proposed fishing on the prey resources are likely to be low given the opportunistic feeding behavior of green sturgeon and the likely dynamic nature of benthic prey. The low expected impacts to green sturgeon prey resources supports the conclusion that the Pacific Coast groundfish fishery is not likely to reduce the value of designated critical habitat for the conservation of Southern DPS green sturgeon.

3.6.2.2.3 Humpback Whale (Endangered)

Humpback whales are found in all oceans of the world. For management under the MMPA, stocks of humpback whales are defined based on feeding areas, with the whales feeding off California, Oregon, and Washington currently considered one stock. The most recent population estimate of humpback whales in the North Pacific Ocean is 21,808 (CV=0.04). The most recent estimated abundance of the CA/OR/WA feeding stock is 2,043 whales (CV=0.10), with a minimum population estimate of 1,878 whales. The maximum expected rate of annual increase for the species as a whole ranges from an estimated 7.3 to 8.6 percent, with a maximum plausible rate of 11.8 percent annually. North Pacific populations as a whole grew by an estimated 6.8 percent annually over the period from 1966 to 2006. The annual growth rate for the CA/OR/WA feeding stock is estimated at 7.5 percent. The Pacific Coast groundfish fishery affects the CA/OR/WA feeding stock, within the context of effects to the globally-listed species. Occurrence of the CA/OR/WA feeding stock overlaps the most with the spatial extent of the groundfish fixed gear fishery. There is uncertainty about the number of past entanglements attributed to fixed gear fishing, but based on precautionary assumptions NMFS PRD estimated that an average of 0.89 humpback whales may be injured or killed by the Pacific Coast groundfish fishery, annually.

The MMPA identifies the concept of potential biological removal (PBR) in assessing the effects of mortality on marine mammal stocks (see further discussion below). Based on the portion of the stock occurring in the west coast EEZ at any given time, PBR within the action area is estimated at 11.3 whales. On average, NMFS PRD estimated that 7.19 human-caused serious injuries or mortalities of CA/OR/WA humpback whales are likely to occur annually. This annual average is below the current PBR. Based on past annual variability, the average estimate likely will be exceeded in some years, up to a maximum of 16.25 injuries or mortalities in a single year. However, on average human-caused humpback injuries and mortalities will be below PBR allowing the stock to grow toward its optimum sustainable population level.

NMFS PRD also evaluated effects with respect to the potential change in the rate of population increase. It concluded that the population growth rate will decrease by approximately 0.04 percent due to groundfish fishing and by approximately 0.37 percent from all human sources, including groundfish fishing. Based on food-web modeling, trophic effects of the Pacific Coast groundfish fishery will likely be minor and in fact may positively affect the abundance of krill (prey of humpback whales) through removal of predators.

Because of uncertainty in the estimates of fishery-caused serious injury/mortality two other methods for estimating the maximum mortality rate potentially imposed by all West Coast fisheries were examined {NWFSC, 2012 risk analysis}. These methods result in estimates of 61 and 88 whales killed annually. The biological opinion discusses reasons to conclude these estimates are implausibly high.

NMFS PRD concluded that impacts of the Pacific Coast groundfish fishery, when combined with other human sources of serious injury/mortality, are not likely to substantially reduce the population abundance or the growth trend of the stock. The lack of substantial impacts on the CA/OR/WA humpback whale stock combined with the increasing population trend for this listed entity supports the conclusion that the proposed fishing will not reduce appreciably the likelihood of both survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution.

The incidental take statement (ITS) for humpback whales in the current biological opinion was conditional on the issuance of a permit to authorize the incidental, but not intentional, taking of individuals pursuant to MMPA section 101(a)(5)(E). This permit was issued on September 4, 2013 (78 FR 54553) based on a Negligible Impact Determination (NID) as required by the MMPA. Therefore, the ITS for CA/OR/WA humpback whale stock is now valid.

Pursuant to the MMPA the WA/OR/CA sablefish pot fishery is listed as a Category II fishery, because of interaction with humpback whales. (See Section 3.6.3 for an explanation of these MMPA fishery categorizations.)

3.6.2.2.4 Steller Sea Lions (Delisted)

The eastern DPS of Steller sea lions is a single population that ranges from southeast Alaska to southern California, including inland waters of Washington State and British Columbia. The total population estimate is a range between 58,334 and 72,223 sea lions, with a minimum population estimate of 52,847 sea lions. The population has increased at a rate of approximately 3.1 percent in recent decades. Methods, as described above for humpback whales, were used to assess the effects of the Pacific Coast groundfish fishery on the eastern DPS of Steller sea lions.

NMFS PRD estimated that on average 13.88 Steller sea lions would be seriously injured or killed incidental to groundfish fishing, annually. When added together, NMFS PRD estimated a total of 60.55 sea lions seriously injured or killed annually from fisheries bycatch, including fishing in the Pacific Coast groundfish fishery. When combined with the estimate from Allen and Angliss {Angliss, 2012} for other sources of injury or mortality of 15.2, the total is 75.75 sea lions per year. The PBR for this DPS is 2,378 sea lions. The estimated number of all human-caused serious injuries and mortalities anticipated to occur in future years from all sources, including the proposed fishing, is approximately 3.19 percent of the PBR. Based on food-web modeling, NFMS PRD also concluded that trophic effects of the Pacific Coast groundfish fishery will be minor. The serious injury/mortality estimate results in a decrease in the population growth rate of about 0.03 percent due to groundfish fishing and by approximately 0.14 percent from all human sources including the groundfish fishery.

Based on the evaluation, NFMS PRD concluded that impacts of groundfish fishing, in addition to other human sources, are not likely to substantially reduce the population abundance or trend. The lack of substantial impacts on the eastern DPS combined with the increasing population trend for this listed entity supports the conclusion that the groundfish fishery will not reduce appreciably the likelihood of both survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution.

Subsequent to conclusion of this consultation NMFS removed the eastern DPS of Stellar sea lions from the list of threatened and endangered species under the authority of the ESA. This delisting became effective December 4, 2013 (78 FR 66140). Section 3.6.3 discusses past and present impacts of the groundfish fishery on non-ESA listed marine mammals. However, since the 2012 NMFS biological opinion contains information relevant to evaluating impacts, the eastern DPS of Stellar sea lions is discussed here.

3.6.2.2.5 Leatherback Sea Turtles (Endangered)

Leatherback sea turtles face a variety of threats depending on the region in which they occur; they are widely distributed across the oceans of the world. Identified threats in the marine environment include direct harvest, debris entanglement and ingestion, fisheries bycatch, and boat collisions, among other threats. In the Pacific Ocean, nesting aggregations occur in the eastern Pacific (primarily in Mexico and Costa Rica) and in the western Pacific (primarily Indonesia, the Solomon Islands, and Papua New Guinea). Leatherbacks that occur within the action area are most likely to originate from nesting aggregations of the western Pacific. The abundance of leatherback sea turtles is currently unknown; however, the most recent global estimate for nesting females is 34,500 turtles. The trend for the western Pacific subpopulation has been declining over the past four decades; however, estimates of breeding females slightly increased from 2000 to 2007 (2,700 to 4,500 turtles in 2007 compared to 1,775 to 1,900 turtles in 2000), although this is likely due to additional nesting sites that were not previously factored into the estimate {Dutton, 2007}. Given recent monitoring over the last few years, however, the trend continues to decline (C. Fahy, pers. comm., NOAA Fisheries SWR, July 18, 2012, as cited in NMFS 2012). NMFS PRD concluded that 0.38 turtles would be killed annually due to groundfish fishing and a total of 5.82 turtles killed due to all activities occurring in the action area. Given that the anticipated mortality attributed to the proposed fishing is less than one turtle per year on average and no more than one turtle in a single year, the groundfish fishery is likely to result in a very small increase to the level of mortality already authorized for the species both inside and outside of the action area.

In addition to the direct and indirect effects to the species, the proposed fishing is likely to result in some bycatch of jellyfish, which will reduce prey availability in critical habitat. However, based on the general predicted pattern of food-web modeling, it is unlikely that the conservation value of critical habitat will be substantially impacted by food-web interactions caused by the groundfish fishery.

NMFS PRD concluded that groundfish fishing contributes a very small additional impact to those of other human sources. It also concluded that the conservation value of critical habitat will not be substantially impacted. In conclusion, effects of the groundfish fishery, when combined with effects of other human sources in the action area, are not anticipated to result in an appreciable change to the population abundance or trend. A lack of an appreciable change in population abundance or trend supports the conclusion that the Pacific Coast groundfish fishery will not appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution. Likewise, a lack of substantial impact on the conservation value of critical habitat supports the conclusion that the proposed fishing will not adversely modify critical habitat.

3.6.2.2.6 Incidental Take Statement

The current biological opinion contains an incidental take statement, or ITS. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The ITS is a formal statement of the estimated take of a listed species within a defined time period and is connected to provisions in the ESA that allow takes incidental to an otherwise lawful agency action, if the action is performed in compliance with the terms and conditions of this incidental take statement. Based on analysis in the biological opinion, take at or below this level has been determined not to cause "jeopardy." Actual takes that exceed the level identified in the ITS are a basis for reinitiating the section 7 consultation, which entails a new analysis of "jeopardy" or adverse habitat modification and new terms and conditions for the continuation of the proposed action. The ITS in the current biological opinion is summarized below.

- Incidental take of **southern DPS eulachon** occurs as a result of bycatch and handling in the fisheries, or mortalities resulting from encounter with fishing gear, as a consequence of fishing activity. Take of eulachon in the proposed action is expected to not exceed 1,004 fish per year. This take is expected to occur in the limited groundfish bottom trawl (shoreside IFQ) and at-sea hake (Pacific whiting) fisheries.
- Under the proposed action, incidental take of **Southern DPS green sturgeon** because of bycatch and handling in the fishery is not expected to exceed 28 fish per year; however, incidental take could be higher in some years. Therefore, this take statement allows for incidental take of up to 86 Southern DPS green sturgeon per year in no more than 2 years within a period of 9 consecutive years.
- Incidental take of **humpback whales** occurs as a result of entanglement with fishing gear, as a consequence of fishing activity. This take is expected to occur in the sablefish pot/trap fishery. The incidental take limit for humpback whales is a 5-year average of 1 humpback whale injury or mortality per year, and up to 3 humpback whale injuries or mortalities in any single year.
- Incidental take of **Steller sea lions** occurs as a result of entanglement with fishing gear as a consequence of fishing activity. This take is expected to occur in limited entry trawl (shoreside IFQ) and at-sea hake (Pacific whiting) fisheries. The incidental take limit for Steller sea lions is a 5-year average of 14 Steller sea lion injuries or mortalities per year, and up to 45 Steller sea lion injuries or mortalities in a single year.
- Incidental take of **leatherback sea turtles** occurs as a result of entanglement with fishing gear as a consequence of fishing activity. This take is expected to occur in the sablefish pot/trap fishery. The incidental take limit for leatherback sea turtles is a 5-year average of 0.38 leatherback sea turtle injury or mortality per year, and up to 1 leatherback sea turtle injury or mortality in a single year.

3.6.2.2.7 Reasonable and Prudent Measures, Terms and Conditions

Terms and conditions implement reasonable and prudent measures (50 CFR 402.14), both of which are described in the current biological opinion. These must be carried out for the exemption to the general ESA prohibition of take resulting from the consultation to apply. The current biological opinion enumerated reasonable and prudent measures and associated terms and conditions as summarized here:

- NMFS establishes a Pacific Coast Groundfish and Endangered Species Workgroup (PCGW) in cooperation with the USFWS and the Council. The PCGW will meet at least biennially to develop recommendations on methods for monitoring take and additional mitigation measures as needed. The PCGW has been organized as a Council committee and held its first meeting in November 2013.
- NMFS will analyze available data to detect changes in fishing effort by gear type as a consequence of implementation of the shoreside IFQ program and biennially report results. The PCGW will provide recommendations on the design of the analysis.
- The WCGOP will provide summaries of observed takes of the species considered in the biological opinion, and NMFS will report fleet-wide estimates of total take biennially. WCGOP will immediately report takes of leatherback sea turtles as well as any opportunistically observed whale or sea turtle entanglements.

- As appropriate, the NWFSC will update the risk assessment {NWFSC, 2012 risk assessment}.

3.6.2.3 Species Covered by the 2012 USFWS Biological Opinion

In 2011 a short-tailed albatross was observed killed in operations of a sablefish longline vessel. On July 30, 2012, at the request of NMFS, USFWS initiated a formal section 7 consultation on the effects of continued operation of the Pacific Coast groundfish fishery on the ESA-listed species enumerated above at the beginning of section 3.6.2. In the consultation USFWS concurred with NMFS's conclusion {2012 biological assessment} that operation of the Pacific Coast groundfish fishery is not likely to adversely affect marbled murrelet, California least tern, southern sea otter, bull trout or bull trout critical habitat. Therefore, the Section 7 consultation and biological opinion focused on the effects of the fishery on short-tailed albatross. Prior to the conclusion of the consultation the Council was notified that USFWS would include in the terms and conditions that NMFS establish regulations requiring the use of streamer lines on commercial groundfish longline vessels 55 feet in length or greater. The current biological opinion (USFWS 2012) was published on November 21, 2012. In November 2013, the Council took final action to recommend a regulatory package to implement the streamer line requirement (USFWS).

In the 19th and early 20th centuries the short-tailed albatross population was decimated by hunting for feathers, oil, and fertilizer. By 1949 no breeding pairs were observed and the species was thought to be extinct. Subsequently, breeding colonies were found on two small volcanic islands in the western Pacific.[37] The population has been recovering since the 1950s. A third breeding colony is being established on another volcanic island through translocation of chicks. A breeding pair successfully hatched and reared a chick on Midway Island in 2011 and 2012, suggesting that a breeding colony may eventually establish there as well. With recovery, short-tailed albatross's foraging range has been reestablished and in recent years they have reappeared with more regularity in the west coast EEZ. Short-tailed albatross prefer foraging area over the continental shelf where food resources are more abundant. Population growth and habitat preference has increased its vulnerability to the Pacific Coast fisheries and other anthropogenic effects in the action area.

The USFWS's recovery plan for short-tailed albatross {USFWS, 2008} lists the following criteria for delisting the species:

- The total breeding population of short-tailed albatross reaches a minimum of 1,000 pairs; (population totaling 4,000 or more birds); AND
- The 3-year running average growth rate of the population as a whole is ≥6% for ≥7 years; AND
- At least 250 breeding pairs exist on two island groups other than Torishima [one of the two original breeding colony sites], each exhibiting ≥6% growth for ≥7 years; AND
- A minimum of 75 pairs occur on a site or sites other than Torishima and the Senkaku [the two original breeding colony sites]

As of the 2011-12 breeding season, the population is estimated at 3,441 birds and 851 breeding pairs. The population growth rate is estimated at about 6.5%.

Injury and mortality occurs primarily in longline fisheries. Birds dive on baited hooks as they are deployed during fishing operations. They may become hooked, pulled underwater, and drown or otherwise be injured or killed when interacting with the gear in this fashion.

[37] Both breeding sites, Torishima Island and the Senkaku Islands, are under the jurisdiction of Japan, although China and Taiwan dispute the claim to the Senkaku Islands. Eighty to eighty-five percent of the breeding population is estimated to breed on Torishima Island.

In the biological opinion, USFWS describes the risk assessment methodology used in the NMFS biological assessment to estimate annual mortality of short-tailed albatross due to the operation of the Pacific Coast groundfish fishery. In the risk assessment the occurrence of black-footed albatross, a closely related species, was used as a surrogate to evaluate injury and mortality, because short-tailed albatross interactions are too rare to derive meaningful statistics. Essentially, the risk assessment scales WCGOP estimates of black-footed albatross mortality in the fishery based on the relative size of the two species' populations. Adjustment factors are included in the equation to account for unobserved mortality ("dropoff") and differences in the distribution of the two species relative to the action area considered in the biological opinion.[38] The resulting groundfish fixed gear (longline) mortality estimate is 0.8 birds per year. The risk assessment includes a sensitivity analysis based on uncertainty in the WCGOP mortality estimates and alternative dropoff rates. This produced a range of annual mortality rates between 0.3 (0% dropoff rate, lower 90% confidence interval on WCGOP estimate) and 1.9 (45% dropoff rate, upper confidence interval on WCGOP estimate). Although unquantified in the sensitivity analysis, it is noted that these estimates could be biased by uncertainty about actual exposure of short-tailed albatross to the groundfish fishery (i.e., occurrence in the action area considered in the biological opinion) and unknown differences in black-footed and short-tailed albatross behavior that could affect vulnerability to the gear. The biological opinion concludes that the estimated mortality of ~1 short-tailed albatross per year will not appreciably affect the population growth rate.

The biological opinion ITS is one short-tailed albatross per year due to continued operation of the Pacific Coast groundfish fishery (including both fixed gear and trawl). The take limit will be calculated based on an average of no more than two birds in any two-year period to accommodate inter-annual variation. The extent of future take will be assessed using documented takes of short-tailed albatross and estimates of interactions with the surrogate species (black-footed albatross) based on observer reports.

Terms and conditions in the opinion include NMFS implementing regulations to require the use of streamer lines on commercial longline vessels in the Pacific Coast groundfish fishery and establishing the Pacific Coast Groundfish and Endangered Species Workgroup also mandated by the NMFS biological opinion described above. As noted above, the development of a regulatory package occurred in the Council process. At its November 2013 meeting the Council adopted a preferred alternative from a range evaluated in a draft EA (USFWS). The preferred alternative requires streamer lines be deployed during setting operations on commercial fixed gear vessels 55 feet or greater in length with a safety exception in the event of rough weather, which would be triggered by a National Weather Service forecast of a gale wind warning.[39]

3.6.3 Marine Mammals not Listed under the Endangered Species Act

The MMPA requires all commercial fisheries to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals in the fishery:

- Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing;
- Category II designates fisheries with occasional serious injuries and mortalities;
- Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities.

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[38] A complete description of the methodology can be found on pages 24-28 of the biological opinion (USFWS).

[39] Section 1.2 in NMFS {short-tailed albatross EA} describes the elements of streamer lines. They are deployed above the groundline as it is paid out from the vessel and creates "a moving fence around the sinking groundline reducing or eliminating bird interactions."

Annually NMFS Office of Protected Resources publishes an updated List of Fisheries with these categorizations. NMFS published the final 2014 List of Fisheries on March 14, 2014 (79 FR 14418). The WA/OR/CA sablefish pot is a Category II fishery; all other groundfish fisheries are Category III.

As discussed above, potential biological removal, PBR, is used to assess the effects of human-caused incidental mortality under the MMPA. PBR represents the maximum level of human-caused mortality a stock can sustain and still have a high likelihood of achieving its optimum sustainable population level. PBR is calculated as N_{min}* 0.5 R_{max} * F, where N_{min} is the minimum current population size, R_{max} is the maximum annual rate of increase for the species or stock, and F is a recovery factor that ranges from 0.1 to 1 depending on the conservation status of the stock {Barlow 1995}. PBR is reported in stock assessment reports and the most recent estimates of PBR can be found in Carretta et al. {2012}.[40]

Table 3-29 shows non-ESA listed marine mammal stocks with observed interactions in groundfish fisheries. Stock definitions, PBR estimates, and estimates of human-caused and fishery-caused serious injury / mortality are taken from Caretta, et al. {Carretta 2012}. (The fishery component is a subset of all human-caused serious injury / mortality.) Stock assessment reports include a breakdown of serious injury / mortality by fishery based on observer information. As noted in the table footnote, where no estimate for groundfish fisheries is reported, but there is an estimate based on stranded animals, that is reported under the groundfish fishery column. Note that in most cases the stock assessment report data are presented as minimum estimates. The table also includes observed interactions and estimates of annual average interactions using WCGOP and A-SHOP (At-Sea Hake Observer Program) data reported in Jannot, et al. {Jannot 2011}.[41] Overall take could only be estimated from observed interactions for three species; California sea lion, harbor seal, and northern elephant seal. This information is used to assess past effects of groundfish fisheries.

Table 3-30 is similar in format but reports remaining non-ESA listed species occurring in the fishery management area but with no observed interactions in the Pacific Coast groundfish fishery. Since there are no observer interactions, the groundfish fishery column shows estimates based on strandings, if reported. These observations could not be attributed to any particular fishery.

Estimates of total human-caused serious injury / mortality are below the PBR for all these stocks. Minimum estimates of fishery-caused serious injury / mortality is less than 1% of the PBR for most of the stocks. The California sea lion stock, the Monterey harbor porpoise stock, the Washington inland waters harbor porpoise stock, Pacific white-sided dolphin stock, and both common dolphin stocks have fractions between 1% and 10% of PBR. The average annual mortality estimate for California sea lion derived from Jannot et al. is greater than the estimate from all fisheries from the stock assessment report but is still a small fraction of the large PBR for this stock. These data suggest that mortality of non-ESA listed marine mammal stocks occurring in the fishery management area caused by the operation of the Pacific Coast groundfish fishery will not prevent these stocks from reaching their optimum sustainable population level.

Observed takes reported in Jannot et al. {2011} break down by fishery sector / gear type as follows:

- California sea lion: Shoreside groundfish trawl, California halibut trawl, non-nearshore fixed gear sablefish, nearshore fixed gear, at-sea hake (Pacific whiting)[42]
- Harbor seal: California halibut trawl, non-nearshore fixed gear sablefish, nearshore fixed gear, at-sea hake (Pacific whiting)

[40] Marine mammal stock assessment reports are available at http://www.nmfs.noaa.gov/pr/sars/region.htm.
[41] Jannot et al. {2011} report estimated takes by year. These values are averaged in Table 3-27 to derive the annual estimate.
[42] California halibut trawl is a state managed fishery and only subject to the proposed action with respect to catch accounting to ensure that ACLs are not exceeded.

- Northern elephant seal: Shoreside groundfish trawl, California halibut trawl, non-nearshore fixed gear sablefish, at-sea hake (Pacific whiting)
- Harbor porpoise: California halibut trawl
- Dall’s porpoise: At-sea hake (Pacific whiting)
- Pacific white-sided dolphin: Shoreside groundfish trawl
- Risso’s dolphin: Shoreside groundfish trawl
- Common bottlenose dolphin: Non-nearshore fixed gear

Animals may interact with the gear or the vessel in a variety of ways. Interactions and takes are a function of gear type and co-occurrence of fisheries and species. Anderson, et al. {2008} present criteria for classifying marine mammal fishery interactions with respect to serious injury. These criteria are with respect to hook-and-line gear (or entanglement in lines associated with gear without hooks, such as pot / trap gear). Marine mammals may be hooked externally, in the mouth region, or ingest the hook. They can also become entangled in the gear. In trawl fisheries the animal is more likely to be caught by the gear and become injured or drown. Large cetaceans are less likely to incur serious injury from hooks but gear entanglement can lead to serious injury in a variety of ways.

Large cetaceans have not been observed directly interacting with the gear in groundfish trawl fisheries. However, a 1997 paper (Fertl and Leatherwood 1997), reviewed global data and found that interactions do occur. These interactions are result of overlap between areas of high prey density for cetaceans and productive fishing areas. Furthermore, cetaceans may be attracted to trawls if fishing operations enhance prey opportunity or because of discards. Most of the interactions documented in this paper are between fishing vessels and various species of dolphins, like those listed above. Minke, humpback, and fin whales are the large cetacean species documented in this paper. Cetaceans are more often caught in midwater gear compared to bottom trawl, because this gear type more often targets pelagic species of interest to cetaceans, are towed at high speeds, and are large.

Saez, et al. {2013} report results of a fishery-large cetacean co-occurrence model for the west coast EEZ. The large cetaceans evaluated are blue whales, fin whales, gray whales, humpback whales, and sperm whales. Gray whales are not listed under the ESA. The gray whale migration is generally very near to shore, crossing through a variety of anthropogenic threats, including fixed-gear fisheries. Sablefish longline and trap occur farther offshore than migrating gray whales and subsequently pose generally lower entanglement risk. However they are considered high risk fisheries considering all whale species, especially in central and northern California.

Table 3-29. Non-ESA listed marine mammal stocks occurring in the fishery management area with observed interactions by the West Coast Groundfish Observer Program and At-sea Pacific Whiting Observer Program, 2002-2009.

Species	Stock Area	PBR	Annual Mortality + Serious Injury	Fishery Annual Mortality + Serious Injury	2012 SAR Estimate of Groundfish Fishery Mortality + Serious Injury	WCGOP Total Observed 200-09	WCGOP Average Annual Fishery Estimate, 2002-09	WCGOP Average Annual Fishery Estimate, 2002-09 - Upper CI
California sea lion	U.S.	9,200	≥431	≥337	34.6	98	43.125	102.125
Harbor seal	California	1,600	31	18	6.4	10	4.57*	12*
Harbor seal	Oregon/Washington Coast	unk	≥3.8	≥1.8				
Harbor seal	Washington Inland Waters	unk	≥13.0	>3.8				
Northern Elephant Seal	California breeding	4,382	≥10.4	≥8.8	0.8	16	2.29*	3.86*
Harbor porpoise	Morro Bay	15	0	0	0	1		
Harbor porpoise	Monterey Bay	10	≥1.0	≥1.0	≥1.0†			
Harbor porpoise	San Francisco – Russian River	67	0	0	0			
Harbor porpoise	Northern CA/Southern OR	577	≥4	≥4	≥0.8†			
Harbor porpoise	Northern Oregon/Washington Coast	114	≥1.4	≥1.4	≥1.4†			
Harbor porpoise	Washington Inland Waters	63	≥2.2	≥2.6	0			
Pacific white-sided dolphin	California/Oregon/Washington	193	15.1	10.5	2.1	1		
Dall's porpoise	California/Oregon/Washington	257	≥0.4	≥0.4	0.2	1		
Risso's dolphin	California/Oregon/Washington	39	1.6	1.6	≥0.2†	1		
Common Bottlenose dolphin	California Coastal	2.4	0.2	0.2	≥0.2†	1		
Common Bottlenose dolphin	California/Oregon/Washington Offshore	5.5	≥0.4	≥0.4	≥0.2†			

*7 years of data only.
†Estimate from strandings assigned to unidentified/unknown fisheries.

Table 3-30. Non-ESA listed marine mammals occurring in the fishery management area with no observed interactions in groundfish fisheries.

Species	Stock Area	PBR	Annual Mortality + Serious Injury	Fishery Annual Mortality + Serious Injury	2012 SAR Estimate of Groundfish Fishery Mortality + Serious Injury
Common dolphin, short-beaked	California/Oregon/Washington	3,440	64	64	≥0.0†
Common dolphin, long-beaked	California	610	13.8	13	≥2.6†
Northern right whale dolphin	California/Oregon/Washington	48	4.8	3.6	0.0
Gray whale	Eastern North Pacific	558	128	3	--

†Estimate from strandings assigned to unidentified/unknown fisheries.

3.6.4 Seabirds not Listed under the Endangered Species Act

Section 3.1.4.5 in the 2013-14 Groundfish Harvest Specifications FEIS includes an overview of the occurrence and abundance of seabirds in the fishery management area. This information is reproduced here.

The California current system supports a diverse array of seabird species. Species found off the west coast include resident species and transitory species (migrating or foraging). All the California Current system seabirds are highly mobile and require an abundant food source to support their high metabolic rates {Ainley, 2005 #314}. The abundance of most seabird species on the west coast is influenced by similar physical and biological factors, such as oceanic productivity and prey availability {Tyler, 1993 #291;Ainley, 2005 #314}. Specifically, the seasonal and latitudinal distribution of seabirds is defined by the intensity of coastal upwelling, which delivers nutrient-rich water and supports higher prey biomass in surface waters accessible to seabirds {Tyler, 1993 #291}. On the west coastcoast, upwelling is most intense south of Cape Blanco, Oregon (42° 50’ N latitude) {Bakun, 1974 #315;Barth, 2000 #292}.

Three distinct oceanic seasons have traditionally been defined for the U.S. west coast: the Upwelling, Oceanic, and Davidson Current seasons {Ford, 2004}. The distribution of seabirds varies by season. During the upwelling season in the late spring and summer, northerly winds transport surface waters southward and away from the coast. Commonly-observed visiting species in summer include the sooty shearwater (*Puffinus griseus*), Northern fulmar (*Fulmarus glacialis*), and black-footed albatross (*Phoebastria nigripes*) {Tyler, 1993 #291}. In the fall (Oceanic season), northerly winds and upwelling intensity decrease, and sea surface temperature reaches its annual maximum. Several species that nest farther south in Mexico and southern California move northward, including the brown pelican (*Pelecanus occidentalis*) and storm-petrels. As winter approaches, these species again return south and breeders from boreal nesting colonies become more abundant, particularly off of California {Tyler, 1993 #291}. The winter months along the west coast are characterized by warmer water delivered by the Davidson current and reduced levels of primary production (Davidson Current season). Seabird abundance during this time is generally low (Tyler *et al*. 1993).

Table 3-31 summarizes information in Jannot, et al. {2011} on non-ESA listed seabird interactions in groundfish fisheries. The breakdown of interactions by fishery / gear type is as follows:

- Black-footed albatross (*Phoebastria nigripes*): Non-nearshore fixed gear fishery and at-sea whiting fishery
- Brandt’s cormorant (*Phalacrocorax penicillatus*): Trawl and fixed gear fisheries.
- Brown pelican *(Pelecanus occidentalis*): Non-nearshore fixed gear fishery
- Common murre (*Uria aalge*): Shoreside trawl, fixed gear fisheries, and at-sea whiting fishery
- Leach’s storm petrel (*Oceanodroma leucorhoa*): shoreside trawl
- Northern fulmar (*Fulmarus glacialis*): Shoreside trawl and non-nearshore fixed gear
- Sooty shearwater (*Puffinus griseus*): Non-nearshore fixed gear and at-sea whiting
- Western gull (*Larus occidentalis)*: Non nearshore fixed gear

Table 3-31. Non-ESA listed seabird species observed by the West Coast Groundfish Observer Program and At-sea Pacific Whiting Observer Program, 2002-2009, WCGOP annual fishery mortality estimate, and IUCN Red List status. Sources:

Species	Shoreside Trawl	CA Halibut Trawl	Fixed Gear	At-Sea Hake	WCGOP Average Annual Fishery Estimate, 2002-09	WCGOP Average Annual Fishery Estimate, 2002-09 - Upper CI	Actual no. years when observations made, 2002-2009	IUCN Red List Status	IUCN Red List Populatoin Trend
Black-footed albatross	0	0	123	8	43.8	93.5	8	Vulnerable	Increasing
Brown pelican	0	0	1	0			8	Least Concern	Increasing
Brandt's cormorant		7	4	0	4	10.8	5	Least Concern	Decreasing
Common murre	1	37	3	5	3.4	5.6	5	Least Concern	Increasing
Leach's storm petrel	8				0.3	1.2	6	Least Concern	Stable
Northern fulmar	1		2	108	15.7	16.1	7	Least Concern	Increasing
Sooty shearwater			20	10	1.7	1.7	6	Near Threatened	Decreasing
Western gull			7		6.3	18.5	4	Least Concern	Increasing
Unspecified/unidentified			3	15			6-8	N/A	N/A

3.7 Nongroundfish Species Caught in Groundfish Fisheries

The 2013-2014 Groundfish Harvest Specifications FEIS (PFMC and NMFS 2012) describes nongroundfish catch with particular attention to commercially important species. These economically important species include:

- Pacific halibut
- California halibut
- Dungeness crab
- Pink shrimp
- Several species of salmon
- Ridgeback and spot prawns

Information on the life history, distribution, and fisheries for these species may be found in the 2013-2014 FEIS.

The West Coast Groundfish Observer Program's Groundfish Management Multiyear Data Product {ref} includes catch estimates of nongroundfish species in groundfish fisheries. Focusing on groundfish directed fisheries (limited entry permit vessels, open access vessels targeting groundfish, tribal fisheries targeting groundfish), some 334 nongroundfish species or groups (including partially or unidentified species) were observed caught from 2002 to 2012. Nongroundfish catch, by weight, accounts for about 2% of total catch in these fisheries. Table 3-32 shows the most commonly caught nongroundfish by weight in rank order and accounting for just over 90% of the catch. About 54% of the nongroundfish catch by weight is invertebrate species, including crabs followed by grenadiers and sharks, each accounting for about 5%.

Table 3-32. Most commonly caught nongroundfish species, by weight, 2002-2012. (Source:

	Species	Catch (mt)	Percent of total nongroundfish catch	Cumulative Percent
1	Dungeness Crab	18,430	29.0%	29.0%
2	Humboldt Squid	8,848	13.9%	42.9%
3	Walleye Pollock	6,726	10.6%	53.5%
4	Pacific Halibut	4,897	7.7%	61.2%
5	Squid Unid	4,657	7.3%	68.5%
6	Tanneri Tanner Crab	3,609	5.7%	74.2%
7	King (Chinook) Salmon	2,427	3.8%	78.0%
8	Giant Grenadier	2,001	3.1%	81.1%
9	Shark Unid	1,129	1.8%	82.9%
10	Silver (Coho) Salmon	1,024	1.6%	84.5%
11	Grenadier Unid	877	1.4%	85.9%
12	Tanner Crab Unid	828	1.3%	87.2%
13	Brown Cat Shark	821	1.3%	88.5%
14	American Shad	808	1.3%	89.7%
15	Pacific Sardine	807	1.3%	91.0%

As shown in Table 3-33, Dungeness crab, which is the most economically important species listed above, are mostly caught in the shoreside trawl and tribal shoreside fisheries.

Table 3-33. Total catch of economically important nongroundfish (mt) by fishery sector, 2002-2012.

Species	Shoreside Trawl*	Nearshore Fixed Gear	Non nearshore Fixed Gear	Non Tribal At-Sea Hake	Shoreside Hake	Tribal At-Sea Hake	Tribal Shoreside	Total	Pct all Non groundfish
Dungeness Crab	3,352	133	83	<0.5	1		14,862	18,430	48%
Pacific Halibut	2,078	18	685	14	5	2	2,095	4,897	13%
King (Chinook) Salmon	56	3	1	69	75	36	2,188	2,427	6%
Silver (Coho) Salmon	<0.5	1	<0.5	1	3	2	1,016	1,024	3%
California Halibut	61	19	5	<0.5	<0.5			86	<0.5%
Pink (Humpback) Salmon	<0.5		<0.5	<0.5	12	8	17	36	<0.5%
Pink Shrimp	<0.5				0			<0.5	<0.5%
Ridgeback Prawn		<0.5						<0.5	<0.5%

Chapter 4 IMPACTS OF THE ALTERNATIVES

This chapter is organized into 14 sections. Sections 4.1 through 4.7 evaluate the impacts of alternative harvest specifications and management measures for the 2015-2016 biennial period. These sections are organized by environmental component, similar to Chapter 3, except that establishing management measures is considered an impact connecting the ACLs, or catch limits, to the ultimate impact on the environment. These sections cover harvest specifications, management measures, the socioeconomic environment, essential fish habitat, the California Current ecosystem, protected species, and nongroundfish. Sections 4.8 through 4.14 look at the long-term impacts of setting harvest specifications and management measures; these impacts are related to the Amendment 24 alternatives, which establish the default harvest control framework that would be used in setting harvest specifications beginning with the 2017-2018 biennial period.

Based on the outcome of the April 2014 Council meeting, the impact evaluation of reorganizing the minor rockfish slope complex currently in Agenda Item C.8.a, Attachment 2 will be integrated into this chapter.

4.1 Biological Impacts of 2015-16 Biennial Harvest Specifications on Groundfish Stocks

This section evaluates the biological impacts of proposed 2015-2016 harvest specifications on a select list of groundfish stocks (the 2014 Stock Assessment and Fishery Evaluation document (PFMC 2014) provides more detailed information on all west coast groundfish stocks and the biological effects under the groundfish harvest specification framework). The focus of this section are on those overfished stocks currently managed under rebuilding plans, the stocks where the Council chose a range of alternative ACLs for analysis, those stocks and stock complexes where total catches in recent years have been at least 80 percent of specified ACLs, and those stocks proposed to be removed from a status quo stock complex and managed with stock-specific harvest specifications.

4.1.1 Overfished Groundfish Stocks

There are currently 6 overfished rockfish stocks (bocaccio south of 40º10’ N lat., canary rockfish, cowcod south of 40º10’ N lat., darkblotched rockfish, Pacific ocean perch, and yelloweye rockfish) and 1 overfished flatfish stock (petrale sole) managed under rebuilding plans. New assessments and rebuilding analyses for these overfished stocks do not indicate any need to modify existing rebuilding plans since all these analyses indicate progress towards rebuilding is on track and, in most cases, ahead of schedule. Table 4-1 provides the estimated times to rebuild and rebuilding probabilities under alternative harvest control rules for the overfished stocks according to the most recent rebuilding analyses.

Table 4-1. Estimated time to rebuild and spawning potential ratio (SPR) harvest rate relative to alternative 2015-2016 ACLs for overfished west coast groundfish stocks (no changes to rebuilding plans were recommended for any of these stocks except cowcod where the target year to rebuild (T_{TARGET}) was changed to X).

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt)		SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
					2015	2016					
Bocaccio S of 40°10' N lat. a/	2022	77.7%	2022		0	0	100%	2019	0	88.0%	99.0%
					150	158	90.0%	2019	0	77.0%	97.0%
				PPA	349	362	77.7%	2021	2	60.0%	90.0%
					483	496	70.0%	2023	4	49.0%	70.0%
					670	679	60.0%	2027	8	33.0%	63.0%
					801	803	53.9%	2031	12	23.0%	51.0%
Canary	2027	88.7%	2030		0	0	100%	2028	0	48.2%	75.0%
					50	52	95.1%	2028	0	41.2%	75.0%
					106	109	90.0%	2029	1	36.4%	75.0%
				PPA	122	125	88.7%	2030	2	34.4%	75.0%
					154	158	85.9%	2030	2	31.7%	75.0%
					191	196	82.9%	2031	3	29.9%	75.0%
					224	230	80.3%	2032	4	27.9%	74.9%
					310	316	74.0%	2035	7	26.1%	73.6%
					401	407	67.9%	2040	12	25.1%	66.3%
					454	459	64.7%	2045	17	25.0%	59.4%
					496	500	62.2%	2050	22	25.0%	50.0%

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt) 2015	2016	SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
Cowcod	2068	82.7%	X		0	0	E = 0	2019	0	95.9%	93.8%
					1.8	1.9	E = 0.0013	2019	0	95.2%	93.0%
					2.4	2.5	E = 0.0018	2019	0	95.0%	92.7%
					3.0	3.1	E = 0.0022	2019	0	94.7%	92.4%
					3.7	3.8	E = 0.0027	2019	0	94.4%	91.9%
				PPA ACT	4.3	4.4	E = 0.0031	2019	0	94.0%	91.5%
					4.9	5.0	E = 0.0036	2019	0	93.4%	91.3%
					5.5	5.6	E = 0.0040	2019	0	93.4%	91.0%
					6.1	6.3	E = 0.0045	2019	0	93.1%	90.6%
					6.7	6.9	E = 0.0049	2019	0	92.7%	90.2%
					7.3	7.5	E = 0.0054	2019	0	92.4%	89.8%
					7.9	8.1	E = 0.0058	2019	0	92.0%	89.6%
					8.5	8.8	E = 0.0063	2019	0	91.5%	89.2%
					9.1	9.4	E = 0.0067	2019	0	91.2%	88.8%
				PPA ACL	9.5	9.8	E = 0.007	2020	1	90.9%	88.4%
					9.7	10.0	E = 0.0072	2020	1	90.9%	88.5%
					55.8	55.8	E = 0.0409	2039	20	55.0%	53.4%
					62.5	62.2	E = 0.0458	2057	38	51.4%	50.0%
Darkblotched	2025	64.9%	2025		0	0	100%	2016	0	100.0%	100.0%
				PPA	338	346	64.9%	2017	1	100.0%	100.0%
					369	376	62.6%	2017	1	100.0%	100.0%
					375	382	62.1%	2018	2	100.0%	100.0%
					394	401	60.7%	2018	2	100.0%	100.0%
					445	452	57.1%	2018	2	100.0%	100.0%

Stock	Current T_{TARGET}	Current SPR or Harvest Control Rule	PPA T_{TARGET}	ACL Alt.	ACLs (mt) 2015	ACLs (mt) 2016	SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
POP	2020	86.4%	2051		0	0	100%	2043	0	25.0%	85.5%
					62	64	94.3%	2045	2	25.0%	81.0%
					138	143	88.0%	2050	7	25.0%	75.0%
				PPA	158	164	86.4%	2051	8	25.0%	73.0%
					166	172	85.8%	2052	9	25.0%	72.6%
					191	198	83.9%	2054	11	25.0%	70.1%
					209	216	82.6%	2055	12	25.0%	68.0%
					258	266	79.2%	2060	17	25.0%	62.0%
					303	312	76.2%	2065	22	25.0%	55.8%
					341	350	73.8%	2071	28	25.0%	50.0%
Petrale	2016	25-5 Rule	2016		0	0	100%	2013	0	100.0%	100.0%
					1,116	1,197	60%	2013	0	100.0%	100.0%
					1,548	1,624	50%	2013	0	100.0%	100.0%
					2,081	2,118	40%	2013	0	100.0%	100.0%
				PPA	2,816	2,910	25-5 Rule	2013	0	100.0%	100.0%
Yelloweye	2074	76.0%	2074		0	0	100%	2045	0	99.2%	99.9%
					10	10	86.4%	2053	8	85.3%	93.7%
					14	15	80.5%	2060	15	75.1%	82.8%
					15	16	79.5%	2061	16	73.2%	81.0%
					18	18	76.5%	2066	21	64.1%	73.9%
				PPA	18	19	76.0%	2067	22	62.1%	72.9%
					22	22	72.7%	2074	29	50.0%	61.3%
					25	25	69.7%	2083	38	37.2%	50.0%

a/ All bocaccio alternatives have been reduced from the rebuilding analysis results by 6% to represent the portion of the stock south of 40°10' N lat.

4.1.1.1 Bocaccio South of 40º10’ N lat.

A bocaccio stock assessment update (Field 2011b) and rebuilding analysis (Field 2011a) were prepared in 2011. The 2011 bocaccio assessment was originally scheduled to be an update of the 2009 full assessment; however, the STAT some limited changes in the 2009 model structure since a strict update estimated that the 2010 year class was extraordinarily and unrealistically strong, based on length frequency data collected in the 2010 NMFS trawl survey. The modified update was ultimately reviewed, endorsed by the SSC, and adopted for use in management decision-making. The 2011 bocaccio rebuilding analysis indicated rebuilding progress was well ahead of schedule with a predicted median year to rebuild of 2021 or one year earlier than the target rebuilding year (Field 2011a). The Council elected to maintain the revised rebuilding plan implemented in 2011.

An update of the 2011 bocaccio assessment model was prepared in 2013, which confirmed the 2009 and 2010 year classes were indeed strong (Field 2013). The assessment estimated a depletion of 31.4 percent at the start of 2013 and predicted the stock would rebuild by 2015. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Field 2011a) was used to inform the projections in Table 4-1.

The Council’s preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the estimated strong recruitment will result in successfully rebuilding the stock as predicted.

4.1.1.2 Canary Rockfish

The 2007 canary assessment estimated relative depletion level was 32.4 percent at the start of 2007 (Stewart 2008b). This was a significant departure from the previous assessment and largely driven by a higher assumed steepness (h = 0.51) relative to past assessments. The 2007 canary rebuilding analysis (Stewart 2008a) predicted the SPR harvest rate in the rebuilding plan (88.7%) would rebuild 42 years earlier (2021) than the originally estimated rebuilding schedule (2063). A modification of the Amendment 16-4 canary rockfish rebuilding plan specifying a target rebuilding year of 2021 while maintaining the SPR harvest rate of 88.7% was implemented in 2009.

The 2009 canary assessment (Stewart 2009c), an update of the 2007 assessment, estimated stock depletion at 23.7% at the start of 2009. This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical California catches from a formal reconstruction of 1916-1980 California catch data (Ralston, *et al.* 2010). The 2009 canary rebuilding analysis (Stewart 2009a) predicted the stock would not rebuild to the target year of 2021 with at least a 50% probability even in the absence of fishing-related mortality starting in 2011 ($T_{F=0}$). The rebuilding plan was revised by changing the target to rebuild the stock to 2027 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2011.

Another update assessment was prepared in 2011 (Wallace and Cope 2011), which estimated stock depletion was 23.2 percent at the start of 2011. This change in stock status was due to a lower estimate of initial, unfished biomass (B_0) largely attributable to the inclusion of revised historical Oregon catches from a formal reconstruction of Oregon catch data. For the period 2000-2011, the spawning biomass was estimated to have increased from 11.2 percent to 23.2 percent of the unfished biomass level.

The 2011 canary rebuilding analysis (Wallace 2011) predicted the stock would not rebuild to the target year of 2027 with at least a 50% probability. The rebuilding plan was revised slightly by changing the target to rebuild the stock to 2030 while maintaining the 88.7% SPR harvest rate; the revised rebuilding plan was implemented in 2013.

The SSC recommended against preparing a new canary rockfish rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Wallace 2011) was used to inform the rebuilding projections in Table 4-1. A canary catch report was provided in 2013 (Agenda Item F.5.a, Attachment 9, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.1.3 Cowcod South of 40º10' N lat.

A new cowcod assessment of the stock in the Southern California Bight was conducted in 2013 (Dick and MacCall 2013b), which estimated stock depletion to be 33.9 percent of unfished spawning biomass at the start of 2013. The 2013 assessment suggested that cowcod in the Southern California Bight constitute a smaller, but more productive stock than was estimated from previous assessments. Median unfished and 2013 spawning biomasses were estimated to be 1,549 mt and 524 mt, respectively.

The 2013 assessment used the Extended Depletion-Based Stock Reduction Analysis (XDB-SRA) modeling platform to estimate stock status, scale, and productivity. Dick et al. (2013b) fit five fishery-independent data sources: four time series of relative abundance (CalCOFI larval abundance survey, Sanitation District trawl surveys, NWFSC trawl survey, and NWFSC hook-and-line survey), and the 2002 Yoklavich et al. (2007) visual survey estimate of absolute abundance.

The 2013 rebuilding analysis (Dick and MacCall 2013a) was unique in that the Punt rebuilding program (Punt 2005) was not used given its incompatibility with XDB-SRA. In each rebuilding model run, 15,000 simulated trajectories were generated using draws from the joint posterior distribution. Since the XDB-SRA platform is not compatible with spawning potential ratios, harvest control rules were translated into exploitation rates (E) calculated as catch/estimated age 11+ biomass. Similar to the previous cowcod rebuilding analysis, variability in future recruitment was expressed as a weighted set of different states of nature (parameter values), rather than random deviations from an average stock-recruitment relationship. While the previous rebuilding analysis accounted only for uncertainty in the Beverton-Holt steepness parameter, the current analysis accounts for uncertainty in all estimated model parameters. Estimates of total cowcod mortality have not exceeded the ACL (or OY) in any year since 2003. The estimate of median time to rebuild under the current harvest rate (2020) is 48 years earlier than the current target year of 2068.

4.1.1.4 Darkblotched Rockfish

A full darkblotched stock assessment in 2013 (Gertseva and Thorson 2013) estimated a stock depletion of 36 percent at the start of 2013. The assessment also predicts the stock will be rebuilt by the start of 2015. The improved stock status and rebuilding outlook were largely attributed to 1) reduced fishing mortality under the rebuilding program; 2) inferences that follow from more favorable perceptions of steepness, fecundity, and age at maturity of the stock; and 3) length and age data indicating relatively large recruitments in 1999, 2000, and 2008. The SSC recommended maintaining the current rebuilding plan for the 2015-2016 management cycle and a full assessment be done in 2015 to confirm this prediction. The SSC further recommended against preparing a rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Stephens 2011) was used to inform the rebuilding projections in Table 4-1.

The Council's preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the stock will successfully rebuild as predicted.

4.1.1.5 Pacific Ocean Perch

A full assessment in 2011 estimated a stock depletion of 19.1 percent at the start of 2011 (Hamel and Ono 2011). The significant decrease in the estimated depletion of the stock was largely due to a much higher estimate of initial, unfished biomass (B_0). Previous assessments assumed a large recruitment in the late 1950s provided the higher biomass to support the estimated removals by the foreign fleets without any data to support that assumption. The assumption in the 2011 assessment is that the large foreign fleet catch fished the biomass down to critical levels, thus resulting in a substantially larger B_0 estimate. The 2011 assessment also estimated a longer sequence of higher recruitment based on fitting to the data available for early years of the assessment period. The 2011 rebuilding analysis (Hamel 2011) predicted rebuilding would not occur by the target year of 2020 with at least a 50% probability even in the absence of fishing-related mortality beginning in 2013 (i.e., $T_{F=0}$). Therefore the rebuilding plan was revised by changing the target rebuilding year to 2051 while maintaining the constant SPR harvest rate of 86.4%.

The SSC recommended against preparing a new POP rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Hamel 2011) was used to inform the rebuilding projections in Table 4-1. A POP catch report was provided in 2013 (Agenda Item F.5.a, Attachment 10, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.1.6 Petrale Sole

The 2013 petrale assessment (Haltuch, *et al.* 2013) estimated a stock depletion of 22.3 percent of its unfished biomass at the start of 2013 and short of the prediction from the 2011 rebuilding analysis; spawning biomass is predicted to reach the B_{MSY} target by the start of 2014. The 2013 stock assessment continued with the coastwide stock assessment, but was restructured to summarize petrale sole landings by the port of landing and combined Washington and Oregon into a single fleet. The down-weighting of the trawl CPUE index used in the 2011 assessment was largely responsible for the more pessimistic result and the one year lag in rebuilding relative to the previous assessment. However, the estimation of recent recruitments indicated two very strong year classes (2007 and 2008) recruiting into the spawning population, which increases the likelihood of imminent success in rebuilding this stock. The SSC recommended against preparing a new petrale sole rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Haltuch 2011) was used to inform the rebuilding projections in Table 4-1.

The Council's preferred alternative is to maintain the rebuilding plan and wait for the next assessment to confirm whether the stock will successfully rebuild as predicted.

4.1.1.7 Yelloweye Rockfish

The benchmark 2009 yelloweye assessment estimated a stock depletion of 20.3 percent of initial, unfished biomass at the start of 2009 (Stewart, *et al*. 2009). The resource was modeled as a single stock, but with three explicit spatial areas: Washington, Oregon and California. Each area was modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial), with the stocks linked via a common stock-recruit relationship with negligible adult movement among areas. The assumed level of historical removals and estimated steepness were identified as the main axes of uncertainty.

The 2009 yelloweye rebuilding analysis (Stewart 2009b) was used to inform a revised rebuilding plan that was implemented under FMP Amendment 16-5. The revised rebuilding plan implemented in 2011 specified a constant harvest rate (SPR = 76%) strategy (the ramp-down strategy was abandoned) and a target year to rebuild the stock of 2074.

The 2011 yelloweye assessment (Taylor and Wetzel 2011), an update of the 2009 assessment, estimated stock depletion at 21.4 percent of initial, unfished biomass at the start of 2011. The update assessment results were very similar to those in the previous assessment. The 2011 yelloweye rebuilding analysis (Taylor 2011) indicated rebuilding progress was on schedule and no revisions were made to the rebuilding plan.

The SSC recommended against preparing a new yelloweye rockfish rebuilding analysis in 2013; therefore, the 2011 rebuilding analysis (Taylor 2011) was used to inform the rebuilding projections in Table 4-1. A yelloweye catch report was provided in 2013 (Agenda Item F.5.a, Attachment 11, June 2013), which indicated 2010-2012 total catches were below specified ACLs/OYs.

The Council's preferred alternative is to maintain the rebuilding plan and wait for new information that might compel a change in course.

4.1.2 Non-Overfished Stocks with Annual Catch Limit Alternatives Identified for Analysis

4.1.2.1 Dover Sole

The 2011 Dover sole assessment indicated the stock was healthy with an increasing abundance trend. Spawning stock biomass depletion was estimated to be 83.7 percent of unfished biomass at the start of 2011 (Hicks and Wetzel 2011). The 2011 Dover sole assessment is data-rich and the species is readily tracked in the NMFS trawl survey (most survey tows are positive for Dover).

The spawning biomass of Dover sole reached a low in the mid-1990s before beginning to increase throughout the last decade. The estimated depletion has remained above the 25 percent biomass target and it is unlikely that the stock has ever fallen below this threshold. Throughout the 1970s, 1980s, and 1990s the exploitation rate and SPR generally increased, but never exceeded the SPR 30 percent F_{MSY} target. Recent exploitation rates on Dover sole have been much lower than F_{MSY}, even with increased catch levels since 2007.

Two ACL alternatives for 2015 and 2016 are analyzed: 1) the status quo ACL of 25,000 mt and 2) an ACL of 50,000 mt. Given the productivity of the stock and constraints on fishing, projections assuming a 25,000 mt constant annual catch predict the stock would remain above the target B_{MSY} level in the next ten years even under the more pessimistic and less likely low state of nature in the assessment decision table (Table 4-2). The higher ACL of 50,000 mt is predicted to be sustainable; Table 4-2 indicates that future mortalities assuming full OFL removals in 2013-2022 would maintain the stock above the target level of $B_{25\%}$ under the most likely base case model in the 2011 assessment. This high catch stream in the decision table predicts a decline in spawning biomass in the ten-year projection to a level above the B_{MSY} target; the decline would be predicted to be less under a revised projection since 2013 and 2014 catches were well below the OFL (and below the 25,000 mt ACL). The average annual 2015-2022 catch in Table 4-2, assuming OFL removals, is higher (50,350 mt) than the alternative ACL of 50,000 mt.

The effective limit of Dover sole in the 2015 and 2016 shorebased IFQ fishery is likely to be driven by the sablefish allocation, which is increasing slightly relative to No Action. Sablefish quota is needed to target Dover sole and the other DTS species using trawl gear. Sablefish IFQ quota is also used in a single-species target fishery using fixed gears. The competition and price for sablefish quota is affected by Asian sablefish demand and supply from north Pacific fisheries outside the west coast EEZ (e.g., BC and the Gulf of Alaska fisheries). It may be the case that the supply and demand of west coast Dover sole will remain limited until there is an increased harvestable surplus of sablefish above the levels proposed for 2015 and 2016. On the other hand, access to a larger volume of Dover sole may allow west coast processors to develop better markets for Dover sole. To the extent that trawl IFQ fishermen can more selectively target quality Dover sole without running out of sablefish quota, a higher catch can be expected achieving a greater positive socioeconomic impact on trawl fishing communities.

Table 4-2. Projected spawning biomass and depletion of Dover sole under three catch streams and two states of nature (the low state of nature and base case models) analyzed in the 2011 stock assessment, from Hicks and Wetzel (2011).

Catch Stream	Year	Catch (mt)	State of nature: Low $M_f = 0.110$ $M_m = 0.125$ Spawning biomass (mt)	Low Depletion	Base case $M_f = 0.117$ $M_m = 0.142$ Spawning biomass (mt)	Base case Depletion
OFL	2013	90,411	240,029	70.20%	377,601	80.40%
	2014	75,517	195,784	57.20%	329,856	70.20%
	2015	64,885	158,399	46.30%	289,873	61.70%
	2016	57,488	127,579	37.30%	257,379	54.80%
	2017	52,453	102,664	30.00%	231,515	49.30%
	2018	49,065	82,887	24.20%	211,283	45.00%
	2019	46,768	67,323	19.70%	195,619	41.60%
	2020	45,158	54,995	16.10%	183,484	39.10%
	2021	43,964	45,020	13.20%	173,995	37.00%
	2022	43,017	36,676	10.70%	166,455	35.40%
Current ACL	2013	25,000	240,029	70.20%	377,601	80.40%
	2014	25,000	228,381	66.80%	362,668	77.20%
	2015	25,000	217,371	63.60%	348,791	74.20%
	2016	25,000	207,555	60.70%	336,770	71.70%
	2017	25,000	199,131	58.20%	326,838	69.60%
	2018	25,000	192,128	56.20%	318,967	67.90%
	2019	25,000	186,405	54.50%	312,909	66.60%
	2020	25,000	181,701	53.10%	308,280	65.60%
	2021	25,000	177,758	52.00%	304,702	64.80%
	2022	25,000	174,364	51.00%	301,870	64.20%
Status quo catches	2013	12,127	240,029	70.20%	377,601	80.40%
	2014	12,135	234,602	68.60%	368,952	78.50%
	2015	12,143	229,771	67.20%	361,268	76.90%
	2016	12,149	226,014	66.10%	355,274	75.60%
	2017	12,154	223,476	65.30%	351,155	74.70%
	2018	12,157	222,149	65.00%	348,848	74.20%
	2019	12,158	221,870	64.90%	348,089	74.10%
	2020	12,158	222,375	65.00%	348,485	74.20%
	2021	12,158	223,398	65.30%	349,654	74.40%
	2022	12,157	224,732	65.70%	351,296	74.80%

4.1.2.2 Widow Rockfish

The 2011 widow rockfish assessment indicated the stock was healthy with a spawning biomass depletion of 51 percent at the start of 2011 (He, *et al*. 2011). The assessment indicated the estimated spawning stock biomass had increased steadily from a low of 30.6 percent at the start of 2001. The estimated relative spawning stock biomass never dropped below the 25 percent MSST.

Widow rockfish are caught mostly in midwater trawls used to target Pacific whiting and, before 2002 and after trawl rationalization was implemented in 2011, used to target widow and yellowtail rockfish. The exploitation rate was above the target SPR of 50 percent (i.e., $F<F_{MSY}$) until the late 1970s when trawl catches in the target midwater fishery increased to rates beyond the target. This continued until the stock was declared overfished and managed under a rebuilding plan. Harvest declined dramatically and the estimated SPR harvest rates increased rapidly above target F_{MSY}. The increase in biomass during the past decade was the result of reduced catches rather than strong year-classes. The stock was declared rebuilt in 2013 based on the results of the 2013 assessment.

Two ACL alternatives for 2015 and 2016 are analyzed: 1) the status quo ACL of 1,500 mt and 2) an ACL of 3,000 mt. Decision table projections in the 2011 assessment assumed constant annual catches varying between 1,500 and 3,000 mt (Table 4-3). A 3,000 mt constant annual catch is predicted to maintain the stock above the target B_{MSY} level in the next ten years under the more likely state of nature in the assessment (Table 4-3). However, there is great uncertainty in the stock's estimated biomass, relative productivity (steepness was fixed), and other aspects of the stock's dynamics.

Table 4-3. Widow rockfish decision table (from He *et al.* 2011).

Management decision	Year	Catch (mt)	State of nature			
			h = 0.41		Base case (*h*=0.76)	
			Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
Constant catch (1,500 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	1,500	28.6%	21,686	49.9%	35,514
	2014	1,500	27.2%	20,619	48.5%	34,473
	2015	1,500	26.1%	19,839	47.5%	33,785
	2016	1,500	25.6%	19,443	47.2%	33,585
	2017	1,500	25.7%	19,515	47.8%	34,014
	2018	1,500	26.4%	19,993	49.2%	35,022
	2019	1,500	27.2%	20,655	51.1%	36,325
	2020	1,500	28.1%	21,354	53.1%	37,737
	2021	1,500	29.0%	22,029	55.1%	39,182
	2022	1,500	29.9%	22,648	57.1%	40,603

Management decision	Year	Catch (mt)	State of nature: *h* = 0.41 Depletion (%)	State of nature: *h* = 0.41 Spawning biomass (mt)	State of nature: Base case (*h*=0.76) Depletion (%)	State of nature: Base case (*h*=0.76) Spawning biomass (mt)
Constant catch (2,000 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	2,000	28.6%	21,686	49.9%	35,514
	2014	2,000	26.8%	20,332	48.1%	34,184
	2015	2,000	25.4%	19,283	46.7%	33,223
	2016	2,000	24.6%	18,639	46.1%	32,770
	2017	2,000	24.4%	18,486	46.3%	32,967
	2018	2,000	24.7%	18,755	47.5%	33,759
	2019	2,000	25.3%	19,217	49.0%	34,860
	2020	2,000	26.0%	19,720	50.7%	36,082
	2021	2,000	26.6%	20,197	52.5%	37,347
	2022	2,000	27.2%	20,609	54.3%	38,596
Constant catch (2,500 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	2,500	28.6%	21,686	49.9%	35,514
	2014	2,500	26.4%	20,046	47.7%	33,896
	2015	2,500	24.7%	18,729	45.9%	32,663
	2016	2,500	23.5%	17,838	44.9%	31,957
	2017	2,500	23.0%	17,460	44.9%	31,922
	2018	2,500	23.1%	17,520	45.7%	32,499
	2019	2,500	23.4%	17,783	47.0%	33,398
	2020	2,500	23.8%	18,089	48.4%	34,429
	2021	2,500	24.2%	18,364	49.9%	35,513
	2022	2,500	24.5%	18,565	51.4%	36,589
Constant catch (3,000 mt)	2011	600	30.0%	22,765	51.1%	36,342
	2012	600	29.4%	22,288	50.7%	36,053
	2013	3,000	28.6%	21,686	49.9%	35,514
	2014	3,000	26.0%	19,758	47.2%	33,607
	2015	3,000	24.0%	18,171	45.1%	32,100
	2016	3,000	22.4%	17,032	43.8%	31,140
	2017	3,000	21.7%	16,430	43.4%	30,871
	2018	3,000	21.5%	16,281	43.9%	31,232
	2019	3,000	21.5%	16,341	44.9%	31,928
	2020	3,000	21.7%	16,447	46.1%	32,765
	2021	3,000	21.8%	16,516	47.3%	33,665
	2022	3,000	21.7%	16,500	48.6%	34,565

4.1.3 Non-Overfished Stocks with Higher Annual Catch Limit Attainment Rates or Proposed to be Removed from a Status Quo Stock Complex and Managed with Stock-Specific Harvest Specifications

4.1.3.1.1 Cabezon in Oregon

Cope and Key (2009) estimated the spawning biomass depletion of the Oregon substock of cabezon (*Scorpaenichthys marmoratus*) was 52% at the start of 2009. The stock was managed as a component of the Other Fish complex until 2011 when the stock was removed from the complex and managed under stock-specific specifications.

Total estimated catch by sector in 2004-2012 is provided in Table 4-4, with an estimated average annual catch of 43.1 mt. Oregon recreational catches were obtained from a March 23, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1).

Table 4-4. Estimated total catch (in mt) of cabezon in Oregon by sector, 2004-2012.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside	**0.002**	**0.01**	**0.003**	**0.01**		**0.01**	**0.002**		
Incidental	0.002		0.003				0.002		
Pink Shrimp		0.01		0.01		0.01			
Trawl	**0.03**	**0.1**	**0.1**	**0.02**	**0.1**	**0.1**	**0.01**		**0.1**
Limited Entry Trawl Permit - Trawl Gear	0.03	0.1	0.1	0.02	0.1	0.1	0.01		0.1
Non-Trawl	**44.6**	**45.9**	**38.4**	**38.3**	**41.4**	**46.5**	**40.2**	**47.3**	**44.5**
Nearshore Fixed Gear	27.2	28.3	22.3	21.9	24.8	30.3	23.6	29.8	29.0
OR Recreational	17.4	17.6	16.1	16.3	16.6	16.2	16.5	17.5	15.5
Grand Total	**44.6**	**46.1**	**38.5**	**38.3**	**41.5**	**46.6**	**40.2**	**47.3**	**44.6**

The 2015 and 2016 OFL and ABC is 49 mt and 47 mt (P* = 0.45), respectively. Total estimated catch in 2004-2012 of Oregon cabezon has never been over the 2015 OFL or ABC (Figure 4-1), although the 2011 total catch was equal to the new proposed ABC. The estimated cumulative 2004-2012 catch was 87.9% and 91.9% of the cumulative 2015 OFL and ABC, respectively. Continued management of this stock under the default harvest control rules is predicted to be sustainable.

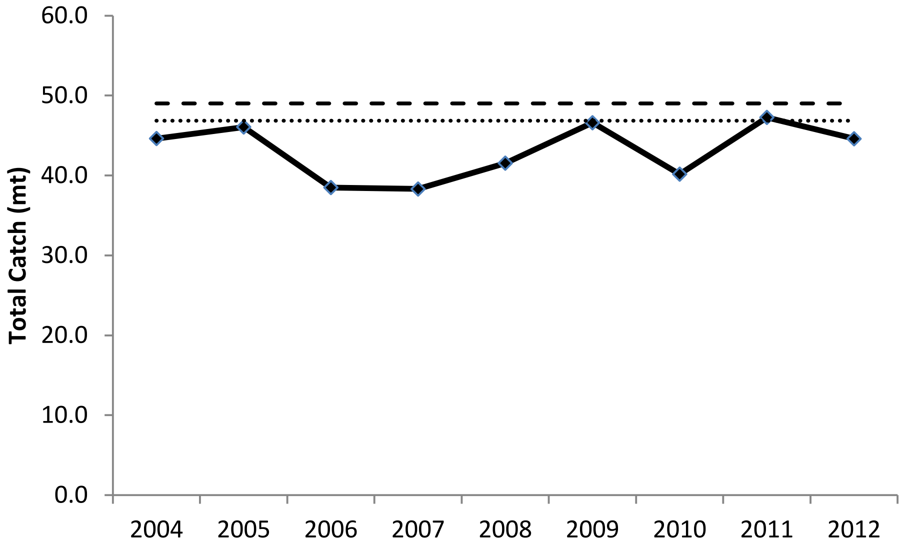


Figure 4-1. Estimated total catch of cabezon in Oregon, 2004-2012, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.2 Cabezon in Washington

The cabezon population in Washington has never been assessed. Cabezon have a very shallow distribution with most common occurrence in waters 30 fm and shallower. Cabezon are distributed almost solely in state waters on the U.S. west coast.

New OFLs for cabezon in Washington were originally proposed using a DB-SRA and a depletion prior of 62% in 1997 based on estimated depletion estimated in the 2009 assessment of the Oregon substock (Cope and Key 2009) (Table 4-5). The SSC noted in March 2014 that the population off Washington was estimated to be at a lower fraction of its unfished level than that off Oregon, even though catches increased substantially off Oregon following the mid-1990s. This resulted from the full assessment for cabezon off Oregon indicating increased recruitment after 1997 which cannot be reflected in the DB-SRA assessment method applied for cabezon off Washington. Therefore, the SSC recommended that the DB-SRA assessment for cabezon off Washington be revised, assuming that the depletion in 2010 equals that inferred from the assessment for Oregon (48%). The Council will decide the P* for deciding 2015 and 2016 OFLs and ABCs for Washington cabezon at the April meeting. The 2016 OFL varies by the P* choice since the 2015 is assumed to be removed in 2015 when projecting the 2016 OFL.

Total estimated catch by sector in 2004-2013 (the recreational fishery is the only sector in the time series) is provided in Table 4-6, with an estimated average annual catch of 5.8 mt. Nearshore commercial fisheries have been prohibited in Washington waters since 1999. Washington recreational catches were obtained from a March 22, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1).

Table 4-5. Washington cabezon OFLs and ABCs for 2015 and 2016, assuming different depletion levels and ABC catches in 2015.

Depletion	P*	OFL		ABC	
		2015	2016	2015	2016
62% in 1997	0.45	4.0	4.4	3.3	3.6
62% in 1997	0.25	4.0	4.7	1.5	1.8
48% in 2010	0.45	4.5	4.8	3.7	4.0
48% in 2010	0.40	4.5	4.9	3.1	3.4
48% in 2010	0.35	4.5	5.0	2.6	2.9
48% in 2010	0.30	4.5	5.1	2.1	2.4
48% in 2010	0.25	4.5	5.1	1.7	1.9

Table 4-6. Estimated total catch (in mt) of cabezon in Washington by sector, 2004-2013.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Non-Trawl	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**2.7**	**8.7**	**6.5**	**5.9**
WA Recreational	5.9	7.9	5.8	4.3	2.7	5.2	2.7	8.7	6.5	5.9
Grand Total	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**5.3**	**8.7**	**6.5**	**5.9**

4.1.3.3 Kelp Greenling in California

The kelp greenling (*Hexagrammos decagrammus*) population in California has never been assessed[43]. Kelp greenling have a very shallow distribution with most common occurrence in waters 10 fm and shallower. Kelp greenling are distributed solely in state waters on the U.S. west coast.

The proposed 2015 and 2016 OFL of 118.9 mt is based on a 2012 DB-SRA estimate first implemented in 2013. The proposed ABC of 99.2 mt is based on a P* of 0.45. Total estimated catch by sector is provided in Table 4-7, with an estimated average annual catch of 13.3 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were provided by the GMT. Set-asides (estimated catch in the California halibut and incidental groundfish fisheries) were assumed to be from fisheries in California, while all trawl catches were assumed to be from fisheries in Oregon. Commercial non-trawl catches were reported by state. Total estimated catch in 2004-2011 of kelp greenling in California has been well below the 2015 OFL and ABC (Figure 4-2). The estimated cumulative 2004-2011 catch was 11.2% and 13.4% of the cumulative 2015 OFL and ABC, respectively.

[43] A 2005 assessment of kelp greenling in California was reviewed by a STAR panel and the SSC but was not recommended for management use due to insufficient data to adequately estimate status or biomass.

Table 4-7. Estimated total catch (in mt) of kelp greenling in California by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Set-Aside	**0.001**	**0.013**	**0.003**	**0.017**	**0.012**	**0.000**	**0.000**	**0.006**
California Halibut		0.012						
Incidental	0.001	0.001	0.003	0.017	0.012			0.006
Non-Trawl	**14.3**	**7.8**	**8.9**	**7.6**	**9.8**	**15.6**	**17.8**	**24.6**
California Commercial	2.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0
California Recreational	12.3	5.8	6.9	6.6	8.8	14.6	15.8	22.6
Grand Total	**14.3**	**7.8**	**8.9**	**7.6**	**9.8**	**15.6**	**17.8**	**24.6**

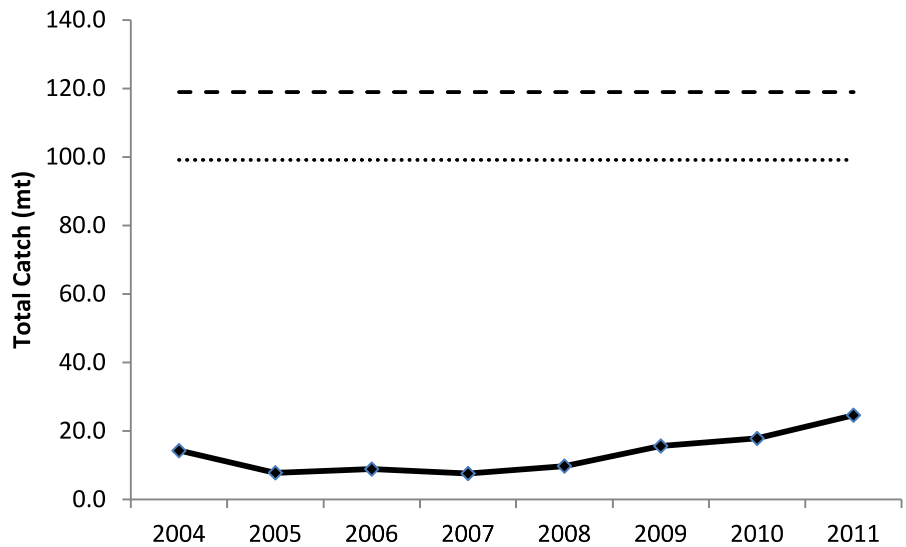


Figure 4-2. Estimated total catch of kelp greenling in California, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.4 Kelp Greenling in Oregon

The kelp greenling population was assessed in 2005 (Cope and MacCall 2006) with an estimated depletion of 49% at the start of 2005. The SSC recommended the assessment was adequate for determining status of the population, but there was too much uncertainty in the biomass estimate to use for deciding harvest specifications. The stock has been managed under an annual state HG of 28 mt since 2007.

A new DB-SRA-based OFL estimate was developed for kelp greenling in Oregon using the 49% depletion prior from the 2005 assessment. Total estimated catch by sector is provided in Table 4-8, with an estimated average annual catch of 24.2 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were provided by the GMT. Set-asides (estimated catch in the California halibut and incidental groundfish fisheries) were assumed to be from fisheries in California, while all trawl catches were assumed to be from fisheries in Oregon. Commercial non-trawl catches were reported by state. Total estimated catch in 2004-2011 of kelp greenling in Oregon has been over the 2015 OFL and ABC (Figure 4-3). The estimated cumulative 2004-2011 catch was 173.1% and 207.5% of the cumulative 2015 OFL and ABC, respectively.

Table 4-8. Estimated total catch (in mt) of kelp greenling in Oregon by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Trawl	**0.1**	**0.1**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.1**
Limited Entry Trawl Permit - Trawl Gear	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.1
Non-Tribal At-Sea Hake		0.0	0.0					
Non-Trawl	**26.4**	**25.1**	**17.1**	**21.5**	**25.6**	**24.2**	**24.8**	**28.5**
Oregon Commercial	22.0	21.0	14.0	18.0	22.0	20.0	18.0	21.0
Oregon Recreational	4.4	4.1	3.1	3.5	3.6	4.2	6.8	7.5
Grand Total	**26.5**	**25.3**	**17.2**	**21.7**	**25.6**	**24.2**	**24.9**	**28.5**

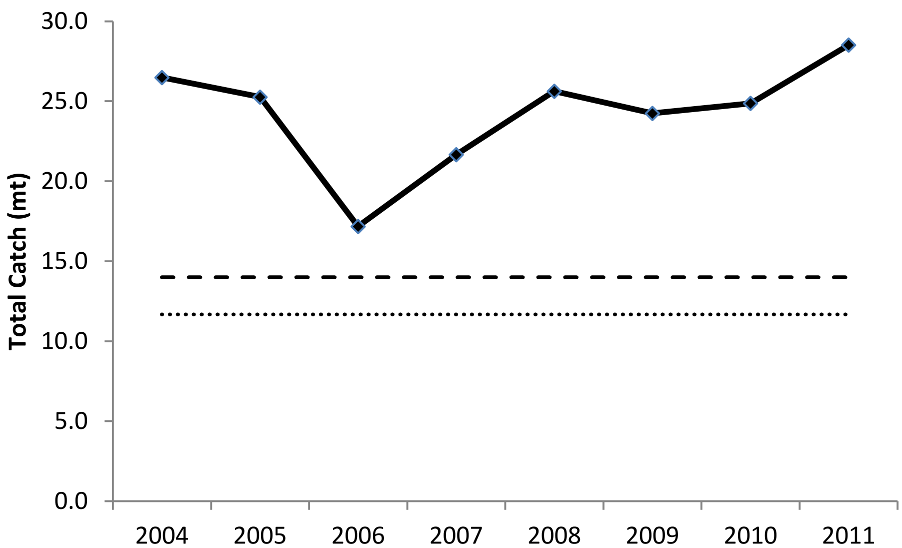


Figure 4-3. Estimated total catch of kelp greenling in Oregon, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.5 Kelp Greenling in Washington

The kelp greenling population in Washington has never been assessed. The proposed 2015 and 2016 OFL of 31.4 mt for kelp greenling in Washington as based on a new DB-SRA estimate using the 49% depletion prior from the 2005 assessment. The proposed ABC of 31.4 mt is based on a P* of 0.4. Total estimated catch by sector (the recreational fishery is the only sector in the time series) is provided in Table 4-9, with an estimated average annual catch of 1.7 mt. Nearshore commercial fisheries have been prohibited in Washington waters since 1999. Washington recreational catches were provided by the GMT. Total estimated catch in 2004-2011 of kelp greenling in Washington has been well below the 2015 OFL and ABC (Figure 4-4). The estimated cumulative 2004-2011 catch was 5.4% and 7.8% of the 2015 OFL and ABC, respectively.

Table 4-9. Estimated total catch (in mt) of kelp greenling in Washington by sector, 2004-2011.

Sector	2004	2005	2006	2007	2008	2009	2010	2011
Non-Trawl	**2.0**	**1.9**	**1.3**	**1.2**	**1.0**	**1.3**	**2.7**	**2.1**
Washington Recreational	2.0	1.9	1.3	1.2	1.0	1.3	2.7	2.1
Grand Total	**2.0**	**1.9**	**1.3**	**1.2**	**1.0**	**1.3**	**2.7**	**2.1**

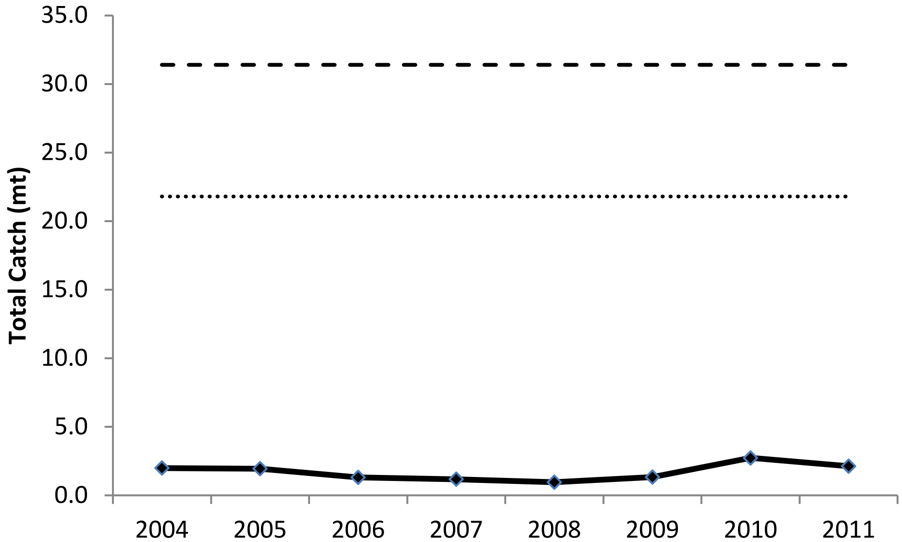


Figure 4-4. Estimated total catch of kelp greenling in Washington, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.6 Leopard Shark

The leopard shark (*Triakis semifasciata*) population on the U.S. west coast has never been assessed. Leopard shark have a very shallow distribution. While they are occasionally found as deep as 50 fm, their most common occurrence is 2 fm and shallower. Leopard shark are only caught in nearshore waters off California.

The proposed 2015 and 2016 OFL of 167.1 mt is based on a 2012 DB-SRA estimate first implemented in 2013. The proposed ABC of 139.4 mt is based on a P* of 0.45. Total estimated catch by sector is provided in Table 4-10, with an estimated average annual catch of 26.8 mt. All commercial catch estimates were from the WCGOP Multi-year Data Product and recreational catches were obtained from a March 23, 2014 RecFIN query of landed catch (A) and reported dead catch (B1). Total estimated catch in 2004-2012 of leopard shark in California has been well below the 2015 OFL and ABC (Figure 4-5). The estimated cumulative 2004-2012 catch was 15.8% and 19% of the cumulative 2015 OFL and ABC, respectively.

Table 4-10. Estimated total catch (in mt) of leopard shark by sector, 2004-2011.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside	**7.6**	**8.2**	**5.9**	**13.3**	**12.1**	**9.1**	**4.6**	**2.5**	**2.3**	**7.6**	**1.7**
California Halibut	0.7	2.3	1.0	7.8	4.9	1.2	2.8	1.2	0.5	5.6	0.0
Incidental	6.9	5.9	4.9	5.5	7.1	7.9	1.8	1.3	1.8	2.0	1.6
Pink Shrimp	0.1	0.05	0.1		0.0				0.03		0.01
Non-Trawl	**6.0**	**3.4**	**22.0**	**21.8**	**61.6**	**5.2**	**10.7**	**3.3**	**12.3**	**15.6**	**25.4**
Nearshore Fixed Gear	0.2	0.2	0.2	0.5	1.1	1.0	0.4	0.1	0.2	0.2	0.2
Non-nearshore Fixed Gear	5.8	3.2	5.6	5.8	2.6	1.8	0.7	0.3	0.7	0.2	1.0
CA Recreational			16.2	15.5	58.0	2.4	9.6	2.8	11.4	15.2	24.2
Trawl	**0.0**	**0.1**	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
Limited Entry Trawl Permit - Trawl Gear	0.0	0.1	0.0	0.9	0.0	0.0				0.0	0.3
Grand Total	**13.7**	**11.7**	**28.0**	**36.0**	**73.7**	**14.3**	**15.3**	**5.7**	**14.6**	**23.2**	**27.3**

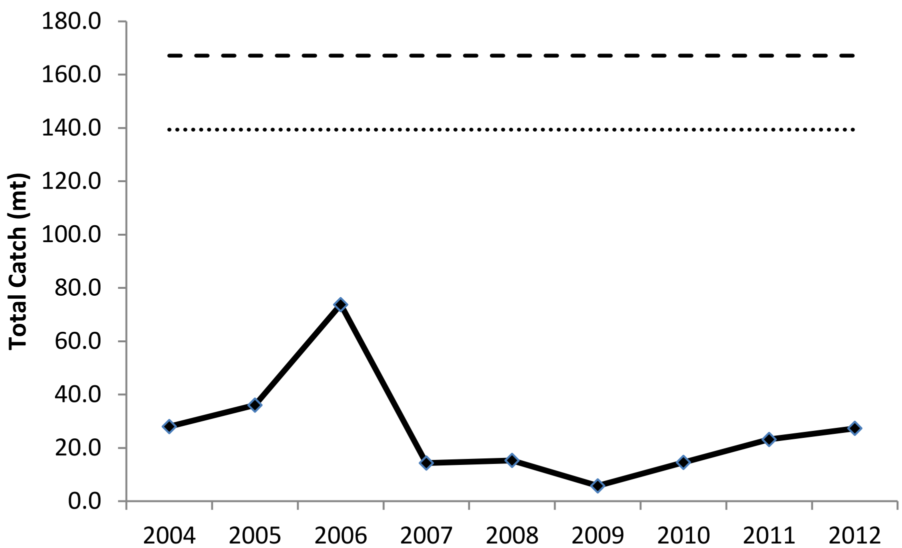


Figure 4-5. Estimated total catch of leopard shark off California, 2004-2011, relative to the proposed 2015 OFL (upper dashed line) and ABC (lower dotted line).

4.1.3.7 Sablefish North of 36º N lat.

The 2011 sablefish (*Anoplopoma fimbria*) assessment estimated spawning stock biomass to be at 33 percent of its unfished biomass at the beginning of 2011 (Stewart, *et al.* 2011). The resource was modeled as a single stock; however, there is some dispersal to and from offshore seamounts and along the coastal waters of the continental U.S., Canada, Alaska, and across the Aleutian Islands to the western Pacific which was not explicitly accounted for in this analysis. They are found in waters as from 27-1,000 fm but are most common in the 110-550 fm depth zone.

Sablefish is a major target species in offshore fixed gear and bottom trawl fisheries and is the most valuable commercial groundfish stock on a per pound basis. While the assessment is coastwide and coastwide OFLs and ABCs are specified for the stock, ACLs are apportioned north and south of 36º N lat. since long-term formal allocations have been decided for the portion of the population north of 36º N lat. Only the population north of 36º N lat. has experienced catches with high attainment rates relative to specified ACLs/OYs; the percent difference in the cumulative 2002-2012 catch of sablefish south of 36º N lat. has been 27.1% of the cumulative 2015 ACL.

The proposed coastwide OFL of 7,857 mt is projected from the 2011 assessment. The proposed ABC of 7,173 mt is based on a P* of 0.4. The coastwide ABC is apportioned 73.6% to the north based on the average annual 2003-2010 proportion of estimated swept-area biomass from the NWFSC trawl survey. The 2015 40-10 adjusted ACL for sablefish north of 36º N lat. is 4,793 mt.

Total catches by sector of sablefish north of 36º N lat. are provided in Table 4-11. The cumulative 2002-2012 total catch of sablefish north of 36º N lat. was 19.5% higher than the cumulative 2015 ACL, although the OY (now ACL) was only exceeded in 2007 due to a data glitch in a PacFIN data feed which has now been fixed. In hindsight, the 2015 ACL was exceeded in 9 of the 11 years analyzed (Figure 4-6). Sablefish is one of the most closely tracked species in the U.S. west coast groundfish fishery and the chance of overfishing the stock in 2015 and 2016 is low.

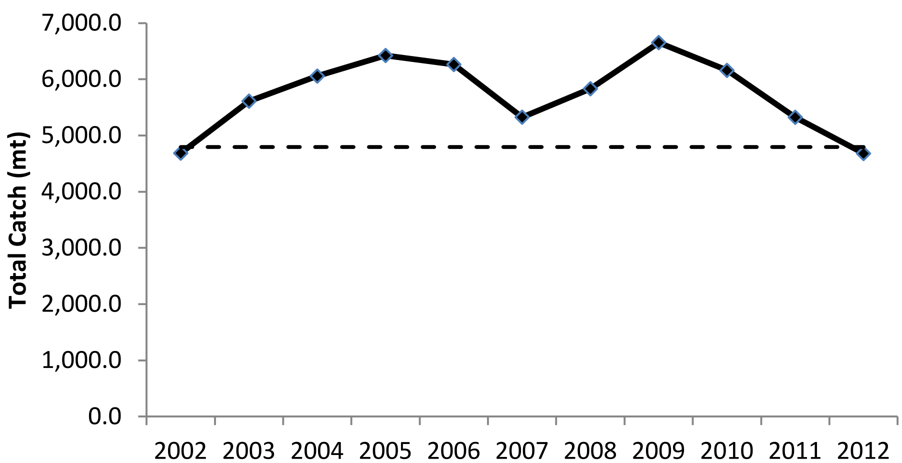


Figure 4-6. Estimated total catch of sablefish north of 36º N lat., 2002-2012 relative to the proposed 2015 ACL (horizontal dashed line).

Table 4-11. Estimated total catch by sector of sablefish north of 36º N lat., 2001-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sablefish (North of 36° N. lat.)											
Set-Aside	**492.3**	**734.4**	**871.8**	**803.6**	**735.0**	**597.8**	**570.8**	**673.2**	**593.0**	**551.9**	**593.7**
California Halibut		0.0	0.1	0.0			0.0				
Incidental	42.3	131.2	161.1	109.7	66.1	82.1	41.3	32.8	12.2	18.7	31.6
Pink Shrimp	13.8	0.6	0.7	0.4		0.3	2.2	0.9	1.3	0.1	0.2
Tribal At-Sea Hake	0.5	0.1	0.1	0.0		0.0	0.8	0.0		0.1	
Tribal Shoreside	435.7	602.5	709.9	693.5	668.8	515.5	526.5	639.5	579.5	533.0	561.9
Non-Trawl	**1,700.0**	**2,450.9**	**2,580.9**	**3,075.6**	**2,890.3**	**2,119.0**	**2,323.3**	**2,791.6**	**2,791.6**	**2,388.3**	**1,899.4**
Nearshore Fixed Gear	14.9	10.7	2.1	41.5	8.6	2.6	3.3	3.2	2.9	1.4	1.7
Non-nearshore Fixed Gear	1,685.1	2,440.2	2,578.8	3,034.1	2,881.7	2,116.3	2,319.9	2,788.5	2,788.7	2,386.8	1,897.7
Trawl	**2,494.1**	**2,425.6**	**2,603.6**	**2,543.7**	**2,637.5**	**2,609.1**	**2,937.2**	**3,187.5**	**2,773.4**	**2,383.6**	**2,186.8**
Non-Tribal At-Sea Hake	21.1	17.1	28.5	15.2	2.4	3.2	1.6	0.2	12.4	5.0	5.1
Shoreside Hake	132.9	40.3	129.4	22.4	11.1	9.0	0.3	49.2	20.8	30.4	47.2
Limited Entry Trawl Permit - Trawl Gear	2,340.0	2,368.2	2,445.7	2,506.1	2,624.1	2,596.9	2,935.3	3,138.1	2,740.2	1,661.0	1,407.7
Limited Entry Trawl Permit - Fixed Gear										687.2	726.8
Grand Total	**4,686.3**	**5,610.9**	**6,056.4**	**6,422.9**	**6,262.8**	**5,325.9**	**5,831.3**	**6,652.3**	**6,158.0**	**5,323.7**	**4,679.8**

4.1.3.8 Spiny Dogfish

Gertseva and Taylor (2011) estimated the spawning stock output of spiny dogfish to be 44,660 thousands of fish, which represented 63% of the unfished spawning output level at the start of 2011. While this depletion level indicated the stock was healthy, fishing at the target SPR of 45% was predicted to severely reduce the spawning output over the long term because of the extremely low productivity and other reproductive characteristics of the stock.

The SSC's recommended change in the proxy F_{MSY} harvest rate to calculate the OFL for this stock from an SPR of 45% to an SPR of 50% addresses the conservation need for a more conservative OFL (see the 2014 Stock Assessment and Fishery Evaluation document (PFMC 2014) for more information on the meta-analysis used to recommend the new proxy F_{MSY} harvest rate for elasmobranchs). The new proposed 2015 and 2016 OFLs based on the 50% SPR harvest rate of 2,523 and 2,503 mt, respectively compare to 2015 and 2016 OFLs based on the status quo 45% SPR harvest rate of 2,921 and 2,893 mt, respectively.

Total annual catches of spiny dogfish from 2004-2012 by sector of the groundfish fishery are provided in Table 4-12. Spiny dogfish catches prior to 2004 were not included in the biological impact analysis due to a lack of confidence in the precision of catch estimates derived from the Marine Recreational Fisheries Statistical Survey (MRFSS), which was the basis of California recreational catch estimates prior to implementation of the California Recreational Fisheries Survey (CRFS) in 2004. Spiny dogfish catches in recreational fisheries by state were generated from a March 15, 2014 Recreational Fisheries Information Network (RecFIN) query by querying for landed catch (A) plus the reported dead catch (B1). Since spiny dogfish catches in the Washington recreational fishery are reported in the Unidentified Sharks category, the A + B1 catches of Unidentified Sharks were used with an assumption 100% of that reported catch was spiny dogfish. Gertseva and Taylor (2011) made a similar assumption in the 2011 assessment. Catches by sector in the non-tribal at-sea hake fishery (Catcher-Processors and Mothership) were generated from a NMFS Alaska Fisheries Information Network NORPAC database query on March 14, 2014. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program.

Figure 4-7 compares the 2004-2012 annual total catches of spiny dogfish to the proposed 2016 OFL and ABC limits (2016 limits are slightly lower than 2015 limits so these values were chosen). In hindsight, the stock did not exceed the 2016 OFL and experience overfishing during the time series (Figure 4-7). The 2016 ABC was exceeded twice (2005 and 2008) primarily due to high bottom trawl catches (Table 4-12). Trawl catches seem to have stabilized at levels below the 2016 ABC in recent years with the lowest bottom trawl catches occurring since 2011 when the sector was rationalized under IFQ management (catches in the trawl IFQ sector since 2011 are the sum of those in the limited entry trawl permit – fixed gear, limited entry trawl permit – trawl gear, and shoreside hake categories in Table 4-12) While spiny dogfish is not an IFQ species, the distribution of bottom trawl effort in the shorebased IFQ sector changed dramatically since implementation of trawl rationalization. Total catches of spiny dogfish in 2012 were the lowest in the time series.

Managing the stock with its own OFL and ABC starting in 2015 will provide more direct catch accounting and control. There does not appear to be a high risk of the stock being subject to overfishing in the next management cycle. If further catch controls are needed in the future to reduce impacts, the Council and NMFS can consider a trawl allocation designating the species as an IFQ species through a regulatory amendment. However, determining an equitable catch history-based allocation of quota shares by trawl permit may be very difficult given the uncertain catch history of spiny dogfish (dogfish are rarely landed and have been discarded in most fisheries). In the meantime, cumulative landing limits and area closures are the catch control tools available to manage spiny dogfish (PFMC and NMFS 2012).

The cumulative catch of spiny dogfish in 2004-2012 was 39.4% less than the cumulative 2016 OFL (the 2016 OFL times the number of years in the analysis (9)), indicating the proposed harvest specifications and the total catch since 2004 have not created a significant biological risk for the stock of spiny dogfish on the U.S. west coast.

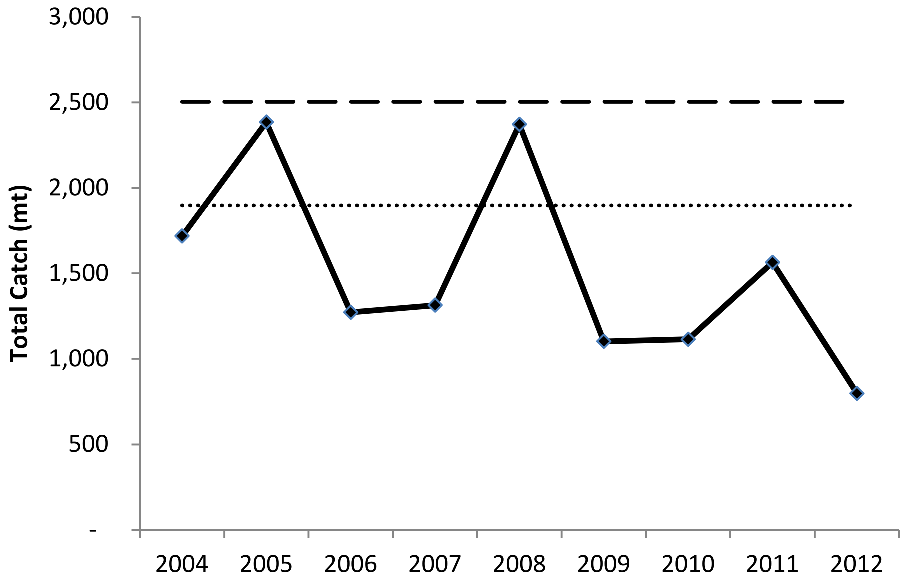


Figure 4-7. Estimated total catch of spiny dogfish, 2004-2012 relative to the proposed 2016 OFL (upper dashed line) and ABC (lower dotted line).

Table 4-12. Annual total catches of spiny dogfish by sector, 2004-2012.

Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**453**	**324**	**127**	**192**	**485**	**259**	**149**	**191**	**5**	**2,185**
California Halibut	35	25	8	3	3	3	3	2	2	84
Incidental	98	8	6	0.2	15	1	1	0.1	0.1	131
Pink Shrimp	5	1		1	4	0.5	16	3	1	31
Tribal At-Sea Hake	275	285	35	69	159	128	122	59	1	1,133
Tribal Shoreside	40	6	77	119	303	125	7	128	2	806
Non-Trawl	**251**	**303**	**351**	**347**	**290**	**125**	**135**	**73**	**85**	**1,961**
Nearshore Fixed Gear	0.04	0.18	0.03	0.27	0.78	0.49	0.11	0.28	0.02	2.20
Non-nearshore Fixed Gear	247	298	347	342	286	120	133	63	82	1,918
CA rec a/	2.3	4.1	3.2	5.0	2.5	3.7	1.3	9.5	2.6	34.10
OR rec a/	0.07	0.09	0.005	0.04	0.02	0.07	0.08	0.05	0.06	0.48
WA rec a/	1.6	0.5	0.8	-	0.9	0.7	1.1	0.2	0.4	6.3
Trawl	**1,015**	**1,757**	**794**	**775**	**1,596**	**719**	**830**	**1,300**	**707**	**9,499**
Limited Entry Trawl Permit - Fixed Gear								27	29	56
Limited Entry Trawl Permit - Trawl Gear	644	1,591	737	637	1,024	663	523	367	340	6,530
Catcher-Processor b/	331	42	6	63	488	28	110	641	148	1,859
Mothership b/	10	28	17	23	24	7	45	85	30	269
Shoreside Hake	30	96	34	51	59	21	151	181	160	785
Total Non-Treaty Groundfish Sectors	**1,266**	**2,060**	**1,145**	**1,122**	**1,886**	**844**	**965**	**1,373**	**793**	**11,461**
Grand Total	**1,719**	**2,385**	**1,272**	**1,314**	**2,371**	**1,103**	**1,114**	**1,564**	**798**	**13,647**

a/ Catches generated from a RecFIN query (03/15/2014) of spiny dogfish catches (A + B1) in CA and OR; and of unidentified shark catches (A + B1), assumed to be spiny dogfish, in WA.
b/ Catches generated from a NORPAC query (03/14/2014).

4.1.4 Stock Complexes and Component Stocks Currently Managed in Stock Complexes with Higher Annual Catch Limit Attainment Rates

4.1.4.1 Nearshore Rockfish North of 40º10' N lat.

In recent years, the ACL (formerly OY) for the Nearshore Rockfish complex north of 40º10' N lat. has typically had a high attainment rate. The bulk of the harvest has occurred in nearshore recreational fisheries in all three states and nearshore commercial fisheries in California and Oregon. The proposed ACL for the northern nearshore rockfish complex in 2015 and 2016 is 69 mt, a 26.6% decrease from the 2014 ACL of 94 mt. Most of this decrease is due to new assessments for brown, China, and copper rockfish, as well as a blue rockfish ACL contribution that is trending downwards. Figure 4-8 depicts the annual total catch estimated in 2004-2012 for the complex relative to the proposed 2015 OFL, ABC, and ACL. In only one year in this time period (2009) has total catch been below the proposed 2015 ACL. In hindsight, total catch has been at or above the proposed 2015 OFL in 5 of the 9 years analyzed.

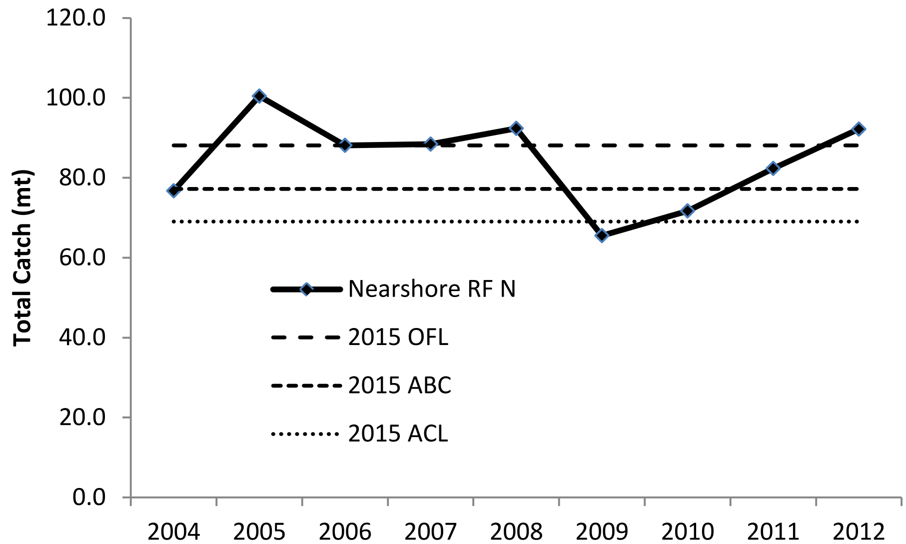


Figure 4-8. Estimated total catch of nearshore rockfish north of 40º10' N lat. in 2004-2012 relative to the proposed 2015 OFL (upper dashed line), ABC (middle dashed line), and ACL (lower dotted line).

Table 4-13 shows the 2004-2012 total catches of species in the northern Nearshore Rockfish complex by sector. Northern Nearshore Rockfish catches prior to 2004 were not included in the biological impact analysis due to a lack of confidence in the precision of catch estimates derived from the Marine Recreational Fisheries Statistical Survey (MRFSS), which was the basis of California recreational catch estimates prior to implementation of the California Recreational Fisheries Survey (CRFS) in 2004. Northern Nearshore Rockfish catches in recreational fisheries by state were generated from a March 18, 2014 RecFIN query by querying for landed catch (A) plus the reported dead catch (B1). Catch estimates for the Redwood District (Humboldt and Del Norte counties) were used in the query to represent catches north of 40º10' N lat. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program.

Two of the assessed stocks managed in the northern Nearshore Rockfish complex (blue rockfish in California and China rockfish) are in the precautionary zone. Both stocks are category 2 stocks with the status of China rockfish informed by a 2013 data-moderate assessment (PFMC 2014). Blue rockfish catches in California have been managed with a statewide HG since 2009. The HG was calculated using the default 40-10 ACL harvest control rule. Total mortality has been maintained within the HG and the stock is predicted to be increasing in abundance. The Council is considering HG management for the entire complex and/or China rockfish to be implemented in 2015.

Other assessed stocks managed in the northern Nearshore Rockfish complex include brown rockfish in California, copper rockfish, and gopher rockfish in California. All of these stocks are estimated to be healthy.

Table 4-13. Annual total catches of nearshore rockfish north of 40º10' N lat. by sector, 2004-2012.

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**0.2**	**0.3**	**0.3**	**0.4**	**0.0**	**0.1**	**0.0**	**0.0**	**0.2**	**1.6**
Incidental	**0.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.4**
Black and Yellow Rockfish										0.0
Blue Rockfish	0.0	0.0		0.0					0.1	0.1
Brown Rockfish							0.0			0.0
China Rockfish				0.0						0.0
Copper Rockfish				0.0						0.0
Gopher Rockfish				0.0						0.0
Nearshore Rockfish Unid	0.1	0.0	0.0	0.0						0.1
Olive Rockfish							0.0			0.0
Quillback Rockfish	0.0								0.1	0.1
Pink Shrimp	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
Blue Rockfish				0.2	0.0					0.2
Copper Rockfish		0.0								0.0
Olive Rockfish								0.0		0.0
Quillback Rockfish										0.0
Tribal Shoreside	**0.1**	**0.2**	**0.3**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.9**
Copper Rockfish	0.0									0.0
Nearshore Rockfish Unid	0.0	0.2	0.0		0.0	0.1		0.0	0.1	0.4
Quillback Rockfish	0.1	0.1	0.2	0.1						0.5
Non-Trawl	**74.2**	**99.8**	**85.2**	**87.9**	**92.3**	**65.3**	**71.7**	**82.2**	**91.8**	**750.5**
Nearshore Fixed Gear	**28.3**	**38.0**	**35.5**	**34.5**	**51.5**	**26.4**	**19.3**	**28.8**	**28.0**	**290.2**
Black and Yellow Rockfish	0.1	0.5	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.9
Blue Rockfish	15.0	21.2	19.8	14.5	29.7	11.7	10.8	15.2	12.3	150.2
Brown Rockfish	0.3	0.9	0.7	0.4	0.4	0.2	0.1	0.0	0.3	3.3
China Rockfish	7.5	4.7	5.8	8.1	9.8	8.8	5.3	8.5	9.4	68.0
Copper Rockfish	2.0	2.5	2.1	3.2	3.8	1.9	1.2	1.7	2.2	20.5

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand
Gopher Rockfish	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.8
Grass Rockfish	0.9	2.0	1.3	0.9	0.4	0.3	0.2	0.2	0.2	6.4
Nearshore Rockfish Unid	0.3	1.4	0.8	0.2						2.8
Olive Rockfish	0.0		0.0	0.4	0.0	0.7	0.0	0.1	0.1	1.3
Quillback Rockfish	2.2	4.7	4.9	6.6	7.1	2.6	1.5	2.9	3.4	35.9
Non-nearshore Fixed Gear	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.3**
Copper Rockfish						0.1				0.1
Olive Rockfish	0.2									0.2
Quillback Rockfish						0.1				0.1
CA Rec	**11.5**	**11.9**	**14.6**	**16.0**	**7.2**	**9.6**	**10.6**	**8.7**	**10.1**	**100.1**
Black and Yellow Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Blue Rockfish	8.0	8.5	9.3	6.6	2.2	3.1	4.1	2.7	2.9	47.4
Brown Rockfish	0.1	0.2	0.7	0.6	0.7	0.5	0.8	0.4	0.5	4.6
China Rockfish	0.5	0.5	0.6	1.5	1.0	1.6	0.9	1.2	1.4	9.2
Copper Rockfish	1.3	0.8	1.6	3.5	1.5	2.2	2.4	1.5	1.4	16.4
Gopher Rockfish	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.2	0.1	0.8
Grass Rockfish	0.1	0.1	0.0	0.2	0.2	0.3	0.6	0.2	0.1	2.0
Olive Rockfish	0.4	0.1	0.4	0.4	0.0	0.2	0.2	0.1	0.1	1.8
Quillback Rockfish	1.0	1.7	1.8	2.9	1.4	1.7	1.4	2.2	3.6	17.7
OR Rec	**27.2**	**41.9**	**27.2**	**29.4**	**26.9**	**24.9**	**32.8**	**36.7**	**45.9**	**292.8**
Black and Yellow Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blue Rockfish	20.8	33.2	16.0	17.3	16.2	15.9	22.0	21.4	26.1	188.8
Brown Rockfish	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.6
China Rockfish	2.0	2.1	2.6	3.1	2.9	2.3	2.6	3.4	3.7	24.6
Copper Rockfish	2.0	3.2	3.7	4.2	3.7	2.8	3.8	5.9	7.2	36.6
Grass Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Olive Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Quillback Rockfish	2.4	3.3	4.8	4.8	4.1	3.7	4.2	5.7	8.8	41.8

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand
WA Rec	**7.1**	**8.0**	**8.0**	**8.0**	**6.7**	**4.3**	**9.0**	**8.1**	**7.9**	**67.0**
Blue Rockfish	1.4	2.3	2.1	1.8	1.0	0.6	2.6	1.4	1.8	15.0
China Rockfish	2.1	2.0	2.4	2.6	2.4	1.7	3.5	2.8	2.7	22.1
Copper Rockfish	0.9	1.2	1.1	1.2	1.3	0.6	1.3	2.2	1.2	11.1
Quillback Rockfish	2.8	2.5	2.4	2.3	2.1	1.3	1.6	1.7	2.2	18.8
Trawl	**2.4**	**0.3**	**2.6**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**5.8**
Limited Entry Trawl Permit - Trawl Gear	**2.4**	**0.3**	**2.5**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**5.7**
Blue Rockfish		0.0						0.0		0.0
Brown Rockfish	0.4	0.0	0.0		0.0			0.0	0.0	0.4
China Rockfish										0.0
Copper Rockfish	0.0	0.1	0.1		0.0					0.2
Nearshore Rockfish Unid	0.3	0.1	0.1	0.0					0.0	0.6
Olive Rockfish	0.1									0.1
Quillback Rockfish	1.5	0.1	2.3	0.1	0.1	0.1	0.0	0.1	0.1	4.3
Non-Tribal At-Sea Hake	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Blue Rockfish			0.0							0.0
Quillback Rockfish			0.0		0.0					0.0
Shoreside Hake	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**
Blue Rockfish			0.0							0.0
Nearshore Rockfish Unid			0.1	0.0	0.0		0.0			0.1
Quillback Rockfish		0.0			0.0					0.0
Grand Total	**76.7**	**100.4**	**88.1**	**88.4**	**92.4**	**65.5**	**71.7**	**82.3**	**92.2**	**757.9**

4.1.4.2 China Rockfish North of 40º10' N lat.

The populations of China rockfish (*Sebastes nebulosus*) north and south of 40º10' N lat. were assessed by Dick and Cope (2014) in a new 2013 data-moderate assessment. The southern population was estimated to be healthy with an estimated depletion of 72% at the start of 2013. However, the northern population, managed as a component stock in the northern Nearshore Rockfish complex, was estimated to at 33% of unfished biomass at the start of 2013 (*cite new figure of SpB and depl time series*), and hence in the precautionary zone.

(*insert new figure of SpB and depl time series*)

China rockfish have a shallow distribution and are most common in the 10-50 fm zone (Love, *et al.* 2002). They are primarily caught in nearshore commercial fisheries in California and Oregon, as well as nearshore recreational fisheries in waters off all three states. Table 4-14 provides the estimated annual catches of China rockfish north of 40º10' N lat. by sector in 2004-2012. The average annual total catch in 2004-2012 is estimated to be 13.8 mt.

The estimated 2015 OFL contribution of China rockfish in the north Nearshore Rockfish complex is 7.2 mt. Under the preferred P* of 0.45, the 2015 ABC contribution is 6.6 mt and the 40-10 adjusted ACL contribution is 6.2 mt. Figure 4-9 depicts total estimated catch of China rockfish north of 40º10' N lat. relative to the 2015 OFL and ACL contributions to the complex. The cumulative 2004-2012 total estimated catch of China rockfish north of 40º10' N lat. was 191% and 221% of the cumulative 2015 OFL and ACL contributions, respectively. Maintaining these catch levels is predicted to lead to continued stock decline (*need final decision table with depletion projections*).

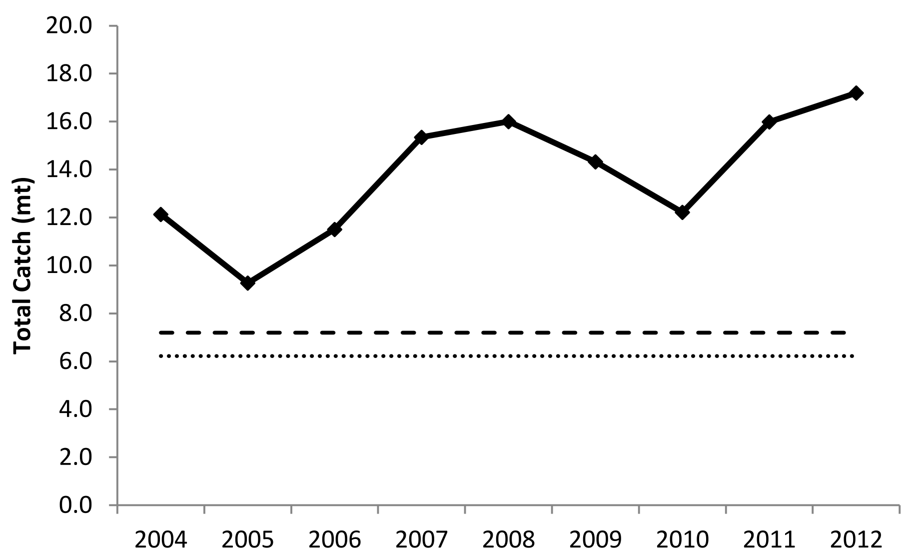


Figure 4-9. Estimated total catch of China rockfish north of 40º10' N lat. in 2004-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ACL contribution (lower dotted line).

Table 4-14. Annual total catches of China rockfish north of 40°10’ N lat. by sector, 2004-2012.

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside				**0.01**					
Incidental				**0.01**					
China Rockfish				0.01					
Non-Trawl	**12.1**	**9.3**	**11.5**	**15.3**	**16.0**	**14.3**	**12.2**	**16.0**	**17.2**
Nearshore Fixed Gear	**7.5**	**4.7**	**5.8**	**8.1**	**9.8**	**8.8**	**5.3**	**8.5**	**9.4**
China Rockfish	7.5	4.7	5.8	8.1	9.8	8.8	5.3	8.5	9.4
CA Rec	**0.5**	**0.5**	**0.6**	**1.5**	**1.0**	**1.6**	**0.9**	**1.2**	**1.4**
China Rockfish	0.5	0.5	0.6	1.5	1.0	1.6	0.9	1.2	1.4
OR Rec	**2.0**	**2.1**	**2.6**	**3.1**	**2.9**	**2.3**	**2.6**	**3.4**	**3.7**
China Rockfish	2.0	2.1	2.6	3.1	2.9	2.3	2.6	3.4	3.7
WA Rec	**2.1**	**2.0**	**2.4**	**2.6**	**2.4**	**1.7**	**3.5**	**2.8**	**2.7**
China Rockfish	2.1	2.0	2.4	2.6	2.4	1.7	3.5	2.8	2.7
Grand Total	**12.1**	**9.3**	**11.5**	**15.3**	**16.0**	**14.3**	**12.2**	**16.0**	**17.2**

4.1.4.3 Shallow Roundfish Complex

An alternative to managing cabezon in Washington; kelp greenling in California, Oregon, and Washington; and leopard shark with stock-specifications is to manage these five populations in a coastwide Shallow Rockfish complex.

4.1.4.4 Slope Rockfish Complexes North and South of 40º10’ N lat.

Alternative Slope Rockfish complex structures are under consideration due primarily to concerns about catches exceeding new OFL contributions for rougheye/blackspotted and shortraker rockfish. Agenda Item C.8 provides information on the Slope Rockfish complex alternatives. The following sections address potential biological risks for rougheye/blackspotted and shortraker rockfish.

4.1.4.5 Rougheye/Blackspotted Rockfish

Rougheye and blackspotted rockfish are currently managed in the Slope Rockfish complexes north and south of 40°10’ N lat., although they are a very minor component of the southern Slope Rockfish complex. Both species share broad overlap in their depth and geographic distributions from the Eastern Aleutian Islands along the North American continental margin to southern Oregon, with blackspotted rockfish’s range extending east beyond the Aleutian chain to the Pacific Coast of Japan (Gharrett, *et al.* 2005; Hawkins, *et al.* 2005; Orr and Hawkins 2008). It is very difficult to visually distinguish between the two species and they have been persistently confused in surveys and catches. It has only been from recent genetic studies in the early 2000s that the two separate species have been identified and described (Orr and Hawkins 2008).

Hicks et al. (2013) conducted the first assessment of the U.S. west coast stock of rougheye and blackspotted rockfish as a complex of two species. The coastwide population was modeled assuming parameters for combined sexes (a single-sex model) and assuming removals beginning in 1916. The predicted spawning biomass from the base model generally showed a slight decline over the entire time series with a period of steeper decline during the 1980s and 1990s. Since 2000, the spawning biomass has stabilized and possibly increased because of reduced catches and above average recruitment in 1999. The 2013 spawning biomass relative to unfished equilibrium spawning biomass was estimated to be 47 percent of its unfished equilibrium at the start of 2013. The stock has been estimated to be healthy throughout the time series in the new assessment (Figure 4-10).

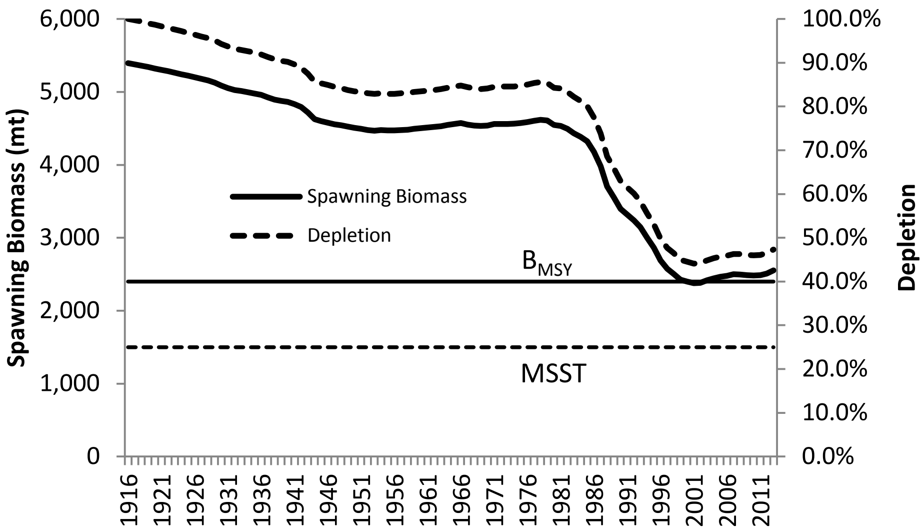


Figure 4-10. Time series of estimated spawning biomass and depletion of rougheye/blackspotted rockfish, 1916-2013 (from Hicks et al. 2013).

Total estimated annual catches of rougheye/blackspotted by sector of the groundfish fishery in 2002-2012 are provided in Table 4-15. Catches by sector in the non-tribal at-sea hake fishery (Catcher-Processors and Mothership) were generated from a NMFS Alaska Fisheries Information Network NORPAC database query on March 14, 2014. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program. Catches by sector in Table 4-15 are the sum of rougheye/blackspotted rockfish catches plus the proportion of rougheye/blackspotted rockfish catches reported in the shortraker-rougheye market category.

Figure 4-11 compares the 2002-2012 annual total catches of rougheye/blackspotted rockfish to the proposed 2015 OFL and ABC limits (2015 limits are slightly lower than 2016 limits so these values were chosen). In hindsight, the stock has exceeded the 2015 OFL and experienced overfishing since 2008 during the time series (Figure 4-7). The 2007 catch also slightly exceeded the 2015 ABC.

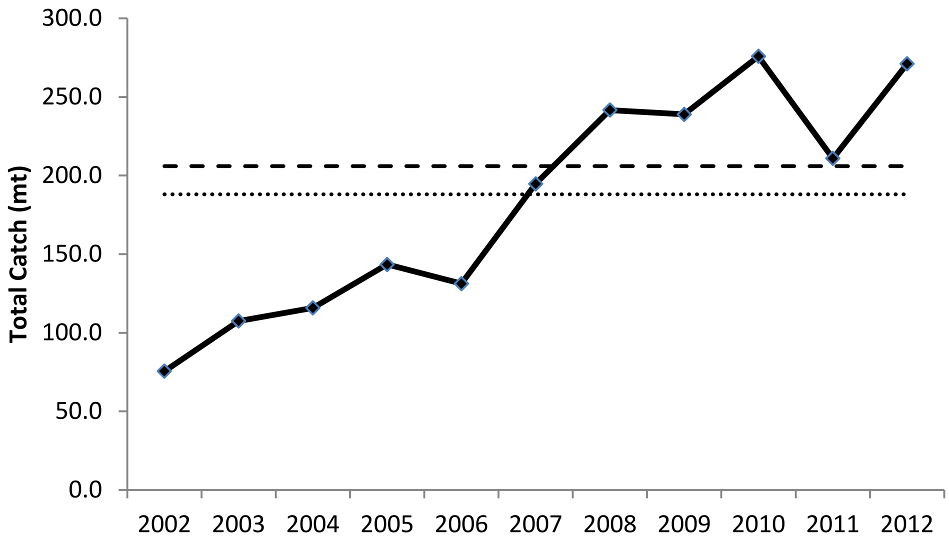


Figure 4-11. Estimated total catch of rougheye/blackspotted rockfish, 2002-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ABC contribution (lower dotted line).

The cumulative coastwide catch of rougheye/blackspotted rockfish in 2002-2012 was 97% of the cumulative 2015 OFL (the 2015 OFL times the number of years in the analysis (11)); however, the cumulative catch since 2008 was 120.2% of the cumulative OFL for that period. This indicates there may be a concern for maintaining the observed harvest levels since 2008. Notwithstanding the recent catches, the average 2015-2024 catch predicted to stabilize the population at the proxy B_{MSY} level of $B_{40\%}$ is 266 mt (Table 4-16) or 145.8% and 107.4% of the average 2002-2012 and 2008-2012 catches, respectively. The 2015-2024 equilibrium yield catch assumes the F_{MSY} harvest rate estimated in the 2013 assessment (SPR = 29.6%). To the extent the actual F_{MSY} harvest rate for the stock is closer to or over the estimated F_{MSY} harvest rate in the 2013 assessment, the risk of future overfishing under status quo management is lessened.

Since 2011, slope rockfish targeting in the bottom trawl fishery has decreased dramatically (only 17% of the 2011 quota of the northern slope rockfish was attained) under IFQ management. The 2011 catch levels are more likely than those preceding implementation of trawl rationalization. Higher than normal catch of rougheye in the 2011 catcher-processor (CP) sector occurred because the CP sector fished much later in the year and concentrated effort more than usual off northern Washington where large numbers of hake were aggregated. This is not typical behavior as evidenced by highly variable catch and effort distribution in the CP sector.

The center of distributions for rougheye and blackspotted rockfish is the Gulf of Alaska and these species are at the fringe of their distributions on the U.S. west coast. The 2013 assessment of the rougheye-blackspotted rockfish complex in the Gulf of Alaska estimated an age 3+ biomass of almost 43,000 mt and predicted an increasing trend in that biomass (Shotwell and Hanselman 2013). The recommended 2015 OFL for Gulf of Alaska fisheries is 1,518 mt (ABC = 1,262 mt). It is likely the small proportion of removals in west coast fisheries will have little effect on overall stock status.

Considerations for restructuring the slope rockfish complexes to either manage rougheye/blackspotted in a coastwide management unit or in a coastwide rougheye/blackspotted/shortraker complex will also reduce risk of future overfishing but could disrupt limited entry trawl and fixed gear fisheries. Risk of future overfishing may also be mitigated by establishing an HG for rougheye/blackspotted rockfish, which would establish a sorting requirement and aid in inseason catch monitoring. Fishermen would have to carefully track their catches to avoid rougheye and blackspotted rockfish or risk an inseason action to close areas where these species are caught. The HG could be allocated by sector, but the contention associated with this would likely require more process and time than available in the 2015-2016 specifications decision-making cycle. A shared HG would put industry on notice and allow them to devise strategies for reducing impacts on rougheye/blackspotted rockfish with less immediate disruption of the fishery. Risk of overfishing could be evaluated in the next management cycle before slope rockfish restructuring and sector allocations are considered necessary.

Table 4-15. Estimated total catch of rougheye/blackspotted rockfish by sector, 2002-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Total estimated Rougheye/Blackspotted Rockfish coastwide catches by sector, 2002-2012.												
Set-Aside	**9.3**	**16.7**	**18.5**	**21.5**	**21.4**	**24.0**	**19.5**	**36.4**	**18.9**	**18.8**	**15.9**	**220.9**
Incidental	2.4	5.0	2.6	1.5	0.5	2.0	1.0	2.2	0.5	0.3	0.7	18.7
Pink Shrimp	0.0	0.0	1.7	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.0
Tribal At-Sea Hake	0.0	0.0	0.0	0.0	0.0	0.1	2.9	0.6	0.0	2.4	0.0	6.0
Tribal Shoreside	6.9	11.6	14.3	19.8	20.9	21.8	15.7	33.6	18.4	16.1	15.2	194.2
Non-Trawl	**21.5**	**13.3**	**24.2**	**37.3**	**42.2**	**47.0**	**62.1**	**71.6**	**86.2**	**41.3**	**84.7**	**531.3**
Nearshore Fixed Gear	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Non-nearshore Fixed Gear	21.5	13.1	24.2	36.6	42.1	47.0	62.1	71.6	86.2	41.3	84.6	530.4
Trawl	**44.8**	**77.6**	**73.1**	**84.6**	**67.7**	**123.7**	**160.0**	**130.9**	**170.7**	**150.9**	**170.5**	**1,254.4**
Limited Entry Trawl Permit - Fixed Gear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	21.7	36.7
Limited Entry Trawl Permit - Trawl Gear	44.1	75.4	58.5	45.6	61.1	92.9	86.9	120.7	144.0	53.1	47.9	830.2
Catcher-Processor	0.3	2.0	13.7	30.5	6.0	27.2	69.4	8.3	17.0	74.4	42.0	290.8
Mothership	0.4	0.2	0.0	8.3	0.6	1.7	3.1	0.4	4.6	4.0	11.8	35.1
Shoreside Hake	0.0	0.0	0.8	0.2	0.0	1.9	0.6	1.6	5.1	4.2	47.1	61.6
Grand Total	**75.6**	**107.5**	**115.8**	**143.4**	**131.2**	**194.7**	**241.7**	**238.9**	**275.8**	**210.9**	**271.1**	**2,006.6**

Table 4-16. Summary table of 12-year projections of rougheye/blackspotted rockfish beginning in 2015 for alternate states of nature based on the axis of uncertainty. Total catches in 2013 and 2014 are determined from 5 year averages of the landings for each fleet (trawl, hook & line, and at-sea), and are also used as status quo catches. Table from Hicks et al., 2013.

			State of nature					
			Low $M = 0.037$		Base case M estimated at 0.042		High $M = 0.047$	
Relative probability of ln(SB_2013)			0.25		0.5		0.25	
Management decision	Year	Catch (mt)	Spawning biomass (mt)	Depletion	Spawning biomass (mt)	Depletion	Spawning biomass (mt)	Depletion
ABC (σ = 0.72; P* = 0.45)	2015	188	1,855	39%	2,653	49%	3,779	60%
	2016	192	1,888	39%	2,706	50%	3,859	61%
	2017	197	1,918	40%	2,755	51%	3,932	62%
	2018	201	1,942	40%	2,797	52%	3,993	63%
	2019	204	1,959	41%	2,829	52%	4,042	64%
	2020	206	1,969	41%	2,851	53%	4,077	64%
	2021	208	1,972	41%	2,864	53%	4,100	65%
	2022	209	1,968	41%	2,868	53%	4,111	65%
	2023	209	1,958	41%	2,865	53%	4,112	65%
	2024	208	1,945	41%	2,856	53%	4,106	65%
Recent 5-year average catches	2015	189	1,855	39%	2,653	49%	3,779	60%
	2016	189	1,888	39%	2,706	50%	3,859	61%
	2017	189	1,919	40%	2,756	51%	3,933	62%
	2018	189	1,946	41%	2,801	52%	3,997	63%
	2019	189	1,968	41%	2,837	53%	4,051	64%
	2020	189	1,983	41%	2,865	53%	4,091	65%
	2021	189	1,992	42%	2,884	53%	4,120	65%
	2022	189	1,995	42%	2,895	54%	4,138	65%
	2023	189	1,993	42%	2,900	54%	4,147	65%
	2024	189	1,987	41%	2,899	54%	4,148	65%
Catch that stabilizes equilibrium depletion at 40% in the base model	2015	258	1,855	39%	2,653	49%	3,779	60%
	2016	261	1,862	39%	2,680	50%	3,833	61%
	2017	265	1,867	39%	2,704	50%	3,880	61%
	2018	267	1,866	39%	2,720	50%	3,917	62%
	2019	269	1,859	39%	2,728	51%	3,942	62%
	2020	270	1,844	38%	2,726	51%	3,954	62%
	2021	270	1,823	38%	2,715	50%	3,953	62%
	2022	269	1,796	37%	2,697	50%	3,942	62%
	2023	267	1,764	37%	2,673	50%	3,923	62%
	2024	264	1,730	36%	2,644	49%	3,897	62%

4.1.4.6 Shortraker Rockfish

Shortraker rockfish (*Sebastes borealis*) is an unassessed category 3 stock on the U.S. west coast. This is one of the largest rockfish species with a broad distribution throughout the North Pacific, from Japan, the Okhotsk Sea, and southeastern Kamchatka to the Bering Sea and Aleutian Islands south to Point Conception (Love, *et al.* 2002). They are common from at least eastern Kamchatka to British Columbia, and are considered at the fringe of their population on the U.S. west coast.

Shortraker are caught in both trawl and fixed gear fisheries on the slope (Table 4-17), almost exclusively off Washington. Total catch of shortraker rockfish has been estimated to be at or above the 2015 OFL contribution in 9 of the 11 years analyzed (Figure 4-12). Trawl catches have been decreasing since the recent year high in 2007. However, the fixed gear fishery on the slope had a recent year high catch in 2012. It is unknown how much of this catch was targeted and how much was incidental to sablefish targeting. Given the large size and higher market value of shortraker, some targeting is likely. A reduction in cumulative landing limits for rougheye and shortraker could reduce some of this targeting and impacts in this sector. Such efforts appear to have been successful in reducing southern blackgill rockfish mortalities in 2013 in fixed gear fisheries that were targeting that stock.

The vast majority of the shortraker rockfish biomass and catch occurs north of the west coast EEZ in waters off British Columbia and Alaska. It is likely the small proportion of removals in west coast fisheries will have little effect on overall stock status.

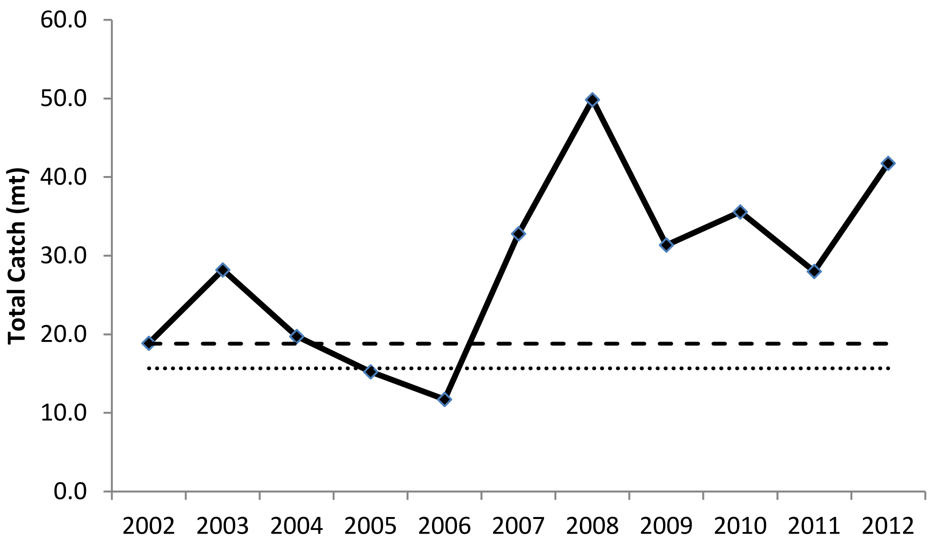


Figure 4-12. Estimated total catch of shortraker rockfish, 2002-2012 relative to the proposed 2015 OFL contribution (upper dashed line) and ABC contribution (lower dotted line).

Table 4-17. Estimated total catch of shortraker rockfish by sector, 2002-2012.

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Set-Aside	**1.7**	**2.0**	**1.1**	**1.2**	**1.5**	**1.2**	**1.7**	**1.1**	**1.1**	**1.3**	**1.5**	**15.3**
Incidental	0.6	1.4	0.5	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.2	3.1
Pink Shrimp				0.2		0.0	0.1					0.3
Tribal At-Sea Hake						0.0		0.0	0.0			0.0
Tribal Shoreside	1.0	0.6	0.6	1.0	1.4	1.0	1.6	1.0	1.1	1.3	1.3	11.9
Non-Trawl	**1.8**	**0.9**	**3.2**	**4.2**	**1.9**	**1.7**	**18.9**	**2.9**	**5.5**	**3.0**	**20.0**	**64.0**
Nearshore Fixed Gear				0.1							0.0	0.1
Non-nearshore Fixed Gear	1.8	0.9	3.2	4.1	1.9	1.7	18.9	2.9	5.5	3.0	20.0	63.9
Trawl	**15.4**	**25.3**	**15.4**	**9.9**	**8.4**	**29.9**	**29.2**	**27.3**	**28.9**	**23.7**	**20.3**	**233.7**
Limited Entry Trawl Permit - Fixed Gear										0.4	1.3	1.7
Limited Entry Trawl Permit - Trawl Gear	15.4	25.2	14.3	9.4	8.0	28.3	28.7	27.0	27.2	20.7	12.7	216.9
Catcher-Processor Mothership	0.1	0.1	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.7	3.5
Shoreside Hake		0.0	0.6			1.2	0.2	0.1	1.4	2.4	5.6	11.6
Grand Total	**18.9**	**28.2**	**19.7**	**15.2**	**11.7**	**32.8**	**49.8**	**31.4**	**35.6**	**28.0**	**41.8**	**313.1**

4.2 Impacts of 2015-2016 Management Measures to Groundfish Stocks

4.2.1 No Action

Deductions from most groundfish ACLs are made to account for groundfish mortality in the Pacific Coast treaty Indian tribal fisheries, scientific research, nongroundfish target fisheries (hereinafter incidental open access fisheries), and, as necessary, EFPs. Set-asides from the sablefish north of 36° N. latitude ACL are slightly different due to the sablefish allocation framework and include groundfish mortality in tribal fisheries, research, recreational fisheries, and EFPs. The Council and NMFS do not have direct management control over these activities, except for EFPs and recreational fisheries. While NMFS has direct control over the terms and conditions of the EFP permits and recreational fishery management, sufficient yield set-aside must be available to accommodate the anticipated groundfish mortality. Deductions from the ACL to account for these activities are important accountability measures that increase the probability that catches will remain below the ACLs.

Table 4-18 details the deductions from the ACLs for No Action. The approach used to calculate appropriate set-asides under No Action and the action alternatives for 2015-2016 is described below.

4.2.1.1 Tribal Fishery Set-Asides

Tribal fisheries consist of trawl (bottom, mid-water, and whiting), fixed gear, and troll. The requested tribal set-asides are based on the amounts in the March XXX, 2014 regulations.

4.2.1.2 Research Set-Asides

Research activities include the NMFS trawl survey, International Pacific Halibut Commission longline survey, and other Federal and state research. The Council approach is that set-asides should be equal to the maximum historical scientific research catch from 2005-2012, except for canary rockfish and yelloweye rockfish. The Council policy for canary and yelloweye rockfish was not based on the maximum historical value. The Council considered the high canary rockfish of 7.2 mt in 2006 from the NMFS trawl survey a rare event since surveys in later years encountered substantially less canary. The Council adopted a 4.5 mt canary rockfish set-aside, which is higher than the average research catch from 2005-2012. For yelloweye rockfish, the Council adopted a 3.3 mt research set-aside based on anticipated research needs of the International Pacific Halibut Commission (1.1 mt), Washington Department of Fish and Wildlife (1 mt), Oregon Department of Fish & Wildlife (1 mt), and other projects (0.2 mt).

4.2.1.3 Incidental Open Access Set-Asides

Deductions from ACLs are made to account for groundfish mortality in the incidental open access fisheries. The set-asides for all species, except longnose skate, were derived from the maximum historical values in the 2007-2011 WCGOP Groundfish Mortality reports. The recommended set-aside for longnose skate was based on data from the 2009-2011 Total Mortality reports, the years in which longnose skate were reported separately from the Other Fish category.

4.2.1.4 EFP Set-Asides

The Council recommended three EFPs and associated set-asides for 2013-2014 cycle which would remain under No Action. The first EFP seeks to test the effectiveness of trolled longline gear to selectively harvest chilipepper rockfish in waters off central California (Agenda Item E.3.a, Attachment 1, November 2011). The second EFP seeks to test the effectiveness of vertical hook-and-line gear to selectively harvest midwater species such as yellowtail rockfish (Agenda Item E.3.a, Attachment 2, November 2011). The third EFP seeks to survey the distribution and size of overfished species in the Rockfish Conservation Area (RCA) off the central coast of California using hook-and-line and trap gear (Agenda Item E.3.a, Attachment 3, November 2011). No total catch limits or yield set-asides are required for the third EFP since those catches will be covered using QP allocated in the shorebased IFQ fishery or trip limits for non-IFQ species.

4.2.1.5 Recreational (Sablefish north of 36° N. latitude only)

The allocation framework for sablefish north of 36° N. latitude specifies that anticipated recreational catches of sablefish be deducted from the ACL prior to the commercial limited entry and open access allocations. The set-aside is the maximum historical value from recreational fisheries from 2004-2011

Table 4-18. No Action. Estimates of tribal, EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline under the No Action Alternative.

Stock	Area	ACL	Tribal	EFP	Res.	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	337	0.0	6.0	1.7	0.7	328.6
CANARY	Coastwide	119	9.5	1.5	4.5	2.0	101.5
COWCOD	S of 40º10' N.	3	0.0	0.0	0.1	0.0	2.9
DARKBLOTCHED	Coastwide	330	0.1	0.2	2.1	18.4	309.2
PETRALE SOLE	Coastwide	2,652	220.0	0.0	11.6	2.4	2418.0
POP	N of 40º10' N.	153	10.9	0.0	5.2	0.4	136.5
YELLOWEYE	Coastwide	18	2.3	0.0	3.3	0.2	12.2
Arrowtooth flounder	Coastwide	5,758	2041.0	0.0	16.4	30.0	3670.6
Black rockfish	N of 46º16' N.	409	14.0	0.0	0.0	0.0	395.0
Black rockfish	S of 46º16' N.	1,000	0.0	0.0	0.0	0.0	1000.0
Cabezon	46º16' to 42º N.	47	0.0	0.0	0.0	0.0	47.0
Cabezon	S of 42º N. lat.	158	0.0	0.0	0.0	0.0	158.0
California scorpionfish	S of 34°27' N.	117	0.0	0.0	0.0	2.0	115.0
Chilipepper	S of 40º10' N.	1,647	0.0	210.0	9.0	5.0	1423.0
Dover sole	Coastwide	25,000	1497.0	0.0	38.0	55.0	23410.0
English sole	Coastwide	5,646	91.0	0.0	5.0	7.0	5543.0
Lingcod	N of 40'10º N.	2,878	250.0	0.0	11.7	16.0	2600.3
Lingcod	S of 40'10º N.	1,063	0.0	2.0	0.0	7.0	1054.0
Longnose skate	Coastwide	2,000	56.0	0.0	13.2	3.0	1927.8
Longspine thornyhead	N of 34º27' N.	1,958	30.0	0.0	13.0	3.0	1912.0
Longspine thornyhead	S of 34º27' N.	347	0.0	0.0	1.0	2.0	344.0
Pacific cod	Coastwide	1,600	400.0	0.0	7.0	2.0	1191.0
Pacific whiting a/	Coastwide	269,745	63,205	0.0	2,500		204,040
Sablefish	N of 36º N. lat.	4,349	See Table 4-18				
Sablefish	S of 36º N. lat.	1,560	0.0	0.0	3.0	2.0	1555.0
Shortbelly	Coastwide	50	0.0	0.0	2.0	0.0	48.0
Shortspine thornyhead	N of 34º27' N.	1,525	50.0	0.0	7.2	2.0	1465.8
Shortspine thornyhead	S of 34º27' N.	393	0.0	0.0	1.0	41.0	351.0
Splitnose	S of 40º10' N.	1,670	0.0	3.0	9.0	0.0	1658.0
Starry flounder	Coastwide	1,528	2.0	0.0	0.0	5.0	1521.0
Widow	Coastwide	1,500	60.0	18.0	7.9	3.3	1410.8

Yellowtail	N of 40º10' N.	4,382	677.0	10.0	11.5	3.0	3680.5
Nearshore rockfish north	N of 40º10' N.	94	0.0	0.0	0.0	0.0	94.0
Nearshore rockfish south	S of 40º10' N.	990	0.0	0.0	0.0	0.0	990.0
Shelf rockfish north	N of 40º10' N.	968	30.0	3.0	6.2	26.0	902.8
Shelf rockfish south	S of 40º10' N.	714	0.0	31.0	6.0	9.0	668.0
Slope rockfish north	N of 40º10' N.	1,160	36.0	1.0	6.0	19.0	1098.0
Slope rockfish south	S of 40º10' N.	622	0.0	2.0	2.0	17.0	601.0
Other fish	Coastwide	4,697	111.8	3.0	12.5	49.5	4520.2
Other flatfish	Coastwide	4,884	60.0	0.0	17.0	125.0	4682.0

a/ The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-19. No Action. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015-2016 (in mt).

				Trawl		Non-trawl	
Stock	**Area**	**Fishery HG**	**Allocation Type**	**%**	**Mt**	**%**	**Mt**
BOCACCIO	S of 40º10' N. lat.	328.6	Biennial	N/A	79.0	N/A	249.6
CANARY	Coastwide	101.5	Biennial	N/A	54.1	N/A	47.4
COWCOD	S of 40º10' N. lat.	2.9	Biennial	N/A	1.0	N/A	1.9
DARKBLOTCHED	Coastwide	309.2	Amendment 21	95%	293.7	5%	15.5
PETRALE	Coastwide	2,418.0	Biennial	N/A	2383.0	N/A	35.0
POP	N of 40º10' N. lat.	136.5	Amendment 21	95%	129.7	5%	6.8
YELLOWEYE	Coastwide	12.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,670.6	Amendment 21	95%	3,487.1	5%	183.5
Black	N of 46º16' N. lat.	395.0	None				
Black	S of 46º16' N. lat.	1,000.0	None				
Cabezon	46º16' to 42º N. lat.	47.0	None				
Cabezon	S of 42º N. lat.	158.0	None				
California scorpionfish	S of 34°27' N. lat.	115.0	None				
Chilipepper	S of 40º10' N. lat.	1,423.0	Amendment 21	75%	1,067.3	25%	355.8
Dover sole	Coastwide	23,410.0	Amendment 21	95%	22,239.5	5%	1,170.5
English sole	Coastwide	5,543.0	Amendment 21	95%	5,265.9	5%	277.2
Lingcod	N of 40'10º N. lat.	2,600.3	Amendment 21	45%	1,170.1	55%	1,430.2
Lingcod	S of 40'10º N. lat.	1,054.0	Amendment 21	45%	474.3	55%	579.7
Longnose skate	Coastwide	1,927.8	Biennial	90%	1,735.0	10%	192.8
Longspine thornyhead	N of 34º27' N. lat.	1,912.0	Amendment 21	95%	1,816.4	5%	95.6
Longspine thornyhead	S of 34º27' N. lat.	344.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Pacific whiting	Coastwide	TBD	Amendment 21	100%	TBA	0%	TBA
Sablefish	N of 36º N. lat.	0.0					
Sablefish	S of 36º N. lat.	1,555.0	Amendment 21	42%	653.1	58%	901.9
Shortbelly	Coastwide	48.0	None				
Shortspine thornyhead	N of 34º27' N. lat.	1,465.8	Amendment 21	95%	1,392.5	5%	73.3
Shortspine thornyhead	S of 34º27' N. lat.	351.0	Amendment 21	N/A	50.0	N/A	301.0
Splitnose	S of 40º10' N. lat.	1,658.0	Amendment 21	95%	1,575.1	5%	82.9
Starry flounder	Coastwide	1,521.0	Amendment 21	50%	760.5	50%	760.5
Widow	Coastwide	1,410.8	Amendment 21	91%	1,283.8	9%	127.0
Yellowtail	N of 40º10' N. lat.	3,680.5	Amendment 21	88%	3,238.8	12%	441.7
Nearshore rockfish north	N of 40º10' N. lat.	94.0	None				
Nearshore rockfish south	S of 40º10' N. lat.	990.0	None				
Other fish	Coastwide	4,520.2	None				
Other flatfish	Coastwide	4,682.0	Amendment 21	90%	4,213.8	10%	468.2
Shelf rockfish north	N of 40º10' N. lat.	902.8	Biennial	60.2%	543.5	39.8%	359.3
Shelf rockfish south	S of 40º10' N. lat.	668.0	Biennial	12.2%	81.5	87.8%	586.5
Slope rockfish north	N of 40º10' N. lat.	1,098.0	Amendment 21	81%	889.4	19%	208.6
Slope rockfish south	S of 40º10' N. lat.	601.0	Amendment 21	63%	378.6	37%	222.4

Table 4-20. No Action. Estimates of tribal, research, recreational and EFP mortality (in mt), used to calculate the fishery sablefish commercial harvest guideline north of 36° N. latitude under No Action.

Stock	ACL (mt)	Tribal Share (mt) a/	Research (mt)	Rec. (mt)	EFP (mt)	Commercial HG (mt)
Sablefish N. of 36° N. lat.	4,349	435	26	6.1	4	3,878

a/ The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

4.2.1.6 Shorebased IFQ – No Action

Groundfish allocated to the shorebased limited entry trawl fishery are managed under an IFQ program in which all vessels with trawl permits making shorebased groundfish landings with groundfish trawl or legal groundfish nontrawl gear are required to participate. Within the IFQ fishery a number of strategies are used which may be subjected to different regulations. Several fishing strategies are implemented in the IFQ fishery including the use of mid-water trawl gear to target Pacific whiting during the primary whiting season (see regulations at 660.131(b)(2)(iii)(c)), the use of midwater gear to target non-whiting species, the use of bottom-trawl gear to target nonwhiting, and the use of legal groundfish nontrawl gears to target groundfish (termed gear switching, 660.140(k)). Principle management measures for the shorebased IFQ fishery include:

- Catch Controls: IFQ and individual bycatch quota (IBQ) for Pacific halibut north of 40°10 N. latitude are the primary catch control tools in the shorebased IFQ fishery. South of 40°10 N. latitude, Pacific halibut is managed with a set-aside. The 2014 IFQ and IBQ used in the analysis of No Action can be found in Table 4-21. Additionally, cumulative monthly landing limits (hereinafter trip limits) for non-IFQ species and Pacific whiting outside the primary season dates apply to each vessel (see regulations Table 1 North and South to Part 660, Subpart D). Once a vessel reaches a limit, the species or species complex can no longer be retained and sold.
- Accumulation limits: The maximum number of QS and QP an entity may control in the shorebased IFQ fishery is limited by accumulation limits (defined in regulation at 50 CFR 660.111). These limits vary according to the management unit for the stock or stock complex and are intended to prevent the consolidation of quota holdings by just a few entities.
- Carry-over provision: The carry-over provision allows a limited amount of surplus QP or IBQ pounds in a vessel account to be carried over from one year to the next or allows a deficit in a vessel account in one year to be covered with QP or IBQ pounds from a subsequent year, up to a carryover limit. The carry-over provision is anticipated to increase individual flexibility for harvesters, improve economic efficiency, and achieve OY while preserving the conservation of stocks. The eligible percentages used for the carry-over provision may be modified during the biennial specifications and management measures process or automatically by NMFS under MSA authority at 305(d).
- Monitoring and Reporting: All trips in the shorebased IFQ fishery are monitored at sea by the West Coast Groundfish Observer Program (WCGOP) and landings are tracked by electronic fish tickets, verified by catch monitors. Together, these two programs provide robust, near-real time tracking and reporting of IFQ species and Pacific halibut IBQ.
- Gear Restrictions: IFQ species may be harvested with groundfish trawl or legal groundfish nontrawl gear. Trawl gear restrictions prohibit certain types of gear that may be used in rocky habitat, reducing habitat impacts and also limiting overfished species bycatch for those species that inhabit rocky substrate. Further, gear restrictions minimize catch of overfished species while allowing sufficient access to target species. For example, the selective flatfish trawl net, which is

required shoreward of the trawl RCA north of 40°10' N. latitude, reduces rockfish bycatch while efficiently catching flatfish. Scottish seine gear is exempted from trawl RCA closures in the area between 38° N. latitude and 36° N. latitude and depths less than 100 fm because the gear has demonstrated low bycatch rates of overfished species. IFQ species can also be harvested with legal nontrawl gears, which have different selectivity and habitat impacts than trawl gears.

- RCAs: Vessels harvesting IFQ must abide by RCA closures, which are specified by gear type (see regulations Table 1 North and South to Part 660, Subpart D and Table 2 North and South to Part 660, Subpart E). For example, vessels fishing with legal groundfish nontrawl gear must abide by the non-trawl RCA while vessels fishing with bottom trawl gear must abide by the trawl RCA. These RCA features were designed to provide sufficient access to target species while minimizing bycatch of overfished species, particularly canary and yelloweye rockfish.
- Bycatch Reduction Areas: Bycatch in the Pacific whiting fishery can be mitigated by implementing bycatch reduction areas. These areas restrictions apply to vessels using mid-water gear during the primary whiting season and limit fishing to depths greater than any of the specified management lines between 75 fm and 150 fm (see regulations at 660.131(c)(4) Subpart D).
- Ocean Conservation Zones: Chinook salmon bycatch in the Pacific whiting fishery can be mitigated by implementing the ocean salmon conservation zones. These zones apply to vessels using mid-water gear during the primary whiting season and restrict fishing to depths seaward of 100 fm.
- Other Groundfish Conservation Areas – Several other groundfish conservation areas exist and provide overfished species and habitat protection. Though not much bottom trawling is done south of Point Conception at 34°27' N. latitude in the Southern California Bight, bottom trawling and other bottom fishing activities are prohibited in two discrete areas called the CCAs (Figure 4-13). Closed EFH areas are used to protect bottom habitat from the adverse effects of trawl gear (see regulations at 660.75). Three areas off the Washington coast are designed to reduce bycatch of yelloweye rockfish. North Coast Area B and South Coast Area B are closed to commercial fishing (Figure 4-14 and Figure 4-15). South Coast Area A is a voluntary “area to be avoided” for commercial groundfish fisheries (Figure 4-15).

The projected groundfish mortality for IFQ species under No Action, as a result of implementing the above mentioned management measures, can be found in Table 4-21. Additionally, Table 4-21 includes mortality estimates for 2011 and 2012 for comparison. Groundfish mortality of non-IFQ species is not projected using a model; however historical data from 2011 and 2012 are provided for comparison (Table 4-22).

Table 4-21. No Action – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under No Action (2014 values). Year end estimates of mortality for 2011 and 2012 are provided for reference (right panel).

IFQ Species	Area	No Action		Historical Mortality a/	
		2014 Projected Mortality (mt)	**2014 SB IFQ Allocation (mt)**	2011 SB IFQ mortality (mt)	2012 SB IFQ mortality (mt)
BOCACCIO	South of 40°10' N. lat.	10.9	79.0	5	9
CANARY	Coastwide	9.4	41.1	4	7
COWCOD	South of 40°10' N. lat.	0.1	1.0	0	0
DARKBLOTCHED	Coastwide	108.5	278.4	91	86
PETRALE	Coastwide	2,252.1	2378.0	810	1,033
POP	North of 40°10' N. lat.	48.0	112.3	47	49
YELLOWEYE	Coastwide	0	1	0	0
Arrowtooth flounder	Coastwide	2,436	3,467	2,487	2,389
Chilipepper rockfish	South of 40°10' N. lat.	291	1,067	317	288
Dover sole	Coastwide	7,713	22,235	7,795	7,025
English sole	Coastwide	137	5,261	138	147
Lingcod	North of 40°10' N. lat.	XXX	1,152	XXX	XXX
Lingcod	South of 40°10' N. lat.	XXX	743	XXX	XXX
Longspine thornyheads	North of 34°27' N. lat	936	1,811	943	892
Pacific cod	Coastwide	266	1,126	258	396
Pacific whiting b/	Coastwide	83,946	85,697	90,978	65,666
Pacific halibut c/	North of 40°10 N. lat.	N/A	107	33.08	42.65
Pacific halibut d/	South of 40°10 N. lat.	N/A	10	0.255	0.60
Sablefish	North of 36° N. lat.	1,887	1,988	2,379	2,182
Sablefish	South of 36° N. lat.	307	653	449	223
Shortspine thornyheads	North of 34°27' N.	733	1,372	718	709
Shortspine thornyheads	South of 34°27' N	4	50	8	1
Splitnose rockfish	South of 40°10' N. lat.	53	1,575	40	60
Starry flounder	Coastwide	9	756	12	8
Widow rockfish	Coastwide	426	994	138	153
Yellowtail rockfish	North of 40°10' N. lat.	816	2,939	739	963
Shelf rockfish	North of 40°10' N. lat.	28	508	16	40
Shelf rockfish	South of 40°10' N. lat.	12	81	3	14
Slope rockfish	North of 40°10' N. lat.	182	789	145	217
Slope rockfish	South of 40°10' N. lat.	98	379	52	123
Other flatfish	Coastwide	728	4,194	703	687

a/ Historical estimates of mortality were generated using the WCGOP multi-year data product (January 2014). Pacific whiting values include inseason allocation reapportionments.
b/The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS, therefore the 2013 values were used.
c/ Pacific halibut is managed using IBQ, see regulations at §660.140. The 2014 Pacific halibut TAC was unavailable during the preparation of the EIS, therefore the 2013 values were used. Pacific halibut mortality is not projected.
d/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each). Pacific halibut mortality is not projected.

Table 4-22. Groundfish mortality for non-IFQ Stock in the shorebased IFQ fishery (in mt).

Stock	Mortality in 2011 (mt)	Mortality in 2012 (mt)
Big Skate	32	48
Black rockfish (North of 46°16' N. lat.)	1	1
California Skate	2	2
Grenadier Unidentified	69	70
Groundfish Unidentified	0	1
Longnose skate	811	908
Pacific Flatnose	3	2
Pacific Grenadier	82	56
Shortbelly rockfish	11	6
Skate Unidentified	278	231
Soupfin Shark	1	1
Spiny Dogfish Shark	575	529
Spotted Ratfish	71	79

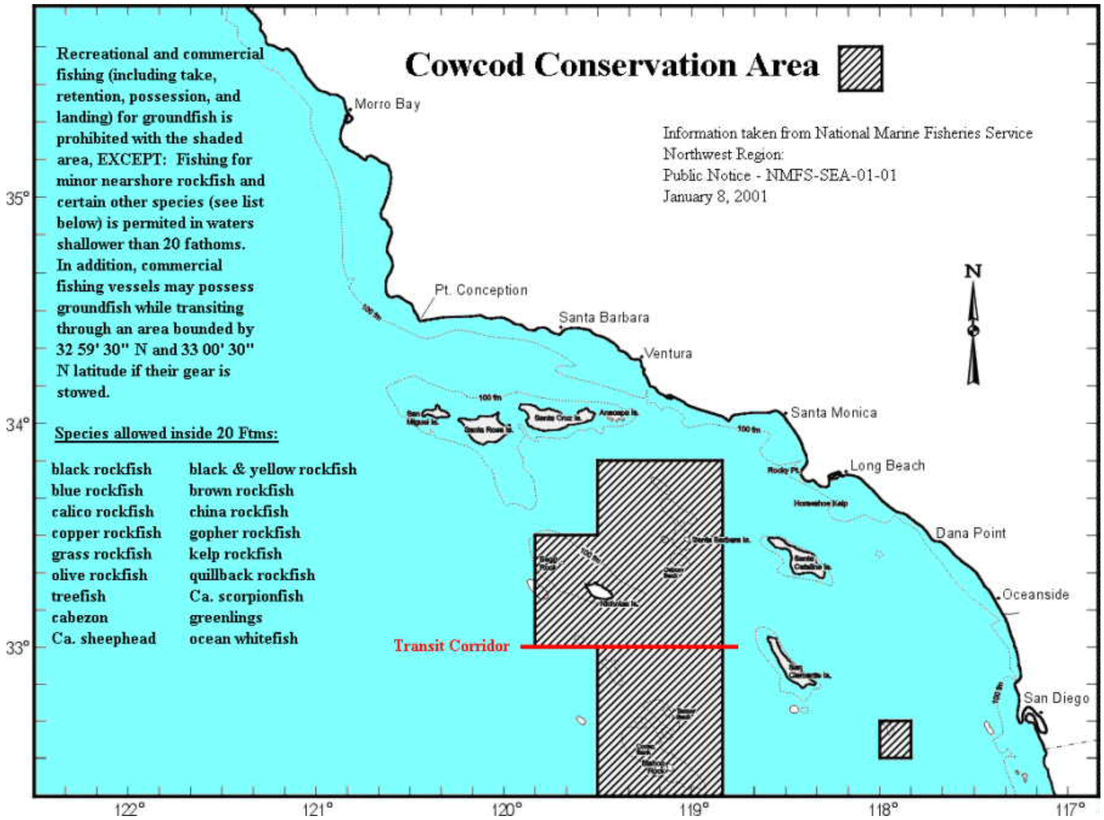


Figure 4-13. No Action. The current Cowcod Conservation Areas located in the Southern California Bight.

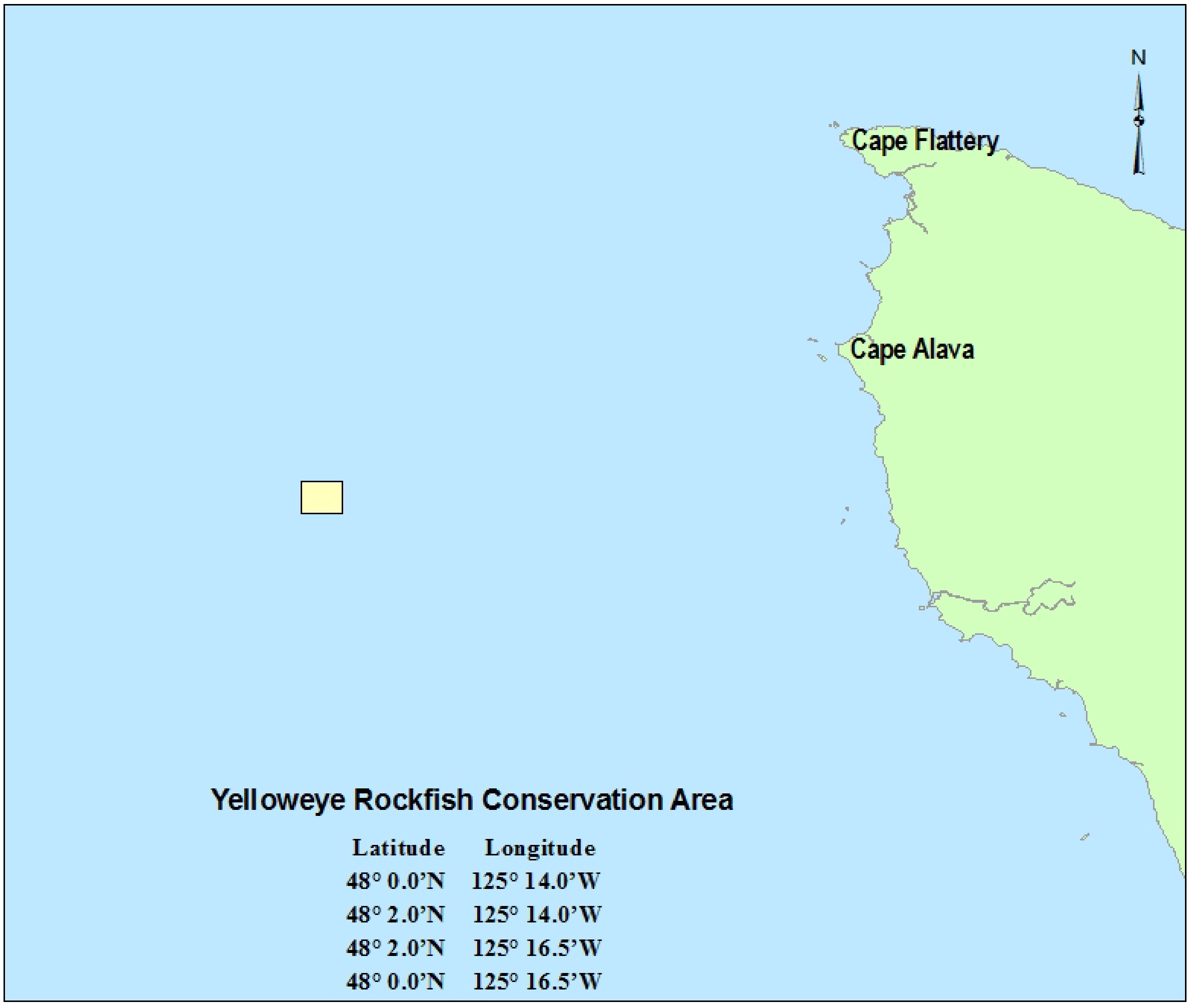


Figure 4-14. No Action. North Coast Area B, a Yelloweye Rockfish Conservation Area in northern Washington.

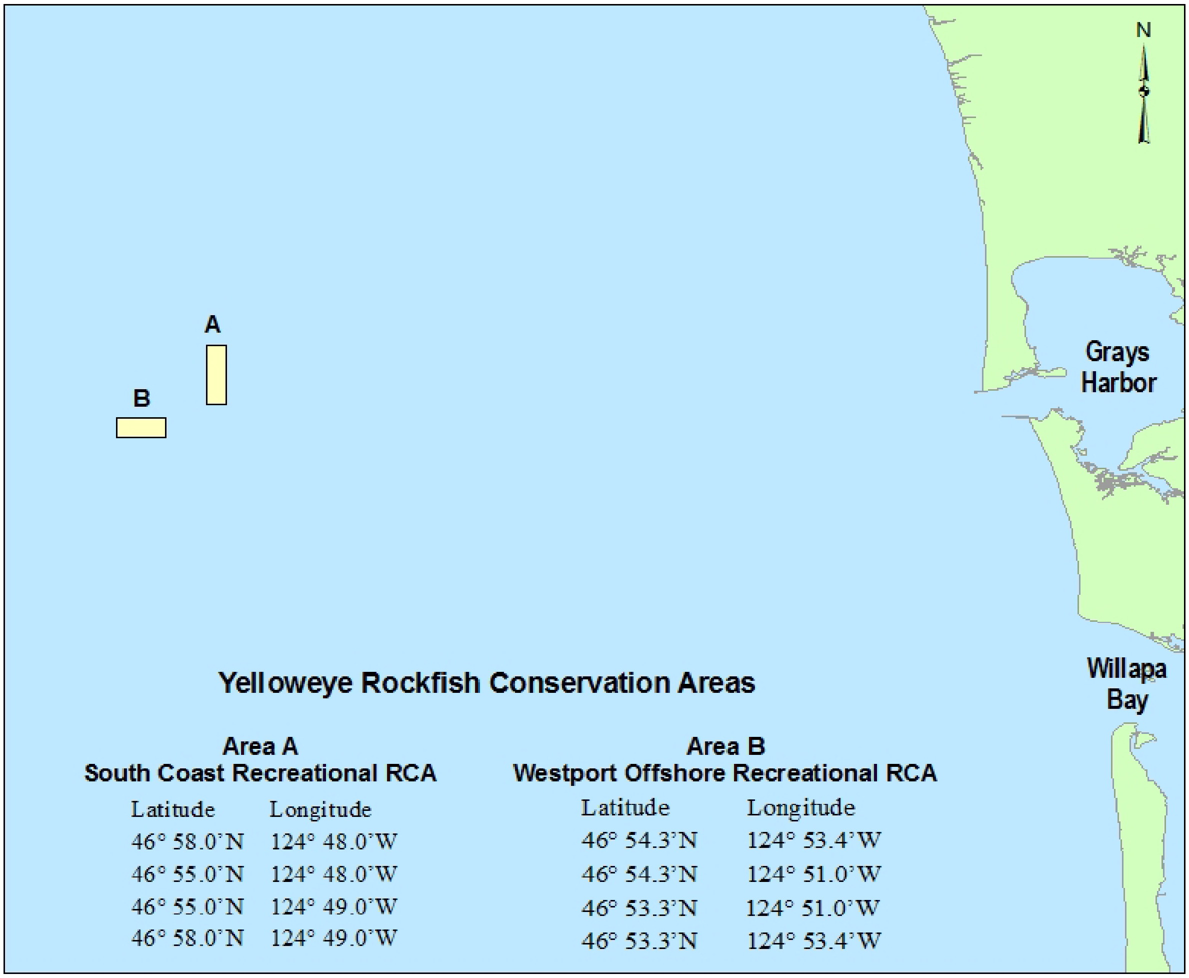


Figure 4-15. No Action. South Coast Area A and B, Yelloweye Rockfish Conservation Areas in southern Washington. South Coast Area A is an area to be voluntarily avoided.

4.2.1.7 At-Sea Whiting Co-ops – No Action

The at-sea sector is composed of catcher-processors and motherships that target Pacific whiting with mid-water trawl gear and process at sea. Management measures include allocations for Pacific whiting, canary rockfish, darkblotched rockfish, POP, and widow rockfish and set-asides for bycatch species. Further, measures are established that restrict the Pacific whiting season dates and provide for bycatch reduction areas and ocean salmon conservation zones, similar to the shorebased IFQ fishery (Section 0).

The at-sea sector is managed under a system of cooperatives (co-ops) that are somewhat like IFQs except that the harvest privilege is assigned to a group, the co-op, instead of an individual. The members of the group then decide how and when the collectively-held harvest privilege would be used. The trawl rationalization program establishes a set of rules for the formation of co-ops in the at-sea mothership sector that provide a strong incentive for catcher vessels to form co-ops associated with a mothership processor (see regulations at 660.150). In the case of the catcher-processor sector, a single, voluntary co-op has been in existence for some time. In that instance the allocation to the sector is essentially an allocation to the co-op. Further, a catcher-processor permit endorsement is required, which essentially closes this sector to new entrants; a move intended to lend greater stability to the functioning of the current, voluntary co-op. Regulations at 660.160 outline the catcher-processor co-op provisions.

Under No Action, allocations for Pacific whiting, canary rockfish, darkblotched rockfish, POP, and widow rockfish and set-asides for bycatch species established in 2014 would remain for 2015-2016 (Table 4-23 and Table 4-24). Groundfish mortality in the at-sea sectors, as a result of the above-mentioned management measures, is not formally estimated. The allocations may be considered the highest estimate of groundfish mortality since the fishery is managed to stay within the allocation.

Table 4-23. No Action – At-Sea. Allocations for the catcher-processor (CP) and mothership sectors (MS) under the No Action alternative for 2015-2016 (values in regulation on March XXX, 2014). Historical mortality for 2011 and 2012 by sector is provided (right panel) for reference.

No Action Allocations				**Historical Mortality a/**			
Stock	**Area**	**CP Allocation (mt)**	**MS Allocation (mt)**	2011 CP (mt)	2012 CP (mt)	2011 MS (mt)	2012 MS (mt)
CANARY	Coastwide	7.6	5.4	0.5	0.3	0.1	0.2
DARKBLOTCHED	Coastwide	9.0	6.3	10.3	1.4	1.7	1.3
POP	N of 40º10' N. lat.	10.2	7.2	6.5	3.1	0.7	1.4
Pacific whiting	Coastwide	69,373	48,970	71,522	55,695	50,050	38,216
Widow	Coastwide	170.0	120.0	24.1	42.4	12.8	37.2

a/ Pacific whiting mortality estimates were derived from the WCGOP GM Reports and include inseason reapportionments of whiting from the tribal sectors. A NORPAC query on January 30, 2014 provided the remaining mortality estimates.

Table 4-24. No Action – At-Sea. At-sea whiting set-asides and allocations under the No Action alternative (values in regulation as of March XXX, 2014). Historical mortality for the catcher-processor (CP) and mothership sectors (MS) is provided for reference.

No Action Set-Asides			Historical Mortality for CPs and MS a/		
Stock	**Area**	**Total Set-Asides (mt)**	**2011 (mt)**	**2012 (mt)**	**Average 2008-2012 (mt)**
PETRALE SOLE	Coastwide	5.0	0	0	0
YELLOWEYE	Coastwide	0.0	0	0	0
Arrowtooth flounder	Coastwide	20.0	45.2	40.6	21.2
Dover sole	Coastwide	5.0	1.2	0.3	1.4
English sole	Coastwide	5.0	0	0	0
Lingcod	N of 40º10' N. lat.	15.0	0.2	0.2	1.6
Longnose skate	Coastwide	5.0	0.4	0.1	0.4
Longspine thornyhead	N of 34º27' N. lat.	5.0	0.4	0	0.3
Pacific cod	Coastwide	5.0	0	0	0
Pacific halibut b/	Coastwide	10.0	0.6	0.6	1.8
Sablefish	N of 36º N. lat.	50.0	5.0	5.1	8.1
Shortspine thornyhead	N of 34º27' N. lat.	20.0	13.3	1.7	8.3
Starry flounder	Coastwide	5.0	0	0	0
Yellowtail	N of 40º10' N. lat.	300.0	81.4	43.1	167.3
Shelf rockfish north	N of 40º10' N. lat.	35.0	1	1	1
Slope rockfish north	N of 40º10' N. lat.	100.0	91	75	63
Other Fish	Coastwide	520.0	726	178	322
Other flatfish	Coastwide	20.0	6	3	4

a/ NORPAC query on January 30, 2014.
b/As stated in §660.55 (m), the Pacific halibut set-aside is 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude (estimated to 5 mt each).

4.2.1.8 Limited Entry and Open Access Fixed Gear Management – No Action

The limited entry fixed gear fishery includes vessels that hold a Federal limited entry permit endorsed by gear type (pot or longline) that targets groundfish. Some limited entry permits have a sablefish endorsement which allows them to participate in the primary sablefish fishery and land higher amounts of sablefish (i.e., tiers) compared to the trip limit fishery (see regulations at 660.231). Further, permit stacking allows sablefish tier limits from one to three sablefish endorsed permits to be used on a single vessel during the primary sablefish season. Additional catch controls in the limited entry fishery include trip limits for numerous species and a nontrawl RCA to limit interactions with overfished species. Table 4-25 summarizes the principle management measures for limited entry fixed gear vessels.

The directed open access sector is composed of vessels without a Federal limited entry permit (trawl or fixed gear) that target groundfish, including sablefish and nearshore species. Commercial fishing vessels targeting non-groundfish species (e.g., salmon, pink shrimp, etc.), but landing groundfish under the open access limits are included in the category of incidental open access fisheries. Catch controls for both the incidental and directed open access fishery include trip limits and the nontrawl RCA. Table 4-26 summarizes the principle management measures for open access fixed gear vessels.

The sablefish stock is the primary target for both the limited entry and open access fixed gear sectors.

Table 4-27 and Table 4-28 summarize the FMP allocations of sablefish for limited entry and open access north of 36° N. latitude under No Action. South of 36° N. latitude, the FMP allocation of sablefish is 42 percent to the trawl sector and 58 percent to the non-trawl sector. A short-term allocation between the limited entry and open access fixed gear sectors of 55 percent and 45 percent, respectively, is established (Table 4-29). Trip limits intended to attain the allocations under No Action can be found in Table 4-32.

One non-trawl RCA is implemented for the limited entry and open access fixed gear fisheries. Routine RCA adjustments can be made for four northern subareas bounded by Cape Mendocino at 40°10' N. latitude, 43° N. latitude, Cascade Head, Point Chehalis at 46.888° N. latitude, and the U.S.-Canada border. These adjustments may be necessary inseason to reduce projected catches of non-target species, typically yelloweye and canary rockfish. The nontrawl RCA seaward boundary south of 40°10' N. latitude under the No Action Alternative is defined by management lines specified with waypoints at roughly 150 fathoms (fm) to avoid areas where bocaccio, canary and yelloweye rockfish are most abundant.

Other groundfish conservation areas include the North Coast Area B Yelloweye Rockfish Conservation Area (YRCA) in Washington (Figure 4-14) which has been closed to limited entry and open access fixed gears since 2007. Additionally, the South Coast Areas A and B YRCAs (Figure 4-15) and the "C-shaped" YRCA in waters off northern Washington (Figure 4-16) are voluntary "areas to be avoided." Fishing is not allowed in the CCAs (Figure 4-13) under the No Action Alternative, except for some nearshore commercial fishing opportunities described in the nearshore section.

The models used project overfished species catches in the limited entry and directed open access fisheries and inform management measures are stratified by area of fishing shoreward (nearshore) or seaward (non-nearshore) of the nontrawl RCA (see Appendix A). Therefore, the estimates of groundfish mortality under No Action and the action alternatives are presented using the same strata.

Table 4-25. No Action – Limited Entry Fixed Gear. Summary of limited entry fixed gear fishery management measures under the No Action Alternative based on regulations as of March XXX, 2014.

Cumulative limits	• Cumulative trip limits for most species, specific to geographic area (See regulations Table 2 North and South to Part 660, Subpart E) Sablefish trip limits are presented in Table 4-32. • Primary sablefish fishery managed with tier limits **Error! Reference source not found.** • Canary and yelloweye landings prohibited coastwide • South of 40°10' N. latitude landings of cowcod and bronzespotted rockfish prohibited
Size limits	Lingcod • North of 42° N. lat. minimum size limit 22 inches total length • South of 42° N. lat. minimum size limit 24 inches total length
Gear restrictions	• Longline, trap or pot marked at the surface, at each terminal end, with a pole, flag, light, radar reflector, and a buoy • Must be attended at least once every 7 days • Traps must have biodegradable escape panels
Seasons	• Primary sablefish fishery from 4/1 to 10/31 • Permit stacking of up to 3 permits is allowed in primary sablefish fishery • Additional seasonal restrictions may be implemented via routine action or the fishery may "close" for some species or some areas during the year through inseason action
GCAs	YRCA • North Coast Commercial YRCA (WA) closed to commercial fixed gears • North Coast Recreational YRCA (WA) is a voluntary area to be avoided • Westport Offshore Recreational YRCA (WA) is a voluntary area to be avoided
	CCA Fishing is prohibited in CCAs with the following exceptions: • Fishing for "other flatfish" when using no more than 12 hooks, #2 or smaller • Fishing for rockfish and lingcod shoreward of 20 fm
	• Farallon Islands commercial fishing for groundfish is prohibited shoreward of 10 fm with the following exceptions: Fishing for "other flatfish" when using no more than 12 hooks, #2 or smaller • Cordell Banks Commercial fishing for groundfish is prohibited in depths less than 100 fm
	EFH Fishing with all bottom contact gear, including longline and pot/trap gear, is prohibited within the following EFH conservation areas: Thompson Seamount, President Jackson Seamount, Cordell Bank (50 fm (91 m) isobath), Harris Point, Richardson Rock, Scorpion, Painted Cave, Anacapa Island, Carrington Point, Judith Rock, Skunk Point, Footprint, Gull Island, South Point, and Santa Barbara. Fishing with bottom contact gear is also prohibited within the Davidson Seamount
Nontrawl RCAs	• North of 46°16' N. lat. Shoreline to 100 fm • 46°16'- 42° N. lat. 30 to 100 fm • 42°-40°10' N. lat. 20 fm depth contour to 100 fm • 40°10'-34°27' N. lat. – 30 to 150 fm • South of 34°27' N. lat. – 60 to 150 fm Fishing is prohibited in nontrawl RCAs with the following exception: Fishing for "other flatfish" when using no more than 12 hooks, #2 or smaller
Monitoring	• VMS required • WCGOP observer coverage when requested
Reporting	• VMS declarations

Table 4-26. No Action – Open Access. Summary of open access fishery management measures under the No Action Alternative based on regulations as of March XXX, 2014.

Cumulative	• Cumulative trip limits for most species, specific to trawl type and geographic area (See

limits	regulations Table 2 North and South to Part 660, Subpart E) • Canary and yelloweye landings prohibited coastwide • South of 40°10' N. latitude landings of cowcod and bronzespotted rockfish prohibited
Gear restrictions	• Longline, trap, pot, hook-and-line (fixed or mobile), setnet (anchored gillnet or trammel net (south of 38° N. lat. only), spear, and non-groundfish trawl gear for: pink shrimp, ridgeback prawn, and California halibut or sea cucumbers (south of Pt. 38°57.50' N. lat.) Non-groundfish trawl gear: • Is exempt from the limited entry trawl gear restrictions • Footrope (>19") prohibited in EFH Fixed gear: • Must be marked at the surface, at each terminal end, with a pole, flag, light, radar reflector, and a buoy; vertical hook-and-line gear that is closely tended may be marked only with a single buoy of sufficient size to float the gear • Must be attended at least once every 7 days • Fishing for groundfish with set nets is prohibited in the fishery management area north of 38°00.00' N. lat. • Traps must have biodegradable escape panels • Spears may be propelled by hand or by mechanical means
Seasons	Seasonal restrictions may be implemented via routine action or the fishery may "close" for some species or some areas during the year through inseason action
GCAs	YRCA • North Coast Commercial YRCA (WA) closed to commercial fixed gears • North Coast Recreational YRCA (WA) is a voluntary area to be avoided • Westport Offshore Recreational YRCA (WA) is a voluntary area to be avoided • Salmon Troll YRCA. Fishing for salmon is prohibited
	CCA Fishing is prohibited in CCAs with the following exceptions: • Fishing for "other flatfish" when using no more than 12 hooks, #2 or smaller • Fishing for rockfish and lingcod shoreward of the 20 fm
Open Access nontrawl RCAs	• North of 46°16' N. lat. Shoreline to 100 fm • 46°16'- 42° N. lat. 30 to 100 fm • 42°-40°10' N. lat. 20 fm depth contour to 100 fm • 40°10'-34°27' N. lat. – 30 to 150 fm • South of 34°27' N. lat. – 60 to 150 fm Fishing is prohibited in nontrawl RCAs with the following exception: Fishing for "other flatfish" when using no more than 12 hooks, #2 or smaller
Monitoring	• VMS required • WCGOP observer coverage when requested
Reporting	• VMS declarations

Table 4-27. No Action: Limited entry sablefish FMP allocations north of 36 N. latitude, based on values in regulation on March XXX, 2014.

Sablefish Com. HG	Limited Entry Share	LEFG Share (mt)				Estimated Tier Limits (lbs) a/		
		LE FG Total Catch Share	Landed Catch Share a/	Primary Season Share	LEFG DTL Share	Tier 1	Tier 2	Tier 3
3,878	3,513	1,476	1,429	1,214	214	37,442	17,019	9,725

a/ The limited entry fixed gear total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2010. In 2015-2016, 15.9 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-28. No Action: Open access FMP allocations north of north of 36 N. latitude, based on values in regulation on March XXX, 2014.

OA Total Catch Share	Directed OA Landed Catch Share a/
365	353

a/ The open access total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2010. In 2015-2016, 15.9 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-29. No Action: Short-term sablefish allocations south of 36 N. latitude for the non-trawl sector, limited entry and open access.

Year	Commercial HG	Non-Trawl Allocation	LE FG Total Catch Share	Directed OA Total Catch Share	LE FG Landed Catch Share a/	Directed OA Landed Catch Share b/
2014	1,555	902	496	406	480	393

a/ The limited entry and open access fixed gear total catch shares are reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2010. In 2015-2016, 15.9 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

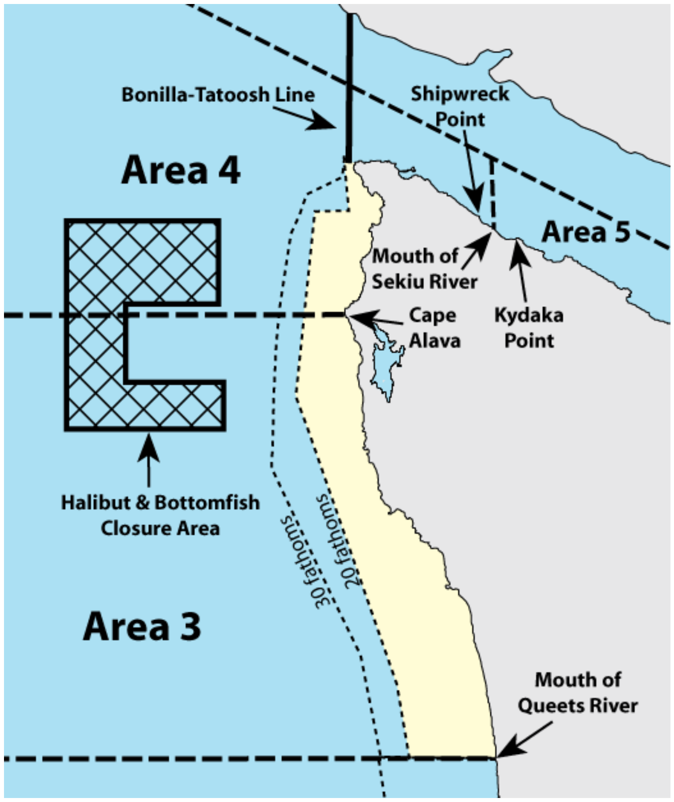


Figure 4-16. No Action. The current "C-shaped" Yelloweye Rockfish Conservation Area in waters off northern Washington where recreational groundfish and Pacific halibut fishing is prohibited.

4.2.1.9 Non-Nearshore – No Action

4.2.1.9.1 North of 36° N. latitude

The non-nearshore model projects mortality of overfished and non-overfished species for the limited entry fixed gear and the open access sectors north of 36° N. latitude and seaward of the nontrawl RCA based on the northern sablefish ACL. The sablefish north stock is the primary target and provides the main source of revenue in both sectors. The bycatch projections are based on the assumption that the limited entry and open access allocations for sablefish, less any discard mortality, are completely harvested.

Yelloweye rockfish and canary rockfish are the two overfished stocks primarily caught in the non-nearshore fisheries. Seaward adjustments of the nontrawl RCA boundary are the main management measure for reducing catches of these two stocks.

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under No Action is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40 (Table 4-18), and the resulting sablefish allocations (Table 4-28 and Table 4-28). Current trip limits (Table 4-32) would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-28 and Table 4-29). The overfished species mortality, as a result of harvesting the sablefish allocations, were evaluated using 2002-2011 WCGOP data in the non-nearshore model. Under No Action, trawl and non-trawl allocations were established for overfished species. Further, the non-nearshore fishery was also allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye to ensure (Table 4-30). Routine adjustments of the non-trawl RCA (Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the allocation (Table 4-30). Table 4-31 contains the projected mortality groundfish for the non-nearshore fishery.

Table 4-30. No Action – Non-Nearshore fishery: Overfished species shares for the non-nearshore fixed gear fishery under No Action, based on the Preferred Alternative for 2014 in the 2013-2014 FEIS.

Stock	Area	Total Projected OFS Mortality 2015-2016 (mt)	Formal Allocations 2015/2016 (mt)	Non-Trawl Allocation (mt)
BOCACCIO	S. 40°10 N. lat.	0.0	76.2/76.2	249.6
CANARY	Coastwide	1.0	3.7/3.7	47.4
COWCOD	S. 40°10 N. lat.	0.0		1.9
DARKBLOTCHED	Coastwide	4.3		15.5
POP	N. 40°10 N.N.	0.2		6.8
PETRALE	Coastwide	0.3		35.0
YELLOWEYE	Coastwide	0.4	1.1/1.1	11.2

Table 4-31. No Action. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt).

Stock	LE	OA	Total
Arrowtooth flounder	40	6	46
Bank rockfish (South of 40°10' N. lat.)	0	0	0
Big skate	5	1	6
Black rockfish (Oregon/California)	0	0	0
Blackgill rockfish (South of 40°10' N. lat.)	11	5	16
Blue rockfish	0	0	0
Cabezon - (California)	0	0	0
Cabezon - (Oregon)	0	0	0
California skate	0	0	0
Chilipepper rockfish	0	0	0
Dover sole	6	1	7
English sole	0	0	0
Greenspotted rockfish	0	0	0
Greenstriped rockfish	1	0	1
Grenadiers	42	14	56
Kelp greenling	0	0	0
Lingcod - (California)	11	3	14
Lingcod - (Washington/Oregon)	3	0	3
Longnose skate	58	11	69
Longspine thornyhead (North Pt. Conception)	2	1	3
Mixed thornyheads	2	1	2
Pacific cod	2	0	2
Pacific hake	0	0	1
Redstripe rockfish (North of 40°10' N. lat.)	0	0	0
Sharpchin rockfish	0	0	0

Stock	LE	OA	Total
Shortbelly rockfish	0	0	0
Shortspine thornyhead (North Pt. Conception)	18	5	22
Silvergrey rockfish (North of 40°10' N. lat.)	0	0	0
Spiny dogfish	135	22	157
Splitnose rockfish	0	0	0
Starry flounder	0	0	0
Unspecified skate	15	3	17
Widow rockfish	0	0	0
Yellowmouth (North of 40°10' N. lat.)	0	0	0
Yellowtail rockfish	0	0	1
Other flatfish	0	0	0
Other groundfish	3	1	4
Other nearshore rockfish	0	0	0
Other shelf rockfish	2	0	3
Other slope rockfish	92	17	108

Table 4-32. No Action. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears based on regulations as of March XXX, 2014.

Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
Limited Entry	950 lb/week, not to exceed 2,850 lb/ 2 months					
Open Access	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 1,600 lb/ 2 months					

4.2.1.9.2 South of 36° N. latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under No Action is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40 (Table 4-18). Anticipated catch of sablefish south of 36° N latitude under No Action would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears (Table 4-29). The current trip limits (Table 4-33) would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-29). Under No Action, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye to ensure that total non-trawl catches remained within the non-trawl allocations for these overfished species (Table 4-30). Routine adjustments of the non-trawl RCA (Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the allocation (Table 4-30).

Table 4-33. No Action. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed gears based on regulations as of March XXX, 2014.

Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
Limited Entry	2000 lb/ week					
Open Access	300 lb/day, or 1 landing per week of up to 1,600 lb, not to exceed 3,200 lb/2 months					

4.2.1.10 Nearshore – No Action

The nearshore model projects mortality of overfished species based on the expected landings of nearshore species by the limited entry and opens access sectors shoreward of the nontrawl RCA coastwide. The majority of vessels participating in nearshore commercial fisheries do not hold Federal limited entry permits. The most common gear used is jig gear; however, some vessels use longline gear to target nearshore species and, in fewer instances, pots or traps are used in the nearshore fishery.

California and Oregon limit entry to the nearshore groundfish fishery by requiring a state limited entry permit to take nearshore groundfish species. Washington does not allow a nearshore commercial fishery. More conservative state harvest targets or guidelines than those specified in Federal regulations exist for most nearshore species, and state trip limits supersede Federal limits in these cases. State trip limits are designed to stay within nearshore species limits while providing a year-round opportunity, if possible. Federal management measures for west coast nearshore commercial groundfish fisheries are typically stratified north and south of 40°10' N. latitude with some measures stratified north and south of 42° N. latitude.

In Oregon, limited entry permit holders may land commercial quantities of black and blue rockfish under state cumulative trip limits (currently two-month periods), with an additional total of 15 lbs per day of any combination of other nearshore groundfish species and two rockfish species with Federal designation as shelf rockfish (tiger and vermilion). Vessels that also have a nearshore endorsement permit, in addition to the black/blue limited entry permit, may land commercial quantities of other nearshore groundfish species up to the state's cumulative trip limits and the Federal limits for tiger and vermilion rockfish. For vessels that do not hold a state permit or endorsement, an incidental landing limit of no more than 15 pounds per day of any combination of black rockfish, blue rockfish, and/or other nearshore fish is allowed, with a few exceptions. Salmon trollers with a valid troll permit may land 100 pounds of black rockfish, blue rockfish, or a combination thereof in the same landing in which a salmon is landed. These rockfish may only be landed dead. If the cumulative landing of black and blue rockfish combined in the salmon troll fishery reaches 3,000 pounds in any calendar year, then each salmon troll vessel is limited to 15 pounds of black rockfish, blue rockfish, or a combination thereof per troll landing for the remaining calendar year. Trawlers may land up to 1,000 pounds of black rockfish, blue rockfish, or a combination thereof per calendar year, and these fish must be 25 percent or less of the total poundage of each landing and be landed dead.

In California, limited entry permit holders, as well as open access fishermen, who have either a shallow nearshore fishery or deeper nearshore fishery permit administered by the California Department of Fish and Wildlife (CDFW) may land minor nearshore rockfish from either the shallow nearshore or deeper nearshore complexes, respectively. Trip limits for shallow nearshore rockfish, deeper nearshore rockfish, cabezon, greenlings, and California scorpionfish vary by period. There is some nearshore commercial fishing allowed in the CCAs (Figure 4-13) in depths shallower than 20 fm under the No Action Alternative. Only southern minor nearshore rockfish, (both shallow and deeper nearshore rockfish), California scorpionfish, cabezon, greenlings, California sheephead, and ocean whitefish are allowed to be retained in depths less than 20 fm in the CCAs.

There are Federal and state harvest guidelines and/or allocations for nearshore species that limit target species landings in the commercial nearshore fishery (Table 4-34). The nearshore fishery is also managed to stay within the overfished allocations. Trawl, non-trawl, and within non-trawl allocations for overfished species, which were established in the 2013-2014 biennium, would be implemented under No Action (Table 4-37). Under the No Action alternative, catch of canary rockfish in California exceeds the catch sharing agreement with Oregon (Table 4-34) as well as the nearshore share of the non-trawl allocation. However, total catch of canary from both commercial and recreational fisheries is within the non-trawl allocation. In the event the projected overfished species mortality is expected to exceed the non-trawl allocation, routine adjustments of the non-trawl RCA (Table 4-25) or reduced trip limits for nearshore species would occur.

The No Action alternative is based on the expectation that landings in the nearshore fishery will be similar to recent historical average landings from 2008-2012 (Table 4-35), which is lower than most of the state harvest guidelines or allocations. Nearshore fishery landings are influenced by a variety of factors, including weather and market, and can vary annually (Table 4-36). As such, there is substantial uncertainty surrounding the estimated landings under No Action and the action alternatives, which in turn influence the projected overfished species mortality and socioeconomic analysis. In the event fishery performance is better than the five year average, mortality of groundfish species will be higher; however the fishery will still be managed to ensure combined commercial and recreational catches stay within the non-trawl allocation.

Table 4-34. No Action. Nearshore species allocations between state and sector under No Action.

Stock	Area	Type	Allocation	
CANARY	OR and CA	Catch sharing	26.7% Oregon	73.3% California
YELLOWEYE	OR and CA	Catch sharing	72.7% Oregon	27.3% California
Black rockfish	OR and CA	Federal HG	58% Oregon	42% California
	OR	State	Commercial	Recreational
	CA	State	Commercial	Recreational
Blue rockfish	OR a/	State	Commercial	Recreational
	CA	Federal HG b/		
	CA	State	Commercial	Recreational
Cabezon	OR	State	Commercial	Recreational
	CA	State	Commercial	Recreational
Kelp greenling	OR	State	Commercial	Recreational
	CA	State	Commercial	Recreational

a/ Oregon implements a black and blue rockfish landing cap through state regulation.
b/ The blue rockfish Federal HG was set equal to the 40:10 adjusted ABC for blue rockfish. The trawl and non-trawl fisheries are managed to the HG, there is no allocation between the trawl and non-trawl sectors.

Table 4-35. No Action. Expected landings under the No Action alternative, which are the average landings for the commercial nearshore fishery from 2008-2012. Target species landings by area are also shown in the far right panel. The 2013 landing caps in Oregon state regulations and California commercial landing targets are provided in parenthesis.

Stock	**Area**	**Total Target Species Landings 2015-2016 (mt)**	**Target Species Landings by Area for 2015-2016**			
			OR Total (mt)	**CA Total (mt)**	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
Black rockfish	S. 46°16 N. lat.	161	105 (137.9)	56	52 (134.8)	4 (34)
Cabezon	OR	27	27 (30)			
Cabezon	CA	24		24	2 (7)	22 (63)
Kelp greenling	OR	20	20 (23.4)			
Kelp greenling	CA	2.3		2.3	0.3 (0.2)	2 (21)
Lingcod	N. 40°10 N. lat.	34	29	5	5	
Lingcod	S. 40°10 N. lat.	16		16		16
Nearshore rockfish N. a/	N. 40°10 N. lat.	27				
--Blue rockfish		*13*	*5*	*8*	*8 (12.3)*	
--Other Nearshore Rockfish		*14*	*10*	*4*	*4 (5.7)*	
Nearshore rockfish S.	S. 40°10 N. lat.	85				
--Blue rockfish		*2*		*2*		*2 (0.04)*
--Shallow nearshore rockfish b/		*52*	*N/A*	*52*	*N/A*	*52 (95.8)*
--Deeper nearshore rockfish c/		*31*	*N/A*	*31*	*N/A*	*31 (62)*

a/ Nearshore rockfish totals consists of black-and-yellow, blue rockfish, China, gopher, grass, kelp, brown, olive, copper, treefish, calico, quillback. These species are part of the nearshore rockfish complex north and south of 40°10 N. latitude.

b/Shallow nearshore rockfish consists of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.

c/ Deeper nearshore consists of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.

Table 4-36. Annual landings and averages for nearshore species from 2008-2012.

Stock	Area	2008	2009	2010	2011	2012	Average
Black rockfish	S. 46°16 N. lat.	181.3	224.5	151.6	123.1	119.5	160.0
--OR		*98.3*	*133.4*	*100.1*	*96.7*	*95.5*	*104.8*
--CA		*83.0*	*91.1*	*51.5*	*26.4*	*24.0*	*55.2*
Calif scorpionfish	CA	2.3	2.7	2.8	3.1	3.0	2.8
Cabezon	OR	24.6	29.8	23.4	29.4	28.9	27.2
Cabezon	CA	22.1	17.4	21.5	30.6	28.4	24.0
Kelp greenling	OR	21.9	20.6	18.3	20.8	19.0	20.1
Kelp greenling	CA	1.3	1.4	1.6	2.0	5.0	2.3
Lingcod	N. 40°10 N. lat.	40.1	30.9	24.1	33.6	38.4	33.5
--OR		*30.8*	*26.6*	*20.2*	*30.1*	*35.1*	*28.6*
--CA		*9.3*	*4.3*	*3.9*	*3.5*	*3.3*	*4.9*
Lingcod	S. 40°10 N. lat.	16.6	14.0	13.8	17.0	18.2	15.9
Nearshore rockfish N. a/	N. 40°10 N. lat.	45.3	22.5	15.6	25.0	24.4	26.6
--Blue rockfish (OR)		*2.7*	*2.8*	*4.0*	*6.6*	*6.8*	*4.6*
--Blue rockfish (CA)		*21.6*	*5.5*	*3.4*	*5.1*	*2.8*	*7.7*
--Other Nearshore Rockfish (OR)		*10.7*	*11.3*	*6.5*	*11.4*	*12.0*	*10.4*
--Other Nearshore Rockfish (CA)		*10.4*	*2.9*	*1.8*	*1.9*	*2.8*	*3.9*
Nearshore rockfish S.	S. 40°10 N. lat.	88.5	85.1	84.8	91.0	79.7	85.8
--Blue rockfish		*5.3*	*2.5*	*1.4*	*2.0*	*1.3*	*2.5*
--Shallow nearshore rockfish b/		*54.1*	*51.2*	*52.8*	*55.8*	*46.5*	*52.1*
--Deeper nearshore rockfish c/		*29.0*	*31.4*	*30.7*	*33.3*	*32.0*	*31.3*

a/ Nearshore rockfish totals consists of black-and-yellow, blue rockfish, China, gopher, grass, kelp, brown, olive, copper, treefish, calico, quillback. These species are part of the nearshore rockfish complex north and south of 40°10 N. latitude.
b/ Shallow nearshore rockfish consists of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.
c/ Deeper nearshore consists of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.

Table 4-37. No Action - Nearshore. Projected overfished species (OFS) mortality compared to the formal allocations for 2015-2016 (mt). Projected overfished species mortality by area is also shown in the right panel and compared to the state specific shares, where applicable (in parenthesis).

Stock	Area	Total Projected OFS Mortality 2015-2016 (mt)	Formal Allocations 2015/2016 (mt)	Projected OFS Mortality by Area for 2015-2016			
				Oregon Total (Share) (mt)	CA Total (Share) (mt)	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
BOCACCIO	S. 40°10 N. lat.	0.4	0.9/0.9	N/A	0.4	N/A	0.4
COWCOD	S. 40°10 N. lat.	0		N/A	0	N/A	0
CANARY	Coastwide	6.8	6.2/6.2	0.9 (1.7)	5.9 (4.5)	0.5	5.4
DARKBLOTCHED	Coastwide	0.2		0.1	0.1	0	0.1
POP	N. 40°10 N.	0		0	0	0	0
PETRALE	Coastwide	0		0	0	0	0
YELLOWEYE	Coastwide	1.1	1.2/1.2	0.8 (0.9)	0.3 (0.3)	0.2	0.1

4.2.1.11 Tribal Fisheries – No Action

Tribal fisheries consist of trawl (bottom, mid-water, and whiting), fixed gear, and troll. Principle management controls in the tribal fisheries include set-asides, HGs, and trip limits. Tribal set-asides are outlined in Table 4-18, which represent the values in the March XXX, 2014 regulations. The Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) conducted their groundfish fisheries in 2014 with the trip limits shown in Table 4-38 and the following allocations:

- The sablefish allocation was 10 percent of the sablefish ACL north of 36° N. latitude (4,349 mt). The allocation of 435 mt was further reduced by 1.5 percent for discard mortality, to produce landed catch allocations of 428 mt.
- Black rockfish was managed with a HG of 30,000 pounds north of Cape Alava, Washington at 48°09'30" N. latitude, and 10,000 pounds between Destruction Island, Washington at 47°40' N. latitude and Leadbetter Point, Washington at 46°38'10" N. latitude. There were no harvest restrictions on black rockfish between Cape Alava and Destruction Island.
- Lingcod had a 250 mt HG.
- Pacific cod had a 400 mt tribal HG.
- Longspine and shortspine thornyheads were managed to the cumulative limits with those limits accumulated across vessels into a cumulative fleetwide harvest target for the year.
- The Makah Tribe would manage the midwater trawl fisheries as follows: Yellowtail rockfish taken in the directed tribal mid-water trawl fisheries are subject to a catch limit of 677 mt for the entire fleet. Landings of widow rockfish must not exceed 10 percent of the weight of yellowtail rockfish landed, for a given vessel, throughout the year. These limits may be adjusted by the tribe inseason to minimize the incidental catch of canary rockfish and widow rockfish, provided the catch of yellowtail rockfish does not exceed 677 mt for the fleet.
- The 2014 Pacific whiting TAC had not been adopted at the time of the analysis, therefore the 2013 harvest level and allocations are used under No Action. In 2013 the U.S. TAC of 269,745 mt for Pacific whiting resulted in a start of the year tribal allocation of 63,205 mt that NMFS

based on the percentage requested by Makah (17.5 percent of the U.S. TAC) and an additional amount to accommodate the Quileute's developing fishery (78FR26526).

All mid-water landing limits were subject to inseason adjustments to minimize the take of both canary and widow rockfish. Full rockfish retention programs, where all overfished and marketable rockfish are retained, as well as a Makah trawl observer program, were in place to provide catch accountability.

Table 4-38. The No Action: Tribal fishery based on regulations as of March XXX, 2014.

Cumulative limits	Full retention of rockfish Rockfish taken during open competition tribal commercial fisheries for Pacific halibut would not be subject to trip limits. Thornyheads • Shortspine thornyhead cumulative trip limits are 17,000-lb per 2 months • Longspine thornyhead cumulative trip limits are 22,000-lb per 2 months Canary rockfish 300 lb per trip Yelloweye rockfish 100 lb per trip Makah Tribe midwater trawl fisheries: Yellowtail rockfish taken in the directed tribal mid-water trawl fisheries are subject to a catch limit of 677 mt for the entire fleet. Landings of widow rockfish must not exceed 10 percent of the weight of yellowtail rockfish landed, for a given vessel, throughout the year. These limits may be adjusted by the tribe inseason to minimize the incidental catch of canary rockfish and widow rockfish, provided the catch of yellowtail rockfish does not exceed 677 mt for the fleet. Minor shelf rockfish and minor slope rockfish. Redstripe rockfish are subject to an 800 lb (363 kg) trip limit. Minor shelf (excluding redstripe rockfish), and minor slope rockfish groups are subject to a 300 lb (136 kg) trip limit per species or species group, or to the non-tribal limited entry fixed gear trip limit for those species if those limits are less restrictive than 300 lb (136 kg) per trip. Limited entry fixed gear trip limits are specified in Table 2 (North) to subpart E of this part. Other rockfish, including minor nearshore, minor shelf, and minor slope rockfish 300 lb per trip limit per species or species group, or to the nontribal limited entry trip limit for those species if those limits are less restrictive than 300 lb (136 kg) per trip. Lingcod are subject to an overall catch of 250 mt for all treaty fishing. Flatfish and other fish (bottom trawl). • For Dover sole, English sole, other flatfish 110,000 lbs (49,895 kg) per 2 months; and for arrowtooth flounder 150,000 lbs (68,039 kg) per 2 months. The Dover sole and arrowtooth limits in place at the beginning of the season would be combined across periods and the fleet to create a cumulative harvest target. The limits available to individual vessels would then be adjusted inseason to stay within the overall harvest targets and overfished species limits. • Petrale sole – are subject to a fleetwide harvest target of 220 mt. Trawl vessels are restricted to small footrope trawl gear. Pacific whiting -The tribal allocation for 2011 is 63,205 mt. Pacific cod - Managed to the tribal HG of 400 mt. Spiny dogfish - limited entry trip limits for the non-tribal fisheries apply
Monitoring	• The Makah Tribe shoreside observer program to monitor and enforce Makah limits.
Reporting	• VMS declarations for trawl only

4.2.1.12 Washington Recreational – No Action

Primary catch controls for the Washington recreational fishery are season dates, depth closures, bag limits, and groundfish conservation areas, including YRCAs. Yelloweye rockfish and canary rockfish are the two overfished stocks primarily caught in the Washington recreational fishery. Seaward adjustments of the nontrawl RCA boundary are the main management measure for reducing catches of these two stocks. Under the No Action Alternative, Washington recreational fisheries would operate under the 2014 ACLs for yelloweye rockfish of 18 mt and canary rockfish of 119 mt, and the associated Washington recreational HGs of 2.9 mt for yelloweye rockfish and 3.1 for canary rockfish (Table 4-39).

Table 4-39. No Action – Washington Recreational. Harvest guidelines (HG) for the Washington recreational fisheries under the No Action Alternative.

Species	HG (mt)
CANARY	2.9
YELLOWEYE	3.1

4.2.1.12.1 Groundfish Seasons and Area Restrictions

<u>Season Structure</u>

Under the No Action Alternative, the Washington recreational fishery would be open year-round for groundfish, except lingcod. Retention of canary and yelloweye rockfish in all areas would continue to be prohibited under No Action.

Depth restrictions are the primary tool used to keep recreational mortality of yelloweye and canary rockfish within specified HGs. Restrictions limiting the depth where groundfish fisheries are permitted are more severe in the area north of the Queets River (Marine Areas 3 and 4) where yelloweye and canary rockfish abundance is higher and therefore caught incidentally at a higher rate. Depth restrictions are fewer in the south coast where incidental catch of yelloweye and canary becomes progressively less. Table 4-40 summarizes key features of the Washington recreational regulations under the No Action Alternative.

Table 4-40. No Action. Washington Recreational Seasons and Groundfish Retention Restrictions.

<table>
<tr><th>Marine Area</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>June</th><th>July</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>3 & 4 (N. Coast)</td><td colspan="4">Open all depths</td><td colspan="5">Open <20 fm May 1-Sep 30 a/</td><td colspan="3">Open all depths</td></tr>
<tr><td>2 (S. Coast)</td><td colspan="2">Open all depths g/</td><td colspan="3">Open <30 fm Mar 15 - June 15 b/, c/, d/, g/</td><td colspan="3">Open all depths except lingcod prohibited on Fri. and Sat. >30 fm e/,g</td><td colspan="4">Open all depths g/</td></tr>
<tr><td>1 (Col. R.)</td><td colspan="4">Open all depths g/</td><td colspan="5">Open all depths f/, g/</td><td colspan="3">Open all depths g/</td></tr>
<tr><td colspan="13">a/ Groundfish retention prohibited >20 fm except, retention of lingcod, Pacific cod and sablefish is allowed seaward of 20 fm on days when Pacific halibut is open.
b/ Retention of sablefish and Pacific cod allowed seaward of 30 fm from May 1- June 15.
c/ Retention of rockfish allowed seaward of 30 fm.
d/ Retention of lingcod allowed seaward of 30 fm on days that the primary halibut season is open.
e/ Retention of lingcod prohibited >30 fm, south of 46°58 on Fri. and Sat. from July 1 – August 31.
f/ Retention of groundfish, except sablefish and Pacific cod, prohibited with Pacific halibut on board.
g/ Retention of lingcod prohibited in deepwater areas at all times.</td></tr>
</table>

North Coast (Marine Areas 3 and 4)

The retention of bottomfish is prohibited seaward of a line approximating 20 fm from May 1- September 30, except lingcod, Pacific cod and sablefish can be retained seaward of 20 fm on days that Pacific halibut fishing is open. Fishing for, retention, or possession of groundfish and Pacific halibut is prohibited in the C-shaped YRCA (Figure 4-17).

South Coast (Marine Area 2)

The retention of bottomfish, except rockfish, is prohibited seaward of 30 fm from March 15 through June 15, except sablefish and Pacific cod retention is allowed May 1 through June 15. Retention of lingcod is allowed seaward of 30 fm on days open to the primary Pacific halibut season. The retention of lingcod is prohibited south of 46°58' N. latitude and seaward of 30 fm on Fridays and Saturdays from July 1 through August 31. Fishing for, retention, or possession of lingcod is prohibited in deepwater areas seaward of a line extending from 47°31.70' N. latitude, 124°45.00' W. longitude to 46°38.17' N. latitude, 124°30.00' W. longitude year-round, except as allowed on days open to the Pacific halibut fishery (Figure 4-19). Fishing for, retention or possession of bottomfish or Pacific halibut is prohibited in the South Coast YRCA and Westport Offshore YRCA (Figure 4-18).

Columbia River (Marine Area 1)

Retention of bottomfish, except sablefish and Pacific cod, is prohibited with halibut onboard from May 1 through September 30, and fishing for, retention, or possession of lingcod in deepwater areas seaward of a line extending from 46°38.17 N. latitude, 124°21.00' W. longitude to 46°25.00' N. latitude, 124°21.00' W. longitude year-round (Figure 4-19).

Area Restrictions

Under the No Action Alternative, fishing for, retention, or possession of groundfish and halibut during the Washington recreational groundfish and Pacific halibut fisheries would be prohibited in the C-shaped YRCA in the north coast (Figure 4-17), and the South Coast and Westport YRCAs in the south coast (Figure 4-18).

Fishing for, retention, or possession of lingcod would be prohibited seaward of a line connecting the following coordinates from the Queets River (47°31.70' N. latitude, 124° 45.00' W. longitude) to 46°25.00' N. latitude, 124°21.00' W. longitude, year round except as allowed in Washington Marine Area 2 on days open to the primary Pacific halibut fishery (Figure 4-19):

1. 47°31.70' N. lat124°45.00' W. long.
2. 46°38.17' N. lat124°30.00' W. long.
3. 46°38.17' N. lat124°21.00' W. long.
4. 46°25.00' N. lat124°21.00' W. long.

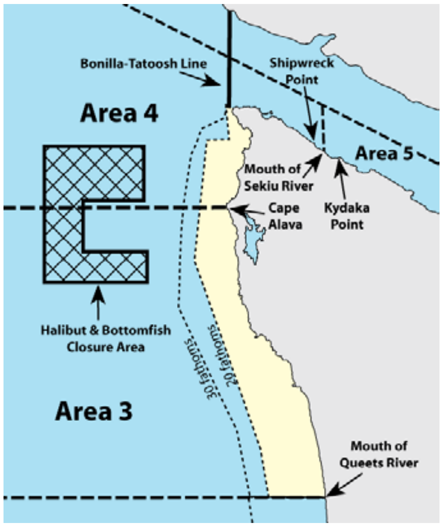


Figure 4-17. No Action. Washington Recreational C-Shaped YRCA

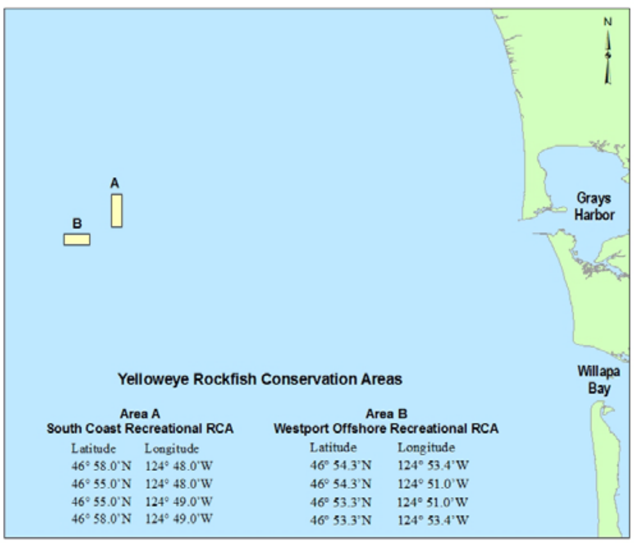


Figure 4-18. No Action. Washington South Coast and Westport YRCAs

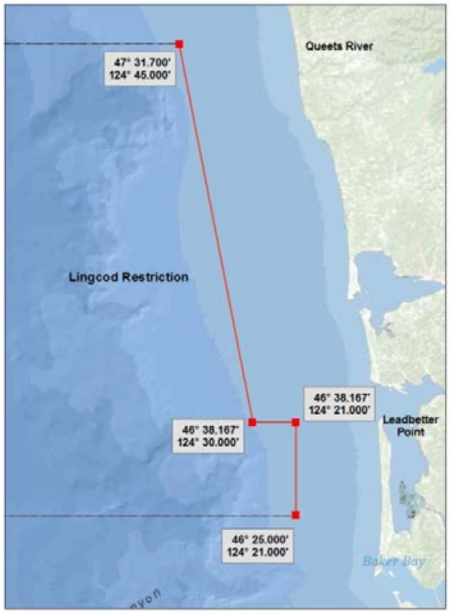


Figure 4-19. No Action. Washington Lingcod Restricted Area.

Groundfish Bag Limits

Under the No Action Alternative the recreational groundfish bag limit, including rockfish and lingcod, would be 12 fish per day. Of the 12 recreational groundfish allowed to be landed per day, sub-limits of 10 rockfish and, two lingcod apply. The recreational bag limit would also include a sub-limit of two cabezon in Marine Areas 1-3 and one cabezon in Marine Area 4.

Lingcod Seasons and Size Limits

The lingcod season in Marine Areas 1 through 3 (Washington-Oregon border at 46°16' N. latitude to Cape Alava at 48°10' N. latitude) would be open from the Saturday closest to March 15 through the Saturday closest to October 15, which was March 15 through October 18 in 2014. Marine Area 4 (Cape Alava to the U.S. Canadian border) would be open from April 16 through October 15, or the Saturday closest to October 15; whichever is earlier, which was April 16 through October 15 in 2014.

Under the No Action Alternative the lingcod seasons and size limits by area would be as follows:

- Marine Areas 1-3: March 14 through October 17 in 2015 and March 12 through October 15 in 2016. Minimum size, 22 inches.
- Marine Area 4: April 16 through October 15 in 2015 and April 16 to October 15 in 2016. Minimum size, 22 inches.

Cabezon Size Limit

Under the No Action Alternative, there is an 18 inch minimum size limit for cabezon in Marine Area 4 (Cape Alava to the U.S. Canadian border).

Pacific Halibut Seasons

It is expected that the Pacific halibut seasons in 2015 and 2016 would be similar to the halibut seasons in 2013 and 2014. There are no changes to the restrictions on groundfish retention during the Pacific halibut season proposed under the No Action Alternative.

Additional Management Measures Analyzed

No additional management measures were analyzed for the No Action Alternative. Status quo management measures would be used to keep recreational harvests of overfished species within specified HGs.

Inseason Management Response

Projected mortality for Washington's recreational fishery is based upon the previous season's harvest estimated by the Ocean Sampling Program (OSP) and incorporated in Recreational Fishery Information Network (RecFIN). It should be noted that the precision of recreational groundfish catch estimates based upon previous seasons would continue to be influenced by factors such as the length and success of salmon and halibut seasons, weather and unforeseen factors.

Washington's Ocean Sampling Program is able to produce estimates of groundfish catch with a one month lag time. Management measures such as more restrictive depth closures, area closures, groundfish retention restrictions, or changes to seasons can be considered and implemented through emergency changes to state regulations if inseason catch reports indicate that recreational harvests of overfished species or non-overfished species are exceeding pre-season projections to the point where HGs are at risk of being exceeded.

Projected mortality for overfished and non-overfished species under the No Action Alternative is summarized in Table 4-41.

Table 4-41. No Action – Washington Recreational. Projected mortality for overfished species under the No Action Alternative.

Stock	2015	2016
CANARY ROCKFISH	0.75	0.75
YELLOWEYE ROCKFISH	2.83	2.83

4.2.1.13 Oregon Recreational – No Action

Primary catch controls for the Oregon recreational fishery are season dates, depth closures, bag limits, and groundfish conservation areas, including YRCAs. The No Action Alternative analyzes the Oregon recreational fishery under the 2014 ACLs (Table 4-18) and Oregon recreational HGs (Table 4-42).

Table 4-42. No Action. Oregon recreational harvest guidelines (HG) under the No Action Alternative (in mt).

Stock	HG (mt)
CANARY	11.1
YELLOWEYE	2.6
Black Rockfish OR	440.8
Greenlings [a/]	N/A
Nearshore Rockfish North of 40°10 N. Lat.[b/]	N/A

[a/] Includes kelp and other greenlings
[b/] Includes blue rockfish

4.2.1.13.1 Groundfish Seasons and Area Restrictions

Season structure

Under the No Action Alternative, the Oregon recreational groundfish fishery would be open offshore year-round, except from April 1 to September 30 when fishing is only allowed shoreward of 40 fathoms, as defined by waypoints (Figure 4-20). Closing the fishery outside of 40 fathoms from April 1 to September 30, months when angler effort and yelloweye rockfish encounters are greatest, mitigates mortality of yelloweye rockfish. Projected mortality of yelloweye and canary rockfish are within the HG, therefore the shore-based fishery would be open year-round.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bottomfish Season	Open all depths			Open < 40 fm						Open all depths		
Marine Bag Limit [1]	Ten (10)			1 Fish Cabezon Sub-Bag [2]						Ten (10)		
Lingcod Bag Limit	Three (3)											
Flatfish Bag Limit [3]	Twenty Five (25)											

1 Marine bag limit includes all species other than lingcod, salmon, steelhead, Pacific halibut, flatfish, surfperch, sturgeon, striped bass, pelagic tuna and mackerel species, and bait fish such as herring, anchovy, sardine, and smelt

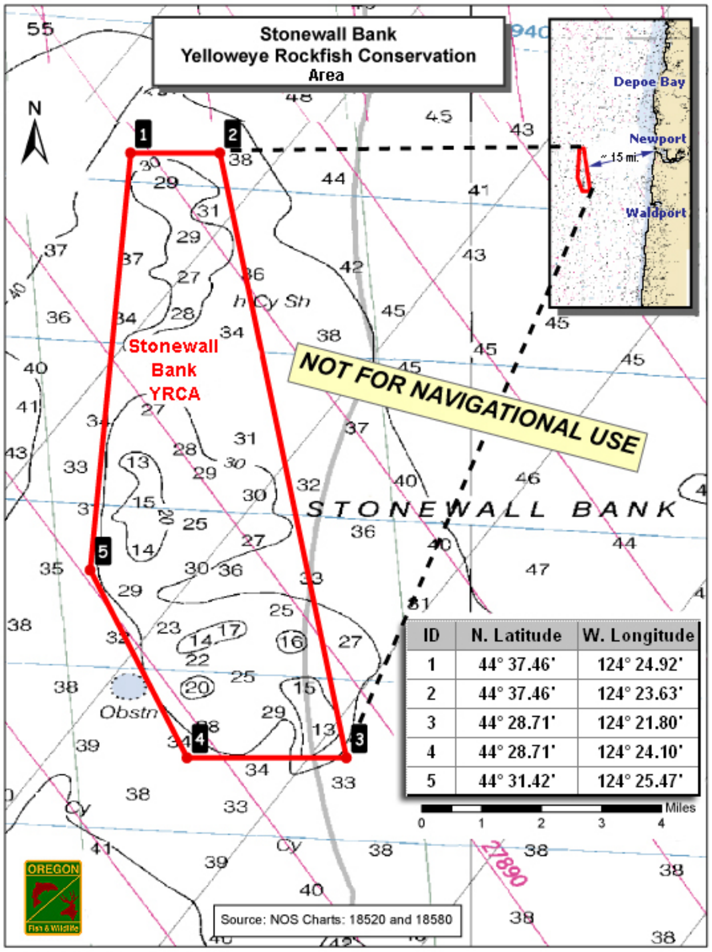
2 From April 1 through September 30, the marine bag limit is Ten (10) fish per day, of which no more than one (1) may be cabezon.

3 Flounders, soles, sanddabs, turbots and halibuts except Pacific halibut

Figure 4-20. No Action. Oregon recreational groundfish season structure and bag limits under the No Action Alternative.

Area Closures

The Stonewall Bank YRCA has been in place since 2006 and would also remain under the No Action alterative (Figure 4-21). The YRCA is located approximately 15 miles west of the Port of Newport and consists of the high-relief area of Stonewall Bank, an area of high yelloweye rockfish encounters. No recreational fishing for groundfish and Pacific halibut can occur within this YRCA, which is bounded by the waypoints contained in Figure 4-21.



ODFW, 05/22/06. Reprinted 12/12/06

Figure 4-21. No Action. The Stonewall Bank Yelloweye Rockfish Conservation Area where recreational fishing for groundfish and Pacific halibut is prohibited.

Groundfish Bag Limits and Size Limits

Under the No Action Alternative, the marine fish daily bag limit of 10 fish in aggregate that was allowed in 2013-2014 Oregon recreational fisheries would carry forward for 2015-2016 (Figure 4-20). The marine bag includes all species other than lingcod, salmon, steelhead, Pacific halibut, flatfish, surfperch, sturgeon, striped bass, pelagic tuna and mackerel species, and bait fish such as herring, anchovy, sardine and smelt. During April through September, there was a one fish sub-bag limit for cabezon (of the 10 fish marine bag limit no more than one could be cabezon). This cabezon sub-bag limit would also carry forward for 2015-2016. A flatfish daily bag limit of 25, which includes all soles and flounders except Pacific halibut, was allowed in addition to the marine fish daily bag limit. Additionally a three-fish bag limit was allowed for lingcod. Retention of canary and yelloweye rockfish was prohibited in 2013-2014 and would continue to be prohibited under the No Action Alternative.

The following minimum size limits applied to 2013-2014 Oregon recreational fisheries and would be carried forward under the No Action Alternative:

- Lingcod – 22 in.

- Cabezon – 16 in.
- Kelp greenling – 10 in.

Pacific Halibut

Under the No Action Alternative, the recreational Pacific halibut fisheries should be able to proceed as in 2013 and 2014, in regards to days and areas open, etc., depending on the halibut quota. Since 2009, only sablefish and Pacific cod may be retained in the Pacific halibut fishery at any depth in the area north of Humbug Mountain, Oregon. It is expected that groundfish retention in the all-depth Pacific halibut fishery would be similarly limited in 2015 and 2016, under the No Action Alternative.

Additional Management Measures Analyzed

Status quo management measures would be used to keep recreational harvests of overfished species within specified HGs under No Action; no additional management measures were analyzed.

Inseason Management Tools

Oregon has a responsive port-based monitoring program through ORBS, and regulatory processes in place to track mortality and take actions inseason if necessary. The following are suggested management measures that could be implemented inseason if the fishery does not proceed as expected.

Inseason management tools, designed to mitigate mortality, include bag limit adjustments (including non-retention), length limit adjustments, gear restrictions, and season, days per week, depth, and area closures.

Season, depth, days open per week, and area closures are the primary inseason tools for limiting yelloweye rockfish and canary rockfish mortality, since retention of these species is prohibited. If catch rates indicate that the bycatch harvest targets for yelloweye rockfish would be reached prematurely, offshore depth closures may be implemented inseason at 30, 25, or 20 fathoms as these two species are less abundant nearshore and release survival rates are higher in shallow waters. Additionally, days per week may also be closed to reduce mortality. ODFW would monitor inseason progress toward recreational harvest targets for canary rockfish and yelloweye rockfish. Regulations would depend upon the timing of the determination for their need.

Adjustments to the marine fish daily bag limit to no more than 10 fish may be implemented to achieve season duration goals in the event of accelerated or decelerated black rockfish or other nearshore rockfish harvest. The lingcod daily bag limits may be adjusted to no more than 3 fish in the event the marine bag limit changes or the halibut catch limit is reduced from 2013 levels. Season and/or area closures may also be considered if harvest targets are projected to be attained. Closing one or more days per week is an inseason tool that could be used to limit mortality. Closing certain days each week would help lengthen the duration of a fishery approaching an HG.

Non-retention and length restrictions are the likely inseason tools to use for cabezon and greenling, as release survival is very high. They may also be used to reduce mortality of nearshore species, such as black rockfish and other nearshore rockfish species.

Gear restrictions and/or release technique requirements may be implemented to reduce the impact of depleted rockfish since a variety of descending devices are available and the Council will be approving new mortality rates in 2014 for yelloweye and canary rockfish when devices are used.

Directed yellowtail rockfish and/or flatfish fisheries may be implemented inseason, as were implemented in 2004, in the event of a closure of the recreational groundfish fishery due to attainment Federal or state HGs or targets. Specific gear restrictions may be implemented in the event that yellowtail rockfish and/or flatfish fisheries remain open during a groundfish closure. Additionally, the fishery may be expanded to waters seaward of the RCA, promoting directed yellowtail rockfish opportunity. Directed flatfish fisheries would be legal year round and open shoreward of 40 fathoms during any period the groundfish fishery has any depth restrictions (i.e. 40, 30, 25, and 20 fathom lines). The flatfish fishery would not have any depth restrictions when the groundfish fishery has no depth restrictions. Fisheries would be monitored to ensure that mortality of yelloweye and canary rockfish are within the harvest targets/guidelines.

In the event that the duration of total season is reduced from 12 months; the nearshore waters are closed to groundfish fishing due to management of nearshore species; or the Pacific halibut catch limit is reduced from 2013 levels, the fishery may be expanded to waters seaward of the RCA that is in effect at the time, promoting directed yellowtail rockfish and offshore lingcod opportunity. Fisheries would be monitored to ensure that mortality of yelloweye rockfish and canary rockfish is not in excess of the HGs.

Projected Mortality and Inseason Management Response

Under the No Action Alternative, and associated season structure and bag limits detailed above, the annual projected mortality of black, canary and yelloweye rockfish are in Table 4-43. Table 4-44 shows the recent mortality of the ten most landed species in the Oregon recreational fishery, including black rockfish. Species in Table 4-44, other than black rockfish, have not been modeled in the past. This table represents recent mortality under similar season structure and bag limits to what will be in place under the No Action Alternative.

Table 4-43. No Action – Oregon Recreational. Projected Mortality (in mt) of species with Oregon recreational specific allocations under the No-Action Alternative.

Stock	Projected Mortality (mt)
CANARY	3.2
YELLOWEYE	2.2
Black Rockfish	322.2
Lingcod	132.0
Greenlings [a/]	6.4
Nearshore Rockfish North of 40°10 N. lat. [b/]	30.5

[a/] Includes kelp and other greenlings
[b/] Includes blue rockfish

Table 4-44. No Action – Oregon Recreational. Recent mortality (mt) of the ten most landed species in the Oregon recreational fishery under the season structure, bag limits, area restrictions, etc. in the No-Action Alternative.

Stock	2008	2009	2010	2011	2012	Average
Black Rockfish	240.0	294.6	302.4	206.1	217.4	252.1
Lingcod	80.3	68.0	82.8	105.9	148.9	97.2
Nearshore Rockfish	26.9	24.9	32.8	36.6	45.9	33.4
Blue Rockfish*	16.2	15.9	22.0	21.4	26.1	20.3
Quillback Rockfish	4.1	3.7	4.2	5.7	8.8	5.3
Copper Rockfish	3.7	2.8	3.8	5.9	7.2	4.7
China Rockfish	2.9	2.3	2.6	3.4	3.7	3.0
Brown Rockfish	0.1	0.0	0.1	0.1	0.0	0.1
Grass Rockfish	0.0	0.0	0.1	0.0	0.0	0.0
Cabezon	16.6	16.2	16.5	17.5	15.5	16.5
Yellowtail Rockfish	5.3	9.3	7.5	11.6	13.9	9.5
Kelp Greenling	3.6	4.2	6.8	7.4	7.0	5.8
Vermillion Rockfish	5.8	3.8	4.6	6.0	9.2	5.9
Canary Rockfish	2.2	2.7	3.2	3.2	2.7	2.8
Yelloweye Rockfish	2.0	1.8	2.1	2.1	3.3	2.2
Sablefish	1.6	0.5	0.1	0.5	0.3	0.6

* Blue Rockfish is managed separately from the rest of the nearshore rockfish complex under Oregon state regulations

4.2.1.14 California Recreational – No Action

Season structures and projected mortality under the No Action Alternative is based on CDFW's updated RecFISH model. Model projections were calculated for the five recreational groundfish management areas using updated 2011 and 2012 RecFIN estimates and overfished species mortality are reported statewide. Under No Action, trawl and non-trawl allocations for overfished species were established (Table 4-45). The California recreational fishery was allocated a share of the non-trawl allocation, through use of a HG, for bocaccio, canary, and yelloweye to ensure that total non-trawl catches remained within the non-trawl allocations for these overfished speices. Under the No Action Alternative, depth restrictions and season length remain unchanged statewide (PFMC and NMFS 2011).

Table 4-45. No Action – California Recreational: Overfished species allocations to the non-trawl sector and shares for the California recreational fisheries under No Action, which is based on the Preferred Alternative for 2014 in the 2013-2014 FEIS.

Stock	Non-Trawl Allocation (mt)	California Recreational HG (mt)
BOCACCIO	249.6	172.5
CANARY	47.4	23
COWCOD	1.9	
DARKBLOTCHED	15.5	
POP	35	
PETRALE SOLE	6.8	
YELLOWEYE	11.2	3.4

4.2.1.14.1 Groundfish Seasons and Area Restrictions

The following recreational season applied in 2014 would remain in place under the No Action Alternative (Figure 4-22). All divers and shore-based anglers are exempt from the seasonal closures for rockfish, cabezon, greenlings, lingcod, and California scorpionfish.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 15–Oct 31 <20fm						Closed	
Mendocino	Closed				May 15–Sept 1 <20fm				Closed			
San Francisco	Closed					Jun 1 – Dec 31 <30fm						
Central	Closed				May 1 – Dec 31 <40fm							
Southern	Closed		Mar 1 – Dec 31 <50fm									

Figure 4-22. No Action: California recreational groundfish season structure based on regulations as of March XXX, 2014.

Groundfish Bag Limits and Size Limits

Under the No Action Alternative, a statewide 10 fish rockfish, cabezon, and greenling (RCG) complex bag limit with a sub-bag limit of 3 fish for bocaccio and cabezon would remain in place. Retention of bronzespotted rockfish, canary rockfish, cowcod, and yelloweye rockfish would continue to be prohibited under the No Action Alternative. The following bag limits would also apply:

- California scorpionfish – 5 fish
- Leopard shark – 3 fish
- Lingcod – 2 fish
- Soupfin shark – 1 fish

There is no bag limit for Pacific sanddab, petrale sole and starry flounder. A bag limit of 10 fish of any one species within the 20 finfish maximum bag limit would apply to the remaining species in the Groundfish FMP.

The following minimum size limits for the California recreational fisheries would remain under the No Action Alternative:

- California scorpionfish – 10 inches
- Cabezon – 15 inches

- Kelp greenling – 12 inches
- Leopard shark – 36 inches
- Lingcod – 22 inches

Based on the ReFISH model, updated with 2011 and 2012 data from RecFIN, all overfished species are projected to be within allowable limits under the No Action Alternative (Table 4-46). These values are pre-season projections and actual mortality may differ.

CDFW closely monitors yelloweye rockfish and cowcod – performing weekly tracking using preliminary CRFS field reports. These preliminary CFRS reports are converted into an anticipated catch value in metric tons using catch and effort data from previous years. This weekly "proxy" value is then used to approximate catch during the five to eight week lag time in CRFS catch estimates. If angler effort or bycatch of overfished groundfish species changes dramatically from prior years, actual mortality can be higher or lower than projected. Based on the inseason tracking, if any of the overfished species harvest guidelines are projected to be attained inseason, CDFW could enact emergency management actions to slow and/or reduce catches; management measures include closing one or more recreational groundfish management areas, restricting recreational fishery seasons, and/or modifying depth restrictions.

Projections for non-overfished species are provided in Table 4-46. In 2009, four yelloweye rockfish conservation areas (YRCA) were adopted in the Northern and Mendocino Management Areas for use in management. The YRCAs include habitat in both state and federal waters and can be implemented inseason (if needed) to reduce yelloweye rockfish mortality. To date, these YRCAs have not been implemented and would remain available under all Alternatives.

Table 4-46. No Action – California Recreational: Projected mortality under No Action (using 2014 data) for the California Recreational fisheries.

Stock	Projected Mortality (mt)	California Recreational HG (mt)
BOCACCIO	100.1	172.5
CANARY	16.3	23
COWCOD	1.0	
YELLOWEYE	1.7	3.4
Black Rockfish	181.9	
Blue Rockfish	54.6	
Cabezon	35.1	
California Scorpionfish	78.3	
Greenlings	15.5	
Lingcod	244.4	
Widow Rockfish	2.8	
Nearshore Rockfish N. of 40°10 N. lat.	11.7	
Nearshore Rockfish S. of 40°10 N. lat.	332.5	

4.2.2 Alternative 1 – P* 0.45

4.2.2.1 Harvest Specifications

Table 4-47 to Table 4-51 contains the harvest specifications and allocations analyzed under Alternative 1. Where applicable, ACLs are determined based on a p-star value of 0.45. For ACLs set below the ABC, the harvest control rule determines the ACL (XXX link to Chapter 2 tables with HCRs). The overfished species set-asides and allocations are found in Table 4-52.

4.2.2.1.1 Action Alternatives Set-Asides

Under all action alternatives, set-asides were updated based on the most recent information on fishery performance and need. A description of the set-aside calculations are provided below.

4.2.2.1.2 Tribal Fishery Set-Asides

Tribal fisheries consist of trawl (bottom, mid-water, and whiting), fixed gear, and troll. The requested tribal set-asides are based on the amounts in the March XXX, 2014 regulations updated with tribal requests (see Agenda Item H.10.b, Supplemental Tribal Report, November 2013 and Agenda Item H.10.b, Supplemental Tribal Report 2, November 2013).

4.2.2.1.3 Research Set-Asides

Research activities include the NMFS trawl survey, International Pacific Halibut Commission longline survey, and other Federal and state research. The Council approach is that set-asides should be equal to the maximum historical scientific research catch from 2005-2012, except for canary rockfish and yelloweye rockfish. The Council policy for canary and yelloweye rockfish was not based on the maximum historical value. The Council considered the high canary rockfish of 7.2 mt in 2006 from the NMFS trawl survey a rare event since surveys in later years encountered substantially less canary. The Council adopted a 4.5 mt canary rockfish set-aside, which is higher than the average research catch from 2005-2012. For yelloweye rockfish, the Council adopted a 3.3 mt research set-aside based on anticipated research needs of the International Pacific Halibut Commission (1.1 mt), Washington Department of Fish and Wildlife (1 mt), Oregon Department of Fish & Wildlife (1 mt), and other projects (0.2 mt).

4.2.2.1.4 Incidental Open Access Set-Asides

Deductions from ACLs are made to account for groundfish mortality in the incidental open access fisheries. The set-asides for all species, except longnose skate, were derived from the maximum historical values in the 2007-2012 WCGOP Groundfish Mortality reports. The recommended set-aside for longnose skate was based on data from the 2009-2012 Total Mortality reports, the years in which longnose skate were reported separately from the Other Fish category.

4.2.2.1.5 EFP Set-Asides

The Council adopted one EFP and associated set-asides for 2015-2016 for public review. The EFP seeks to test the effectiveness of vertical hook-and-line gear to selectively harvest midwater species such as yellowtail rockfish (Agenda Item H.2.a, Attachment 4, November 2013).

4.2.2.1.6 Recreational (Sablefish north of 36° N. latitude only)

The allocation framework for sablefish north of 36° N. latitude specifies that anticipated recreational catches of sablefish be deducted from the ACL prior to the commercial limited entry and open access allocations. The set-aside is the maximum historical value from recreational fisheries from 2004-2012.

Table 4-47. Alternative 1. 2015 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 1.

Stock	Area	ACL	Trib	EFP	Res	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	349		3	4.6	0.7	340.7
CANARY	Coastwide	122	7.7	1	4.5	2	106.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	338	0.2	0.1	2.1	18.4	317.2
PETRALE SOLE	Coastwide	2,816	220		14.2	2.4	2,579.4
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
YELLOWEYE	Coastwide	18	2.3	0.03	3.3	0.2	12.2
Arrowtooth flounder	Coastwide	6,025	2,041		16.39	30	3,937.6
Black	N of 46º16' N. lat.	402	14				388.0
Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	154					154.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	114				2	112.0
Chilipepper	S of 40º10' N. lat.	1,628		10	9	5	1,604.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	11,040	91		5.8	7	10,936.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	12					11.7
Kelp Greenling	WA	26					26.2
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,830	250	0.5	11.67	16	2,551.8
Lingcod	S of 40'10º N. lat.	1,100		1.0	1.1	7	1,090.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine thornyhead	N of 34º27' N. lat.	3,474	30		13.5	3	3,427.5
Longspine thornyhead	S of 34º27' N. lat.	1,097			1	2	1,094.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Pacific whiting a/	Coastwide	269,745	63,205		2,500		204,040
Sablefish	N of 36º N. lat.	5,012		See Table 4-51			
Sablefish	S of 36º N. lat.	1,798			3	2	1,793.0
Shortbelly	Coastwide	50			2		48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,913	50		7.22	2	1,853.8
Shortspine thornyhead	S of 34º27' N. lat.	1,012			1	41	970.0
Spiny Dogfish	Coastwide	2,303	111.8	1	12.5	49.53	2,128.4
Splitnose	S of 40º10' N. lat.	1,715		1.5	9	0	1,704.5
Starry flounder	Coastwide	1,681	2			8.3	1,670.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	11,213	677	10	16.6	3	10,506.4
Nearshore rockfish north	N of 40º10' N. lat.	69					69.0
Nearshore rockfish south	S of 40º10' N. lat.	1,114			2.6	1.4	1,110
Other flatfish	Coastwide	9,865	60		19	125	9,661.0
Shelf rockfish north	N of 40º10' N. lat.	1,944	30	3	13.4	26	1,871.6
Shelf rockfish south	S of 40º10' N. lat.	1,624		30	9.6	9	1,575.4
Slope rockfish north	N of 40º10' N. lat.	1,669	36	1	8.1	19	1,604.9
Slope rockfish south	S of 40º10' N. lat.	687		1	2	17	667.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-48. Alternative 1. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015 (in mt).

Species	Area	Fishery HG or ACT		Trawl		Non-trawl	
			Allocation Type	%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	340.7	Biennial	N/A	81.9	N/A	258.8
CANARY	Coastwide	106.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	317.2	Amendment 21	95%	301.3	5%	15.9
PETRALE SOLE	Coastwide	2,579.4	Biennial	N/A	2,544.4	N/A	35.0
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
YELLOWEYE	Coastwide	12.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,937.6	Amendment 21	95%	3,740.7	5%	196.9
Black	N of 46º16' N. lat.	388.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	154.0	None				
Cabezon	CA	47.0	None				
Cabezon	WA	XXX	None				
California scorpionfish	S of 34°27' N. lat.	112.0	None				
Chilipepper	S of 40º10' N. lat.	1,604.0	Amendment 21	75%	1,203.0	25%	401.0
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	10,936.2	Amendment 21	95%	10,389.4	5%	546.8
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	11.7	None				
Kelp Greenling	WA	26.2	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N. lat.	2,551.8	Amendment 21	45%	1,148.3	55%	1,403.5
Lingcod	S of 40'10º N. lat.	1,090.9	Amendment 21	45%	490.9	55%	600.0
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine thornyhead	N of 34º27' N. lat.	3,427.5	Amendment 21	95%	3,256.1	5%	171.4
Longspine thornyhead	S of 34º27' N. lat.	1,094.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Pacific whiting b/	Coastwide	TBD	Amendment 21	100%		0%	
Sablefish	N of 36º N. lat.		See Table 4-51				
Sablefish	S of 36º N. lat.	1,793.0	Amendment 21	42%	753.1	58%	1,039.9
Shortbelly	Coastwide	48.0	None				0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,853.8	Amendment 21	95%	1,761.1	5%	92.7
Shortspine thornyhead	S of 34º27' N. lat.	970.0	Amendment 21	NA	50.0	NA	920.0
Spiny Dogfish	Coastwide	2,128.4	None				
Splitnose	S of 40º10' N. lat.	1,704.5	Amendment 21	95%	1,619.3	5%	85.2
Starry flounder	Coastwide	1,670.7	Amendment 21	50%	835.4	50%	835.4
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	10,506.4	Amendment 21	88%	9,245.6	12%	1,260.8
Nearshore rockfish north	N of 40º10' N. lat.	69.0	None				
Nearshore rockfish south	S of 40º10' N. lat.	1,045.0	None				
Other flatfish	Coastwide	9,661.0	Amendment 21	90%	8,694.9	10%	966.1
Shelf rockfish north	N of 40º10' N. lat.	1,871.6	Biennial	60.2%	1,126.7	39.8%	744.9
Shelf rockfish south	S of 40º10' N. lat.	1,575.4	Biennial	12.2%	192.2	87.8%	1,383.2
Slope rockfish north	N of 40º10' N. lat.	1,604.9	Amendment 21	81%	1,300.0	19%	304.9
Slope rockfish south	S of 40º10' N. lat.	678.0	Amendment 21	63%	427.1	37%	250.9

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-49. Alternative 1. 2016 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline, under Alternative 1.

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	362		3	4.6	0.7	353.7
CANARY	Coastwide	125	7.7	1	4.5	2	109.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	346	0.2	0.1	2.1	18.4	325.2
PETRALE SOLE	Coastwide	2,910	220		14.2	2.4	2,673.4
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
YELLOWEYE	Coastwide	19	2.3	0.03	3.3	0.2	13.2
Arrowtooth flounder	Coastwide	5,840	2,041		16.39	30	3,752.6
Black	N of 46º16' N. lat.	404	14				390.0
Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	151					151.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	111				2	109.0
Chilipepper	S of 40º10' N. lat.	1,619		10	9	5	1,595.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	7,754	91		5.8	7	7,650.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	13					12.9
Kelp Greenling	WA	23					23.1
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,719	250	0.5	11.67	16	2,440.8
Lingcod	S of 40'10º N. lat.	1,037		1.0	1.1	7	1,027.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine thornyhead	N of 34º27' N. lat.	3,305	30		13.5	3	3,258.5
Longspine thornyhead	S of 34º27' N. lat.	1,044			1	2	1,041.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Pacific whiting a/	Coastwide	269,745	63,205		2,500		204,040
Sablefish	N of 36º N. lat.	5,467	Table 4-51				
Sablefish	S of 36º N. lat.	1,961			3	2	1,956.0
Shortbelly	Coastwide	50			2		48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,892	50		7.22	2	1,832.8
Shortspine thornyhead	S of 34º27' N. lat.	1,001			1	41	959.0
Spiny Dogfish	Coastwide	2,285	111.8	1	12.5	49.53	2,110.4
Splitnose	S of 40º10' N. lat.	1,746		1.5	9		1,735.5
Starry flounder	Coastwide	1,686	2			8.3	1,675.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	10,634	677	10	16.6	3	9,927.4
Nearshore rockfish N.	N of 40º10' N. lat.	69					69.0
Nearshore rockfish S.	S of 40º10' N. lat.	1,048			2.6	1.4	1,044.0
Other flatfish	Coastwide	8,633	60		19	125	8,429.0
Shelf rockfish N.	N of 40º10' N. lat.	1,952	30	3	13.4	26	1,879.6
Shelf rockfish S.	S of 40º10' N. lat.	1,625		30	9.6	9	1,576.4
Slope rockfish N.	N of 40º10' N. lat.	1,683	36	1	8.1	19	1,618.9
Slope rockfish S.	S of 40º10' N. lat.	699	0	1	2	17	679.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-50. Alternative 1. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2016 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	353.7	Biennial	N/A	85.0	N/A	268.7
CANARY	Coastwide	109.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	325.2	Amendment 21	95%	308.9	5%	16.3
PETRALE SOLE	Coastwide	2,673.4	Biennial	N/A	2,638.4	N/A	35.0
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
YELLOWEYE	Coastwide	13.2	Biennial	N/A	1.1	N/A	12.1
Arrowtooth flounder	Coastwide	3,752.6	Amendment 21	95%	3,565.0	5%	187.6
Black	N of 46º16' N. lat.	390.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	151.0	None				
Cabezon	WA	XXX	None				
California scorpionfish	S of 34°27' N. lat.	109.0	None				
Chilipepper	S of 40º10' N. lat.	1,595.0	Amendment 21	75%	1,196.3	25%	398.8
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	7,650.2	Amendment 21	95%	7,267.7	5%	382.5
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	12.9	None				
Kelp Greenling	WA	23.1	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N. lat.	2,440.8	Amendment 21	45%	1,098.4	55%	1,342.5
Lingcod	S of 40'10º N. lat.	1,027.9	Amendment 21	45%	462.6	55%	565.3
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine thornyhead	N of 34º27' N. lat.	3,258.5	Amendment 21	95%	3,095.6	5%	162.9
Longspine thornyhead	S of 34º27' N. lat.	1,041.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Pacific whiting b/	Coastwide	TBD	Amendment 21	100%		0%	
Sablefish	N of 36º N. lat.		See Table 4-51				
Sablefish	S of 36º N. lat.	1,956.0	Amendment 21	42%	821.5	58%	1,134.5
Shortbelly	Coastwide	48.0	None				0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,832.8	Amendment 21	95%	1,741.1	5%	91.6
Shortspine thornyhead	S of 34º27' N. lat.	959.0	Amendment 21	NA	50.0	NA	909.0
Spiny Dogfish	Coastwide	2,110.4	None				
Splitnose	S of 40º10' N. lat.	1,735.5	Amendment 21	95%	1,648.7	5%	86.8
Starry flounder	Coastwide	1,675.7	Amendment 21	50%	837.9	50%	837.9
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	9,927.4	Amendment 21	88%	8,736.1	12%	1,191.3
Nearshore rockfish north	N of 40º10' N. lat.	69.0	None				
Nearshore rockfish south	S of 40º10' N. lat.	1,044.0	None				
Other flatfish	Coastwide	8,429.0	Amendment 21	90%	7,586.1	10%	842.9
Shelf rockfish north	N of 40º10' N. lat.	1,879.6	Biennial	60.2%	1,131.5	39.8%	748.1
Shelf rockfish south	S of 40º10' N. lat.	1,576.4	Biennial	12.2%	192.3	87.8%	1,384.1
Slope rockfish north	N of 40º10' N. lat.	1,618.9	Amendment 21	81%	1,311.3	19%	307.6
Slope rockfish south	S of 40º10' N. lat.	679.0	Amendment 21	63%	427.8	37%	251.2

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-51. Alternative 1. Sablefish north of 36° N. latitude ACLs, set-asides used to calculate the commercial harvest guideline (mt).

Stock	Year	ACL	Tribal Share a/	EFP	Research	Rec	Commercial HG
Sablefish N. 36° N. lat.	2015	5,012	501	1	26	6.1	4,478
	2016	5,467	547	1	26	6.1	4,887

a/ The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

Table 4-52. Overfished species set-asides and allocations under the action alternatives.

	Bocaccio		**Canary**		**Cowcod**		**Darkblotched**		**POP**		**Petrale**		**Yelloweye**	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**
ACL	349	362	122	125	10	10	338	346	158	164	2,816	2,910	18	19
Set-Asides Total	8.3	8.3	15.2	15.2	2.0	2.0	20.8	20.8	15.0	15.0	236.6	236.6	5.83	5.83
Tribal			7.7	7.7	0	0	0.2	0.2	9.2	9.2	220	220	2.3	2.3
EFP	3	3	1	1	0.015	0.015	0.1	0.1					0.03	0.03
Research	4.6	4.6	4.5	4.5	2	2	2.1	2.1	5.2	5.2	14.2	14.2	3.3	3.3
Open Access	0.7	0.7	2	2	0	0	18.4	18.4	0.6	0.6	2.4	2.4	0.2	0.2
Fishery HG	340.7	353.7	106.8	109.8	4.0	4.0	317.2	325.2	143.0	149.0	2,579.4	2,673.4	12.2	13.2
Trawl Total	81.9	85.0	56.9	58.5	1.4	1.4	301.3	308.9	135.9	141.6	2,544.4	2,638.4	1.0	1.1
Shorebased IFQ	81.9	85.0	43.3	44.5	1.4	1.4	285.6	293.0	118.5	124.0	2,539.4	2,633.4	1.0	1.1
At-Sea Whiting	0.0		13.7	14.0			15.7	16.1	17.4	17.4	5	5		
C-P	0.0		8.0	8.2			9.2	9.5	10.2	10.2				
Mothership	0.0		5.6	5.8			6.5	6.7	7.2	7.2				
Non-Trawl Total	258.8	268.7	49.9	51.3	2.6	2.6	15.9	16.3	7.2	7.5	35.0	35.0	11.2	12.1
Non-Nearshore	79.1	82.1	3.8	3.9									1.1	1.2
Nearshore FG	1.0	1.0	6.7	6.9									1.2	1.3
WA Rec a/	0.0	0.0	3.4	3.5									2.9	3.1
OR Rec a/	0.0	0.0	11.7	12.0									2.6	2.8
CA Rec	178.8	185.6	24.3	25.0									3.4	3.7

a/ Values represent HGs which may be adjusted within the non-trawl allocation.

4.2.2.2 Management Measures

The following bullet points summarize the management measure changes by sector under Alternative 1. New measures, discussed in Section XXXChapter2 and analyzed in Appendix C, could be implemented. Overarching changes could include modifications to the boundaries defining the RCAs in Oregon and California, implementation of new GCAs for rougheye rockfish and spiny dogfish, and reorganization of the Other Fish complex (see Section XXXChapter2). New management measures or noteworthy changes that are specific to a sector are described in greater detail below.

- The shorebased IFQ fishery would operate under the same management measures as No Action, with a few modifications. The IFQ would be issued based the 2015-2016 ACLs and resulting trawl allocations under Alternative 1. Legal-sized Pacific halibut IBQ would be limited to 15 percent of the Area 2A total constant exploitation yield (TCEY) for legal size halibut (net weight), not to exceed 100,000 pounds (45 mt) annually for legal size halibut (net weight), which is a 30,000 pound (62 mt) reduction from status quo. Additionally, GCAs could be implemented to reduce spiny dogfish catch. Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or a requirement to use rockfish excluders for shorebased IFQ vessels targeting Pacific whiting.
- The at-sea whiting co-ops would operate under the same management measures described under No Action with a few modifications. Allocations would be issued based the 2015-2016 ACLs and resulting at-sea trawl allocations under Alternative 1. Adjustments to the at-sea whiting set-asides would be necessary to accommodate the restructuring of the Other Fish Complex, which removed spiny dogfish from the complex. A range of spiny dogfish set-asides and GCAs are analyzed and available to reduce spiny dogfish catch. Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or a requirement to use rockfish excluders for the at-sea whiting vessels.
- Tribal fisheries would operate under the harvest guidelines and allocations under Alternative 1. Tribal fisheries would be managed using the same measures described under No Action.
- The non-nearshore fixed gear fishery would operate under the same management measures as No Action, except trip limits increases for several species, including sablefish, are proposed to attain the ACLs under Alternative 1. GCAs to reduce catch of spiny dogfish and rougheye rockfish would be available.
- The nearshore fixed gear fishery would operate under the same management measures as No Action with a few modifications. Trip limit decreases or non-retention may be required for kelp greenling and nearshore rockfish north of 40°10 N. latitude, including china rockfish, to keep mortality at or within the complex ACL or china rockfish HGs. The prohibition on lingcod retention in Periods 1, 2, and 6 could be removed. Removing or modifying the commercial gear restriction that allows individuals to legally fish in the non-trawl RCA, Farallon Islands, Cordell Banks, and in the CCAs could be implemented.
- Washington recreational fisheries would operate under the same management measures as No Action, except the season dates for the depth closure in the North Coast (Marine Areas 3 and 4) would be shorter than under No Action. In the South Coast (Marine Area 2), the prohibition on lingcod retention seaward of 30 fathoms in the area south of 46°58 N. latitude on Fridays and Saturdays from July to August 31 would be removed. Lastly, in the Columbia River Area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved three miles north. Reductions to bag limits or non-retention may be needed to reduce catch of nearshore rockfish, including china rockfish.
- Oregon recreational fisheries would operate under the same management measures as under the No Action Alternative. Reductions to bag limits or non-retention may be needed to reduce catch of nearshore rockfish, including china rockfish, and kelp greenling.

- Season lengths and depth restrictions were explored for the California recreational fisheries. The lingcod bag limit would be increased from two to three fish. Reductions to bag limits or non-retention may be needed to reduce catch of nearshore rockfish, including china rockfish. All other management measures would be the same as under No Action.

4.2.2.2.1 Shorebased IFQ – Alternative 1

The shorebased fishery would be issued IFQ based the 2015-2016 ACLs and resulting trawl allocations (Table 4-53 and Table 4-54). Notable IFQ increases from No Action include petrale, longspine thornyheads north, sablefish, shortpine thornyhead, yellowtail, and Other Flatfish.

The shoreside trawl rationalization program keeps the trawl sector bycatch of halibut within expectations by requiring that trawlers account for their total mortality of all halibut in round weight (legal and sublegal sized). Therefore, to determine a trawl bycatch mortality limit the amount of halibut pounds available to the trawl fleet will be determined by expanding the expected legal sized halibut mortality (net weight) into a round weight legal+sublegal sized amount. To achieve this, the following conversions will be applied.

- Net weight to round weight conversion: multiply by the IPHC net weight to round weight conversion factor in use at the time of each year's the calculation.
- Legal to legal+sublegal sized conversion factor: multiply by the ratio of legal sized halibut to legal+sublegal sized halibut from the most up-to-date NMFS analysis of trawl fishery bycatch available at the time of each year's calculation.

After these conversions, 10 mt will be subtracted to cover bycatch mortality in the at-sea whiting fishery and trawl fishery south of 40°10' N. lat, and the remainder will be issued as IBQ, to be used to cover Pacific halibut mortality by vessels operating in the shoreside trawl IFQ program. Under all action alternatives, legal-sized Pacific halibut IBQ would be limited to 15 percent of the Area 2A total constant exploitation yield (TCEY) for legal size halibut (net weight), not to exceed 100,000 pounds annually for legal size halibut (net weight), which is a 30,000 pound reduction from status quo.

In addition to the management measures described under No Action, GCAs and trip limit adjustments could be implemented to reduce spiny dogfish catch. Management measures to reduce rougheye rockfish catch could also be implemented, including rougheye GCAs and/or rockfish excluders for shorebased IFQ vessels targeting whiting.

Table 4-53. Alternative 1 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 1 for 2015. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 1		No Action	
		2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt) a/ b/	2014 Projected Mortality (mt)	2014 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.3	81.9	10.9	79.0
CANARY	Coastwide	9.9	43.3	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	111.3	285.6	108.5	278.4
PETRALE	Coastwide	2,405.0	2539.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	50.7	118.5	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	2,436	3,696	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	308	1,203	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	152	10,384	137	5,261
Lingcod	North of 40°10' N. lat.	XXX	1,133		1,152
Lingcod	South of 40°10' N. lat.	XXX	491		743
Longspine thornyheads	North of 34°27' N. lat	1,680	3,251	936	1,811
Pacific cod	Coastwide	266	1,126	266	1,126
Pacific halibut a/	North of 40°10 N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10 N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	2,186	2,303	1,887	1,988
Sablefish	South of 36° N. lat.	354	753	307	653
Shortspine thornyheads	North of 34°27' N.	930	1,741	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	54	1,619	53	1,575
Starry flounder	Coastwide	9	830	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,484	8,946	816	2,939
Shelf rockfish	North of 40°10' N. lat.	60	1,091	28	508
Shelf rockfish	South of 40°10' N. lat.	27	192	12	81
Slope rockfish	North of 40°10' N. lat.	276	1,200	182	789
Slope rockfish	South of 40°10' N. lat.	110	427	98	379
Other flatfish	Coastwide	1,506	8,675	728	4,194

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each).

Table 4-54. Alternative 1 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 1 for 2016. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 1		No Action	
		2016 Projected Mortality (mt)	2016 SB IFQ Allocation (mt) a/ b/	2014 Projected Mortality (mt)	2014 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.8	85.0	10.9	79.0
CANARY	Coastwide	10.2	44.5	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	114.1	292.8	108.5	278.4
PETRALE	Coastwide	2,494.0	2633.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	53.1	124.2	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	2,436	3,520	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	306	1,196	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	137	7,263	137	5,261
Lingcod	North of 40°10' N. lat.	XXX	1,083	XXX	1,152
Lingcod	South of 40°10' N. lat.		463	XXX	743
Longspine thornyheads	North of 34°27' N. lat	1,597	3,091	936	1,811
Pacific cod	Coastwide	266	1,126	266	1,126
Pacific halibut a/	North of 40°10 N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10 N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	2,390	2,518	1,887	1,988
Sablefish	South of 36° N. lat.	387	822	307	653
Shortspine thornyheads	North of 34°27' N.	919	1,721	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	55	1,649	53	1,575
Starry flounder	Coastwide	9	833	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,343	8,436	816	2,939
Shelf rockfish	North of 40°10' N. lat.	60	1,097	28	508
Shelf rockfish	South of 40°10' N. lat.	27	192	12	81
Slope rockfish	North of 40°10' N. lat.	279	1,211	182	789
Slope rockfish	South of 40°10' N. lat.	110	428	98	379
Other flatfish	Coastwide	1,313	7,566	728	4,194

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each).

4.2.2.2.2 At-Sea Whiting Co-ops – Alternative 1

The at-sea whiting co-ops would operate under the same management measures described under No Action with a few modifications. The 2015-2016 allocations for the catcher-processor and mothership sectors under Alternative 1 for 2015-2016 are provided in Table 4-55 and compared to No Action.

At-sea whiting set-asides would be increased for some species compared to No Action (Table 4-56), based on recent fishery data. Further, adjustments would be necessary to accommodate the restructuring of the Other Fish Complex, which removed spiny dogfish from the complex. The Council requested a range of spiny dogfish set-asides ranging from 163 mt to 725 mt be analyzed (see Section XXX, Appendix C). The effectiveness of GCAs to reduce spiny dogfish mortality was also explored in Appendix C. Historically, spiny dogfish comprised the majority of catch of in the Other Fish Complex. Therefore, it may not be necessary to specify an Other Fish Complex set-aside for the at-sea sectors.

Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or rockfish excluders for the at-sea whiting vessels (Appendix C).

Table 4-55. Alternative 1 – At-Sea. Allocations for the catcher-processor (CP) and mothership sectors (MS) under Alternative 1 for 2015-2016. The No Action allocations are provided (right panel) for reference.

Alternative						No Action Allocations	
		2015		2016			
Stock	Area	CP All. (mt)	MS All. (mt)	CP All. (mt)	MS All. (mt)	CP All. (mt)	MS All. (mt)
CANARY	Coastwide	8.0	5.6	8.2	5.8	7.6	5.4
DARKBLOTCHED	Coastwide	9.2	6.5	9.5	6.7	9.0	6.3
POP	N of 40º10' N. lat.	10.2	7.2	10.2	7.2	10.2	7.2
Pacific whiting	Coastwide	69,373	48,970	69,373	48,970	69,373	48,970
Widow	Coastwide	170.0	120.0	170.0	120.0	170.0	120.0

Table 4-56. Alternative – At-Sea. At-sea whiting set-asides under Alternative. The No Action set-aside values are provided for reference.

Alternative			No Action Set-Asides
Stock	**Area**	**Total Set-Asides (mt)**	**Total Set-Asides (mt)**
PETRALE SOLE	Coastwide	5	5
YELLOWEYE	Coastwide	0	0
Arrowtooth flounder	Coastwide	45	20
Dover sole	Coastwide	5	5
English sole	Coastwide	5	5
Lingcod	N of 40º10' N. lat.	15	15
Longnose skate	Coastwide	5	5
Longspine thornyhead	N of 34º27' N. lat.	5	5
Pacific cod	Coastwide	5	5
Pacific halibut a/	Coastwide	10	10
Sablefish	N of 36º N. lat.	50	50
Shortspine thornyhead	N of 34º27' N. lat.	20	20
Starry flounder	Coastwide	5	5
Yellowtail	N of 40º10' N. lat.	300	300
Shelf rockfish north	N of 40º10' N. lat.	35	35
Slope rockfish north	N of 40º10' N. lat.	100	100
Other Fish b/	Coastwide	TBD	520
Spiny Dogfish	Coastwide	TBD	N/A
Other flatfish	Coastwide	20	20

a/As stated in §660.55 (m), the Pacific halibut set-aside is 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude (estimated to 5 mt each).
b/ In 2014, spiny dogfish was managed as part of the Other Fish complex. Starting in 2015-2016, spiny dogfish will be managed separately.

4.2.2.2.3 Non-Nearshore – Alternative 1

North of 36° N. latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under Alternative 1 is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.45 (Table 4-57), and the resulting sablefish allocations (Table 4-57 and Table 4-58). Trip limit increases for sablefish would be proposed (Table 4-59) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-57 and Table 4-58). The overfished species mortality, as a result of harvesting the sablefish allocations, were evaluated using 2002-2012 WCGOP data in the non-nearshore model. Under Alternative 1, trawl and non-trawl allocations were established for overfished species. Further, the non-nearshore fishery was also allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye (Table 4-60). Routine adjustments of the non-trawl RCA (Table 4-25) would occur in the event the projected overfished species mortality is projected to exceed the non-nearshore share or non-trawl allocation. Table 4-61 contains the projected mortality groundfish for the non-nearshore fishery.

Table 4-57 Alternative 1. Limited entry sablefish FMP allocations north of 36 N. latitude for 2015-2016.

Year	Sablefish Com. HG	Limited Entry Share	LEFG Share (mt)				Estimated Tier Limits (lbs) a/		
			LE FG Total Catch Share	Landed Catch Share a/	Primary Season Share	LEFG DTL Share	Tier 1	Tier 2	Tier 3
2015	4,478	4,057	1,704	1,644	1,397	247	43,071	19,578	11,187
2016	4,887	4,428	1,860	1,794	1,525	269	47,010	21,368	12,210

a/ The limited entry fixed gear total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-58 Alternative 1. Open access FMP allocations north of north of 36 N. latitude for 2015-2016.

Year	Open Access Total Catch Share (mt)	Open Access Landed Catch Share (mt) a/
2015	421	406
2016	459	443

a/ The open access total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-59 Alternative 1. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	1,075 lb/week, not to exceed 3,225 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 950 lb, not to exceed 1,900 lb/ 2 months					
2016	Limited Entry	1,175 lb/week, not to exceed 3,525 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 1,025 lb, not to exceed 2,050 lb/ 2 months					

Table 4-60. Alternative 1 – Non-Nearshore. Overfished species projected mortality, compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations, for 2015-2016.

Stock	2015 Projected Mortality (mt)	2015 Non-Nearshore Share (mt)	2015 Non-Trawl Allocation (mt)	2016 Projected Mortality (mt)	2016 Non-Nearshore Share (mt)	2016 Non-Trawl Allocation (mt)
BOCACCIO	0.0	79.1	258.8	0.0	82.1	268.7
CANARY	1.1	3.8	49.9	1.2	3.9	51.3
COWCOD	0.0		2.6	0.0		2.6
DARKBLOTCHED	4.9			5.4		
POP	0.3			0.3		
PETRALE SOLE	0.3			0.3		
YELLOWEYE	0.5	1.1	11.2	0.6	1.2	12.1

Table 4-61. Alternative 1. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt).

Stock	2015			2016		
	LE	OA	Total	LE	OA	Total
Arrowtooth flounder	46	7	53	50	8	58
Bank rockfish (South of 40°10' N. lat.)	0	0	0	0	0	0
Big skate	6	1	7	7	1	8
Black rockfish (Oregon/California)	0	0	0	0	0	0
Blackgill rockfish (South of 40°10' N. lat.)	13	5	18	14	6	20
Blue rockfish	0	0	0	0	0	0
Cabezon - (California)	0	0	0	0	0	0
Cabezon - (Oregon)	0	0	0	0	0	0
California skate	0	0	0	0	0	0
Chilipepper rockfish	0	0	0	0	0	0
Dover sole	7	1	8	7	1	9
English sole	0	0	0	0	0	0
Greenspotted rockfish	0	0	0	0	0	0

Stock	2015			2016		
	LE	OA	Total	LE	OA	Total
Greenstriped rockfish	1	0	1	1	0	2
Grenadiers	49	16	65	53	18	71
Kelp greenling	0	0	0	0	0	0
Lingcod - (California)	13	4	16	14	4	18
Lingcod - (Washington/Oregon)	3	0	4	3	0	4
Longnose skate	66	13	79	72	14	86
Longspine thornyhead (North Pt. Conception)	3	1	4	3	1	4
Mixed thornyheads	2	1	2	2	1	3
Pacific cod	2	0	2	2	0	2
Pacific hake	0	0	1	1	0	1
Redstripe rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Sharpchin rockfish	0	0	0	0	0	0
Shortbelly rockfish	0	0	0	0	0	0
Shortspine thornyhead (North Pt. Conception)	21	5	26	22	6	28
Silvergrey rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Spiny dogfish	156	25	181	170	28	198
Splitnose rockfish	0	0	0	0	0	0
Starry flounder	0	0	0	0	0	0
Unspecified skate	17	3	20	19	3	22
Widow rockfish	0	0	0	0	0	0
Yellowmouth (North of 40°10' N. lat.)	0	0	0	0	0	0
Yellowtail rockfish	1	0	1	1	0	1
Other flatfish	0	0	0	0	0	0
Other groundfish	3	1	4	4	1	5
Other nearshore rockfish	0	0	0	0	0	0
Other shelf rockfish	3	0	3	3	0	4
Other slope rockfish	105	19	125	115	21	136

South of 36° N. latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under Alternative 1 is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.45 (Table 4-62). Anticipated catch of sablefish south of 36° N latitude under Alternative 1 would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears (Table 4-62). Increases to the sablefish trip limits would be proposed (Table 4-33) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-62). Under Alternative 1, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye (Table 4-60). Routine adjustments of the non-trawl RCA (Table 4-25) would occur in the event the projected overfished species mortality is projected to exceed the non-nearshore share or non-trawl allocation (Table 4-60).

Table 4-62. Alternative 1. Short-term sablefish allocations south of 36 N. latitude for the non-trawl sector, limited entry and open access for 2015-2016.

Year	ACL	Commercial HG	Non-Trawl Allocation	LE FG Total Catch Share	Directed OA Total Catch Share	LE FG Landed Catch Share a/	Directed OA Landed Catch Share b/
2015	1,798	1,793	1,040	572	468	555	451
2016	1,961	1,956	1,134	624	511	606	492

a/ The limited entry and open access fixed gear total catch shares are reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-63. Alternative 1. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	2,125 lb/ week					
	Open Access	320 lb/day, or 1 landing per week of up to 1,600 lb, not to exceed 3,200 lb/2 months					
2016	Limited Entry	2,200 lb/ week					
	Open Access	330 lb/day, or 1 landing per week of up to 1,650 lb, not to exceed 3,300 lb/2 months					

4.2.2.2.4 Nearshore – Alternative 1

There are both Federal and state allocations for nearshore species that limit target species landings in the commercial nearshore fishery (Table 4-34). Alternative 1 is based on the expectation that landings in the Oregon nearshore fishery will be equal to their allocations, except for lingcod where the historical average landings are assumed. In California, nearshore fishery allocations are unable to be achieved given the current overfished species allocations. As such, landings are reduced to stay within the nearshore fishery overfished species allocations. Nearshore fishery landings are influenced by a variety of factors, including weather and market, and can vary annually (Table 4-36). As such, there is substantial uncertainty surrounding the estimated landings under the action alternatives, which in turn influence the projected overfished species mortality and socioeconomic analysis. In the event fishery performance is lower than the allocations, mortality of groundfish species will be lower.

Trawl and non-trawl allocations for overfished species, would be implemented under Alternative 1 (Table 4-65). Specifically, the nearshore fishery would be managed to stay within its share of the non-trawl allocation for bocaccio, canary, and yelloweye or the overall non-trawl allocations. Under the Alternative 1, catch of canary rockfish in California exceeds the catch sharing agreement with Oregon (Table 4-65) and the nearshore fishery share. However, the non-trawl allocation for canary is not exceeded. Routine adjustments of the non-trawl RCA (Table 4-25) or reduced trip limits for target species may be necessary to reduce catch of overfished species under the current catch-sharing agreement.

Under Alternative 1, catch of yelloweye rockfish in California exceeds the 2015 catch sharing agreement with Oregon by 0.1 mt (Table 4-65). However, the non-trawl allocation for canary is not exceeded.

Routine adjustments of the non-trawl RCA (Table 4-25) or reduced trip limits for target species may be necessary to reduce catch of overfished species under the current catch-sharing agreement.

Table 4-64. Alternative 1. Expected landings under Alternative 1. Target species landings by area are also shown (far right panel).

Stock	Area	Total Target Species Landings 2015-2016 (mt)	Target Species Landings by Area for 2015-2016			
			OR Total (mt)	CA Total (mt)	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
Black rockfish	S. 46°16 N. lat.	223	139	84	80	4
Cabezon	OR	31	31			
Cabezon	CA	60		60	6	54
Kelp greenling	OR	10	10			
Kelp greenling	CA	21.2		21.2	0.2	21
Lingcod	N. 40°10 N. lat.	33	29	4	4	
Lingcod	S. 40°10 N. lat.	15		15		15
Nearshore rockfish N. a/	N. 40°10 N. lat.	15				
--Blue rockfish		*8*	*3*	*5*	*5*	
--Other nearshore rockfish		*7*	5	2	2	
Nearshore rockfish S.	S. 40°10 N. lat.	79				
--Blue rockfish		*2*		*2*		*2*
--Shallow nearshore rockfish b/		*53*		*53*		*53*
--Deeper nearshore rockfish c/		*24*		*24*		*24*

a/ Nearshore rockfish totals consists of black-and-yellow, blue rockfish, China, gopher, grass, kelp, brown, olive, copper, treefish, calico, quillback. These species are part of the nearshore rockfish complex north and south of 40°10 N. latitude.
b/Shallow nearshore rockfish consists of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.
c/ Deeper nearshore consists of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.

Table 4-65. Alternative 1. Total projected overfished species (OFS) mortality compared to the formal allocations for 2015-2016 (mt). Projected overfished species mortality by area is also shown in the right panel and compared to the state specific shares, where applicable (in parenthesis). Overages of the allocations are indicated in bold.

Stock	Area	Total Projected OFS Mortality 2015-2016 (mt)	Formal Allocations 2015/2016 (mt)	Projected OFS Mortality by Area for 2015-2016			
				Oregon Total (Share 2015/2016) (mt)	CA Total (Share 2015/2016) (mt)	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
BOCACCIO	S. 40°10	0.4	1.0/1.0	N/A	0.4	N/A	0.4
COWCOD	S. 40°10	0		N/A	0	N/A	0
CANARY	Coastwide	**7.0**	6.7/6.9	1.0 (1.8/1.9)	**6.0** (4.9/5.0)	0.7	5.3
DARKBLOTCHE	Coastwide	0.2		0.1	0.1	0	0.1
POP	N. 40°10	0		0	0	0	0
PETRALE	Coastwide	0		0	0	0	0
YELLOWEYE	Coastwide	**1.3**	1.2/1.3	0.9 (0.9/0.9)	0.4	0.3	0.1

4.2.2.2.5 Tribal Fisheries – Alternative 1

Tribal fisheries would operate under the harvest guidelines and allocations displayed in Table 4-47, Table 4-49, and Table 4-51. Tribal fisheries would be managed using the same measures described under No Action.

4.2.2.2.6 Washington Recreational – Alternative 1

Primary catch controls for the Washington recreational fishery are season dates, depth closures, bag limits, and groundfish conservation areas, including YRCAs. Under Alternative 1, Washington recreational fisheries would operate under the 2015 and 2016 ACLs (Table 4-47 and Table 4-49) and Washington recreational harvest guidelines (HGs) for overfished and non-overfished species (Table 4-66).

Table 4-66. Alternative 1: Washington recreational harvest guidelines for 2015 and 2016.

Stock	2015	2016
CANARY ROCKFISH	3.4	3.5
YELLOWEYE ROCKFISH	2.9	3.1

<u>Groundfish Seasons and Area Restrictions</u>

Season Structure

Under Alternative 1, the Washington recreational fishery would be open year-round for groundfish, except lingcod. Washington would continue to prohibit the retention of canary and yelloweye rockfish in all areas.

Depth restrictions are the primary tool used to keep recreational mortality of yelloweye and canary rockfish within specified HGs. Restrictions limiting the depth where groundfish fisheries are permitted are more severe in the area north of the Queets River (Marine Areas 3 and 4) where yelloweye and canary rockfish abundance is higher and therefore caught incidentally at a higher rate. Depth restrictions are less restrictive moving south where incidental catch of yelloweye and canary becomes progressively less.

Management measures under Alternative 1 differ only slightly from the No Action Alternative. Under Alternative 1, the depth closure in the North Coast (Marine Areas 3 and 4) would be in place from May 9th through Labor Day rather than from May 1 through September 30. In the South Coast (Marine Area 2), the prohibition on lingcod retention seaward of 30 fathoms in the area south of 46°58 on Fridays and Saturdays from July to August 31 would be removed and in the Columbia River Area (Marine Area 1), the southern boundary for the year round lingcod closure would be moved three miles north. The primary intent of these changes is to simplify management measures for recreational anglers while maintaining total mortality projections that stay within Washington's HGs for overfished species. Management measures, in addition to those analyzed in the 2013-14 EIS were implemented in 2013 through inseason action to respond to higher than anticipated encounters with yelloweye rockfish. These additional management measures reduced the potential for encounters with overfished species and provide some leeway to refine and streamline management measures described under the No Action Alternative. Table 4-67 summarizes key features of the Washington recreational regulations under Alternative 1.

Table 4-67. Alternative 1. Washington Recreational Seasons and Groundfish Retention Restrictions.

<table>
<tr><th>Marine Area</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>June</th><th>July</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>3 & 4 (N. Coast)</td><td colspan="4">Open all depths</td><td colspan="5">Open <20 fm May 9-Labor Day a/</td><td colspan="3">Open all depths</td></tr>
<tr><td>2 (S. Coast)</td><td colspan="2">Open all depths e/</td><td colspan="4">Open <30 fm Mar 15 - June 15 b/, c/, d/, e/</td><td colspan="6">Open all depths e/</td></tr>
<tr><td>1 (Col. R.)</td><td colspan="4">Open all depths e/</td><td colspan="5">Open all depths e/, f/</td><td colspan="3">Open all depths e/</td></tr>
<tr><td colspan="13">a/ Groundfish retention prohibited >20 fm except, retention of lingcod, Pacific cod and sablefish is allowed seaward of 20 fm on days when Pacific halibut is open.
b/ Retention of sablefish and Pacific cod allowed seaward of 30 fm from May 1- June 15.
c/ Retention of rockfish allowed seaward of 30 fm.
d/ Retention of lingcod allowed seaward of 30 fm on days that the primary halibut season is open.
e/ Retention of lingcod prohibited in deepwater areas at all times.
f/ Retention of groundfish, except sablefish and Pacific cod, prohibited with Pacific halibut on board on days open to the all depth Pacific halibut fishery.</td></tr>
</table>

<u>North Coast (Marine Areas 3 and 4)</u>

The retention of bottomfish is prohibited seaward of a line approximating 20 fm from May 9th through the first Monday in September, except, lingcod, Pacific cod and sablefish can be retained seaward of 20 fm on days open to recreational fishing for Pacific halibut. Fishing for, retention, or possession of groundfish and Pacific halibut is prohibited in the C-shaped YRCA (Figure 4-17).

South Coast (Marine Area 2)

The retention of bottomfish, except rockfish, is prohibited seaward of 30 fm from March 15 through June 15, except sablefish and Pacific cod retention is allowed May 1 through June 15. Retention of lingcod is allowed seaward of 30 fm on days open to the primary Pacific halibut season. Fishing for, retention, or possession of lingcod is prohibited in deepwater areas seaward of a line extending from 47°31.70’ N. latitude, 124°45.00’ W. longitude to 46°38.17’ N. latitude, 124°30.00’ W. longitude year-round, except as allowed on days open to the Pacific halibut fishery (Figure 4-23). Fishing for, retention or possession of bottomfish or Pacific halibut is prohibited in the South Coast YRCA and Westport Offshore YRCA (Figure 4-18).

Columbia River (Marine Area 1)

Retention of bottomfish, except sablefish and Pacific cod, is prohibited with Pacific halibut onboard during the all-depth recreational halibut fishery from May 1 through September 30. Fishing for, retention, or possession of lingcod in deepwater areas seaward of a line extending 46°38.17 N. latitude, 124°21.00’ W. longitude to 46°28.00’ N. latitude, 124°21.00’ W. longitude is prohibited year-round (Figure 4-23).

Area Restrictions

Under Alternative 1, fishing for, retention, or possession of groundfish and halibut during the Washington recreational groundfish and Pacific halibut fisheries would be prohibited in the C-shaped YRCA in the north coast (Figure 4-17) and the South Coast and Westport YRCAs in the south coast (Figure 4-18).

Fishing for, retention, or possession of lingcod would be prohibited seaward of a line connecting the following coordinates from the Queets River (47°31.70’ N. latitude, 124° 45.00’ W. longitude) to 46°28.00’ N. latitude, 124°21.00’ W. longitude, year round except as allowed in Washington Marine Area 2 on days open to the primary Pacific halibut fishery (Figure 4-23):

5. 47°31.70’ N. lat 124°45.00’ W. long.
6. 46°38.17’ N. lat 124°30.00’ W. long.
7. 46°38.17’ N. lat 124°21.00’ W. long.
8. 46°28.00’ N. lat 124°21.00’ W. long.

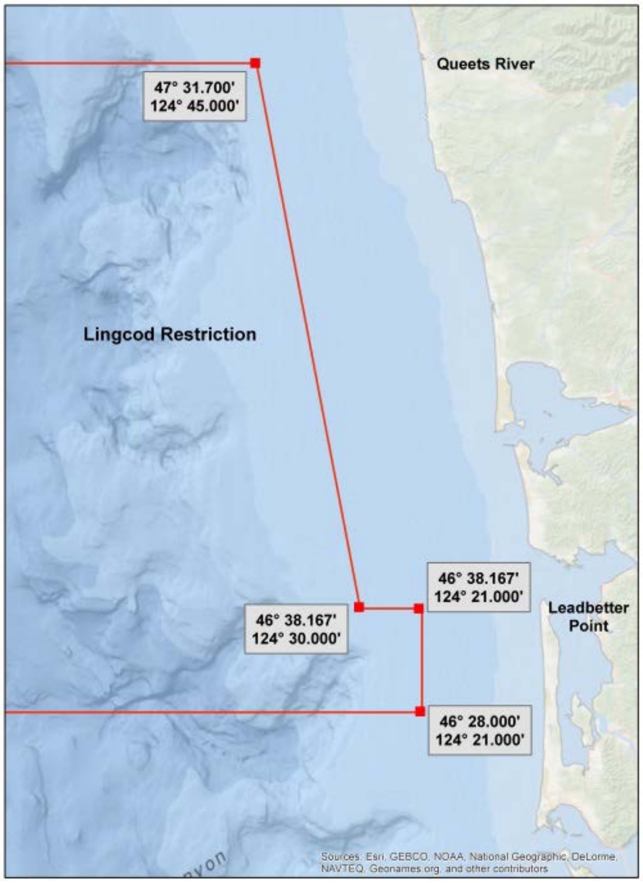


Figure 4-23. Alternative 1. Washington Lingcod Restricted Area.

Groundfish Bag Limits

Groundfish bag limits would be the same under Alternative 1 as they are under the No Action alternative. The recreational groundfish bag limit, including rockfish and lingcod, would be 12 fish per day. Of the 12 recreational groundfish allowed to be landed per day, sub-limits of 10 rockfish and, two lingcod apply. The recreational bag limit also includes a sub-limit of two cabezon in Marine Areas 1-3 and one cabezon in Marine Area 4.

Lingcod Seasons and Size Limits

Under Alternative 1, the lingcod seasons would be the same as they are under the No Action Alternative. In Marine Areas 1 through 3 (Washington-Oregon border at 46°16’ N. latitude to Cape Alava at 48°10’ N. latitude) the lingcod season would be open from the Saturday closest to March 15 through the Saturday closest to October 15. In Marine Area 4, (Cape Alava to the U.S. Canadian border) the lingcod season would be open from April 16 through October 15, or the Saturday closest to October 15 if that Saturday comes before October 15, whichever is earlier. Lingcod seasons under Alternative 1 would be structured the same as they were under the No Action Alternative.

Under the Alternative 1 the lingcod seasons and size limits by area are as follows:

- Marine Areas 1-3: March 14 through October 17 in 2015 and March 12 through October 15 in 2016. Minimum size, 22 inches.
- Marine Area 4: April 16 through October 15 in 2015 and April 16 to October 15 in 2016. Minimum size, 22 inches.

Cabezon Size Limit

Under both Alternative 1, there is an 18 inch minimum size limit for cabezon in Marine Area 4 (Cape Alava to the U.S. Canadian border).

Pacific Halibut Seasons

It is expected that the Pacific halibut seasons in 2015 and 2016 would be similar to the halibut seasons in 2013 and 2014. There are no changes to the restrictions on groundfish retention during the Pacific halibut season proposed under Alternative 1.

Additional Management Measures Analyzed

No additional management measures were analyzed for Alternative 1. Alternative 1 management measures will be used to keep recreational harvests of overfished species within specified HGs for 2015-2016.

Projected Morality and Inseason Management Response

Projected mortality for Washington's recreational fishery is based upon previous season's harvest estimated by the Ocean Sampling Program (OSP) and incorporated in Recreational Fishery Information Network (RecFIN). Table 4-68 summarizes the projected mortality for overfished and non-overfished species under Alternative 1.

It should be noted that the precision of recreational groundfish catch estimates based upon previous seasons will continue to be influenced by factors such as the length and success of salmon and halibut seasons, weather and unforeseen factors.

Washington's Ocean Sampling Program is able to produce estimates of groundfish catch with a one month lag time. Management measures such as more restrictive depth closures, area closures, groundfish retention restrictions, or changes to seasons can be considered and implemented through emergency changes to state regulations if inseason catch reports indicate that recreational harvests of overfished or non-overfished species are exceeding pre-season projections to the point where HGs are at risk of being exceeded.

Table 4-68. Alternative 1: Washington recreational projected mortality for overfished species in 2015 and 2016.

Stock	2015	2016
CANARY ROCKFISH	0.75	0.75
YELLOWEYE ROCKFISH	2.83	2.83

4.2.2.2.7 Oregon Recreational – Alternative 1

Primary catch controls for the Oregon recreational fishery are season dates, depth closures, bag limits, and groundfish conservation areas, including yelloweye rockfish conservation areas (YRCAs). Alternative 1 analyzes the Oregon recreational fishery with the 2015 and 2016 ACLs (Table 4-47 and Table 4-49), and Oregon recreational harvest guidelines (HGs) for overfished species which directly influence the recommended management measures (Table 4-69). Key target species with a state or sector specific HG are also shown, such as black rockfish which has a HG of 440.4 mt.[44] Projected mortality under Alternative 1 for the Oregon recreational fisheries is shown in Table 4-70.

Table 4-69. **Oregon recreational harvest guidelines (in mt) under Alternative 1 for 2015-2016. Italics indicate estimated harvest guidelines.**

Stock	**2015**	**2016**
CANARY ROCKFISH	11.7	12.0
YELLOWEYE ROCKFISH	2.6	2.8
Black Rockfish	440.4	440.4
Greenlings	*2.5*	*2.5*
Nearshore Rockfish N. of 40°10 N. lat. [a/]	*19.7*	*19.8*

[a/]Includes blue rockfish

Table 4-70. Projected Mortality in the Oregon recreational fisheries under the action alternatives for 2015-2016.

Stock	**Projected Mortality (mt)**
CANARY ROCKFISH	3.2
YELLOWEYE ROCKFISH	2.2
Black Rockfish	322.2
Cabezon	35.8
Greenlings [a/]	6.4
Lingcod	132.0
Nearshore Rockfish N. 40°10 N. Lat.	30.5
--*Blue Rockfish*	*17.5*
Yellowtail Rockfish	7.7

[a/] Includes kelp and other greenlings.

<u>Groundfish Seasons and Area Restrictions</u>

Season structure

Under Alternative 1, the Oregon recreational groundfish fishery would be open offshore year-round, except from April 1 to September 30 when fishing is only allowed shoreward of 40 fathoms, as defined by waypoints (Figure 4-24). Closing the fishery outside of 40 fathoms from April 1 to September 30, months when angler effort and yelloweye rockfish encounters are greatest, mitigates mortality of yelloweye rockfish. Projected mortality of yelloweye and canary rockfish are within the HG, therefore the shore-based fishery would be open year-round.

[44] The black rockfish ACL is allocated 58 percent to Oregon and 42 percent to California. Of the Oregon portion, Oregon state rule specifies that 76 percent is allocated to the recreational fishery with 24 percent to the commercial fishery. Similarly for nearshore rockfish species, state regulations allocate 48.7 percent of the Oregon portion to the recreational fishery.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bottomfish Season	Open all depths			Open < 40 fm						Open all depths		
Marine Bag Limit [1]	Ten (10)											
Lingcod Bag Limit	Three (3)											
Flatfish Bag Limit [2]	Twenty Five (25)											

1 Marine bag limit includes all species other than lingcod, salmon, steelhead, Pacific halibut, flatfish, surfperch, sturgeon, striped bass, pelagic tuna and mackerel species, and bait fish such as herring, anchovy, sardine, and smelt.
2 Flounders, soles, sanddabs, turbots and halibuts except Pacific halibut.

Figure 4-24. Alternative 1. Oregon recreational groundfish season structure and bag limits under Alternative 1.

Area Closures

The Stonewall Bank YRCA has been in place since 2006 and would also remain under the Alterative 1 (Figure 4-25). The YRCA is located approximately 15 miles west of the Port of Newport and consists of the high-relief area of Stonewall Bank, an area of high yelloweye rockfish encounters. No recreational fishing for groundfish and Pacific halibut can occur within this YRCA, which is bounded by the following waypoints specified in Table 4-71.

Two options for extending the status quo Stonewall Bank YRCA for 2015-2016 recreational fisheries, should they become necessary, are also shown in Figure 4-25 and are defined by the coordinates in Table 4-72 and Table 4-73.

Table 4-71. Alternative 1. Coordinates for the Stonewall Bank currently specified in regulation.

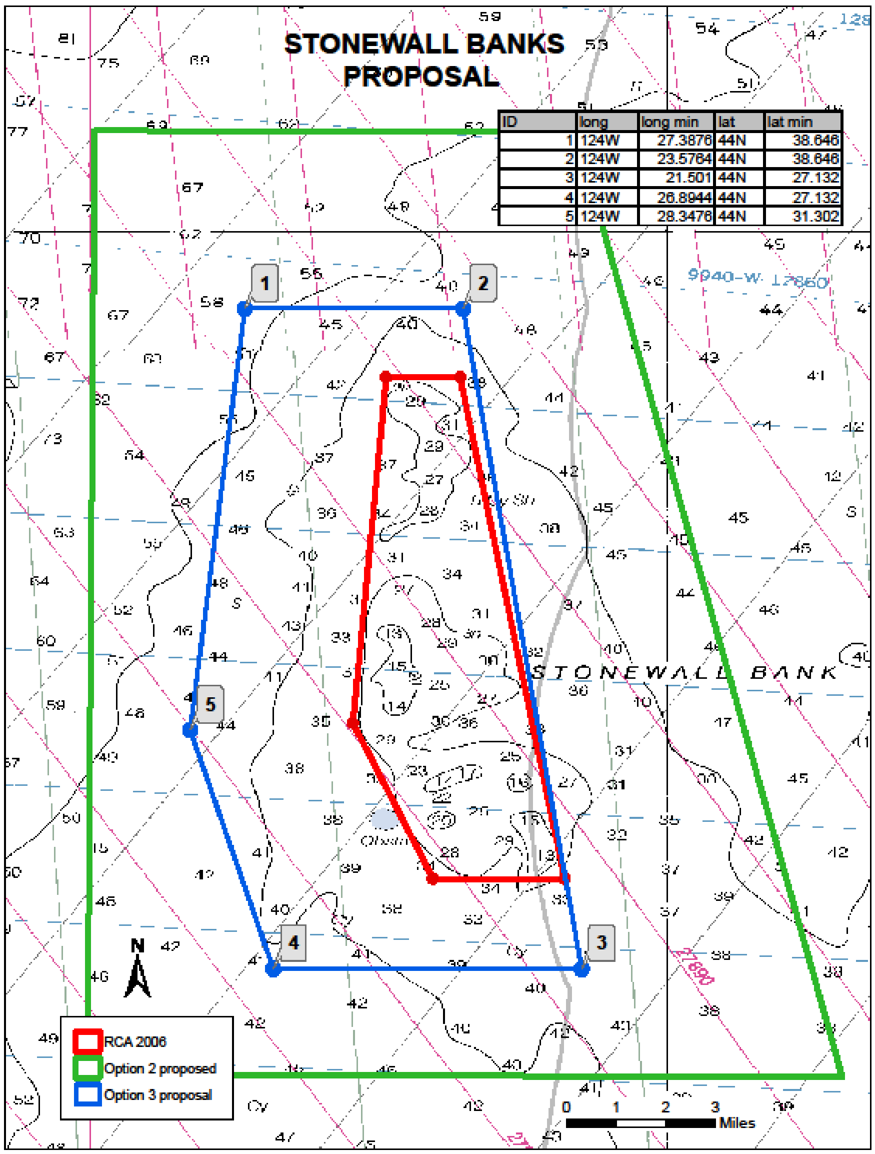
Latitude	Longitude
44°37.458’ N.	124°24.918’ W.
44°37.458’ N.	124°23.628’ W.
44°28.710’ N.	124°21.798’ W.
44°28.710’ N.	124°24.102’ W.
44°31.422’ N.	124°25.500’ W.

Table 4-72. Alternative 1, Option 2. Coordinates for the expanding the Stonewall Bank area closure under Option 2.

Latitude	Longitude
44°41.7594’ N.	124°30.018’ W.
44°41.7348’ N.	124°21.603’ W.
44°25.2456’ N.	124°16.944’ W.
44°25.2942’ N.	124°30.1404’ W.
44°41.7594’ N.	124°30.018’ W.

Table 4-73. Alternative 1, Option 3. Coordinates for the expanding the Stonewall Bank area closure.

Latitude	Longitude
44°38.544’ N	124°27.4122’ W
44°38.544’ N	124°23.8554’ W
44°27.132’ N	124°21.501’ W
44°27.132’ N	124°26.8944’ W
44°31.302’ N	124°28.3476’ W



ODFW, 05/22/06

Figure 4-25. Alternative 1. The Stonewall Bank Yelloweye Rockfish Conservation Area where recreational fishing for groundfish and Pacific halibut is prohibited.

<u>Groundfish Bag Limits and Size Limits</u>

Under Alternative 1, a marine fish daily bag limit of 10 fish in aggregate would be implemented, the same as under No Action, for 2015-2016 (Figure 4-24). The marine bag includes all species other than lingcod, salmon, steelhead, Pacific halibut, flatfish, surfperch, sturgeon, striped bass, pelagic tuna and mackerel species, and bait fish such as herring, anchovy, sardine and smelt. The seasonal one fish sub-bag limit for cabezon which was in place under No Action would be removed for 2015-2016. Cabezon mortality would be limited via state regulations. A flatfish daily bag limit of 25, which includes all soles and flounders except Pacific halibut, would be allowed in addition to the marine fish daily bag limit. Additionally a three-fish bag limit would be allowed for lingcod. Retention of canary and yelloweye rockfish would continue to be prohibited under Alternative 1.

The following minimum size limits applied to 2013-2014 Oregon recreational fisheries and would be carried forward under Alternative 1:

- Lingcod – 22 in.
- Cabezon – 16 in.
- Kelp greenling – 10 in.

Under Alternative 1, the recreational Pacific halibut fisheries should be able to proceed as in 2013 and 2014, in regards to days and areas open, etc., depending on the halibut quota. Since 2009, only sablefish and Pacific cod may be retained in the Pacific halibut fishery at any depth in the area north of Humbug Mountain, Oregon. It is expected that groundfish retention in the all-depth Pacific halibut fishery would be similarly limited in 2015 and 2016, under Alternative 1.

Under Alternative 1, actions may be necessary to reduce impact to the nearshore rockfish complex and/or kelp greenling. Due to the timing of receiving the ABC, ACL, and sector-specific HGs, the State of Oregon did not have time to engage the public in developing alternatives for management measures to reduce mortality to those species, if necessary. ODFW intends to use state processes to solicit public input and develop state regulations.

Additional Management Measures Analyzed

Under Alternative 1, three additional management measures were analyzed for the Oregon recreational fisheries: adding a 50 fathom management line, allowing limited retention of canary rockfish, and allowing retention of some groundfish during all-depth halibut openings. Additionally, a variety of season structure (depths and months) were modeled to determine potential mortality to overfished species.

Inseason Management Tools

Oregon has a responsive port-based monitoring program through the Ocean Recreational Boat Survey (ORBS) and regulatory processes in place to track mortality and take actions inseason, if necessary. The following are suggested management measures that could be implemented inseason if the fishery does not proceed as expected.

Inseason management tools, designed to mitigate mortality, include bag limit adjustments (including non-retention), length limit adjustments, gear restrictions, and season, days per week, depth, and area closures.

Season, depth, days open per week, and area closures are the primary inseason tools for limiting yelloweye rockfish and canary rockfish mortality, since retention of these species is already prohibited. If catch rates indicate that the bycatch harvest targets for yelloweye rockfish would be reached prematurely, offshore depth closures may be implemented inseason at 30, 25, 20, or 50 fathoms as these two species are less abundant nearshore, and release survival rates are higher in shallow waters. Additionally, days per week may also be closed to reduce mortality. ODFW would monitor inseason progress toward recreational harvest targets for canary rockfish and yelloweye rockfish. Regulations would depend upon the timing of the determination for their need.

Adjustments to the marine fish daily bag limit to no more than 10 fish may be implemented to achieve season duration goals in the event of accelerated or decelerated black rockfish or other nearshore rockfish harvest. The lingcod daily bag limits may be adjusted to no more than 3 fish in the event the marine bag limit changes or the halibut catch limit is reduced from 2013 levels. Season and/or area closures may also be considered if harvest targets are projected to be attained. Closing one or more days per week is an inseason tool that could be used to limit mortality. Closing certain days each week would help lengthen the duration of a fishery approaching an HG.

Non-retention and/or length restrictions are the likely inseason tools to use for cabezon and kelp greenling, as release survival is very high. They may also be used to reduce mortality of nearshore species, such as nearshore rockfish species, especially when combined with the use of descending devices.

Gear restrictions and/or release technique requirements may be implemented to reduce the impact of depleted rockfish since a variety of descending devices are available and the Council will be approving new mortality rates in 2014 for yelloweye and canary rockfish when devices are used.

Directed yellowtail rockfish and/or flatfish fisheries may be implemented inseason, as were implemented in 2004, in the event of a closure of the recreational groundfish fishery due to attainment Federal or state HGs or targets. Specific gear restrictions may be implemented in the event that yellowtail rockfish and/or flatfish fisheries remain open during a groundfish closure. Additionally, the fishery may be expanded to waters seaward of the RCA, promoting directed yellowtail rockfish opportunity. Directed flatfish fisheries would be legal year round and open shoreward of 40 fathoms during any period the groundfish fishery has any depth restrictions (e.g., 40, 30, 25, 20, and 50 fathom lines). The flatfish fishery would not have any depth restrictions when the groundfish fishery has no depth restrictions. Fisheries would be monitored to ensure that mortality of yelloweye and canary rockfish are within the harvest targets/guidelines.

In the event that the duration of total season is reduced from 12 months; the nearshore waters are closed to groundfish fishing due to management of nearshore species; or the Pacific halibut catch limit is reduced from 2013 levels, the fishery may be expanded to waters seaward of the RCA that is in effect at the time, promoting directed yellowtail rockfish and offshore lingcod opportunity. Fisheries would be monitored to ensure that mortality of yelloweye rockfish and canary rockfish is not in excess of the HGs.

4.2.2.2.8 California Recreational – Alternative 1

The 2015-2016 California recreational groundfish projected mortality and season structure under Alternative 1 are based on CDFW's updated RecFISH model. Model projections were calculated for the five recreational groundfish management areas using updated 2011 and 2012 RecFIN estimates; overfished species mortality are reported statewide. Table 4-74 depicts Alternative 1 overfished species harvest guidelines for the 2015-2016 California recreational groundfish seasons.

Table 4-74. Alternative 1: California recreational allocations/harvest guidelines for 2015-2016.

Stock	2015	2016
BOCACCIO	178.8	185.6
CANARY	24.3	25.0
COWCOD*	2.6	2.6
YELLOWEYE	3.4	3.7

*Non-trawl allocation

<u>Groundfish Seasons and Area Restrictions</u>

Under Alternative 1, tradeoffs between season lengths and depth restrictions were explored (Options 1, 2, and 3). Because the non-trawl allocation for cowcod will increase to 2.6 mt in 2015-2016, all three Options allow depth restrictions to be modified from 50 fm to 60 fm in the Southern Management Area. Under Option 1, longer seasons and status quo (or No Action) depth restrictions were examined. Option 2 explored longer seasons north of Point Conception and limited additional opportunity in deeper depths in the Northern and Mendocino Management Areas; the area where the depths restrictions are the most restrictive under status quo regulations (20 fm). Option 3 examined shorter seasons and deeper depths north of Point Conception. The three fish lingcod bag limit can be accommodated under all Options.

Option 1

Under Option 1, the depth restrictions would be the same as the No Action Alternative and the season lengths would be extended for all areas north of Point Conception from March 1 through December 31 (Figure 4-26). Due to lower yelloweye rockfish mortality in recent years the season lengths in the areas north of Point Conception can be extended. Black rockfish mortality limits the season length at the current depth restrictions. Under this option, the portion of the recreational catch share is exceeded by 1.7 mt, but could be accommodated by the residual from the commercial fishery. The mortality of cowcod and bocaccio in the Southern Management Area are projected to be far below the respective harvest guidelines. Season length in the Southern Management Area would remain the same as status quo, March 1st – December 31st, but the depth restriction would be modified from 50 fm to 60 fm to resume access to deeper depths allowed in 2012 prior to an inseason action.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed		Mar 1 – Dec 31 <20 fm									
Mendocino	Closed		Mar 1 –Dec 31 <20 fm									
San Francisco	Closed		Mar 1 – Dec 31 <30 fm									
Central	Closed		Mar 1 – Dec 31 <40 fm									
Southern	Closed		Mar 1 – Dec 31 <60fm									

Figure 4-26. Alternative 1 (Option 1): California recreational groundfish season structure and depth restrictions for 2015-2016 with maximized season length.

Option 2

Due to lower yelloweye rockfish encounter rates in recent years, the season length north of Point Conception can be extended to April 1st through December 31st (Figure 4-27). In addition, under Option 2, deeper depth restrictions are analyzed in the Northern and Mendocino Management Areas for part of the year; the depth restriction would be 20 fm from April 1st through September 30th, then increase to 30 fm from October 1st through December 31st. The depth and season in all other areas would be unchanged from Option 1.

When depth restrictions are liberated, it becomes more challenging to predict angler behavior and uncertainty in the yelloweye rockfish projections increases. Further, the RecFISH model assumes proportion of catch by depth and those proportions of catch can change when depth is increased, which results in underestimates of mortality. The relatively low effort during October 1st through December 31st makes it possible to allow access to deeper depths without greatly increasing the risk of exceeding the yelloweye rockfish harvest guideline. Black rockfish mortality remains within the state recreational share under this option.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed			April 1 – Sep 30 <20 fm, Oct 1– Dec 31 <30 fm								
Mendocino	Closed			April 1 – Sep 30 <20 fm, Oct 1– Dec 31 <30 fm								
San Francisco	Closed			April 1 – Dec 31 <30 fm								
Central	Closed			April 1 – Dec 31 <40 fm								
Southern	Closed		Mar 1 – Dec 31 <60 fm									

Figure 4-27. Alternative 1 (Option 2): California recreational groundfish season structure and depth restrictions for 2015-2016.

Option 3

Under Option 3, tradeoffs between increased depth and season lengths north of Point Conception were explored. By allowing access to deeper depths, encounters with overfished shelf rockfish species are expected to increase. In order to keep mortality of overfished species from exceeding harvest guidelines, season lengths north of Point Conception were reduced (Figure 4-28). Similar to Option 2, when depth restrictions are modified uncertainty increases, as effort shifts to deeper depths may be greater than projected, resulting in mortality exceeding projected values.

Season length in the Southern Management Area would also be reduced to the May 15th to August 15th to explore reductions in catch savings on cowcod, bocaccio, or other species. In recent years, bocaccio and cowcod encounters have increased, making it more difficult to model projected mortality. Given these concerns, examining a shorter season in the Southern Management Area is prudent in the event inseason action may be necessary to keep catches within allowable levels. California scorpionfish would remain open year round to 60 fm.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May15–Aug15<30fm				Closed			
Mendocino	Closed				May15–Aug15<30fm				Closed			
San Francisco	Closed				May15–Aug15<40fm				Closed			
Central	Closed				May15–Aug15<50fm				Closed			
Southern	Closed				May15–Aug15<60fm				Closed			

Figure 4-28. Alternative 1 (Option 3): California recreational groundfish season structure and depth restrictions for 2015-2016.

<u>Groundfish Bag Limits and Size Limits</u>

Under Alternative 1, the groundfish bag limits or size limits are the same as under No Action except for the following:

Lingcod – The No Action bag limit for lingcod is two fish. The Council is proposing to increase the bag limit from two fish to three fish. The mortality (in metric tons) as a result of the increase in the bag limit for Options 1, 2, and 3 is provided in Table 4-75. An increase in the lingcod bag limit from two to three fish can be accommodated statewide with the aforementioned season and depth restrictions under all options. The Council is not proposing any changes to the lingcod minimum size restriction. Increases to overfished species mortality as a result of this increase are expected to be minimal (if any).

Additional Management Measures Analyzed

None

Projected mortality for bocaccio, canary rockfish, cowcod, and yelloweye rockfish for all Options under Alternative 1 can be found in Table 4-75. Under all the Options contemplated under Alternative 1 the projected mortality of cowcod, bocaccio, canary and yelloweye rockfish increases compared to the No Action alternative, due to the increased season lengths or deeper depth restrictions (Table 4-75). The number of angler trips is expected to increase under the Options allowing for increased opportunity for both private/rental boats (PR) and commercial passenger fishing vessels (CPFV). Projections for non-overfished species for Alternative 1 under each Option are provided in Table 4-76.

Similar to the No Action Alternative, if overfished species encounters are tracking higher or lower than projected, inseason action could be taken, which could include closing one or more recreational groundfish management areas, restricting recreational fishery seasons and/or modifying depth restrictions. As in the No Action Alternative, the YRCAs would be available and could be implemented inseason if catches are projected to exceed harvest guidelines.

Table 4-75. Alternative 1: California recreational projected mortality of overfished species for 2015-2016 under Option 1, Option 2 and Option 3.

Stock	California Recreational 2015 HG (mt)	California Recreational 2016 HG (mt)	Projected Mortality (mt)		
			Option 1	Option 2	Option 3
BOCACCIO	178.8	185.6	117.5	117.6	23.5
CANARY	24.3	25.0	19.8	19.8	10.6
COWCOD			1.2	1.2	0.3
YELLOWEYE	3.4	3.7	2.8	2.9	2.7

a/The non-trawl allocation of cowcod is 2.6 mt.

Table 4-76. Alternative 1: California recreational projected mortality of non-overfished species for 2015-2016 under Option 1, Option 2, and Option 3. Results in parenthesis reflect lingcod mortality with a three fish bag limit.

Stock	Projected Mortality (mt)		
	Option 1	**Option 2**	**Option 3**
Black Rockfish	232.5*	219.7	110.3
Blue Rockfish	65.2	62.2	22.9
Cabezon	42.5	40.2	16.9
California scorpionfish	81.1	81.1	13.3
Greenlings	24.7	22.4	8.7
Lingcod	296.2 (356.4)	280.9 (338.0)	111.0 (134.0)
Minor Nearshore Rockfish North	15.6	15.4	6.7
Minor Nearshore Rockfish South	376.5	365.4	118.6
Widow Rockfish	4.2	3.8	1.5

**Mortality exceeds the recreational portion of the California catch share of 230.8 mt. Further discussion provided under the text describing Option 1.*

4.2.3 Alternative 2 – P* 0.25

4.2.3.1 Harvest Specifications

Table 4-77 through Table 4-81 contains the harvest specifications and allocations under Alternative 2. Where applicable, ACLs are determined based on a p-star value of 0.25. For ACLs set below the ABC, the harvest control rule determines the ACL (XXX link to Chapter 2 tables with HCRs). The overfished species set-asides and allocations are found in Table 4-52.

Table 4-77. Alternative 2. 2015 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 2.

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	349		3	4.6	0.7	340.7
CANARY	Coastwide	122	7.7	1	4.5	2	106.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	338	0.2	0.1	2.1	18.4	317.2
PETRALE	Coastwide	2,310	220		14.2	2.4	2,073.4
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
YELLOWEYE	Coastwide	18	2.3	0.03	3.3	0.2	12.2
Arrowtooth flounder	Coastwide	4,058	2,041		16.39	30	1,970.6
Black	N of 46º16' N. lat.	330	14				316.0
Black	S of 46º16' N. lat.	922		1			921.0
Cabezon	46º16' to 42º N. lat.	38					38.0
Cabezon	S of 42º N. lat.	126					126.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	93				2	91.0
Chilipepper	S of 40º10' N. lat.	1,335		10	9	5	1,311.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	7,437	91		5.8	7	7,333.2
Kelp Greenling	CA	45					45.1
Kelp Greenling	OR	5					5.3
Kelp Greenling	WA	12					11.9
Leopard Shark	Coastwide	63					63.3
Lingcod	N of 40'10º N. lat.	2,172	250	0.5	11.67	16	1,893.8
Lingcod	S of 40'10º N. lat.	741		1.0	1.1	7	731.9
Longnose skate	Coastwide	1,920	56		13.18	3.8	1,847.0
Longspine thornyhead	N of 34º27' N. lat.	2,340	30		13.5	3	2,293.5
Longspine thornyhead	S of 34º27' N. lat.	739			1	2	736.0
Pacific cod	Coastwide	1,213	400		7.04	2	804.0
Pacific whiting a/	Coastwide	269,745	63,205		2,500		204,040
Sablefish	N of 36º N. lat.	4,114		See Table 4-81			
Sablefish	S of 36º N. lat.	1,475			3	2	1,470.0
Shortbelly	Coastwide	50			2		48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,288	50		7.22	2	1,228.8
Shortspine thornyhead	S of 34º27' N. lat.	682			1	41	640.0
Spiny Dogfish	Coastwide	1,552	111.8	1	12.5	49.53	1,376.7
Splitnose	S of 40º10' N. lat.	1,406		1.5	9		1,395.5
Starry flounder	Coastwide	1,132	2			8.3	1,121.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	7,553	677	10	16.6	3	6,846.4
Nearshore rockfish north	N of 40º10' N. lat.	40					40
Nearshore rockfish south	S of 40º10' N. lat.	693			2.6	1.4	689.0
Shelf rockfish north	N of 40º10' N. lat.	1,142	30	3	13.4	26	1,069.6
Shelf rockfish south	S of 40º10' N. lat.	802		30	9.6	9	753.4
Slope rockfish north	N of 40º10' N. lat.	1,215	36	1	8.1	19	1,150.9
Slope rockfish south	S of 40º10' N. lat.	384		1	2	17	364.0
Other flatfish	Coastwide	5,606	60		19	125	5,402.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-78. Alternative 2. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	340.7	Biennial	N/A	81.9	N/A	258.8
CANARY	Coastwide	106.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	317.2	Amendment 21	95%	301.3	5%	15.9
PETRALE	Coastwide	2,073.4	Biennial	N/A	2,038.4	N/A	35.0
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
YELLOWEYE	Coastwide	12.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	1,970.6	Amendment 21	95%	1,872.1	5%	98.5
Black	N of 46º16' N. lat.	316.0	None				
Black	S of 46º16' N. lat.	921.0	None				
Cabezon	OR	38.0	None				
Cabezon	CA	126.0	None				
Cabezon	WA	XXX	None				
California scorpionfish	S of 34°27' N. lat.	91.0	None				
Chilipepper	S of 40º10' N. lat.	1,311.0	Amendment 21	75%	983.3	25%	327.8
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	7,333.2	Amendment 21	95%	6,966.5	5%	366.7
Kelp Greenling	CA	45.1	None				
Kelp Greenling	OR	5.3	None				
Kelp Greenling	WA	11.9	None				
Leopard Shark	Coastwide	63.3	None				
Lingcod	N of 40'10º N. lat.	1,893.8	Amendment 21	45%	852.2	55%	1,041.6
Lingcod	S of 40'10º N. lat.	731.9	Amendment 21	45%	329.4	55%	402.5
Longnose skate	Coastwide	1,847.0	Biennial	90%	1,662.3	10%	184.7
Longspine thornyhead	N of 34º27' N. lat.	2,293.5	Amendment 21	95%	2,178.8	5%	114.7
Longspine thornyhead	S of 34º27' N. lat.	736.0	None				
Pacific cod	Coastwide	804.0	Amendment 21	95%	763.8	5%	40.2
Pacific whiting b/	Coastwide	0.0	Amendment 21	100%	0.0	0%	0.0
Sablefish	N of 36º N. lat.		See Table 4-81				
Sablefish	S of 36º N. lat.	1,470.0	Amendment 21	42%	617.4	58%	852.6
Shortbelly	Coastwide	48.0	None		48.0		0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,228.8	Amendment 21	95%	1,167.3	5%	61.4
Shortspine thornyhead	S of 34º27' N. lat.	640.0	Amendment 21	NA	50.0	NA	590.0
Spiny Dogfish	Coastwide	1,376.7	None				
Splitnose	S of 40º10' N. lat.	1,395.5	Amendment 21	95%	1,325.7	5%	69.8
Starry flounder	Coastwide	1,121.7	Amendment 21	50%	560.9	50%	560.9
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	6,846.4	Amendment 21	88%	6,024.8	12%	821.6
Nearshore rockfish N.	N of 40º10' N. lat.	45.0	None				
Nearshore rockfish S.	S of 40º10' N. lat.	718.0	None				
Other flatfish	Coastwide	5,402.0	Amendment 21	90%	4,861.8	10%	540.2
Shelf rockfish N.	N of 40º10' N. lat.	1,069.6	Biennial	60.2%	643.9	39.8%	425.7
Shelf rockfish S.	S of 40º10' N. lat.	753.4	Biennial	12.2%	91.9	87.8%	661.5
Slope rockfish N.	N of 40º10' N. lat.	1,150.9	Amendment 21	81%	932.2	19%	218.7
Slope rockfish S.	S of 40º10' N. lat.	366.0	Amendment 21	63%	230.6	37%	135.4

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-79. Alternative 2. 2016 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 2.

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	362	0	3	4.6	0.7	353.7
CANARY	Coastwide	125	7.7	1	4.5	2	109.8
COWCOD	S of 40º10' N. lat.	10	0	0.015	2	0	7.98
DARKBLOTCHED	Coastwide	346	0.2	0.1	2.1	18.4	325.2
PETRALE	Coastwide	2,386	220		14.2	2.4	2,149.4
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
YELLOWEYE	Coastwide	19	2.3	0.03	3.3	0.2	13.2
Arrowtooth flounder	Coastwide	3,934	2,041		16.39	30	1,846.6
Black	N of 46º16' N. lat.	332	14		0	0	318.0
Black	S of 46º16' N. lat.	927	0	1	0	0	926.0
Cabezon	OR	38	0		0	0	38.0
Cabezon	CA	124	0		0	0	124.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	91	0		0	2	89.0
Chilipepper	S of 40º10' N. lat.	1,328	0	10	9	5	1,304.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	5,223	91		5.8	7	5,119.2
Kelp Greenling	CA	45					45.1
Kelp Greenling	OR	6					6.3
Kelp Greenling	WA	11					11.4
Leopard Shark	Coastwide	63					63.3
Lingcod	N of 40'10º N. lat.	2,089	250	0.5	11.67	16	1,810.8
Lingcod	S of 40'10º N. lat.	699	0	1.0	1.1	7	689.9
Longnose skate	Coastwide	1,885	56		13.18	3.8	1,812.0
Longspine thornyhead	N of 34º27' N. lat.	2,226	30		13.5	3	2,179.5
Longspine thornyhead	S of 34º27' N. lat.	703	0		1	2	700.0
Pacific cod	Coastwide	1,213	400		7.04	2	804.0
Pacific whiting a/	Coastwide	269,745			2,500		204,040
Sablefish	N of 36º N. lat.	4,540		See Table 4-81			
Sablefish	S of 36º N. lat.	1,629	0		3	2	1,624.0
Shortbelly	Coastwide	50	0		2	0	48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,275	50		7.22	2	1,215.8
Shortspine thornyhead	S of 34º27' N. lat.	674	0		1	41	632.0
Spiny Dogfish	Coastwide	1,540	111.8	1	12.5	49.53	1,364.7
Splitnose	S of 40º10' N. lat.	1,432	0	1.5	9	0	1,421.5
Starry flounder	Coastwide	1,136	2		0	8.3	1,125.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	7,163	677	10	16.6	3	6,456.4
Nearshore rockfish N.	N of 40º10' N. lat.	41					41
Nearshore rockfish S.	S of 40º10' N. lat.	694			2.6	1.4	690.0
Shelf rockfish N.	N of 40º10' N. lat.	1,148	30	3	13.4	26	1,705.6
Shelf rockfish S.	S of 40º10' N. lat.	803	0	30	9.6	9	754.4
Slope rockfish N.	N of 40º10' N. lat.	1,227	36	1	8.1	19	1,162.9
Slope rockfish S.	S of 40º10' N. lat.	386	0	1	2	17	366.0
Other flatfish	Coastwide	4,775	60		19	125	4,571.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-80. Alternative 2. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2016 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	353.7	Biennial	N/A	85.0	N/A	268.7
CANARY	Coastwide	109.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	325.2	Amendment 21	95%	308.9	5%	16.3

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
PETRALE	Coastwide	2,149.4	Biennial	N/A	2,114.4	N/A	35.0
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
YELLOWEYE	Coastwide	13.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	1,846.6	Amendment 21	95%	1,754.3	5%	92.3
Black	N of 46º16' N. lat.	318.0	None				
Black	S of 46º16' N. lat.	926.0	None				
Cabezon	46º16' to 42º N. lat.	38.0	None				
Cabezon	S of 42º N. lat.	124.0	None				
Cabezon	WA	XXX					
California scorpionfish	S of 34°27' N. lat.	89.0	None				
Chilipepper	S of 40º10' N. lat.	1,304.0	Amendment 21	75%	978.0	25%	326.0
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	5,119.2	Amendment 21	95%	4,863.2	5%	256.0
Kelp Greenling	CA	45.1					
Kelp Greenling	OR	6.3					
Kelp Greenling	WA	11.4					
Leopard Shark	Coastwide	63.3					
Lingcod	N of 40'10º N. lat.	1,810.8	Amendment 21	45%	814.9	55%	996.0
Lingcod	S of 40'10º N. lat.	689.9	Amendment 21	45%	310.5	55%	379.4
Longnose skate	Coastwide	1,812.0	Biennial	90%	1,630.8	10%	181.2
Longspine thornyhead	N of 34º27' N. lat.	2,179.5	Amendment 21	95%	2,070.5	5%	109.0
Longspine thornyhead	S of 34º27' N. lat.	700.0	None				
Pacific cod	Coastwide	804.0	Amendment 21	95%	763.8	5%	40.2
Pacific whiting b/	Coastwide	204,040	Amendment 21	100%	0.0	0%	0.0
Sablefish	N of 36º N. lat.	0.0	See Table 1 c				
Sablefish	S of 36º N. lat.	1,624.0	Amendment 21	42%	682.1	58%	941.9
Shortbelly	Coastwide	48.0	None		48.0		0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,215.8	Amendment 21	95%	1,155.0	5%	60.8
Shortspine thornyhead	S of 34º27' N. lat.	632.0	Amendment 21	NA	50.0	NA	582.0
Spiny Dogfish	Coastwide	1,364.7	None				
Splitnose	S of 40º10' N. lat.	1,421.5	Amendment 21	95%	1,350.4	5%	71.1
Starry flounder	Coastwide	1,125.7	Amendment 21	50%	562.9	50%	562.9
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	6,456.4	Amendment 21	88%	5,681.6	12%	774.8
Nearshore rockfish N	N of 40º10' N. lat.	46.0	None				
Nearshore rockfish S	S of 40º10' N. lat.	716.0	None				
Other flatfish	Coastwide	4,571.0	Amendment 21	90%	4,113.9	10%	457.1
Shelf rockfish N	N of 40º10' N. lat.	1,075.6	Biennial	60.2%	647.5	39.8%	428.1
Shelf rockfish S	S of 40º10' N. lat.	754.4	Biennial	12.2%	92.0	87.8%	662.4
Slope rockfish N	N of 40º10' N. lat.	1,162.9	Amendment 21	81%	941.9	19%	221.0
Slope rockfish S	S of 40º10' N. lat.	367.0	Amendment 21	63%	231.2	37%	135.8

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-81. Alternative 2. Sablefish north of 36° N. latitude ACLs, set-asides used to calculate the commercial harvest guideline (mt).

Stock	Year	ACL	Tribal Share a/	Research	Rec	EFP	Non-Tribal Comm.

							Share
Sablefish N. 36° N. lat.	2015	4,114	411	26	6.1	1	3,670
	2016	4,540	454	26	6.1	1	4,053

a/ The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

4.2.3.2 Management Measures

The following bullet points summarize management measure by sector under Alternative 2. If adopted by the Council, new management measures discussed under Section XXX {Chapter 2 reference} and Appendix C would be implemented.

- The shorebased IFQ fishery would receive IFQ based on the 2015-2016 ACLs and resulting trawl allocations under Alternative 2, which are generally lower than under No Action. The IFQ fishery would operate under the same management measures as described under Alternative 1.
- The at-sea whiting co-ops would operate under the same allocations and management measures described under Alternative 1.
- Allocations and harvest guidelines for the tribal fishery would be issued based the 2015-2016 ACLs under Alternative 2. The tribal fishery would operate under the same management measures described under No Action.
- The non-nearshore fixed gear fishery would operate under the same management measures as No Action, except trip limits decreases for several species, including sablefish, would be necessary to stay within the lower ACLs under Alternative 2. New management measures described under Alternative 1 would also be available.
- The nearshore fixed gear fishery would operate under the same management measures as No Action, except trip limits decreases for several species, including sablefish, would be necessary to stay within the lower ACLs under Alternative 2.
- Tribal fisheries would operate under the harvest guidelines and allocations under Alternative 2. Tribal fisheries would be managed using the same measures described under No Action.
- Washington recreational fisheries would operate under the same management measures as described under Alternative 1.
- Oregon recreational fisheries would operate under the same management measures as No Action. Reductions to bag limits or non-retention may be needed to reduce catch of nearshore rockfish, including china rockfish, and kelp greenling.
- Season lengths and depth restrictions were explored for the California recreational fisheries under Alternative 2. Bag limit reductions for kelp greenling (10 to 2) and California Scorpionfish (5 to 3) and increases for lingcod (2 to 3) are proposed under Alternative 2.

4.2.3.2.1 Shorebased IFQ – Alternative 2

The IFQ would be issued based the 2015-2016 ACLs under Alternative 2 (Table 4-77, Table 4-79, and Table 4-81) and resulting trawl allocations (Table 4-82 and Table 4-83). Notable IFQ decreases from No Action include petrale and arrowtooth flounder. Notable increases from No Action include longspine thornyhead and yellowtail.

Under all action alternatives, legal-sized Pacific halibut IBQ would be limited to 15 percent of the Area 2A total constant exploitation yield (TCEY) for legal size halibut (net weight), not to exceed 100,000 pounds annually for legal size halibut (net weight), which is a 30,000 pound reduction from status quo.

Additionally, GCAs could be implemented to reduce spiny dogfish catch. Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or rockfish excluders for shorebased IFQ vessels targeting whiting.

Table 4-82. Alternative 2 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 2 for 2015. No action estimates of mortality are provided (right panel).

IFQ Stock	Area	Alternative 2		No Action	
		2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt) a/ b/	2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.3	81.9	10.9	79.0
CANARY	Coastwide	9.9	43.3	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	111.3	285.6	108.5	278.4
PETRALE	Coastwide	1,925.8	2033.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	50.7	118.5	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	1,827	1,827	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	291	983	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	137	6,962	137	5,261
Lingcod	North of 40°10' N. lat.	XXX	837	XXX	1,152
Lingcod	South of 40°10' N. lat.	XXX	329	XXX	743
Longspine thornyheads	North of 34°27' N. lat	1,123	2,174	936	1,811
Pacific cod	Coastwide	179	759	266	1,126
Pacific halibut a/	North of 40°10' N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10' N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	1,860	1,878	1,887	1,988
Sablefish	South of 36° N. lat.	291	617	307	653
Shortspine thornyheads	North of 34°27' N.	713	1,147	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	44	1,326	53	1,575
Starry flounder	Coastwide	6	556	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	1,590	5,725	816	2,939
Shelf rockfish	North of 40°10' N. lat.	33	608	28	508
Shelf rockfish	South of 40°10' N. lat.	13	92	12	81
Slope rockfish	North of 40°10' N. lat.	191	832	182	789
Slope rockfish	South of 40°10' N. lat.	60	231	98	379
Other flatfish	Coastwide	840	4,842	728	379

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each).

Table 4-83. Alternative 2 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 2 for 2016. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 2		No Action	
		2015 Projected Mortality (mt)	2016 SB IFQ Allocation (mt) a/ b/	2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.8	85.0	10.9	79.0
CANARY	Coastwide	10.2	44.5	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	114.1	292.8	108.5	278.4
PETRALE	Coastwide	1,997.7	2109.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	53.1	124.2	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	1,709	1,709	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	291	978	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	137	4,858	137	5,261
Lingcod	North of 40°10' N. lat.	290	800	XXX	1,152
Lingcod	South of 40°10' N. lat.		310	XXX	743
Longspine thornyheads	North of 34°27' N. lat	1,067	2,066	936	1,811
Pacific cod	Coastwide	179	759	266	1,126
Pacific halibut a/	North of 40°10' N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10' N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	1,973	2,078	1,887	1,988
Sablefish	South of 36° N. lat.	321	682	307	653
Shortspine thornyheads	North of 34°27' N.	713	1,135	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	45	1,350	53	1,575
Starry flounder	Coastwide	6	558	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	1,494	5,382	816	2,939
Shelf rockfish	North of 40°10' N. lat.	34	612	28	508
Shelf rockfish	South of 40°10' N. lat.	13	92	12	81
Slope rockfish	North of 40°10' N. lat.	194	842	182	789
Slope rockfish	South of 40°10' N. lat.	60	231	98	379
Other flatfish	Coastwide	711	4,094	728	379

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude (estimated to 5 mt each).

4.2.3.2.2 At-Sea Whiting Co-ops – Alternative 2

The at-sea whiting co-ops would operate under the same management measures described under Alternative 1.

4.2.3.2.3 Non-Nearshore – Alternative 2

North of 36° N. latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under Alternative 2 are largely influenced by the sablefish ACL, which would be calculated with a P* of 0.25 (Table 4-84), and the resulting sablefish allocations (Table 4-84 and Table 4-85). Trip limit decreases for sablefish would be proposed (Table 4-86) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-84 and Table 4-85). The overfished species mortality, as a result of harvesting the sablefish allocations, were evaluated using 2002-2012 WCGOP data in the non-nearshore model. Under Alternative 2, trawl and non-trawl allocations were established for overfished species. Further, the non-nearshore fishery was also allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye (Table 4-87). Routine adjustments of the non-trawl RCA (same as No Action, Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the non-nearshore share and non-trawl allocation. Table 4-88 contains the projected mortality groundfish for the non-nearshore fishery under Alternative 2.

Table 4-84. Alternative 2: Limited entry sablefish FMP allocations north of 36 N. latitude for 2015-2016.

Year	ACL	Com. HG	Limited Entry Share	LEFG Share (mt)				Estimated Tier Limits (lbs) a/		
				LE FG Total Catch Share	Landed Catch Share a/	Primary Season Share	LEFG DTL Share	Tier 1	Tier 2	Tier 3
2015	4,114	3,670	3,325	1,396	1,347	1,145	202	35,297	16,044	9,168
2016	4,540	4,053	3,672	1,542	1,488	1,264	223	38,985	17,720	10,126

a/ The limited entry fixed gear total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-85. Alternative 2: Open access FMP allocations north of north of 36 N. latitude for 2015-2016.

Year	Open Access Total Catch Share (mt)	Open Access Landed Catch Share (mt) a/
2015	345	333
2016	381	367

a/ The open access total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-86. Alternative 2. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	875 lb/week, not to exceed 2,625 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 1,600 lb/ 2 months					
2016	Limited Entry	975 lb/week, not to exceed 2,925 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 850 lb, not to exceed 1,700 lb/ 2 months					

Table 4-87. Alternative 2 – Non-Nearshore. Overfished species projected mortality, compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations, for 2015-2016.

Stock	2015 Projected Mortality (mt)	2015 Non-Nearshore Share (mt)	2015 Non-Trawl Allocation (mt)	2016 Projected Mortality (mt)	2016 Non-Nearshore Share (mt)	2016 Non-Trawl Allocation (mt)
BOCACCIO	0.0	79.1	258.8	0.0	82.1	268.7
CANARY	0.9	3.8	49.9	1.0	3.9	51.3
COWCOD	0.0		2.6	0.0		2.6
DARKBLOTCHED	4.1			4.5		
POP	0.2			0.2		
PETRALE SOLE	0.2			0.3		
YELLOWEYE	0.4	1.1	11.2	0.5	1.2	12.1

Table 4-88. Alternative 2. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt).

Stocks	2015			2016		
	LE	OA	Total	LE	OA	Total
Arrowtooth flounder	38	6	43	42	6	48
Bank rockfish (South of 40°10' N. lat.)	0	0	0	0	0	0
Big skate	5	1	6	6	1	6
Black rockfish (Oregon/California)	0	0	0	0	0	0
Blackgill rockfish (South of 40°10' N. lat.)	10	4	15	12	5	16
Blue rockfish	0	0	0	0	0	0
Cabezon - (California)	0	0	0	0	0	0
Cabezon - (Oregon)	0	0	0	0	0	0
California skate	0	0	0	0	0	0
Chilipepper rockfish	0	0	0	0	0	0
Dover sole	5	1	6	6	1	7
English sole	0	0	0	0	0	0
Greenspotted rockfish	0	0	0	0	0	0
Greenstriped rockfish	1	0	1	1	0	1

Stocks	2015			2016		
	LE	OA	Total	LE	OA	Total
Grenadiers	40	13	53	44	15	59
Kelp greenling	0	0	0	0	0	0
Lingcod - (California)	10	3	14	12	3	15
Lingcod - (Washington/Oregon)	3	0	3	3	0	3
Longnose skate	54	11	65	60	12	72
Longspine thornyhead (North Pt. Conception)	2	1	3	3	1	3
Mixed thornyheads	1	0	2	2	1	2
Pacific cod	2	0	2	2	0	2
Pacific hake	0	0	0	0	0	1
Redstripe rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Sharpchin rockfish	0	0	0	0	0	0
Shortbelly rockfish	0	0	0	0	0	0
Shortspine thornyhead (North Pt. Conception)	17	4	21	19	5	23
Silvergrey rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Spiny dogfish	128	21	148	141	23	164
Splitnose rockfish	0	0	0	0	0	0
Starry flounder	0	0	0	0	0	0
Unspecified skate	14	3	16	15	3	18
Widow rockfish	0	0	0	0	0	0
Yellowmouth (North of 40°10' N. lat.)	0	0	0	0	0	0
Yellowtail rockfish	0	0	1	0	0	1
Other flatfish	0	0	0	0	0	0
Other groundfish	3	1	3	3	1	4
Other nearshore rockfish	0	0	0	0	0	0
Other shelf rockfish	2	0	3	3	0	3
Other slope rockfish	86	16	102	95	17	113

<u>South of 36° N. latitude</u>

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under Alternative 2 is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.25 (Table 4-81). Anticipated catch of sablefish south of 36° N latitude under Alternative 2 would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears (Table 4-89). Decreases to the sablefish trip limits would be proposed (Table 4-90) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-89). Under Alternative 2, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye to ensure that total non-trawl catches remained within the non-trawl allocations for these overfished species (Table 4-87). Routine adjustments of the non-trawl RCA (same as No Action, Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the non-nearshore share or non-trawl allocation (Table 4-89).

Table 4-89 Alternative 2: Short-term sablefish allocations south of 36 N. latitude for the non-trawl sector, limited entry and open access for 2015-2016.

Year	ACL	Commercial HG	Non-Trawl Allocation	LE FG Total Catch Share	Directed OA Total Catch Share	LE FG Landed Catch Share a/	Directed OA Landed Catch Share a/
2015	1,475	1,470	853	469	384	456	371
2016	1,629	1,624	942	518	424	504	410

a/ The limited entry and open access fixed gear total catch shares are reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-90. Alternative 2. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed for 2015-2016.

<table>
<tr><th>Year</th><th>Fishery</th><th>Jan-Feb</th><th>Mar-Apr</th><th>May-Jun</th><th>July-Aug</th><th>Sept-Oct</th><th>Nov-Dec</th></tr>
<tr><td rowspan="2">2015</td><td>Limited Entry</td><td colspan="6">1,975 lb/week</td></tr>
<tr><td>Open Access</td><td colspan="6">300 lb/ day, or 1 landing per week of up to 1,500 lb,
not to exceed 3,000 lb/ 2 months</td></tr>
<tr><td rowspan="2">2016</td><td>Limited Entry</td><td colspan="6">2,050 lb/week</td></tr>
<tr><td>Open Access</td><td colspan="6">310 lb/ day, or 1 landing per week of up to 1,550 lb,
not to exceed 3,100 lb/ 2 months</td></tr>
</table>

4.2.3.2.4 Nearshore – Alternative 2

There are both Federal and state allocations for nearshore species that limit target species landings in the commercial nearshore fishery (Table 4-34). Alternative 2 is based on the expectation that landings in the Oregon nearshore fishery will be equal to their allocations (Table 4-90), except for lingcod, which is based on the historical average landings. In California, nearshore fishery allocations are unable to be achieved given the current overfished species allocations. As such, landings are reduced to stay within the nearshore fishery overfished species allocations. Nearshore fishery landings are influenced by a variety of factors, including weather and market, and can vary annually (Table 4-36). As such, there is substantial uncertainty surrounding the estimated landings under the action alternatives, which in turn influence the projected overfished species mortality and socioeconomic analysis. In the event fishery performance is lower than the allocations, mortality of groundfish species will be lower.

Trawl and non-trawl allocations for overfished species, would be implemented under Alternative 2 (Table 4-92). Specifically, the nearshore fishery would be managed to stay within its share of the non-trawl allocation for bocaccio, canary, and yelloweye. Under the Alternative 2, catch of canary and yelloweye rockfish in California exceed the catch sharing agreements with Oregon (Table 4-92); however total catch of canary and yelloweye by both states is within the non-trawl allocation. In the event the projected overfished species mortality is expected to exceed the nearshore fishery share or the non-trawl allocation, routine adjustments of the non-trawl RCA (Table 4-25) or reductions to trip limits would occur.

Table 4-91. Alternative 2. Expected landings under Alternative 2, compared to the Federal and state allocations. Target species landings by area are also shown (far right panel).

Stock	Area	Total Target Species Landings 2015-2016 (mt)	Target Species Landings by Area for 2015-2016			
			OR Total (mt)	CA Total (mt)	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
Black rockfish	S. 46°16 N. lat.	212	128	83.9	80	3.9
Cabezon	OR	25	25			
Cabezon	CA	49		49	5.0	44.0
Kelp greenling	OR	4.3	4.3			
Kelp greenling	CA	21.2		21.2	0.2	21.0
Lingcod	N. 40°10 N. lat.	32.9	29	3.9	3.9	
Lingcod	S. 40°10 N. lat.	14.9		14.9		14.9
Nearshore rockfish N. a/	N. 40°10 N. lat.	12				
--Blue rockfish		*6.6*	*1.9*	*4.7*	*4.7*	
--Other Nearshore Rockfish		*5.4*	*3.2*	*2.2*	*2.2*	
Nearshore rockfish S.	S. 40°10 N. lat.	79.2				
--Blue rockfish		*1.9*		*1.9*		*1.9*
--Shallow nearshore rockfish b/		*53.3*		*53.3*		*53.3*
--Deeper nearshore rockfish c/		*24.0*		*24.0*		*24.0*

a/ Nearshore rockfish totals consists of black-and-yellow, blue rockfish, China, gopher, grass, kelp, brown, olive, copper, treefish, calico, quillback. These species are part of the nearshore rockfish complex north and south of 40°10 N. latitude.
b/Shallow nearshore rockfish consists of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.
c/ Deeper nearshore consists of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish south of 40°10 N. latitude. These species are part of the nearshore rockfish complex south of 40°10 N. latitude.

Table 4-92. Alternative 2. Total projected overfished species (OFS) mortality compared to the formal allocations for 2015-2016 (mt). Projected overfished species mortality by area is also shown in the right panel and compared to the state specific shares, where applicable (in parenthesis).

Stock	Area	Total Projected OFS Mortality 2015/2016 (mt)	Formal Allocations 2015/2016 (mt)	Projected OFS Mortality by Area for 2015-2016			
				Oregon Total (Share 2015/2016) (mt)	CA Total (Share 2015/2016) (mt)	40°10' – 42° N. lat. (mt)	S. of 40°10' N. lat. (mt)
BOCACCIO	S. 40°10 N.	0.4	1.0/1.0	N/A	0.4	N/A	0.4
COWCOD	S. 40°10 N.	0		N/A	0	N/A	0
CANARY	Coastwide	6.8	6.7/6.9	0.9	5.9 (4.9/5.0)	0.7	5.2
DARKBLOTCHE	Coastwide	0.2		0.1	0.1	0	0.1
POP	N. 40°10 N.	0		0	0	0	0
PETRALE	Coastwide	0		0	0	0	0
YELLOWEYE	Coastwide	1.2	1.2/1.3	0.8	0.4	0.3	0.1

4.2.3.2.5 Tribal Fisheries – Alternative 2

Tribal fisheries would operate under the harvest guidelines and allocations displayed in Table 4-77, Table 4-79, and Table 4-81. Tribal fisheries would be managed using the same measures described under No Action.

4.2.3.2.6 Washington Recreational – Alternative 2

Washington recreational fisheries would operate under the same management measures under Alternative 2 as under Alternatives 1 and Alternative 3. Projected mortality to overfished and non-overfished species and angler effort in 2015 and 2016 under Alternative 2 are expected to be similar to previous seasons however, if anger effort and fishing success result in catch estimates higher than what is projected, inseason action through state regulations such as modifications to seasons, groundfish retention and closed areas may be considered to ensure catches do not exceed harvest guideline.

4.2.3.2.7 Oregon Recreational – Alternative 2

Under Alternative 2 the Oregon recreational harvest guidelines for yelloweye and canary rockfish remain the same as under all other action alternatives. The black rockfish ACL will decrease, which decreases the Oregon recreational harvest guideline from 440.8 mt to 406.0 mt in 2015 and 408.2 mt in 2016 (Table 4-93). Under this alternative, yelloweye rockfish allocations directly relate to the recommended management measures, and prevent the full utilization of the black rockfish HG. Therefore, even though there is a reduction in the black rockfish HG, the fisheries would operate under the same management measures as the No Action and the action alternatives (Alternatives 1-3). The HG for other nearshore rockfish, including china rockfish, and kelp greenling would decrease along with the lower ACLs under Alterative 2.

Under the Alternative 2, actions may be necessary to reduce impact to the nearshore rockfish complex and/or kelp greenling. Due to the timing of receiving the ABC, ACL, and sector-specific HGs, the State of Oregon did not have time to engage the public in developing alternatives for management measures to reduce mortality to those species, if necessary. ODFW intends to use state processes to solicit public input and develop state regulations to keep harvest within the state-specific HGs.

Table 4-93. Oregon recreational harvest guidelines (mt) under the No Action Alternative and for 2015 and 2016 under Alternative 2, with a P* of 0.25.

Stock	No Action	2015	2016
CANARY ROCKFISH	11.1	11.7	12.0
YELLOWEYE ROCKFISH	2.6	2.6	2.8
Black Rockfish	440.8	406.0	408.2
Kelp Greenling	N/A	TBD	TBD
Nearshore Rockfish N. 40°10 N. lat. [a/]	N/A	TBD	TBD

[a/] Includes blue rockfish

4.2.3.2.8 California Recreational – Alternative 2

While harvest limits on overfished species do not change under Alternative 2, the ABC values from a P* of 0.25 applied to all target species reduce the harvest limits relative to the Alternatives 1 and 3 requiring additional recreational management measures under all Options. The three fish lingcod bag limit can be accommodated under all the Options of this Alternative.

<u>Groundfish Seasons and Area Restrictions</u>

Option 1

Under Alternative 2, the lower black rockfish ACL apportioned to the recreational fishery would limit the season length north of Point Conception to May 1 to December 31, a one month reduction from Alternative 1 (Figure 4-29). To maintain this season, while remaining below harvest limits under the lower ACLs for kelp greenling and California scorpionfish, bag limits would need to be reduced. This would require a reduction from 10 fish to two fish for kelp greenling and from five fish to three fish for California scorpionfish. The season length in the Southern Management Area would remain March 1st through December 31st with a 60 fm depth restriction.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 1 – Dec 31 <20 fm							
Mendocino	Closed				May 1 –Dec 31 <20 fm							
San Francisco	Closed				May 1 – Dec 31 <30 fm							
Central	Closed				May 1 – Dec 31 <40 fm							
Southern	Closed		Mar 1 – Dec 31 <60fm									

Figure 4-29. Alternative 2 (Option 1): California recreational groundfish season structure and depth restrictions for 2015-2016 with maximized season length.

Option 2

As in Option 1, the season in management areas north of Point Conception would be May 1 to Dec 31 to keep black rockfish mortality below the lower ACLs under a P* of 0.25 for target stocks, while the season in the Southern Management Area would remain March 1st – December 31st (Figure 4-30). The split depth season in the Northern and Mendocino Management Areas starting in 20 fm from May 1 to Sept 30 to 30 fm from October 1st through Dec 31st could be accommodated. As in Option 1 the kelp greenling bag limit would need to be reduced from ten fish to two fish and for California scorpionfish, from five fish to three fish, to keep mortality below harvest limits without further reduction to season lengths.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 1 – Sep 30 <20 fm, Oct 1– Dec 31 <30 fm							
Mendocino	Closed				May 1 – Sep 30 <20 fm, Oct 1– Dec 31 <30 fm							
San Francisco	Closed				May 1 – Dec 31 <30 fm							
Central	Closed				May 1 – Dec 31 <40 fm							
Southern	Closed		Mar 1 – Dec 31 <60fm									

Figure 4-30. Alternative 2 (Option 2): California recreational groundfish season structure and depth restrictions for 2015-2016.

Option 3

Under Option 3, season length and depth restrictions are the same as those described in Option 3 of Alternative 3 and Alternative 1, analyzing mortality from a depth restriction 10 fm deeper than the No Action Alternative. In order to keep catches within allowable limits, season lengths north of Point Conception were reduced to May 15th through August 15th to prevent yelloweye rockfish mortality from exceeding the harvest guidelines (Figure 4-31). The reduced season length north of Point Conception reduces the kelp greenling mortality to below the harvest limit even with the current ten fish bag limit.

Season length in the Southern Management Area would be reduced by seven months relative to the No Action Alternative while maintaining the 60 fm depth restriction. This is intended to illustrate the magnitude of reduction in mortality that can be achieved by a reduction in season length and to bracket the low end of the seasons analyzed to facilitate implementation inseason if needed. California scorpionfish would remain open year round to 60 fm. A reduction in the California scorpionfish bag limit from five fish to three fish is necessary to keep mortality below the lower harvest limit under Alternative 2, to maintain year round fishing opportunity.

Similar to Option 3 in Alternative 1 when depth restrictions are modified uncertainty increases, as effort shifts to deeper depths may be greater than projected, resulting in mortality exceeding projected values. If inseason monitoring projects mortality is expected to exceed allowable limits inseason action to implement shallower depth restrictions or close the fishery prematurely may be necessary.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May15–Aug15<30fm				Closed			
Mendocino	Closed				May15–Aug15<30fm				Closed			
San Francisco	Closed				May15–Aug15<40fm				Closed			
Central	Closed				May15–Aug15<50fm				Closed			
Southern	Closed				May15–Aug15<60fm				Closed			

Figure 4-31. Alternative 2 (Option 3): California recreational groundfish season structure and depth restrictions for 2015-2016.

<u>Groundfish Bag Limits and Size Limits</u>

Under Alternative 2, groundfish bag limits and size limits are the same as No Action, except for the following:

Lingcod – The No Action bag limit for lingcod is two fish. The Council is proposing to increase the bag limit from two fish to three fish. The increase in the bag limit is expected to increase total lingcod mortality by 17% south of Point Conception and 21% north of Point Conception (the mortality in metric tons is provided for option 1, 2, and 3 –in Table 4-95). An increase in the lingcod bag limit from two to three fish can be accommodated statewide with the aforementioned season and depth restrictions under all options. The Council is not proposing any changes to the lingcod minimum size restriction. There are no expected increases to overfished species as a result of this increase.

Kelp Greenling- Analyses used in the 2013-2014 regulatory specification analysis (http://www.pcouncil.org/groundfish/current-season-management/current-management-cycle/) provide the results expected from a decrease in mortality with lower bag limits. A reduction in the bag limit from ten fish to two fish corresponding to a 20.6 percent reduction in mortality would be necessary to reduce mortality to below the harvest limits under Options 1 and 2 (the mortality in metric tons is provided for Options 1 and 2 –in Table 4-95).

California Scorpionfish - The bag limit management measure analysis for this biennium in section X.X provides the decrease in mortality expected with lower bag limits. A reduction in the bag limit from five fish to three fish corresponding to a reduction in mortality of 21.9 percent would be necessary to reduce mortality to below the harvest limits while maintaining the status quo fishing season (the mortality in metric tons is provided for Options 1, 2, and 3 (Table 4-95).

With all Options under Alternative 2, the projected mortality of, bocaccio, canary rockfish, cowcod and yelloweye rockfish is expected to increase compared to the No Action Alternative, due to the increased season lengths or deeper depth restrictions with the exception of bocaccio and cowcod in Option 3 (Table 4-94). The number of angler trips is expected to increase under the Options allowing increased opportunity for both private/rental boats (PR) and the commercial passenger fishing vessels (CPFV). Projections for non-overfished species under Alternative 2 for each Option are provided in Table 4-95.

The same inseason management actions as the No Action Alternative and Alternative 1 are available if allowable limits are projected to be exceeded. The YRCAs described under No Action would also be available under this Alternative.

Table 4-94. Alternative 2: California recreational projected mortality of overfished species for 2015-2016 under Option 1, Option 2 and Option 3.

Stock	California Recreational 2015 HG (mt)	California Recreational 2016 HG (mt)	Projected Mortality (mt)		
			Option 1	Option 2	Option 3
BOCACCIO	178.8	185.6	116.8	116.8	23.5
CANARY	24.3	25.0	18.0	18.0	10.6
COWCOD a/			1.2	1.2	0.3
YELLOWEYE	3.4	3.7	2.6	2.7	2.7

a/The non-trawl allocation of cowcod is 2.6 mt.

Table 4-95. Alternative 2: California recreational projected mortality of non-overfished species for 2015-2016 under Option 1, Option 2, and Option 3. Results in parenthesis reflect lingcod mortality with a three fish bag limit.

Stock	Projected Mortality (mt)		
	Option 1	Option 2	Option 3
Black Rockfish	208.3	207.6	110.3
Blue Rockfish	59.4	59.3	22.9
Cabezon	38.1	38.0	16.9
California scorpionfish	63.3	63.3	13.3
Greenlings	16.2	16.1	8.7
Lingcod	265.6 (319.7)	265.5 (319.6)	111.0 (134.0)
Widow Rockfish	3.4	3.4	1.5
Nearshore Rockfish North	14.1	14.6	6.7
Nearshore Rockfish South	354.0	354.2	118.6

4.2.4 Alternative 3 – Preliminary Preferred

4.2.4.1 Harvest Specifications

Table 4-96 through Table 4-100 contains the harvest specifications and allocations analyzed under Alternative 2. Where applicable, ACLs are determined based on a p-star value of 0.25. For ACLs set below the ABC, the harvest control rule determines the ACL (XXX link to Chapter 2 tables with HCRs). The overfished species set-asides and allocations are found in Table 4-52.

Table 4-96. Alternative 3. 2015 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	349		3	4.6	0.7	340.7
CANARY	Coastwide	122	7.7	1	4.5	2	106.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	338	0.2	0.1	2.1	18.4	317.2
PETRALE SOLE	Coastwide	2,816	220		14.2	2.4	2,579.4
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
YELLOWEYE	Coastwide	18	2.3	0.03	3.3	0.2	12.2
Arrowtooth flounder	Coastwide	5,497	2,041		16.39	30	3,409.6
Black	N of 46º16' N. lat.	402	14				388.0

Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	154					154.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	114				2	112.0
Chilipepper	S of 40º10' N. lat.	1,628		10	9	5	1,604.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	11,040	91		5.8	7	10,936.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	12					11.7
Kelp Greenling	WA	26					26.2
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,830	250	0.5	11.67	16	2,551.8
Lingcod	S of 40'10º N. lat.	1,004		1.0	1.1	7	994.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine thornyhead	N of 34º27' N. lat.	3,170	30		13.5	3	3,123.5
Longspine thornyhead	S of 34º27' N. lat.	1,001			1	2	998.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Pacific whiting a/	Coastwide	269,745	63,205	1	2,500		204,040
Sablefish	N of 36º N. lat.	4,793		See Table 4-100			
Sablefish	S of 36º N. lat.	1,719			3	2	1,714.0
Shortbelly	Coastwide	50			2		48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,745	50		7.22	2	1,685.8
Shortspine thornyhead	S of 34º27' N. lat.	923			1	41	881.0
Spiny Dogfish	Coastwide	1,912	111.8	1	12.5	49.53	1,737.2
Splitnose	S of 40º10' N. lat.	1,715		1.5	9		1,704.5
Starry flounder	Coastwide	1,534	2			8.3	1,523.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	11,213	677	10	16.6	3	10,506.4
Nearshore rockfish N.	N of 40º10' N. lat.	69					69.0
Nearshore rockfish S.	S of 40º10' N. lat.	1,049			2.6	1.4	1,045.0
Shelf rockfish N.	N of 40º10' N. lat.	1,944	30	3	13.4	26	1,871.6
Shelf rockfish S.	S of 40º10' N. lat.	1,624		30	9.6	9	1,575.4
Slope rockfish N.	N of 40º10' N. lat.	1,669	36	1	8.1	19	1,604.9
Slope rockfish S.	S of 40º10' N. lat.	687		1	2	17	667.0
Other flatfish	Coastwide	8,620	60		19	125	8,416.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-97. Alternative 3. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	340.7	Biennial	N/A	81.9	N/A	258.8
CANARY	Coastwide	106.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	317.2	Amendment 21	95%	301.3	5%	15.9
PETRALE SOLE	Coastwide	2,579.4	Biennial	N/A	2,544.4	N/A	35.0
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
YELLOWEYE	Coastwide	12.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,409.6	Amendment 21	95%	3,239.1	5%	170.5
Black	N of 46º16' N. lat.	388.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	154.0	None				
Cabezon	WA	XXX	None				
California scorpionfish	S of 34°27' N. lat.	112.0	None				
Chilipepper	S of 40º10' N. lat.	1,604.0	Amendment 21	75%	1,203.0	25%	401.0
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	10,936.2	Amendment 21	95%	10,389.4	5%	546.8
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	11.7	None				
Kelp Greenling	WA	26.2	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N. lat.	2,551.8	Amendment 21	45%	1,148.3	55%	1,403.5
Lingcod	S of 40'10º N. lat.	994.9	Amendment 21	45%	447.7	55%	547.2
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine thornyhead	N of 34º27' N. lat.	3,123.5	Amendment 21	95%	2,967.3	5%	156.2
Longspine thornyhead	S of 34º27' N. lat.	998.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Pacific whiting b/	Coastwide	0.0	Amendment 21	100%	0.0	0%	0.0
Sablefish	N of 36º N. lat.		See Table 1 c				
Sablefish	S of 36º N. lat.	1,714.0	Amendment 21	42%	719.9	58%	994.1
Shortbelly	Coastwide	48.0	None				0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,685.8	Amendment 21	95%	1,601.5	5%	84.3
Shortspine thornyhead	S of 34º27' N. lat.	881.0	Amendment 21	NA	50.0	NA	831.0
Spiny Dogfish	Coastwide	1,737.2	None				
Splitnose	S of 40º10' N. lat.	1,704.5	Amendment 21	95%	1,619.3	5%	85.2
Starry flounder	Coastwide	1,523.7	Amendment 21	50%	761.9	50%	761.9
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	10,506.4	Amendment 21	88%	9,245.6	12%	1,260.8
Nearshore rockfish N.	N of 40º10' N. lat.	77.0	None				
Nearshore rockfish S.	S of 40º10' N. lat.	1,157.0	None				
Other flatfish	Coastwide	8,416.0	Amendment 21	90%	7,574.4	10%	841.6
Shelf rockfish N.	N of 40º10' N. lat.	1,871.6	Biennial	60.2%	1,126.7	39.8%	744.9
Shelf rockfish S.	S of 40º10' N. lat.	1,575.4	Biennial	12.2%	192.2	87.8%	1,383.2

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
Slope rockfish N.	N of 40º10' N. lat.	1,604.9	Amendment 21	81%	1,300.0	19%	304.9
Slope rockfish S.	S of 40º10' N. lat.	678.0	Amendment 21	63%	427.1	37%	250.9

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-98. Alternative 3. 2016 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	362		3	4.6	0.7	353.7
CANARY	Coastwide	125	7.7	1	4.5	2	109.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	346	0.2	0.1	2.1	18.4	325.2
PETRALE SOLE	Coastwide	2,910	220		14.2	2.4	2,673.4
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
YELLOWEYE	Coastwide	19	2.3	0.03	3.3	0.2	13.2
Arrowtooth flounder	Coastwide	5,328	2,041		16.39	30	3,240.6
Black	N of 46º16' N. lat.	404	14				390.0
Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	151					151.0
Cabezon	WA	XXX					XXX
California scorpionfish	S of 34°27' N. lat.	111				2	109.0
Chilipepper	S of 40º10' N. lat.	1,619		10	9	5	1,595.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	7,754	91		5.8	7	7,650.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	13					12.9
Kelp Greenling	WA	23					23.1
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,719	250	0.5	11.67	16	2,440.8
Lingcod	S of 40'10º N. lat.	946		1.0	1.1	7	936.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine thornyhead	N of 34º27' N. lat.	3,015	30		13.5	3	2,968.5
Longspine thornyhead	S of 34º27' N. lat.	952			1	2	949.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Pacific whiting a/	Coastwide	269,745	63,205		2,500		204,040
Sablefish	N of 36º N. lat.	5,241		See Table 4-100			
Sablefish	S of 36º N. lat.	1,880			3	2	1,875.0

Stock	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
Shortbelly	Coastwide	50			2		48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,726	50		7.22	2	1,666.8
Shortspine thornyhead	S of 34º27' N. lat.	913			1	41	871.0
Spiny Dogfish	Coastwide	1,897	111.8	1	12.5	49.53	1,722.2
Splitnose	S of 40º10' N. lat.	1,746		1.5	9		1,735.5
Starry flounder	Coastwide	1,539	2			8.3	1,528.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	10,634	677	10	16.6	3	9,927.4
Nearshore rockfish N.	N of 40º10' N. lat.	69					69.0
Nearshore rockfish S.	S of 40º10' N. lat.	1,048			2.6	1.4	1,045
Shelf rockfish N.	N of 40º10' N. lat.	XXX	30	3	13.4	26	XXX
Shelf rockfish S.	S of 40º10' N. lat.	XXX		30	9.6	9	XXX
Slope rockfish N.	N of 40º10' N. lat.	1,683	36	1	8.1	19	1,618.9
Slope rockfish S.	S of 40º10' N. lat.	699		1	2	17	679.0
Other flatfish	Coastwide	7,496	60		19	125	7,292.0

a/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-99. Alternative 3. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2016 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	353.7	Biennial	N/A	85.0	N/A	268.7
CANARY	Coastwide	109.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	325.2	Amendment 21	95%	308.9	5%	16.3
PETRALE SOLE	Coastwide	2,673.4	Biennial	N/A	2,638.4	N/A	35.0
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
YELLOWEYE	Coastwide	13.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,240.6	Amendment 21	95%	3,078.6	5%	162.0
Black	N of 46º16' N. lat.	390.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	151.0	None				
Cabezon	WA	XXX	None				
California scorpionfish	S of 34°27' N. lat.	109.0	None				
Chilipepper	S of 40º10' N. lat.	1,595.0	Amendment 21	75%	1,196.3	25%	398.8
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	7,650.2	Amendment 21	95%	7,267.7	5%	382.5
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	12.9	None				
Kelp Greenling	WA	23.1	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N. lat.	2,440.8	Amendment 21	45%	1,098.4	55%	1,342.5
Lingcod	S of 40'10º N. lat.	936.9	Amendment 21	45%	421.6	55%	515.3
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine thornyhead	N of 34º27' N. lat.	2,968.5	Amendment 21	95%	2,820.1	5%	148.4

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
Longspine thornyhead	S of 34º27' N. lat.	949.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Pacific whiting b/	Coastwide	0.0	Amendment 21	100%	0.0	0%	0.0
Sablefish	N of 36º N. lat.	0.0	See Table 1 c				
Sablefish	S of 36º N. lat.	1,875.0	Amendment 21	42%	787.5	58%	1,087.5
Shortbelly	Coastwide	48.0	None				0.0
Shortspine thornyhead	N of 34º27' N. lat.	1,666.8	Amendment 21	95%	1,583.4	5%	83.3
Shortspine thornyhead	S of 34º27' N. lat.	871.0	Amendment 21	NA	50.0	NA	821.0
Spiny Dogfish	Coastwide	1,722.2	None				
Splitnose	S of 40º10' N. lat.	1,735.5	Amendment 21	95%	1,648.7	5%	86.8
Starry flounder	Coastwide	1,528.7	Amendment 21	50%	764.4	50%	764.4
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	9,927.4	Amendment 21	88%	8,736.1	12%	1,191.3
Nearshore rockfish N.	N of 40º10' N. lat.	77.0	None				
Nearshore rockfish S.	S of 40º10' N. lat.	1,155.0	None				
Other flatfish	Coastwide	7,292.0	Amendment 21	90%	6,562.8	10%	729.2
Shelf rockfish N.	N of 40º10' N. lat.	1,879.6	Biennial	60.2%	1,131.5	39.8%	748.1
Shelf rockfish S.	S of 40º10' N. lat.	1,573.4	Biennial	12.2%	192.0	87.8%	1,381.4
Slope rockfish N.	N of 40º10' N. lat.	1,618.9	Amendment 21	81%	1,311.3	19%	307.6
Slope rockfish S.	S of 40º10' N. lat.	679.0	Amendment 21	63%	427.8	37%	251.2

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.
b/ Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS, therefore the 2013 values were used.

Table 4-100. Alternative 3. Sablefish north of 36° N. latitude ACLs, set-asides used to calculate the commercial harvest guideline (mt) for 2015-2016 under Alternative 3.

Year	ACL	Tribal Share a/	Res.	Rec	EFP	Non-Tribal Comm. Share
2015	4,793	479	26	6.1	1	4,281
2016	5,241	524	26	6.1	1	4,684

a/ The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

4.2.4.2 Management Measures

The following bullet points summarize management measure changes by sector under Alternative 3. A more detailed discussion of management measures by sector follows. New measures, discussed under Chapter 2, Section XXX and analyzed in Appendix C, would be implemented. New management measures that are specific to a sector are described below.

- The shorebased IFQ fishery would receive IFQ based on the 2015-2016 ACLs and resulting trawl allocations under Alternative 3. The IFQ fishery would operate under the same management measures as described under Alternative 1.
- The at-sea whiting co-ops would operate under the same allocations and management measures described under Alternative 1.

- Allocations and harvest guidelines for the tribal fishery would be issued based the 2015-2016 ACLs under Alternative 3. The tribal fishery would operate under the same management measures described under No Action.
- The non-nearshore fixed gear fishery would operate under the same management measures as under Alternative 1, except trip limit increases for sablefish are proposed to attain the higher sablefish allocation under Alternative 3.
- The nearshore fixed gear fishery would operate under the same management measures as under Alternative 1.
- Washington recreational fisheries would operate under the same management measures as described under Alternative 1.
- Oregon recreational fisheries would operate under the same management measures as described under No Action and Alternative 1.
- The California recreational fisheries would operate under the same management measures as described under Alternative 1.

4.2.4.2.1 Shorebased IFQ – Alternative 3

The IFQ would be issued based the 2015-2016 ACLs and resulting trawl allocations (Table 4-101 and Table 4-102). Notable IFQ increases from No Action include petrale, longspine thornyheads north, sablefish, shortpine thornyhead, yellowtail, and Other Flatfish.

Under all action alternatives, legal-sized Pacific halibut IBQ would be limited to 15 percent of the Area 2A total constant exploitation yield (TCEY) for legal size halibut (net weight), not to exceed 100,000 pounds annually for legal size halibut (net weight), which is a 30,000 pound reduction from status quo.

Additionally, GCAs could be implemented to reduce spiny dogfish catch. Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or rockfish excluders for shorebased IFQ vessels targeting whiting.

Table 4-101. Alternative 3 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 3 for 2015. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 3		No Action	
		2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt) a/ b/	2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.3	81.9	10.9	79.0
CANARY	Coastwide	9.9	43.3	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	111.3	285.6	108.5	278.4
PETRALE	Coastwide	2,405.0	2539.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	50.7	118.5	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	2,436	3,194	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	308	1,203	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	152	10,384	137	5,261
Lingcod	North of 40°10' N. lat.	301	1,133	XXX	1,152
Lingcod	South of 40°10' N. lat.		448	XXX	743
Longspine thornyheads	North of 34°27' N. lat	1,531	2,962	936	1,811
Pacific cod	Coastwide	266	1,126	266	1,126
Pacific halibut a/	North of 40°10' N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10' N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	2,088	2,199	1,887	1,988
Sablefish	South of 36° N. lat.	339	720	307	653
Shortspine thornyheads	North of 34°27' N.	845	1,581	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	54	1,619	53	1,575
Starry flounder	Coastwide	9	757	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,484	8,946	816	2,939
Shelf rockfish	North of 40°10' N. lat.	60	1,091	28	508
Shelf rockfish	South of 40°10' N. lat.	27	192	12	81
Slope rockfish	North of 40°10' N. lat.	276	1,200	182	789
Slope rockfish	South of 40°10' N. lat.	110	427	98	379
Other flatfish	Coastwide	1,311	7,554	728	379

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each).

Table 4-102. Alternative 3 – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under Alternative 3 for 2016. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 3		No Action	
		2016 Projected Mortality (mt)	2016 SB IFQ Allocation (mt) a/ b/	2016 Projected Mortality (mt)	2016 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	11.8	85.0	10.9	79.0
CANARY	Coastwide	10.2	44.5	9.4	41.1
COWCOD	South of 40°10' N. lat.	0.1	1.4	0.1	1.0
DARKBLOTCHED	Coastwide	114.1	292.8	108.5	278.4
PETRALE	Coastwide	2,494.0	2633.4	2,252.1	2378.0
POP	North of 40°10' N. lat.	53.1	124.2	48.0	112.3
YELLOWEYE	Coastwide	0	1	0	1
Arrowtooth flounder	Coastwide	2,436	3,033	2,436	3,467
Chilipepper rockfish	South of 40°10' N. lat.	306	1,196	291	1,067
Dover sole	Coastwide	7,712	22,231	7,713	22,235
English sole	Coastwide	137	7,263	137	5,261
Lingcod	North of 40°10' N. lat.	XXX	1,083	XXX	1,152
Lingcod	South of 40°10' N. lat.		422	XXX	743
Longspine thornyheads	North of 34°27' N. lat	1,455	2,815	936	1,811
Pacific cod	Coastwide	266	1,126	266	1,126
Pacific halibut a/	North of 40°10' N. lat.		45 max		45 max
Pacific halibut b/	South of 40°10' N. lat.		10		10
Pacific whiting	Coastwide	83,928	85,679	83,946	85,697
Sablefish	North of 36° N. lat.	2,289	2,411	1,887	1,988
Sablefish	South of 36° N. lat.	371	788	307	653
Shortspine thornyheads	North of 34°27' N.	835	1,563	733	1,372
Shortspine thornyheads	South of 34°27' N	4	50	4	50
Splitnose rockfish	South of 40°10' N. lat.	55	1,649	53	1,575
Starry flounder	Coastwide	9	759	9	756
Widow rockfish	Coastwide	430	1,002	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,343	8,436	816	2,939
Shelf rockfish	North of 40°10' N. lat.	60	1,097	28	508

Shelf rockfish	South of 40°10' N. lat.	27	192	12	81
Slope rockfish	North of 40°10' N. lat.	279	1,211	182	789
Slope rockfish	South of 40°10' N. lat.	110	428	98	379
Other flatfish	Coastwide	1,136	6,543	728	379

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to 5 mt each).

4.2.4.2.2 At-Sea Whiting Co-ops – Alternative 3

The at-sea whiting co-ops would operate under the same management measures described under Alternative 1.

4.2.4.2.3 Non-Nearshore – Alternative 3

North of 36° N. latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under Alternative 3 is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40 (Table 4-103), and the resulting sablefish allocations (Table 4-103 and Table 4-104). Trip limit increases for sablefish would be proposed (Table 4-105) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-103 and Table 4-104). The overfished species mortality, as a result of harvesting the sablefish allocations, were evaluated using 2002-2012 WCGOP data in the non-nearshore model. Under Alternative 3, trawl and non-trawl allocations were established for overfished species. Further, the non-nearshore fishery was also allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye to ensure (Table 4-106). Routine adjustments of the non-trawl RCA (same as No Action, Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the allocation. Table 4-107 contains the projected mortality groundfish for the non-nearshore fishery.

Table 4-103. Alternative 3: Limited entry sablefish FMP allocations north of 36 N. latitude for 2015-2016.

Year	ACL	Sablefish Com. HG	Limited Entry Share	LEFG Share (mt)				Estimated Tier Limits (lbs) a/		
				LE FG Total Catch Share	Landed Catch Share a/	Primary Season Share	LEFG DTL Share	Tier 1	Tier 2	Tier 3
2015	4,793	4,281	3,878	1,629	1,571	1,336	236	41,175	18,716	10,695
2016	5,241	4,684	4,244	1,782	1,719	1,461	258	45,053	20,479	11,702

a/ The limited entry fixed gear total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-104. Alternative : Open access FMP allocations north of north of 36 N. latitude for 2015-2016.

Year	Open Access Total Catch Share (mt)	Open Access Landed Catch Share (mt) a/
2015	402	388
2016	440	425

a/ The open access total catch share is reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-105. Alternative 3. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	1,025 lb/week, not to exceed 3,075 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 1,800 lb/ 2 months					
2016	Limited Entry	1,275 lb/week, not to exceed 3,375 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 1,000 lb, not to exceed 2,000 lb/ 2 months					

Table 4-106. Alternative 3 – Non-Nearshore. Overfished species projected mortality, compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations, for 2015-2016.

Stock	2015 Projected Mortality (mt)	2015 Non-Nearshore Share (mt)	2015 Non-Trawl Allocation (mt)	2016 Projected Mortality (mt)	2016 Non-Nearshore Share (mt)	2016 Non-Trawl Allocation (mt)
BOCACCIO	0.0	79.1	258.8	0.0	82.1	268.7
CANARY	1.1	3.8	49.9	1.2	3.9	51.3
COWCOD	0.0		2.6	0.0		2.6
DARKBLOTCHED	4.7			5.2		
POP	0.3			0.3		
PETRALE SOLE	0.3			0.3		
YELLOWEYE	0.5	1.1	11.2	0.5	1.2	12.1

Table 4-107. Alternative 3. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt).

	2015			2016		
Stock	LE	OA	Total	LE	OA	Total
Arrowtooth flounder	44	7	51	48	7	55
Bank rockfish (South of 40°10' N. lat.)	0	0	0	0	0	0
Big skate	6	1	7	6	1	7
Black rockfish (Oregon/California)	0	0	0	0	0	0
Blackgill rockfish (South of 40°10' N. lat.)	12	5	17	13	5	19
Blue rockfish	0	0	0	0	0	0

	2015			2016		
Stock	**LE**	**OA**	**Total**	**LE**	**OA**	**Total**
Cabezon - (California)	0	0	0	0	0	0
Cabezon - (Oregon)	0	0	0	0	0	0
California skate	0	0	0	0	0	0
Chilipepper rockfish	0	0	0	0	0	0
Dover sole	6	1	7	7	1	8
English sole	0	0	0	0	0	0
Greenspotted rockfish	0	0	0	0	0	0
Greenstriped rockfish	1	0	1	1	0	2
Grenadiers	47	15	62	51	17	68
Kelp greenling	0	0	0	0	0	0
Lingcod - (California)	12	4	16	13	4	17
Lingcod - (Washington/Oregon)	3	0	3	3	0	4
Longnose skate	63	12	76	69	14	83
Longspine thornyhead (North Pt. Conception)	3	1	3	3	1	4
Mixed thornyheads	2	1	2	2	1	2
Pacific cod	2	0	2	2	0	2
Pacific hake	0	0	1	1	0	1
Redstripe rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Sharpchin rockfish	0	0	0	0	0	0
Shortbelly rockfish	0	0	0	0	0	0
Shortspine thornyhead (North Pt. Conception)	20	5	25	22	5	27
Silvergrey rockfish (North of 40°10' N. lat.)	0	0	0	0	0	0
Spiny dogfish	149	24	173	163	26	189
Splitnose rockfish	0	0	0	0	0	0
Starry flounder	0	0	0	0	0	0
Unspecified skate	16	3	19	18	3	21
Widow rockfish	0	0	0	0	0	0
Yellowmouth (North of 40°10' N. lat.)	0	0	0	0	0	0
Yellowtail rockfish	1	0	1	1	0	1
Other flatfish	0	0	0	0	0	0
Other groundfish	3	1	4	4	1	4
Other nearshore rockfish	0	0	0	0	0	0
Other shelf rockfish	3	0	3	3	0	3
Other slope rockfish	101	18	119	110	20	130

South of 36° N. latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under Alternative 3 is largely influenced by the sablefish ACL, which would be calculated with a P* of 0.45 (Table 4-108). Anticipated catch of sablefish south of 36° N latitude under Alternative 2 would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears (Table 4-108). Increases to the sablefish trip limits would be proposed (Table 4-109) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-108). Under Alternative 3, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye to ensure that total non-trawl catches remained within the non-trawl allocations for these overfished species (Table 4-106). Routine adjustments of the non-trawl RCA (same as No Action, Table 4-25) would occur in the event the projected overfished species mortality is expected to exceed the allocation (Table 4-106).

Table 4-108 Alternative 3: Short-term sablefish allocations south of 36 N. latitude for the non-trawl sector, limited entry and open access for 2015-2016.

Year	Commercial HG	Non-Trawl Allocation	LE FG Total Catch Share	Directed OA Total Catch Share	LE FG Landed Catch Share a/	Directed OA Landed Catch Share a/
2015	1,714	994	547	447	531	432
2016	1,875	1,088	598	489	581	472

a/ The limited entry and open access fixed gear total catch shares are reduced by the anticipated discard mortality of sablefish, based on WCGOP data from 2002 to 2012. In 2015-2016, 17.7 percent of the sablefish caught are anticipated to be discarded and 20 percent are expected to die.

Table 4-109. Alternative 3. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	2,100 lb/week					
	Open Access	315 lb/ day, or 1 landing per week of up to 1,575 lb, not to exceed 3,200 lb/ 2 months					
2016	Limited Entry	2,175 lb/week					
	Open Access	325 lb/ day, or 1 landing per week of up to 1,625 lb, not to exceed 3,250 lb/ 2 months					

4.2.4.2.4 Nearshore – Alternative 3

The nearshore fishery structure and projected mortality to groundfish species under Alternative 3 is the same as described under Alternative 1.

4.2.4.2.5 Tribal Fisheries – Alternative 3

Tribal fisheries would operate under the harvest guidelines and allocations displayed in Table 4-96, Table 4-98, and Table 4-100. Tribal fisheries would be managed using the same measures described under No Action.

4.2.4.2.6 Washington Recreational – Alternative 3

Washington recreational fisheries would operate under the same management measures under Alternative 3 as Alternative 1. Projected mortality to overfished and non-overfished species and angler effort in 2015 and 2016 under Alternative 3 are expected to be similar to previous seasons however, if anger effort and fishing success result in catch estimates higher than what is projected, inseason action through state regulations such as modifications to seasons, groundfish retention and closed areas may be considered to ensure catches do not exceed harvest guideline.

4.2.4.2.7 Oregon Recreational – Alternative 3

Under Alternative 3, the Oregon recreational fisheries would operate under the same management measures as the No Action and Alternative 1.

4.2.4.2.8 California Recreational – Alternative 3

The California recreational fisheries would operate under the same management measures as described under Alternative 1.

4.3 Socioeconomic Impacts of 2015-2016 Harvest Specifications and Management Measures

This section evaluates the effects of the alternatives (see Section **Error! Reference source not found.**) on fishery participants and fishing communities. Section **Error! Reference source not found.** describes the economic status of these affected groups during the baseline period 2005-2010 based on historical commercial landings data, estimates of recreational fishing activity, and census data. Here, various methods are used to estimate how conditions may change from the baseline, either by continuing to apply the ACLs and management measures in effect in 2014 (No Action) or under the action alternatives, which are organized around different combinations of ACLs for key species. ACLs for other groundfish species categories may or may not vary depending on the alternative.

4.3.1 Models and Data

The GMT has developed several methods or models to project catch of overfished and principal target species in different groundfish fisheries, or "sectors." (Appendix A) For commercial and tribal fisheries these catch (or landings) estimates are converted to ex-vessel revenue estimates by applying historical price information derived from the PacFIN database. A landings distribution model is then used to estimate where landings are likely to occur and the resulting port-level ex-vessel revenue. The landings distribution model was reviewed by the SSC in September 2011. A description of the model and SSC review comments can be found at http://www.pcouncil.org/wp-content/uploads/G5a_ATT6_DIST_MDL_SEPT2011BB.pdf and http://www.pcouncil.org/wp-content/uploads/G5b_SUP_SSC_SEPT2011BB.pdf.

Another measure used to compare impacts on commercial fisheries under the alternatives is the estimated change in total accounting net revenues ("profits") by each directed shoreside groundfish vessel sector. Results are presented for vessels engaged in shoreside whiting, nonwhiting trawl, limited entry fixed gear, and directed open access sectors.

Since recreationally-caught fish are not sold, a different metric—recreational angler trips—is used to compare the impacts of the alternatives on recreational fisheries. These estimates are made by state and within states by county level regions.

In addition to ex-vessel revenue, the effect of the alternatives on coastal communities (ports where commercial groundfish landings are made) is evaluated by estimating personal income generated ("income impacts") and resulting employment. These metrics are derived from the IOPAC model developed by economists at the NWFSC.[45] Personal income impact is a valuable metric because in addition to earnings received by harvesters, it also captures effects on processors, local input suppliers, and retail businesses in the communities. However since personal income impacts are generated by an economic model and only produced for the base years and the alternative scenarios being evaluated, there is no existing time series of personal income impacts that can be used to establish baseline conditions in the communities. Consequently personal income impacts are not used to compare effects under the alternatives against historic conditions, but rather solely to illustrate the differences between the alternatives (including No Action) in terms of regional economic effects that can be expected in coastal communities.

Personal income impact results are also used to project the average change in employment and overall unemployment rates in each community under the alternatives.

The models used to project harvest by fisheries sector, and the socioeconomic impacts associated with those activities are detailed in Appendices A and C and summarized in the sections below.

The socioeconomic impacts of the alternatives are evaluated using the following comparisons.

4.3.1.1 Commercial and Tribal Groundfish Fisheries: Change in total ex-vessel revenue (and accounting net revenue) from No Action from the 2003-2012 baseline by fishery sector

In Section 4.3.2.1 the alternatives are compared based on data summarized in Table 4-111 and Table 4-112 showing projected ex-vessel revenues by groundfish fisheries sectors under the proposed management alternatives. Revenue estimates are based on projected landings estimates shown in Table 4-110. All comparisons are with respect to the No Action Alternative unless otherwise indicated. Projections assume average ex-vessel prices observed in 2013. Effects are presented according to groundfish fishery "sectors," which are described in Section **Error! Reference source not found.**. It should be noted that shoreside whiting trawl is presented separately from nonwhiting trawl, although both these sectors, along with a nontrawl fixed gear component, have comprised the shorebased IFQ fishery beginning in 2011. As explained in Section **Error! Reference source not found.**, because vessels fishing under the IFQ program may use any legal groundfish gear, the terminology is moving away from referring to "trawl" sectors. Participants in the IFQ fishery may use fixed gear, principally to target sablefish, while species such as Pacific whiting and flatfish will continue to be harvested with trawl gear since they are not vulnerable to fixed gear. In the evaluations of alternatives below, in some cases the terminology "trawl" sector may include non-trawl components of the shorebased IFQ fishery.

In modeling commercial fishery impacts, it is assumed that effort that is displaced or discouraged by management measures under a particular alternative is not able to switch readily into another fishery in the same region, or another region elsewhere along the coast. Thus the numbers reported probably represent something of an upper bound on regional economic impacts on commercial fisheries, or the maximum amount of displacement that could be expected to occur under the alternatives. This also means that the models may not necessarily be able to distinguish subtle differences resulting from

[45] Commercial fishing sectors in IOPAC are based on vessel costs and earnings estimates collected using periodic surveys. Since cost and earnings for tribal vessels have not been surveyed, IOPAC currently doesn't include community income impact estimates attributable to activities by the tribal groundfish fleet. Tribal groundfish landings are concentrated in communities along the Washington Coast.

relatively fine distinctions between the alternatives if those differences lie within the models' margins of error.

Catch projection in the shoreside IFQ fishery (which has historically accounted for almost 45 percent of groundfish ex-vessel revenue, see **Error! Reference source not found.**) was based on catch in 2013. Because of the scheduling of this EIS process, data for the last weeks of that year were not yet available at the time catch projection modeling was conducted. As a result fishing patterns in late 2013 had to be inferred from the seasonal distribution apparent in the prior two years under the IFQ fishery.

Under IFQ management, where harvesters are individually accountable for covering their catch with matching QP, quotas for rebuilding stocks function like performance standards. While the direct revenue realized from landing the small amounts of available rebuilding species stocks is negligible, these stocks leverage access to much higher levels of target species landings.[46] Consequently a higher allocation of, e.g., canary rockfish to the shoreside IFQ fishery may generate more actual revenue than is forecast using the current catch projection models.

In addition to the limitations in catch projection models, stock recruitment variability and catch monitoring uncertainty mean that actual catches may differ from the projections. If encounters with rebuilding species run higher than projected, reductions in trip limits or adjustments to the RCAs may be necessary inseason. While overall target species landings may not be increased directly, higher overfished species ACLs may provide an additional buffer against the need to impose more restrictive inseason measures if actual mortality proves to be higher than modeled.

For Pacific whiting a total allowable catch (TAC) is determined annually consistent with the Agreement with Canada on Pacific Hake/Whiting; 73.88 percent of the TAC is allocated to U.S. fisheries. As noted in Chapter 2 the actual TACs and related allocations to U.S. fisheries for 2015 and 2016 were not known at the time this document was prepared. To model the socioeconomic impacts of the alternatives the same TAC, U.S. allocation, and sector allocations—equal to those set for 2013—were used for No Action and all of the action alternatives. Note however there is some variation in estimated ex-vessel revenues earned by the shoreside whiting IFQ sector under the action alternatives chiefly due to variation in ACLs or other inferred management measures for constraining bycatch species such as POP and canary rockfish.

To facilitate comparison of the effects under the alternatives with the experience of the recent past,

	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Shoreside Sectors:							
Whiting	*22.5*	+2.3%	+2.3%	+1.0%	+2.2%	+2.2%	+0.9%
Nonwhiting Trawl+Nontrawl IFQ	*29.8*	+13.3%	+16.3%	-1.9%	+15.9%	+18.7%	-0.24%
Limited Entry Fixed Gear	*12.0*	+8.9%	+13.2%	-4.8%	+17.9%	+22.4%	+3.8%
Nearshore Open Access	*3.5*	+20.1%	+20.1%	+11.6%	+20.1%	+20.1%	+11.6%
Non-nearshore Open Access	*5.0*	+9.6%	+14.2%	-5.3%	+19.2%	+24.2%	+4.0%
Incidental Open Access	*0.1*	-	-	-	-	-	-
Tribal (incl. whiting)	*10.7*	+2.5%	+2.5%	+2.5%	+4.7%	+4.7%	+4.7%
Shoreside sectors' Totals	*83.5*	+8.4%	+10.3%	-0.6%	+11.4%	+13.4%	+2.0%
At-Sea Sectors:		-	-	-	-	-	-
Non Tribal Whiting	*31.5*	-	-	-	-	-	-

46 The at-sea whiting fishery, managed with co-ops, has similar accountability mechanisms. While the same 2013 Pacific whiting TAC must be assumed for forecasting revenue and income impacts in the whiting fisheries under the alternatives, similar dynamics in terms of fleet performance in response to bycatch limits are likely to play out in these fisheries.

Tribal Whiting	*9.1*	-	-	-	-	-	-
At sea sectors' Totals	*40.5*	-	-	-	-	-	-
TOTAL Groundfish Revenue	*124.1*	+5.6%	+7.0%	-0.4%	+7.7%	+9.0%	+1.4%

Table 4-113 and Table 4-114 show the change in groundfish ex-vessel revenue by fishery sector from the baseline period described in Section **Error! Reference source not found.** in absolute and percentage terms. The baseline used is average annual inflation-adjusted ex-vessel revenue from 2003 to 2012. In order to be more directly comparable with the revenue impact estimates under the alternatives the 2003-2012 annual average baseline is expressed in terms of inflation-adjusted $2013.

In addition, Table 4-115 and **Error! Reference source not found.** report projected aggregate accounting net revenues (i.e., “profits”) for the non-tribal. directed shoreside groundfish sectors in terms of dollar and percentage change from No Action, respectively. Accounting net revenues are calculated as the difference between the ex-vessel value of estimated landings and the costs incurred in achieving those landings. Estimates are based on a comparison of landings revenues projected under the alternatives with landings and average costs reported in cost-earnings surveys of samples of vessels in each sector. Note that since separate surveys of average costs incurred by vessels in the two open access subsectors have not been performed, for purposes of this analysis the Nearshore Open Access and Non-nearshore Open Access subsectors have been combined into a single “Open Access” sector.

Table 4-110. Projected combined commercial and tribal fisheries landings (mt) of non-overfished west coast groundfish species and species complexes under No Action and the 2015-16 Action Alternatives ("PPA"=Prelininary Preferred Alternative).

Stock or Stock Complex	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Non-Overfished Stocks							
Arrowtooth Flounder	2,094.7	2,094.7	2,094.7	1,574.7	2,094.7	2,094.7	1,474.1
Black Rockfish OR and CA	165.0	227.1	227.1	216.0	227.1	227.1	216.0
Black Rockfish WA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cabezon CA	25.1	61.0	61.0	50.1	61.0	61.0	50.1
Cabezon OR	29.3	33.3	33.3	27.3	33.3	33.3	27.3
California Scorpionfish	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Chilipper S. of 40-10	247.6	261.6	261.6	247.7	260.1	260.1	247.7
Dover Sole	7,694.8	7,693.6	7,693.6	7,693.2	7,693.6	7,693.6	7,693.1
English Sole	265.9	277.6	277.6	265.9	265.9	265.9	265.9
Kelp greenling	23.5	32.5	32.5	26.7	32.5	32.5	26.7
Lingcod WA	191.5	196.3	200.2	182.6	198.0	201.3	184.9
Lingcod OR	566.2	619.6	632.3	553.6	614.4	624.7	552.3
Lingcod N. of 40-10 CA	82.9	88.8	92.4	77.7	95.4	99.0	83.8
Lingcod S. of 40-10	31.8	30.5	30.8	30.0	30.1	30.3	30.0
Longnose Skate	756.6	756.9	757.0	756.4	757.2	757.3	756.7
Longspine Thornyheads N. of 34-27	915.3	1,465.7	1,603.8	1,088.6	1,395.2	1,527.0	1,036.8
Longspine Thornyheads S. of 34-27	23.2	23.2	23.2	23.2	23.2	23.2	23.2
Pacific Cod	622.6	629.2	632.4	535.8	635.8	639.1	539.5
Pacific Whiting	112,492.1	112,474.6	112,474.6	112,474.6	112,474.6	112,474.6	112,474.6
Petrale sole	2,377.6	2,526.8	2,526.8	2,059.0	2,613.7	2,613.7	2,129.3
Sablefish N. of 36	4,207.8	4,631.3	4,813.5	4,133.0	5,049.7	5,238.1	4,463.8
Sablefish S. of 36	1,022.0	1,125.7	1,176.3	965.7	1,230.0	1,283.4	1,066.3
Shortspine Thornyheads N. of 34-27	786.7	894.9	977.6	767.3	885.6	967.3	767.3
Shortspine Thornyheads S. of 34-27	80.5	92.0	94.8	84.1	90.5	93.3	83.1

Stock or Stock Complex	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Spiny dogfish	128.0	128.0	128.0	128.0	128.0	128.0	128.0
Splitnose Rockfish S. of 40-10	22.1	23.3	23.6	19.3	24.2	24.6	20.2
Starry flounder	11.2	11.2	12.0	9.1	11.2	12.0	9.1
Widow Rockfish	476.5	479.9	479.9	479.9	479.9	479.9	479.9
Yellowtail Rockfish N. of 40-10	1,485.1	3,125.9	3,126.0	2,246.0	2,986.8	2,986.9	2,152.4
Stock Complexes							
Minor Nearshore Rockfish N. of 40-10	28.6	16.6	16.6	14.7	16.6	16.6	14.7
Minor Shelf Rockfish N. of 40-10	32.7	58.1	58.1	37.0	58.3	58.3	37.2
Minor Slope Rockfish N. of 40-10	220.3	292.1	292.1	227.8	294.1	294.1	229.5
Minor Nearshore Rockfish S. of 40-10	86.9	80.9	80.9	81.1	80.9	80.9	81.1
Minor Shelf Rockfish S. of 40-10	20.2	21.5	21.5	20.3	21.5	21.5	20.3
Minor Slope Rockfish S. of 40-10	116.6	128.5	128.5	80.2	128.7	128.7	80.4
Other flatfish	682.9	1,173.5	1,337.2	777.5	1,025.9	1,175.3	668.3
Other Groundfish	78.5	78.5	78.5	78.5	78.5	78.5	78.5
Overfished Stocks							
Pacific Ocean Perch	44.5	46.9	46.9	46.9	49.1	49.1	49.1
Canary Rockfish	17.8	16.7	16.8	16.5	17.1	17.2	16.9
Bocaccio S. of 40-10	14.9	15.3	15.3	15.3	15.7	15.7	15.7
Cowcod S. of 40-10	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Darkblotched Rockfish	110.0	113.0	113.2	112.5	116.0	116.2	115.5
Yelloweye Rockfish	1.2	1.2	1.2	1.2	1.2	1.2	1.2

4.3.1.2 Recreational Fisheries: Change in marine angler trips from No Action under the alternatives

In Section 4.3.2.2 impacts of the alternatives on recreational fisheries are compared using the data summarized in Table 4-129 showing projected numbers of marine area angler boat trips taken in groundfish plus Pacific halibut recreational fisheries under the proposed management alternatives. All comparisons are with respect to the No Action Alternative unless otherwise indicated.

In modeling recreational fishery impacts, it is assumed that anglers who are displaced or discouraged by management measures under a particular alternative are not able to switch readily into a different fishery in the same region or another region elsewhere along the coast. Thus the numbers reported below probably represent something of an upper bound on regional economic impacts on recreational fisheries, or the maximum amount of displacement likely to occur under the alternatives. This also means that the models may not necessarily be able to distinguish subtle differences resulting from relatively fine distinctions between the alternatives if those differences lie within the models' margins of error.

Also note that impacts projected for most management areas vary little if at all under most of the action alternatives. This is for two main reasons: (1) certain groundfish species are not generally caught by recreational anglers, so variation in, for example, the POP ACL does not impact recreational fisheries, and (2) measures used to manage recreational fisheries to stay within the common ACLs and HGs for cowcod, bocaccio and yelloweye rockfish allow little or no flexibility to respond to variation in ACLs for other recreational target species.

Recreational fisheries impacts are compared at the coastwide and individual state levels. Comparison of income impacts at the sub-state regional level are discussed under the communities impacts section, below.

4.3.1.3 Communities: Change in personal income and employment from No Action under the alternatives and change from the 2003-12 baseline in ex-vessel revenue

Change in personal income (income impacts) and employment-related measures for communities under the alternatives are compared in Section 4.3.2.3. These effects are a function of the projected changes in commercial and recreational fishing activity described above. Comparisons are with respect to the No Action Alternative unless otherwise indicated. Impacts were estimated using NWFSC IOPAC input-output model and convey combined direct, indirect, and induced economic effects resulting from projected changes in recreational angling, commercial fishing, fish processing and related input supply and support activities.

For simplification and ease of combining and comparing impacts from commercial and recreational fishing activities, coastal ports are grouped regionally into the following community groups:

- Puget Sound: ports in combined King, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston and Whatcom counties in Washington.
- Washington Coast: ports in combined Jefferson, Clallam, Grays Harbor and Pacific counties in Washington.
- Astoria-Tillamook: ports in combined Clatsop and Tillamook counties in Oregon.
- Newport: ports in Lincoln County Oregon.
- Coos Bay – Brookings: ports in combined Lane, Douglas, Coos and Curry counties in Oregon.
- Crescent City – Eureka: ports in combined Del Norte and Humboldt counties in California.

- Fort Bragg – Bodega Bay: ports in combined Mendocino and Sonoma counties in California.
- San Francisco: ports in combined Marin, Alameda, Contra Costa, San Francisco and San Mateo counties in California.
- Santa Cruz – Monterey – Morro Bay: ports in combined Santa Cruz, Monterey and San Luis Obispo counties in California.
- Santa Barbara – Los Angeles – San Diego: ports in combined Santa Barbara, Ventura, Los Angeles, Orange and San Diego counties in California.

Commercial fishery and recreational fishery impacts are calculated and displayed separately. Impacts are calculated by applying income and employment multipliers generated using IOPAC regional impact models to the projected levels of local expenditures by commercial harvesters, processors and recreational anglers under the alternatives. Although strictly speaking, the commercial and recreational impact components are not directly additive due to the slightly different estimation procedures used, in the following discussion, income impacts generated by combined commercial and recreational fishing activities are presented at the community level in order to provide an index to facilitate comparison of effects under the alternatives.

As noted above, it is assumed that commercial and recreational fishing effort displaced or discouraged under a particular alternative is not able to switch readily into a different fishery in the same region or another region elsewhere along the coast. Therefore the numbers reported below probably represent something of an upper bound on community income and employment impacts, or the maximum amount of short term economic disruption likely to occur under the alternatives. Also as noted above, the impact models are not necessarily able to distinguish subtle differences resulting from relatively fine distinctions between the alternatives if those differences lie within the models' margins of error.

Projected changes in measures of personal income and employment in community groups under the alternatives are shown in the following tables. Table 4-124 displays the dollar change in commercial fishery income impacts from No Action. Table 4-125 displays the same information in terms of percentage change. Table 4-126 and Table 4-127 display the projected change in commercial fishery employment impacts from No Action in terms of in number of total jobs (combined full-time and part-time) and percentage change, respectively. Table 4-128 displays the projected change in regional unemployment rates from No Action in each community resulting from the commercial fishery employment impacts. Table 4-129 and Table 4-130 display recreational fishery income impacts in terms of change in dollars and percentage change, respectively. Table 4-131 and Table 4-132 display the combined commercial plus recreational fishery income impacts for each community group under the alternatives in terms of change in dollars and percentage change, respectively, subject to the caveat in the preceding paragraph.

As discussed above, estimates of personal income for the full range of baseline years are not available for comparison. Therefore, Table 4-135 and Table 4-136 use the change in total commercial groundfish ex-vessel revenue to compare impacts under the alternatives against the baseline for each community group. The baseline, described above, is average annual inflation-adjusted average ($2013) ex-vessel revenue during 2003-12.

4.3.1.4 Processors

Section 4.3.2.4 describes impacts to processors under the proposed management alternatives using the comparison in Table 4-137 and Table 4-138, which show the change in projected processor purchases of groundfish landings from No Action in dollar and percentage terms, respectively. These are actually estimates of ex-vessel revenues paid to harvesters but are used here as a measure of the value of raw material inputs available to groundfish processors. Comparisons are with respect to the No Action

Alternative unless otherwise indicated. The projections assume average 2013 ex-vessel prices. Results are summarized for whiting and combined nonwhiting groundfish species.

In modeling impacts on processors, it is assumed that effects of the management measures under a particular alternative are not avoidable by simply buying from another fishery in the same region or from another region elsewhere along the coast. Thus the numbers reported below probably represent something of an upper bound on regional economic impacts on processors, or the maximum amount of economic disruption likely to occur under the alternatives. Also note that the models used to estimate impacts are not necessarily able to distinguish subtle differences resulting from relatively fine distinctions between the alternatives if those differences lie within the models' margins of error.

4.3.1.5 Impacts on Non-market and Non-use Values

EISs evaluating previous harvest specifications discussed effects related to non-market and non-use (NMNU) values. These are non-consumptive uses that range from recreational enjoyment of the environment (e.g., wildlife viewing) to option or existence value (benefit derived from the knowledge that these resources will be available in the future or simply that environmental quality is maintained). There is no information to directly determine these preferences with respect to the resources most directly affected by the proposed action (groundfish species). Since all the alternatives evaluated here (including No Action) are consistent with FMP goals and MSA National Standards, which among other things include the objective of maintaining or rebuilding fish stocks to MSY (or proxy) biomass, there are not likely to be substantive differences among the alternatives in terms of NMNU values.

4.3.1.6 Impacts on Vessel Safety

The differences between the integrated alternatives in terms of their possible effects on vessel safety are expected to be negligible. Any proposed differences between the alternatives in RCA boundaries, thereby potentially pushing vessels to fish in much deeper waters or much closer to shore, are minimal and therefore are not expected to adversely impact vessel safety. Also the introduction of the fixed gear sablefish permit stacking program and the individual quota program for groundfish trawl fisheries during prior management cycles has relieved pressure on vessels to pursue "use-it-or-lose-it" periodic trip limits.

4.3.1.7 Impacts on Other Indicators of Social Welfare

The effect of the integrated alternatives on other indicators of community social welfare (e.g., poverty, divorce rates, graduation/dropout rates, incidents of domestic violence, etc.) cannot be directly measured, but are expected to be negligible. Change in personal income in communities may be used as a rough proxy for other socioeconomic effects to the degree change in these indicators correlates with potential change in income. However, changes in the broader regional economy ("cumulative effects") and long term trends in fishery-related employment are more likely to drive these indicators of social well being than the short term economic effects of the alternatives.

4.3.2 Direct and Indirect Economic Impacts of the Alternatives

4.3.2.1 Commercial and Tribal Groundfish Fisheries

4.3.2.1.1 No Action

Under No Action, total shoreside ex-vessel revenues from groundfish landings of $83.5 million are projected in 2014. This total includes the following projections for shoreside groundfish sectors: Whiting Trawl $22.5 million; Nonwhiting Trawl and Non-trawl IFQ $29.8 million; Limited Entry Fixed Gear $12 million; Nearshore Open Access $3.5 million; Non-nearshore Open Access $5 million; Tribal groundfish (including shoreside tribal whiting) $10.7 million; and Incidental Open Access $0.1 million. In addition, $31.5 million ex-vessel revenue equivalent[47] from At Sea Non-Tribal whiting (combined Motherships and Catcher Processors), and $9.1 million ex-vessel revenue equivalent from At Sea Tribal whiting (Mothership) fisheries are projected under the No Action. These same amounts for the tribal and non-tribal at sea whiting fisheries are projected under all the action alternatives.

There is no projected change from No Action for groundfish landings by the Incidental Open Access and At Sea whiting sectors under the action alternatives. Therefore discussion of results for these sectors is omitted from the summary of impacts, below. Also note that a small amount of revenue projected from groundfish landings by EFP and miscellaneous fisheries has been omitted from the tables and the relevant discussion of impacts.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003-12 baseline, revenue increases by $4.8 million (7 percent) for all shoreside groundfish fisheries combined. Projected shoreside whiting ex-vessel revenue accounts for most of this, increasing by $9.6 million (75 percent) from the baseline under No Action because of relatively high Pacific whiting ACL in 2013 as well as recently-observed high ex-vessel prices. Changes from the baseline for nonwhiting fishery sectors are all negative. The combined non-nearshore limited entry and open access fixed gear sector shows a decline of $0.8 million (-5 percent), and revenue in the nonwhiting trawl sector declines under No Action by $4 million (-12 percent).

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors…

4.3.2.1.2 The Preliminary Preferred Alternative (PPA)

The Preliminary Preferred Alternative (PPA) is a combination of selected components from Alternative 1 and Alternative 2. Projections have been made for both years of the management cycle (2015 and 2016). Compared with No Action, total shoreside ex-vessel revenue under the PPA is projected to increase by $7 million (8 percent) in 2015 and by 9.5 million (11 percent) in 2016.

Projected revenues are higher than under No Action for every shorebased groundfish sector. The greatest absolute increase in revenue is projected for the IFQ sector: $4 million (13 percent) in 2015 and $4.7 million (16 percent) in 2016. The greatest percentage increase in revenue is projected for the nearshore open access sector: $0.7 million (20 percent) in both 2015 and 2016.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003-12 baseline, revenue increases by $11.5 million (17 percent) in 2015 and $13.8

[47] Ex-vessel revenue equivalent is the estimated value of Pacific whiting delivered as raw material inputs to at sea mothership floating processers plus the imputed value of Pacific whiting caught by at sea catcher-processors.

million (20 percent) in 2016 for all shoreside groundfish fisheries combined. Again projected shoreside whiting ex-vessel revenue accounts for most of this, increasing from the baseline by 79 percent in both 2015 and 2016 due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for nonwhiting fishery sectors are all positive but small in dollar terms. The nearshore open access fixed gear sector shows the largest percentage increase among nonwhiting fishery sectors, increasing from the baseline by 19 percent in both 2015 and 2016.

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors…

4.3.2.1.3 Alternative 1

Total shorside sectors' exvessel revenue under Alternative 1 is projected to be the highest among the action alternatives. Compared with No Action, under the Alternative 1 total shoreside ex-vessel revenue is projected to increase by $8.6 million (10 percent) in 2015 and by 11.2 million (13 percent) in 2016.

Projected revenues are higher than No Action for every shorebased groundfish sector. The greatest absolute increase in revenue is projected for the IFQ sector: $4.8 million (16 percent) in 2015 and $5.6 million (19 percent) in 2016. The greatest percentage increase in revenue is again projected for the nearshore open access sector: $0.7 million (20 percent) in both 2015 and 2016.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003-12 baseline, revenue increases by $13.2 million (19 percent) in 2015 and $15.5 million (23 percent) in 2016 for all shoreside groundfish fisheries combined. Again most of the projected increase is shoreside whiting ex-vessel revenues, increasing from the baseline by 79 percent in both 2015 and 2016 due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for nonwhiting fishery sectors are all positive but relatively small in dollar terms. The non-nearshore fixed gear sector shows the largest dollar increase among the nonwhiting fishery sectors, increasing from the baseline by $1.5 million (8 percent) in 2015 and $3.1 million (17 percent) 2016. The nearshore open access fixed gear sector shows the largest percentage increase among the nonwhiting fishery sectors, increasing from the baseline by 19 percent in both 2015 and 2016.

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors…

4.3.2.1.4 Alternative 2

Total aggregated shoreside sectors' exvessel revenue under Alternative 2 is projected to be the lowest among the action alternatives. Compared with No Action, under Alternative 2 total shoreside ex-vessel revenue is projected to decrease by $0.5 million (-1 percent) in 2015 and increase by $1.7 million (2 percent) in 2016.

Projected revenue changes from No Action under Alternative 2 for the shorebased groundfish sectors are mixed. The greatest absolute increase in revenue for 2015 is projected for the Nearshore Open access sector at $0.4 million (12 percent). In 2016 the largest increase is projected for the Limited Entry fixed gear sector: $0.5 million (4 percent). The greatest absolute decrease in revenue for 2015 is projected for the Limited Entry fixed gear sector at -$0.6 million (-5 percent) in 2015, and the Nonwhiting IFQ sector at -$0.1 million (-0.2 percent) in 2016. In terms of percentage change, the largest percentage increase in both 2015 and 2016 is projected for the Nearshore Open access sector at 12 percent ($0.4 million). The largest percentage decrease is for the Non-nearshore Open access sector in 2015 at -5 percent (-$0.3 million), and the Nonwhiting IFQ sector at -0.2 percent (-$0.1 million) in 2016.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003-12 baseline, revenue increases for all shoreside groundfish fisheries combined by $4 million (6 percent) in 2015 and $6 million (9 percent) in 2016. Again most of the projected increase is shoreside whiting ex-vessel revenues, increasing from the baseline by 79 percent in both 2015 and 2016 due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for nonwhiting fishery sectors are mixed. The Nonwhiting Trawl+Nontrawl IFQ fixed gear sector shows the largest dollar and percentage decrease among the fishery sectors, decreasing from the baseline by $4.5 million (-13 percent) in 2015 and $4 million (-12 percent) in 2016. The non-nearshore fixed gear sector is also negatively affected relative to the baseline under this alternative. The nearshore open access sector shows the largest dollar and percentage increase among the nonwhiting fishery sectors, increasing from the baseline by 11 percent ($0.4 million) in both 2015 and 2016.

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors…

Table 4-111. Change in groundfish ex-vessel revenues from No Action by groundfish harvest sector under the 2015-16 alternatives ($million).

	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Shoreside Sectors:							
Whiting	*22.5*	+0.5	+0.5	+0.2	+0.5	+0.5	+0.2
Nonwhiting Trawl+Nontrawl IFQ	*29.8*	+4.0	+4.8	-0.561	+4.7	+5.6	-0.1
Limited Entry Fixed Gear	*12.0*	+1.1	+1.6	-0.578	+2.1	+2.7	+0.5
Nearshore Open Access	*3.5*	+0.7	+0.7	+0.4	+0.7	+0.7	+0.4
Non-nearshore Open Access	*5.0*	+0.5	+0.7	-0.3	+1.0	+1.2	+0.2
Incidental Open Access	*0.1*	-	-	-	-	-	-
Tribal (incl. whiting)	*10.7*	+0.3	+0.3	+0.3	+0.5	+0.5	+0.5
Shoreside sectors Totals	*83.5*	+7.0	+8.6	-0.5	+9.5	+11.2	+1.7
At-Sea Sectors:		-	-	-	-	-	-
Non Tribal Whiting	*31.5*	-	-	-	-	-	-
Tribal Whiting	*9.1*	-	-	-	-	-	-
At sea sectors Totals	*40.5*	-	-	-	-	-	-
TOTAL Groundfish Revenue	*124.1*	+7.0	+8.6	-0.5	+9.5	+11.2	+1.7

Table 4-112. Change in groundfish ex-vessel revenues from No Action by shoreside harvest sector under the 2015-16 alternatives (percent).

	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Shoreside Sectors:							
Whiting	*22.5*	+2.3%	+2.3%	+1.0%	+2.2%	+2.2%	+0.9%
Nonwhiting Trawl+Nontrawl IFQ	*29.8*	+13.3%	+16.3%	-1.9%	+15.9%	+18.7%	-0.24%
Limited Entry Fixed Gear	*12.0*	+8.9%	+13.2%	-4.8%	+17.9%	+22.4%	+3.8%
Nearshore Open Access	*3.5*	+20.1%	+20.1%	+11.6%	+20.1%	+20.1%	+11.6%
Non-nearshore Open Access	*5.0*	+9.6%	+14.2%	-5.3%	+19.2%	+24.2%	+4.0%
Incidental Open Access	*0.1*	-	-	-	-	-	-
Tribal (incl. whiting)	*10.7*	+2.5%	+2.5%	+2.5%	+4.7%	+4.7%	+4.7%
Shoreside sectors' Totals	*83.5*	+8.4%	+10.3%	-0.6%	+11.4%	+13.4%	+2.0%
At-Sea Sectors:		-	-	-	-	-	-
Non Tribal Whiting	*31.5*	-	-	-	-	-	-
Tribal Whiting	*9.1*	-	-	-	-	-	-
At sea sectors' Totals	*40.5*	-	-	-	-	-	-
TOTAL Groundfish Revenue	*124.1*	+5.6%	+7.0%	-0.4%	+7.7%	+9.0%	+1.4%

Table 4-113. Change in groundfish ex-vessel revenues from the Baseline (10 year 2003-2012 inflation-adjusted average annual ex-vessel revenue) by aggregated non-tribal shoreside commercial harvest sector under the 2015-16 alternatives (2013 $million).

$ million	*Baseline*	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*12.8*	+9.6	+10.2	+10.2	+9.9	+10.1	+10.1	+9.8
Nonwhiting Trawl+Nontrawl IFQ	*33.7*	-4.0	+0.0	+0.9	-4.5	+0.8	+1.6	-4.0
Nearshore Fixed Gear	*3.5*	-0.0	+0.7	+0.7	+0.4	+0.7	+0.7	+0.4
Non-nearshore Fixed Gear	*17.8*	-0.8	+0.7	+1.5	-1.7	+2.3	+3.1	-0.2
Totals	68.0	+4.8	+11.5	+13.2	+4.0	+13.8	+15.5	+6.0

Table 4-114. Change in groundfish ex-vessel revenues from the Baseline (10 year 2003-2012 inflation-adjusted average annual ex-vessel revenue) by aggregated non-tribal shoreside commercial harvest sector under the 2015-16 alternatives (percent).

	Baseline	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*12.8*	+75.1%	+79.2%	+79.2%	+76.9%	+78.9%	+78.9%	+76.7%
Nonwhiting Trawl+Nontrawl IFQ	*33.7*	-11.7%	+0.1%	+2.6%	-13.4%	+2.3%	+4.8%	-11.9%
Nearshore Fixed Gear	*3.5*	-0.7%	+19.3%	+19.3%	+10.8%	+19.3%	+19.3%	+10.8%
Non-nearshore Fixed Gear	*17.8*	-4.7%	+4.0%	+8.2%	-9.4%	+12.7%	+17.2%	-1.0%
Totals	68.0	+7.1%	+17.0%	+19.4%	+5.9%	+20.3%	+22.7%	+8.8%

Table 4-115. Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from No Action under the 2015-16 alternatives ($1,000).

Alternative:	***No Action***	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting							
Nonwhiting Trawl							
Limited Entry Fixed Gear							
Open Access							
TOTAL SHORESIDE SECTOR CHANGE ($,000)							

Table 4-116. Change in groundfish accounting net revenue impacts by directed shoreside commercial fishery sector from No Action under the 2015-16 alternatives (%).

Alternative:	***No Action***	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting							

Nonwhiting Trawl	
Limited Entry Fixed Gear	
Open Access	
TOTAL SHORESIDE SECTOR CHANGE (%)	

4.3.2.2 Recreational Fisheries

Each action alternative for recreational fisheries includes three optional scenarios describing projected angler effort impacts under three different sets of possible management measures. Options 1 and 2 apply to the Preliminary Preferred Alternative, Alternative 1 and Alternative 2 (although note that Option 1 and Option 2 have identical impacts under Alternative 2. Projected impacts under Option 3 are identical under all three action alternatives and have most highly negative effects on projected angler effort.

4.3.2.2.1 No Action

Projected angler effort levels under the No Action alternative are derived from estimates developed independently by each state. No Action for Washington's recreational fishery is based on total bottomfish plus Pacific halibut marine-area angler boat trips taken in 2012. For Oregon's fishery, the annual average of marine area bottomfish plus Pacific halibut angler boat trips recorded during 2010 to 2012 is used to quantify No Action. California's angler effort level under No Action is based on average annual bottomfish boat trips recorded during 2011-2012.

Under No Action, a total of 835,500 groundfish and Pacific halibut trips are projected coastwide. Sixty two percent over half of these are charter boat trips with the remainder taken on private boats. The breakdown by state is: Washington 33,600 trips (18,100 charter + 15,500 private), Oregon 90,200 trips (38,500 charter + 51,600 private), and California 711,800 (465,100 charter + 246,600 private).

<u>Washington Recreational – No Action</u>

Under the No Action Alternative, management measures necessary to keep recreational harvest of yelloweye rockfish within harvest guidelines require closure or significant restriction of the groundfish fishery in areas deeper than 20 and 30 fathoms along a substantial portion of the Washington coast, restrictions on groundfish retention during peak recreational fishing periods, and closed areas. While these restrictions have been effective at keeping recreational catch of overfished species under specified harvest guidelines in the past they are limiting to recreational fishing opportunity.

Projected impacts to overfished and non-overfished species and angler effort in 2015 and 2016 under status quo management measures are expected to be similar to previous seasons however, if anger effort and fishing success result in catch estimates higher than what is projected, additional fishing restrictions will be considered and could be implemented through state regulations to ensure that harvest of overfished species do not exceed harvest guidelines. If necessary, additional restrictions to groundfish management measures could result in fewer anglers participating in recreational fisheries which would put additional burden on coastal communities that are economically dependent on recreational fishing.

<u>Oregon Recreational – No Action</u>

Depth restrictions for the recreational groundfish fishery are the primary management method used to keep overfished yelloweye and canary rockfish mortality within their respective HGs in the Oregon recreational fisheries. Depth restrictions reduce mortality of overfished species because catch rates and discard mortality rates of overfished species are lesser in shallower depths. The depth restrictions under the No Action Alternative are all-depths from Jan-Feb, inside 40 fathoms from Apr-Sep, and all depths Oct-Dec (Figure 4-20).

Although depth restrictions reduce mortality of overfished species, they can also decrease angler trips by reducing the quantity and quality of fishable bottomfish grounds. Ports are disproportionately affected by depth restrictions due to varying amounts of fishing grounds by depth. For example, Newport is relatively unaffected by a 40 fathom depth restriction because the majority (98%) of bottomfish grounds are shallower than 20 fathoms (Figure 4-32). In contrast, Winchester Bay and Florence are greatly impacted by depth restrictions because nearly all bottomfish grounds are deeper than 40 fathoms. Other ports, such as Garibaldi and Gold Beach, where the majority of bottomfish grounds are between 20-40 fathoms, are relatively unaffected by 40 fathoms depth restrictions, but are greatly affected by 20 fathoms depth restrictions.

Under the No-Acton Alternative, mortality of canary and yelloweye rockfish in the groundfish fishery and the Pacific halibut fishery are projected to be within allocations and expected angler trips are anticipated to be similar to what has been seen in recent years (Table 4-117 and Table 4-118). However, projections are based on past catch rates and angler trips, and greater than expected values for these parameters could necessitate more conservative inseason depth restrictions and/or closures of the fisheries.

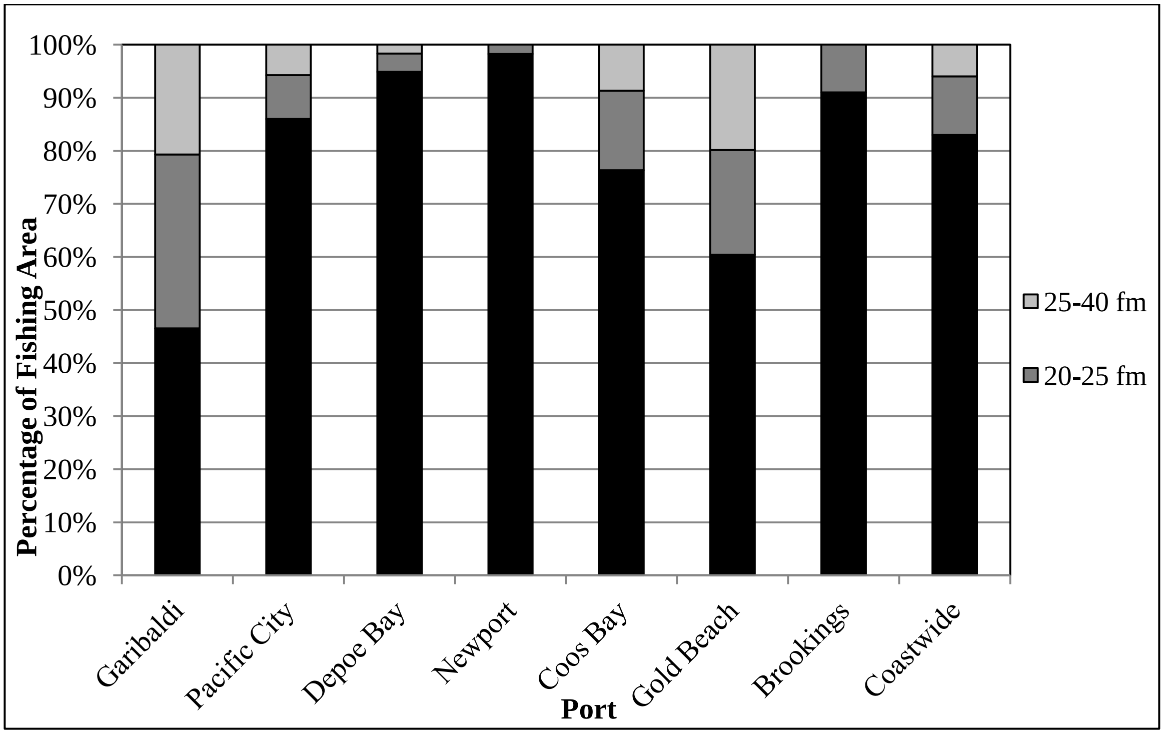


Figure 4-32. **Percentage of Marine Area by Depth Bin and Port for the Oregon Coast.**

Table 4-117. **Average bottomfish angler trips per month by port and boat type for months without depth restrictions (all-depth), 2010-2012.**

	Charter						Private						Total					
Port	Jan	Feb	Mar	Oct	Nov	Dec	Jan	Feb	Mar	Oct	Nov	Dec	Jan	Feb	Mar	Oct	Nov	Dec
Astoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Garibaldi	24	82	77	112	7	20	23	50	30	88	4	35	47	132	107	200	11	55
Pacific City	2	7	15	25	3	2	21	69	78	172	14	28	23	77	93	197	17	30
Depoe Bay	44	178	395	402	42	37	26	70	41	98	12	46	70	248	436	501	54	83
Newport	142	337	738	537	170	139	83	173	172	159	33	99	225	510	910	696	203	239
Winchester	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charleston	17	59	109	153	5	10	78	139	162	298	19	116	95	198	271	451	24	127
Bandon	0	0	13	40	6	3	2	11	17	65	2	7	2	11	30	105	8	11
Port Orford	0	0	0	4	0	0	6	7	9	28	4	8	6	7	9	32	4	8
Gold Beach	0	3	8	26	4	2	6	22	35	100	6	14	6	25	43	126	9	16
Brookings	10	48	62	77	0	6	168	370	263	495	109	205	178	418	325	573	109	211
Total	240	714	1,417	1,376	237	220	412	912	806	1,504	203	558	652	1,626	2,223	2,880	440	779

Table 4-118. **Average bottomfish angler trips per month by port and boat type for months with 40 fathoms depth restrictions, 2010-2012.**

	Charter						Private						Total					
Port	Apr	May	Jun	Jul	Aug	Sep	Apr	May	Jun	Jul	Aug	Sep	Apr	May	Jun	Jul	Aug	Sep
Astoria	0	10	35	6	6	5	2	92	133	60	24	10	2	102	168	66	30	15
Garibaldi	147	340	837	1,167	858	389	121	359	661	491	519	223	267	699	1,498	1,658	1,377	613
Pacific City	25	47	77	168	170	37	202	464	552	893	626	191	227	510	629	1,061	797	228
Depoe Bay	782	1,446	1,870	2,659	2,437	808	251	418	545	312	259	171	1,033	1,864	2,415	2,971	2,696	978
Newport	964	1,106	1,896	2,289	2,322	1,219	624	1,111	1,051	1,176	1,163	493	1,588	2,217	2,948	3,465	3,485	1,712
Winchester	0	0	0	0	0	0	0	6	13	2	0	3	0	6	13	2	0	3
Charleston	299	449	669	694	664	451	380	878	1,231	789	1,345	825	679	1,327	1,900	1,484	2,009	1,276
Bandon	31	66	216	256	426	161	68	165	185	144	279	93	99	231	401	400	706	254
Port Orford	0	28	32	0	0	7	30	100	59	188	63	49	30	129	91	188	63	56
Gold Beach	45	88	133	194	238	119	69	283	184	389	667	135	114	371	318	583	905	254
Brookings	149	280	541	580	556	274	633	1,906	2,386	2,923	2,587	1,407	782	2,186	2,927	3,502	3,143	1,681
Total	2,443	3,859	6,306	8,014	7,678	3,471	2,379	5,782	7,000	7,367	7,533	3,599	4,822	9,641	13,306	15,381	15,211	7,070

California Recreational – No Action

Under the No Action Alternative, California communities will continue to be negatively impacted by existing shallow depth restrictions and shortened seasons. The California recreational groundfish fishery has historically operated in deeper depths with longer seasons (PFMC 2003); however, with more restrictive recreational harvest guidelines for overfished groundfish species, communities in all the management areas coast wide have seen drastic reductions in season length and considerable increases in depth restrictions. Management areas north of Point Arena have seen the most restrictive season and depth constraints. Due to these restrictions placed on the groundfish fishery and other marine fisheries in the region (e.g., salmon), many communities along the North Coast have seen a decrease in angler effort. In particular, the northern California ports of Crescent City, Humboldt Bay, Shelter Cove, and Fort Bragg have seen their season length slowly reduced over the past decade. The port of Crescent City often competes with the Oregon ports of Brookings and Gold Beach, where fewer restrictions and lower fuel prices have attracted many anglers who once fished out of Crescent City (Pomeroy et al. 2010).

4.3.2.2.2 The Preliminary Preferred Alternative and Alternative 1

Under the Preliminary Preferred Alternative Option 1, an increase of 25,800 angler trips is projected from No Action coastwide, all in California. Trips increase by 4,400 (22 percent) in the North Coast region, 3,700 (47 percent) in the upper North-Central Coast region, 8,900 (18 percent) in the lower North-Central Coast region and 8,800 (8 percent) in the South-Central Coast region. No change from No Action is projected for California's South Coast region or for recreational fisheries in Washington and Oregon.

Under the Preliminary Preferred Alternative Option 2, an increase of 16,700 angler trips is projected from No Action, all in California. Trips increase by 2,700 (13 percent) in the North Coast region, 2,900 (37 percent) in the upper North-Central Coast region, 6,700 (13 percent) in the lower North-Central Coast region and 4,400 (4 percent) in the South-Central Coast region. No change from No Action is projected for California's South Coast region or for recreational fisheries in Washington and Oregon.

Under the Preliminary Preferred Alternative Option 3, a decrease of 394,700 angler trips is projected from No Action, all in California. This represents more than half of total California angler trips under No Action. Trips decrease by 6,100 (-30 percent) in the North Coast region, by 1,300 (-16 percent) in the upper North-Central Coast region, by 31,300 (-63 percent) in the lower North-Central Coast region, by 62,900 (-58 percent) in the South-Central Coast region, and by 293,100 (-56 percent) in the South Coast region. No change from No Action is projected for California's South Coast region or for recreational fisheries in Washington and Oregon.

4.3.2.2.3 Alternative 1

Impacts under Alternative 1 Option 1 are the same as under the Preliminary Preferred Alternative Option 1.

Impacts under Alternative 1 Option 2 are the same as under the Preliminary Preferred Alternative Option 2.

Impacts under Alternative 1 Option 3 are the same as under the Preliminary Preferred Alternative Option 3.

<u>Washington Recreational – Alternative 1</u>

Under Alternative 1, management measures necessary to keep recreational harvest of yelloweye rockfish within harvest guidelines require closure or significant restriction of the groundfish fishery in areas deeper than 20 and 30 fathoms along a substantial portion of the Washington coast, restrictions on groundfish retention during peak recreational fishing periods, and closed areas. While these restrictions have been effective at keeping recreational catch of overfished species under specified harvest guidelines in the past they are limiting to recreational fishing opportunity.

Management measures under Alternative 1 modify the time period that the 20 fathom depth restriction is in place in the North Coast (Marine Areas 3 and 4) and provides recreational fishing access to deepwater areas off the North Coast for a small amount of time prior to the opening of the recreational halibut fishery and again late in the summer. Angler effort in May is driven in large part by recreational halibut opportunities while angler effort in September is driven by salmon and albacore tuna opportunities. The modification to the depth restriction in this area is designed to occur when angler effort is low, prior to the opening of recreational halibut fisheries in May or, focused on other fishing opportunities such as salmon and albacore tuna in September after Labor Day.

In 2012, a large deepwater area, covering all of the South Coast (Marine Area 2) and a large portion of the Columbia River (Marine Area 1), was closed to lingcod retention year round to reduce encounters with yelloweye rockfish associated with anglers targeting lingcod. Implementation of this large closed area allows for the removal of the prohibition on lingcod retention in the area seaward of 30 fathoms, south of 46°58' on Fridays and Saturday from July 1 through August 31, a regulation that was somewhat complicated, making regulations easier to follow while keeping yelloweye mortalities from exceeding Washington recreational harvest guidelines. Additional review of the deepwater lingcod closure area off the Columbia River (Marine Area 1) and discussions with recreational anglers in this are indicate that moving the southern boundary three miles north covers the area where increased yelloweye encounters were a concern.

Projected impacts to overfished species and angler effort in 2015 and 2016 under Alternative 1 management measures are expected to be similar to previous seasons however, if anger effort and fishing success result in catch estimates higher than what is projected, additional fishing restrictions may be considered to ensure that harvest of overfished species do not exceed harvest guidelines.

Washington state specific harvest guidelines for the nearshore rockfish complex, including china rockfish, and cabezon under Alternative 1 could be reached before the end of the year and, as such, inseason action through state regulations may be considered to ensure catches do not exceed harvest guidelines. If necessary, additional restrictions to groundfish management measures could result in fewer anglers participating in recreational fisheries which would put an additional burden on coastal communities that are economically dependent on recreational fishing.

Oregon Recreational – Alternative 1

Table 4-119 shows the allocations, or model targets, for overfished species and key target species for the Oregon recreational fisheries under Alternative 1, the same as the No Action Alternative.

Oregon recreational management measures, projected impacts, and community impacts under Preferred Alternative are expected to be the same as the No Action Alternative; except the seasonal cabezon sub-bag limit would be removed. Cabezon impacts would be limited via state processes. Any management measures necessary to reduce nearshore rockfish complex or greenlings impacts would be done through the state process.

Table 4-119. Oregon recreational harvest guidelines (in mt) under the Alternative 1 (P* = 0.45) for 2015-2016.

Species	2015	2016
Black Rockfish	440.4	440.4
Canary Rockfish	11.7	12.0
Yelloweye Rockfish	2.6	2.8
Nearshore Rockfish*	*19.7*	*19.8*
Lingcod	N/A	N/A
Kelp Greenling	*2.5*	*2.5*
Other Greenlings	TBD	TBD

* includes blue rockfish

California Recreational – Alternative 1

The season structure and depth restrictions under No Action as well as Options 1, 2 and 3 under Alternative 1 are provided in Table 4-120 for comparison; changes in community impacts under each Option are discussed below.

Option 1

Under Option 1, season lengths would be increased in every Management Area north of Point Conception compared to the No Action Alternative, which will provide for increased fishing opportunity. As a result, increased revenues to local business can be expected, providing economic benefit to the greater community. This will be of particular benefit to coastal communities in the Northern and Mendocino Management Areas, especially in March, November and December when effort is otherwise low since other fisheries (e.g. Pacific halibut and salmon) are closed. Opening the season on March 1st and extending the season in the Northern and Mendocino Management Area through December 31st will increase fishing opportunity four and a half months and six and a half months, respectively. Extending the season is expected to result in increased revenues to local business, providing economic benefit to the greater community.

While the season length in the Southern Management Area would not be extended, a deeper depth restriction of 60 fm depth will increase fishing opportunity by opening more fishing grounds. While the economic effects of such a change in depth restriction are not quantified, industry has commented that deeper depth restrictions provide significant improvements in fishing opportunity that affect their business (PMFC, March 2013, H.3.c, Public Comment).

Option 2

The benefits from changes to season lengths and depth restrictions under Option 1 apply to Option 2 as well. While the current depth restrictions in the Northern and Mendocino Management Areas have greatly reduced yelloweye rockfish impacts, anglers are still confined to fishing within 20 fm year round. A deeper depth restriction of 30 fm from October 1st to December 31st in the Northern and Mendocino Management Areas will allow access to more fishing grounds, when fishing effort is historically low compared to summer months. Although this increased fishing opportunity may attract some anglers to the coast during months of the 30 fm depth restriction, changes in effort are expected to be relatively minor and will not be accounted for in economic modeling, which quantifies only the increase in the number of expected fishing trips with an increase in season length.

Option 3

A ten fathom increase in depth restriction for each of the management areas north of Point Conception (relative to No Action) would require substantial reductions in season lengths to keep overfished species impacts within harvest guidelines given the high uncertainty in projected impacts discussed above.

The season under Option 3 would be reduced relative to No Action in the Northern Management Area by two and a half months, the Mendocino Management Area reduced by 16 days, San Francisco Management Area reduced by four months and the Central management area reduced by five months. Compared to Option 2, the season in the Northern Management Area would be reduced by six months, the Mendocino Management Area reduced by five and a half months, while the San Francisco and Central Management Areas would have a six month reduction in season length.

In the Southern Management Area, loss of seven months of season relative to the no action alternative to result in a severe reduction in trips. The limited opportunity for California scorpionfish during the closed months of fishing for the RCG complex is not expected to draw as much effort as the forgone opportunities. In addition, any increase in effort as a result of the deeper depth restriction relative to status quo is not quantified and is not expected to compensate for the loss of fishing season during March and April as well as September through and December, when the RCG complex is one of few opportunities available in the absence of pelagic species distributed further to the south or offshore that time of year.

While a deeper depth restriction would increase fishing opportunity, the effect in terms of additional trips is not quantified. However, the reduction in season length would translate to a greatly reduced number of fishing trips, resulting in reduced revenue to coastal communities. Mortality estimates do not account for the use of descending devices in the release of overfished species, which began in 2013. If anglers use descending devices with sufficient frequency, future projections may indicate sufficient reduction in mortality to allow increased opportunity in deeper depths as the devices have been shown to greatly reduce mortality on released rockfish.

Table 4-120. Preliminary Preferred Alternative: Summary of season structures under No Action, Option 1, Option 2, and Option 3. Season length (in months) is included in parenthesis.

Management Area	Season Length and Number of months			
	No Action	Option 1	Option 2	Option 3
Northern	May 15 – Oct 31 (5.5)	Mar 1 – Dec 31 (10)	Apr 1 – Dec 31 (9)	May 15 – Aug 15 (3)
Mendocino	May 15 – Sep 1 (3.5)	Mar 1 – Dec 31 (10)	Apr 1 – Dec 31 (9)	May 15 – Aug 15 (3)
San Francisco	June 1 – Dec 31 (7)	Mar 1 – Dec 31 (10)	Apr 1 – Dec 31 (9)	May 15 – Aug 15 (3)
Central	May 1- Dec 31 (1)	Mar 1 – Dec 31 (10)	Apr 1 – Dec 31 (9)	May 15 – Aug 15 (3)
Southern	Mar 1 – Dec 31 (10)	Mar 1 – Dec 31 (10)	Mar 1 – Dec 31 (10)	May 15 – Aug 15 (3)

4.3.2.2.4 Alternative 2

Under Alternative 2 Option 1, a decrease of a total of 19,300 angler trips (-3 percent) is projected from No Action in California although impacts vary considerably by region. Trips increase by 1,000 (5 percent) in the North Coast region, by 2,100 (26 percent) in the upper North-Central Coast region, by 4,500 (9 percent) in the lower North-Central Coast region, but decrease by 26,800 (-25 percent) in the South-Central Coast region. No change from No Action is projected for California's South Coast region or for recreational fisheries in Washington and Oregon.

Impacts under Alternative 2 Option 2 are the same as under Alternative 2 Option 1.

Impacts under Alternative 2 Option 3 are the same as under the Preliminary Preferred Alternative Option 3.

California Recreational – Alternative 2

The season and season length under No Action as well as Options 1, 2 and 3 under Alternative 2 are provided in Table 4-121 for comparison. The changes in community impacts under each option are discussed below.

Option 1

Combined with reduced yelloweye rockfish mortality in recent years informing the catch projection model, the higher ACL compared to the no action alternative will allow increased fishing opportunity north of Point Conception where they are more commonly encountered (XXX Figure in Chapter 2 – Alternative 2 (Option 1): California recreational groundfish season structure under Alternative 2), compared to the status quo seasons (XXX Figure in Chapter 2 – No Action: California Recreational groundfish season structure for 2014). This will provide increased economic benefit to coastal communities in the region from expenditures by anglers fishing in the area during the open months of the season. Compared to the Alternative 3 and Alternative 1, the season north of Point Conception would be one month shorter since April would have to remain closed to keep black rockfish mortality within the lower harvest limit under Alternative 2. Extending the season in the Northern and Mendocino Management Area through December 31st will increase fishing opportunity, especially in November and December when effort is low and other fisheries (e.g. Pacific halibut and salmon) are closed. Extending the season to December 31st is expected to result in increased revenues to local business, providing economic benefit to the greater community.

The reduced bag limit for kelp greenling will mainly affect anglers fishing north of Point Conception where the majority of the encounters occur. This will decrease fishing opportunity for shore based anglers who regularly encounter kelp greenling as well as boat based anglers fishing in waters within 20 fm. In addition, reduced bag limits for California scorpionfish will adversely affect anglers south of Point Conception where the vast majority of encounters occur, having a disproportionate affect during January and February when the season is closed for many groundfish species and pelagic species have moved south into Mexican waters and are unavailable. During this period of the year, California scorpionfish are targeted more frequently and the reduced bag limit of three fish will diminish fishing opportunity for this species. The economic affects in terms of reduced effort are not quantified for bag limit changes, thus the actual reduction in expenditures are not accounted for.

Option 2

The season length can be extended north of Point Conception relative to status quo due to the increase in ACLs as a result of rebuilding and recent reductions in yelloweye rockfish impacts with the same season as in Option 1. The season would be one month shorter than the Alternative 3 or Alternative 1 opening May 1st instead of April 1, resulting in a loss of revenues from the groundfish effort. While the current depth restrictions in the Northern and Mendocino Management Areas have greatly reduced impacts, they are the shallowest in the state and anglers are confined to fishing within 20 fm year round under status quo regulations. A deeper depth restriction of 30 fm from October to December in the Northern and Mendocino Management Areas will allow access to more fishing grounds, when fishing effort is historically low compared to summer months. Although this increased fishing opportunity may attract some anglers to the coast during months of the 30 fm depth restriction, changes in effort are expected to be relatively minor and will not be accounted for in economic modeling, which quantifies only the increase in the number of expected fishing trips with an increase in season length. As noted under Option 1, the reduced bag limits for kelp greenling and California scorpionfish would diminish the quality of fishing opportunity, but the economic effects are not quantified.

While the season length in the Southern Management Area would not be extended, a deeper depth restriction of 60 fm depth will increase fishing opportunity by opening more fishing grounds. While the economic effects of changes in depth restriction are not quantified, industry has commented that deeper depth restrictions provide significant improvements in fishing opportunity that affect their business (PMFC, March 2013, H.3.c, Public Comment). A three fish California scorpionfish bag limit may reduce effort targeting them due to the reduced opportunity. Qualitatively, the greatest impact would be in January and February when California scorpionfish is one of a few fishing opportunities available in the Southern Management Area. During this period, when most other groundfish fisheries are closed and pelagic species are unavailable.

Option 3

A ten fathom deeper depth restriction in each of the management areas north of Point Conception (relative to No Action) would require substantial reductions in season lengths to keep overfished species impacts within harvest guidelines given the high uncertainty in projected impacts as discussed under the preliminary preferred alternative, Option 3. The season under Option 3 would be reduced relative to No Action in the Northern Management Area by two and a half months, the Mendocino Management Area reduced by 16 days, San Francisco Management Area reduced by four months and the Central management area reduced by five months. Compared to Option 1, the season in the northern management area would be reduced by five months, the Mendocino Management Area reduced by four and a half months, San Francisco Management Area reduced by five months and the Central management area reduced by five months.

In the Southern Management Area, loss of seven months of season relative to the no action alternative would result in a severe reduction in the number of fishing trips. Any increase in effort as a result of the deeper depth restriction relative to the status quo is not quantified and is not expected to compensate for the loss of fishing season when the RCG complex is one of few opportunities available in the absence of pelagic species distributed further to the south or offshore that time of year. The limited opportunity for California scorpionfish during the closed months of fishing for the RCG complex is not expected to draw as much effort as the forgone opportunities. Furthermore the reduced bag limit for California scorpionfish would still be necessary under this alternative to maintain the status quo season year round length south of Point Conception under the ACLs in Alternative 2. This would diminish fishing opportunity for anglers in the Southern Management Area where they are predominantly encountered, with greater effects during January and February when few other opportunities are available as discussed in Option 1 and Option 2.

While a deeper depth restriction would increase fishing opportunity, the effect in terms of additional trips is not quantified, but the reduction in season length would translate to a greatly reduced number of fishing trips during the season, resulting in reduced revenue to coastal communities. Mortality estimates do not account for the use of descending devices in the release of overfished species, which began in 2013. If anglers use descending devices with sufficient frequency, future projections may indicate sufficient reduction in mortality to allow increased opportunity in deeper depths as the devices have been shown to greatly reduce mortality on released rockfish.

Table 4-121. Alternative 2: Summary of season structures under No Action in addition Option 1, Option 2, and Option 3. Season length (in months) is included in parenthesis.

Management Area	Season Length and Number of months			
	No Action	Option 1	Option 2	Option 3
Northern	May 15 – Oct 31 (5.5)	May 1 – Dec 31 (8)	May 1 – Dec 31 (8)	May 15 – Aug 15 (3)
Mendocino	May 15 – Sep 1 (3.5)	May 1 – Dec 31 (8)	May 1 – Dec 31 (8)	May 15 – Aug 15 (3)
San Francisco	June 1 – Dec 31 (7)	May 1 – Dec 31 (8)	May 1 – Dec 31 (8)	May 15 – Aug 15 (3)
Central	May 1- Dec 31 (8)	May 1 – Dec 31 (8)	May 1 – Dec 31 (8)	May 15 – Aug 15 (3)
Southern	Mar 1 – Dec 31 (10)	Mar 1 – Dec 31 (10)	Mar 1 – Dec 31 (10)	May 15 – Aug 15 (3)

4.3.2.2.5 Alternative 3

Table 4-122. Estimated bottomfish + Pacific halibut marine angler boat trips under No Action and change from No Action under the 2015-16 recreational fisheries action alternatives (thousands of trips).

State / District	*No Action*			PPA Option 1			Alt 1 Option 1			Alt 2 Option 1		
	Charter	*Private*	*Total*	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total
Washington												
La Push-Neah Bay	*1.2*	*11.6*	*12.8*	-	-	-	-	-	-	-	-	-
Westport	*15.5*	*2.5*	*18.0*	-	-	-	-	-	-	-	-	-
Ilwaco-Chinook	*1.4*	*1.4*	*2.8*	-	-	-	-	-	-	-	-	-
Washington Total	***18.1***	***15.5***	***33.6***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Oregon												
Astoria	*0.2*	*0.5*	*0.7*	-	-	-	-	-	-	-	-	-
Tillamook	*5.0*	*8.2*	*13.2*	-	-	-	-	-	-	-	-	-
Newport	*24.6*	*18.0*	*42.6*	-	-	-	-	-	-	-	-	-
Coos Bay	*5.1*	*8.3*	*13.4*	-	-	-	-	-	-	-	-	-
Brookings	*3.6*	*16.6*	*20.2*	-	-	-	-	-	-	-	-	-
Oregon Total	***38.5***	***51.6***	***90.2***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
California												
North Coast: Del Norte and Humboldt	*2.5*	*17.6*	*20.1*	+0.5	+3.8	+4.4	+0.5	+3.8	+4.4	+0.1	+0.9	+1.0
North-Central Coast: Mendocino and Sonoma	*1.5*	*6.5*	*8.0*	+0.7	+3.0	+3.7	+0.7	+3.0	+3.7	+0.4	+1.7	+2.1
North-Central Coast: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+4.9	+4.0	+8.9	+4.9	+4.0	+8.9	+2.5	+2.0	+4.5
South-Central Coast: Santa Cruz through San Luis Obispo	*31.1*	*77.4*	*108.5*	+2.5	+6.3	+8.8	+2.5	+6.3	+8.8	-7.7	-19.1	-26.8
South Coast: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-
California Total	***465.1***	***246.6***	***711.8***	**+8.7**	**+17.1**	**+25.8**	**+8.7**	**+17.1**	**+25.8**	**-4.7**	**-14.6**	**-19.3**
Washington-Oregon-California Total	***521.8***	***313.7***	***835.5***	**+8.7**	**+17.1**	**+25.8**	**+8.7**	**+17.1**	**+25.8**	**-4.7**	**-14.6**	**-19.3**

Table 4-122. Estimated bottomfish + Pacific halibut marine angler boat trips under No Action and change from No Action under the 2015-16 recreational fisheries action alternatives (thousands of trips). (cont.)

State / District	*No Action*			PPA Option 2			Alt 1 Option 2			Alt 2 Option 2			All Alts Option 3		
	Charter	*Private*	*Total*	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total
Washington															
La Push-Neah Bay	*1.2*	*11.6*	*12.8*	-	-	-	-	-	-	-	-	-	-	-	-
Westport	*15.5*	*2.5*	*18.0*	-	-	-	-	-	-	-	-	-	-	-	-
Ilwaco-Chinook	*1.4*	*1.4*	*2.8*	-	-	-	-	-	-	-	-	-	-	-	-
Washington Total	***18.1***	***15.5***	***33.6***	-	-	-	-	-	-	-	-	-	-	-	-
Oregon															
Astoria	*0.2*	*0.5*	*0.7*	-	-	-	-	-	-	-	-	-	-	-	-
Tillamook	*5.0*	*8.2*	*13.2*	-	-	-	-	-	-	-	-	-	-	-	-
Newport	*24.6*	*18.0*	*42.6*	-	-	-	-	-	-	-	-	-	-	-	-
Coos Bay	*5.1*	*8.3*	*13.4*	-	-	-	-	-	-	-	-	-	-	-	-
Brookings	*3.6*	*16.6*	*20.2*	-	-	-	-	-	-	-	-	-	-	-	-
Oregon Total	***38.5***	***51.6***	***90.2***	-	-	-	-	-	-	-	-	-	-	-	-
California															
North Coast: Del Norte and Humboldt	*2.5*	*17.6*	*20.1*	+0.3	+2.3	+2.7	+0.3	+2.3	+2.7	+0.1	+0.9	+1.0	-0.8	-5.3	-6.1
North-Central Coast: Mendocino and Sonoma	*1.5*	*6.5*	*8.0*	+0.5	+2.4	+2.9	+0.5	+2.4	+2.9	+0.4	+1.7	+2.1	-0.2	-1.0	-1.3
North-Central Coast: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+3.7	+3.0	+6.7	+3.7	+3.0	+6.7	+2.5	+2.0	+4.5	-17.3	-14.1	-31.3
South-Central Coast: Santa Cruz through San Luis Obispo	*31.1*	*77.4*	*108.5*	+1.3	+3.1	+4.4	+1.3	+3.1	+4.4	-7.7	-19.1	-26.8	-18.0	-44.9	-62.9
South Coast: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-	-224.6	-68.5	-293.1
California Total	***465.1***	***246.6***	***711.8***	**+5.8**	**+10.9**	**+16.7**	**+5.8**	**+10.9**	**+16.7**	**-4.7**	**-14.6**	**-19.3**	**-260.9**	**-133.8**	**-394.7**
Washington-Oregon-California Total	***521.8***	***313.7***	***835.5***	**+5.8**	+10.9	+16.7	**+5.8**	**+10.9**	**+16.7**	**-4.7**	**-14.6**	**-19.3**	**-260.9**	**-133.8**	**-394.7**

Table 4-123. Estimated bottomfish + Pacific halibut marine angler boat trips under No Action and change from No Action under the 2015-16 action alternatives (% change).

	No Action			PPA Option 1			Alt 1 Option 1			Alt 2 Option 1			
State / District	***Charter***	***Private***	***Total***	**Charter**	**Private**	**Total**	**Charter**	**Private**	**Total**	**Charter**	**Private**	**Total**	
Washington													
La Push-Neah Bay	*1.2*	*11.6*	*12.8*	-	-	-	-	-	-	-	-	-	
Westport	*15.5*	*2.5*	*18.0*	-	-	-	-	-	-	-	-	-	
Ilwaco-Chinook	*1.4*	*1.4*	*2.8*	-	-	-	-	-	-	-	-	-	
Washington Total	***18.1***	***15.5***	***33.6***	-	-	-	-	-	-	-	-	-	
Oregon													
Astoria	*0.2*	*0.5*	*0.7*	-	-	-	-	-	-	-	-	-	
Tillamook	*5.0*	*8.2*	*13.2*	-	-	-	-	-	-	-	-	-	
Newport	*24.6*	*18.0*	*42.6*	-	-	-	-	-	-	-	-	-	
Coos Bay	*5.1*	*8.3*	*13.4*	-	-	-	-	-	-	-	-	-	
Brookings	*3.6*	*16.6*	*20.2*	-	-	-	-	-	-	-	-	-	
Oregon Total	***38.5***	***51.6***	***90.2***	-	-	-	-	-	-	-	-	-	
California													
North Coast: Del Norte and Humboldt	*2.5*	*17.6*	*20.1*	+21.8%	+21.8%	+21.8%	+21.8%	+21.8%	+21.8%	+4.8%	+4.8%	+4.8%	
North-Central Coast: Mendocino and Sonoma	*1.5*	*6.5*	*8.0*	+46.9%	+46.9%	+46.9%	+46.9%	+46.9%	+46.9%	+26.4%	+26.4%	+26.4%	
North-Central Coast: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+17.8%	+17.8%	+17.8%	+17.8%	+17.8%	+17.8%	+8.9%	+8.9%	+8.9%	
South-Central Coast: Santa Cruz through San Luis	*31.1*	*77.4*	*108.5*	+8.1%	+8.1%	+8.1%	+8.1%	+8.1%	+8.1%	-24.7%	-24.7%	-24.7%	
South Coast: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-	
California Total	*465.1*	*246.6*	*711.8*	+1.9%	+7.0%	+3.6%	+1.9%	+7.0%	+3.6%	-1.0%	-5.9%	-2.7%	
Washington-Oregon-California Total	*521.8*	*313.7*	*835.5*	+1.7%	+5.5%	+3.1%	+1.7%	+5.5%	+3.1%	-0.9%	-4.6%	-2.3%	

Table 4-123. Estimated bottomfish + Pacific halibut marine angler boat trips under No Action and change from No Action under the 2015-16 action alternatives (% change). (cont.)

	No Action			PPA Option 2			Alt 1 Option 2			Alt 2 Option 2			All Alts Option 3		
State / District	***Charter***	***Private***	***Total***	**Charter**	**Private**	**Total**	**Charter**	**Private**	**Total**	**Charter**	**Private**	**Total**	**Charter**	**Private**	**Total**
Washington															
La Push-Neah	*1.2*	*11.6*	*12.8*	-	-	-	-	-	-	-	-	-	-	-	-
Westport	*15.5*	*2.5*	*18.0*	-	-	-	-	-	-	-	-	-	-	-	-
Ilwaco-Chinook	*1.4*	*1.4*	*2.8*	-	-	-	-	-	-	-	-	-	-	-	-
Washington Total	*18.1*	*15.5*	*33.6*	-	-	-	-	-	-	-	-	-	-	-	-
Oregon															
Astoria	*0.2*	*0.5*	*0.7*	-	-	-	-	-	-	-	-	-	-	-	-
Tillamook	*5.0*	*8.2*	*13.2*	-	-	-	-	-	-	-	-	-	-	-	-
Newport	*24.6*	*18.0*	*42.6*	-	-	-	-	-	-	-	-	-	-	-	-
Coos Bay	*5.1*	*8.3*	*13.4*	-	-	-	-	-	-	-	-	-	-	-	-
Brookings	*3.6*	*16.6*	*20.2*	-	-	-	-	-	-	-	-	-	-	-	-
Oregon Total	*38.5*	*51.6*	*90.2*	-	-	-	-	-	-	-	-	-	-	-	-
California															
North Coast: Del Norte and Humboldt	*2.5*	*17.6*	*20.1*	+13.3%	+13.3%	+13.3%	+13.3%	+13.3%	+13.3%	+4.8%	+4.8%	+4.8%	-30.2%	-30.2%	-30.2%
North-Central Coast: Mendocino and	*1.5*	*6.5*	*8.0*	+36.6%	+36.6%	+36.6%	+36.6%	+36.6%	+36.6%	+26.4%	+26.4%	+26.4%	-15.7%	-15.7%	-15.7%
North-Central Coast: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+13.4%	+13.4%	+13.4%	+13.4%	+13.4%	+13.4%	+8.9%	+8.9%	+8.9%	-62.8%	-62.8%	-62.8%
South-Central Coast: Santa Cruz through San	*31.1*	*77.4*	*108.5*	+4.1%	+4.1%	+4.1%	+4.1%	+4.1%	+4.1%	-24.7%	-24.7%	-24.7%	-58.0%	-58.0%	-58.0%
South Coast: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-	-55.8%	-55.8%	-55.8%
California Total	*465.1*	*246.6*	*711.8*	+1.3%	+4.4%	+2.3%	+1.3%	+4.4%	+2.3%	-1.0%	-5.9%	-2.7%	-56.1%	-54.2%	-55.5%
Washington-Oregon-California Total	*521.8*	*313.7*	*835.5*	+1.1%	+3.5%	+2.0%	+1.1%	+3.5%	+2.0%	-0.9%	-4.6%	-2.3%	-50.0%	-42.6%	-47.2%

4.3.2.3 Communities

4.3.2.3.1 No Action

Coastwide:

Compared to the 2003-12 baseline period, total groundfish ex-vessel revenue would increase by $13.6 million coastwide, or 19 percent under the No Action Alternative. Relative to the baseline period, No Action would produce the second smallest increase in ex-vessel revenue among the alternatives.

Income impact

Employment impacts

Change in Unemployment rate…

Puget Sound:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.5 million in Puget Sound, or -46 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Washington Coast:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $4.8 million on the Washington Coast, or 34 percent under the No Action Alternative. Note that revenues from landings in tribal groundfish fisheries are included in these totals but not in the income impact results reported in Table 4-124, since cost and earnings data for tribal vessels have not been formally surveyed.

Income impact

Employment impacts

Change in Unemployment rate…

Astoria – Tillamook:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $5.9 million in Astoria-Tillamook, or 46 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Newport:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $3.7 million in Newport, or 36 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Coos Bay – Brookings:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $0.9 million in Coos Bay - Brookings, or -10 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Crescent City – Eureka:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $2.1 million in Crescent City - Eureka, or -36 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Fort Bragg – Bodega Bay:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $0.3 million in Fort Bragg – Bodega Bay, or 8 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

San Francisco Area:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would decrease by $0.3 million in the San Francisco Area, or -19 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Cruz – Monterey – Morro Bay:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $1.9 million in the Santa Cruz – Monterey – Morro Bay region, or 38 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Barbara – Los Angeles – San Diego:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $1.8 million in the Santa Barbara – Los Angeles – San Diego region, or 65 percent under the No Action Alternative.

Income impact

Employment impacts

Change in Unemployment rate…

4.3.2.3.2 The Preliminary Preferred Alternative

Coastwide:

Compared to the 2003-12 baseline period, total groundfish ex-vessel revenue would increase by $20.6 million coastwide in 2015 (29 percent) and by $23.1 million (33 percent) in 2016. Relative to the baseline period, this alternative would produce the second largest increase in ex-vessel revenue among the alternatives in 2015 and 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Puget Sound:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.2 million (-37 percent) in Puget Sound in 2015 and by $1.2 million (-34 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Washington Coast:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $5.7 million on the Washington Coast in 2015 (40 percent) and by $6.2 million (43 percent) in 2016. Note that revenues from landings in tribal groundfish fisheries are included in these totals but not in the income impact results reported in Table 4-124, since cost and earnings data for tribal vessels have not been formally surveyed.

Income impact

Employment impacts

Change in Unemployment rate…

Astoria – Tillamook:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $8.1 million (63 percent) in Astoria-Tillamook in 2015 and by $8.3 million (65 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Newport:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $4.2 million (40 percent) in Newport in 2015 and by $4.5 million (43 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Coos Bay – Brookings:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $0.2 million (-2 percent) in Coos Bay – Brookings in 2015 and increase by $0.2 million (2 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Crescent City – Eureka:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.7 million (-29 percent) in Crescent City – Eureka in 2015 and by $1.6 million (-27 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Fort Bragg – Bodega Bay:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $0.8 million (21 percent) in Fort Bragg – Bodega Bay in 2015 and by $1.1 million (28 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

San Francisco Area:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would decrease by $0.2 million (-12 percent) in the San Francisco Area in 2015 and by $0.2 million (-11 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Cruz – Monterey – Morro Bay:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $2.9 million (57 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015 and by $3.3 million (66 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Barbara – Los Angeles – San Diego:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $2.2 million (79 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015 and by $2.5 million (91 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

4.3.2.3.3 Alternative 1

Coastwide:

Compared to the 2003-12 baseline period, total groundfish ex-vessel revenue would increase by $22.2 million coastwide in 2015 (32 percent) and by $24.7 million (35 percent) in 2016. Relative to the baseline period, this alternative would produce the largest increase in ex-vessel revenue among the alternatives in 2015 and 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Puget Sound:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.2 million (-36 percent) in Puget Sound in 2015 and by $1.1 million (-33 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Washington Coast:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $5.9 million on the Washington Coast in 2015 (41 percent) and by $6.3 million (44 percent) in 2016. Note that revenues from landings in tribal groundfish fisheries are included in these totals but not in the income impact results reported in Table 4-124, since cost and earnings data for tribal vessels have not been formally surveyed.

Income impact

Employment impacts

Change in Unemployment rate…

Astoria – Tillamook:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $8.4 million (66 percent) in Astoria-Tillamook in 2015 and by $8.6 million (67 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Newport:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $4.4 million (42 percent) in Newport in 2015 and by $4.6 million (44 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Coos Bay – Brookings:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $0.1 million (1 percent) in Coos Bay – Brookings in 2015 and by $0.5 million (5 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Crescent City – Eureka:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.6 million (-27 percent) in Crescent City – Eureka in 2015 and by $1.5 million (-25 percent) in 2016.

Fort Bragg – Bodega Bay:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $1 million (25 percent) in Fort Bragg – Bodega Bay in 2015 and by $1.2 million (32 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

San Francisco Area:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would decrease by $0.2 million (-10 percent) in the San Francisco Area in 2015 and by $0.2 million (-9 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Cruz – Monterey – Morro Bay:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $3.1 million (62 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015 and by $3.6 million (71 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Barbara – Los Angeles – San Diego:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $2.3 million (85 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015 and by $2.6 million (97 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

4.3.2.3.4 Alternative 2

Coastwide:

Compared to the 2003-12 baseline period, total groundfish ex-vessel revenue would increase by $13.1 million coastwide in 2015 (19 percent) and by $15.3 million (22 percent) in 2016. Relative to the baseline period, this alternative would produce the lowest total coastwide increase in ex-vessel revenue among the alternatives in 2015 and 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Puget Sound:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.6 million (-47 percent) in Puget Sound in 2015 and by $1.5 million (-44 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Washington Coast:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $5.0 million on the Washington Coast in 2015 (35 percent) and by $5.5 million (38 percent) in 2016. Note that revenues from landings in tribal groundfish fisheries are included in these totals but not in the income impact results reported in Table 4-124, since cost and earnings data for tribal vessels have not been formally surveyed.

Income impact

Employment impacts

Change in Unemployment rate…

Astoria – Tillamook:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $6.0 million (47 percent) in Astoria-Tillamook in 2015 and by $6.1 million (48 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Newport:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $3.6 million (34 percent) in Newport in 2015 and by $3.8 million (36 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Coos Bay – Brookings:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $1.3 million (-14 percent) in Coos Bay – Brookings in 2015 and by $1.0 million (-11 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Crescent City – Eureka:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would decrease by $2.1 million (-35 percent) in Crescent City – Eureka in 2015 and by $2.0 million (-34 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Fort Bragg – Bodega Bay:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $0.2 million (5 percent) in Fort Bragg – Bodega Bay in 2015 and by $0.4 million (11 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

San Francisco Area:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would decrease by $0.4 million (-20 percent) in the San Francisco Area in 2015 and by $0.3 million (-19 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Cruz – Monterey – Morro Bay:

Compared to the 2003-12 baseline period, groundfish ex-vessel revenue would increase by $2.0 million (39 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015 and by $2.4 million (48 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Santa Barbara – Los Angeles – San Diego:

Compared to the 2003-12 baseline period groundfish ex-vessel revenue would increase by $1.6 million (61 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015 and by $2.0 million (72 percent) in 2016.

Income impact

Employment impacts

Change in Unemployment rate…

Table 4-124. Change in commercial fishery income impacts (from No Action) under the action alternatives by community group ($1,000).

Community Groups	*No Action ($,000)*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound							
Washington Coast							
Astoria-Tillamook							
Newport							
Coos Bay-Brookings							
Crescent City-Eureka							
Fort Bragg - Bodega Bay							
San Francisco Area							
SC – Mo - MB							
SB – LA - SD							
Coastwide Total							

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 4-125. Change in Commercial Fishery Income Impacts (from No Action) under the Action Alternatives by Community Group (%).

Community Groups	*No Action ($,000)*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound							
Washington Coast							
Astoria-Tillamook							
Newport							
Coos Bay-Brookings							
Crescent City-Eureka							
Fort Bragg - Bodega Bay							
San Francisco Area							
SC – Mo - MB							
SB – LA - SD							
Coastwide Total							

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 4-126. Change in commercial fishery employment impacts (from No Action) under the action alternatives by community group (number of jobs).

Table 4-127. Change in commercial fishery employment impacts (from No Action) under the action alternatives by community group (%).

Table 4-128. Change in regional unemployment rates[t] for all industries (from No Action) resulting from commercial fishery employment impacts under the action alternatives by community group.

Table 4-129. Change in recreational fishery income impacts (from No Action) by community group ($1,000).

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								
Coos Bay-Brookings								
Crescent City-Eureka								
Fort Bragg - Bodega Bay								
San Francisco Area								
SC – Mo – MB*								
SB – LA – SD*								
Coastwide Total								

Table 4-130. Change in Recreational fishery income impacts (from No Action) by community group (%).

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								

Coos Bay-Brookings	
Crescent City-Eureka	
Fort Bragg - Bodega Bay	
San Francisco Area	
SC – Mo – MB*	
SB – LA – SD*	
Coastwide Total	

*SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 4-131. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2015 ($1,000)[t].

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	PPA Op3
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								
Coos Bay-Brookings								
Crescent City-Eureka								
Fort Bragg - Bodega Bay								
San Francisco Area								
SC – Mo - MB								
SB – LA - SD								
Coastwide Total								

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 4-132. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2015 (%)[t].

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	PPA Op3
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								
Coos Bay-Brookings								
Crescent City-Eureka								
Fort Bragg - Bodega Bay								
San Francisco Area								
SC – Mo - MB								
SB – LA - SD								
Coastwide Total								

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 4-133. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2016 ($1,000)[t].

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	PPA Op3
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								
Coos Bay-Brookings								
Crescent City-Eureka								
Fort Bragg - Bodega Bay								
San Francisco Area								
SC – Mo - MB								
SB – LA - SD								
Coastwide Total								

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 4-134. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2016 (%)[t].

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	PPA Op3
Puget Sound								
Washington Coast								
Astoria-Tillamook								
Newport								
Coos Bay-Brookings								
Crescent City-Eureka								
Fort Bragg - Bodega Bay								
San Francisco Area								
SC – Mo - MB								
SB – LA - SD								
Coastwide Total								

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 4-135. Change in groundfish ex-vessel revenue from baseline 2003-12 average annual revenue (inflation-adjusted $2013) ($ million).

Community Groups	*Baseline (2003-12)*	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Puget Sound	*3.4*	*-1.5*	-1.2	-1.2	-1.6	-1.2	-1.1	-1.5
Washington Coast	*14.4*	+4.8	+5.7	+5.9	+5.0	+6.2	+6.3	+5.5
Astoria-Tillamook	*12.8*	+5.9	+8.1	+8.4	+6.0	+8.3	+8.6	+6.1
Newport	*10.5*	+3.7	+4.2	+4.4	+3.6	+4.5	+4.6	+3.8
Coos Bay-Brookings	*9.6*	-0.9	-0.2	+0.1	-1.3	+0.2	+0.5	-1.0
Crescent City-Eureka	*5.9*	-2.1	-1.7	-1.6	-2.1	-1.6	-1.5	-2.0

Fort Bragg - Bodega Bay	*3.9*	+0.3	+0.8	+1.0	+0.2	+1.1	+1.2	+0.4
San Francisco Area	*1.8*	-0.3	-0.2	-0.2	-0.4	-0.2	-0.2	-0.3
Santa Cruz - Monterey - Morro Bay	*5.0*	+1.9	+2.9	+3.1	+2.0	+3.3	+3.6	+2.4
Santa Barbara - Los Angeles - San Diego	*2.7*	+1.8	+2.2	+2.3	+1.6	+2.5	+2.6	+2.0
Shoreside Total	*70.1*	+13.6	+20.6	+22.2	+13.1	+23.1	+24.7	+15.3

Table 4-136. Change in groundfish ex-vessel revenue from baseline 2003-12 average annual revenue (inflation-adjusted $2013) (%).

Community Groups	***Baseline (2003-12)***	**No Action**	**2015 PPA**	**2015 Alt1**	**2015 Alt2**	**2016 PPA**	**2016 Alt1**	**2016 Alt2**
Puget Sound	*3.4*	-45.6%	-37.1%	-35.5%	-46.7%	-34.2%	-32.5%	-44.0%
Washington Coast	*14.4*	+33.6%	+39.6%	+40.6%	+35.0%	+42.8%	+43.8%	+38.0%
Astoria-Tillamook	*12.8*	+45.9%	+63.3%	+65.6%	+46.5%	+64.7%	+66.9%	+47.5%
Newport	*10.5*	+35.5%	+40.1%	+41.5%	+34.3%	+42.5%	+44.0%	+36.3%
Coos Bay-Brookings	*9.6*	-9.7%	-1.7%	+1.3%	-14.0%	+2.2%	+5.2%	-10.9%
Crescent City-Eureka	*5.9*	-35.5%	-28.5%	-26.6%	-35.3%	-26.6%	-24.8%	-34.0%
Fort Bragg - Bodega Bay	*3.9*	+8.0%	+21.0%	+25.3%	+5.1%	+27.6%	+32.0%	+10.7%
San Francisco Area	*1.8*	-18.6%	-11.8%	-10.1%	-20.0%	-10.7%	-9.0%	-19.0%
Santa Cruz - Monterey - Morro Bay	*5.0*	+38.1%	+57.0%	+61.9%	+39.3%	+65.6%	+70.6%	+47.5%
Santa Barbara - Los Angeles - San Diego	*2.7*	+65.3%	+79.3%	+84.9%	+60.5%	+91.1%	+97.1%	+71.8%
Shoreside Total	*70.1*	+19.4%	+29.4%	+31.7%	+18.7%	+32.9%	+35.3%	+21.8%

4.3.2.4 Processors

4.3.2.4.1 No Action

Under No Action, total purchases of groundfish landings by shoreside processors of $83.8 million are projected. This total includes projected purchases of $28.6 million of whiting, and $55.2 million in deliveries of combined nonwhiting groundfish species.

4.3.2.4.2 The Preliminary Preferred Alternative

Compared with No Action, under the Preferred Alternative total groundfish purchases by processors are projected to increase by $7 million (8 percent) in 2015 and $9.5 million (11 percent) in 2016. Purchases of whiting are the same as under No Action, while deliveries of combined nonwhiting groundfish species increase by $7 million (13 percent) in 2015 and $9.5 million (17 percent) in 2016. These values describe the second highest level of non-whiting groundfish and total groundfish purchases among the action alternatives.

4.3.2.4.3 Alternative 1

Compared with No Action, under Alternative 1 total groundfish purchases by processors are projected to increase by $8.6 million (10 percent) in 2015 and $11.2 million (13 percent) in 2016. Purchases of whiting are the same as under No Action, while deliveries of combined nonwhiting groundfish species increase by $8.6 million (16 percent) in 2015 and $11.2 million (20 percent) in 2016. These values describe the highest overall level of non-whiting groundfish and total groundfish purchases among the action alternatives.

4.3.2.4.4 Alternative 2

Compared with No Action, under the Alternative 2 total groundfish purchases by processors are projected to decrease by $0.5 million (-1 percent) in 2015 and increase by $1.7 million (2 percent) in 2016. Purchases of whiting are the same as under No Action, while deliveries of combined nonwhiting groundfish species decrease by $0.5 million (-1 percent) in 2015 and increase by $1.7 million (3 percent) in 2016. These values describe the lowest overall level of non-whiting groundfish and total groundfish purchases among the action alternatives.

Table 4-137. Change from No Action in shoreside processors' groundfish purchases by species group under the 2015-16 alternatives ($ million).

Alternative:	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*28.6*	-	-	-	-	-	-
Nonwhiting	*55.2*	+7.0	+8.6	-0.5	+9.5	+11.2	+1.7
TOTAL CHANGE	*83.8*	+7.0	+8.6	-0.5	+9.5	+11.2	+1.7

Table 4-138. Change from No Action in shoreside processors' groundfish purchases by species group under the 2015-16 alternatives (%).

Alternative:	No Action	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*28.6*	-	-	-	-	-	-
Nonwhiting	*55.2*	+1%	+16%	-1%	+17%	+20%	+3%
TOTAL CHANGE	*83.8*	+8%	+10%	-1%	+11%	+13%	+2%

4.3.2.5 Effects on the IFQ Fishery of Alternative ACLs for Widow Rockfish and Pacific Whiting

In addition to the No Action and Preferred ACL alternatives for widow rockfish of 1,500 mt the Council is also considering an alternative widow rockfish ACL of 3,000 mt. Results of the 3,000 mt widow rockfish ACL analysis could be applied to any of the action alternatives analyzed above. Widow rockfish are encountered in the Pacific whiting fishery and have also historically been a midwater trawl target species along with yellowtail rockfish. Consequently, in conjunction with the TAC decision that is ultimately adopted for Pacific whiting (in a separate action), the ACL decision for widow rockfish will help determine (1) to what degree the Pacific whiting fisheries, particularly the at-sea catcher-processor and mothership sectors, will be able to harvest their Pacific whiting allocations, and (2) whether the shoreside trawl sector will be able to resume a midwater trawl fishery targeting widow and yellowtail rockfish.

Effects of alternative Pacific whiting TACs on the trawl fishery

Table 4-139 shows a range of possible whiting sector allocations derived from an historical analysis of Pacific whiting harvest limits (OY, U.S. TAC) during 2005-2013. Note that during most of this period widow rockfish was being managed under a rebuilding plan. In addition to the 2013 whiting allocation levels assumed in alternatives, four scenarios are shown including the lowest and highest values observed for each whiting sector during the 2005-2013 period, and two additional scenarios, one derived by subtracting 50 percent from the lowest scenario, and another by adding 50 percent to the highest scenario, respectively. These are based on examination of "final" sector allocations during the 2005-2013 period (i.e., after all in-season reallocations). Consequently the potential sector allocations shown do not necessarily adhere to the Pacific whiting intersector allocation shares specified in the FMP. The whiting sector allocations shown are used (1) to illustrate associated impacts on whiting sector ex-vessel revenues (i.e., the equivalent of what would be paid to catcher vessel operators upon delivery to the processors), and (2) to infer potential ex-vessel revenue impacts generated from a possible shoreside midwater trawl fishery for widow and yellowtail rockfish.

Shoreside sector Pacific whiting allocations shown in Table 4-139 under the alternative U.S. TAC scenarios range from 20,369 mt to 147,446 mt. The highest and lowest final allocations for the shoreside sector were 98,297 mt which occurred in 2013 and 40,738 mt in 2009, respectively. By comparison, the allocation assumed for the shoreside sector under the alternatives is 85,697 mt, the original shoreside sector allocation in 2013.

Allocations under the alternative TACs for the whiting mothership sector range from 12,017 mt to 87,131 mt. The highest and lowest final allocations for the sector were 58,087 mt in 2008 and 24,034 mt in 2009, respectively. The allocation assumed for the mothership sector under the alternatives is 48,969 mt, the original mothership sector allocation in 2013.

Allocations under the alternative TACs for the catcher-processor sector range from 17,688 mt to 173,684 mt. The highest and lowest final allocations for the sector were 115,789 mt recorded in 2008 and 35,376 mt in 2009, respectively. By comparison, the allocation for the catcher-processor sector assumed under the alternatives is 69,373 mt, the original catcher-processor sector allocation in 2013.

Table 4-140 shows the potential whiting sector ex-vessel revenues associated with the range of Pacific whiting TAC alternatives shown in Table 4-139. Estimated potential revenues under the alternatives are also shown for comparison. Revenues are projected by assuming all sectors take their entire allocation delivered at average 2013 shoreside ex-vessel prices. Ex-vessel revenues for the catcher-processor sector are imputed to represent the equivalent value for the volume of whiting harvested by catcher-processors.

Table 4-140 shows potential ex-vessel revenues for the three combined, non-Tribal commercial whiting sectors ranging from $13.3 million to $108.6 million, compared with a projected level of $54.3 million under the integrated alternatives. Potential mothership sector revenues under the whiting TAC scenarios are shown to range from $3.2 million to $23.2 million compared with a projected level of $12.8 million under the alternatives. Catcher-processor sector (equivalent) revenues under the whiting TAC scenarios range from $4.7 million to $46.2 million, compared with $18.5 million projected under the alternatives.

Shoreside sector revenues under the whiting TAC scenarios range from $5.4 million to $39.2 million compared with $22.8 million projected under the alternatives. Based on patterns observed in the 2013 fishery, about 44 percent of shoreside whiting exvessel revenues is projected to derive from landings delivered to Newport, with Astoria projected to receive about 34 percent, and ports on the Washington coast receiving about 21 percent of total shoreside Pacific whiting sector ex-vessel revenues.

Effects of alternative widow rockfish ACLs on the trawl fishery

As mentioned above, the widow rockfish ACL will partially determine whether the shoreside trawl sector is able to resume a midwater trawl fishery targeting widow and yellowtail rockfish following the rebuilding of widow rockfish stocks. Each commercial whiting sector will leverage its available widow rockfish (and the other bycatch species) to maximize catch up to the sector's Pacific whiting allocation. If, having assured that the bycatch requirements of the Pacific whiting harvest will be satisfied, there is sufficient additional widow rockfish quota available to the shoreside sector, then a targeted widow rockfish-yellowtail rockfish fishery may possibly ensue.

Table 4-141 shows potential Pacific whiting catch by the three non-Tribal commercial whiting sectors under the different widow rockfish ACL and intersector allocation options and two sets of assumed widow rockfish bycatch rates: (1) the average widow rockfish bycatch rate over 2005-2011 (during which period widow rockfish was being managed under a rebuilding plan), and (2) the maximum annual bycatch rate observed during that period. Unshaded cells in Table 4-141 indicate that the widow rockfish ACL is not likely to constrain Pacific whiting harvest even under the "Highest plus 50 percent" Pacific whiting TAC option for that sector shown in Table 4-139. Conversely the shaded cells indicate that under the assumed widow rockfish ACL and bycatch rate the sector may be unable to harvest up to its "Highest plus 50 percent" Pacific whiting TAC option.

A key point to note here is that under the higher assumed widow rockfish bycatch rate, the mothership and catcher-processor sectors may become limited by widow rockfish bycatch under both of the widow rockfish ACL alternatives. However under the average assumed 2005-2011 widow rockfish bycatch rates, no sector appears to be potentially limited by widow rockfish bycatch under either widow rockfish ACL alternative. The difference in bycatch rates observed between the sectors is thought to be primarily due to the different areas and times of year in which the sectors' fisheries usually occur.

Another implication of this analysis is that Table 4-141 indicates the shoreside whiting sector appears not to be limited by widow rockfish bycatch under both the 1,500 mt and 3,000 mt widow rockfish ACL alternatives. Assuming adequate widow bycatch has been allotted to take the shoreside sector's "Highest plus 50 percent" whiting allocation, Table 4-142 calculates potential maximum harvest and ex-vessel revenue in a directed shoreside widow rockfish-yellowtail rockfish fishery under the widow rockfish ACL alternatives. Table 4-142 shows that assuming the average 2001 widow-yellowtail encounter (landing) rate and 2013 ex-vessel prices, combined landings of widow plus yellowtail rockfish in a directed fishery may have an ex-vessel value between approximately $1.2 million and $1.6 million under the 1,500 mt widow ACL alternative, and between $3.9 million and $4.3 million under the 3,000 mt widow ACL alternative, depending on the assumed bycatch rate.

By way of comparison, PacFIN landings data show that the shoreside widow-yellowtail midwater trawl fishery in 2001 landed approximately 1,700 mt of widow rockfish and 1,500 mt of yellowtail rockfish. At an average ex-vessel price of about $1,000 per metric ton, the total ex-vessel value of these landings was approximately $3.7 million. Landings from that fishery were widely distributed in ports north of 40°10' N. latitude. The greatest share (35 percent) were landed in Astoria, with 15 percent landed in Newport, 15 percent on the Washington coast, 13 percent in Puget Sound ports, 6 percent in Brookings, 6 percent in Eureka, 5 percent in Coos Bay, and 3 percent in Crescent City.

Table 4-139. Range of potential Pacific whiting allocations by sector based on actual annual 2005-2013 final sector allocations compared with values projected under the alternatives (mt).*

	Shoreside Sector		Mothership Sector		Catcher-Processor Sector		Total implied combined commercial whiting sectors' TAC (mt)
ACL Scenario	mt	year	mt	year	mt	year	
Lowest minus 50%	20,369	-	12,017	-	17,688	-	50,074
Lowest	40,738	(2009)	24,034	(2009)	35,376	(2009)	100,148
Highest	98,297	(2013)	58,087	(2008)	115,789	(2008)	272,173
Highest plus 50%	147,446	-	87,131	-	173,684	-	408,260
2013 (Assumed under the Alternatives)	85,697	(2013)	48,969	(2013)	69,373	(2013)	204,039

* Based on examination of "final" sector allocations each year during the period (i.e., after all in-season reallocations). Note that the potential sector allocations shown do not necessarily adhere to intersector allocation shares in the FMP.

Table 4-140. Potential Pacific whiting sector ex-vessel revenues under the range of Pacific whiting sector allocations compared with values projected under the alternatives ($ million)*

HG Scenario	Shoreside Sector	Mothership Sector	Catcher-Processor Sector	Commercial Whiting Sectors Total
Lowest minus 50%	5.4	3.2	4.7	13.3
Lowest	10.8	6.4	9.4	26.6
Highest	26.2	15.5	30.8	72.4
Highest plus 50%	39.2	23.2	46.2	108.6
2013 Original (Assumed under the Alternatives)	22.8	13.0	18.5	54.3

* Assuming average 2013 shoreside ex-vessel prices and all sectors take their entire allocations.

Ex-vessel revenues for the catcher-processor sector represent the equivalent value of raw whiting harvested.

Table 4-141. Projected potential whiting catch at the average and maximum widow bycatch rates for whiting sectors during 2005-2011.*

Widow ACL Alt. (mt)	Widow Allocation Option	Projected potential whiting catch (mt) at the average widow bycatch rate			Projected potential whiting catch (mt) at the highest widow bycatch rate		
		Shoreside	MS	CP	Shoreside	MS	CP
1,500	No Action	741,282	122,534	356,860	373,244	78,601	171,152
3,000	No Action	1,759,416	122,534	356,860	885,885	78,601	171,152

*Highlighted cells show projected maximum potential whiting catch levels that are lower than the "Highest plus 50%" whiting HG, indicating a potential widow rockfish bycatch constraint under that scenario.

Table 4-142. Potential residual widow and yellowtail rockfish harvest by the shoreside trawl sector after assumed "Highest plus 50%" whiting harvest guideline has been taken.*

Widow ACL Alt. (mt)	Widow Allocation Alternative	Using average 2005-2011 whiting-per-widow bycatch rate			Using maximum 2005-2011 whiting-per-widow bycatch rate		
		Widow mt	Yellowtail mt	Revenue $,000	Widow mt	Yellowtail mt	Revenue $,000
1,500	No Action	796	678	$1,589	601	512	$1,200
3,000	No Action	2,161	1,839	$4,314	1,966	1,673	$3,925

*Note: Assumes average and highest whiting-per-widow bycatch rates observed during 2005-2011, average yellowtail-per-widow landings rates observed in 2001, and 2013 widow and yellowtail rockfish ex-vessel prices.

4.3.2.6 Impacts of alternative ACLs for Dover sole

Under the individual quota program Dover sole has become a primary target of the trawl fleet. To the extent markets are able to absorb more Dover sole than is currently available a higher ACL may result in greater harvest levels and revenue for the trawl sector. At some point, however, the trawl sector may not have sufficient QP for co-occurring species (thornyheads, sablefish, etc.) that are caught with Dover sole, thus limiting harvesters' ability to freely target Dover sole.

In the past the GAP has recommended possible consideration of an increase in the ACL for Dover sole to 40,000 mt (from the current 25,000 mt), arguing that a larger ACL would increase vessel QP use caps for the stock and could help attract larger volume retail and food service outlets without jeopardizing the health of the projected stock biomass (GAP report reference?).

From 2003 to 2012 historical catch of Dover sole ranged from a high of 12,475 mt in 2009 to a low of 7,134 mt in 2012. Over the same period the ACL ranged from a high of 25,000 mt in 2011 and 2012 to a low of 7,440 mt at the beginning of the time series. The highest catch level (12,475 mt in 2009) occurred under an ACL of 16,500 mt (Figure 4-33).

Figure 4-34 compares trends over the 2003-2012 time period in exvessel prices ($/lb) and ACL attainment (catch/ACL). The figure shows the ACL attainment share fluctuating starting from a very high level when the ACL was relatively low prior to 2007 to attainment levels around 30 percent in 2011 and 2012. It is noteworthy that the lowest attainment levels in the time series occurred under IFQ management, however it is not clear what factors contributed to the recent apparently declining trend in Dover sole catch and ACL attainment since 2009. It may also be noteworthy that current dollar average exvessel prices (total revenue / total landings) for Dover sole were the highest for the time series in the most recent years (2011 and 2012), having recovered from their lowest levels recorded during relatively higher harvests in 2009 and 2010. In inflation-adjusted terms, average Dover sole exvessel prices have been fairly flat and were slightly lower in 2012 than at the beginning of the time series in 2002.

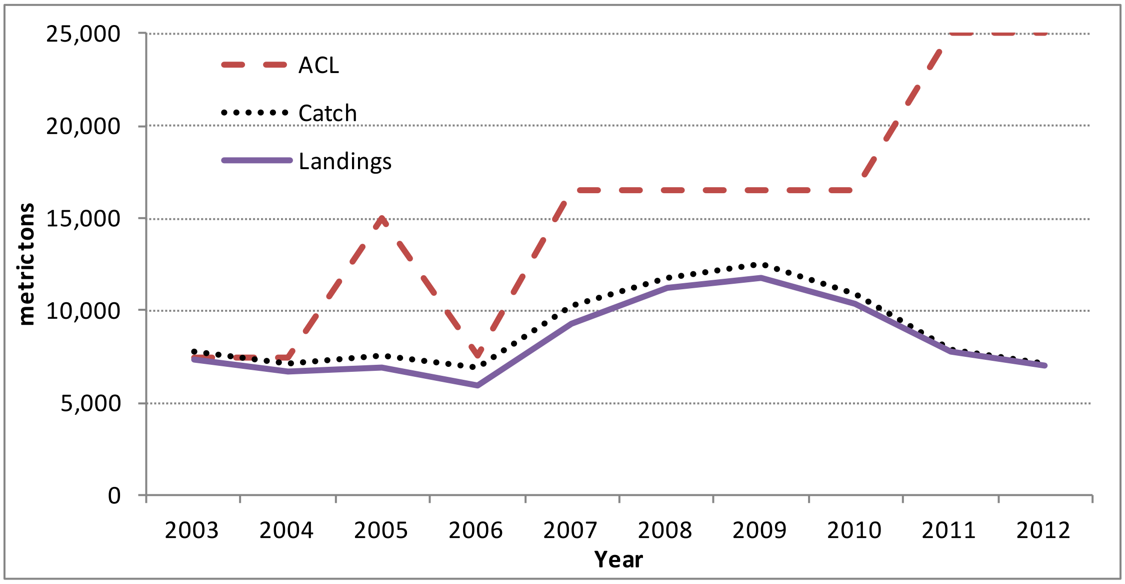


Figure 4-33. ACLs, catch and landings for Dover sole: 2003-2012

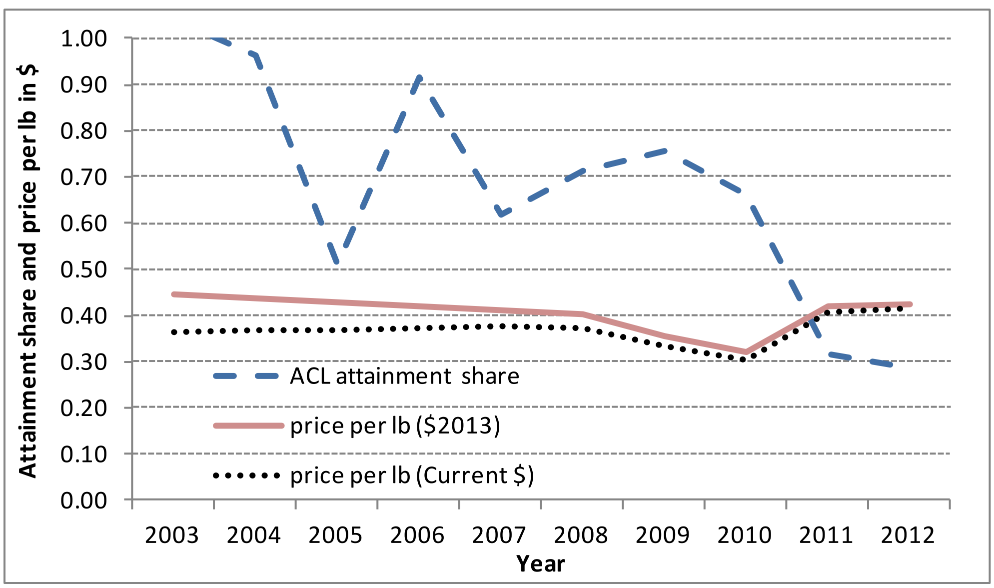


Figure 4-34. Attainment share (catch/ACL) and price per pound in current and inflation-adjusted $2013 for Dover sole: 2003-2012

4.3.2.7 New Management Measures for Commercial Fisheries

4.3.2.8 New Management Measures for Recreational Fisheries

4.4 Impacts of 2015-2016 Harvest Specifications and Management Measures on Essential Fish Habitat

Groundfish fishery removals in 2015-16 are expected to result in effects consistent with the types of long-term effects discussed in Section 4.11.

4.5 Impacts of 2015-2016 Harvest Specifications and Management Measures on the California Current Ecosystem

Groundfish fishery removals in 2015-16 are expected to result in effects consistent with the types of long-term effects discussed in Section 4.12.

4.6 Impacts of 2015-2016 Harvest Specifications and Management Measures on Protected Species

Groundfish fishery removals in 2015-16 are expected to result in effects consistent with the types of long-term effects discussed in Section 4.13.

4.7 Impacts of 2015-2016 Harvest Specifications and Management Measures on Nongroundfish

Groundfish fishery removals in 2015-16 are expected to result in effects consistent with the types of long-term effects discussed in Section4.14.

4.8 Long-term Biological Impacts of Setting Harvest Specifications for Groundfish Stocks

4.9 Long-term Impacts of Establishing and Adjusting Management Measures for Groundfish Fisheries

Management measures are the primary link between management objectives (such as harvest specifications) and environmental impacts. Management measures affect behavior (most directly, fishing activity), which in turn determines how resources are affected and the location and intensity of benefits and costs for human communities. For this reason the effects of management measures are evaluated in their own right in this section.

This section describes the long-term effects of the application of different types of management measures during the biennial management process by linking their potential impacts to the environmental components evaluated in this chapter. As discussed in section 3.2, the Groundfish FMP distinguishes between new measures and routine measures. The categories of management measures discussed below encompasses measures that may be considered routine or new. For example, a change in the configuration of an RCA (a type of closed area) may be considered routine, if the boundary lines and configuration were used in the past; it would be considered a new measure if a new boundary line or configuration is proposed. Since these categories of management measures are applied continuously with changes such as just described, they are an important aspect of the long-term impacts of groundfish fishery management.

This section describes the types of management measure adjustments and associated impacts anticipated when harvest specifications are implemented in future biennial cycles. A comprehensive description of management measures and application by sector can be found in Section XXX (reference Chapter 4, Description of No Action Management Measures). Section XXX provides a more detailed look at the measures proposed for implementation in regulations for the 2015-16 biennial period.

This section does not evaluate every possible adjustment in management measures (e.g., changes to RCA configurations, trip limit adjustments, bag and sub-bag limits) given the range of ACL projections under the various states of nature. Many or most changes in routine measures result in impacts of the same type and intensity. Furthermore, individually, the specific impacts of such adjustments are usually too small to predict.

As specified in the FMP, the principal management measures available to control fishing mortality in the west coast groundfish fisheries are:

- Measures to reduce bycatch and bycatch mortality
- Defining authorized fishing gear and regulating the configuration and deployment of fishing gear, including mesh size in nets and escape panels or ports in traps
- Restricting catches by defining prohibited species and establishing landing, trip frequency, bag, and size limits
- Establishing fishing seasons and closed areas
- Limiting fishing capacity or effort through permits, licenses and endorsements, and quotas, or by means of input controls on fishing gear, such as restrictions on trawl size/shape or longline length or number of hooks or pots. Fishing capacity may be further limited through programs that reduce participation in the fishery by retiring permits and/or vessels

Management measures may also be imposed for habitat protection, resource conservation, or social or economic reasons consistent with the criteria, procedures, goals, and objectives set forth in the FMP.

Management measures are normally imposed, adjusted, or removed at the beginning of the biennial fishing period when revised harvest specifications are implemented. Inseason adjustments, including automatic actions by the NMFS Regional Administrator, may be imposed, adjusted, or removed during the biennial period based on projected mortality relative to the ACL. New management measures may be developed through a regulatory or FMP amendment.

4.9.1 Commercial Fisheries

Commercial management measures have been applied to lengthen the duration of the fishery, so as not to disturb traditional fishing and marketing patterns; to reduce discards and waste, or; to discourage targeted fishing of some stocks. In cases where protection of an overfished or depleted stock is required, limits may differ by gear type or closed areas or seasons may be established.

Impact mechanisms and the types and intensity of impacts for each type of measure are discussed below. In general, all these measures are intended to reduce the mortality of certain groundfish species in order to achieve but not exceed ACLs. Measures may be developed to reconcile this principal objective with other objectives, such as maximizing commercial fishing opportunity and related socioeconomic benefits.

Season Restrictions: Time and area restrictions can be reviewed as related types of measures in two dimensions. Fishing seasons prohibit fishing during specified periods and are at least implicitly applied to a certain area. Time/area restrictions control fishing effort with the possibility of concentrating fishing effort on stocks or portions of stocks based on the availability in time and space. For example, such restrictions may direct fishing effort toward or away from spawning fish, a particular age or size class, or fish that are seasonable available due to their migratory pattern.

Groundfish Conservation Areas: Areas where it is unlawful to take and retain, possess, or land groundfish with commercial gear. Impacts are similar to season restrictions by limiting fishing opportunity by time and area. As stocks rebuild or if lower overfished species bycatch rates occur, less restrictive GCAs will likely be implemented. Conversely, if progress toward rebuilding is not proceeding consistent with the rebuilding plan and MSA, new stocks are declared overfished, or higher than anticipated overfished species bycatch rates occur, more restrictive GCAs may be implemented.

IFQ and IBQ: These tools divide the total amount of quota into shares controlled by individual fishermen or groups of fishermen (cooperatives).

Cumulative Landing Limits (also known as trip limits): These are limits on the pounds of fish a vessel may land in a period. Adjustments to cumulative landing limits influence fishing mortality, either directly through catch or indirectly by reducing fishing effort (“time on the water”).

Take and Retain Prohibitions: These restrictions discourage targeting because retention and thus sale is prohibited. This type of measure is functionally equivalent to a trip limit set at zero.

Size Limits: Limits the size of fish (usually by length) that may be retained by a commercial fishing vessel. There can also be limits on “headed” or fillet sizes, which are easier to monitor onshore and can be correlated to the original size of the fish. Size limits change age-specific fishing mortality (fishery selectivity) and therefore can control mortality by life stage (e.g., juveniles, spawning stock).

Gear Restrictions: Gear definitions and restrictions are used to protect juvenile fish (trawl mesh size), to disable lost gear so that it no longer catches fish (biodegradable escape panels for pots), to slow the rates of catch in particular sectors (hook limits), to reduce bycatch of non-target species (trawl configuration requirements), and to protect marine habitat (trawl roller gear size restrictions).

4.9.2 Recreational Fisheries

In addition to the broad management objectives mentioned in Section XXX recreational management measures are also designed to avoid waste, spread catch over a large number of anglers, protect juvenile fish, and enhance the quality of the recreational fishing experience.

The requirement to rebuild stocks that have been declared overfished is an important consideration when establishing and adjusting recreational management measures. Presently, the following species are encountered in the recreational fisheries and are declared overfished: bocaccio south of 40°10 N. latitude, canary, cowcod south of 40°10 N. latitude, and yelloweye rockfish. Season and depth closures, including specific area closures are the primary management measure adjustments used to reduce overfished species mortality.

Most bag limits, size limits, and area closures in the recreational fisheries have been designated as “routine”.

Impact mechanisms and the types and intensity of impacts for each type of measure are discussed below. In general, all these measures are intended to reduce the mortality of certain groundfish species in order to achieve but not exceed ACLs. Measures may be developed to reconcile this principal objective with other objectives, such as maximizing recreational fishing opportunity and related socioeconomic benefits.

4.9.3 Impact Mechanisms

Season Restrictions: Time and area restrictions can be reviewed as related types of measures in two dimensions. Fishing seasons prohibit fishing during specified periods and are at least implicitly applied to a certain area. Time/area restrictions control fishing effort with the possibility of concentrating fishing effort on stocks or portions of stocks based on the availability in time and space. For example, such restrictions may direct fishing effort toward or away from spawning fish, a particular age or size class, or fish that are seasonable available due to their migratory pattern.

Recreational Rockfish Conservation Areas: Areas where it is unlawful to take and retain, possess, or land groundfish with recreational gear. Impacts are similar to season restrictions by limiting fishing opportunity by time and area.

Bag Limits, Boat Limits, Hook Limits: These are limits on: 1) the number of fish an angler may keep, 2) the total number of fish that may be retained aboard a vessel (no matter who aboard caught them), 3) on the number of hooks on any given fishing line. Bag and boat limits include fish taken in both state and federal waters. Changes in these limits influence fishing mortality, either directly through catch or indirectly by reducing fishing effort (“time on the water”) due to a change in the perceived value of the recreational experience.

Take and Retain Prohibitions: Discourages targeting species because of restrictions on anglers taking and retaining certain species. This type of measure is functionally equivalent to a bag or boat limit set at zero.

Prohibited Sale: Groundfish taken in the course of recreational groundfish fishing cannot be sold. No money revenue is realized, which otherwise could offset costs, increase the value of the activity, and therefore stimulate more fishing effort.

Size Limits: Limits the size of fish (usually by length) that may be retained by an angler. There can also be limits on fillet sizes, which are easier to monitor onshore and can be correlated to the original size of the fish. Size limits change age-specific fishing mortality (fishery selectivity) and therefore can control mortality by life stage (e.g., juveniles, spawning stock).

Gear Restrictions: Only hook-and-line or spear can be used for recreational fishing. This limits the efficiency (CPUE) and other gear-specific adverse impacts. If prohibited gear would enhance the angler experience, restrictions would reduce the value of recreational activity.

4.9.4 Impacts

Figure 4-35 diagrams the impact mechanisms, or causal relationships, for recreational and commercial management measures based on the above descriptions. Measures may control fishing effort, possibly in time and space (seasons, RCAs, take and retain prohibitions, prohibited sale); directly control fishing mortality (bag and boat limits, size limits); or control gear (hook limits, gear restrictions). This in turn affects the pattern of fishing effort, fishing efficiency (CPUE), and fishery selectivity. These intermediate effects determine fishing mortality and angler experience; there may other incidental effects that are not the principal objective of the management measures. Finally, these effects can be described with respect to the environmental components evaluated in this EIS.

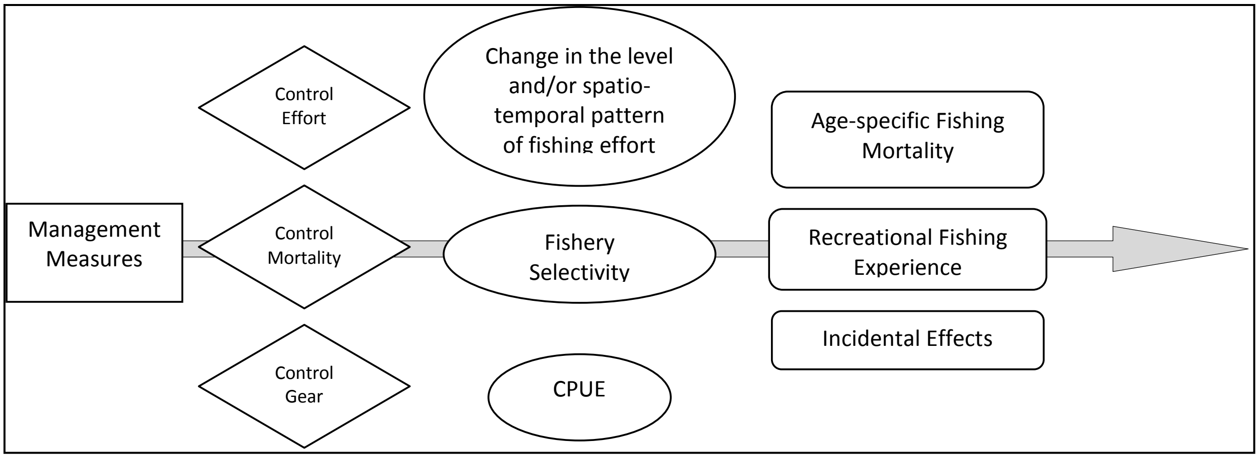


Figure 4-35. Summary of impact mechanisms for recreational management measures.

4.9.4.1 Groundfish Stocks

- By limiting fishing effort, time/area restrictions (seasons, RCAs) reduce groundfish mortality, which is usually the primary objective of such measures. Time/area restrictions are particularly effective in reducing mortality of … (species, life stage). Age-specific mortality may be an input to stock assessments and the effect of time/area closures would be accounted for in this way.
- Bag, boat, and trip limits have a direct effect on groundfish fishing mortality by restricting how many fish may be retained.
- Hook limits and other gear restrictions reduce the efficiency of the fishing gear and thus CPUE, indirectly affecting fishing mortality.
- Prohibiting the take and retention discourages targeting, which decreases mortality. These measures may provide an additional disincentive for vulnerable species (e.g., overfished species). Prohibiting commercial sale is a more general disincentive to increasing fishing effort, because the financial cost of the activity cannot be offset by revenue.
- Size limits affect fishery selectivity. This can help to increase yield by focusing catch on larger fish or conversely by discouraging catch of sexually mature fish.

4.9.4.2 California Current Ecosystem

- Changes in age-specific fishing mortality affect stock structure and relative abundance. Section 3.3 describes how these factors influence ecosystem structure.
- Reduced fishing effort may correlate with a reduction in vessel-related pollution. The direct effect is likely negligible but may have cumulative impacts. If other boat-based recreational activities are substituted (e.g., targeting other species) there would be no net change in the effect.

4.9.4.3 Essential Fish Habitat

- Adverse impacts to groundfish EFH due to fishing are a function of the type of gear used. Recreational gear is hook-and-line and infrequently contacts benthic groundfish EFH. Because of the small size of the gear even when contacting the bottom, adverse impacts are negligible. Therefore, other measures affecting fishing effort (reducing aggregate gear contact) also have a negligible effect on EFH.

4.9.4.4 Non-Groundfish Species

- The impact mechanism and effects are the same for non-groundfish species as for groundfish (reduction in fishing effort, mortality, change in fishery selectivity). Most catch of non-groundfish would be regulated under other authorities (other Council FMPs, state management programs) and any “bycatch mortality” is accounted for in the management of those stocks.

4.9.4.5 Protected Species

- Measures that control fishing effort and its spatio-temporal distribution (time/area closures) influence interactions between recreational vessels and protected species (marine mammals, seabirds, other ESA-listed species) according to their seasonal occurrence in the management area. Effects could include injurious/fatal interactions with fishing gear or vessels and adverse effects on behavior from non-injurious interactions. Because of gear restrictions recreational fishing employs relatively light hook-and-line gear so fatal interactions are unlikely [Cite any information in BiOp]

4.9.4.6 Anglers and Fishing Communities

- Measures that affect fishing effort (time/area closures) influence the size and distribution of recreational expenditures. Changes in expenditure affect coastal communities that have recreational fishing engaged businesses. Measures may also affect the quality of the recreational fishing experience, which could indirectly affect fishing effort and related expenditures. These include limits on catch (bag and boat limits, take and retain prohibitions), prohibition of commercial sale, and gear restrictions. In long-term, management measures that maintain or increase target species abundance could enhance the recreational fishing experience by increasing CPUE and resulting in adaptive management feedback where management restriction are relaxed.

4.9.5 Summary

Table 4-143 summarizes the effects of the commercial and recreational groundfish management measures described above on the environmental components evaluated in this EIS.

Table 4-143. Summary of commercial and recreational management measures and impacts to environmental components. (- adverse effect, 0 negligible/no effect, + positive effect)

	Environmental Component					
Measure	**Groundfish Stocks**	**California Current Ecosystem**	**Essential Fish Habitat**	**Non-Groundfish Species**	**Protected Species**	**Anglers and Fishing Communitie s**
Season restrictions	+	0	0	0	+	-/+
GCAs	+	0	+	0	+	-/+
Trip limit	+	0	0	0	0	-/+
Bag limit	+	0	0	0	0	-/+
Boat limit	+	0	0	0	0	-/+
Gear restrictions	+	0	+	0	+	0
Hook limit	+	0	0	0	0	0
Size limit	+	0	0	0	0	-/+
Take & retain prohibs	+	0	0	0	0	-/+

Measure	Environmental Component					
	Groundfish Stocks	California Current Ecosystem	Essential Fish Habitat	Non-Groundfish Species	Protected Species	Anglers and Fishing Communities
Prohib sale	+	0	0	0	0	-/+

4.10 Long-term Impacts of Setting Harvest Specifications on the Socioeconomic Environment

4.10.1 No Action

Under the No Action Alternative 2014 harvest specifications would be carried forward into subsequent years. Historically this has occurred for a short time at the beginning of some biennial management periods, because of delays in publishing regulations with the new harvest specifications. It is unlikely that the same harvest specifications would remain in effect indefinitely. However, because the Groundfish FMP does not describe how new harvest specifications would be implemented if the Council does not take action, No Action is interpreted this way. Routine management measures, defined as those already in place, can be changed inseason. These routine changes usually involve some form of catch control to ensure that ACLs are not exceeded.

All other factors being equal, ex-vessel revenue would be expected to be the same as 2014. In the evaluation of 2015-2016 impacts (Section 4.x) annual coastwide commercial and tribal ex-vessel revenue for No Action is estimated to be $124 million versus an annual average for the 2003-2012 baseline period of $91 million. The No Action uses 2013 catch to estimate at-sea whiting revenues, which were much higher than the baseline average.

Although static ACLs are assumed under No Action, future fishery performance should be considered with respect to historical inter-annual volatility in ex-vessel revenue. Such changes can be in response to a variety of factors, including management (the proposed action), prices, and other environmental factors. Figure 3-2 shows the deviation from the 1981-2012 long-term mean of total annual inflation-adjusted groundfish revenue (including at-sea Pacific whiting sectors). Figure 4-36 is similar except that it is based on data from 1998 to 2012 and shows nonwhiting and whiting revenue separately. As discussed below, groundfish revenues dropped precipitously and remained below the long-term average starting in 2008. Although above the mean in 2009, there is considerable volatility in following years, especially for Pacific whiting. High prices for sablefish likely contributed to the spike in nonwhiting revenue in 201. The time series does not necessarily suggest a trend of increasing revenue going forward; rather, the historical record suggests that inherent volatility will cause revenue to periodically fall to—or below—the average at.

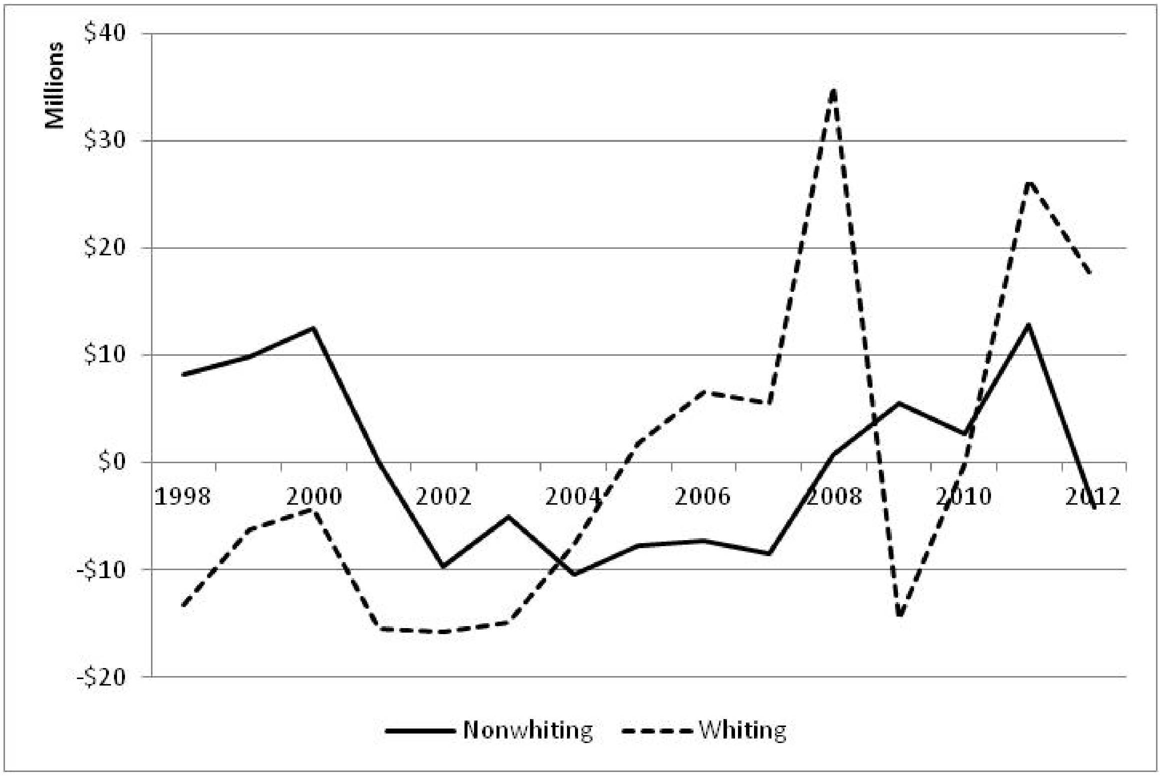


Figure 4-36. Deviation from the mean for inflation adjusted ex-vessel revenue from nonwhiting and whiting fisheries, 1998-2012.

By way of comparison, Table 4-144 shows some metrics for the absolute and relative variability in inflation-adjusted ex-vessel revenue for different species groups. For the entire time series the absolute variation (the range between the maximum value and minimum value) for groundfish is about $73 million; crab, HMS, and salmon show a greater range while CPS and shrimp are very close to the value for groundfish. The lower panels in the table show the coefficient of variation (CV), a relative measure of variability. For the entire time series groundfish shows the smallest relative variability; the only instance where groundfish shows greater relative variability than another group is in the 1998-2011 period where the Other species group (generally, various state-managed species) has a lower CV.

Table 4-144. Absolute variation in ex-vessel revenue (range between maximum and minimum value) in inflation-adjusted $1,000s during 1981-2011, and coefficient of variation for three time periods, by species group.

	CPS	Crab	Ground fish	HMS	Other	Salmon	Shellfish	Shrimp
Absolute Variation (inflation-adjusted $1,000s)								
1981-2011	$73,237	$121,503	**$73,389**	$95,012	$52,950	$112,882	$26,564	$73,090
Coefficients of Variation (CV)								
1981-2011	0.348	0.397	**0.247**	0.516	0.397	0.924	1.343	0.507
1981-1997	0.290	0.307	**0.092**	0.486	0.385	0.774	0.819	0.387
1998-2011	0.358	0.271	**0.149**	0.175	0.132	0.618	0.537	0.339

Table 4-145. Maximum year-on-year decline in inflation-adjusted revenue, 1982-2011, by species group; showing year of maximum decline and the amount of the decline in $millions, and in percent.

	CPS	Crab	Groundfish	HMS	Other	Salmon	Shellfish	Shrimp	All Species
Year	1998	1991	**1998**	1985	1998	2008	1998	2003	1998
$mil	-$47	-$39	**-$38**	-$57	-$14	-$71	-$12	-$32	-$139
Percent	-78%	-53%	**-35%**	-54%	-35%	-84%	-94%	-48%	-37%

Table 4-145 presents information on the maximum year-on-year revenue decline by species group. In addition to revenue for all species, 1997-98 also showed the maximum decline for the CPS (-78%), Groundfish (-35%), Other (-35%), and Shellfish (-94%) species groups. Although the maximum decline in percent terms is smaller for groundfish than all other groups except "Other," in absolute dollar terms Groundfish's largest single-year decline, $38 million, is larger than Other, Shellfish, and Shrimp. More generally, all of the maximum 1-year declines occurred after 1990 except for HMS. The comparisons show that revenue from groundfish revenues are not unusually volatile compared to other west coast fisheries. Expressed as percent, the maximum year-on-year change for groundfish, -35%, is close to the value for all species, -37%.

Note that these data represent a longer time series than the 2003-2012 baseline period used elsewhere. During the baseline period the maximum year-on-year decline was between 2011 and 2012 at $20.7 million or -22%. However, this statistic is somewhat misleading, because 2011 recorded the largest year-on-year gain of $23.9 million or 34%. Applying the historical data to describe socioeconomic impact over the long-term future suggests that inter-annual volatility in revenues is to be expected and could be as much as a one-third gain or drop. Since ACLs remain constant at 2014 values under No Action, exogenous factors, such as changes in prices, would likely be more important than management (the proposed action) in determining ex-vessel revenue. The fact that record setting declines in revenue occurred in four of the eight groups shown in Table 4-145 suggests that management of the groundfish fishery at that time was not a primary factor in the decline in revenue.

4.10.1.1 Commercial Fisheries: Shoreside IFQ and Non-nearshore Fixed Gear

During the baseline period shoreside groundfish limited entry fisheries have accounted for 70% of inflation-adjusted ex-vessel revenue from non-tribal groundfish fisheries; with at-sea whiting included the fraction rises to 94%. The evaluation below focuses on the ACLs and catch of selected commercially important groundfish based on value or, in the case of overfished species, their effect on fishery performance. While this analysis uses data for all groundfish fisheries (to simplify comparisons to ACLs, which apply to all groundfish catch), the species considered are primarily caught in shoreside IFQ and non-nearshore fixed gear fisheries. (Recreational fishing mortality is also accounted for in the management scheme while only commercial data are considered here. For the species in question recreational catch is negligible.)

Table 4-146 shows average annual catch of these commercially important species compared to the 2014 ACLs.[48] Commercial catch attainment (the fraction of the ACL caught in commercial fisheries) for the 2003-2012 period is also shown. Historically, low ACLs for overfished species have affected fishery performance, because management measures that discourage catch of these species can also limit fishing opportunity for target stocks. Individual accountability in the shoreside IFQ fishery is changing fishery strategies in a variety of ways and the greater flexibility afforded harvesters in pursuing fishing strategies may improve their ability to avoid catching stocks for which they have relatively few quota pounds. Since these types of behavioral changes cannot be predicted, one must rely on the assumption stated

[48] See Figure 3-1 for a breakdown of total shoreside ex-vessel revenue by species.

above, that at a gross level the magnitude of the ACL affects performance. In this regard, comparing historical catch attainment to catch as a fraction of the 2014 ACL may be indicative. The 2014 ACL for sablefish, the most commercially valuable species, would likely have the largest impact on fishery performance. The ACL was mostly caught during the baseline period (an attainment rate of 95%) and average catch during the baseline period exceeds the 2014 ACL. This suggests that coastwide revenue under No Action is likely to be lower compared to the baseline. By this logic, cases where average annual catch during the baseline period divided by the 2014 ACL (the right most column in Table 4-146) is greater than baseline period catch attainment (the third column from the left in Table 4-146) could result in lower revenue compared to the baseline period. Arrowtooth flounder is the only target species aside from sablefish where this holds true (and arrowtooth is a relatively unimportant species, accounting for only 1.2% of coastwide inflation-adjusted revenue during the baseline period). For overfished species shown in Table 4-146 this relationship holds true only for POP.

Table 4-146. Comparison of 2003-2012 catch to ACLs for commercially important stocks. (Catch estimates from WCGOP multi-year data product.)

Stock	2003-2012 Average Annual Catch	2003-2012 ACL Attainment	2014 ACL	Catch/ 2014 ACL
Arrowtooth Flounder	3,399	42%	5,758	59%
Dover Sole	8,981	63%	25,000	36%
Longspine Thornyhead - coastwide*	1,173	53%	2,305	51%
Petrale Sole	1,887	81%	2,652	71%
Sablefish - coastwide*	6,325	95%	5,909	107%
Shortspine Thornyhead - coastwide*	1,122	80%	1,918	58%
CANARY ROCKFISH	31	56%	119	26%
DARKBLOTCHED	216	87%	330	65%
PACIFIC OCEAN PERCH	119	50%	153	78%
YELLOWEYE	3	16%	18	15%

*Sum of geographically defined component ACLs.

4.10.1.2 Commercial Fisheries: Pacific Whiting

Pacific whiting fisheries show greater revenue volatility compared to non-whiting fisheries as indicated in Figure 3-5. Baseline inflation adjusted ex-vessel revenue and catch limits for Pacific whiting are depicted in Figure 3-7. The CVs for whiting sectors' inflation-adjusted ex-vessel revenue during the baseline period is higher than the CV for nonwhiting trawl. As mentioned in section 3.7.2.1, this is partly explained by the greater variability in catch limits for Pacific whiting. Table 4-147 shows CVs for revenue from whiting and non-whiting trawl fisheries and for the catch limits on which allocations to these fisheries are based during the baseline period. Whiting fisheries show much higher variability in revenue compared to non-whiting trawl. This at least partly explained by the variability in catch limits; the CV for whiting catch limits is more than double that for non-whiting catch limits.

Table 4-147. CVs for inflation adjsuted ex-vessel revenue and catch limits for whiting and non-whiting trawl fisheries, 2003-2012. (CV for non-whiting catch limits is the sum of commercially important non-whiting species' ACLs.)

Fishery	Revenue	Catch Limit
Whiting		0.25
Shoreside	0.44	
C-P	0.50	
Mothership	0.55	
Non-whiting	0.13	0.12

Under No Action ex-vessel revenue from Pacific whiting are projected to be $63 million, about half of total groundfish revenue. During the baseline period whiting fisheries (including tribal sectors) landed between 79% and 99% of the catch limit with no strong relationship between the limit and attainment. Since historical variability in revenue has been about twice that of ACLs (Table 4-147), it is likely that exogenous factors play an important role in both attainment and revenues. Thus, even under a constant ACL, variability in revenue may remain high.

4.10.1.3 Commercial Fisheries: Nearshore Fixed Gear

The nearshore fixed gear sector accounted for 5% of inflation-adjusted revenue from shoreside fisheries during the baseline period. Although this fishery sector is not very significant from a coastwide perspective, as discussed in Sections 3.2.2.4 and 3.2.7 it makes up an important component of groundfish revenue in some coastal communities. Table 4-148 is modeled after Table 4-146, comparing catch, 2005-2012, to the 2014 ACLs for the nearshore rockfish stock complexes. As shown in Figure 3-9, black rockfish, cabezon, lingcod, kelp greenling, and species in the nearshore rockfish complex make up landings from this fishery. Because some species were moved out of stock complexes or the stock definition was redefined during the baseline period the calculations in Table 4-148 cover varying number of years during this period as noted in the last column to the right in the table.

Table 4-148. Comparison of catch (mt) to ACLs for commercially important nearshore stocks and stock complexes. Column labeled "Years" shows the number of years during the 2003-2012 period that the stock had its own ACL and related computations were made. (Catch estimates from WCGOP multi-year data product. Black rockfish north complex not shown, because no catch recorded in the WCGOP data set.)

	Average Annual Catch	Attainment	2014 ACL	Catch / 2014 ACL	Years
Black Rockfish South	168	19%	1000	17%	7
Cabezon (CA)	31	23%	158	20%	4
Cabezon (OR)	26	60%	47	56%	2
Lingcod North	29	1%	2878	1%	4
Lingcod South	27	2%	1063	3%	4
Minor nearshore rockfish North	32	26%	94	34%	8
Minor nearshore rockfish South	90	14%	990	9%	8

During the baseline period these stocks had low attainment rates. These species are also important in the recreational groundfish fishery. The three west coast states establish allocations and are principally responsible for managing the commercial nearshore fishery and recreational groundfish fishery. Thus, these low attainment rates may not accurately reflect how management affects fishing opportunity in the nearshore sector. Section 4.3.2.7 describes management measures that would be established for the 2015-16 biennial period. This information can also inform the discussion of fishery performance in the long term. Short-term management measures for the nearshore fishery under No Action were developed based on the expectation that landings will be comparable to the recent past. Under this scenario target species catch is below the sector allocations; management measures are primarily intended to limit catch of bocaccio (in California), canary rockfish, and yelloweye rockfish. Since under No Action the ACLs for these stocks would not change, it is expected that management, including allocations established by the states would not change. Unless exogenous factors (e.g., costs, prices) change it is expected that target species catch would not need to be limited except to manage overfished species impacts.

4.10.1.4 Recreational Fisheries

4.10.1.5 Buyers and Processors

4.10.1.6 Fishing Communities

Section 3.2.7 summarizes the economic characteristics of west coast fishing communities during the 2003-2012 baseline period, focusing on the distribution of ex-vessel revenue and the relative importance of different groundfish fishery sectors among ports. Setting harvest specifications has an indirect effect on fishing opportunity, which, along with other factors such as price and allocations, determines the amount of ex-vessel revenue flowing to a particular fishing community. As noted above, 2014 ex-vessel revenue is estimated at $124 million for no action. Table 4-x shows the projected distribution of revenue among ports under No Action. These distributions are based on landing patterns in 2013, and should be broadly similar to the information on landings distributions during the baseline period, as described in Section 3.2.7. All other factors being equal one would expect the amount and distribution of income to fishing communities would be comparable to what is projected for No Action in Section 4.x. It is not possible to predict changes in community characteristics due to exogenous factors; the description of communities in Section 3.2 during the baseline period is the best characterization of future conditions if exogenous factors do not change. These factors, which could affect the amount and distribution of ex-vessel revenue and income, include:

- Changes in the relative prices of fish and fish products leading to changes in fishery behavior including the amounts landed and the distribution of landings.
- An increase in ACL attainment for a particular species due to technical factors (e.g., more selective fishing gear)
- A decrease in ACL attainment for target species because of increases in stock abundance of non-target species not accounted for in No Action ACLs (the “rebuilding paradox”).
- Changes in the distribution of landings due to agglomeration (geographic concentration of related firms)

With respect to the last bullet, the effect of harvest specifications on concentration or agglomeration cannot be predicted, because countervailing factors are likely to influence landing patterns. For example, concentration of processing facilities could be mediated by owner/operator preferences and overland transport costs related to trucking fish from landing sites to processing facilities. Under No Action ACLs would remain constant over time so one might expect the trends shown in Figure 3-18 to continue until a plateau is reached. On the other hand, if stock abundance increases without a corresponding increase in catch limits (the “rebuilding paradox”), if harvesters are unable to avoid catching stocks with low ACLs their ability to attain target species’ ACLs could be impeded.

4.10.2 Action Alternatives

Projected aggregate catch (the sum of catch over the 2015-2024 projection period) for the action alternatives is used to evaluate the potential effect of the action alternatives. Catch under both the base case and high state of nature are used for Alternative 1, the base case and the low state of nature for Alternative 2, and just the base case for Alternative 3. Pairing the high state of nature with Alternative 1 and the low state of nature with Alternative 2 is intended to "bookend" the potential yields in the projections. Minimum aggregate catch is also considered although not associated with any of the alternatives. This approach recognizes that the base case represents the most likely scenario for any policy choice.

Projected catches are based on the assumption that the entire ACL is caught; in other words total catch is equal to the ACL. In order to make these scenarios comparable to historical information they have been adjusted by applying the historical ACL catch attainment rates based on WCGOP data.[49] It should be noted that adjusting the projections in this way likely under-represents future yield and catch. First, since the projections assume that the stock is being reduced each year by the entire ACL, catches below that level (the assumption made in applying attainment rates) would likely result in some additional yield in future years. Second, technical and market changes could lead to higher attainment rates for some species. It is also important to bear in mind that these projections assume perfect information and no management error. As a result, over the projection period yields converge towards an equilibrium related to MSY. In the case of stocks above the B_{MSY} proxy yields decline as the stock is fished down to the B_{MSY} level while stocks below B_{MSY} increase to that level. That is illustrated in Figure 4-37, which shows catch streams and depletion (current biomass as a percent of unfished biomass) for arrowtooth flounder, an underexploited stock above the biomass target, and sablefish whose status is in the precautionary zone.

[49] http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/species_management.cfm

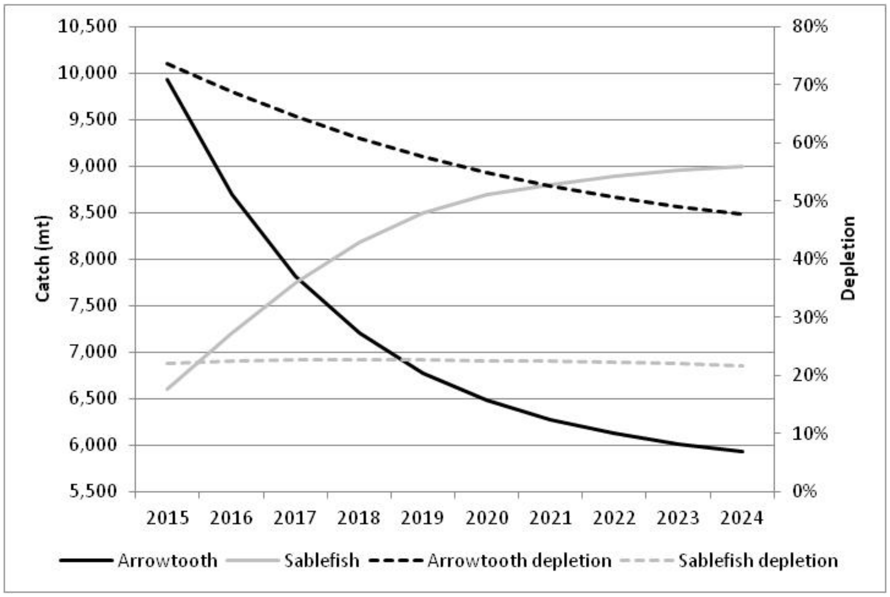


Figure 4-37. Catch and depletion over the projection period for arrowtooth flounder and sablefish under the P*=0.4 control rule and base case state of nature.

4.10.2.1 Commercial Fisheries: Shoreside IFQ and Non-nearshore Fixed Gear

Table 4-149 shows aggregate catch under the alternatives for the commercially important species in the shoreside IFQ and non-nearshore fixed gear fisheries. The economic importance of these species is indicated in the table by the proportion of landings and inflation adjusted revenue these species comprise.
*Sum of geographically defined component ACLs.

Table 4-150 presents the information in Table 4-149 as a ratio to catch during the 2003-2012 baseline period. This is intended to make it easier to compare the difference between the alternatives in terms of potential revenues. Actual dollar figures are not used, because the uncertainty surrounding actual future conditions makes presenting them misleading.

Ratios for sablefish, which accounted for over half of total groundfish revenue during the baseline period, is range from 0.6 (Alternative 2 low state of nature) to 1.7 (Alternative 1 high state of nature). Dover sole has higher ratios,2of the base case Alternative 1 attainment adjusted catch to baseline catch. Dover sole has the highest ratios, ranging from 1.6 (Alternative 3 base case) to 5.9 (Alternative 1 high state of nature). Overall, Alternative 1, high state of nature has the largest ratio, 4.0, while Alternative 2, low state of nature, has the smallest, 1.2. The ratios for Alternative 3, the preliminary preferred alternative, are fairly small. Comparing base case catches across the alternatives, it is clear that the state of nature has a greater influence of yields than the policy choice. The state of nature expresses uncertainty about stock assessment model parameters but could also be considered a proxy for unknown environmental variability.

It should be noted that these calculations assume that ACL attainment remains constant as ACLs change, which is unlikely. Depending on market demand for species, catch may not increase with increasing ACLs. On the other hand, ACL attainment could increase if the ACL for a species gets smaller.

These deterministic projections show increasing catches as stocks with biomasses below their target rebuild. But in a multispecies fishery involving a variety of different targeting strategies it is likely that one or more stocks will fall below their target biomasses, because of factors other than management policy dictating catch. According to the management framework more restrictive catch limits would be required for those stocks, potentially affecting harvesters who cannot avoid catching those species. Given the range of unpredictable exogenous factors influencing the proposed action (setting harvest specifications and related management measures) it is reasonable to conclude that across the action alternatives ex-vessel revenue from the groundfish fishery is unlikely to differ substantially from the baseline period. As shown in Table 3-1, annual average ex-vessel revenue during the baseline period has been $29 million for sablefish, $7.3 million for Dover sole, $4.6 million for petrale sole, and $2.9 million for shortspine thornyhead.

Table 4-149. Commercially important species baseline catch, ACL attainment, and summed attainment adjusted catch streams for action alternatives.

	Percent of Groundfish		2003-2012	ACL	Alt 1 (P*=0.45)		Alt. 2 (P* =0.25)		Alt. 3	Minimum
Stock	By weight	By value	Catch	Attainment	High	Base	Low	Base	Base	
Arrowtooth Flounder	9.3%	1.1%	33,985	38.1%	144,451	27,841	15,244	24,247	27,145	1,176
Dover Sole	31.1%	13.3%	89,812	58.5%	534,253	331,453	204,219	296,437	146,373	4,421
Lingcod - coastwide*	1.0%	1.2%	3,565	9.5%	5,070	4,030	2,626	3,200	3,956	17
Longspine Thornyhead - coastwide*	<0.5%	<0.5%	11,733	44.9%	29,729	16,308	7,776	12,051	15,245	423
Petrale Sole	6.8%	8.4%	18,874	73.2%	23,217	20,296	16,048	18,469	20,296	688
Sablefish	22.2%	52.6%	63,245	88.3%	108,890	75,408	36,071	64,955	72,898	2,164
Shortspine Thornyhead - coastwide*	3.4%	4.5%	11,218	73.9%	59,202	20,648	5,572	14,247	18,961	556
Total	**73.9%**	**81.3%**	**236,125**		**934,752**	**506,447**	**289,743**	**442,451**	**309,108**	**9,537**

*Sum of geographically defined component ACLs.

Table 4-150. Ratio of attainment adjusted projections to 2003-2012 catch. Cells with values greater than 1.5 shaded.

	Alt 1 (P*=0.45)		Alt. 2 (P* =0.25)		Alt. 3	Minimum
Stock	High	Base	Low	Base	Base	
Arrowtooth Flounder	4.3	0.8	0.4	0.7	0.8	<0.1
Dover Sole	5.9	3.7	2.3	3.3	1.6	<0.1
Lingcod - coastwide*	1.4	1.1	0.7	0.9	1.1	<0.1
Longspine Thornyhead - coastwide*	2.5	1.4	0.7	1.0	1.3	<0.1
Petrale Sole	1.2	1.1	0.9	1.0	1.1	<0.1
Sablefish	1.7	1.2	0.6	1.0	1.2	<0.1
Shortspine Thornyhead - coastwide*	5.3	1.8	0.5	1.3	1.7	<0.1
Total	**4.0**	**2.1**	**1.2**	**1.9**	**1.3**	**<0.1**

*Sum of geographically defined component ACLs.

4.10.2.2 Commercial Fisheries: Pacific Whiting

Ten-year projections were not made for Pacific whiting, because yield is highly variable and long-term projections were deemed unrealistic. It is also important to note that the proposed action does not include setting harvest specifications for Pacific whiting; these are set in an intergovernmental forum between the U.S. and Canada. However, whiting is considered in this impact evaluation because ex-vessel revenue from these fisheries is an important component of ex-vessel revenue for the target fisheries. In past groundfish harvest specifications EISs a baseline whiting ACL (e.g., the No Action amount) is ranged arbitrarily (e.g., +/- 50%) to consider potential economic impacts. During the baseline period total ex-vessel revenue from Pacific whiting (including the at-sea sectors) ranged from $16.9 to $66.8 million and this range holds going back to 1997, the first year that at-sea data are available. Arbitrarily increasing these extremes by 50% produces a long-term potential range in ex-vessel revenue from Pacific whiting fisheries of $8.5 to $100 million. In Section 4.3.2 whiting landings are ranged in a similar fashion to evaluate the socioeconomic impacts of 2015-2016 harvest specifications and management measures. But the baseline period used is 2005-2013, using 2013 price per pound without adjusting for inflation.

4.10.2.3 Commercial Fisheries: Nearshore Fixed Gear

4.10.2.4 Recreational Fisheries

4.10.2.5 Fishing Communities

4.11 Long-term Impacts of Setting Harvest Specifications and Management Measures on Essential Fish Habitat

A possible inference is that alternatives with higher ACLs will result in greater impacts to essential fish habitat (EFH). This is inferred from an assumption that higher ACLs provide more fishing opportunity, resulting in more fishing effort (measured, for example, by time fishing or tow distance). Greater fishing effort increases the total area of EFH affected by fishing gear or the likelihood that a vessel will encounter a protected species. This inference has been made in other studies, for example a recent NOAA Technical Memorandum on the co-occurrence of large whales and commercial fixed gear off the west coast. For a model used in this study landings data obtained through the Pacific Fisheries Information Network (PacFIN) was used to derive an estimate of fishing effort (Saez, et al. 2013).

With respect to the relationship between harvest specifications and EFH impacts, an analysis of groundfish trawl logbook data housed in the PacFIN data system, suggests a weak relationship between ACLs and fishing effort. Data were obtained from the lbk_trip and lbk_tow tables to compare tow time, a measure of effort, with the "hail weight" of each tow (hail weight is the harvester's estimate of the catch weight) over the 2003-2012 baseline period. After evaluating both tow distanc and tow time as effort metrics, tow time was chosen as the better metric for measuring effort, because it appears to better correlate with catch estimates. The logbook database includes a column coding a PacFIN target code; Dover sole, thornyheads and sablefish represent the bulk of the species targeted under several of these target codes so the analysis focuses on the DTS (Dover sole-thornyheads-sablefish) and sablefish strategies.

Table 4-151 shows the results of comparing logbook effort data (tow hours) for a longer time period to Observer Program catch estimates and ACLs. The left and center panels evaluate effort for the DTS PacFIN target. (DTS stands for Dover sole-thornyheads-sablefish, a trawl strategy targeting these species on the continental slope.) In the left panel DTS effort is compared to the catch and combined ACLs for the three constituent species while in the center panel it is compared to just sablefish catch and ACLs. This comparison is made because sablefish generates the bulk of revenue in the fishery and a large fraction of the ACL is caught (reported in the ACL Attainment column in each panel) so one might conclude that the sablefish ACL alone would influence the amount of catch and effort for all DTS. Table 4-152 shows r-squared values for the relationship between fishing effort and catch, the ACL and effort, and the ACL and catch for these different PacFIN targets. [50] (Because of the change in CPUE resulting from implementation of the IFQ program, as depicted in Figure 3-23, just the years 2002-2010 were also tested. Although r-squared values generally increased, the results are broadly similar and do not contradict the conclusion discussed below.)

[50] The r-squared value (Pearson product moment correlation coefficient) can be interpreted as the proportion of the variance in y attributable to the variance in x.

The only variables showing relatively close correlation are effort in the DTS fishery and West Coast Groundfish Observer Program (WCGOP) catch for these three species, and the sablefish ACL and WCGOP sablefish catch. In all cases fishing effort is poorly correlated with the ACL (the middle row in Table 4-152). These results could be explained in part by errors in the underlying data, if the PacFIN target codes do not correspond closely to catch composition. ACL attainment, the fraction of the ACL that is actually caught, also likely influences the relationship between the ACL and fishing effort. Dover sole is a good example, because a substantial increase in the ACL has not resulted in similar increases in catch (see the right panel in Table 4-151). This explains why the ACL is poorly correlated with catch and effort. Contrast this with the relationship between the sablefish ACL and sablefish catch; in this case most of the ACL is caught (and was exceeded in 2 years of the time series) so it makes sense that resulting r-square value is relatively large.

Table 4-151. Fishing effort, observed catch, and ACLs for three scenarios. Left, annual effort (tow hours) for the DTS Pacfin target compared to WCGOP estimated catch of Dover sole, thornyheads, and sablefish and summed ACLs for these species. Center, DTS effort compared to sablefish catch and ACLs. Right, Dover sole effort compared to catch and ACLs. In each panel ACL Attainment is catch divided by the ACL.

DTS	Hours	Catch	DTS ACLs	ACL Attainment
2002	16,437	15,251	15,647	97%
2003	12,506	16,324	17,845	91%
2004	9,825	15,110	19,060	79%
2005	6,277	15,668	26,368	59%
2006	8,135	15,018	18,872	80%
2007	11,322	17,856	26,763	67%
2008	32,127	20,745	26,763	78%
2009	44,515	23,206	29,571	78%
2010	35,236	21,290	28,790	74%
2011	18,823	16,437	36,285	45%
2012	17,360	14,355	36,032	40%

DTS	Hours	Sablefish Catch	Sablefish ACL	ACL Attainment
2002	16,437	4,886	4,596	106%
2003	12,506	5,840	6,794	86%
2004	9,825	6,251	7,981	78%
2005	6,277	6,576	7,761	85%
2006	8,135	6,455	7,634	85%
2007	11,322	5,524	5,933	93%
2008	32,127	6,051	5,933	102%
2009	44,515	7,429	8,423	88%
2010	35,236	7,190	7,729	93%
2011	18,823	6,546	6,813	96%
2012	17,360	5,384	6,645	81%

Dover	Hours	Catch	ACL	ACL Attainment
2002	17,093	7,227	7,440	97%
2003	24,165	7,736	7,440	104%
2004	17,264	7,155	7,440	96%
2005	19,670	7,608	14,952	51%
2006	19,675	6,929	7,564	92%
2007	27,068	10,222	16,500	62%
2008	18,489	11,758	16,500	71%
2009	9,693	12,475	16,500	76%
2010	6,989	10,894	16,500	66%
2011	7,027	7,901	25,000	32%
2012	7,673	7,134	25,000	29%

Table 4-152. R-squared values for the relationship between WCGOP catch, logbook effort (tow hours), and ACLs for different logbook targets, 2002-2012.

Indpendent v.-Dependent v.	DTS-DTS	DTS-Sablefish	Dover-Dover	Sablefish-Sablefish
Effort:Catch	0.81	0.27	0.02	0.008
ACL:Effort	0.15	0.03	0.37	0.01
ACL:Catch	0.07	0.72	0.07	0.72

A similar evaluation was conducted on those logbook records that are linked to corresponding fish tickets in the data system for the years 2003-2010 (again, the post-IFQ implementation period was excluded because of the change in CPUE). For this analysis, effort (tow time) was determined for PacFIN strategies for the DTS species.[51] Landings of these species from fish tickets corresponding to these logbook trips were also obtained. The correlation between tow hours for these strategies and landings aggregated annually was then evaluated. The r-squared value for catch against effort is 0.73 and for ACL against effort is 0.27.

These results suggest that changes in ACLs are not a good predictor of incidental impacts to EFH. In some of the scenarios tested here catch is a better predictor of fishing effort; even so, if is probably unreasonable to assume that catch projections could serve as a proxy for changes in fishing effort and

[51] The target codes used are 'DOVR', 'DTS', 'DVR1', 'LSP1', 'SABL', 'SSP1', and 'THHD'.

related impacts. More generally, no models have been developed to predict changes in the amount and distribution of fishing effort resulting from changes in harvest specifications and related management measures. Practically speaking, it is not be possible to differentiate between alternative harvest specifications with respect to impacts to EFH.

Given that there are not quantitative methods to project how changes in harvest specifications will affect the intensity and location of adverse impacts to EFH, but the description of effects during the baseline period in Chapter 3, including observed trends, reasonably characterizes the range of future effects. This supposition also holds true for protected species and non-groundfish species impacts.

These sections will be expanded to discuss trends observed during the baseline period and factors that could result in future impacts different from those that occurred during the baseline period.

4.12 Long-term Impacts of Setting Harvest Specifications and Management Measures on the California Current Ecosystem

Ten-year projections are used in the Atlantis model to evaluated ecosystem impacts. Model results will be reviewed by the SSC at the April 2014 Council meeting.

4.13 Long-term Impacts of Setting Harvest Specifications and Management Measures on Protected Species

4.14 Long-term Impacts of Setting Harvest Specifications and Management Measures on Non-groundfish Species

Chapter 5 CONSISTENCY WITH THE GROUNDFISH FMP AND MSA NATIONAL STANDARDS

Need to revise as necessary for the current EIS.

5.1 FMP Goals and Objectives

The Groundfish FMP contains 3 broad goals and 17 objectives intended to achieve those goals. Past EISs for rebuilding plans and harvest specifications describe how the actions address each objective. The proposed actions evaluated in the current EIS address the goals and objectives in a similar fashion as described in the previous groundfish harvest specifications EISs.

5.2 National Standards

An FMP or plan amendment and any pursuant regulations must be consistent with ten national standards contained in the MSA (§301). These are:

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the United States fishing industry.

The harvest specification action alternatives are consistent with the OY harvest management framework described in Chapter 4 of the Groundfish FMP. Chapter 4 describes OY as "a decisional mechanism for resolving the Magnuson Stevens Act's multiple purposes and policies, implementing an FMP's objectives and balancing the various interests that comprise the national welfare." The OY harvest management framework (as revised by Amendment 23 to the Groundfish FMP) is consistent with revised National Standard 1 Guidelines. In this EIS, Section 2.1 describes how the proposed harvest specifications were developed in relation to the OFL, ABC, and ACL reference points. The OFL is the estimate of catch level above which overfishing is occurring, or the estimate of MFMT applied to a stock's abundance. The ABC is a level of annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty. Chapter 4 in the Groundfish FMP describes an ABC control rule, ABC values described in this document were determined following that control rule. The ACL is the level of annual catch that serves as the basis for invoking Accountability Measures. The ACL may equal but may not exceed the ABC. The ACL may be set lower than the ABC to account for a wide range of factors. The application of the OY harvest management framework to the specifications described in this document should result in ACLs that reduce the likelihood of overfishing.

The revised National Standard 1 guidelines set forth principles on which stock complexes should be organized, including that stocks within a complex should be similar in terms of geographic distribution, life history, and vulnerability to the fishery. Stock complexes are being reexamined, and as necessary, reorganized, incrementally as scientific information and institutional resources allow. Until the stock complexes can be reorganized the current stock complexes will remain in place. At this time the current configuration of the stock complexes has not shown to allow overfishing on any species therefore allowing them to remain in place thorough the Council's reexamination does not pose a threat to the ongoing sustainability of any of the species in any complex. As part of this biennial cycle the Council is considering new sorting requirements in commercial fisheries for aurora, rougheye, and shortraker rockfish, which are part of the Minor Slope Rockfish complex north or 40°10' N. latitude. This requirement would provide information on the susceptibility of these species to groundfish fisheries. Future reorganization of stock complexes based on common biological characteristics, such as vulnerability, would benefit from this information.

Because of past overfishing seven groundfish stocks are currently declared overfished. Widow rockfish was determined to be rebuilt in 2011 and will no longer be managed under a rebuilding plan beginning in 2013. Petrale sole was declared overfished in 2010 based on a revision to the OY harvest management framework that incorporates estimates of B_{MSY} of $B_{25\%}$ and MSST of $B_{12.5\%}$ for flatfish. Petrale sole is estimated to be rebuilt in 2013, but will be managed under its rebuilding plan for the 2013-14 biennial cycle.

Of the remaining overfished species four will be managed under the current, default rebuilding plans, maintaining the same SPR harvest rate and target year. The best available scientific information indicates that there is a less than 50 percent probability that canary rockfish and POP can be rebuilt by the target years currently in their rebuilding plans, even in the absence of fishing (zero ACL at $T_{F=0}$). Therefore, the target years in these rebuilding plans must be revised. The preferred alternatives for these stocks maintains the default SPR harvest rate but revises the target year based on the median rebuilding year estimated in the most recent rebuilding analysis. For canary rockfish, the revised target year is 2030, 3 years later than the current target year but only 2 years later than the re-estimated $T_{F=0}$ zero harvest level. The re-estimated target year for POP based on the default harvest rate is 2051, 31 years after the current rebuilding target year but only 8 years after the estimated rebuilding year under zero harvest.

Section 304(e) introduces a tradeoff formulated as specifying a time to rebuild "as short as possible, taking into account the status and biology of any overfished stocks, the needs of fishing communities, … and the interaction of the overfished stock of fish within the marine ecosystem…" The proposed action is evaluated based on these considerations in Chapter 4 of this EIS.

National Standard 2 states that conservation and management measures shall be based on the best scientific information available.

The best available science standard applies to the following areas in relation to this proposed action: stock assessments, rebuilding analyses, and methods for determining management reference points (OFL, ABC, ACL, etc.), which forms the basis for determining harvest levels, and the evaluation of socioeconomic impacts. The supporting science is discussed below.

The harvest specifications (specifically, ACLs) considered under the proposed action (the action alternatives, including the Preferred Alternative), are based on the most recent stock assessments, developed through the peer-review STAR process. As part of the management cycle the Council recommends which stocks should be assessed in advance of current decision-making. Only a small proportion of the 80+ managed groundfish species are regularly assessed, because of a combination of factors. For many stocks there may not be enough data to support a full assessment (the FMP describes a classification system based on the availability of data). For unassessed stocks proxy methods must be used to determine reference points. Stocks may be subjected to little or no fishing pressure, or determined to have low vulnerability, and thus less in need of regular assessment. Finally, there is a limit on the institutional resources needed to carry out the assessments (i.e., fishery scientists). In some cases a previous assessment may be updated; this means that the underlying model is not reevaluated but the model is re-run with the addition of more recent data from the period since the last full assessment. Section 2.1 reviews the basis for alternative harvest specifications and references the stock assessments that were used.

The No Action Alternative specifications do not benefit from the new assessments and updates conducted as part of the current management cycle. For those stocks No Action does not represent the best available science.

Section 4.1 describes the methods that were used to determine reference points for harvest specifications (OFL, ABC, ACL, etc.) for stocks and stock complexes.

The NWFSC has developed a model application, called IO-Pac, for estimating personal income impacts of commercial fishing on the west coast. This model is documented in Appendix A.

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Groundfish ACLs are set for management units, which include stocks, stock complexes, or geographic subdivisions thereof. Stock complexes group co-occurring species, many of which have not been formally assessed. Section 2.1.3 describes how ACLs for stock complexes are developed based on ABC estimates of component stocks. Stocks within these complexes are not managed individually for a variety of reasons including the lack of assessments, lack of reliable catch data at the species level, or they constitute a small portion of catches. If a stock within a complex is individually assessed it may be managed under a separate harvest limit, when practicable.

Stocks with their own ACLs are managed throughout the range of that stock (as opposed to the species), although issues do arise in the case of stocks straddling international borders. For this reason, allocation of the harvestable surplus of Pacific whiting between the U.S. and Canada is subject to international agreement.

Separate ACLs may be set for geographic subcomponents of a stock for management purposes. However, the development of subcomponent ACLs is based on managing these stocks throughout their range within U.S. waters. As part of the proposed action the Council is considering a change in the scope of subcomponent ACLs for lingcod that would better reflect biological and fishery characteristics. Currently lingcod is managed in two area components, north and south of 42° N. latitude. Under the proposed action the dividing line would be moved to 40°10’ N. latitude, near Cape Mendocino. Cape Mendocino is a biogeographic boundary and as such 40°10’ N. latitude is commonly used in groundfish fishery management for the differential application of management measures.

National Standard 4 states that 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 fishers, such allocation shall be (A) fair and equitable to all such fishers; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The proposed measures will not discriminate between residents of different states.

Allocation decisions are also made as part of the biennial harvest specifications process for those stocks for which formal allocations have not been established under the FMP. Section 2.2.2 describes these allocation decisions. Emphasis is placed on equitable division while ensuring conservation goals. Decision-making on these allocations occurs through the Council process, which facilitates substantial participation by state representatives. Generally, state proposals are brought forward when alternatives are crafted and integrated to the degree practicable.

National Standard 5 states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

Measures have been taken to reduce fishing capacity in the limited entry trawl fleet and nontrawl fleets, including: fixed gear permit stacking program implemented by FMP Amendment 14, the trawl vessel buyback program, and catch share management implemented by FMP Amendment 20. Reducing excess capacity is expected to improve the efficiency in the utilization of fishery resources as well as reduce the levels of incidental catch.

Catch share management in the at-sea whiting sectors and the shoreside IFQ fishery promote efficiency of utilization by reducing regulatory discards. Vessels in these fisheries are subject to 100 percent observer coverage, which improves catch accounting.

National Standard 6 states that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

Management measures reflect differences in catch, and in particular bycatch, of overfished species, among different fisheries. For example, different RCA configurations are established for different gear types (trawl versus fixed gear) and the catch control tools also differ. For example, at-sea whiting fisheries are managed by co-ops, the shoreside IFQ fishery by IFQs, and limited entry fixed gear fishery for sablefish by vessel-level allocations (permit stacking). Within these fisheries and in the open access sector cumulative trip limits are used for particular management units and/or during certain times of the year. Recreational fisheries are managed with area closures and bag limits proposed by the states and appropriate to the catches and characteristics of each state's recreational fishery.

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

Generally, by coordinating management, monitoring, and enforcement activities between the three west coast states, duplication, and thus cost, is minimized. Appendix C evaluates proposed management measures in detail, including consideration of associated costs and duplication.

National Standard 8 states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), … take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

This document evaluates the effects of the alternatives on fishing communities (see section 4.3). These effects were taken into account in choosing the preferred "integrated alternative" (incorporating harvest specifications and related management measures). The alternatives are structured to allow a comparison of the tradeoffs between the requirements of the MSA. The requirements in Section 304(e)(4)(A) of the MSA include rebuilding overfished stocks in as short a time possible, taking into account the needs of fishing communities, and minimizing adverse economic impacts to fishing communities. Each integrated alternative contains a suite of ACLs for overfished species associated with a particular rebuilding strategy (target year and harvest rate) and management measures needed to constrain catches to these harvest levels. Target species catch for each alternative is projected based on these management measures, which allows an estimate of resulting ex-vessel revenue and personal income impacts at the community level (with the port group area the unit of analysis for community impacts). In this way the 'rebuild in as short a time as possible' standard can be contrasted with the 'needs of fishing communities' standard to demonstrate what level of catch or bycatch of overfished species is necessary to address adverse impacts to fishing communities.

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Minimizing bycatch, of overfished species in particular, is an important component of the alternatives. Through the use of GCAs fishing effort is reduced in areas where overfished species are most abundant, thereby reducing potential bycatch. As noted above, catch share management, particularly in the shoreside IFQ fishery, has reduced bycatch by eliminating most regulatory discards (some non-target species are managed with cumulative trip limits, which may induce some level of regulatory discards). Nontrawl sectors use cumulative trip limits as the principal catch control tool. Because trip limits are based on landings, when they are set at a low level to discourage directed and incidental catch of overfished species, this can result in regulatory discards.

The petrale sole rebuilding plan established objectives reflecting that it is an important target species for vessels using groundfish bottom trawl gear (managed under the shoreside IFQ fishery). The rebuilding plan allows a limited target fishery to continue, which in concert with IFQ management minimizes discards.

The at-sea whiting sectors are managed under bycatch limits for selected overfished species. Mandatory co-ops in the mothership sector are allocated a portion of these sector bycatch limits and are accountable for keeping catch of these species within their allocation. The catcher-processor operates as a single, voluntary co-op responsible for the bycatch limit assigned to the sector.

As noted above, the at-sea whiting sectors and shoreside IFQ fishery are subject to 100 percent observer coverage. While necessary for catch accounting under IFQ/co-op management, observers also allow complete monitoring of total catch (including bycatch). The limited entry fixed gear sector and directed open access fisheries are subject to partial observer coverage. This observer data is used to develop bycatch rate estimates, which can be used to forecast and account for total catch of all managed species.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

RCAs may affect safety if more vessels elect to fish seaward of the closed areas and are more exposed to bad weather conditions. Individual accountability under catch share management has resulted in vessels fishing more often seaward of the RCA in order to avoid catch of species such as canary and yelloweye rockfish, for which the allocations and resulting available QP are limited. As harvesters gain experience with the management program they may be able to develop opportunities to fish shoreward of RCAs while avoiding catch of these species, resulting in more inshore fishing.

The moratorium on quota share trading is expected to sunset beginning in 2013, which may lead to further capacity reduction and increased profits in the trawl sector. This may result in more investment in vessels and equipment that would enhance safety. Less efficient vessels are expected to leave the trawl fishery as part of this consolidation, which may eliminate older, less safe vessels.

For vessels electing to increase the amount of time fishing seaward of RCAs, implementing a VMS capable of sending distress calls could provide some mitigation. Although units with this capability have been approved for use, vessel owners are not required to purchase a unit with this capability. Also, by providing near real-time vessel position data, VMS could aid in search and rescue operations.

5.3 Other Applicable MSA Provisions

Harvest specifications are set based on targets established in overfished species rebuilding plans, which conform to Section 304(e) Rebuild Overfished Fisheries. Rebuilding plans contain the elements required by Section 304(e)(4) and discussed in the NS1 Guidelines (50 CFR 600.310).

NMFS prepared an EIS evaluating programmatic measures designed to identify and describe west coast groundfish EFH (NMFS), and minimize potential fishing impacts on west coast groundfish EFH. The Council took final action amending the groundfish FMP to incorporate new EFH provisions in November 2005. NMFS partially approved the amendment in March 2006. Implementing regulations became effective in June 2006. The effects of the proposed actions on groundfish EFH are within the scope of effects evaluated in the programmatic groundfish EFH EIS. The Council commenced a 5-year review of its groundfish EFH designation in December 2010. Section 4.1.4 in this EIS describes impacts of the proposed action on EFH, consistent with the EFH assessment requirements of 50 CFR 600.920 (e)(3).

5.4 Public Scoping under MSA

The Council process, which is based on stakeholder involvement and allows for public participation and public comment on fishery management proposals during Council, subcommittee, and advisory body meetings, is the principal mechanism to scope the biennial specifications process. The advisory bodies involved in groundfish management include the GMT, with representation from state, Federal, and tribal fishery scientists; and the Groundfish Advisory Subpanel (GAP), whose members are drawn from the commercial, tribal, and recreational fisheries, fish processors, and environmental advocacy organizations. Meetings of the Council and its advisory bodies constitute the Council scoping process, involving the development of alternatives and consideration of the impacts of the alternatives. In addition to Council-sponsored meetings, the Washington Department of Fish and Wildlife (WDFW), ODFW and CDFG held public hearings to solicit input on the formulation of management measures.

Table 5-1 summarizes Council decision-making steps in developing biennial harvest specifications and management measures.

Table 5-1.Summary of Council decision-making during biennial harvest specifications process.

Council meeting	Council Actions
June 20-25, 2013	Set schedule for developing 2013-14 harvest specifications and conduct preliminary review of stock status information.
September 12-17, 2013	Adopt new stock assessments for use in management, OFLs, and a range of ABC values; prioritize a range of new management measures for preliminary analysis.
November 1-6, 2013	Adopt overfished species rebuilding analyses; adopt ABCs for analysis; identify tentative range of allocation alternatives. Review exempted fishing permits for 2015-16. Adopt new management measures for detailed analysis.
March 8-13, 2014	
April 5-10, 2014	Adopt preferred alternative ACLs and narrow the range of allocations and management measures under consideration.
June 20-25, 2014	Adopt final preferred alternative including all elements for the 2015-16 management program.

Chapter 6 NEPA AND OTHER APPLICABLE LAWS

This chapter will be updated as necessary.

6.1 National Environmental Policy Act

The CEQ has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508), and NOAA's agency policy and procedures for NEPA can be found in NOAA Administrative Order 216-6 (NAO 216-6). The required elements of an Environmental Impact Statement (EIS) and the public process associated with an EIS are specified in both CEQ's regulations and NAO 216-6.

The required elements of an EIS are as follows (as per NAO 216-6 5.04b):

- A cover sheet and table of contents;
- A discussion of the purpose and need for the action;
- A summary of the EIS, including the issues to be resolved, and in the FEIS, the major conclusions and areas of controversy including those raised by the public;
- Alternatives, as required by Sections 102(2)(C)(iii) and 102(2)(E) of NEPA;
- A description of the affected environment;
- A succinct description of the environmental impacts of the proposed action and alternatives, including cumulative impacts;
- A listing of agencies and persons consulted, and to whom copies of the EIS are sent;
- A ROD, in the case of a FEIS, and;
- An index and appendices, as appropriate.

Comments received on this DEIS will be considered and responded to in the FEIS. After the comments are considered, NMFS will publish a Notice of Availability for a 30-day public comment period for the FEIS and will conclude the NEPA process with a Record of Decision documenting whether to approve, partially approve, or disapprove this proposed action under the MSA.

6.2 Notice of Intent and Public Scoping Under NEPA

The National Marine Fisheries Service in coordination with the Pacific Fishery Management Council published a Notice of Intent (NOI) on Month, day, 2013, to announce the intent to develop and prepare an EIS. This EIS will include analysis of the long-term impacts of setting harvest specifications (including OFLs, ABCs, and ACLs) and management measures including the 2015-16 biennial period, pursuant to the Pacific Coast Groundfish Fishery Management Plan.

The purpose of the NOI was to alert the interested public of the commencement of the scoping process and to provide for public participation in compliance with the National Environmental Policy Act. The scoping process is the first and best opportunity for the public to raise issues and concerns for the Council and NMFS to consider during the development of the harvest specifications and management measures.

The Council and NMFS rely on input during scoping to both identify management measures and develop alternatives that meet the objectives of the Pacific Coast Groundfish FMP.

The public comment period was open for thirty days, ending on Month, day, 2013. A summary of public comments received during the thirty-day public comment period will be included here.

6.3 Related NEPA documents

The following NEPA documents provide information and analyses related to the effects of this proposed action:

- Trailing Actions for the Pacific Coast Groundfish Trawl Rationalization Program, Including 1. Pacific Halibut Trawl Bycatch Mortality Limit (Amendment 21-1); 2. Exemption from the Prohibition on Processing At Sea in the Shorebased IFQ Program, DRAFT Environmental Assessment. Published by the Pacific Fishery Management Council in July 2011. (http://www.pcouncil.org/groundfish/fishery-management-plan/amendment-21-1/)
- Proposed Harvest Specifications and Management Measures for the 2013-2014 Pacific Coast Groundfish Fishery and Amendment 21-2 to the Pacific Coast Groundfish Fishery Management Plan; Final Environmental Impact Statement. Published by the Pacific Fishery Management Council and NMFS in September 2012. (http://www.pcouncil.org/groundfish/fishery-management-plan/amendment-21-2/)
- Amendment 23: Considerations for a New Harvest Specification Framework that Incorporates Revised National Standard 1 Guidelines to Prevent Overfishing, Environmental Assessment. Published by the Pacific Fishery Management Council and NMFS in September 2010. (http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-23/)
- Allocation of Harvest Opportunity between Sectors of the Pacific Coast Groundfish Fishery (Amendment 21 to the Groundfish FMP); Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Published by the Pacific Fishery Management Council and NMFS in June 2010.(http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-21/)
- Rationalization of the Pacific Coast Groundfish Limited Entry Trawl Fishery (Amendment 20 to the Groundfish FMP); Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Published by the Pacific Fishery Management Council and NMFS in June 2010. (http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-20/#EIS)

Information may be incorporated by reference from these documents into this EIS. Council on Environmental Quality (CEQ) regulations (40 CFR 1502.21) state "Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described." When information from the above document is incorporated, these procedures are followed within the body of this EIS.

6.4 Preparers and Listing of Agencies and Persons Consulted

The following people wrote the EIS:

- Kelly Ames, Pacific Fishery Management Council: Sections
- Christopher "Kit" Dahl, Pacific Fishery Management Council: Sections
- John DeVore, Pacific Fishery Management Council: Sections

- Kerry Griffin, Pacific Fishery Management Council: Sections
- Becky Renko, National Marine Fisheries Service, Northwest Region: Sections
- Edward Waters, Contracting Economist: Sections

This EIS was prepared and evaluated in consultation with the National Marine Fisheries Service and the Pacific Fishery Management Council. In addition, members of the Groundfish Management Team (GMT) and the Scientific and Statistical Committee (SSC) prepared and reviewed portions of the analyses and provided technical advice during the development of the EIS. Members of Council advisory bodies are listed in rosters available at http://www.pcouncil.org/council-operations/council-and-committees/council-and-committee-rosters/. In addition the following persons were consulted or were involved in reviewing drafts of the document:

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- Ryan Couch, NOAA GC, Attorney
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- Mariam McCall, NOAA GC, Attorney
- Sarah Williams, NMFS NWR, Groundfish Section
- Becky Renko, NMFS NWR, Groundfish Section
- Others TBD

6.5 DEIS Distribution List

The Council makes the EIS available on its website so anyone with computer access may download a copy of the document. Electronic copies on CD-ROM and paper copies are made available upon request. The Council distributes a notice of availability for the EIS through its electronic mail list, which includes state and Federal agencies, tribes, and individuals. Copies of the FEIS are sent to anyone who comments on the DEIS. In addition, NMFS distributes copies of the EIS to the following agencies:

- Department of Interior,
- Department of State,
- U.S. Coast Guard Commander Pacific Area,
- Marine Mammal Commission,
- Pacific States Marine Fisheries Commission, and
- Environmental Protection Agency.

As part of the review process for consistency with applicable laws such as the CZMA, NMFS also distributes the EIS to the following coastal states and agencies:

- Washington Coastal Zone Management Program, Shoreline Environmental Assistance, Department of Ecology, Washington State;
- Ocean-Coastal Management Program, Department of Land Conservation and Development, State of Oregon; and
- California Coastal Commission.

Members of the public may also request to be on the distribution list. The following individuals have requested copies of the EIS:

TBD

In addition, a Notice of Availability of the DEIS is also published in the *Federal Register*. The DEIS is available for a 45-day public comment period. During this time, any member of the public may call the Council office and request a copy of the DEIS for their review.

Questions concerning this document and requests for additional copies of this document may be addressed to:

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6.6 Addressing NEPA in Subsequent Biennial Cycles

The adoption and adjustment of regulations for managing the groundfish fishery (including harvest specifications and management measures) is an ongoing, adaptive process. Changes in the type and intensity of environmental impacts tend not to differ substantially from one period to the next. With this view in mind this EIS evaluates the impacts of the ongoing action over a longer time period than 2 years. Biennial changes to the management program may then be subject to more focused analyses, as described below based on Council on Environmental Quality (CEQ) guidelines for supplementing and/or tiering from a previously prepared NEPA document.

When harvest specifications (and related management measures) are periodically adjusted, NMFS will determine whether to supplement this EIS or prepare a tiered NEPA analysis. These methods and the circumstances where they could be applied are discussed below.

CEQ regulations identify two conditions that trigger the need to “supplement” a NEPA document: (1) Has the agency made substantial changes in the proposed action that are relevant to environmental concerns?; (2) Are there significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts? (See 40 CFR 1502.9(c)(1)). If the answer to these questions is “no,” then no additional NEPA analysis is needed. The rationale for the agency’s “no” finding must be adequately documented in the administrative record. Agencies, including NMFS, have used a “supplemental information report” (SIR) format to document these findings. Circumstances where this EIS would be supplemented could arise if the Council makes substantial changes to harvest policies, such as changing proxy values for F_{MSY} or adopting several new rebuilding plans for key stocks.

Alternatively, if circumstances have changed such that additional NEPA documentation may be required, the concept of “tiering,” introduced in CEQ regulations, would be used: “Whenever a broad environmental impact statement has been prepared (such as a program or policy statement) and a subsequent statement or environmental assessment is then prepared on an action included within the entire program or policy (such as a site specific action) the subsequent statement or environmental assessment need only summarize the issues discussed in the broader statement and incorporate discussions from the broader statement by reference and shall concentrate on the issues specific to the subsequent action.” (40 CFR 1502.20) If, when harvest specifications and management measures are periodically adjusted, it is determined that this EIS does not address the environmental impacts of the proposed action, a subsequent tiered NEPA document would be prepared. The tiered NEPA document would be narrowly focused on those aspects of the proposal that may have environmental impacts different from those identified in this EIS. For example, the tiered NEPA document could focus on changes to harvest control rules that were not analyzed in this EIS.

6.7 Administrative Procedure Act

The Administrative Procedures Act, or APA, governs the Federal regulatory process and establishes standards for judicial review of Federal regulatory activities. Most Federal rulemaking, including regulations promulgated pursuant to the MSA, are considered “informal,” which is determined by the controlling legislation. Provisions at 5 U.S.C. 553 establish rulemaking procedures applicable to the proposed action. Section 6.2 in the Groundfish FMP (PFMC 2011) specifies that biennial harvest specifications and management measures require ‘full notice-and-comment rulemaking’ to implement the regulations necessary to implement the Council recommendation. The rulemaking associated with this proposed action will be conducted in accordance with the APA and procedures identified in section 304 of the MSA.

6.8 Additional Laws and Executive Orders Applicable to the Proposed Action

In addition to the Magnuson-Stevens Act (see Chapter 5), the National Environmental Policy Act, and the Administrative Procedure Act there are other laws and Federal Executive Orders that may impose substantive and procedural requirements on the proposed action. These other laws and executive orders are described below.

6.8.1 Coastal Zone Management Act:

Section 307(c)(1) of the Federal Coastal Zone Management Act (CZMA) of 1972 requires all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. A determination as to whether the proposed action is would be implemented in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved coastal zone management programs of Washington, Oregon, and California will be submitted to the responsible state agencies for review under Section 307(c)(1) of the CZMA. The relationship of the groundfish FMP with the CZMA is discussed in Section 11.7.3 of the Groundfish FMP. The Groundfish FMP has been found to be consistent with the Washington, Oregon, and California coastal zone management programs.

6.8.2 Endangered Species Act

The Endangered Species Act of 1973 (ESA) was signed on December 28, 1973, and provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The ESA replaced the Endangered Species Conservation Act of 1969; it has been amended several times.

A “species” is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future.

Federal agencies are directed, under section 7(a)(1) of the ESA, to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Federal agencies must also consult with NMFS or USFWS, under section 7(a)(2) of the ESA, on activities that may affect a listed species. These interagency consultations, or section 7 consultations, are designed to assist Federal agencies in fulfilling their duty to ensure Federal actions do not jeopardize the continued existence of a species or destroy or adversely modify critical habitat. Should an action be determined to jeopardize a species or result in the destruction or adverse modification of critical habitat, NMFS or USFWS will suggest Reasonable and Prudent Alternatives (RPAs) that would not violate section 7(a)(2).

Biological opinions document whether the Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of critical habitat. Where appropriate, biological opinions provide an exemption for the "take" of listed species while specifying the extent of take allowed, the Reasonable and Prudent Measures (RPMs) necessary to minimize impacts from the Federal action, and the Terms and Conditions with which the action agency must comply.

This section will be updated with finding from the most recent BiOps.

6.8.3 Marine Mammal Protection Act

The MMPA of 1972 is the principle Federal legislation that guides marine mammal species protection and conservation policy in the United States. Under the MMPA, NMFS is responsible for the management and conservation of 153 stocks of whales, dolphins, porpoise, as well as seals, sea lions, and fur seals; while the USFWS is responsible for walrus, sea otters, and the West Indian manatee.

Off the west coast, the Steller sea lion (*Eumetopias jubatus*) eastern stock, Guadalupe fur seal (*Arctocephalus townsendi*), and Southern sea otter (*Enhydra lutris*) California stock are listed as threatened under the ESA. The sperm whale (*Physeter macrocephalus*) Washington, Oregon, and California stock, humpback whale (*Megaptera novaeangliae*) Washington, Oregon, and California - Mexico Stock, blue whale (*Balaenoptera musculus*) eastern north Pacific stock, and Fin whale (*Balaenoptera physalus*) Washington, Oregon, and California stock are listed as depleted under the MMPA. Any species listed as endangered or threatened under the ESA is automatically considered depleted under the MMPA.

Pursuant to the MMPA, the List of Fisheries (LOF) classifies U.S. commercial fisheries into one of three Categories according to the level of incidental mortality or serious injury of marine mammals:
I. frequent incidental mortality or serious injury of marine mammals
II. occasional incidental mortality or serious injury of marine mammals
III. remote likelihood of/no known incidental mortality or serious injury of marine mammals

The Marine Mammal Protection Act (MMPA) mandates that each fishery be classified by the level of serious injury and mortality of marine mammals that occurs incidental to each fishery is reported in the annual Marine Mammal Stock Assessment Reports for each stock. On the 2012 List of Fisheries the WA/OR/CA sablefish pot fishery is listed as a category II fishery due to interactions with humpback whales. All other west coast groundfish fisheries are listed as category III fisheries. (See http://www.nmfs.noaa.gov/pr/interactions/lof/final2012.htm. [update with Final 2013 LOF when available].)

Commercial fishing vessels participating in Category I or II fisheries must be covered by a Federal permit under the MMPA. For most fisheries, including all west coast fisheries, a blanket permit is issued for all Federal or state permits authorizing participation in the fishery.

6.8.4 Migratory Bird Treaty Act

The MBTA of 1918 was designed to end the commercial trade of migratory birds and their feathers that, by the early years of the 20th century, had diminished the populations of many native bird species. The MBTA states that it is unlawful to take, kill, or possess migratory birds and their parts (including eggs, nests, and feathers) and is a shared agreement between the United States, Canada, Japan, Mexico, and

Russia to protect a common migratory bird resource. The MBTA prohibits the directed take of seabirds, but the incidental take of seabirds does occur.

6.8.5 Paperwork Reduction Act

The Paperwork Reduction Act requires that agency information collections minimize duplication and burden on the public, have practical utility, and support the proper performance of the agency's mission.

6.8.6 Regulatory Flexibility Act

The Regulatory Flexibility Act requires government agencies to assess the effects that regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those effects. A fish-harvesting business is considered a "small" business by the Small Business Administration if it has annual receipts not in excess of $4.0 million. For related fish-processing businesses, a small business is one that employs 500 or fewer persons. For wholesale businesses, a small business is one that employs not more than 100 people. For marinas and charter/party boats, a small business is one with annual receipts not in excess of $6.5 million. If the projected impact of the regulation exceeds $100 million, it may be subject to additional scrutiny by the Office of Management and Budget

6.8.7 Executive Order12866 (Regulatory Impact Review)

EO 12866, Regulatory Planning and Review, covers a variety of regulatory policy considerations and establishes procedural requirements for analysis of the benefits and costs of regulatory actions. It directs agencies to choose those approaches that maximize net benefits to society, unless a statute requires another regulatory approach. The agency must assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only after reasoned determination the benefits of the intended regulation justify the costs. In reaching its decision, the agency must use the best reasonably obtainable information, including scientific, technical and economic data, about the need for and consequences of the intended regulation. NMFS requires the preparation of a regulatory impact review (RIR) for all regulatory actions of public interest. The purpose of the analysis is to ensure the regulatory agency systematically and comprehensively considers all available alternatives, so the public welfare can be enhanced in the most efficient and cost-effective way. The RIR addresses many of the items in the regulatory philosophy and principles of EO 12866.

6.8.8 Executive Order 12898 (Environmental Justice)

EO 12898 obligates Federal agencies to identify and address "disproportionately high adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States" as part of any overall environmental impact analysis associated with an action. NOAA guidance, NAO 216-6, at Section 7.02, states that "consideration of EO 12898 should be specifically included in the NEPA documentation for decision-making purposes." Agencies should also encourage public participation, especially by affected communities during scoping, as part of a broader strategy to address environmental justice issues.

6.8.9 Executive Order 13132 (Federalism)

EO 13132, which revoked EO 12612, an earlier federalism EO, enumerates eight "fundamental federalism principles." The first of these principles states "Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people." In this spirit, the EO directs agencies to consider the implications of policies that may limit the scope of or preempt states' legal authority. Preemptive action having such "federalism implications" is subject to a consultation process with the states; such actions should not create unfunded mandates for the states; and any final rule published must be accompanied by a "federalism summary impact statement."

6.8.10 Executive Order 13175 (Consultation and Coordination with Indian Tribal Government)

EO 13175 is intended to ensure regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes.

The Secretary recognizes the sovereign status and co-manager role of Indian tribes over shared Federal and tribal fishery resources. In Section 302(b)(5), the MSA reserves a seat on the Council for a representative of an Indian tribe with Federally-recognized fishing rights from California, Oregon, Washington, or Idaho.

The U.S. government formally recognizes the four Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish. In general terms, the quantification of those rights is 50 percent of the harvestable surplus of groundfish available in the tribes' U and A fishing areas (described at 50 CFR 660.324). Each of the treaty tribes has the discretion to administer their fisheries and to establish their own policies to achieve program objectives.

6.8.11 Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)

EO 13186 supplements the MBTA (above) by requiring Federal agencies to work with the USFWS to develop memoranda of agreement to conserve migratory birds. NMFS is in the process of implementing a memorandum of understanding. The protocols developed by this consultation will guide agency regulatory actions and policy decisions in order to address this conservation goal. The EO also directs agencies to evaluate the effects of their actions on migratory birds in environmental documents prepared pursuant to the NEPA.

6.9 Findings

The Council process and this EIS are intended, where possible, to meet the public involvement requirements and provide the information and analysis necessary to address the mandates described above. Mandates that require additional analysis, documentation, and process not met through NEPA are discussed in section 6.10 below. The information and analysis in this EIS supports the following findings with respect to other applicable law.

Coastal Zone Management Act: Harvest specifications and management measures for 2015-2016 are not expected to affect any state's coastal management program.

ESA: NMFS and USFWS conducted a section 7 consultations to determine whether activities authorized under groundfish regulations in 2013 and subsequent years are likely to jeopardize the continued existence of any species listed under the ESA. Findings (Incidental Take Statements, Reasonable and Prudent Measures, etc.) are summarized here.

Marine Mammal Protection Act: Section 4.x describes new information about the incidental take of marine mammals and section 4.x assesses the effects of the proposed action on marine mammals. Although the operation of groundfish fisheries may differ from previous management cycles there is insufficient information to predict whether the effects on marine mammals will differ from previous management cycles.

Migratory Bird Treaty Act: The proposed action is unlikely to cause the incidental take of seabirds protected by the Migratory Bird Treaty Act to differ substantially from levels in previous years. Past EISs evaluating the impact of groundfish harvest specifications (PFMC 2006; PFMC 2008; PFMC and NMFS 2011) evaluated impacts to seabirds and concluded that the proposed action will not significantly impact seabirds. (Section 4.x evaluated impacts of the proposed action on protected species)

Paperwork Reduction Act: The proposed action, as implemented by any of the alternatives considered in this EIS, does not require collection-of-information subject to the Paperwork Reduction Act.

Executive Order 12898 (Environmental Justice): The proposed action will not result in disproportionate adverse impacts to low income and minority communities (see section 4.x).

Executive Order 13132 (Federalism): The proposed action does not have federalism implications subject to EO 13132.

Executive Order 13175 (Consultation and Coordination with Indian Tribal Government): Harvest specifications and management measures for 2015-2016 have been developed in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.

Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds): See the finding for the Migratory Bird Treaty Act, above.

6.10 Mandates Addressed Through Separate or Parallel Processes

6.10.1 ESA

NMFS Northwest Region Sustainable Fisheries Division consulted with the Protected Resources Division and with the USFWS pursuant to section 7(a)(2) of the ESA on the effects of the operation of the Pacific coast groundfish fishery in 2013 and subsequent years. Outcomes implemented outside of the biennial harvest specifications process are summarized here.

6.10.2 Executive Order 12866 (Regulatory Impact Review) and the Regulatory Flexibility Act

NMFS develops the necessary analysis and documentation needed to address these mandates as part of the Federal rulemaking process implementing groundfish harvest specifications and management measures. These analyses rely substantially on the contents of this EIS and the socioeconomic impact evaluation in Chapter 4 and baseline information in Chapter 3, which have been developed in conjunction with NMFS NWR staff to provide information needed for the Regulatory Impact Review and Regulatory Flexibility Act analyses.

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Caption
Landings (shoreside commercial and tribal) by species group (mt), 1981-2012
Ex-vessel revenue (shoreside commercial and tribal) by species group in current (2012) dollars, $1,000s, 1981-2012.
Groundfish landings (shoreside commercial and tribal) by species or species group (mt), 1981-2012.
Groundfish ex-vessel revenue (shoreside commercial and tribal) by species or species group in current (2012) dollars, $1,000s, 1981-2012.
Groundfish landings (shoreside commercial and tribal) by gear type (mt), 1991-2012.
Groundfish ex-vessel revenue (shoreside commercial and tribal) by gear type in current (2012) dollars, $1,000s, 1981-2012.
Shoreside IFQ - Trawl (whiting and nonwhiting) by groundish species or species group (mt), 2003-2012.
Shoreside IFQ - Trawl (whiting and nonwhiting) ex-vessel revenue by groundish species or species group in current (2012) dollars, $1,000s, 2003-2012.
Shoreside IFQ - Nontrawl by groundish species or species group (mt), 2011-2012.
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Limited entry fixed gear landings by groundish species or species group (mt), 2003-2012.
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Open access landings (other than by fixed gear gear) by groundish species or species group (mt), 2003-2012.
Open access ex-vessel revenue (other than by fixed gear) by groundish species or species group in current (2012) dollars, $1,000s, 2003-2012.
Nonnearshore fixed gear landings by groundish species or species group (mt), 2003-2012.
2012.
Nearshore fixed gear landings by groundish species or species group (mt), 2003-2012.
Nearshore fixed gear ex-vessel revenue by groundish species or species group in current (2012) dollars, $1,000s, 2003-2012.
Incidental open access landings by groundish species or species group (mt), 2003-2012.
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Nonnearshore Nonsablefish landings by groundish species or species group (mt), 2003-2012.
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Groundish landings by shoreside commercial fishery sectors (mt), 2003-2012.
Groundish ex-vessel revenue in current (2012) dollars, $1,000s, by shoreside commercial fishery sectors, 2003-2012.
Treaty nonwhiting groundfish sector landings (groundfish only) by gear group (mt), 2003-2012.
Treaty nonwhiting groundfish sector ex-vessel revenue (groundfish only), current (2012) dollars, $1,000s, 2003-2012.
Landings (mt) by whiting sectors, 2003-2012.
Ex-vessel revenue, current (2012) dollars, $1,000s, by whiting sectors, 2003-2012.
Average monthly landings (mt) by commercial fishery sectors, 5 years, 2008-2012 (except as noted).
Average monthly ex-vessel revenue in nominal dollars, $1,000s, by commercial fishery sectors, 5 years, 2008-2012 (except as r
Average monthly landings (mt) by Treaty fishery sectors, 5 years, 2008-2012.
Average monthly ex-vessel revenue in nominal dollars, $1,000s, by Treaty fishery sectors, 5 years, 2008-2012.
Average monthly groundfish landings (mt) by species and species groups, 5 years, 2008-2012.
Average monthly groundfish ex-vessel revenue in nominal dollars, $1,000s, by species and species groups, 5 years, 2008-2012.
Groundfish landings (mt) by "IOPAC port groups", 2003-2012
Groundish ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups", 2003-2012.
Landings (mt) ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups" and species and species groups, 2010-2012
Landings (mt) ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups" and commercial fishery sectors, 2010-2012
Number of vessels making at least one groundfish landing by "IOPAC port groups" and commercial fishery sectors, 5 years 2008-2012.
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Engagement (groundfish ex-vessel revenue in port as percent of ex-vessel coastwide revenue) and dependence (groundfishex-vessel revenue in port as percent of total ex-vessel revenue in port), using current (2012) dollars, 2003-2012.
Groundfish landings (mt) on west coast (Washington-Oregon-California) from inside and outside the Pacific Council management area.
Inflation adjustment. (Source: Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product, 2005=100, March 28, 2013)

ıoted).

Table 1a. Landings (shoreside commercial and tribal) by species group (mt), 1981-2012.

Year	CPS	CRAB	Groundfish	HMS	Other	Salmon	Shellfish
1981	139,770	9,652	103,344	26,883	14,787	7,972	10,813
1982	126,970	8,235	119,356	17,272	12,173	8,823	3,623
1983	69,346	7,862	98,978	55,062	11,011	2,935	3,288
1984	63,822	7,177	89,804	43,992	10,653	2,178	3,661
1985	68,174	8,559	90,923	14,249	13,603	5,046	2,447
1986	84,042	8,390	82,480	13,011	19,753	7,377	508
1987	90,441	9,373	91,982	12,881	24,553	9,410	458
1988	108,364	17,509	92,248	15,005	27,920	12,515	344
1989	113,412	16,814	99,372	7,711	30,985	6,869	425
1990	88,510	14,507	94,539	9,886	29,739	4,685	320
1991	90,592	7,027	105,547	11,007	25,043	3,734	262
1992	60,596	15,882	132,555	13,608	19,227	2,048	328
1993	79,172	18,076	116,394	16,959	16,155	2,213	537
1994	85,674	18,167	135,677	16,065	14,598	1,802	336
1995	128,069	17,468	134,493	14,046	13,706	4,755	300
1996	135,920	25,139	146,452	25,957	12,779	3,306	158
1997	151,057	13,013	143,571	23,202	11,678	3,697	98
1998	74,372	12,388	131,011	16,322	7,682	1,850	57
1999	171,035	16,191	125,883	11,878	9,188	2,711	45
2000	225,774	13,566	123,031	10,955	9,816	3,704	114
2001	195,827	11,850	103,556	12,708	8,989	3,363	93
2002	182,843	16,113	75,056	10,834	9,666	5,109	168
2003	125,368	34,013	82,905	17,648	7,932	6,015	108
2004	143,398	28,537	122,303	15,190	8,284	5,663	191
2005	157,885	25,098	135,454	10,050	8,208	4,296	113
2006	159,783	35,707	151,260	13,503	7,716	1,190	137
2007	195,044	20,722	117,495	12,519	8,590	1,451	148
2008	145,498	17,373	97,667	11,610	10,163	264	177
2009	171,619	23,441	82,194	13,246	9,618	476	240
2010	201,475	24,863	94,045	11,926	8,926	1,031	259
2011	174,232	26,792	128,585	11,776	9,317	1,185	200
2012	208,618	20,784	90,384	14,132	9,755	2,330	179
Total	**4,216,702**	**550,284**	**3,538,542**	**531,092**	**442,212**	**130,002**	**30,131**
Pct of Total	42%	5%	35%	5%	4%	1%	0%
Ann Average	129,293	17,081	111,231	16,676	13,950	4,118	966

Table 1b. Ex-vessel revenue (shoreside commercial and tribal) by species group in current (2012) dollars, $1,000s

Year	CPS	CRAB	Groundfish	HMS	Other	Salmon	Shellfish
1981	$59,680	$43,250	$99,360	$96,687	$23,753	$70,120	$27,104
1982	$58,446	$41,171	$124,177	$50,687	$20,059	$77,789	$14,583
1983	$50,204	$49,450	$104,735	$118,259	$20,092	$18,183	$9,867

1984	$25,646	$45,052	$93,393	$106,863	$20,511	$20,716	$11,676
1985	$36,476	$48,946	$104,769	$49,319	$25,310	$39,028	$11,401
1986	$35,178	$45,031	$103,392	$46,522	$35,713	$46,099	$3,973
1987	$37,000	$48,619	$127,638	$53,329	$38,634	$81,970	$4,707
1988	$42,311	$77,072	$117,690	$54,284	$50,513	$117,051	$3,747
1989	$37,472	$68,464	$114,014	$29,611	$57,754	$44,329	$5,551
1990	$35,479	$75,863	$102,573	$29,671	$64,952	$35,040	$4,338
1991	$35,493	$35,797	$112,096	$26,281	$73,952	$21,900	$3,146
1992	$28,189	$61,027	$107,278	$38,097	$62,280	$13,960	$5,146
1993	$24,753	$65,077	$94,081	$43,503	$55,447	$13,160	$6,666
1994	$31,226	$77,503	$97,997	$43,526	$52,800	$10,478	$4,210
1995	$53,118	$91,621	$122,590	$31,052	$48,845	$21,833	$4,532
1996	$59,598	$105,157	$113,988	$57,171	$42,620	$12,954	$3,184
1997	$60,609	$72,798	$110,234	$48,246	$39,954	$13,776	$1,533
1998	$13,257	$64,549	$71,877	$34,640	$26,015	$7,700	$94
1999	$57,182	$90,813	$76,162	$31,446	$31,957	$12,876	$65
2000	$54,390	$82,109	$79,651	$29,679	$34,940	$18,152	$208
2001	$40,900	$67,313	$63,837	$30,808	$30,163	$13,454	$226
2002	$40,665	$74,472	$52,936	$21,548	$29,262	$17,951	$457
2003	$42,829	$144,262	$58,633	$34,541	$25,910	$25,773	$165
2004	$38,551	$122,800	$55,574	$35,187	$26,173	$36,791	$558
2005	$49,789	$96,980	$63,237	$26,521	$23,793	$27,808	$323
2006	$45,409	$146,062	$67,733	$29,978	$24,588	$11,351	$400
2007	$48,641	$113,854	$63,983	$27,507	$23,641	$13,835	$391
2008	$47,496	$95,833	$74,119	$33,028	$29,010	$2,150	$521
2009	$77,109	$109,774	$69,427	$31,752	$27,298	$2,632	$711
2010	$87,805	$116,459	$70,256	$32,118	$30,545	$9,318	$716
2011	$79,681	$159,591	$94,146	$47,467	$35,898	$11,138	$522
2012	$86,956	$151,408	$73,448	$46,790	$35,593	$21,970	$489
Total	**$1,521,538**	**$2,688,177**	**$2,885,025**	**$1,416,120**	**$1,167,978**	**$891,284**	**$131,211**
Pct of Total	13%	23%	25%	12%	10%	8%	1%
Ann Average	$46,277	$81,831	$90,696	$44,172	$36,529	$28,042	$4,217

Shrimp	Total	Pct of Ann Average
19,186	332,406	107%
13,433	309,884	99%
6,879	255,360	82%
5,618	226,904	73%
13,609	216,610	69%
26,893	242,454	78%
31,514	270,611	87%
32,832	306,737	98%
36,398	311,985	100%
25,632	267,817	86%
20,157	263,368	84%
36,422	280,667	90%
23,496	273,002	88%
15,752	288,071	92%
12,312	325,149	104%
14,919	364,629	117%
18,881	365,196	117%
5,662	249,344	80%
14,226	351,157	113%
16,283	403,242	129%
18,599	354,985	114%
26,246	326,035	105%
14,594	288,583	93%
9,688	333,254	107%
11,404	352,509	113%
8,914	378,211	121%
11,604	367,573	118%
15,835	298,586	96%
14,952	315,785	101%
20,763	363,287	117%
30,051	382,137	123%
29,866	376,049	121%
602,619	**10,041,584**	
6%	100%	
18,476	311,791	

s, 1981-2012.

Shrimp	Total	Pct of Ann Average
$51,459	$471,413	130%
$36,922	$423,833	116%
$25,767	$396,557	109%

$19,136	$342,992	94%
$24,801	$340,050	93%
$61,303	$377,212	104%
$86,593	$478,491	132%
$53,704	$516,373	142%
$50,467	$407,661	112%
$46,585	$394,502	108%
$40,474	$349,139	96%
$44,558	$360,535	99%
$29,036	$331,725	91%
$33,694	$351,434	97%
$31,633	$405,223	111%
$33,171	$427,843	118%
$31,298	$378,448	104%
$18,571	$236,704	65%
$26,692	$327,194	90%
$26,679	$325,808	90%
$21,293	$267,995	74%
$26,757	$264,047	73%
$14,026	$346,140	95%
$13,095	$328,729	90%
$16,234	$304,685	84%
$12,196	$337,716	93%
$16,597	$308,449	85%
$24,660	$306,817	84%
$15,854	$334,556	92%
$20,971	$368,188	101%
$39,210	$467,653	129%
$37,964	$454,618	125%
$1,031,398	**$11,732,730**	
9%	100%	
$32,046	$363,810	

Table 2a. Groundfish landings (shoreside commercial and tribal) by species or species group (mt), 1981-2012.

Year	P. Whiting	Sablefish	Lingcod	P. Cod	Other Roundfish	Rockfish	Thornyheads	Arrowtooth Flounder
1981	839	11,419	3,304	1,237	41	57,779	1,801	1,074
1982	1,027	18,627	3,840	908	46	59,316	2,158	2,351
1983	1,051	14,652	4,252	597	16	46,289	1,749	2,077
1984	2,721	14,015	4,029	585	25	36,819	3,189	2,379
1985	3,894	14,132	3,839	411	18	33,263	4,069	2,679
1986	3,465	13,150	1,891	331	37	33,387	3,610	2,230
1987	4,795	12,602	2,587	2,281	38	36,526	3,747	2,830
1988	6,868	10,744	2,767	3,345	41	35,193	5,663	1,946
1989	7,414	10,285	3,563	2,189	43	37,238	8,085	3,553
1990	9,633	9,065	2,907	1,064	22	33,179	10,084	5,824
1991	23,970	9,501	3,167	1,796	24	28,737	6,515	4,945
1992	56,128	9,361	1,888	1,778	37	28,121	8,873	3,573
1993	42,108	8,147	2,210	1,370	23	29,005	9,224	2,713
1994	73,617	7,579	1,907	866	50	23,539	8,048	3,249
1995	74,963	7,915	1,469	505	102	21,980	7,555	2,321
1996	85,129	8,317	1,559	445	124	21,669	6,532	2,192
1997	87,417	7,943	1,569	595	175	18,245	5,504	2,344
1998	87,857	4,384	350	413	221	16,298	3,526	3,169
1999	83,471	6,648	358	280	191	10,815	2,648	5,285
2000	85,855	6,281	146	279	193	8,887	2,378	3,276
2001	73,412	5,637	156	324	424	5,673	1,761	2,465
2002	45,708	3,798	206	752	3,876	2,962	2,716	2,085
2003	55,336	5,420	165	1,250	338	1,668	2,402	2,327
2004	96,504	5,755	178	1,403	163	2,112	1,477	2,327
2005	109,053	6,208	203	851	297	1,900	1,312	2,240
2006	127,166	6,199	260	367	68	1,463	1,460	1,922
2007	91,442	5,241	268	89	68	1,493	1,822	2,262
2008	67,761	5,871	285	38	72	1,524	2,679	2,668
2009	49,223	7,198	233	236	84	2,073	2,703	3,844
2010	64,654	6,829	173	345	68	2,280	2,712	3,228
2011	103,190	6,407	376	604	89	2,552	1,904	2,292
2012	66,369	5,246	484	631	84	2,937	1,773	2,243
Total	**1,692,039**	**274,576**	**50,588**	**28,160**	**7,097**	**644,922**	**129,679**	**89,912**
Pct of Total	48%	8%	1%	1%	0%	18%	4%	3%
Ann. Average	52,876	8,580	1,581	880	222	20,154	4,052	2,810

Table 2b. Groundfish ex-vessel revenue (shoreside commercial and tribal) by species or species group in current (2012) d

Year	P. Whiting	Sablefish	Lingcod	P. Cod	Other Roundfish	Rockfish	Thornyheads	Arrowtooth Flounder
1981	$311	$11,605	$3,669	$1,128	$31	$47,223	$1,960	$499
1982	$377	$21,576	$4,380	$926	$40	$52,974	$2,228	$1,180
1983	$376	$15,379	$4,683	$622	$34	$45,757	$1,789	$915
1984	$781	$12,857	$4,207	$579	$25	$39,359	$3,254	$978
1985	$1,067	$19,950	$4,188	$416	$17	$39,234	$4,194	$1,093

1986	$830	$20,157	$2,434	$366	$24	$42,888	$4,067	$918
1987	$1,184	$23,907	$3,852	$2,944	$32	$50,592	$4,765	$1,627
1988	$1,933	$21,798	$3,867	$3,361	$46	$42,721	$7,554	$873
1989	$1,753	$17,664	$4,605	$2,073	$41	$42,201	$10,936	$1,294
1990	$2,335	$15,489	$3,657	$1,014	$29	$38,141	$13,665	$2,157
1991	$5,986	$22,154	$3,795	$1,837	$42	$34,553	$10,095	$1,935
1992	$8,931	$20,558	$2,440	$1,927	$104	$34,097	$13,524	$1,262
1993	$4,295	$14,753	$2,749	$1,444	$196	$33,853	$14,080	$867
1994	$7,278	$19,869	$2,519	$927	$432	$29,423	$18,594	$1,023
1995	$11,119	$33,232	$2,108	$612	$971	$29,075	$23,769	$809
1996	$7,156	$35,753	$2,234	$540	$1,209	$27,032	$17,461	$687
1997	$11,131	$38,094	$2,262	$701	$1,380	$22,863	$13,014	$691
1998	$6,423	$15,257	$770	$538	$1,937	$21,947	$7,547	$964
1999	$9,088	$22,672	$833	$351	$1,891	$15,891	$6,756	$1,525
2000	$9,907	$26,350	$449	$376	$2,203	$14,394	$6,797	$1,055
2001	$6,632	$22,159	$491	$455	$1,810	$10,263	$5,064	$805
2002	$5,465	$14,577	$650	$1,053	$2,050	$6,395	$7,320	$594
2003	$6,487	$22,351	$499	$1,731	$1,234	$3,887	$5,441	$646
2004	$8,800	$20,047	$516	$1,692	$1,149	$4,689	$3,370	$641
2005	$13,814	$23,353	$531	$1,005	$944	$4,302	$3,081	$597
2006	$17,776	$25,503	$643	$450	$761	$3,910	$3,613	$511
2007	$15,216	$22,554	$718	$117	$753	$4,223	$3,850	$543
2008	$16,114	$28,825	$781	$58	$804	$4,479	$5,108	$623
2009	$6,652	$36,186	$634	$260	$717	$4,890	$4,445	$874
2010	$10,328	$37,274	$494	$358	$681	$4,712	$4,716	$714
2011	$24,137	$45,539	$878	$715	$861	$5,321	$4,218	$501
2012	$20,499	$28,033	$1,114	$788	$846	$5,721	$3,662	$607
Total	**$244,182**	**$755,473**	**$67,651**	**$31,363**	**$23,294**	**$767,010**	**$239,937**	**$30,008**
Pct of Total	8%	26%	2%	1%	1%	27%	8%	1%
Ann. Average	$7,631	$23,609	$2,114	$980	$728	$23,969	$7,498	$938

Dover Sole	English Sole	Petrale Sole	Other Flatfish	Other Groundfish	Total	Pct of Ann Average
16,468	2,711	2,041	3,672	960	**103,344**	93%
21,000	2,793	2,630	3,931	728	**119,356**	108%
20,084	2,356	2,214	3,001	639	**98,978**	90%
19,307	1,721	1,739	2,660	615	**89,804**	81%
20,616	1,929	1,840	3,460	772	**90,923**	82%
17,396	2,039	1,750	2,761	433	**82,480**	75%
18,489	2,482	2,205	2,915	485	**91,982**	83%
18,185	2,103	2,149	2,731	514	**92,248**	83%
18,881	2,412	2,153	2,969	589	**99,372**	90%
15,753	1,912	1,765	2,505	828	**94,539**	85%
18,274	2,185	1,927	3,239	1,267	**105,547**	95%
16,074	1,626	1,554	2,018	1,525	**132,555**	120%
14,371	1,603	1,503	1,938	2,180	**116,394**	105%
9,389	1,124	1,375	2,439	2,497	**135,677**	123%
10,593	1,133	1,659	2,559	1,740	**134,493**	122%
12,187	1,154	1,829	1,999	3,318	**146,452**	132%
10,126	1,505	1,948	2,310	3,891	**143,571**	130%
8,023	1,140	1,463	1,700	2,468	**131,011**	118%
9,141	913	1,498	2,015	2,621	**125,883**	114%
8,780	769	1,893	1,622	2,672	**123,031**	111%
6,890	993	1,845	1,717	2,258	**103,556**	94%
6,301	1,175	1,797	1,724	1,957	**75,056**	68%
7,356	931	2,070	1,575	2,068	**82,905**	75%
6,746	952	1,962	1,394	1,328	**122,303**	111%
6,903	929	2,734	1,237	1,587	**135,455**	122%
5,970	912	2,610	1,215	1,649	**151,260**	137%
9,279	690	2,253	972	1,617	**117,495**	106%
11,217	363	2,220	811	2,159	**97,667**	88%
11,753	357	1,767	971	1,751	**82,194**	74%
10,391	221	803	745	1,595	**94,045**	85%
7,745	170	932	686	1,638	**128,585**	116%
7,066	189	1,094	690	1,577	**90,384**	82%
400,752	**43,492**	**59,223**	**66,177**	**51,926**	**3,538,543**	
11%	1%	2%	2%	1%	100%	
12,524	1,359	1,851	2,068	1,623	110,579	

ollars, $1,000s, 1981-2012.

Dover Sole	English Sole	Petrale Sole	Other Flatfish	Other Groundfish	Total	Pct of Ann Average
$17,528	$3,905	$5,084	$5,724	$691	**$99,358**	110%
$22,179	$4,068	$7,305	$6,296	$649	**$124,175**	137%
$19,748	$3,344	$6,669	$4,841	$572	**$104,731**	115%
$18,850	$2,351	$5,235	$4,178	$731	**$93,387**	103%
$20,294	$2,651	$5,578	$5,327	$760	**$104,769**	116%

$18,065	$2,960	$5,483	$4,600	$597	**$103,389**	114%
$22,072	$3,929	$7,044	$5,048	$644	**$127,641**	141%
$20,907	$3,137	$6,645	$4,260	$585	**$117,686**	130%
$18,934	$3,232	$6,440	$4,242	$600	**$114,015**	126%
$14,810	$2,212	$5,126	$3,320	$615	**$102,568**	113%
$18,707	$2,565	$5,410	$4,255	$765	**$112,098**	124%
$15,044	$1,808	$4,161	$2,620	$800	**$107,277**	118%
$12,761	$1,661	$3,844	$2,572	$1,010	**$94,083**	104%
$8,838	$1,227	$3,684	$2,988	$1,195	**$97,995**	108%
$10,760	$1,314	$4,929	$2,954	$936	**$122,588**	135%
$11,514	$1,268	$5,127	$2,337	$1,673	**$113,990**	126%
$8,933	$1,473	$5,275	$2,450	$1,970	**$110,237**	122%
$8,119	$1,186	$4,107	$1,796	$1,286	**$71,877**	79%
$8,805	$897	$4,171	$2,085	$1,197	**$76,162**	84%
$8,704	$765	$5,490	$1,826	$1,336	**$79,651**	88%
$6,809	$979	$5,155	$2,051	$1,162	**$63,837**	70%
$6,246	$1,110	$4,508	$2,054	$915	**$52,938**	58%
$7,135	$853	$5,487	$1,858	$1,024	**$58,632**	65%
$6,412	$860	$5,196	$1,570	$633	**$55,574**	61%
$6,405	$767	$6,344	$1,360	$733	**$63,236**	70%
$5,433	$723	$6,465	$1,214	$733	**$67,735**	75%
$8,309	$532	$5,391	$903	$876	**$63,984**	71%
$9,787	$282	$5,270	$745	$1,243	**$74,120**	82%
$9,109	$259	$3,741	$872	$786	**$69,427**	77%
$7,237	$160	$2,083	$718	$780	**$70,255**	77%
$7,089	$124	$2,940	$771	$1,052	**$94,146**	104%
$6,496	$145	$3,550	$795	$1,192	**$73,448**	
$392,041	**$52,747**	**$162,932**	**$88,629**	**$29,742**	**$2,885,009**	
14%	2%	6%	3%	1%	100%	
$12,251	$1,648	$5,092	$2,770	$929	$90,157	

Table 3a. Groundfish landings (shoreside commercial and tribal) by gear type (mt), 1991-2012.

Year	Dredge	Hook-and-line	Miscellaneous	Net	Pot	Shrimp Trawl	Trawl	Troll
1981		4,308	2	1,770	3,961	1,846	90,949	508
1982		5,016	3	2,249	6,550	1,395	103,575	567
1983		3,990	6	3,203	5,989	1,221	84,141	430
1984		3,210	9	4,326	4,448	497	77,020	296
1985		5,361	1	5,499	3,938	522	75,261	340
1986		6,579	2	5,777	3,049	1,600	65,211	262
1987		7,576	11	4,650	2,139	1,622	75,789	196
1988		6,440	3	3,054	2,277	1,310	78,952	213
1989		6,680	11	3,248	2,125	1,232	85,800	276
1990		6,627	28	3,163	1,705	966	81,693	358
1991		8,293	1	1,898	1,086	873	93,282	115
1992		9,151	6	1,794	827	926	119,693	159
1993		7,559	2	1,287	871	1,597	104,844	235
1994		6,461	1	757	1,404	890	125,793	373
1995		6,396	2	792	1,118	754	125,214	217
1996		7,474	2	328	861	890	136,675	222
1997		7,100	<0.5	322	662	393	134,678	415
1998		4,661	2	387	546	386	124,751	279
1999		4,647	<0.5	140	821	427	119,755	93
2000		4,110	1	94	939	311	117,541	35
2001		3,697	1	87	734	241	98,760	37
2002	*	3,191	3	73	520	89	71,156	23
2003		3,489	1	80	842	32	78,438	24
2004	*	3,704	*	65	850	27	117,616	39
2005		3,932	2	56	1,023	16	130,383	42
2006		3,663	<0.5	63	1,079	19	146,397	39
2007		3,157	1	47	714	25	113,530	23
2008		3,588	<0.5	34	704	14	93,313	15
2009		4,391	*	13	890	16	76,872	13
2010		4,367	<0.5	8	934	14	88,704	18
2011		4,299	<0.5	9	1,484	70	122,708	16
2012	*	3,548	1	10	1,219	20	85,564	23
Total	*****	**166,665**	**102**	**45,280**	**56,303**	**20,236**	**3,244,054**	**5,901**
Pct of Total	<1%	4%	<1%	<1%	1%	<1%	95%	<1%
Ann. Average	*	5,268	3	1,460	1,777	652	101,879	191

Table 3b. Groundfish ex-vessel revenue (shoreside commercial and tribal) by gear type in current (2012) dollars, $1,000s,

Year	Dredge	Hook-and-line	Miscellaneous	Net	Pot	Shrimp Trawl	Trawl	Troll
1981		$8,464	$7	$3,457	$4,353	$1,404	$81,027	$649
1982		$9,895	$8	$3,835	$10,844	$1,215	$97,594	$786
1983		$6,961	$10	$4,593	$7,790	$1,117	$83,720	$546
1984		$6,007	$14	$6,283	$4,792	$484	$75,370	$446
1985		$11,595	$28	$8,641	$6,439	$515	$77,051	$500

1986		$14,217	$27	$8,939	$5,382	$1,716	$72,668	$443
1987		$18,572	$34	$7,719	$4,424	$2,044	$94,499	$347
1988		$16,924	$38	$4,970	$4,791	$1,153	$89,465	$348
1989		$15,332	$17	$4,967	$3,644	$1,098	$88,509	$448
1990		$15,213	$37	$4,942	$2,932	$867	$77,958	$624
1991		$22,746	$3	$2,839	$2,615	$874	$82,825	$193
1992		$21,603	$14	$2,647	$1,957	$941	$79,865	$252
1993		$16,864	$3	$2,003	$1,792	$1,489	$71,614	$317
1994		$16,686	$3	$1,185	$4,232	$1,114	$74,195	$582
1995		$23,698	$4	$1,280	$5,215	$1,066	$90,950	$376
1996		$27,070	$4	$566	$4,354	$1,171	$80,462	$362
1997		$30,217	<$1	$517	$3,970	$564	$74,336	$630
1998		$15,378	$3	$578	$2,400	$572	$52,538	$410
1999		$18,574	$1	$235	$3,613	$614	$52,963	$162
2000		$19,408	$9	$155	$5,175	$605	$54,215	$85
2001		$17,065	$6	$160	$3,630	$374	$42,525	$78
2002	*	$13,878	$33	$134	$2,678	$176	$35,983	$53
2003		$15,977	$10	$137	$4,316	$82	$38,056	$54
2004	*	$15,917	*	$148	$3,515	$72	$35,842	$77
2005		$17,558	$7	$96	$4,356	$69	$41,062	$88
2006		$17,729	$1	$130	$5,006	$60	$44,727	$79
2007		$16,180	$10	$108	$3,383	$51	$44,180	$72
2008		$19,093	$3	$60	$3,987	$26	$50,915	$36
2009		$24,129	*	$16	$4,966	$24	$40,270	$19
2010		$26,148	$2	$14	$5,676	$30	$38,345	$42
2011		$31,589	$2	$15	$10,734	$101	$51,646	$58
2012		$21,543	$4	$18	$6,452	$42	$45,319	$70
Total	*****	**$572,229**	**$347**	**$71,384**	**$149,411**	**$21,731**	**$2,060,695**	**$9,230**
Pct of Total	<0.5%	34%	<0.5%	<0.5%	11%	<0.5%	55%	<0.5%
Ann. Average	*	$17,452	$11	$2,262	$4,532	$687	$63,861	$290

Total
103,344
119,356
98,978
89,804
90,923
82,480
91,982
92,248
99,372
94,539
105,547
132,555
116,394
135,677
134,493
146,452
143,570
131,011
125,883
123,031
103,556
75,056
82,905
122,303
135,454
151,260
117,495
97,667
82,195
94,045
128,585
90,384
3,538,542
100%
111,231

1981-2012.

Total
$99,360
$124,177
$104,737
$93,394
$104,769

$103,392
$127,638
$117,690
$114,014
$102,573
$112,096
$107,278
$94,081
$97,997
$122,588
$113,990
$110,234
$71,878
$76,162
$79,651
$63,838
$52,936
$58,632
$55,574
$63,236
$67,733
$63,983
$74,119
$69,427
$70,256
$94,145
$73,448
$2,885,028
100%
$89,096

Table 4a. Shoreside IFQ - Trawl (whiting and nonwhiting) by groundish species or species group (mt), 2003-201

Fishery	P. Whiting	Sablefish	Lingcod	P. Cod
Whiting Total	**717,634**	**361**	**35**	**10**
2003	51,183	40	<0.5	<0.5
2004	89,641	131	4	1
2005	97,559	22	6	1
2006	97,267	11	6	1
2007	73,277	9	5	<0.5
2008	50,760	<0.5	3	<0.5
2009	40,294	49	1	<0.5
2010	62,655	21	2	<0.5
2011	89,826	30	5	7
2012	65,171	47	4	<0.5
Nonwhiting Total	**104**	**22,969**	**1,273**	**3,487**
2003	30	2,097	48	720
2004	12	2,183	53	825
2005	*	2,315	74	724
2006	*	2,467	115	330
2007	2	2,428	119	43
2008	1	2,871	107	12
2009	<0.5	3,009	109	87
2010	9	2,511	73	100
2011	26	1,663	239	252
2012	19	1,427	337	395
Grand Total	**717,738**	**23,331**	**1,308**	**3,497**

Table 4b. Shoreside IFQ - Trawl (whiting and nonwhiting) ex-vessel revenue by groundish species or species grc

Fishery	P. Whiting	Sablefish	Lingcod	P. Cod
Whiting Total	123,210	**663**	**32**	**4**
2003	5,966	49	<$1	<$1
2004	8,271	67	4	1
2005	12,413	43	6	1
2006	14,018	21	5	<$1
2007	12305	14	4	<$1
2008	12305	<$1	2	<$1
2009	5590	8	<$1	<$1
2010	10116	79	1	<$1
2011	22027	189	5	<$1
2012	20199	194	3	<$1
Nonwhiting Total	**29**	**87160**	**2166**	**4394**
2003	**5**	**6,885**	**97**	**1,021**
2004	2	5,984	93	1,000
2005	*	6,516	119	860
2006	*	7,997	184	402
2007	<$1	8,556	216	57

2008	**1**	**12,073**	**177**	**15**
2009	<$1	13096	184	94
2010	3	11152	138	102
2011	9	9340	402	322
2012	8	5562	556	520
Grand Total	**123239**	**87823**	**2199**	**4398**

.2.

Other Roundfish	Rockfish	Thorny heads	Arrowtooth Flounder	Dover Sole
178	**2,706**	**24**	**59**	**2**
*	68	<0.5	<0.5	
10	176	1	1	
165	289	<0.5	1	
<0.5	226	<0.5	2	
*	319	<0.5	3	*
	151	<0.5	2	
	211	<0.5	4	
1	333	12	10	
	530	2	13	
	401	8	25	
31	**7,744**	**17,897**	**21,991**	**82,302**
21	708	2,171	936	6,872
4	979	1,279	1,246	6,555
5	500	1,134	2,076	6,748
<0.5	515	1,261	1,716	5,740
*	576	1,605	2,025	8,951
<0.5	603	2,438	2,635	10,970
*	757	2,459	3,823	11,611
*	825	2,428	3,211	10,326
*	928	1,585	2,167	7,586
<0.5	1,354	1,538	2,158	6,944
208	**10,449**	**17,921**	**22,051**	**82,305**

oup in current (2012) dollars, $1,000s, 2003-2012.

Other Roundfish	Rockfish	Thorny heads	Arrowtooth Flounder	Dover Sole
18	**2,358**	**11**	**9**	**<$1**
*	66	<$1	<$1	
2	174	<$1	<$1	
15	274	<$1	<$1	
<$1	207	<$1	<$1	
*	246	<$1	<$1	*
	109	<$1	<$1	
	151	<$1	<$1	
<$1	226	2	<$1	
	531	2	2	
	375	6	4	
25	**9535**	**24859**	**5427**	**71485**
21	**805**	**3,922**	**289**	**6,669**
2	1,186	2,007	371	6,241
2	567	1,767	553	6,267
<$1	582	2,171	463	5,224
*	747	2,311	487	8,016

<$1	**853**	**3,319**	**615**	**9,565**
*	976	2726	870	8989
*	1025	2638	713	7182
*	1152	1927	476	6952
<$1	1642	2072	589	6380
43	**11894**	**24869**	**5436**	**71485**

English Sole	Petrale Sole	Other Flatfish	Other Groundfish	Nonground fish
2	**1**	**15**	**804**	**2,241**
	<0.5	<0.5	4	88
	<0.5	<0.5	33	205
	<0.5	<0.5	97	280
	<0.5	<0.5	38	71
*	<0.5	1	52	197
	<0.5	<0.5	60	880
	<0.5	<0.5	21	24
	1	8	155	177
	<0.5	1	182	78
	<0.5	4	162	242
4,804	**17,351**	**9,255**	**12,013**	**398**
666	1,659	1,390	1,320	93
817	1,749	1,280	784	38
859	2,701	1,114	1,090	31
868	2,581	1,101	1,199	50
622	2,207	884	1,090	40
327	2,175	743	1,391	43
265	1,696	887	1,441	49
158	770	684	1,308	23
108	792	585	1,177	12
115	1,021	587	1,212	19
4,805	**17,352**	**9,271**	**12,818**	**2,639**

English Sole	Petrale Sole	Other Flatfish	Other Groundfish	Nonground fish
<$1	**2**	**3**	**143**	**185**
	<$1	<$1	<$1	17
	<$1	<$1	10	27
	<$1	<$1	38	23
	<$1	<$1	12	11
*	<$1	<$1	16	40
	<$1	<$1	4	24
	<$1	<$1	<$1	<$1
	1	<$1	3	6
	<$1	<$1	46	12
	<$1	1	13	24
3923	**43473**	**9121**	**6440**	**1229**
617	**4,374**	**1,586**	**610**	**341**
735	4,617	1,340	312	140
704	6,260	1,146	430	113
684	6,390	1,026	447	116
474	5,273	783	584	136

251	**5,154**	**655**	**865**	**109**
186	3557	770	647	97
111	2000	607	690	86
76	2538	604	827	40
86	3312	605	1028	51
3923	**43475**	**9124**	**6583**	**1414**

Total
724,072
51,385
90,203
98,420
97,622
73,864
51,857
40,605
63,377
90,674
66,065
201,618
18,730
17,803
19,372
17,946
20,592
24,313
26,192
22,425
17,120
17,126
925,690

Total
126,639
6,100
8,558
12,813
14,276
12627
12444
5751
10436
22814
20820
269266
27,243
24,029
25,302
25,687
27,639

33,652
32193
26445
24666
22410
395904

Table 5a. Shoreside IFQ - Nontrawl by groundish species or species group (mt), 2011-2012.

Species	2011	2012
Sablefish	1,116	923
Rougheye Rockfish	7	15
Blackgill Rockfish	2	6
Other Slope Rockfish	3	3
Shelf Rockfish	<0.5	<0.5
Thornyheads	23	13
Other Roundfish	3	2
Other Rockfish	1	<0.5
Flatfish	44	3
Other Groundfish	4	6
Nongroundfish	<0.5	<0.5
Total	**1203**	**971**

Table 5b. Shoreside IFQ - Nontrawl ex-vessel revenue by groundish species or species group in current (2012) dollars, $1,000s, 2011-2012.

Species	2011	2012
Sablefish	$7,611	$4,896
Rougheye Rockfish	$8	$17
Blackgill Rockfish	$8	$19
Other Slope Rockfish	$4	$4
Shelf Rockfish	<$1	<$1
Thornyheads	$146	$29
Other Roundfish	$6	$4
Other Rockfish	$1	<$1
Flatfish	$37	$9
Other Groundfish	$2	$5
Nongroundfish	<$1	<$1
Total	**$7,822**	**$4,983**

Spiny dogfish landings excluded due to data confidentiality rules.

Table 6a. Limited entry fixed gear landings by groundish species or species group (mt), 2003-2012.

Year	Sablefish	Rougheye Rockfish	Spiny Dogfish	Blackgill Rockfish	Other Slope Rockfish	Shelf Rockfish	Thorny heads
2003	1,890	10	105	72	23	6	178
2004	2,136	19	90	42	25	12	166
2005	2,188	25	230	24	30	15	161
2006	2,209	40	131	38	23	14	172
2007	1,782	37	196	15	21	14	174
2008	1,844	39	181	20	21	13	199
2009	2,434	67	24	48	22	5	200
2010	2,474	48	8	40	29	3	225
2011	2,416	38	8	80	22	2	247
2012	1,845	34	1	47	36	6	177
Total	**21,218**	**356**	**974**	**425**	**250**	**91**	**1,901**

Table 6b. Limited entry fixed gear ex-vessel revenue by groundish species or species group in current (2012) dollars, $

Year	Sablefish	Rougheye Rockfish	Spiny Dogfish	Blackgill Rockfish	Other Slope Rockfish	Shelf Rockfish	Thorny heads
2003	$9,620	$12	$56	$244	$41	$15	$1,404
2004	$8,976	$20	$47	$152	$38	$53	$1,307
2005	$10,226	$28	$133	$71	$35	$60	$1,274
2006	$11,143	$43	$75	$109	$33	$55	$1,382
2007	$9,244	$42	$115	$60	$27	$51	$1,452
2008	$10,716	$46	$94	$79	$32	$57	$1,708
2009	$14,285	$80	$10	$135	$37	$18	$1,610
2010	$16,056	$68	$4	$109	$44	$11	$1,846
2011	$19,603	$61	$3	$232	$38	$8	$1,994
2012	$11,620	$60	<0.5	$165	$74	$26	$1,418
Total	**$121,488**	**$461**	**$538**	**$1,356**	**$399**	**$354**	**$15,396**

Other Roundfish	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
18	22	6	61	49	**2,441**
22	19	5	37	54	**2,627**
20	21	6	42	47	**2,808**
21	23	4	36	50	**2,760**
22	28	4	45	40	**2,377**
32	38	7	66	31	**2,491**
27	30	8	50	12	**2,928**
24	32	8	57	4	**2,953**
22	22	9	59	4	**2,929**
20	18	10	84	8	**2,286**
226	**252**	**67**	**539**	**299**	**26,599**

$1,000s, 2003-2012.

Other Roundfish	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
$98	$119	$6	$33	$300	**$11,948**
$88	$87	$7	$17	$320	**$11,112**
$72	$87	$5	$22	$262	**$12,274**
$74	$107	$3	$18	$373	**$13,414**
$99	$160	$2	$23	$325	**$11,600**
$150	$208	$9	$36	$239	**$13,377**
$125	$155	$8	$27	$67	**$16,556**
$111	$131	$17	$37	$33	**$18,466**
$102	$83	$19	$37	$32	**$22,213**
$99	$99	$34	$67	$56	**$13,718**
$1,018	**$1,237**	**$110**	**$316**	**$2,007**	**$144,678**

Table 7a. Open access landings (other than by fixed gear gear) by groundish species or species group (mt), 2003-

<table>
<tr><th>Year</th><th>Sablefish</th><th>Black Rockfish</th><th>Brown Rockfish</th><th>Lingcod</th><th>Cabezon</th><th>Nearshore Rockfish</th></tr>
<tr><td>2003</td><td>4</td><td><0.5</td><td rowspan="10">*</td><td>2</td><td rowspan="10">*</td><td><0.5</td></tr>
<tr><td>2004</td><td>4</td><td><0.5</td><td>2</td><td><0.5</td></tr>
<tr><td>2005</td><td>4</td><td>1</td><td>2</td><td><0.5</td></tr>
<tr><td>2006</td><td>3</td><td><0.5</td><td>3</td><td><0.5</td></tr>
<tr><td>2007</td><td>7</td><td><0.5</td><td>5</td><td>1</td></tr>
<tr><td>2008</td><td>3</td><td>*</td><td>1</td><td>*</td></tr>
<tr><td>2009</td><td rowspan="2">3</td><td>*</td><td><0.5</td><td>*</td></tr>
<tr><td>2010</td><td>*</td><td>1</td><td>*</td></tr>
<tr><td>2011</td><td>3</td><td><0.5</td><td>1</td><td>*</td></tr>
<tr><td>2012</td><td>6</td><td><0.5</td><td>1</td><td><0.5</td></tr>
<tr><td>Total</td><td>36</td><td>2</td><td><0.5</td><td>18</td><td><0.5</td><td>2</td></tr>
</table>

Spiny dogfish, kelp greenling, and other roundfish excluded for data confidentiality.

Table 7b. Open access ex-vessel revenue (other than by fixed gear) by groundish species or species group in curr

<table>
<tr><th>Year</th><th>Sablefish</th><th>Black Rockfish</th><th>Brown Rockfish</th><th>Lingcod</th><th>Cabezon</th><th>Nearshore Rockfish</th></tr>
<tr><td>2003</td><td>$9</td><td>$1</td><td rowspan="10">*</td><td>$7</td><td rowspan="10">*</td><td>$1</td></tr>
<tr><td>2004</td><td>$11</td><td>$1</td><td>$11</td><td>$2</td></tr>
<tr><td>2005</td><td>$13</td><td>$1</td><td>$13</td><td>$1</td></tr>
<tr><td>2006</td><td>$9</td><td>$1</td><td>$16</td><td>$2</td></tr>
<tr><td>2007</td><td>$24</td><td>$1</td><td>$28</td><td>$4</td></tr>
<tr><td>2008</td><td>$17</td><td>*</td><td>$6</td><td>*</td></tr>
<tr><td>2009</td><td rowspan="2">$19</td><td>*</td><td>$1</td><td>*</td></tr>
<tr><td>2010</td><td>*</td><td>$4</td><td>*</td></tr>
<tr><td>2011</td><td>$17</td><td><$1</td><td>$6</td><td>*</td></tr>
<tr><td>2012</td><td>$28</td><td><$1</td><td>$3</td><td><$1</td></tr>
<tr><td>Total</td><td>$146</td><td>$6</td><td>$3</td><td>$95</td><td>$3</td><td>$13</td></tr>
</table>

-2012.

Thorny heads	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
1	27	<0.5	27	8	69
1	24	7	20	6	64
*	13	<0.5	22	8	50
*	19	<0.5	20	5	52
*	12	<0.5	12	5	43
	2	<0.5	8	7	22
*	1	*	4	1	16
*	1	*	3	1	7
*	<0.5	<0.5	4	2	11
<0.5	3	<0.5	5	2	16
6	**101**	**13**	**125**	**45**	**347**

ent (2012) dollars, $1,000s, 2003-2012.

Thorny heads	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
$4	$64	<$1	$37	$42	$165
$2	$62	$8	$33	$29	$161
*	$36	<$1	$31	$47	$144
*	$47	<$1	$34	$30	$139
*	$45	<$1	$20	$33	$155
	$13	$1	$11	$48	$100
*	$2	*	$6	$8	$31
*	$3	*	$3	$4	$28
*	$2	$3	$5	$12	$47
*	$9	$1	$4	$14	$61
$15	**$282**	**$17**	**$184**	**$267**	**$1,031**

Table 8a. Nonnearshore fixed gear landings by groundish species or species group (mt), 2003-2012.

Year	Sablefish	Rougheye Rockfish	Spiny Dogfish	Blackgill Rockfish	Other Slope Rockfish	Shelf Rockfish	Thorny heads
2003	2,445	11	149	80	26	4	159
2004	2,604	20	99	47	27	3	161
2005	3,085	30	135	26	36	5	158
2006	3,007	41	101	48	26	6	170
2007	2,243	38	107	16	23	4	152
2008	2,419	41	125	24	22	3	155
2009	3,421	69	29	58	26	2	150
2010	3,521	49	10	67	32	1	172
2011	3,024	39	10	114	24	1	192
2012	2,247	36	2	80	37	4	146
Total	**28,016**	**374**	**766**	**560**	**278**	**34**	**1,615**

Table 8b. Nonnearshore fixed gear ex-vessel revenue by groundish species or species group in current (2012) dollars

Year	Sablefish	Rougheye Rockfish	Spiny Dogfish	Blackgill Rockfish	Other Slope Rockfish	Shelf Rockfish	Thorny heads
2003	$11,895	$13	$77	$256	$48	$7	$1,221
2004	$10,651	$20	$51	$162	$43	$7	$1,252
2005	$13,572	$36	$77	$77	$46	$9	$1,246
2006	$14,335	$45	$59	$137	$40	$15	$1,361
2007	$11,134	$43	$62	$46	$29	$4	$1,268
2008	$13,528	$49	$64	$75	$30	$6	$1,318
2009	$18,946	$82	$12	$154	$42	$3	$1,187
2010	$21,343	$71	$5	$179	$48	$2	$1,362
2011	$23,699	$61	$4	$323	$42	$5	$1,540
2012	$13,956	$63	$1	$251	$73	$13	$1,168
Total	**$153,058**	**$483**	**$413**	**$1,660**	**$441**	**$72**	**$12,923**

Other Roundfish	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
9	2	7	104	55	3,051
14	4	5	81	58	3,122
15	6	7	80	52	3,637
16	9	5	52	57	3,537
12	8	5	55	50	2,712
20	8	8	96	45	2,965
17	9	10	60	17	3,867
15	15	8	73	6	3,969
12	17	8	71	6	3,518
11	8	8	91	11	2,680
140	**84**	**70**	**764**	**359**	**33,058**

, $1,000s, 2003-2012.

Other Roundfish	Other Rockfish	Flatfish	Other Groundfish	Nonground fish	Total
$17	$2	$6	$58	$352	$13,953
$20	$6	$6	$37	$355	$12,611
$27	$8	$6	$44	$302	$15,450
$29	$13	$4	$26	$428	$16,494
$24	$11	$3	$29	$446	$13,100
$49	$13	$5	$52	$414	$15,603
$41	$15	$6	$32	$152	$20,671
$36	$28	$5	$48	$56	$23,183
$29	$37	$7	$45	$57	$25,847
$29	$18	$13	$71	$79	$15,735
$301	**$151**	**$63**	**$441**	**$2,642**	**$172,647**

Table 9a. Nearshore fixed gear landings by groundish species or species group (mt), 2003-2012.

Year	Black Rockfish	Cabezon	Lingcod	Other Nearshore Rockfish	Brown Rockfish	Kelp Greenling	Gopher Rockfish
2003	172	64	55	45	20	25	13
2004	182	75	63	50	24	25	16
2005	170	58	52	50	22	23	18
2006	153	49	52	53	21	16	15
2007	184	46	54	59	22	20	19
2008	181	47	56	57	24	23	24
2009	225	47	45	50	24	22	23
2010	152	45	38	39	26	20	27
2011	123	60	51	44	28	23	30
2012	119	57	57	45	26	24	22
Total	**1,661**	**548**	**521**	**491**	**236**	**220**	**206**

Other roundfish excluded for data confidentiality

Table 9b. Nearshore fixed gear ex-vessel revenue by groundish species or species group in current (2012) dollars, $1,000s, 2003-2012.

Year	Black Rockfish	Blue Rockfish	Brown Rockfish	Cabezon	Flatfish	Gopher Rockfish	Kelp Greenling
2003	$583	$43	$249	$723	$1	$188	$279
2004	$632	$64	$345	$821	$2	$243	$283
2005	$621	$77	$327	$639	$2	$299	$267
2006	$652	$87	$303	$550	$2	$268	$189
2007	$810	$71	$319	$515	$2	$328	$217
2008	$796	$123	$355	$515	$7	$412	$273
2009	$959	$44	$346	$467	$4	$365	$236
2010	$668	$32	$346	$451	$8	$404	$210
2011	$569	$49	$382	$604	$10	$466	$233
2012	$589	$37	$359	$557	$21	$348	$260
Total	**$6,879**	**$628**	**$3,330**	**$5,843**	**$61**	**$3,321**	**$2,447**

Other roundfish excluded for data confidentiality

Other Rockfish	Blue Rockfish	Nonground fish	Flatfish	Other Groundfish	Thorny heads	Total
13	13	4	<0.5	<0.5		**424**
24	18	5	<0.5	<0.5		**482**
24	23	3	<0.5	1		**444**
26	24	4	<0.5	2		**415**
26	17	3	<0.5	1	*	**451**
23	30	4	2	1		**470**
21	11	4	1	1		**473**
14	9	4	1	1		**375**
17	14	4	1	<0.5		**395**
18	11	4	3	1		**386**
205	**169**	**39**	**9**	**8**	**<0.5**	**4,314**

Lingcod	Nonground fish	Other Groundfish	Other Nearshore Rockfish	Other Rockfish	Thorny heads	Total
$248	$31	<$1	$723	$71		**$3,139**
$271	$38	$1	$809	$135		**$3,645**
$226	$20	$2	$820	$132		**$3,433**
$237	$21	$3	$918	$143		**$3,373**
$256	$14	$2	$1,004	$152	*	**$3,691**
$281	$24	$1	$953	$133		**$3,876**
$230	$26	$1	$770	$123		**$3,570**
$192	$33	$1	$625	$88		**$3,062**
$263	$32	$1	$687	$107		**$3,403**
$311	$22	$1	$699	$127		**$3,331**
$2,514	**$261**	**$14**	**$8,009**	**$1,211**	**$4**	**$34,522**

Table 10a. Incidental open access landings by groundish species or species group (mt), 2003-2012.

Year	Sablefish	Roundfish	Rockfish	Flatfish	Other Groundfish	CPS	Crab
2003	78	230	262	51	72	18	61
2004	72	219	303	49	64	21	45
2005	52	179	296	40	59	16	35
2006	64	141	199	41	63	27	42
2007	50	132	193	40	69	23	42
2008	46	96	101	33	46	25	33
2009	41	98	91	33	40	18	36
2010	21	120	132	22	31	10	30
2011	35	160	126	55	47	13	36
2012	38	194	177	62	36	15	37
Total	**497**	**1,569**	**1,880**	**426**	**527**	**186**	**397**

Table 10b. Incidental open access ex-vessel revenue by groundish species or species group in current (2012) dollars,

Year	Sablefish	Roundfish	Rockfish	Flatfish	Other Groundfish	CPS	Crab
2003	$99	$44	$33	$2	$21	$4	$181
2004	$72	$44	$38	$4	$32	$1	$85
2005	$83	$24	$42	$1	$18	$1	$36
2006	$85	$27	$23	$2	$23	$39	$58
2007	$101	$27	$17	$2	$25	$685	$67
2008	$64	$23	$15	<$1	$10	$1,622	$52
2009	$57	$18	$13	$1	$5	$695	$50
2010	$18	$28	$27	$1	$7	$624	$40
2011	$48	$36	$35	$1	$5	$389	$92
2012	$32	$44	$38	$3	$5	$528	$96
Total	**$658**	**$315**	**$281**	**$18**	**$152**	**$4,588**	**$756**

HMS	Other	Salmon	Shrimp	Total
49	248	228	8	**1,305**
42	254	258	6	**1,333**
36	226	253	3	**1,195**
37	202	144	4	**964**
43	206	140	6	**944**
32	149	15	8	**584**
18	149	23	6	**553**
24	152	81	5	**628**
20	180	89	5	**766**
25	197	110	4	**895**
326	**1,963**	**1,341**	**55**	**9,167**

$1,000s, 2003-2012.

HMS	Other	Salmon	Shrimp	Total
$72	$1,169	$934	$260	**$2,820**
$51	$1,267	$1,267	$104	**$2,965**
$27	$1,246	$1,125	$74	**$2,677**
$55	$1,345	$510	$158	**$2,325**
$59	$1,452	$389	$133	**$2,958**
$48	$868	$40	$64	**$2,805**
$14	$651	$98	$43	**$1,644**
$23	$843	$363	$76	**$2,049**
$84	$1,212	$415	$53	**$2,370**
$24	$1,125	$619	$46	**$2,560**
$456	**$11,179**	**$5,760**	**$1,009**	**$25,174**

Table 11a. Nonnearshore Nonsablefish landings by groundish species or species group (mt), 2003-2012.

Year	Blackgill Rockfish	Rougheye Rockfish	Thorny heads	Spiny Dogfish	Other Slope Rockfish	Shelf Rockfish	Other Rockfish
2003	42	<0.5	21		2	3	2
2004	19	*	7	78	3	14	2
2005	9	*	4	98	4	12	1
2006	6	<0.5	4	90	1	17	5
2007	7		23	91	1	19	4
2008	12	<0.5	45	67	2	16	3
2009	21	1	57	<0.5	6	11	2
2010	21	1	67		1	9	1
2011	16	1	65	*	1	13	2
2012	26	1	40	*	3	15	2
Total	**177**	**4**	**332**	**425**	**23**	**128**	**23**

Table 11b. Nonnearshore nonsablefish ex-vessel revenue by groundish species or species group in current (2012) do

Year	Blackgill Rockfish	Rougheye Rockfish	Thorny heads	Spiny Dogfish	Other Slope Rockfish	Shelf Rockfish	Other Rockfish
2003	$141	<$1	$195		$7	$10	$6
2004	$66	*	$64	$42	$8	$66	$6
2005	$35	*	$37	$57	$13	$55	$6
2006	$20	<$1	$37	$51	$4	$76	$20
2007	$39		$196	$55	$4	$97	$17
2008	$55	<$1	$400	$36	$7	$82	$13
2009	$62	$2	$471	<$1	$18	$63	$7
2010	$60	$1	$580		$2	$50	$3
2011	$48	$3	$549	*	$2	$66	$8
2012	$83	$2	$334	*	$9	$80	$9
Total	**$609**	**$8**	**$2,862**	**$241**	**$76**	**$645**	**$96**

Other Roundfish	Flatfish	Other Groundfish	Nonground fish	Total
11	2	13	1	97
13	4	14	*	155
17	1	8	*	155
17	2	4	2	148
20	3	6	2	177
21	2	3	1	172
14	2	2	2	116
10	3	1	1	114
11	4	2	1	116
17	5	7	2	115
151	**28**	**59**	**14**	**1,364**

llars, $1,000s, 2003-2012.

Other Roundfish	Flatfish	Other Groundfish	Nonground fish	Total
$44	$15	$15	$6	$439
$52	$19	$17	$11	$351
$67	$5	$12	$5	$290
$72	$15	$9	$11	$315
$86	$22	$10	$11	$537
$113	$14	$3	$10	$732
$78	$9	$3	$9	$724
$54	$20	$2	$6	$779
$61	$24	$2	$9	$773
$98	$32	$7	$15	$669
$725	**$174**	**$79**	**$93**	**$5,607**

Table 12a. Groundish landings by shoreside commercial fishery sectors (mt), 2003-2012.

Year	Shoreside IFQ Trawl (Nonwhiting)	Shoreside IFQ Trawl (Whiting)	Shoreside IFQ Nontrawl	Non Nearshore Fixed Gear	Nearshore Fixed Gear	Non Fixed Gear Open Access
2003	18,638	51,297		3,092	420	69
2004	17,765	89,999		3,217	476	62
2005	19,342	98,141		3,739	441	48
2006	17,896	97,552		3,625	411	52
2007	20,552	73,667		2,837	448	38
2008	24,270	50,977		3,090	466	28
2009	26,143	40,580		3,964	469	14
2010	22,401	63,200		4,076	371	7
2011	17,108	90,596	1,203	3,626	391	9
2012	17,107	65,823	971	2,783	382	14
Total	**201,220**	**721,831**	**2,175**	**34,049**	**4,275**	**341**
Pct of total	21%	74%	0%	3%	0%	0%
Ann Average	20,122	72,183	1,087	3,405	428	34

Table 12b. Groundish ex-vessel revenue in current (2012) dollars, $1,000s, by shoreside commercial fishery sectors, 2003-

Year	Shoreside IFQ Trawl (Nonwhiting)	Shoreside IFQ Trawl (Whiting)	Shoreside IFQ Nontrawl	Non Nearshore Fixed Gear	Nearshore Fixed Gear	Non Fixed Gear Open Access
2003	$26,902	$6,083		$14,033	$3,108	$137
2004	$23,889	$8,531		$12,597	$3,607	$142
2005	$25,189	$12,790		$15,433	$3,413	$103
2006	$25,571	$14,264		$16,369	$3,353	$127
2007	$27,503	$12,587		$13,179	$3,678	$125
2008	$33,544	$12,420		$15,912	$3,850	$64
2009	$32,096	$5,751		$21,235	$3,543	$23
2010	$26,359	$10,430		$23,901	$3,027	$25
2011	$24,626	$22,802	$7,821	$26,553	$3,372	$35
2012	$22,359	$20,796	$4,982	$16,308	$3,309	$47
Total	**$268,037**	**$126,454**	**$12,803**	**$175,519**	**$34,259**	**$827**
Pct of total	43%	20%	2%	28%	5%	0%
Ann Average	$26,803.8	$12,645.4	$6,401.5	$17,552.0	$3,426.0	$82.8

Incidental Open Access	Exempted trawl, EFP/Research, Misc.	Grand Total
54	3,747	**77,317**
53	1,982	**113,554**
52	293	**122,054**
44	121	**119,701**
49	116	**97,707**
26	156	**79,013**
25	136	**71,331**
17	304	**90,375**
20	1,850	**114,804**
23	786	**87,890**
363	**9,490**	**973,745**
0%	1%	**100%**
36	949	**97,375**

-2012.

Incidental Open Access	Exempted trawl, EFP/Research, Misc.	Grand Total
$200	$3,731	**$54,194**
$190	$1,766	**$50,721**
$169	$615	**$57,712**
$160	$333	**$60,177**
$171	$243	**$57,485**
$111	$324	**$66,225**
$93	$421	**$63,162**
$80	$1,132	**$64,955**
$126	$904	**$86,239**
$123	$616	**$68,538**
$1,423	**$10,084**	**$629,407**
0%	2%	**100%**
$142.3	$1,008.5	**$62,941**

Table 13a. Treaty nonwhiting groundfish sector landings (groundfish only) by gear group (mt), 2003-2012.

Year	Hook-and-Line	Pot	Shrimp Trawl	Other Trawl	Total
2003	629		10	758	**1,397**
2004	754		16	1,071	**1,841**
2005	679		25	1,242	**1,946**
2006	654	<0.5	30	865	**1,548**
2007	535		11	935	**1,481**
2008	669		13	726	**1,408**
2009	759		2	1,046	**1,807**
2010	598	34	12	1,050	**1,693**
2011	557	20	7	1,431	**2,014**
2012	552	47	10	1,273	**1,881**
Total	**6,386**	**101**	**135**	**10,395**	**17,017**

Table 13b. Treaty nonwhiting groundfish sector ex-vessel revenue (groundfish only), current (2012) dollars, $1,000s, 2003-2012.

Year	Hook-and-Line	Pot	Shrimp Trawl	Other Trawl	Total
2003	$2,652		$13	$1,101	**$3,766**
2004	$2,938		$21	$1,341	**$4,300**
2005	$2,620		$35	$1,452	**$4,107**
2006	$2,754	<$1	$47	$932	**$3,733**
2007	$2,483		$18	$998	**$3,499**
2008	$3,014		$21	$912	**$3,947**
2009	$3,902		$3	$1,250	**$5,155**
2010	$3,609	$214	$15	$1,254	**$5,092**
2011	$4,235	$140	$9	$1,814	**$6,198**
2012	$3,048	$164	$16	$1,550	**$4,777**
Total	**$31,255**	**$518**	**$197**	**$12,603**	**$44,574**

Table 14a. Landings (mt) by whiting sectors, 2003-2012.

Sector / Species Group	2003	2004	2005	2006
Catcher-Processor Subtotal	**41,434**	**71,004**	**79,333**	**79,096**
P. Whiting	41,215	69,412	78,890	78,865
Other Groundfish	101	401	204	97
Nongroundfish	118	1,192	239	134
Mothership Subtotal	**26,040**	**24,163**	**49,295**	**55,601**
P. Whiting	26,022	24,102	48,597	55,355
Other Groundfish	5	53	123	176
Nongroundfish	13	8	575	70
Shoreside Whiting Trawl Subtotal	**51,385**	**90,204**	**98,420**	**97,622**
P. Whiting	51,183	89,641	97,559	97,267
Other Groundfish	115	358	582	285
Nongroundfish	88	205	280	71
Treaty Shoreside Whiting Trawl Subtotal	**4,196**	**6,909**	**11,457**	**30,026**
P. Whiting	4,079	6,848	11,422	29,896
Other Groundfish	113	61	32	115
Nongroundfish	5	<0.5	2	15
Treaty Mothership Subtotal	**20,684**	**23,950**	**24,356**	**5,661**
P. Whiting	19,376	23,459	23,582	5,568
Other Groundfish	1,270	470	746	91
Nongroundfish	38	20	28	2
Grand Total	**143,739**	**216,230**	**262,861**	**268,006**

Table 14b. Ex-vessel revenue, current (2012) dollars, $1,000s, by whiting sectors, 2003-2012.

Sector / Species Group	2003	2004	2005	2006
Catcher-Processor Subtotal	**$6,542**	**$11,760**	**$9,987**	**$10,670**
P. Whiting	$6,372	$11,567	$9,823	$10,582
Other Groundfish	$131	$85	$96	$42
Nongroundfish	$38	$109	$68	$46
Mothership Subtotal	**$6,041**	**$3,185**	**$6,057**	**$7,271**
P. Whiting	$6,039	$3,133	$5,948	$7,199
Other Groundfish	$1	$47	$79	$67
Nongroundfish	<1$	$4	$31	$5
Shoreside Whiting Trawl Subtotal	**$6,100**	**$8,558**	**$12,813**	**$14,276**
P. Whiting	$5,966	$8,271	$12,413	$14,018
Other Groundfish	$116	$260	$378	$247
Nongroundfish	$17	$27	$23	$11
Treaty Shoreside Whiting Trawl Subtotal	**$680**	**$554**	**$1,418**	**$3,823**
P. Whiting	$507	$524	$1,389	$3,756
Other Groundfish	$165	$29	$29	$67
Nongroundfish	$7	<1$	<1$	<1$
Treaty Mothership Subtotal	**$2,860**	**$2,123**	**$3,119**	**$834**
P. Whiting	$2,237	$2,036	$3,026	$779
Other Groundfish	$624	$87	$93	$55
Nongroundfish	<1$	<1$	<1$	<1$

Grand Total	**$22,223**	**$26,180**	**$33,394**	**$36,874**

2007	2008	2009	2010	2011	2012	Grand Total
74,304	**109,134**	**38,748**	**54,787**	**72,759**	**55,669**	**676,267**
73,264	108,240	34,801	54,292	71,680	55,264	665,922
211	718	49	219	835	290	3,125
829	175	3,898	277	244	114	7,220
47,986	**57,687**	**24,297**	**35,935**	**50,331**	**38,604**	**409,939**
47,811	57,498	24,091	35,714	50,051	38,442	407,683
157	162	199	175	192	108	1,350
18	26	7	47	88	54	906
73,864	**51,857**	**40,605**	**63,377**	**90,674**	**66,065**	**724,072**
73,277	50,760	40,294	62,655	89,826	65,171	717,634
390	217	287	545	770	651	4,198
197	880	24	177	78	242	2,241
18,321	**17,516**	**9,158**	**1,977**	**11,766**	**613**	**111,938**
18,158	16,972	8,929	1,968	11,756	613	110,642
149	275	127	9	10		889
14	269	102	<0.5	<0.5		407
5,275	**15,152**	**14,107**	**16,530**	**6,438**	**33**	**132,186**
5,167	14,944	13,458	16,309	6,344	31	128,239
82	205	142	218	89	2	3,316
26	3	507	3	5	<0.5	631
219,750	**251,346**	**126,915**	**172,606**	**231,968**	**160,984**	**2,054,402**

2007	2008	2009	2010	2011	2012	Grand Total
$11,910	**$26,610**	**$4,178**	**$9,995**	**$16,263**	**$16,376**	**$124,291**
$11,775	$26,299	$4,163	$9,937	$16,022	$16,259	$122,799
$121	$264	$13	$46	$160	$86	$1,044
$14	$47	$3	$12	$81	$31	$448
$7,423	**$17,355**	**$2,959**	**$6,437**	**$12,331**	**$11,016**	**$80,075**
$7,356	$17,274	$2,818	$6,356	$12,275	$10,974	$79,373
$64	$76	$139	$81	$35	$38	$627
$3	$4	$2	<1$	$21	$4	$76
$12,627	**$12,444**	**$5,751**	**$10,436**	**$22,814**	**$20,820**	**$126,639**
$12,305	$12,305	$5,590	$10,116	$22,027	$20,199	$123,210
$282	$115	$161	$314	$776	$597	$3,245
$40	$24	<1$	$6	$12	$24	$185
$3,000	**$4,010**	**$1,132**	**$209**	**$1,708**	**$133**	**$16,668**
$2,908	$3,799	$1,061	$205	$1,701	$133	$15,985
$91	$148	$48	$4	$7		$588
$2	$62	$23	<1$	<1$		$95
$921	**$3,523**	**$1,308**	**$1,841**	**$1,512**	**$10**	**$18,051**
$911	$3,477	$1,296	$1,738	$1,479	$10	$16,989
$10	$46	$12	$98	$30	<1$	$1,055
<1$	<1$	<1$	$4	$3	<1$	$7

$35,881	$63,942	$15,328	$28,918	$54,628	$48,355	$365,724

Table 15a. Average monthly landings (mt) by commercial fishery sectors, 5 years, 2008-2012 (except as noted).

Sector /Species	January	February	March	April	May
At-Sea Catch-Processor (Whiting)					**15,132**
P. Whiting					15,074
Other Groundfish					58
At-Sea Mothership (Whiting)					**16,346**
P. Whiting					16,253
Other Groundfish					93
Shoreside IFQ Trawl (Whiting)					**1,829**
P. Whiting					1,815
Other Groundfish					14
Shoreside IFQ Trawl (Nonwhiting)	**1,303**	**1,897**	**2,003**	**2,287**	**2,131**
P. Whiting	<0.5	<0.5	1	1	2
Other Groundfish	1,302	1,897	2,001	2,286	2,130
Non Nearshore Fixed Gear	**97**	**104**	**131**	**339**	**414**
P. Whiting	<0.5	<0.5	<0.5	<0.5	<0.5
Other Groundfish	97	104	131	339	414
Nearshore Fixed Gear	**19**	**16**	**11**	**23**	**58**
Other Groundfish	19	16	11	23	58
Non Fixed Gear Open Access	**1**	**1**	**<0.5**	**1**	**1**
Other Groundfish	1	1	<0.5	1	1
Incidental Open Access	**1**	**1**	**<0.5**	**1**	**2**
P. Whiting		*			
Other Groundfish	1	1	<0.5	1	2
Exempted trawl, EFP/Research, Misc.	**7**	**6**	**5**	**6**	**19**
P. Whiting		*	<0.5		*
Other Groundfish	**7**	**6**	**5**	**6**	**19**
Shoreside IFQ Nontrawl**	*****	*****	**33**	**64**	**6**
Other Groundfish	*	*	33	64	6

**2-year average, 2011-2012

Table 15b. Average monthly ex-vessel revenue in nominal dollars, $1,000s, by commercial fishery sectors, 5 years, 2008-

Sector /Species	January	February	March	April	May
At-Sea Catch-Processor (Whiting)					**$3,434**
P. Whiting					$3,405
Other Groundfish					$29
At-Sea Mothership (Whiting)					**$2,936**
P. Whiting					$2,886
Other Groundfish					$50
Shoreside IFQ Trawl (Whiting)					**$338**
P. Whiting					$333
Other Groundfish					$5
Shoreside IFQ Trawl (Nonwhiting)	**$1,797**	**$2,285**	**$2,238**	**$2,420**	**$2,472**
P. Whiting	<1$	<1$	$1	<1$	<1$
Other Groundfish	$1,797	$2,285	$2,238	$2,420	$2,471

Non Nearshore Fixed Gear	**$494**	**$511**	**$685**	**$1,835**	**$2,452**
P. Whiting	<1$	<1$	<1$	<1$	<1$
Other Groundfish	$494	$511	$685	$1,835	$2,452
Nearshore Fixed Gear	**$200**	**$160**	**$71**	**$130**	**$432**
Other Groundfish	$200	$160	$71	$130	$432
Non Fixed Gear Open Access	**$2**	**$2**	**$1**	**$1**	**$3**
Other Groundfish	$2	$2	$1	$1	$3
Incidental Open Access	$7	$4	$1	$2	$9
P. Whiting		*			
Other Groundfish	**$7**	**$4**	**$1**	**$2**	**$9**
Exempted trawl, EFP/Research, Misc.	$16	$13	$8	$18	$45
P. Whiting		*	<1$		*
Other Groundfish	**$16**	**$13**	**$8**	**$18**	**$45**
Shoreside IFQ Nontrawl**	*****	*****	**$131**	**$382**	**$40**
Other Groundfish	*	*	$131	$382	$40

**2-year average, 2011-2012

June	July	August	September	October	November	December
4,226	**56**	**4,860**	**9,904**	**11,412**	**12,914**	**6,773**
4,190	56	4,845	9,872	11,386	12,833	6,599
36	<0.5	15	32	26	82	174
6,871	**1,624**	**1,820**	**2,395**	**8,696**	**3,259**	**316**
6,846	1,621	1,816	2,385	8,679	3,250	310
25	3	5	11	17	9	6
10,966	**11,276**	**17,855**	**7,008**	**8,611**	**4,062**	**628**
10,888	11,167	17,719	6,947	8,576	4,011	618
78	109	136	61	34	51	11
1,796	**1,805**	**1,816**	**1,674**	**1,745**	**1,508**	**1,440**
1	1	1	2	1	1	1
1,795	1,805	1,816	1,672	1,745	1,508	1,439
423	**406**	**443**	**517**	**352**	**164**	**118**
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
423	406	443	517	352	164	118
53	**57**	**53**	**56**	**34**	**21**	**14**
53	57	53	56	34	21	14
1	**1**	**5**	**2**	**1**	**<0.5**	**<0.5**
1	1	5	2	1	<0.5	<0.5
7	**6**	**1**	**1**	**1**	**1**	**1**
	*					
7	6	1	1	1	1	1
179	**117**	**64**	**192**	**40**	**6**	**5**
136	87	25	*	28	*	
43	**30**	**39**	*****	**12**	**6**	**5**
57	**69**	**95**	**265**	**281**	**128**	**77**
57	69	95	265	281	128	77

·2012 (except as noted).

June	July	August	September	October	November	December
$1,362	**$9**	**$1,040**	**$2,045**	**$2,576**	**$2,756**	**939**
$1,337	$9	$1,039	$2,038	$2,569	$2,744	910
$25	<1$	$1	$7	$7	$11	29
$1,954	**$534**	**$525**	**$617**	**$2,242**	**$836**	**43**
$1,944	$534	$524	$616	$2,238	$832	41
$10	<1$	$1	$1	$4	$4	$1
$1,965	**$2,651**	**$4,222**	**$1,619**	**$2,131**	**$1,056**	**$93**
$1,908	$2,533	$4,107	$1,574	$2,113	$1,032	$90
$57	$118	$116	$45	$17	$24	$2
$2,266	**$2,409**	**$2,314**	**$2,226**	**$2,251**	**$2,074**	**$2,036**
<1$	<1$	<1$	$1	$1	<1$	<1$
$2,266	$2,409	$2,314	$2,224	$2,251	$2,074	$2,036

$2,523	**$2,438**	**$2,643**	**$2,965**	**$2,052**	**$879**	**$626**
<1$	<1$	<1$	<1$	<1$	<1$	<1$
$2,523	$2,438	$2,643	$2,965	$2,052	$879	$626
$393	**$448**	**$398**	**$426**	**$282**	**$207**	**$157**
$393	$448	$398	$426	$282	$207	$157
$3	**$5**	**$8**	**$5**	**$5**	**$1**	**<1$**
$3	$5	$8	$5	$5	$1	<1$
$28	$26	$8	$4	$5	$4	$5
	*					
$28	**$26**	**$8**	**$4**	**$5**	**$4**	**$5**
$116	$131	$110	$110	$47	$26	$20
$30	$26	$8	*	$7	*	
$85	**$105**	**$102**	*****	**$40**	**$26**	**$20**
$174	**$294**	**$565**	**$1,649**	**$1,841**	**$764**	**$475**
$174	$294	$565	$1,649	$1,841	$764	$475

Table 16a. Average monthly landings (mt) by Treaty fishery sectors, 5 years, 2008-2012.

Sector/ Species	January	February	March	April
Treaty Whiting Mothership				
P. Whiting				
Other Groundfish				
Treaty Shoreside Whiting Trawl				
P. Whiting				
Other Groundfish				
Treaty Shoreside Nonwhiting Groundfish	**40**	**47**	**107**	**247**
Other Groundfish	40	47	107	247

Table 16b. Average monthly ex-vessel revenue in nominal dollars, $1,000s, by Treaty fishery sectors, 5 years, 20

Sector/ Species	January	February	March	April
Treaty Whiting Mothership				
P. Whiting				
Other Groundfish				
Treaty Shoreside Whiting Trawl				
P. Whiting				
Other Groundfish				
Treaty Shoreside Nonwhiting Groundfish	**$46**	**$53**	**$315**	**$931**
Other Groundfish	$46	$53	$315	$931

May	June	July	August	September	October	November	December
	6,426	**10,541**	**5,769**	**3,312**	**5,013**	**1,869**	**630**
	6,063	10,222	5,618	3,267	4,859	1,824	625
	362	319	151	44	154	45	6
17	**4**	**2,125**	**1,269**	**1,102**	**2,090**	**990**	**535**
14	4	2,112	1,266	1,098	2,070	965	520
3		14	3	5	20	25	14
236	**204**	**165**	**146**	**202**	**198**	**93**	**77**
236	204	165	146	202	198	93	77

)08-2012.

May	June	July	August	September	October	November	December
	$676	**$1,086**	**$659**	**$524**	**$778**	**$252**	**$22**
	$571	$1,024	$607	$492	$732	$249	$21
	$106	$62	$52	$32	$46	$2	$1
$6	**$1**	**$282**	**$175**	**$250**	**$417**	**$148**	**$77**
$3	$1	$277	$173	$248	$408	$138	$70
$3		$5	$2	$3	$9	$10	$7
$649	**$601**	**$438**	**$290**	**$503**	**$559**	**$280**	**$209**
$649	$601	$438	$290	$503	$559	$280	$209

Table 17a. Average monthly groundfish landings (mt) by species and species groups, 5 years, 2008-2012.

Month	P. Whiting	Sablefish	P. Cod	Other Roundfish	Rockfish	Thorny heads	Arrowtooth Flounder
January	<0.5	186	6	6	73	132	118
February	1	225	12	4	78	192	254
March	2	312	14	3	97	175	257
April	1	645	37	5	123	235	398
May	1,831	661	61	11	228	249	420
June	11,029	683	59	8	260	220	277
July	13,366	687	58	11	289	194	260
August	19,010	669	46	8	295	192	235
September	8,209	821	22	10	311	215	152
October	10,675	687	38	6	238	227	189
November	4,977	418	5	4	143	184	141
December	1,139	318	13	3	141	140	155

Table 17b. Average monthly groundfish ex-vessel revenue in nominal dollars, $1,000s, by species and species groups,

Month	P. Whiting	Sablefish	P. Cod	Other Roundfish	Rockfish	Thorny heads	Arrowtooth Flounder
January	<$1	$838	$7	$63	$230	$295	$26
February	<$1	$1,019	$13	$46	$212	$326	$56
March	<$1	$1,481	$16	$29	$160	$336	$58
April	<$1	$3,461	$43	$41	$237	$378	$93
May	$336	$3,708	$69	$112	$515	$400	$96
June	$1,939	$3,782	$69	$82	$553	$372	$62
July	$2,837	$3,772	$65	$83	$633	$367	$58
August	$4,288	$3,767	$56	$77	$597	$339	$52
September	$1,865	$4,616	$24	$98	$649	$394	$36
October	$2,529	$3,926	$45	$58	$469	$399	$41
November	$1,170	$2,102	$6	$37	$317	$364	$30
December	$161	$1,551	$14	$31	$294	$302	$34

Dover Sole	English Sole	Lingcod	Other Flatfish	Other Groundfish	Petrale Sole
562	11	6	33	82	255
864	18	13	41	130	244
1,062	18	20	42	127	143
1,196	19	11	56	155	50
877	23	36	79	162	73
672	35	40	108	181	85
670	38	48	102	177	86
769	35	41	110	197	83
776	20	38	72	150	62
806	16	25	64	163	52
743	13	14	43	136	77
638	14	18	32	85	154

, 5 years, 2008-2012.

Dover Sole	English Sole	Lingcod	Other Flatfish	Other Groundfish	Petrale Sole
$444	$8	$9	$31	$48	$564
$654	$13	$24	$39	$73	$559
$815	$13	$34	$37	$68	$323
$943	$14	$21	$52	$85	$124
$694	$16	$101	$75	$96	$203
$530	$24	$106	$109	$113	$224
$548	$27	$115	$105	$102	$234
$641	$25	$104	$110	$111	$226
$644	$15	$99	$68	$87	$176
$644	$12	$70	$57	$87	$150
$586	$10	$44	$41	$59	$214
$513	$10	$29	$30	$49	$394

Table 18a. Groundfish landings (mt) by "IOPAC port groups", 2003-2012

Port	2003	2004	2005	2006	2007
Washington Subtotal	**23,997**	**39,341**	**50,471**	**65,430**	**50,139**
Puget Sound	3,580	3,465	2,983	1,959	1,462
North WA coast	2,284	2,128	2,438	1,891	1,592
South and central WA coast	18,133	33,748	45,049	61,580	47,086
Oregon Subtotal	**48,266**	**70,680**	**73,807**	**73,743**	**56,807**
Astoria	19,136	21,556	23,145	31,489	25,734
Tillamook	107	88	46	73	49
Newport	22,679	41,380	43,304	33,647	24,066
Coos Bay	5,110	6,857	6,203	7,458	5,570
Brookings	1,234	799	1,109	1,075	1,389
California Subtotal	**10,643**	**12,282**	**11,176**	**12,087**	**10,549**
Crescent City	1,024	2,177	1,568	2,140	1,642
Eureka	3,817	4,950	5,166	6,223	5,213
Fort Bragg	1,597	1,616	1,902	1,446	1,470
Bodega Bay	212	41	13	62	95
San Francisco	1,031	1,208	690	714	1,119
Monterey	1,585	1,009	989	916	457
Morro Bay	956	893	507	244	223
Santa Barbara	97	100	92	107	91
Los Angeles	200	221	160	111	165
San Diego	123	67	89	122	76
Grand Total	**82,905**	**122,303**	**135,454**	**151,260**	**117,495**

Table 18b. Groundish ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups", 2003-2012

Port	2003	2004	2005	2006	2007
Washington Subtotal	**$14,862**	**$14,787**	**$18,601**	**$20,137**	**$17,254**
Puget Sound	$4,801	$4,599	$5,071	$4,545	$3,033
North WA coast	$4,840	$4,662	$4,614	$4,099	$3,852
South and central WA coast	$5,221	$5,526	$8,916	$11,492	$10,369
Oregon Subtotal	**$25,349**	**$24,362**	**$28,649**	**$31,188**	**$29,321**
Astoria	$8,813	$9,257	$10,741	$12,470	$11,317
Tillamook	$265	$239	$140	$236	$201
Newport	$7,542	$8,316	$9,536	$9,593	$8,734
Coos Bay	$5,663	$4,397	$5,222	$5,989	$5,797
Brookings	$3,065	$2,152	$3,011	$2,900	$3,273
California Subtotal	**$18,421**	**$16,425**	**$15,986**	**$16,407**	**$17,408**
Crescent City	$2,108	$1,291	$1,661	$1,863	$1,903
Eureka	$3,692	$3,303	$3,616	$4,278	$4,826
Fort Bragg	$2,933	$2,897	$3,400	$2,730	$2,987
Bodega Bay	$385	$151	$103	$155	$261
San Francisco	$1,865	$2,070	$1,451	$1,703	$2,161
Monterey	$2,847	$2,115	$2,067	$2,080	$1,434
Morro Bay	$2,362	$2,411	$1,675	$1,502	$1,597
Santa Barbara	$489	$538	$469	$560	$617

Los Angeles	$1,090	$1,350	$967	$688	$1,059
San Diego	$651	$300	$579	$848	$564
Grand Total	**$58,633**	**$55,574**	**$63,236**	**$67,732**	**$63,983**

2008	2009	2010	2011	2012
39,386	**24,516**	**35,645**	**39,393**	**22,311**
1,138	1,565	1,403	706	804
1,522	1,829	1,642	1,833	1,819
36,726	21,123	32,600	36,855	19,688
45,077	**47,330**	**48,236**	**81,822**	**61,727**
18,441	22,662	21,567	49,935	30,672
41	62	37	30	30
19,074	17,347	20,702	26,459	27,211
5,850	5,515	4,148	3,962	2,377
1,671	1,743	1,783	1,436	1,437
13,204	**10,349**	**10,164**	**7,368**	**6,342**
4,284	2,666	2,746	386	178
4,738	3,152	2,726	2,229	1,935
1,758	1,956	1,857	1,670	1,484
118	82	75	73	53
1,027	774	723	521	373
541	476	566	585	618
393	874	937	1,275	1,162
80	126	266	332	257
145	144	151	181	146
122	100	119	117	136
97,667	**82,195**	**94,045**	**128,583**	**90,380**

2.

2008	2009	2010	2011	2012
$17,949	**$14,786**	**$16,529**	**$23,224**	**$17,007**
$2,594	$2,838	$2,011	$2,030	$1,605
$3,844	$4,822	$4,659	$5,706	$4,377
$11,511	$7,125	$9,859	$15,487	$11,025
$35,882	**$33,590**	**$32,309**	**$45,760**	**$38,443**
$12,840	$11,577	$9,675	$20,217	$17,527
$180	$198	$144	$171	$150
$11,478	$10,607	$10,902	$14,237	$12,829
$7,193	$6,416	$6,962	$6,221	$4,260
$4,191	$4,792	$4,626	$4,914	$3,678
$20,288	**$21,050**	**$21,418**	**$25,151**	**$17,993**
$2,708	$2,520	$1,296	$897	$563
$5,403	$4,505	$4,494	$4,314	$3,284
$3,637	$4,356	$4,113	$4,834	$3,330
$325	$271	$380	$444	$358
$2,055	$1,538	$1,484	$1,991	$1,096
$1,556	$1,364	$1,569	$1,899	$1,428
$2,086	$3,932	$4,669	$6,796	$4,305
$563	$790	$1,531	$2,111	$1,883

$982	$1,027	$1,063	$1,158	$924
$972	$746	$819	$705	$822
$74,120	**$69,427**	**$70,256**	**$94,135**	**$73,443**

Table 19. Landings (mt) ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups" and spec

	P. Whiting		Sablefish		Other Ro
	metric tons	$000s	metric tons	$000s	metric tons
2010					
Washington Subtotal	**30,688**	**$4,270**	**1,473**	**$9,653**	**340**
Puget Sound			192	$1,275	47
North WA coast			497	$3,324	287
South and central WA coast	30,688	$4,270	784	$5,054	6
Oregon Subtotal	**31,539**	**$5,628**	**2,858**	**$15,665**	**175**
Astoria	14,099	$2,176	681	$2,895	83
Tillamook			2	$13	6
Newport	17,304	$3,439	926	$5,482	13
Coos Bay	135	$13	761	$4,453	17
Brookings			487	$2,822	55
California Subtotal	**2,427**	**$430**	**2,498**	**$11,956**	**71**
Crescent City	2,343	$419	86	$395	8
Eureka	84	$11	523	$2,629	4
Fort Bragg			504	$2,588	23
Bodega Bay			41	$262	2
San Francisco			109	$660	5
Monterey			212	$896	6
Morro Bay	*	*	773	$3,288	19
Santa Barbara	<0.5	<$1	174	$794	5
Los Angeles	*	*	53	$311	<0.5
San Diego			25	$133	1
2011					
Washington Subtotal	**34,482**	**$7,319**	**1,535**	**$12,457**	**505**
Puget Sound	*	*	159	$1,446	76
North WA coast			486	$4,027	392
South and central WA coast	34,480	$7,319	889	$6,984	37
Oregon Subtotal	**68,704**	**$16,813**	**2,305**	**$17,662**	**497**
Astoria	42,444	$10,373	590	$3,592	391
Tillamook			7	$48	8
Newport	24,722	$6,095	785	$7,103	15
Coos Bay	1,538	$345	522	$3,906	12
Brookings	<0.5	<$1	401	$3,012	71
California Subtotal	**5**	**$5**	**2,566**	**$15,411**	**67**
Crescent City			72	$457	7
Eureka	<0.5	<$1	363	$2,391	3
Fort Bragg	*	*	462	$3,185	14
Bodega Bay			67	$412	1
San Francisco	*	*	175	$1,341	4
Monterey	*	*	221	$1,223	5
Morro Bay			875	$4,618	28
Santa Barbara	<0.5	<$1	244	$1,318	6
Los Angeles	<0.5	<$1	58	$316	<0.5

San Diego			30	$150	1
2012					
Washington Subtotal	**17,535**	**$5,882**	**1,316**	**$7,514**	**406**
Puget Sound	*	*	142	$911	31
North WA coast			483	$2,766	285
South and central WA coast	17,535	$5,882	691	$3,837	89
Oregon Subtotal	**48,831**	**$14,611**	**2,152**	**$11,529**	**709**
Astoria	23,518	$7,558	596	$3,150	598
Tillamook			*	*	12
Newport	25,312	$7,053	741	$4,512	17
Coos Bay	1	<$1	464	$2,159	13
Brookings	<0.5	<$1	352	$1,705	70
California Subtotal	**4**	**$6**	**1,778**	**$8,989**	**83**
Crescent City	*	*	63	$318	6
Eureka	<0.5	<$1	318	$1,515	6
Fort Bragg	2	$2	392	$1,845	18
Bodega Bay			*	*	1
San Francisco	*	*	98	$498	6
Monterey	*	*	164	$728	8
Morro Bay	2	$2	426	$1,982	30
Santa Barbara			169	$1,121	7
Los Angeles	<0.5	$2	47	$277	1
San Diego			57	$411	1

ies and species groups, 2010-2012

oundfish	Rockfish		Flatfish		Other Groundfish	
$000s	metric tons	$000s	metric tons	$000s	metric tons	$000s
$379	**984**	**$1,092**	**1,946**	**$1,077**	**215**	**$57**
$51	74	$79	1,035	$579	55	$28
$322	649	$806	175	$194	34	$12
$6	261	$206	736	$304	125	$18
$672	**2,194**	**$2,618**	**10,365**	**$7,133**	**1,105**	**$593**
$106	853	$829	5,392	$3,436	458	$233
$39	20	$78	*	*	*	*
$52	572	$586	1,590	$1,186	295	$158
$55	463	$458	2,474	$1,806	297	$177
$421	287	$667	901	$691	53	$25
$481	**1,814**	**$5,717**	**3,077**	**$2,704**	**276**	**$129**
$43	134	$298	163	$136	12	$4
$11	402	$560	1,598	$1,247	115	$36
$109	546	$786	752	$620	32	$10
$10	17	$65	*	*	*	*
$23	170	$349	400	$433	39	$19
$48	159	$436	127	$146	63	$42
$161	134	$1,200	7	$15	5	$5
$68	80	$655	4	$11	3	$4
$2	80	$692	11	$52	6	$6
$6	93	$677	*	*	1	$3
$663	**1,063**	**$1,204**	**1,496**	**$1,387**	**314**	**$195**
$135	32	$38	407	$390	30	$21
$472	530	$661	375	$525	49	$22
$57	501	$505	714	$471	235	$152
$1,217	**1,812**	**$2,517**	**7,478**	**$6,901**	**1,027**	**$651**
$539	1,085	$1,190	4,700	$4,037	726	$486
$50	15	$72				
$60	224	$259	638	$681	76	$40
$54	247	$299	1,473	$1,522	169	$94
$514	240	$696	667	$661	56	$31
$574	**1,581**	**$5,818**	**2,852**	**$3,136**	**296**	**$207**
$41	54	$160	*	*	11	$9
$9	282	$417	1,459	$1,404	123	$92
$95	503	$796	636	$720	51	$33
$5	4	$26	1	$1	*	*
$28	77	$234	248	$375	18	$13
$55	121	$370	176	$220	62	$31
$254	282	$1,796	69	$113	22	$15
$78	73	$699	6	$11	4	$5
$4	102	$772	16	$61	6	$6

$5	85	$548	*	*	*	*
$558	**1,276**	**$1,492**	**1,511**	**$1,385**	**269**	**$175**
$57	170	$205	400	$380	62	$52
$355	620	$783	344	$419	87	$55
$147	486	$504	767	$587	120	$69
$1,550	**1,857**	**$2,660**	**7,188**	**$7,315**	**990**	**$779**
$841	1,107	$1,225	4,189	$4,171	665	$582
$66	18	$81				
$69	246	$295	774	$829	121	$71
$58	231	$328	1,510	$1,618	158	$98
$515	255	$731	714	$699	46	$28
$639	**1,577**	**$5,231**	**2,582**	**$2,891**	**318**	**$238**
$38	60	$162	*	*	6	$2
$19	291	$413	1,198	$1,241	122	$97
$86	475	$728	546	$634	52	$36
$12	5	$50	*	*	*	*
$35	90	$261	170	$294	11	$8
$79	98	$345	284	$242	66	$35
$271	340	$1,656	318	$352	47	$43
$85	64	$649	10	$18	7	$10
$8	79	$568	12	$64	7	$6
$6	76	$400	1	$3	1	$2

Table 20. Landings (mt) ex-vessel revenue in current (2012) dollars, $1,000s, by "IOPAC port groups" and commercial fishe

	2010				
	P. Whiting		Other Groundfish		P. Wh
	mt	$1,000s	mt	$1,000s	mt
Puget Sound			**1,399**	**1,979**	*
Shoreside IFQ Trawl (Nonwhiting)			1,250	1,016	*
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			142	941	
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.			*	*	
North WA coast			**172**	**947**	
Shoreside IFQ Trawl (Nonwhiting)			*	*	
Non Nearshore Fixed Gear			159	927	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			1	2	
South and central WA coast	**28,721**	**4,065**	**1,684**	**4,237**	**22,724**
Shoreside IFQ Trawl (Whiting)	28,720	4,065	254	96	22,063
Shoreside IFQ Trawl (Nonwhiting)	<0.5	<$1	866	570	*
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			*	*	
Non Fixed Gear Open Access			1	7	
Incidental Open Access			2	6	
Exempted trawl, EFP/Research, Misc.			*	*	*
Astoria	**14,099**	**2,176**	**7,468**	**7,499**	**42,444**
Shoreside IFQ Trawl (Whiting)	14,077	2,171	102	106	41,631
Shoreside IFQ Trawl (Nonwhiting)	*	*	7,331	7,190	18
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			31	195	
Nearshore Fixed Gear					
Non Fixed Gear Open Access			*	*	
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.	*	*	4	6	795
Tillamook			**37**	**144**	
Shoreside IFQ Trawl (Nonwhiting)			*	*	
Non Nearshore Fixed Gear			4	19	
Nearshore Fixed Gear			24	109	
Non Fixed Gear Open Access			<0.5	1	
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.					
Newport	**17,304**	**3,439**	**3,397**	**7,464**	**24,722**
Shoreside IFQ Trawl (Whiting)	*	*	157	102	24,595
Shoreside IFQ Trawl (Nonwhiting)	*	*	2,723	3,808	<0.5
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			500	3,486	
Nearshore Fixed Gear			13	47	
Non Fixed Gear Open Access			<0.5	<$1	
Incidental Open Access			2	9	

Exempted trawl, EFP/Research, Misc.			3	11	*
Coos Bay	**135**	**13**	**4,012**	**6,949**	**1,538**
Shoreside IFQ Trawl (Whiting)	*	*	1	<$1	*
Shoreside IFQ Trawl (Nonwhiting)	*	*	3,616	4,247	1
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			388	2,656	*
Nearshore Fixed Gear			5	37	
Non Fixed Gear Open Access			<0.5	1	
Incidental Open Access			1	2	
Exempted trawl, EFP/Research, Misc.			1	5	
Brookings			**1,783**	**4,626**	**<0.5**
Shoreside IFQ Trawl (Nonwhiting)			1,321	1,867	<0.5
Non Nearshore Fixed Gear			322	1,912	*
Nearshore Fixed Gear			133	835	
Non Fixed Gear Open Access					
Incidental Open Access			<0.5	<$1	
Exempted trawl, EFP/Research, Misc.			6	12	*
Crescent City	**2,343**	**419**	**403**	**876**	
Shoreside IFQ Trawl (Whiting)	*	*	29	7	
Shoreside IFQ Trawl (Nonwhiting)			259	403	
Non Nearshore Fixed Gear			40	181	
Nearshore Fixed Gear			59	272	
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.	*	*	*	*	
Eureka	**84**	**11**	**2,641**	**4,483**	**<0.5**
Shoreside IFQ Trawl (Whiting)	79	9	2	3	
Shoreside IFQ Trawl (Nonwhiting)	6	2	2,441	3,450	<0.5
Non Nearshore Fixed Gear			194	1,009	
Nearshore Fixed Gear			4	20	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			*	*	
Fort Bragg			**1,857**	**4,113**	*****
Shoreside IFQ Trawl (Nonwhiting)			1,572	2,338	*
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			268	1,586	
Nearshore Fixed Gear			15	178	
Non Fixed Gear Open Access					
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.			*	*	
Bodega Bay			**75**	**380**	
Shoreside IFQ Trawl (Nonwhiting)			*	*	
Non Nearshore Fixed Gear			41	265	
Nearshore Fixed Gear			3	48	
Non Fixed Gear Open Access					
Incidental Open Access			<0.5	1	
Exempted trawl, EFP/Research, Misc.			*	*	
San Francisco			**722**	**1,484**	*****

Shoreside IFQ Trawl (Nonwhiting)			625	820	*
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			72	509	
Nearshore Fixed Gear			10	119	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			*	*	
Exempted trawl, EFP/Research, Misc.			15	27	
Monterey			**566**	**1,569**	*****
Shoreside IFQ Trawl (Nonwhiting)			*	*	
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear			214	865	*
Nearshore Fixed Gear			13	147	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			<0.5	1	
Exempted trawl, EFP/Research, Misc.			*	*	
Morro Bay	*****	*****	**937**	**4,668**	
Shoreside IFQ Trawl (Nonwhiting)					
Shoreside IFQ Nontrawl					
Non Nearshore Fixed Gear	*	*	655	2,764	
Nearshore Fixed Gear			74	945	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			1	5	
Exempted trawl, EFP/Research, Misc.			207	955	
Santa Barbara	**<0.5**	**<$1**	**266**	**1,531**	*****
Non Nearshore Fixed Gear	<0.5	<$1	239	1,241	*
Nearshore Fixed Gear			14	229	
Non Fixed Gear Open Access			1	2	
Incidental Open Access			4	29	
Exempted trawl, EFP/Research, Misc.			9	29	
Los Angeles	*****	*****	**151**	**1,063**	*****
Non Nearshore Fixed Gear	*	*	132	991	*
Nearshore Fixed Gear			4	33	
Non Fixed Gear Open Access			3	3	
Incidental Open Access			3	5	
Exempted trawl, EFP/Research, Misc.			9	31	
San Diego			**119**	**819**	
Non Nearshore Fixed Gear			116	800	
Nearshore Fixed Gear			1	8	
Non Fixed Gear Open Access			*	*	
Incidental Open Access			1	9	
Exempted trawl, EFP/Research, Misc.			*	*	

ry sectors, 2010-2012

2011			2012			
iiting	Other Groundfish		P. Whiting		Other Groundfish	
$1,000s	mt	$1,000s	mt	$1,000s	mt	$1,000s
*****	**703**	**2,022**	*****	*****	**804**	**1,604**
*	551	698	*	*	*	*
	*	*			*	*
	131	1,141			108	626
					*	*
	*	*			*	*
	154	**1,124**			**154**	**846**
	153	1,121			150	829
					2	13
	1	3			1	4
5,617	**2,032**	**6,563**	**16,922**	**5,749**	**1,940**	**3,899**
5,456	219	179	16,813	5,715	157	98
*	1,172	1,867	*	*	1,346	1,524
	297	1,814			183	857
	332	2,677			249	1,399
	*	*			1	4
	*	*			3	12
*	10	12	*	*	3	6
10,373	**7,492**	**9,843**	**23,518**	**7,558**	**7,154**	**9,969**
10,160	415	344	23,117	7,440	297	229
3	6,805	8,188	14	3	6,433	7,635
	45	389			257	1,591
	90	759			64	390
	*	*				
	2	9			3	8
210	135	155	387	115	100	116
	30	**171**			**30**	**150**
	9	60			4	21
	21	110			25	126
	*	*			*	*
	<0.5	<$1			<0.5	2
	*	*			*	*
6,095	**1,737**	**8,143**	**25,312**	**7,052**	**1,899**	**5,776**
6,066	132	250	25,242	7,044	198	271
<$1	890	1,435	<0.5	<$1	1,052	1,532
	260	2,291			216	1,174
	409	4,035			377	2,656
	7	30			11	49
	<0.5	3			<0.5	1
	2	15			3	14

*	37	82	*	*	41	80
345	**2,423**	**5,876**	**1**	**<$1**	**2,377**	**4,260**
*	*	*				
<$1	2,094	3,101	*	*	2,138	2,836
	20	132			*	*
*	286	2,541			207	1,269
	8	57			11	81
	*	*			*	*
	3	15			1	5
	8	25	*	*	9	12
<$1	**1,436**	**4,914**	**<0.5**	**<$1**	**1,437**	**3,678**
<$1	967	1,621	<0.5	<$1	1,070	1,527
*	285	2,240			207	1,124
	163	1,012			154	1,014
	*	*			<0.5	<$1
	*	*			1	6
*	21	39			5	7
	386	**897**	*****	*****	**178**	**563**
	*	*	*	*	*	*
	52	344			36	202
	36	165			32	155
	<0.5	1			<0.5	1
	*	*			*	*
<$1	**2,229**	**4,314**	**<0.5**	**<$1**	**1,935**	**3,284**
<$1	2,120	3,415	<0.5	<$1	1,855	2,722
	105	874			77	540
	4	17			3	20
	*	*			*	*
	*	*			<0.5	<$1
*****	**1,665**	**4,829**	**2**	**2**	**1,482**	**3,329**
*	1,331	2,401	2	2	1,195	1,843
	*	*			*	*
	286	2,004			254	1,306
	17	210			10	104
	*	*			<0.5	2
	<0.5	1			*	*
	<0.5	2			1	3
	73	**444**			**53**	**358**
	*	*			*	*
	68	420			47	312
	1	18			3	43
	<0.5	2				
	<0.5	1			<0.5	<$1
					*	*
*****	**521**	**1,991**	*****	*****	**373**	**1,096**

*	335	557	*	*	251	420
	54	323			27	49
	107	935			60	381
	11	136			12	140
	<0.5	5			1	4
	<0.5	4			1	5
	14	31			23	97
*****	**584**	**1,899**	*****	*****	**618**	**1,428**
	*	*			*	*
	*	*			14	60
*	195	928	*	*	169	682
	12	149			14	173
	*	*			3	9
	1	4			<0.5	2
	5	15			*	*
	1,275	**6,796**	**2**	**2**	**1,161**	**4,303**
	*	*	*	*	*	*
	454	2,336			209	964
	549	2,890	*	*	296	1,374
	96	1,243			86	1,124
	*	*			*	*
	1	4			1	6
	8	37			11	41
*****	**332**	**2,111**			**257**	**1,883**
*	300	1,827			222	1,584
	10	178			14	212
	3	9			*	*
	4	37			*	*
	15	61			17	50
*****	**181**	**1,158**	**<0.5**	**2**	**146**	**922**
*	158	1,065	<0.5	2	125	810
	5	40			7	65
	3	3			3	3
	3	6			3	9
	13	43			8	36
	117	**705**			**136**	**821**
	114	690			131	798
	*	*			1	5
	1	1			1	4
	1	8			2	11
	*	*			1	3

Table 21. Number of vessels making at least one groundfish landing by "IOPAC port groups" and commercial fis

Fishery / Port	Vessels	Fishery / Port	Vessels
Shoreside IFQ Trawl (Whiting)		**Nearshore Fixed Gear**	
Washington	**21**	**Oregon**	**216**
South and central WA coast	21	Astoria	1
Oregon	**32**	Tillamook	42
Astoria	26	Newport	35
Newport	20	Coos Bay	36
Coos Bay	4	Brookings	132
California	**12**	**California**	**382**
Crescent City	11	Crescent City	27
Eureka	7	Eureka	18
Coastwide	**41**	Fort Bragg	36
Shoreside IFQ Trawl (Nonwhiting)		Bodega Bay	20
Washington	**20**	San Francisco	49
Puget Sound	8	Monterey	56
North WA coast	3	Morro Bay	113
South and central WA coast	13	Santa Barbara	61
Oregon	**84**	Los Angeles	23
Astoria	42	San Diego	13
Tillamook	3	**Coastwide**	**597**
Newport	29	**Non Fixed Gear Open Access**	
Coos Bay	29	**Washington**	**18**
Brookings	14	North WA coast	6
California	**42**	South and central WA coast	12
Crescent City	13	**Oregon**	**44**
Eureka	16	Astoria	3
Fort Bragg	7	Tillamook	5
Bodega Bay	3	Newport	11
San Francisco	13	Coos Bay	19
Monterey	3	Brookings	7
Morro Bay	2	**California**	**88**
Santa Barbara	1	Eureka	3
Coastwide	**125**	Fort Bragg	7
Shoreside IFQ Nontrawl		Bodega Bay	3
Washington	**10**	San Francisco	12
Puget Sound	3	Monterey	10
South and central WA coast	10	Morro Bay	7
Oregon	**17**	Santa Barbara	18
Astoria	7	Los Angeles	26
Newport	8	San Diego	6
Coos Bay	4	**Coastwide**	**150**
California	**22**	**Incidental Open Access**	
Fort Bragg	1	**Washington**	**46**
San Francisco	4	Puget Sound	2
Monterey	4	North WA coast	22

Morro Bay	15
Coastwide	**40**
Non Nearshore Fixed Gear	
Washington	**124**
Puget Sound	23
North WA coast	40
South and central WA coast	87
Oregon	**317**
Astoria	33
Tillamook	43
Newport	123
Coos Bay	97
Brookings	64
California	**722**
Crescent City	21
Eureka	61
Fort Bragg	91
Bodega Bay	32
San Francisco	126
Monterey	142
Morro Bay	182
Santa Barbara	85
Los Angeles	75
San Diego	61
Coastwide	**1129**
South and central WA coast	34
Oregon	**200**
Astoria	25
Tillamook	27
Newport	59
Coos Bay	76
Brookings	29
California	**367**
Crescent City	11
Eureka	10
Fort Bragg	16
Bodega Bay	20
San Francisco	51
Monterey	49
Morro Bay	70
Santa Barbara	64
Los Angeles	62
San Diego	46
Coastwide	**604**

hery sectors, 5 years 2008-2012.

Fishery / Port	Vessels
Exempted trawl, EFP/Research, Misc.	
Washington	**19**
Puget Sound	4
South and central WA coast	16
Oregon	**76**
Astoria	23
Tillamook	2
Newport	28
Coos Bay	16
Brookings	29
California	**133**
Crescent City	5
Eureka	2
Fort Bragg	17
Bodega Bay	2
San Francisco	23
Monterey	8
Morro Bay	35
Santa Barbara	38
Los Angeles	24
San Diego	8
Coastwide	**218**

Table 22. Number of vessels making at least one groundfish landing by commercial fishery sector and length category (feet), 5 years 2008-2012.

	Length category)				
Fishery	**<= 40**	**41-50**	**51-60**	**61-70**	**71-150**
Shoreside IFQ Trawl (Whiting)			2	8	35
Shoreside IFQ Trawl (Nonwhiting)	1	15	34	34	50
Shoreside IFQ Nontrawl	9	10	7	12	5
Non Nearshore Fixed Gear	831	211	65	26	9
Nearshore Fixed Gear	563	30	2		1
Non Fixed Gear Open Access	102	41	6		1
Incidental Open Access	437	124	27	8	10
Exempted trawl, EFP/Research, Misc.	109	47	27	15	22

Table 23. Engagement (groundfish ex-vessel revenue in port as percent of ex-vessel coastwide revenue) and dependence (groundfishex-vessel revenue in port as percent of total ex-vessel revenue in port), using current (2012) dollars, 2003-2012.

	Engagement	Dependence
Puget Sound	5%	44%
North WA coast	7%	45%
South and central WA coast	14%	14%
Washington	**25%**	**20%**
Astoria	18%	37%
Tillamook	0%	5%
Newport	15%	30%
Coos Bay	8%	22%
Brookings	5%	32%
Oregon	**47%**	**30%**
Crescent City	2%	10%
Eureka	6%	26%
Fort Bragg	5%	36%
Bodega Bay	0%	4%
San Francisco	3%	9%
Monterey	3%	16%
Morro Bay	5%	65%
Santa Barbara	1%	3%
Los Angeles	1%	3%
San Diego	1%	10%
California	**28%**	**12%**
Coastwide		**19%**

Table 24. Groundfish landings (mt) on the west coast (Washington-Oregon-California) from inside and outside the Pacific Council management area.

Year	Pacific Council Area		Council Area		Neither Council Area	
	metric tons	percent	metric tons	percent	metric tons	percent
1981	103,344	85%	8,254	7%	9,827	8%
1982	119,356	85%	10,051	7%	10,579	8%
1983	98,978	80%	10,114	8%	14,352	12%
1984	89,804	73%	18,483	15%	14,353	12%
1985	90,923	77%	8,969	8%	17,760	15%
1986	82,480	76%	5,185	5%	20,488	19%
1987	91,982	77%	553	<1%	26,633	22%
1988	92,248	85%	270	<1%	16,123	15%
1989	99,372	84%	131	<1%	18,456	16%
1990	94,539	86%	1,755	2%	13,416	12%
1991	105,547	83%	3,711	3%	17,425	14%
1992	132,555	85%	379	<1%	22,179	14%
1993	116,394	87%	437	<1%	17,125	13%
1994	135,677	91%	569	<1%	12,093	8%
1995	134,493	92%	485	<1%	10,523	7%
1996	146,452	92%	459	<1%	12,956	8%
1997	143,571	93%	346	<1%	10,488	7%
1998	131,011	93%	363	<1%	9,729	7%
1999	125,883	95%	251	<1%	6,364	5%
2000	123,031	97%	191	<1%	3,586	3%
2001	103,556	97%	93	<1%	3,154	3%
2002	75,056	97%	94	<1%	2,058	3%
2003	82,905	97%	91	<1%	2,532	3%
2004	122,303	97%	87	<1%	3,301	3%
2005	135,454	98%	28	<1%	2,898	2%
2006	151,260	100%	39	<1%	484	<1%
2007	117,495	100%	48	<1%	356	<1%
2008	97,667	100%	31	<1%	158	<1%
2009	82,194	100%	23	<1%	125	<1%
2010	94,045	100%	23	<1%	79	<1%
2011	128,585	100%	18	<1%	136	<1%
2012	90,384	98%	15	<1%	1,732	2%

Table 25. Inflation adjustment. (Source: Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product, 2005=100, March 28, 2013)

Year	Gross domestic product	Adjustment factor
1981	52.27	2.207518653
1982	55.459	2.080582052
1983	57.652	2.001439673
1984	59.817	1.929000117
1985	61.628	1.872314532
1986	62.991	1.831801368
1987	64.819	1.780141625
1988	67.046	1.721012439
1989	69.577	1.658407232
1990	72.262	1.596786693
1991	74.824	1.542112157
1992	76.598	1.506397034
1993	78.29	1.473840848
1994	79.94	1.443420065
1995	81.606	1.413952405
1996	83.159	1.387546748
1997	84.628	1.363461266
1998	85.584	1.348230978
1999	86.842	1.328700398
2000	88.723	1.300530866
2001	90.727	1.271804424
2002	92.196	1.251540197
2003	94.135	1.225760875
2004	96.786	1.192186887
2005	100	1.15387
2006	103.231	1.117755325
2007	106.227	1.086230431
2008	108.582	1.062671529
2009	109.529	1.053483552
2010	110.993	1.039588082
2011	113.359	1.017890066
2012	115.387	1

ADOPTED SCHEDULE FOR DEVELOPING THE 2015-2016 AND BEYOND GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES

Non-italicized font in the table below represents the proposed Council schedule for the activities associated with implementing the 2015-2016 and beyond harvest specifications and management measures. Bold font dates represent Council meeting dates.

Italicized font represents a draft schedule for the National Marine Fisheries Service (NMFS) review and implementation process, including procedures and public comment periods required by the National Environmental Policy Act (NEPA) and the Administrative Procedures Act (APA). This schedule is premised on the preparation of an environmental impact statement (EIS), which has statutorily defined minimum time periods for public comment. Note that, like the last cycle, the draft EIS (DEIS) would be circulated before the June 2014 Council meeting, when final action is scheduled. If the Council's final preferred alternative represents "substantial changes in the proposed action that are relevant to environmental concerns" (40 CFR 1502.9(c)) NMFS may have to recirculate the DEIS, delaying implementation.

Start Date	End Date	Task
April 22, 2013	April 26, 2013	Data Moderate Stock Assessment Review (STAR) (Santa Cruz, CA): brown rockfish, China rockfish, copper rockfish, English sole, rex sole, sharpchin rockfish, stripetail rockfish, vermilion rockfish, and yellowtail rockfish. One GMT and GAP representative attended.
May 13, 2013	May 17, 2013	STAR Panel (Seattle, WA): Petrale sole and darkblotched rockfish. One GMT and GAP representative attended.
June 18, 2013	June 18, 2013	SSC Groundfish Subcommittee meets to review: 1. Data moderate stock assessments. 2. Petrale sole stock assessment. 3. Darkblotched rockfish stock assessment. 4. Bocaccio rockfish update. 5. Canary rockfish catch report. 6. Pacific ocean perch catch report. 7. Yelloweye rockfish catch report.

Start Date	End Date	Task
June 19, 2013	June 20, 2013	SSC meets to discuss and/or reach recommendations on: 1. Data moderate assessments recommended by the STAR Panel and the SSC Groundfish Subcommittee. 2. Bocaccio update and catch reports recommended by the SSC Groundfish Subcommittee. 3. Stock assessments for petrale sole and darkblotched rockfish recommended by the STAR Panel. 4. Impact projection models for use in the NEPA analysis.[1] 5. Proposed analytical framework for the NEPA document. 6. Recalculating sigmas for stock categories. 7. Alternatives for stock complex aggregations.
June 20, 2013	**June 25, 2013**	The Council meets and adopts: 1. A final schedule, process, and work plan for developing groundfish harvest specifications and management measures for 2015-2016 and beyond. 2. Data moderate assessments, as recommended by the SSC. 3. Updates and catch reports as recommended by the SSC. 4. Stock assessments for petrale sole and darkblotched rockfish recommended by the SSC. 5. Adopt the preliminary preferred alternatives (PPA) for stock complex aggregations.[2] 7. Projection models for use in the NEPA analysis. 8. Changes to the Council Operating Procedure 9 based on Council action in March 2013.
	July-August 2013	*Notice of Intent to prepare an EIS is published; 30-day public comment period. DEIS will address any comments received or, if no comments received, state so.*

[1]The SSC Economic Subcommittee reviewed the following models: The Washington, Oregon, and California recreational impact projection models, the nearshore and non-nearshore impact projection models, the Landings Distribution model, and the Input-Output Model for Pacific Coast Fisheries (IOPAC).

[2]Stock complex alternatives are being analyzed in a separate NEPA document than the 2015-16 and beyond specifications EIS. The proposed stock complex decision-making schedule is necessary to align the 2015-2016 and beyond analysis and for timely implementation of new regulations on January 1, 2015.

Start Date	End Date	Task
July 8, 2013	July 12, 2013	STAR Panel (Seattle, WA): Rougheye rockfish and aurora rockfish. One GMT and GAP representative to attend.
July 22, 2013	July 26, 2013	STAR Panel (Seattle, WA): Shortspine thornyheads and longspine thornyheads. One GMT and GAP representative to attend.
August 5, 2013	August 9, 2013	STAR Panel (Santa Cruz, CA): Cowcod and Pacific sanddabs. One GMT and GAP representative to attend.
September 11, 2013	September 13, 2013	SSC meets[3] to reach recommendations on: 1. OFLs. 2. Stock categories (i.e., categories 1, 2, and 3). 3. Sigma values. 4. Six full assessments, as recommended by the STAR panels. 5. Alternatives for stock complex aggregations. 6. Preliminary considerations for rebuilding plan revisions. 7. Elasmobranch F_{MSY}.

[3]SSC meeting dates are estimated based on past meeting schedules.

Start Date	End Date	Task
September 12, 2013	**September 17, 2013**	The Council meets and adopts: 1. Stock assessments for the six species subject to summer STAR panels.[4] 2. Adopt the final preferred alternatives (FPAs) for stock complex aggregations. 3. FPA for OFLs recommended by the SSC. 4. FPA sigma values recommended by the SSC. 5. A range of P* values, including PPA P* values, if applicable. 6. A range of acceptable biological catches (ABCs), including PPA ABCs levels, if applicable. 7. Preliminary policy for rebuilding plan revisions. 8. Preliminary range of new management measures to address conservation concerns for preliminary analysis.[5]
September 23, 2013	September 27, 2013	The SSC Groundfish Subcommittee meets to review rebuilding analyses prepared for overfished species as well as any stock assessments approved for further review by the Council (Seattle, WA). One GMT and GAP representative to attend.
September 30, 2013	October 4, 2013	The GMT meets to review new stock assessments and rebuilding analyses. The GMT, NMFS NWR, NOAA GC, and NMFS NEPA coordinator draft a recommended range of 2015-2016 harvest specifications and preliminary management measures for analysis (Seattle, WA or Portland, OR).
October 31, 2013	November 1, 2013	SSC meets[6] to reach recommendations on: 1. Rebuilding analyses. 2. Any stock assessments relegated to “mop-up” reconsiderations completed at the September 23-27 SSC Groundfish Subcommittee meeting. 3. Final considerations for rebuilding plan revisions.
November 1, 2013	**November 6, 2013**	The Council meets and adopts:

[4]Council action could be postponed from September to November for any stock assessments recommended for further review by a 2013 STAR panel and/or the SSC (i.e., those assessments the Council authorizes to be sent to the September 23-27 mop-up panel).
[5]New management measures are those management measures that have not been analyzed or implemented in a previous cycle. In March 2013, the Council decided to focus on management measures necessary to achieve conservation purposes during normal biennial cycles.
[6]SSC meeting dates are estimated based on past meeting schedules.

Start Date	End Date	Task
		1. Rebuilding analyses and any assessments sent to the mop-up panel and recommended by the SSC. 2. Final policy for rebuilding plan revisions. 3. PPA for default harvest control rules (Amendment 24). 4. FPA for P* values. 5. FPA for ABCs. 6. PPA for non-overfished species ACLs. 7. A range of overfished species ACLs, if necessary, and PPA ACLs. 8. A tentative range of two-year allocation alternatives.[7] 9. Final range of new management measures to address conservation concerns for detailed analysis. 10. Preliminary selection of exempted fishing permits for 2015-16.
November 7, 2013	April 4, 2014	Opportunity for state and tribal agencies to hold constituent meetings to obtain input on final harvest specifications and preliminary management measures in preparation for the April meeting.
November 7, 2013	February 17, 2014[8]	The Council staff, GMT, and subject matter experts prepare the DEIS.
January 1, 2014	February 15, 2014	If necessary, convene the Ad-Hoc Groundfish Allocation Committee (GAC) for a one to two day meeting prior to the March Council meeting (i.e., the meeting will occur at some point between the start and end date). The GAC will consider the results of the analysis and generate recommendations for Council consideration.
February 25, 2014	*May 27, 2014*	*DEIS reviewed and cleared by:* • *NMFS NWR* • *NOAA GC* • *PPI* *EIS project team addresses comments to allow clearance*
March 8, 2014	**March 13, 2014**	At the March Council meeting, the Council and

[7] Allocations to be reviewed for tentative adoption include both the trawl and non-trawl allocations as well as the within non-trawl sector apportionments and accountability measures (e.g., recreational harvest guidelines). Specifically, this includes two-year allocation alternatives for species not allocated under Amendment 21 (e.g., bocaccio, canary, cowcod, yelloweye and some non-overfished species (e.g., black rockfish in Oregon and California)).
[8] February 17, 2014 is the estimated briefing book deadline for the March 2014 Council meeting.

Start Date	End Date	Task
		advisory bodies will receive an informational briefing on selected results and provide guidance or take action on emerging issues, as necessary.
	March 19, 2014[9]	Preliminary DEIS submitted for the April meeting advance briefing book for Council, advisory body, and public review.
April 5, 2014	**April 10, 2014**	The Council meets and adopts: 1. FPA for ACLs. 2. PPA for management measures from the range adopted at the November Council meeting.[10] 3. PPA for two-year allocations. 4. FPA for default harvest control rules (Amendment 24).
April 11, 2014	May 26, 2014	Council staff, GMT, and analytical team validate and refine analysis, consequent to the April Council meeting actions, as necessary.
May 27, 2014	*June 1, 2014*	• *Prepare DEIS* • *File DEIS with Environmental Protection Agency*
	June 6, 2014	*EPA publishes Notice of Availability starting 45-day public comment period on DEIS.*
June 20, 2014	**June 25, 2014**	The Council meets and adopts: 1. Corrections to the FPA for harvest specifications, if needed. 2. Final exempted fishing permits for 2015-16. 3. FPA for allocations. 4. FPA for management measures. 5. A prioritized list of management measures to be analyzed outside of the harvest specifications and management measures process (i.e., those measures not directly related to conservation objectives).
July 7, 2014	July 11, 2014	The GMT meets to finalize analysis of the Council's FPA for the EIS, if necessary.
July 9, 2014	*August 5, 2014*	• *NWR initiates iterative process by sending draft regulations to Council staff and GMT for review.* • *Council and NMFS staffs reach consensus on*

[9]Estimated briefing book deadline for the April 2014 Council meeting.
[10]Additional management measures that require limited analysis could be added, if necessary; however, the January 1, 2015 fishery start date may be compromised.

Start Date	End Date	Task
		draft regulation language. Council staff & GMT send draft regulations comments to NWR. • *NWR provides Council staff with near complete regulations text for deeming.*
	July 23, 2014	*45-day NEPA public comment period on DEIS ends.*
July 24, 2014		*Prepare FEIS:* • *EIS project team organizes public comments and responses to comments, and revises DEIS based on public comments and final action by the Council, and prepares draft FEIS* • *NWR SFD staff, Regional NEPA Coordinator, and GC conduct concurrent and expedited reviews of draft FEIS* • *EIS project team addresses comments* • *PPI review of draft FEIS*[11] • *EIS project team addresses comments and prepares draft FEIS for public release* • *NWR clearance of draft FEIS* • *PPI clearance of draft*
August 5, 2014	*August 26, 2014*	• *NWR sends draft proposed rule package to GC, Issues Advisory to headquarters (HQ)* • *NWR sends draft proposed rule to Edits Unit for review* • *NWR makes Edits Unit changes and sends draft proposed rule and FMP amendment package (if necessary) to HQ*
	August 24, 2014	• *Council staff provides draft FMP language to NWR, if necessary* • *GC & Sustainable Fisheries Division simultaneous review of FMP language* • *NWR & Council staff reach consensus on rule and FMP language*
	August 30, 2014	*Council Executive Director transmits final FMP recommendation and final regulations deemed necessary and appropriate for 2013-14 groundfish fisheries.*
	September 7, 2014	• *Prepare and send FEIS package to EPA (will need to overnight FEIS or request HQ to hand deliver FEIS)* • *File FEIS with EPA*
September 9, 2014	*October 8, 2014*	*Proposed rule publishes, 30-day proposed rule*

[11]NMFS will have needed to secure expedited review and clearance processes agreement with PPI well in advance.

Start Date	End Date	Task
		public comment period required by APA ends.
September 19, 2014	*October 19, 2014*	*FEIS 30-day public comment period.*
October 2, 2014	*November 16, 2014*	*Preparation of Final Rule under APA:* • *SFD drafts final rule and sends package to GC for review* • *GC completes review and sends to SFD* • *SFD completes revisions and sends to Edits Unit* • *SFD completes Edits Unit changes and sends package to HQ*
October 19, 2014	*November 27, 2014*	*NMFS prepares Record of Decision:* • *Review any comments received during 30-day cooling off period and prepare draft record of decision (ROD).* • *Finalize draft ROD* • *NWR SFD staff, Regional NEPA Coordinator, and GC conduct concurrent and expedited reviews of draft ROD* • *Project team addresses comments* • *NWR clearance of draft ROD* • *Draft ROD submitted to HQ for review* • *HQ signs ROD (must be submitted with final rule package)*
	December 2, 2014	*Final Rule Publishes under the APA.*
	January 1, 2015	*30-day cooling off period required by APA ends; FMP amendment and regulations effective and groundfish fishery begins under new regulations.*

Table 1. Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from No Action under the 2015-16 alternatives ($1,000).

Alternatives:	*No Action*	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*9,412*	+518	+519	+234	+476	+477	+206
Non-whiting trawl IFQ	*6,569*	+1,745	+1,974	-274	+1,669	+1,883	-247
Non-whiting non-trawl IFQ	*827*	+199	+288	-53	+380	+471	+75
Limited entry fixed gear	*1,934*	+401	+599	-218	+809	+1,015	+171
Open access nearshore	*406*	+436	+436	+242	+436	+436	+242
Open access non-nearshore	*590*	+210	+311	-116	+422	+531	+89
TOTAL SHORESIDE SECTOR CHANGE ($,000)	*19,739*	+3,509	+4,127	-185	+4,192	+4,812	+536

Table 2. Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from No Action under the 2015-16 alternatives (percent).

Alternatives:	*No Action ($,000)*	2015 PPA	2015 Alt1	2015 Alt2	2016 PPA	2016 Alt1	2016 Alt2
Whiting	*9,412*	+5.5%	+5.5%	+2.5%	+5.1%	+5.1%	+2.2%
Non-whiting trawl IFQ	*6,569*	+26.6%	+30.1%	-4.2%	+25.4%	+28.7%	-3.8%
Non-whiting non-trawl IFQ	*827*	+24.1%	+34.8%	-6.4%	+45.9%	+56.9%	+9.1%
Limited entry fixed gear	*1,934*	+20.7%	+31.0%	-11.3%	+41.8%	+52.5%	+8.8%
Open access nearshore	*406*	+107.4%	+107.4%	+59.6%	+107.4%	+107.4%	+59.6%
Open access non-nearshore	*590*	+35.6%	+52.8%	-19.6%	+71.5%	+89.9%	+15.1%
TOTAL SHORESIDE SECTOR CHANGE (%)	*19,739*	+17.8%	+20.9%	-0.9%	+21.2%	+24.4%	+2.7%

Table 3. Change in commercial fishery income impacts (from No Action) under the action alternatives by community group ($1,000).

Community Groups	*No Action ($,000)*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound	*2,982*	+468	+559	-64	+631	+725	+92
Washington Coast	*16,405*	+926	+1,144	-84	+1,253	+1,473	+207
Astoria-Tillamook	*30,168*	+3,210	+3,633	+96	+3,463	+3,876	+268
Newport	*22,326*	+621	+817	-172	+959	+1,159	+106
Coos Bay-Brookings	*11,936*	+1,128	+1,550	-494	+1,661	+2,082	-75
Crescent City-Eureka	*6,298*	+619	+804	-40	+782	+966	+77
Fort Bragg - Bodega Bay	*6,338*	+761	+1,015	-167	+1,123	+1,381	+138
San Francisco Area	*2,813*	+237	+299	-53	+277	+337	-16
SC – Mo - MB	*7,691*	+1,020	+1,301	+18	+1,507	+1,797	+481
SB – LA - SD	*6,125*	+512	+722	-191	+952	+1,178	+234
Coastwide Total	*113,082*	+9,503	+11,844	-1,151	+12,607	+14,973	+1,514

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 4. Change in commercial fishery income impacts (from No Action) under the action alternatives by community group (percent).

Community Groups	*No Action ($,000)*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound	*2,982*	+ 15.7%	+ 18.8%	- 2.1%	+ 21.2%	+ 24.3%	+ 3.1%
Washington Coast	*16,405*	+ 5.6%	+ 7.0%	- 0.5%	+ 7.6%	+ 9.0%	+ 1.3%
Astoria-Tillamook	*30,168*	+ 10.6%	+ 12.0%	+ 0.3%	+ 11.5%	+ 12.8%	+ 0.9%
Newport	*22,326*	+ 2.8%	+ 3.7%	- 0.8%	+ 4.3%	+ 5.2%	+ 0.5%
Coos Bay-Brookings	*11,936*	+ 9.5%	+ 13.0%	- 4.1%	+ 13.9%	+ 17.4%	- 0.6%
Crescent City-Eureka	*6,298*	+ 9.8%	+ 12.8%	- 0.6%	+ 12.4%	+ 15.3%	+ 1.2%
Fort Bragg - Bodega Bay	*6,338*	+ 12.0%	+ 16.0%	- 2.6%	+ 17.7%	+ 21.8%	+ 2.2%
San Francisco Area	*2,813*	+ 8.4%	+ 10.6%	- 1.9%	+ 9.8%	+ 12.0%	- 0.6%
SC – Mo - MB	*7,691*	+ 13.3%	+ 16.9%	+ 0.2%	+ 19.6%	+ 23.4%	+ 6.3%
SB – LA - SD	*6,125*	+ 8.4%	+ 11.8%	- 3.1%	+ 15.5%	+ 19.2%	+ 3.8%
Coastwide Total	*113,082*	+ 8.4%	+ 10.5%	- 1.0%	+ 11.1%	+ 13.2%	+ 1.3%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 5. Change in commercial fishery employment impacts (from No Action) under the action alternatives by community group (number of jobs).

Community Groups	*No Action*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound	*44*	+6	+8	-1	+9	+11	+1
Washington Coast	*318*	+17	+21	-2	+24	+29	+4
Astoria-Tillamook	*488*	+49	+56	+3	+54	+61	+7
Newport	*403*	+13	+17	-3	+20	+24	+3
Coos Bay-Brookings	*299*	+20	+28	-20	+31	+39	-11
Crescent City-Eureka	*141*	+15	+19	+2	+19	+22	+4
Fort Bragg - Bodega Bay	*192*	+27	+35	-1	+40	+48	+11
San Francisco Area	*67*	+6	+7	+0	+6	+8	+1
SC – Mo - MB	*303*	+54	+62	+21	+69	+77	+35
SB – LA - SD	*184*	+16	+20	-1	+25	+30	+8
Coastwide Total	*2,436*	+224	+273	-1	+298	+349	+64

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 6. Change in commercial fishery employment impacts (from No Action) under the action alternatives by community group (percent).

Community Groups	*No Action*	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound	*44*	+ 14.3%	+ 17.7%	- 2.7%	+ 20.6%	+ 24.1%	+ 3.2%
Washington Coast	*318*	+ 5.3%	+ 6.8%	- 0.7%	+ 7.6%	+ 9.1%	+ 1.3%
Astoria-Tillamook	*488*	+ 10.1%	+ 11.4%	+ 0.6%	+ 11.1%	+ 12.5%	+ 1.4%
Newport	*403*	+ 3.2%	+ 4.2%	- 0.7%	+ 5.0%	+ 6.1%	+ 0.7%
Coos Bay-Brookings	*299*	+ 6.9%	+ 9.5%	- 6.6%	+ 10.4%	+ 13.1%	- 3.7%
Crescent City-Eureka	*141*	+ 10.7%	+ 13.4%	+ 1.1%	+ 13.2%	+ 15.9%	+ 3.0%
Fort Bragg - Bodega Bay	*192*	+ 14.1%	+ 18.2%	- 0.5%	+ 21.0%	+ 25.3%	+ 5.5%
San Francisco Area	*67*	+ 8.5%	+ 10.1%	+ 0.5%	+ 9.7%	+ 11.3%	+ 1.7%
SC – Mo - MB	*303*	+ 18.0%	+ 20.5%	+ 7.0%	+ 22.9%	+ 25.5%	+ 11.6%
SB – LA - SD	*184*	+ 8.6%	+ 11.0%	- 0.4%	+ 13.6%	+ 16.2%	+ 4.4%
Coastwide Total	*2,436*	+ 9.2%	+ 11.2%	- 0.1%	+ 12.2%	+ 14.3%	+ 2.6%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 7. Change in regional unemployment ratest for all industries (from No Action) resulting from commercial fishery employment impacts under the action alternatives by community group.

Community Groups	*No Action*[t]	2015 PPA	2015 Alt 1	2015 Alt 2	2016 PPA	2016 Alt 1	2016 Alt 2
Puget Sound	*7.552%*	-0.000%	-0.000%	+0.000%	-0.000%	-0.000%	-0.000%
Washington Coast	*10.553%*	-0.006%	-0.007%	+0.001%	-0.008%	-0.010%	-0.001%
Astoria-Tillamook	*7.772%*	-0.011%	-0.013%	-0.001%	-0.012%	-0.014%	-0.002%
Newport	*9.295%*	-0.057%	-0.075%	+0.013%	-0.089%	-0.108%	-0.013%
Coos Bay-Brookings	*9.551%*	-0.008%	-0.011%	+0.008%	-0.012%	-0.015%	+0.004%
Crescent City-Eureka	*10.916%*	-0.021%	-0.026%	-0.002%	-0.026%	-0.031%	-0.006%
Fort Bragg - Bodega Bay	*7.960%*	-0.006%	-0.008%	+0.000%	-0.009%	-0.011%	-0.002%
San Francisco Area	*8.698%*	-0.000%	-0.000%	-0.000%	-0.000%	-0.000%	-0.000%
SC – Mo - MB	*10.394%*	-0.010%	-0.012%	-0.004%	-0.013%	-0.015%	-0.007%
SB – LA - SD	*9.968%*	-0.000%	-0.000%	+0.000%	-0.000%	-0.000%	-0.000%
Coastwide Total	*9.324%*	-0.001%	-0.002%	+0.000%	-0.002%	-0.002%	-0.000%

t Based on 2012 county labor force and employment statistics from the Bureau of Labor Statistics http://www.bls.gov/data/
SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 8. Change in recreational fishery income impacts (from No Action) by community group ($1,000).

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound	-	-	-	-	-	-	-	-
Washington Coast	*5,606*	-	-	-	-	-	-	-
Astoria-Tillamook	*1,023*	-	-	-	-	-	-	-
Newport	*4,722*	-	-	-	-	-	-	-
Coos Bay-Brookings	*2,465*	-	-	-	-	-	-	-
Crescent City-Eureka	*1,498*	+327	+200	+327	+200	+73	+73	-452
Fort Bragg - Bodega Bay	*714*	+335	+262	+335	+262	+189	+189	-112
San Francisco Area	*8,034*	+1,428	+1,073	+1,428	+1,073	+718	+718	-5,045
SC – Mo – MB*	*10,711*	+870	+435	+870	+435	-2,645	-2,645	-6,212
SB – LA – SD*	*110,778*	-	-	-	-	-	-	-61,813
Coastwide Total	*145,552*	+2,960	+1,969	+2,960	+1,969	-1,666	-1,666	-73,635

Table 9. Change in recreational fishery income impacts (from No Action) by community group (percent).

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound	-	-	-	-	-	-	-	-
Washington Coast	*5,606*	-	-	-	-	-	-	-
Astoria-Tillamook	*1,023*	-	-	-	-	-	-	-
Newport	*4,722*	-	-	-	-	-	-	-
Coos Bay-Brookings	*2,465*	-	-	-	-	-	-	-
Crescent City-Eureka	*1,498*	+21.8%	+13.3%	+21.8%	+13.3%	+4.8%	+4.8%	-30.2%
Fort Bragg - Bodega Bay	*714*	+46.9%	+36.6%	+46.9%	+36.6%	+26.4%	+26.4%	-15.7%
San Francisco Area	*8,034*	+17.8%	+13.4%	+17.8%	+13.4%	+8.9%	+8.9%	-62.8%
SC – Mo – MB*	*10,711*	+8.1%	+4.1%	+8.1%	+4.1%	-24.7%	-24.7%	-58.0%
SB – LA – SD*	*110,778*	-	-	-	-	-	-	-55.8%
Coastwide Total	*145,552*	+2.0%	+1.4%	+2.0%	+1.4%	-1.1%	-1.1%	-50.6%

*SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 10. Change in recreational fishery employment impacts (from No Action) by community group (number of jobs).

Community Groups	*No Action*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound	-	-	-	-	-	-	-	-
Washington Coast	*155*	-	-	-	-	-	-	-
Astoria-Tillamook	*32*	-	-	-	-	-	-	-
Newport	*139*	-	-	-	-	-	-	-
Coos Bay-Brookings	*68*	-	-	-	-	-	-	-
Crescent City-Eureka	*33*	+7	+4	+7	+4	+2	+2	-10
Fort Bragg - Bodega Bay	*14*	+6	+5	+6	+5	+4	+4	-2
San Francisco Area	*148*	+26	+20	+26	+20	+13	+13	-93
SC – Mo – MB*	*216*	+18	+9	+18	+9	-53	-53	-125
SB – LA – SD*	*2,146*	-	-	-	-	-	-	-1,198
Coastwide Total	*2,952*	+57	+38	+57	+38	-35	-35	-1,428

Table 11. Change in recreational fishery employment impacts (from No Action) by community group (percent).

Community Groups	*No Action (jobs)*	PPA Op1	PPA Op2	Alt1 Op1	Alt1 Op2	Alt2 Op1	Alt2 _Op2	Op3 (All Alts)
Puget Sound	-	-	-	-	-	-	-	-
Washington Coast	*155*	-	-	-	-	-	-	-
Astoria-Tillamook	*32*	-	-	-	-	-	-	-
Newport	*139*	-	-	-	-	-	-	-
Coos Bay-Brookings	*68*	-	-	-	-	-	-	-
Crescent City-Eureka	*33*	+21.8%	+13.3%	+21.8%	+13.3%	+4.8%	+4.8%	-30.2%
Fort Bragg - Bodega Bay	*14*	+46.9%	+36.6%	+46.9%	+36.6%	+26.4%	+26.4%	-15.7%
San Francisco Area	*148*	+17.8%	+13.4%	+17.8%	+13.4%	+8.9%	+8.9%	-62.8%
SC – Mo – MB*	*216*	+8.1%	+4.1%	+8.1%	+4.1%	-24.7%	-24.7%	-58.0%
SB – LA – SD*	*2,146*	-	-	-	-	-	-	-55.8%
Coastwide Total	*2,952*	+1.9%	+1.3%	+1.9%	+1.3%	-1.2%	-1.2%	-48.4%

*SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.

Table 12. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2015 ($1,000)t.

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*2,982*	+468	+468	+468	+559	+559	+559	-64	-64	-64
Washington Coast	*22,011*	+926	+926	+926	+1,144	+1,144	+1,144	-84	-84	-84
Astoria-Tillamook	*31,191*	+3,210	+3,210	+3,210	+3,633	+3,633	+3,633	+96	+96	+96
Newport	*27,049*	+621	+621	+621	+817	+817	+817	-172	-172	-172
Coos Bay-Brookings	*14,401*	+1,128	+1,128	+1,128	+1,550	+1,550	+1,550	-494	-494	-494
Crescent City-Eureka	*7,796*	+946	+818	+167	+1,131	+1,004	+352	+32	+32	-492
Fort Bragg - Bodega Bay	*7,052*	+1,096	+1,023	+649	+1,350	+1,277	+903	+22	+22	-279
San Francisco Area	*10,848*	+1,666	+1,310	-4,808	+1,728	+1,372	-4,746	+665	+665	-5,098
SC – Mo - MB	*18,402*	+1,890	+1,455	-5,192	+2,171	+1,736	-4,911	-2,627	-2,627	-6,194
SB – LA - SD	*116,903*	+512	+512	-61,301	+722	+722	-61,091	-191	-191	-62,005
Coastwide Total	*258,635*	+12,463	+11,473	-64,132	+14,804	+13,814	-61,791	-2,817	-2,817	-74,786

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 13. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2015 (percent)t.

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*2,982*	+15.7%	+15.7%	+15.7%	+18.8%	+18.8%	+18.8%	-2.1%	-2.1%	-2.1%
Washington Coast	*22,011*	+4.2%	+4.2%	+4.2%	+5.2%	+5.2%	+5.2%	-0.4%	-0.4%	-0.4%
Astoria-Tillamook	*31,191*	+10.3%	+10.3%	+10.3%	+11.6%	+11.6%	+11.6%	+0.3%	+0.3%	+0.3%
Newport	*27,049*	+2.3%	+2.3%	+2.3%	+3.0%	+3.0%	+3.0%	-0.6%	-0.6%	-0.6%
Coos Bay-Brookings	*14,401*	+7.8%	+7.8%	+7.8%	+10.8%	+10.8%	+10.8%	-3.4%	-3.4%	-3.4%
Crescent City-Eureka	*7,796*	+12.1%	+10.5%	+2.1%	+14.5%	+12.9%	+4.5%	+0.4%	+0.4%	-6.3%
Fort Bragg - Bodega Bay	*7,052*	+15.5%	+14.5%	+9.2%	+19.1%	+18.1%	+12.8%	+0.3%	+0.3%	-4.0%
San Francisco Area	*10,848*	+15.4%	+12.1%	-44.3%	+15.9%	+12.7%	-43.8%	+6.1%	+6.1%	-47.0%
SC – Mo - MB	*18,402*	+10.3%	+7.9%	-28.2%	+11.8%	+9.4%	-26.7%	-14.3%	-14.3%	-33.7%
SB – LA - SD	*116,903*	+0.4%	+0.4%	-52.4%	+0.6%	+0.6%	-52.3%	-0.2%	-0.2%	-53.0%
Coastwide Total	*258,635*	+4.8%	+4.4%	-24.8%	+5.7%	+5.3%	-23.9%	-1.1%	-1.1%	-28.9%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 14. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2016 ($1,000)t.

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*2,982*	+631	+631	+631	+725	+725	+725	+92	+92	+92
Washington Coast	*22,011*	+1,253	+1,253	+1,253	+1,473	+1,473	+1,473	+207	+207	+207
Astoria-Tillamook	*31,191*	+3,463	+3,463	+3,463	+3,876	+3,876	+3,876	+268	+268	+268
Newport	*27,049*	+959	+959	+959	+1,159	+1,159	+1,159	+106	+106	+106
Coos Bay-Brookings	*14,401*	+1,661	+1,661	+1,661	+2,082	+2,082	+2,082	-75	-75	-75
Crescent City-Eureka	*7,796*	+1,109	+982	+330	+1,293	+1,166	+514	+150	+150	-375
Fort Bragg - Bodega Bay	*7,052*	+1,457	+1,384	+1,010	+1,715	+1,642	+1,268	+327	+327	+26
San Francisco Area	*10,848*	+1,705	+1,350	-4,769	+1,765	+1,410	-4,709	+702	+702	-5,061
SC – Mo - MB	*18,402*	+2,376	+1,942	-4,705	+2,667	+2,232	-4,415	-2,164	-2,164	-5,731
SB – LA - SD	*116,903*	+952	+952	-60,861	+1,178	+1,178	-60,636	+234	+234	-61,579
Coastwide Total	*258,635*	+15,567	+14,577	-61,028	+17,933	+16,942	-58,662	-152	-152	-72,121

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 15. Change in combined commercial plus recreational fishery income impacts (from No Action) by community group in 2016 (percent)t.

Community Groups	*No Action ($,000)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*2,982*	+21.2%	+21.2%	+21.2%	+24.3%	+24.3%	+24.3%	+3.1%	+3.1%	+3.1%
Washington Coast	*22,011*	+5.7%	+5.7%	+5.7%	+6.7%	+6.7%	+6.7%	+0.9%	+0.9%	+0.9%
Astoria-Tillamook	*31,191*	+11.1%	+11.1%	+11.1%	+12.4%	+12.4%	+12.4%	+0.9%	+0.9%	+0.9%
Newport	*27,049*	+3.5%	+3.5%	+3.5%	+4.3%	+4.3%	+4.3%	+0.4%	+0.4%	+0.4%
Coos Bay-Brookings	*14,401*	+11.5%	+11.5%	+11.5%	+14.5%	+14.5%	+14.5%	-0.5%	-0.5%	-0.5%
Crescent City-Eureka	*7,796*	+14.2%	+12.6%	+4.2%	+16.6%	+14.9%	+6.6%	+1.9%	+1.9%	-4.8%
Fort Bragg - Bodega Bay	*7,052*	+20.7%	+19.6%	+14.3%	+24.3%	+23.3%	+18.0%	+4.6%	+4.6%	+0.4%
San Francisco Area	*10,848*	+15.7%	+12.4%	-44.0%	+16.3%	+13.0%	-43.4%	+6.5%	+6.5%	-46.7%
SC – Mo - MB	*18,402*	+12.9%	+10.6%	-25.6%	+14.5%	+12.1%	-24.0%	-11.8%	-11.8%	-31.1%
SB – LA - SD	*116,903*	+0.8%	+0.8%	-52.1%	+1.0%	+1.0%	-51.9%	+0.2%	+0.2%	-52.7%
Coastwide Total	*258,635*	+6.0%	+5.6%	-23.6%	+6.9%	+6.6%	-22.7%	-0.1%	-0.1%	-27.9%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined income impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 16. Change in combined commercial plus recreational fishery employment impacts (from No Action) by community group in 2015 (number of jobs)t.

Community Groups	*No Action*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*44*	+6	+6	+6	+8	+8	+8	-1	-1	-1
Washington Coast	*473*	+17	+17	+17	+21	+21	+21	-2	-2	-2
Astoria-Tillamook	*520*	+49	+49	+49	+56	+56	+56	+3	+3	+3
Newport	*541*	+13	+13	+13	+17	+17	+17	-3	-3	-3
Coos Bay-Brookings	*367*	+20	+20	+20	+28	+28	+28	-20	-20	-20
Crescent City-Eureka	*173*	+22	+19	+5	+26	+23	+9	+3	+3	-8
Fort Bragg - Bodega Bay	*205*	+33	+32	+25	+41	+40	+33	+3	+3	-3
San Francisco Area	*215*	+32	+25	-88	+33	+27	-86	+14	+14	-93
SC – Mo - MB	*519*	+72	+63	-71	+80	+71	-63	-32	-32	-104
SB – LA - SD	*2,330*	+16	+16	-1,182	+20	+20	-1,177	-1	-1	-1,198
Coastwide Total	*5,388*	+281	+262	-1,205	+331	+311	-1,155	-36	-36	-1,430

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 17. Change in combined commercial plus recreational fishery employment impacts (from No Action) by community group in 2015 (percent)t.

Community Groups	*No Action (jobs)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*44*	+14.3%	+14.3%	+14.3%	+17.7%	+17.7%	+17.7%	-2.7%	-2.7%	-2.7%
Washington Coast	*473*	+3.6%	+3.6%	+3.6%	+4.5%	+4.5%	+4.5%	-0.5%	-0.5%	-0.5%
Astoria-Tillamook	*520*	+9.4%	+9.4%	+9.4%	+10.7%	+10.7%	+10.7%	+0.6%	+0.6%	+0.6%
Newport	*541*	+2.4%	+2.4%	+2.4%	+3.1%	+3.1%	+3.1%	-0.5%	-0.5%	-0.5%
Coos Bay-Brookings	*367*	+5.6%	+5.6%	+5.6%	+7.7%	+7.7%	+7.7%	-5.3%	-5.3%	-5.3%
Crescent City-Eureka	*173*	+12.8%	+11.2%	+3.0%	+15.0%	+13.4%	+5.2%	+1.8%	+1.8%	-4.8%
Fort Bragg - Bodega Bay	*205*	+16.2%	+15.6%	+12.1%	+20.1%	+19.4%	+15.9%	+1.3%	+1.3%	-1.5%
San Francisco Area	*215*	+14.9%	+11.8%	-40.7%	+15.4%	+12.4%	-40.2%	+6.3%	+6.3%	-43.2%
SC – Mo - MB	*519*	+13.9%	+12.2%	-13.7%	+15.4%	+13.7%	-12.2%	-6.2%	-6.2%	-20.1%
SB – LA - SD	*2,330*	+0.7%	+0.7%	-50.7%	+0.9%	+0.9%	-50.5%	-0.0%	-0.0%	-51.4%
Coastwide Total	*5,388*	+5.2%	+4.9%	-22.4%	+6.1%	+5.8%	-21.4%	-0.7%	-0.7%	-26.5%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 18. Change in combined commercial plus recreational fishery employment impacts (from No Action) by community group in 2016 (number of jobs)t.

Community Groups	*No Action*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*44*	+9	+9	+9	+11	+11	+11	+1	+1	+1
Washington Coast	*473*	+24	+24	+24	+29	+29	+29	+4	+4	+4
Astoria-Tillamook	*520*	+54	+54	+54	+61	+61	+61	+7	+7	+7
Newport	*541*	+20	+20	+20	+24	+24	+24	+3	+3	+3
Coos Bay-Brookings	*367*	+31	+31	+31	+39	+39	+39	-11	-11	-11
Crescent City-Eureka	*173*	+26	+23	+9	+29	+27	+12	+6	+6	-6
Fort Bragg - Bodega Bay	*205*	+47	+45	+38	+55	+53	+46	+14	+14	+8
San Francisco Area	*215*	+33	+26	-87	+34	+27	-86	+14	+14	-92
SC – Mo - MB	*519*	+87	+78	-56	+95	+86	-48	-18	-18	-90
SB – LA - SD	*2,330*	+25	+25	-1,173	+30	+30	-1,168	+8	+8	-1,190
Coastwide Total	*5,388*	+356	+336	-1,130	+406	+387	-1,079	+29	+29	-1,365

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

Table 19. Change in combined commercial plus recreational fishery employment impacts (from No Action) by community group in 2016 (percent)t.

Community Groups	*No Action (jobs)*	PPA Op1	PPA Op2	PPA Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*44*	+20.6%	+20.6%	+20.6%	+24.1%	+24.1%	+24.1%	+3.2%	+3.2%	+3.2%
Washington Coast	*473*	+5.1%	+5.1%	+5.1%	+6.1%	+6.1%	+6.1%	+0.9%	+0.9%	+0.9%
Astoria-Tillamook	*520*	+10.4%	+10.4%	+10.4%	+11.7%	+11.7%	+11.7%	+1.3%	+1.3%	+1.3%
Newport	*541*	+3.7%	+3.7%	+3.7%	+4.5%	+4.5%	+4.5%	+0.5%	+0.5%	+0.5%
Coos Bay-Brookings	*367*	+8.5%	+8.5%	+8.5%	+10.6%	+10.6%	+10.6%	-3.0%	-3.0%	-3.0%
Crescent City-Eureka	*173*	+14.8%	+13.2%	+5.1%	+17.0%	+15.4%	+7.2%	+3.4%	+3.4%	-3.2%
Fort Bragg - Bodega Bay	*205*	+22.7%	+22.0%	+18.6%	+26.7%	+26.0%	+22.5%	+6.9%	+6.9%	+4.1%
San Francisco Area	*215*	+15.3%	+12.2%	-40.3%	+15.8%	+12.7%	-39.8%	+6.7%	+6.7%	-42.8%
SC – Mo - MB	*519*	+16.7%	+15.0%	-10.8%	+18.3%	+16.6%	-9.3%	-3.5%	-3.5%	-17.4%
SB – LA - SD	*2,330*	+1.1%	+1.1%	-50.3%	+1.3%	+1.3%	-50.1%	+0.4%	+0.4%	-51.0%
Coastwide Total	*5,388*	+6.6%	+6.2%	-21.0%	+7.5%	+7.2%	-20.0%	+0.5%	+0.5%	-25.3%

Note: SC- Mo –MB: Santa Cruz - Monterey - Morro Bay; SB – LA – SD: Santa Barbara - Los Angeles - San Diego.
t Although strictly speaking, the two measures are not directly additive due to the slightly different estimation procedures used, combined impacts generated by commercial and recreational fishing activities are displayed here in order to facilitate comparison of the alternatives.

PROPOSED 2015 AND 2016 HARVEST SPECIFICATIONS AND SELECT MANAGEMENT MEASURES FOR GROUNDFISH STOCKS AND STOCK COMPLEXES

Summary of Tables included in this attachment:

- Table 1. 2014 OFLs (mt) and preferred 2015 and 2016 OFLs (mt) for west coast groundfish stocks, excluding kelp greenling, cabezon in Washington, and leopard shark (overfished stocks in CAPS; stocks with new assessments in **bold**; component stocks in status quo stock complexes in *italics*).
- Table 2. Preferred 2015 and 2016 OFLs (in mt) and ABCs (in mt) for kelp greenling in California, kelp greenling in Oregon, kelp greenling in Washington, and leopard shark.
- Table 3. Alternative 2015 and 2016 OFLs (in mt) and ABCs (in mt) for cabezon in Washington varied by the choice of an overfishing probability (P*) and according to the methodology recommended by the SSC in March 2014 for calculating the OFLs.
- Table 4. Preliminary preferred 2015 and 2016 annual catch limits (ACLs in mt) for west coast groundfish stocks and stock complexes (stocks with new assessments in bold).
- Table 5. Estimated time to rebuild and exploitation rate relative to alternative 2015-2016 ACLs for cowcod south of 40º10' N lat.
- Table 6. Proposed annual catch limits and alternative state harvest guidelines for the Nearshore Rockfish complex north of 40º10' N lat. in 2015 and 2016 (as adopted for analysis in November 2013[a/]).
- Table 7. Proposed annual catch limits and alternative state harvest guidelines for China rockfish north of 40º10' N lat. in 2015 and 2016 as adopted for analysis in November 2013 (P* = 0.45; 40-10 adj.).
- Table 8. Proposed blue rockfish harvest guidelines for California fisheries in 2015 and 2016.
- Table 9. Proposed 2015 and 2016 OFL and ABC contributions (in mt), and proposed harvest guidelines (in mt) for blackgill rockfish south of 40º10' N lat.
- Table 10. Alternative 3 – Preliminary Preferred Alternative (PPA). 2015 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.
- Table 11. Alternative 3 – PPA. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015 (in mt).
- Table 12. Alternative 3 - PPA. 2016 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.
- Table 13. Alternative 3 – Preliminary Preferred Alternative. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2016 (in mt).
- Table 14. Alternative 3 – Preliminary Preferred Alternative. Sablefish north of 36° N. latitude ACLs, set-asides used to calculate the commercial harvest guideline (mt) for 2015-2016 under Alternative 3.

- Table 15. Alternative 3 – Preliminary Preferred. At-sea whiting set-asides under the Preferred Alternative. The No Action set-aside values are provided for reference.
- Table 16. Preliminary preferred set-asides and allocations for overfished species.
- Table 17. Alternative 3 – Shorebased IFQ. IFQ species and Pacific halibut allocations or set-asides under Alternative 3 for 2015 and 2016. No action allocations are provided in the right panel.

Table 1. 2014 OFLs (mt) and preferred 2015 and 2016 OFLs (mt) for west coast groundfish stocks, excluding kelp greenling, cabezon in Washington, and leopard shark (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in status quo stock complexes in *italics*).

Stock	2014 OFL	Cat.	2015 OFL	2016 OFL	Comments
OVERFISHED STOCKS					
BOCACCIO S. of 40^{0}10' N. lat.	**881**	**1**	**1,444**	**1,351**	**Projected using a 50% SPR from the 2013 update stock assessment with a 6% reduction to subtract the portion of the assessed stock north of 40°10' N. lat.**
CANARY	741	1	733	729	Based on projections in the 2011 rebuilding analysis
COWCOD S. of 40^{0}10' N. lat.	12		**66.6**	**66.1**	Sum of Conception and Monterey OFLs.
COWCOD (Conception)	**7**	**2**	***55.0***	***54.1***	**Projected using a 50% SPR from the 2013 stock assessment.**
COWCOD (Monterey)	5	3	*11.6*	*12.0*	Revised DB-SRA estimate calculated in 2011.
DARKBLOTCHED	**553**	**1**	**574**	**580**	**Projected using a 50% SPR from the 2013 stock assessment**
PACIFIC OCEAN PERCH	838	1	842	850	Projected using a 50% SPR from the 2011 rebuilding analysis
PETRALE SOLE	**2,774**	**1**	**2,946**	**3,044**	**Projected using a 30% SPR from the 2013 stock assessment**
YELLOWEYE	51	2	52	52	Projected using a 50% SPR from the 2011rebuilding analysis
NON-DEPLETED STOCKS					
Arrowtooth Flounder	6,912	2	6,599	6,396	Projected using a 30% SPR from the 2007 full assessment.
Black Rockfish (OR-CA)	1,166	1	1,176	1,183	Projected using a 50% SPR from the 2007 full assessment with the addition of 3% of the northern OFL to account for the portion of the stock estimated between Cape Falcon and the Columbia River.
Black Rockfish (WA)	428	1	421	423	Projected using a 50% SPR from the 2007 full assessment with a 3% reduction to account for the portion of the stock estimated between Cape Falcon and the Columbia River.
Cabezon (CA)	165	1	161	158	Projected using a 45% SPR from the 2009 full assessment.
Cabezon (OR)	49	1	49	49	Projected using a 45% SPR from the 2009 full assessment.
California scorpionfish	122	1	119	117	Projected using a 45% SPR from the 2005 full assessment.
Chilipepper S. of 40^{0}10' N. lat.	1,722	1	1,703	1,694	Projected using a 50% SPR from the 2007 full assessment. The portion of the coastwide stock south of 40°10' N. lat. (93%) is based on average historical landings.
Dover Sole	77,774	1	66,871	59,221	Projected using a 30% SPR from the 2011 full assessment.
English Sole	**5,906**	**2**	**12,092**	**8,493**	**Projected using a 30% SPR from the 2013 data-moderate assessment.**
Lingcod N. of 42º N. lat. (OR & WA)	1,984	1	1,898	1,842	Projected using a 45% SPR from the 2009 full assessment.
Lingcod S. of 42º N. lat. (CA)	2,454	2	2,317	2,185	Projected using a 45% SPR from the 2009 full assessment.
Lingcod N. of 40º10' N. lat.	3,162	1	3,010	2,891	Projected using a 45% SPR from the 2009 full assessment with 48% of the OFL S. of 42º N. lat. added to account for line shift.
Lingcod S. of 40º10' N.	1,276	2	1,205	1,136	Projected using a 45% SPR from the 2009 full assessment with 48% of the OFL S. of 42º N. lat.

Stock	2014 OFL	Cat.	2015 OFL	2016 OFL	Comments
lat.					subtracted to account for line shift.
Longnose skate	2,816	1	2,449	2,405	Projected using a 50% SPR from the 2007 full assessment. 2015 and 2016 OFLs projected using the status quo 45% SPR rate are 2,745 and 2,686 mt, respectively.
Longspine Thornyhead (coastwide)	**3,304**	**2**	**5,007**	**4,763**	**Projected using a 50% SPR from the 2013 full assessment.**
Pacific Cod	3,200	3	3,200	3,200	Status quo OFL.
Sablefish (coastwide)	7,158	1	7,857	8,526	Projected using a 45% SPR from the 2011 full assessment.
Shortbelly	6,950	2	6,950	6,950	MSY estimated from 2007 assessment.
Shortspine Thornyhead (coastwide)	2,310	**2**	**3,203**	**3,169**	**Projected using a 50% SPR from the 2013 full assessment.**
Spiny dogfish	2,950	2	2,523	2,503	*Projected using a 50% SPR from the 2011 full assessment. 2015 and 2016 OFLs projected using the status quo 45% SPR rate are 2,921 and 2,893 mt, respectively.*
Splitnose S. of 40°10' N. lat.	1,747	1	1,794	1,826	Projected using a 50% SPR from the 2009 full assessment. The portion of the coastwide stock south of 40°10' N. lat. (64.2%) is based on average historical (1916-2008) landings.
Starry Flounder	1,834	2	1,841	1,847	Projected using a 30% SPR from the 2005 full assessment.
Widow	4,435	1	4,137	3,990	Projected using a 50% SPR from the 2011 full assessment.
Yellowtail N. of 40°10' N. lat.	**4,584**	**2**	**12,281**	**11,647**	**Projected using a 50% SPR from the 2013 data-moderate assessment.**
STOCK COMPLEXES					
Nearshore Rockfish North	110		88	88	Sum of OFL contributions of component stocks in the complex.
Black and yellow	*0.01*	3	*0.01*	*0.01*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Blue (CA)	*27.4*	2	*27.4*	*27.7*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the assessed stock in CA north of 40°10' N. lat. (12.7%) is based on average historical landings.*
Blue (OR & WA)	*32.3*	3	*32.3*	*32.3*	*DCAC estimate.*
Brown	***5.5***	**2**	***1.9***	***1.9***	**Projected using a 50% SPR from the 2013 data-moderate assessment.**
Calico	-	3	-	-	*No harvest contribution (3a stock). Max. landings <2 mt, 1928-2008; mainly a discard species*
China	***9.8***	**2**	***7.2***	***7.4***	**Projected using a 50% SPR from the 2013 data-moderate assessment. Assumes P* = 0.45**
Copper	***26.0***	**2**	***10.6***	***10.3***	**Projected using a 50% SPR from the 2013 data-moderate assessment.**
Gopher	-	3	-	-	*No harvest contribution (3a stock).*
Grass	*0.7*	3	*0.7*	*0.7*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Kelp	*0.01*	3	*0.01*	*0.01*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Olive	*0.3*	3	*0.3*	*0.3*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Quillback	*7.4*	3	*7.4*	*7.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*

Stock	2014 OFL	Cat.	2015 OFL	2016 OFL	Comments
Treefish	*0.2*	3	*0.2*	*0.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Shelf Rockfish North	2,195		2,209	2,218	Sum of OFL contributions of component stocks in the complex.
Bronzespotted	-	3	-	-	*No harvest contribution in the north (3a stock)*
Bocaccio	*284.0*	3	*284.0*	*284.0*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Chameleon	-	3	-	-	*No harvest contribution (3a stock).*
Chilipepper	*129.6*	3	*128.2*	*127.5*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the coastwide stock north of 40°10' N. lat. (7%) is based on average historical landings.*
Cowcod	-	3	*0.4*	*0.4*	*No harvest contribution (3a stock).*
Flag	*0.1*	3	*0.1*	*0.1*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Freckled	-	3	-	-	*No harvest contribution (3a stock).*
Greenblotched	*1.3*	3	*1.3*	*1.3*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Greenspotted 40°10' to 42° N. lat.	*9.4*	2	*10.0*	*9.9*	*Projection using a 50% SPR from the full 2011 assessment. The portion of the assessed area north of 40º10' N lat. (22.2% of OFL from northern California model) based on average historical catch.*
Greenspotted N. of 42 N. lat. (OR & WA)	*6.1*	3	*6.1*	*6.1*	*DCAC estimate*
Greenstriped	*1,268.3*	2	*1,281.9*	*1,292.0*	*Projected using a 50% SPR from the full 2009 assessment. The portion of the coastwide stock north of 40°10' N. lat. (84.5%) is based on the mean of the 2003-2008 swept area biomass estimates from the NMFS trawl survey.*
Halfbanded	-	3	-	-	*No harvest contribution (3a stock). Max. landings <2 mt, 1928-2008; mainly a discard species*
Harlequin	-	3	-	-	*DB-SRA estimate calculated in 2011 calculated in 2011*
Honeycomb	-	3	-	-	*No harvest contribution in the north (3a stock)*
Mexican	-	3	-	-	*No harvest contribution in the north (3a stock)*
Pink	*0.004*	3	*0.004*	*0.004*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Pinkrose	-	3	-	-	*DB-SRA estimate calculated in 2011 calculated in 2011*
Puget Sound	-	3	-	-	*No harvest contribution (3a stock).*
Pygmy	-	3	-	-	*No harvest contribution (3a stock).*
Redstripe	*269.9*	3	*269.9*	*269.9*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Rosethorn	*12.9*	3	*12.9*	*12.9*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Rosy	*3.0*	3	*3.0*	*3.0*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Silvergray	*159.4*	3	*159.4*	*159.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Speckled	*0.2*	3	*0.2*	*0.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Squarespot	*0.2*	3	*0.2*	*0.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Starry	*0.004*	3	*0.004*	*0.004*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Stripetail	*40.4*	3	*40.4*	*40.4*	***DB-SRA estimate calculated in 2011 calculated in 2011. Only status determined from 2013 data-moderate assessment, so remains a cat. 3 stock***
Swordspine	*0.0001*	3	*0.0001*	*0.0001*	*DB-SRA estimate calculated in 2011 calculated in 2011*

Stock	2014 OFL	Cat.	2015 OFL	2016 OFL	Comments
Tiger	*1.0*	3	*1.0*	*1.0*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Vermilion	*9.7*	3	*9.7*	*9.7*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Slope Rockfish North	1,553		1,804	1,818	Sum of OFL contributions of component stocks in the complex.
Aurora	***15.4***	**1**	***17.4***	***17.5***	***Projected using a 50% SPR from the 2013 full assessment. The portion of the coastwide stock north of 40º10' N lat. (19%) is based on average survey biomass.***
Bank	*17.2*	3	*17.2*	*17.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Blackgill	*4.7*	3	*4.7*	*4.7*	*DCAC estimate.*
Redbanded	*45.3*	3	*45.3*	*45.3*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Rougheye/Blackspotted	***71.1***	**2**	***201.9***	***206.8***	***Projected using a 50% SPR from the 2013 full assessment. The coastwide OFLs are apportioned north (98%) and south (2%) based on average landings during 1985-2012.***
Sharpchin	***214.5***	**2**	***305.6***	***297.6***	***Coastwide OFLs projected using a 50% SPR from the 2013 data-moderate assessment. OFLs are apportioned north and south of 40º10' N lat. (80%N, 20% S) based on average swept area biomass estimates from the triennial survey.***
Shortraker	*18.7*	3	*18.7*	*18.7*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Splitnose	*974.1*	1	*1,000.6*	*1,018.2*	*Projected using a 50% SPR from the 2009 full assessment. The portion of the coastwide stock north of 40°10' N. lat. (35.8%) is based on average historical (1916-2008) landings.*
Yellowmouth	*192.4*	3	*192.4*	*192.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Nearshore Rockfish South	1,160		1,313	1,288	Sum of OFL contributions of component stocks in the complex.
Shallow Nearshore Species	NA	NA	NA	NA	
Black and yellow	*27.5*	3	*27.5*	*27.5*	*DB-SRA estimate calculated in 2011 calculated in 2011*
China	***16.6***	**2**	***55.2***	***52.7***	**Projected using a 50% SPR from the 2013 data-moderate assessment**
Gopher (N of Pt. Conception)	*153.0*	1	*148.0*	*144.0*	*Projected using a 50% SPR from the 2005 full assessment.*
Gopher (S of Pt. Conception)	*25.6*	3	*25.6*	*25.6*	*DCAC estimate.*
Grass	*59.6*	3	*59.6*	*59.6*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Kelp	*27.7*	3	*27.7*	*27.7*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Deeper Nearshore Species	NA	NA	NA	NA	
Blue (assessed area)	*187.8*	2	*188.6*	*190.3*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the assessed stock in CA south of 40°10' N. lat. (87.3%) is based on average historical landings.*
Blue (S of 34º27' N. lat.)	*72.9*	3	*72.9*	*72.9*	*DCAC estimate.*
Brown	***204.6***	**2**	***163.8***	***160.2***	**Projected using a 50% SPR from the 2013 data-moderate assessment**

Stock	2014 OFL	Cat.	2015 OFL	2016 OFL	Comments
Calico	-	3	-	-	*No harvest contribution (3a stock). Max. landings <2 mt, 1928-2008; mainly a discard species*
Copper	***141.5***	**2**	***301.1***	***284.3***	**Projected using a 50% SPR from the 2013 data-moderate assessment**
Olive	*224.6*	3	*224.6*	*224.6*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Quillback	*5.4*	3	*5.4*	*5.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Treefish	*13.2*	3	*13.2*	*13.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Shelf Rockfish South	1,912.9		1,917.9	1,918.9	Sum of OFL contributions of component stocks in the complex.
Bronzespotted	*3.6*	3	*3.6*	*3.6*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Chameleon	-	3	-	-	*No harvest contribution (3a stock).*
Flag	*23.4*	3	*23.4*	*23.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Freckled	-	3	-	-	*No harvest contribution (3a stock).*
Greenblotched	*23.1*	3	*23.1*	*23.1*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Greenspotted	*80.3*	2	*82.8*	*82.0*	*Projection using a 50% SPR from the full 2011 assessment. The portion of the assessed area south of 40º10' N lat. (77.8% of OFL from northern California model from average historical catch + the OFL from the southern California model)*
Greenstriped	*232.7*	2	*235.1*	*237.0*	*Projected using a 50% SPR from the full 2009 assessment. The portion of the coastwide stock south of 40°10' N. lat. (15.5%) is based on the mean of the 2003-2008 swept area biomass estimates from the NMFS trawl survey.*
Halfbanded	-	3	-	-	*No harvest contribution (3a stock).*
Harlequin	-	3	-	-	*DB-SRA estimate calculated in 2011 calculated in 2011*
Honeycomb	*9.9*	3	*9.9*	*9.9*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Mexican	*5.1*	3	*5.1*	*5.1*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Pink	*2.5*	3	*2.5*	*2.5*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Pinkrose	-	3	-	-	*DB-SRA estimate calculated in 2011 calculated in 2011*
Pygmy	-	3	-	-	*No harvest contribution (3a stock).*
Redstripe	*0.5*	3	*0.5*	*0.5*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Rosethorn	*2.1*	3	*2.1*	*2.1*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Rosy	*44.5*	3	*44.5*	*44.5*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Silvergray	*0.5*	3	*0.5*	*0.5*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Speckled	*39.4*	3	*39.4*	*39.4*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Squarespot	*11.1*	3	*11.1*	*11.1*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Starry	*62.6*	3	*62.6*	*62.6*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Stripetail	*23.6*	3	*23.6*	*23.6*	***DB-SRA estimate calculated in 2011 calculated in 2011. Only status determined from 2013 data-moderate assessment, so presumed to remain a cat. 3 stock.***
Swordspine	*14.2*	3	*14.2*	*14.2*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Tiger	*0.04*	3	*0.04*	*0.04*	*DB-SRA estimate calculated in 2011 calculated in 2011*
Vermilion	*269.3*	3	*269.3*	*269.3*	*DB-SRA estimate calculated in 2011.*

Stock	**2014 OFL**	**Cat.**	**2015 OFL**	**2016 OFL**	**Comments**
Yellowtail	*1,064.4*	3	*1,064.4*	*1,064.4*	*DB-SRA estimate calculated in 2011.*
Slope Rockfish South	685		806	807	Sum of OFL contributions of component stocks in the complex.
Aurora	***26.1***	**1**	***74.3***	***74.3***	***Projected using a 50% SPR from the 2013 full assessment. The portion of the coastwide stock south of 40º10' N lat. (81%) is based on average survey biomass.***
Bank	*503.2*	3	*503.2*	*503.2*	*DB-SRA estimate calculated in 2011.*
Blackgill	*134.0*	2	*137.0*	*140.0*	*Projected using a 50% SPR from the 2011 full assessment.*
Pacific ocean perch	-	3	-	-	*No harvest contribution (3a stock).*
Redbanded	*10.4*	3	*10.4*	*10.4*	*DB-SRA estimate calculated in 2011.*
Rougheye/Blackspotted	***0.4***	**2**	***4.1***	***4.2***	***Projected using a 50% SPR from the 2013 full assessment. The coastwide OFLs are apportioned north (98%) and south (2%) based on average landings during 1985-2012.***
Sharpchin	***9.8***	**2**	***76.4***	***74.4***	***Coastwide OFLs projected using a 50% SPR from the 2013 data-moderate assessment. OFLs are apportioned north and south of 40º10' N lat. (80%N, 20% S) based on average swept area biomass estimates from the triennial survey.***
Shortraker	*0.1*	3	*0.1*	*0.1*	*DB-SRA estimate calculated in 2011.*
Yellowmouth	*0.8*	3	*0.8*	*0.8*	*DB-SRA estimate calculated in 2011.*
Other Flatfish	10,060		11,298	9,948	Sum of OFL contributions of component stocks in the complex.
Butter sole	*4.6*	3	*4.6*	*4.6*	*Based on the average catch during 1994-1998 + a 60% discard rate estimated from the EDCP study.*
Curlfin sole	*8.2*	3	*8.2*	*8.2*	*Based on the average catch during 1994-1998 + a 60% discard rate estimated from the EDCP study.*
Flathead sole	*35.0*	3	*35.0*	*35.0*	*Max. catch = 35 mt in 2005*
Pacific sanddab	*4,801.0*	**3**	*4,801.0*	*4,801.0*	***DB-SRA estimate calculated in 2011. Only status determined from 2013 full assessment, so presumed to remain a cat. 3 stock.***
Rex sole	***4,371.5***	**2**	***5,609.0***	***4,259.0***	***Projected using a 50% SPR from the 2013 data-moderate assessment.***
Rock sole	*66.7*	3	*66.7*	*66.7*	*DB-SRA estimate calculated in 2011.*
Sand sole	*773.2*	3	*773.2*	*773.2*	*DB-SRA estimate calculated in 2011.*

Table 2. Preferred 2015 and 2016 OFLs (in mt) and ABCs (in mt) for kelp greenling in California, kelp greenling in Oregon, kelp greenling in Washington, and leopard shark.

Stock	P*	2015 OFL	2015 ABC	2016 OFL	2016 ABC
Kelp greenling in CA	0.45	118.9	99.2	118.9	99.2
Kelp greenling in OR	0.45	14.0	11.7	16.6	12.9
Kelp greenling in WA	0.4	31.4	21.8	28.4	19.7
Leopard shark	0.45	167.1	139.4	167.1	139.4

Table 3. Alternative 2015 and 2016 OFLs (in mt) and ABCs (in mt) for cabezon in Washington varied by the choice of an overfishing probability (P*) and according to the methodology recommended by the SSC in March 2014 for calculating the OFLs.

Stock	P*	2015 OFL	2015 ABC	2016 OFL	2016 ABC
Cabezon in WA	0.45	4.5	3.7	4.8	4.0
	0.4	4.5	3.1	4.9	3.4
	0.35	4.5	2.6	5.0	2.9
	0.3	4.5	2.1	5.1	2.4
	0.25	4.5	1.7	5.1	1.9

Table 4. Preliminary preferred 2015 and 2016 annual catch limits (ACLs in mt) for west coast groundfish stocks and stock complexes (stocks with new assessments in bold).

Stock	Status Quo ACL	Preliminary Preferred ACLs (Alt. 3)			ACLs Varied by the Overfishing Probability (P*)			
					2015		2016	
	2014	2015	2016	ACL Harvest Control Rule	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)
OVERFISHED STOCKS								
BOCACCIO S. of 40°10'	337	**349**	**362**	SPR = 77.7%	349	349	362	362
CANARY	119	122	125	SPR = 88.7%	122	122	125	125
COWCOD S. of 40°10'	3	**10**	**10**	SPR = 82.7% (F = 0.007); ACT = 4 mt	10	10	10	10
DARKBLOTCHED	330	**338**	**346**	SPR = 64.9%	338	338	346	346
PACIFIC OCEAN PERCH	153	158	164	SPR = 86.4%	158	158	164	164
PETRALE SOLE	2,652	**2,816**	**2,910**	25-5 rule	2,816	2,310	2,910	2,386
YELLOWEYE	18	18	19	SPR = 76.0%	18	18	19	19
NON-DEPLETED STOCKS								
Arrowtooth Flounder	5,758	5,497	5,328	ACL = ABC (P* = 0.4)	6,025	4,058	5,840	3,934
Black Rockfish (OR-CA)	1,000	1,000	1,000	Constant catch strategy	1,000	922	1,000	927
Black Rockfish (WA)	409	402	404	ACL = ABC (P* = 0.45)	402	330	404	332
Cabezon (CA)	158	154	151	ACL = ABC (P* = 0.45)	154	126	151	124
Cabezon (OR)	47	47	47	ACL = ABC (P* = 0.45)	47	38	47	38
California scorpionfish	117	114	111	ACL = ABC (P* = 0.45)	114	93	111	91
Chilipepper S. of 40°10'	1,647	1,628	1,619	ACL = ABC (P* = 0.45)	1,628	1,335	1,619	1,328
Dover Sole	25,000	25,000	25,000	Constant catch strategy; alt. ACL = 50,000 mt	25,000	25,000	25,000	25,000
English Sole	5,646	**11,040**	**7,754**	ACL = ABC (P* = 0.45)	11,040	7,437	7,754	5,223
Lingcod N. of 40°10'	2,635	2,830	2,719	ACL = ABC (P* = 0.45)	2,830	2,172	2,719	2,089
Lingcod S. of 40°10'	1,063	1,004	946	ACL = ABC (P* = 0.4)	1,100	741	1,037	699
Longnose skate	2,000	2,000	2,000	Constant catch strategy	2,000	1,920	2,000	1,885
Longspine Thornyhead N. of 34°27'	1,958	**3,170**	**3,015**	ACL = 76% of coastwide ABC (P* = 0.4)	3,474	2,340	3,305	2,226
Longspine Thornyhead S. of 34°27'	347	**1,001**	**952**	ACL = 24% of coastwide ABC (P* = 0.4)	1,097	739	1,044	703
Pacific Cod	1,600	1,600	1,600	ACL = 50% of OFL	1,600	1,213	1,600	1,213
Sablefish N. of 36°	4,349	4,793	5,241	40-10 rule applied to 73.6% of coastwide ABC (P* = 0.4)	5,012	4,114	5,467	4,540

Stock	Status Quo ACL	Preliminary Preferred ACLs (Alt. 3)			ACLs Varied by the Overfishing Probability (P*)			
					2015		2016	
	2014	2015	2016	ACL Harvest Control Rule	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)
Sablefish S. of 36°	1,560	1,719	1,880	40-10 rule applied to 26.4% of coastwide ABC (P* = 0.4)	1,798	1,475	1,961	1,629
Shortbelly	50	50	50	De minimis ACL to accommodate incidental bycatch and allow harvestable surplus to be available as forage	50	50	50	50
Shortspine Thornyhead N. of 34°27'	1,525	**1,745**	**1,726**	ACL = 65.4% of coastwide ABC (P* = 0.4)	1,913	1,288	1,892	1,275
Shortspine Thornyhead S. of 34°27'	393	**923**	**913**	ACL = 34.6% of coastwide ABC (P* = 0.4)	1,012	682	1,001	674
Spiny dogfish		1,912	1,897	ACL = ABC (P* = 0.35)	2,303	1,551	2,285	1,540
Splitnose S. of 40^{0}10’	1,670	1,715	1,746	ACL = ABC (P* = 0.45)	1,715	1,406	1,746	1,432
Starry Flounder	1,528	1,534	1,539	ACL = ABC (P* = 0.4)	1,681	1,132	1,686	1,136
Widow	1,500	1,500	1,500	Constant catch strategy; alt. ACL = 3,000 mt	1,500	1,500	1,500	1,500
Yellowtail N. of 40^{0}10’	4,382	**11,213**	**10,634**	ACL = ABC (P* = 0.45)	11,213	7,553	10,634	7,163
STOCK COMPLEXES								
Nearshore Rockfish North	94	69	69	ACL = ABC (P* = 0.45); 40-10 adj. ACL contrib. for blue RF in CA and China RF	69	40	69	41
Shelf Rockfish North	968	1,944	1,952	ACL = ABC (P* = 0.45); 40-10 adj. ACL contrib. for greenspotted RF in CA	1,944	1,142	1,952	1,148
Slope Rockfish North	1,160	1,669	1,683	ACL = ABC (P* = 0.45)	1,669	1,215	1,683	1,227
Nearshore Rockfish South	990	1,114	1,006	ACL = ABC (P* = 0.45); 40-10 adj. ACL contrib. for blue RF N of 34º27’ N lat.	1,114	696	1,006	684
Shelf Rockfish South	714	1,624	1,625	ACL = ABC (P* = 0.45); 40-10 adj. ACL contrib. for greenspotted RF in CA	1,624	802	1,625	803
Slope Rockfish South	622	687	689	ACL = ABC (P* = 0.45); 40-10 adj. ACL contrib. for blackgill RF	687	384	689	386
Other Flatfish	4,884	8,620	7,496	ACL = ABC (P* = 0.4)	9,865	5,606	8,633	4,775
Other Fish	4,697	This complex no longer exists			NA	NA	NA	NA
Cabezon (WA) a/	*NA*	*3.7*	*4.0*	ACL = ABC (P* = 0.45)	*3.7*	*1.7*	*4.0*	*1.8*
Kelp greenling (CA) a/	*NA*	*99.2*	*99.2*	ACL = ABC (P* = 0.45)	*99.2*	*45.1*	*99.2*	*45.1*
Kelp greenling (OR) a/	*NA*	*11.7*	*12.9*	ACL = ABC (P* = 0.45)	*11.7*	*5.3*	*12.9*	*6.3*
Kelp greenling (WA) a/	*NA*	*21.8*	*19.7*	ACL = ABC (P* = 0.4)	*26.2*	*11.9*	*23.7*	*10.8*
Leopard shark a/	*NA*	*139.4*	*139.4*	ACL = ABC (P* = 0.45)	*139.4*	*63.3*	*139.4*	*63.3*

Stock	Status Quo ACL	Preliminary Preferred ACLs (Alt. 3)			ACLs Varied by the Overfishing Probability (P*)			
					2015		2016	
	2014	2015	2016	ACL Harvest Control Rule	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)	P* = 0.45 (Alt. 1)	P* = 0.25 (Alt. 2)
ECOSYSTEM COMPONENT SPECIES								
Big skate	No harvest specifications for an EC species							
California skate								
Aleutian skate								
Roughtail/black skate								
Bering/sandpaper skate								
All other skates (other than longnose)								
Pacific grenadier								
Giant grenadier								
All other grenadiers								
Ratfish								
Soupfin shark								
Finescale codling								

a/ These stocks have been managed in the Other Fish complex and are contemplated for individual stock management or in a new shallow roundfish stock complex in 2015-2016.

Table 5. Estimated time to rebuild and exploitation rate relative to alternative 2015-2016 ACLs for cowcod south of 40º10' N lat.

Stock	Current TTARGET	Current SPR or Harvest Control Rule	PPA TTARGET	ACL Alt.	ACLs (mt) 2015	ACLs (mt) 2016	SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax
Cowcod	2068	82.7%	X		0	0	E = 0	2019	0	95.9%	93.8%
					1.8	1.9	E = 0.0013	2019	0	95.2%	93.0%
					2.4	2.5	E = 0.0018	2019	0	95.0%	92.7%
					3.0	3.1	E = 0.0022	2019	0	94.7%	92.4%
					3.7	3.8	E = 0.0027	2019	0	94.4%	91.9%
				PPA ACT	4.3	4.4	E = 0.0031	2019	0	94.0%	91.5%
					4.9	5.0	E = 0.0036	2019	0	93.4%	91.3%
					5.5	5.6	E = 0.0040	2019	0	93.4%	91.0%
					6.1	6.3	E = 0.0045	2019	0	93.1%	90.6%
					6.7	6.9	E = 0.0049	2019	0	92.7%	90.2%
					7.3	7.5	E = 0.0054	2019	0	92.4%	89.8%
					7.9	8.1	E = 0.0058	2019	0	92.0%	89.6%
					8.5	8.8	E = 0.0063	2019	0	91.5%	89.2%
					9.1	9.4	E = 0.0067	2019	0	91.2%	88.8%
				PPA ACL	9.5	9.8	E = 0.007	2020	1	90.9%	88.4%
					9.7	10.0	E = 0.0072	2020	1	90.9%	88.5%
					55.8	55.8	E = 0.0409	2039	20	55.0%	53.4%
					62.5	62.2	E = 0.0458	2057	38	51.4%	50.0%

Table 6. Proposed annual catch limits and alternative state harvest guidelines for the Nearshore Rockfish complex north of 40º10' N lat. in 2015 and 2016 (as adopted for analysis in November 2013[a/]).

Year	ACL (mt)	Basis for HG	N CA		OR		WA		OR + WA	
			HG (mt)	%	HG (mt)	%	HG (mt)	%	HG (mt)	%
2015	69	Prop. of cum. catch	36.1	52.6%	28.1	40.9%	4.5	6.5%	32.6	47.4%
2016	69	Prop. of cum. catch	36.4	52.6%	28.3	40.9%	4.5	6.5%	32.8	47.4%

a/ See Agenda Item C.4.b, WDFW Report for additional alternative HGs for the northern Nearshore Rockfish complex.

Table 7. Proposed annual catch limits and alternative state harvest guidelines for China rockfish north of 40º10' N lat. in 2015 and 2016 as adopted for analysis in November 2013 (P* = 0.45; 40-10 adj.).

Year	ACL (mt) a/	Basis for HG	N CA		OR		WA		OR + WA	
			HG (mt)	%	HG (mt)	%	HG (mt)	%	HG (mt)	%
2015	6.2	Prop. of cum. catch	0.9	15.3%	4.2	66.9%	1.1	17.9%	5.3	84.7%
		Prop of highest rec. catch	0.7	10.5%	3.5	55.5%	2.1	34.0%	5.6	89.5%
		Prop. of highest comm. catch	1.0	16.6%	5.2	83.4%	0.0	0.0%	5.2	83.4%
2016	6.5	Prop. of cum. catch	1.0	15.3%	4.3	66.9%	1.2	17.9%	5.5	84.7%
		Prop of highest rec. catch	0.7	10.5%	3.6	55.5%	2.2	34.0%	5.8	89.5%
		Prop. of highest comm. catch	1.1	16.6%	5.4	83.4%	0.0	0.0%	5.4	83.4%

a/ Annual catch limits adjusted from the ABCs (cat. 2/P* = 0.45) using the 40-10 harvest control rule.

Table 8. Proposed blue rockfish harvest guidelines for California fisheries in 2015 and 2016.

Area	OFL contribution by area		ABC contribution by area		40-10 adjusted HG contribution by area	
			P* = 0.45 a/		P* = 0.45 a/	
	2015	2016	2015	2016	2015	2016
40º10' - 42º N lat.	27.4	27.7	25.0	25.3	17.0	17.5
34º27' - 40º10' N lat.	188.6	190.3	172.2	173.8	116.6	120.0
South of 34º27' N lat. (unassessed area)	72.9	72.9	60.8	60.8	60.8	60.8
Total for CA	288.9	290.9	258.0	259.8	194.4	198.3

a/ Harvest specifications based on the ABCs determined using a P* = 0.45 are preferred.

Table 9. Proposed 2015 and 2016 OFL and ABC contributions (in mt), and proposed harvest guidelines (in mt) for blackgill rockfish south of 40º10' N lat.

Stock	2015 OFL contribution	2015 ABC contribution	2015 HG a/	2016 OFL contribution	2016 ABC contribution	2016 HG a/
Blackgill Rockfish S of 40º10'	137	125	114	140	128	117

a/ Harvest guideline is based on the 40-10 adjustment from the preferred ABC.

Table 10. Alternative 3 – Preliminary Preferred Alternative (PPA). 2015 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.

Species	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	349		3	4.6	0.7	340.7
CANARY	Coastwide	122	7.7	1	4.5	2	106.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	338	0.2	0.1	2.1	18.4	317.2
PETRALE SOLE	Coastwide	2,816	220		14.2	2.4	2,579.4
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
YELLOWEYE	Coastwide	18	2.3	0.03	3.3	0.2	12.2
Arrowtooth flounder	Coastwide	5,497	2,041		16.39	30	3,409.6
Black	N of 46º16' N. lat.	402	14				388.0
Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	154					154.0
Cabezon	WA	XXX					XXX
California	S of 34°27' N. lat.	114				2	112.0
Chilipepper	S of 40º10' N. lat.	1,628		10	9	5	1,604.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	11,040	91		5.8	7	10,936.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	12					11.7
Kelp Greenling	WA	21.8					21.8
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,830	250	0.5	11.67	16	2,551.8
Lingcod	S of 40'10º N. lat.	1,004		1.0	1.1	7	994.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine	N of 34º27' N. lat.	3,170	30		13.5	3	3,123.5
Longspine	S of 34º27' N. lat.	1,001			1	2	998.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Sablefish	N of 36º N. lat.	4,793		See Table 14			
Sablefish	S of 36º N. lat.	1,719			3	2	1,714.0
Shortbelly	Coastwide	50			2		48.0
Shortspine	N of 34º27' N. lat.	1,745	50		7.22	2	1,685.8
Shortspine	S of 34º27' N. lat.	923			1	41	881.0
Spiny Dogfish	Coastwide	1,912	111.8	1	12.5	49.53	1,737.2
Splitnose	S of 40º10' N. lat.	1,715		1.5	9		1,704.5
Starry flounder	Coastwide	1,534	2			8.3	1,523.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	11,213	677	10	16.6	3	10,506.4
Nearshore rockfish N.	N of 40º10' N. lat.	69					69.0
Nearshore rockfish S.	S of 40º10' N. lat.	1,114			2.6	1.4	1,110.0
Shelf rockfish N.	N of 40º10' N. lat.	1,944	30	3	13.4	26	1,871.6
Shelf rockfish S.	S of 40º10' N. lat.	1,624		30	9.6	9	1,575.4
Slope rockfish N.	N of 40º10' N. lat.	1,669	36	1	8.1	19	1,604.9
Slope rockfish S.	S of 40º10' N. lat.	687		1	2	17	667.0
Other flatfish	Coastwide	8,620	60		19	125	8,416.0

Table 11. Alternative 3 – PPA. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2015 (in mt).

Species	Area	Fishery HG or ACT	Allocation Type	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	340.7	Biennial	N/A	81.9	N/A	258.8
CANARY	Coastwide	106.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	317.2	Amendment 21	95%	301.3	5%	15.9
PETRALE SOLE	Coastwide	2,579.4	Biennial	N/A	2,544.4	N/A	35.0
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
YELLOWEYE	Coastwide	12.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,409.6	Amendment 21	95%	3,239.1	5%	170.5
Black	N of 46º16' N. lat.	388.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	154.0	None				
Cabezon	WA	XXX	None				
California	S of 34°27' N. lat.	112.0	None				
Chilipepper	S of 40º10' N. lat.	1,604.0	Amendment 21	75%	1,203.0	25%	401.0
Dover sole	Coastwide	23,406.1	Amendment 21	95%	22,235.8	5%	1,170.3
English sole	Coastwide	10,936.2	Amendment 21	95%	10,389.4	5%	546.8
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	11.7	None				
Kelp Greenling	WA	21.8	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N. lat.	2,551.8	Amendment 21	45%	1,148.3	55%	1,403.5
Lingcod	S of 40'10º N. lat.	994.9	Amendment 21	45%	447.7	55%	547.2
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine	N of 34º27' N. lat.	3,123.5	Amendment 21	95%	2,967.3	5%	156.2
Longspine	S of 34º27' N. lat.	998.0	None				
Pacific cod	Coastwide	1,191.0	Amendment 21	95%	1,131.4	5%	59.5
Sablefish	N of 36º N. lat.		See Table 1 c				
Sablefish	S of 36º N. lat.	1,714.0	Amendment 21	42%	719.9	58%	994.1
Shortbelly	Coastwide	48.0	None				0.0
Shortspine	N of 34º27' N. lat.	1,685.8	Amendment 21	95%	1,601.5	5%	84.3
Shortspine	S of 34º27' N. lat.	881.0	Amendment 21	NA	50.0	NA	831.0
Spiny Dogfish	Coastwide	1,737.2	None				
Splitnose	S of 40º10' N. lat.	1,704.5	Amendment 21	95%	1,619.3	5%	85.2
Starry flounder	Coastwide	1,523.7	Amendment 21	50%	761.9	50%	761.9
Widow	Coastwide	1,419.8	Amendment 21	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N. lat.	10,506.4	Amendment 21	88%	9,245.6	12%	1,260.8
Nearshore rockfish N.	N of 40º10' N. lat.	69.0	None				
Nearshore rockfish S.	S of 40º10' N. lat.	1,110.0	None				
Other flatfish	Coastwide	8,416.0	Amendment 21	90%	7,574.4	10%	841.6
Shelf rockfish N.	N of 40º10' N. lat.	1,871.6	Biennial	60.2%	1,126.7	39.8%	744.9
Shelf rockfish S.	S of 40º10' N. lat.	1,575.4	Biennial	12.2%	192.2	87.8%	1,383.2
Slope rockfish N.	N of 40º10' N. lat.	1,604.9	Amendment 21	81%	1,300.0	19%	304.9
Slope rockfish S.	S of 40º10' N. lat.	667.0	Amendment 21	63%	420.2	37%	246.8

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.

Table 12. Alternative 3 - PPA. 2016 ACLs and estimates of tribal (Trib), EFP, research (Res.), and incidental open access (OA) groundfish mortality in metric tons, used to calculate the fishery harvest guideline (HG), under Alternative 3.

Species	Area	ACL	Tribal	EFP	Research	OA	Fishery HG
BOCACCIO	S of 40º10' N. lat.	362		3	4.6	0.7	353.7
CANARY	Coastwide	125	7.7	1	4.5	2	109.8
COWCOD	S of 40º10' N. lat.	10		0.015	2		7.98
DARKBLOTCHED	Coastwide	346	0.2	0.1	2.1	18.4	325.2
PETRALE SOLE	Coastwide	2,910	220		14.2	2.4	2,673.4
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
YELLOWEYE	Coastwide	19	2.3	0.03	3.3	0.2	13.2
Arrowtooth flounder	Coastwide	5,328	2,041		16.39	30	3,240.6
Black	N of 46º16' N. lat.	404	14				390.0
Black	S of 46º16' N. lat.	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	151					151.0
Cabezon	WA	XXX					XXX
CA scorpionfish	S of 34°27' N. lat.	111				2	109.0
Chilipepper	S of 40º10' N. lat.	1,619		10	9	5	1,595.0
Dover sole	Coastwide	25,000	1,497		41.9	55	23,406.1
English sole	Coastwide	7,754	91		5.8	7	7,650.2
Kelp Greenling	CA	99					99.2
Kelp Greenling	OR	13					12.9
Kelp Greenling	WA	19.7					19.7
Leopard Shark	Coastwide	139					139.4
Lingcod	N of 40'10º N. lat.	2,719	250	0.5	11.67	16	2,440.8
Lingcod	S of 40'10º N. lat.	946		1.0	1.1	7	936.9
Longnose skate	Coastwide	2,000	56		13.18	3.8	1,927.0
Longspine	N of 34º27' N. lat.	3,015	30		13.5	3	2,968.5
Longspine	S of 34º27' N. lat.	952			1	2	949.0
Pacific cod	Coastwide	1,600	400		7.04	2	1,191.0
Sablefish	N of 36º N. lat.	5,241		See Table 14			
Sablefish	S of 36º N. lat.	1,880			3	2	1,875.0
Shortbelly	Coastwide	50			2		48.0
Shortspine	N of 34º27' N. lat.	1,726	50		7.22	2	1,666.8
Shortspine	S of 34º27' N. lat.	913			1	41	871.0
Spiny Dogfish	Coastwide	1,897	111.8	1	12.5	49.53	1,722.2
Splitnose	S of 40º10' N. lat.	1,746		1.5	9		1,735.5
Starry flounder	Coastwide	1,539	2			8.3	1,528.7
Widow	Coastwide	1,500	60	9	7.9	3.3	1,419.8
Yellowtail	N of 40º10' N. lat.	10,634	677	10	16.6	3	9,927.4
Nearshore rockfish N.	N of 40º10' N. lat.	69					69.0
Nearshore rockfish S.	S of 40º10' N. lat.	1,006			2.6	1.4	1,002.0
Shelf rockfish N.	N of 40º10' N. lat.	1,952	30	3	13.4	26	1,879.6
Shelf rockfish S.	S of 40º10' N. lat.	1,625		30	9.6	9	1,576.4
Slope rockfish N.	N of 40º10' N. lat.	1,683	36	1	8.1	19	1,618.9
Slope rockfish S.	S of 40º10' N. lat.	689		1	2	17	669.0
Other flatfish	Coastwide	7,496	60		19	125	7,292.0

Table 13. Alternative 3 – Preliminary Preferred Alternative. Stock specific fishery harvest guidelines (HG) or annual catch targets (ACT) and allocations for 2016 (in mt).

Species	Area	Fishery HG	Allocation	Trawl		Non-trawl	
				%	Mt	%	Mt
BOCACCIO	S of 40º10' N. lat.	353.7	Biennial	N/A	85.0	N/A	268.7
CANARY	Coastwide	109.8	Biennial	N/A	56.9	N/A	49.9
COWCOD a/	S of 40º10' N. lat.	4.0	Biennial	N/A	1.4	N/A	2.6
DARKBLOTCHED	Coastwide	325.2	Amendment	95%	308.9	5%	16.3
PETRALE SOLE	Coastwide	2,673.4	Biennial	N/A	2,638.4	N/A	35.0
POP	N of 40º10' N.	149.0	Amendment	95%	141.6	5%	7.5
YELLOWEYE	Coastwide	13.2	Biennial	N/A	1.0	N/A	11.2
Arrowtooth flounder	Coastwide	3,240.6	Amendment	95%	3,078.6	5%	162.0
Black	N of 46º16' N.	390.0	None				
Black	S of 46º16' N. lat.	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	151.0	None				
Cabezon	WA	XXX	None				
California	S of 34°27' N. lat.	109.0	None				
Chilipepper	S of 40º10' N. lat.	1,595.0	Amendment	75%	1,196.3	25%	398.8
Dover sole	Coastwide	23,406.	Amendment	95%	22,235.	5%	1,170.
English sole	Coastwide	7,650.2	Amendment	95%	7,267.7	5%	382.5
Kelp Greenling	CA	99.2	None				
Kelp Greenling	OR	12.9	None				
Kelp Greenling	WA	19.7	None				
Leopard Shark	Coastwide	139.4	None				
Lingcod	N of 40'10º N.	2,440.8	Amendment	45%	1,098.4	55%	1,342.
Lingcod	S of 40'10º N. lat.	936.9	Amendment	45%	421.6	55%	515.3
Longnose skate	Coastwide	1,927.0	Biennial	90%	1,734.3	10%	192.7
Longspine	N of 34º27' N.	2,968.5	Amendment	95%	2,820.1	5%	148.4
Longspine	S of 34º27' N. lat.	949.0	None				
Pacific cod	Coastwide	1,191.0	Amendment	95%	1,131.4	5%	59.5
Sablefish	N of 36º N. lat.	0.0	See Table 1 c				
Sablefish	S of 36º N. lat.	1,875.0	Amendment	42%	787.5	58%	1,087.
Shortbelly	Coastwide	48.0	None				0.0
Shortspine	N of 34º27' N.	1,666.8	Amendment	95%	1,583.4	5%	83.3
Shortspine	S of 34º27' N. lat.	871.0	Amendment	NA	50.0	NA	821.0
Spiny Dogfish	Coastwide	1,722.2	None				
Splitnose	S of 40º10' N. lat.	1,735.5	Amendment	95%	1,648.7	5%	86.8
Starry flounder	Coastwide	1,528.7	Amendment	50%	764.4	50%	764.4
Widow	Coastwide	1,419.8	Amendment	91%	1,292.0	9%	127.8
Yellowtail	N of 40º10' N.	9,927.4	Amendment	88%	8,736.1	12%	1,191.
Nearshore rockfish	N of 40º10' N.	69.0	None				
Nearshore rockfish	S of 40º10' N. lat.	1,002.0	None				
Other flatfish	Coastwide	7,292.0	Amendment	90%	6,562.8	10%	729.2
Shelf rockfish N.	N of 40º10' N.	1,879.6	Biennial	60.2	1,131.5	39.8	748.1
Shelf rockfish S.	S of 40º10' N. lat.	1,576.4	Biennial	12.2	192.3	87.8	1,384.
Slope rockfish N.	N of 40º10' N.	1,618.9	Amendment	81%	1,311.3	19%	307.6
Slope rockfish S.	S of 40º10' N. lat.	669.0	Amendment	63%	421.5	37%	247.5

a/ The cowcod fishery harvest guideline is further reduced to an ACT of 4 mt.

Table 14. Alternative 3 – Preliminary Preferred Alternative. Sablefish north of 36° N. latitude ACLs, set-asides used to calculate the commercial harvest guideline (mt) for 2015-2016 under Alternative 3.

Year	ACL	Tribal Share a/	Res.	Rec	EFP	Non-Tribal Comm. Share
2015	4,793	479	26	6.1	1	4,281
2016	5,241	524	26	6.1	1	4,684

a/ The sablefish allocation to Pacific coast treaty Indian Tribes is 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

Table 15. Alternative 3 – Preliminary Preferred. At-sea whiting set-asides under the Preferred Alternative. The No Action set-aside values are provided for reference.

Alternative			No Action Set-Asides
Species	**Area**	**Total Set-Asides (mt)**	**Total Set-Asides (mt)**
PETRALE SOLE	Coastwide	5	5
YELLOWEYE	Coastwide	0	0
Arrowtooth flounder	Coastwide	45	20
Dover sole	Coastwide	5	5
English sole	Coastwide	5	5
Lingcod	N of 40º10' N. lat.	15	15
Longnose skate	Coastwide	5	5
Longspine thornyhead	N of 34º27' N. lat.	5	5
Pacific cod	Coastwide	5	5
Pacific halibut a/	Coastwide	10	10
Sablefish	N of 36º N. lat.	50	50
Shortspine thornyhead	N of 34º27' N. lat.	20	20
Starry flounder	Coastwide	5	5
Yellowtail	N of 40º10' N. lat.	300	300
Shelf rockfish north	N of 40º10' N. lat.	35	35
Slope rockfish north	N of 40º10' N. lat.	100	100
Other Fish b/	Coastwide	**TBD**	520
Spiny Dogfish	Coastwide	**TBD**	N/A
Other flatfish	Coastwide	20	20

a/As stated in §660.55 (m), the Pacific halibut set-aside is 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude (estimated to 5 mt each).
b/ In 2014, spiny dogfish was managed as part of the Other Fish complex. Under the Preferred Alternative, starting in 2015-2016, spiny dogfish will be managed separately.

Table 16. Preliminary preferred set-asides and allocations for overfished species.

	Bocaccio		Canary		Cowcod		Darkblotched		POP		Petrale		Yelloweye	
	2015	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**	**2015**	**2016**
ACL	349	362	122	125	10	10	338	346	158	164	2,816	2,910	18	19
Set-Asides Total	8.3	8.3	15.2	15.2	2.0	2.0	20.8	20.8	15.0	15.0	236.6	236.6	5.83	5.83
Tribal			7.7	7.7	0	0	0.2	0.2	9.2	9.2	220	220	2.3	2.3
EFP	3	3	1	1	0.015	0.015	0.1	0.1					0.03	0.03
Research	4.6	4.6	4.5	4.5	2	2	2.1	2.1	5.2	5.2	14.2	14.2	3.3	3.3
Open Access	0.7	0.7	2	2	0	0	18.4	18.4	0.6	0.6	2.4	2.4	0.2	0.2
Fishery HG	340.7	353.7	106.8	109.8	4.0	4.0	317.2	325.2	143.0	149.0	2,579.4	2,673.4	12.2	13.2
Trawl Total	81.9	85.0	56.9	58.5	1.4	1.4	301.3	308.9	135.9	141.6	2,544.4	2,638.4	1.0	1.1
Shorebased IFQ	81.9	85.0	43.3	44.5	1.4	1.4	285.6	293.0	118.5	124.0	2,539.4	2,633.4	1.0	1.1
At-Sea Whiting	0.0		13.7	14.0			15.7	16.1	17.4	17.4	5	5		
C-P	0.0		8.0	8.2			9.2	9.5	10.2	10.2				
Mothership	0.0		5.6	5.8			6.5	6.7	7.2	7.2				
Non-Trawl Total	258.8	268.7	49.9	51.3	2.6	2.6	15.9	16.3	7.2	7.5	35.0	35.0	11.2	12.1
Non-Nearshore	79.1	82.1	3.8	3.9									1.1	1.2
Nearshore FG	1.0	1.0	6.7	6.9									1.2	1.3
WA Rec a/	0.0	0.0	3.4	3.5									2.9	3.1
OR Rec a/	0.0	0.0	11.7	12.0									2.6	2.8
CA Rec	178.8	185.6	24.3	25.0									3.4	3.7

a/ Values represent HGs which may be adjusted within the non-trawl allocation.

Table 17. Alternative 3 – Shorebased IFQ. IFQ species and Pacific halibut allocations or set-asides under Alternative 3 for 2015 and 2016. No action allocations are provided in the right panel.

IFQ Species	Area	Alt 3- 2015 SB IFQ Allocation (mt) a/ b/	Alt 3- 2016 SB IFQ Allocation (mt) a/ b/	No Action – 2014 SB IFQ Allocation (mt)
BOCACCIO	South of 40°10' N. lat.	81.9	85.0	79.0
CANARY	Coastwide	43.3	44.5	41.1
COWCOD	South of 40°10' N. lat.	1.4	1.4	1.0
DARKBLOTCHED	Coastwide	285.6	292.8	278.4
PETRALE	Coastwide	2,539.4	2,633.4	2,378.0
POP	North of 40°10' N. lat.	118.5	124.2	112.3
YELLOWEYE	Coastwide	1.0	1.1	1.0
Arrowtooth flounder	Coastwide	3,194	3,033	3,467
Chilipepper rockfish	South of 40°10' N. lat.	1,203	1,196	1,067
Dover sole	Coastwide	22,231	22,231	22,235
English sole	Coastwide	10,384	7,263	5,261
Lingcod	North of 40°10' N. lat.	1,133	1,083	1,152
Lingcod	South of 40°10' N. lat.	448	422	473
Longspine thornyheads	North of 34°27' N. lat	2,962	2,815	1,811
Pacific cod	Coastwide	1,126	1,126	1,126
Pacific halibut a/	North of 40°10' N. lat.	45 max	45 max	60 max
Pacific halibut b/	South of 40°10' N. lat.	10	10	10
Sablefish	North of 36° N. lat.	2,199	2,411	1,988
Sablefish	South of 36° N. lat.	720	788	653
Shortspine thornyheads	North of 34°27' N.	1,581	1,563	1,372
Shortspine thornyheads	South of 34°27' N	50	50	50
Splitnose rockfish	South of 40°10' N. lat.	1,619	1,649	1,575
Starry flounder	Coastwide	757	759	756
Widow rockfish	Coastwide	1,002	1,002	994
Yellowtail rockfish	North of 40°10' N. lat.	8,946	8,436	2,939
Shelf rockfish	North of 40°10' N. lat.	1,091	1,097	508
Shelf rockfish	South of 40°10' N. lat.	192	192	81
Slope rockfish	North of 40°10' N. lat.	1,200	1,211	789
Slope rockfish	South of 40°10' N. lat.	427	428	379
Other flatfish	Coastwide	7,554	6,543	4,190

a/ Pacific halibut is managed using IBQ, see regulations at §660.140. Starting in 2015, the maximum IBQ allocation of legal sized fish is 45 mt, see (§660.55 (m)).
b/ As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt, to accommodate bycatch in the at-sea Pacific whiting fisheries and in the shorebased trawl sector south of 40°10 N. latitude. (estimated to be 5 mt each).

Appendix B

Proposed Harvest Specifications and Management Measures for the 2015-2016 Pacific Coast Groundfish Fishery and Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan Preliminary Draft Environmental Impact Statement

Prepared by
The Pacific Fishery Management Council
And The National Marine Fisheries Service

April 2014

Contents

B.1 Rockfish Conservation Area Boundary Adjustments

Description of the 200 m Petrale-Modified Depth Contour

The 200 fathom (fm) rockfish conservation area (RCA) line was adjusted beginning January 1, 2013 to better align with depth contours (See 2013-2014 FEIS). Unfortunately, the 200-fm modified RCA, which contains cut-outs to provide greater access to petrale sole, was not simultaneously adjusted. The result was areas where the petrale cut-outs were deeper than the 200 fm RCA (without petrale cut outs; Figure B-1). For those areas, the State of Oregon proposes replacing the 200 fm petrale line with the 200 fm "un-modified" line (Table B-1).

Table B-1. Coordinate list for proposed modification to 200 fm-modified RCA coordinates.

ID	Name	Degrees, decimal minutes	Decimal degrees
79	Current waypoint	44°46.87'N, 124°38.20'W	44.781243, -124.636738
1	OR proposed modification	44°48.25'N, 124°40.61'W	44.8041, -124.6769
2	OR proposed modification	44°42.24'N, 124°48.05'W	44.704, -124.8008
3	OR proposed modification	44°41.35'N, 124°48.03'W	44.6892, -124.8005
4	OR proposed modification	44°40.27'N, 124°49.11'W	44.6712, -124.8185
5	OR proposed modification	44°38.52'N, 124°49.11'W	44.642, -124.8185
6	OR proposed modification	44°21.73'N, 124°49.82'W	44.362167, -124.830333
7	OR proposed modification	44°17.57'N, 124°55.04'W	44.292833, -124.917333
80	Current waypoint (Deleted)	44°48.25'N, 124°40.62'W	44.804115, -124.676919
81	Current waypoint (Deleted)	44°41.34'N, 124°49.20'W	44.688998, -124.819945
82	Current waypoint (Deleted)	44°23.30'N, 124°50.17'W	44.388395, -124.8361781
83	Current waypoint	44°13.19'N, 124°58.66'W	44.219879, -124.977606

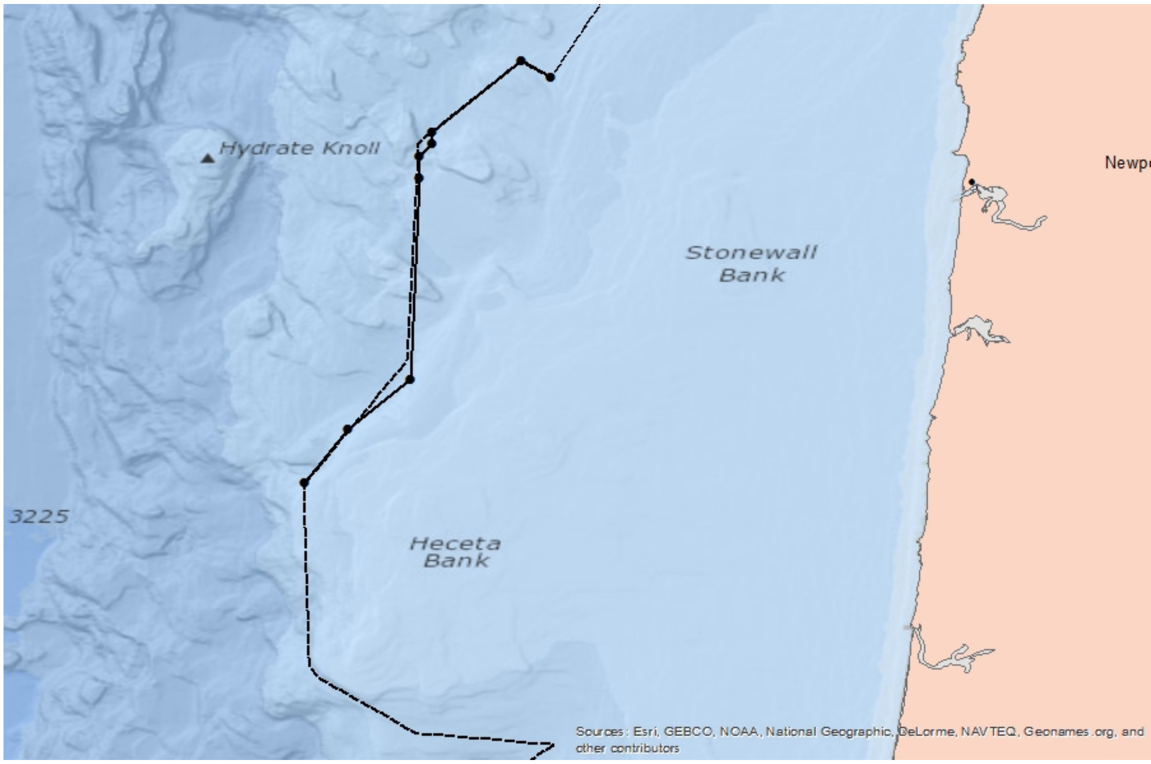

Figure B-1. Modification to the 200 fm "modified" (with petrale cut outs) depth contour proposed by Oregon. Dashed line represents the original 200 fm petrale line. Solid line represents Oregon proposed changes (which mimic the 200 fm line (without petrale cut outs).

B.2 Groundfish Closure Areas for Rougheye Rockfish and Spiny Dogfish

Groundfish closure areas (GCAs) are a management measure intended to help reduce catch of non-target species that have been identified as a possible concern. GCAs such as RCAs are currently in place as one tool to keep catches of overfished species below their respective overfishing levels (OFLs) (and annual catch limits; ACLs). For the 2015-16 Pacific Coast groundfish fishery, GCAs for rougheye rockfish and/or spiny dogfish are being considered. The Groundfish Management Team (GMT) was asked to provide analysis to aid the Pacific Fishery Management Council (Council) in deliberations on this matter. This report provides a description of the analysis and some results. Also note that due to the short time frame between the March and April 2014 Council meetings, the full GMT did not have an opportunity to review this report by the April Briefing Book deadline. However, the GMT will have an opportunity to review and provide comments at the April Council meeting. In addition, the GMT did not have time to explore many analyses that may be needed, such as in-depth analysis of inter-annual and intra-annual variation. Guidance from the Council and the Scientific and Statistical Committee (SSC) on analyses that may be beneficial but not shown here is requested. For example, the GMT seeks guidance from the SSC regarding the most appropriate metric to identify concentrations of stocks along the U.S. west coast.

B.2.1 Rougheye rockfish groundfish closure area (GCA)

To aid consideration of groundfish closure area(s) for rougheye rockfish, an analysis was conducted to identify areas where rougheye may be caught in significantly higher proportion than in other areas. For identification of these "hot spots", a cluster analysis of high catch locations was conducted. Observer data collected from the following sectors were used: at-sea whiting, non-nearshore fixed gear, and individual fishing quota (IFQ). Focus was on midwater trawl gear (at-sea whiting and IFQ sectors), fixed gears (non-nearshore fixed gear), and bottom trawl gear (IFQ sector). Data relative to fixed gears used by the IFQ sector were not analyzed in time for this report. More detail about the data and methods, as well as additional figures resulting from different analytical assumptions, are found below. In addition, our analysis up to this point includes exploration of different methods and assumptions for identifying hot spots. The resulting figures may vary in the location and size of these hot spots. This suggests that further exploration may be needed; also, these results should be considered in addition to other information about the behavior of rougheye rockfish and these fishery sectors (e.g., from fisheries scientists, managers, and participants).

At-sea whiting sector

Areas where statistically significant clusters of high bycatch ratios (rougheye rockfish-to-Pacific whiting) and low bycatch ratios are shown in Figure B-2. All data for this sector were located north of 40° 10’ N latitude.

Non-nearshore fixed gear sector

Areas where statistically significant clusters of high bycatch ratios (rougheye-to-sablefish) and low bycatch ratios are shown in Figure B-3. The area north of 42° N latitude was the focus of this figure due to the occurrence of hot spots in this area.

Individual fishing quota sector

Areas where statistically significant clusters of high bycatch ratios and low bycatch ratios are shown in Figure B-4 and Figure B-5. For midwater trawl observations, rougheye rockfish-to-Pacific whiting was the bycatch ratio used in the analysis. The area north of 43° N latitude was the focus of Figure B-4 due to the occurrence of hot spots in this area. For bottom trawl observations, rougheye-to-all other groundfish was the bycatch ratio used. This area north of 42° N latitude was the focus of Figure B-5 due to the occurrence of hot spots in this area.

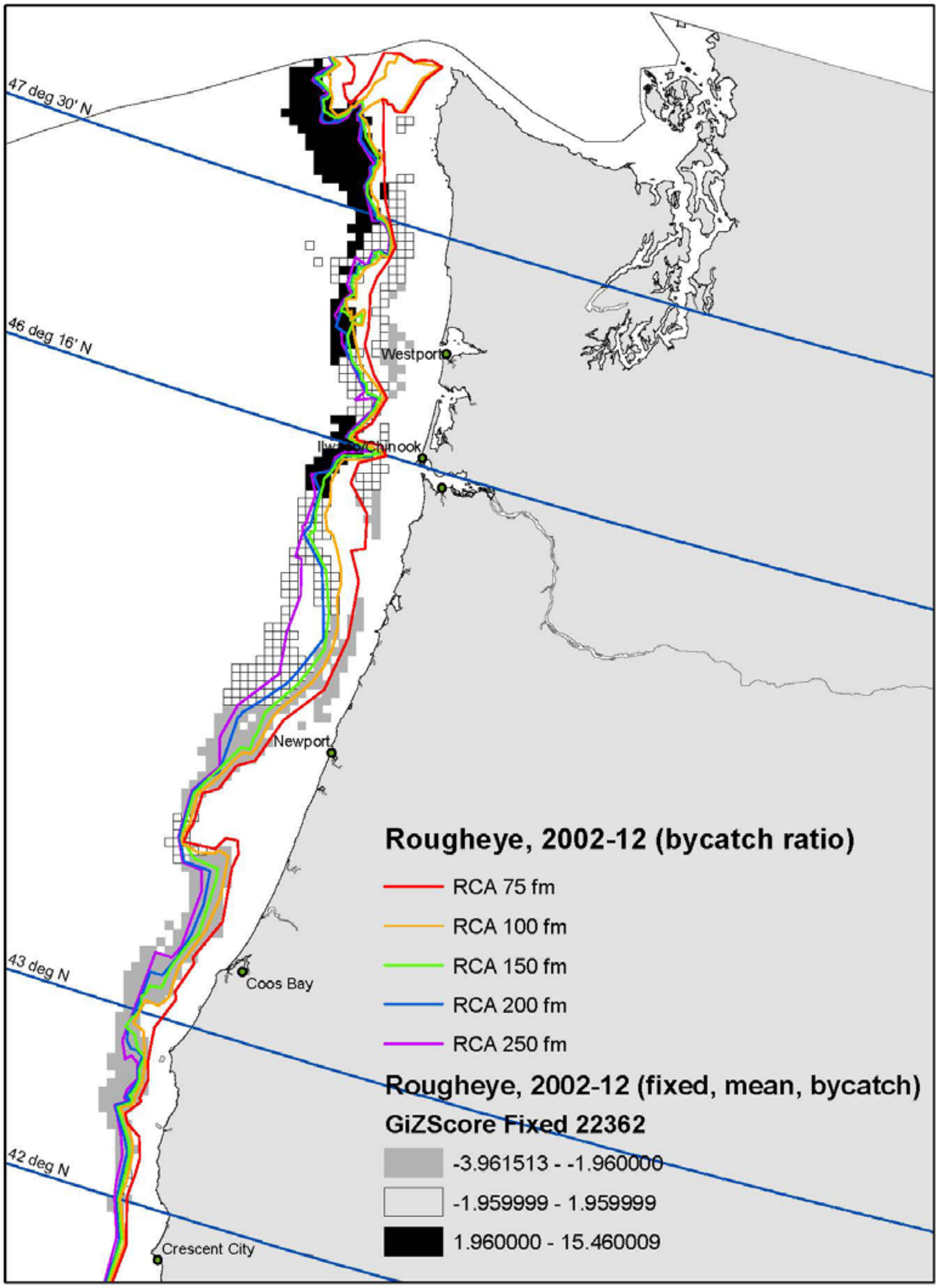

Figure B-2. Hot and cold spots of rougheye rockfish in the at-sea whiting sector, 2002-12.

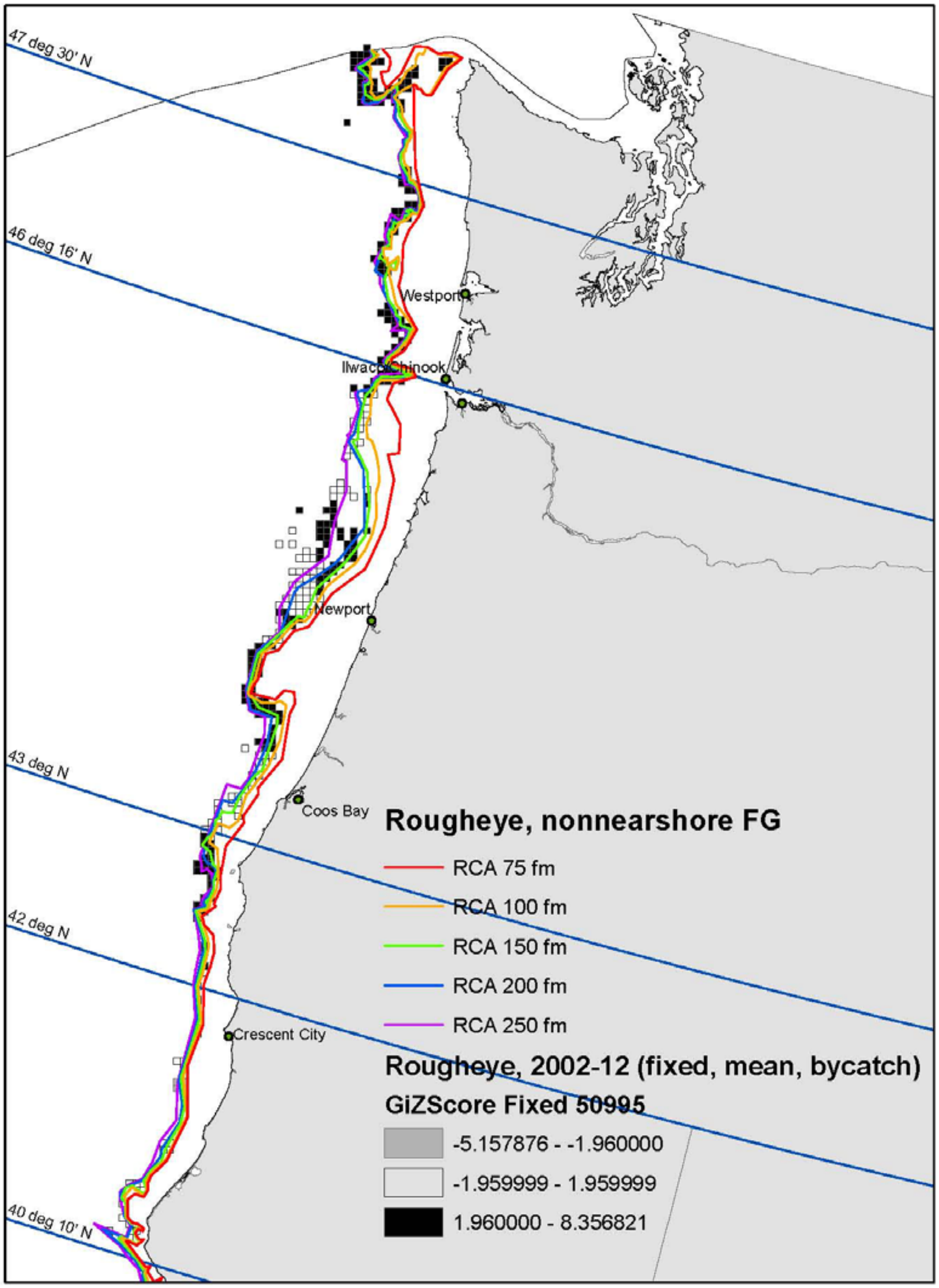

Figure B-3. Hot and cold spots of rougheye rockfish in the non-nearshore fixed gear sector, 2002-12.

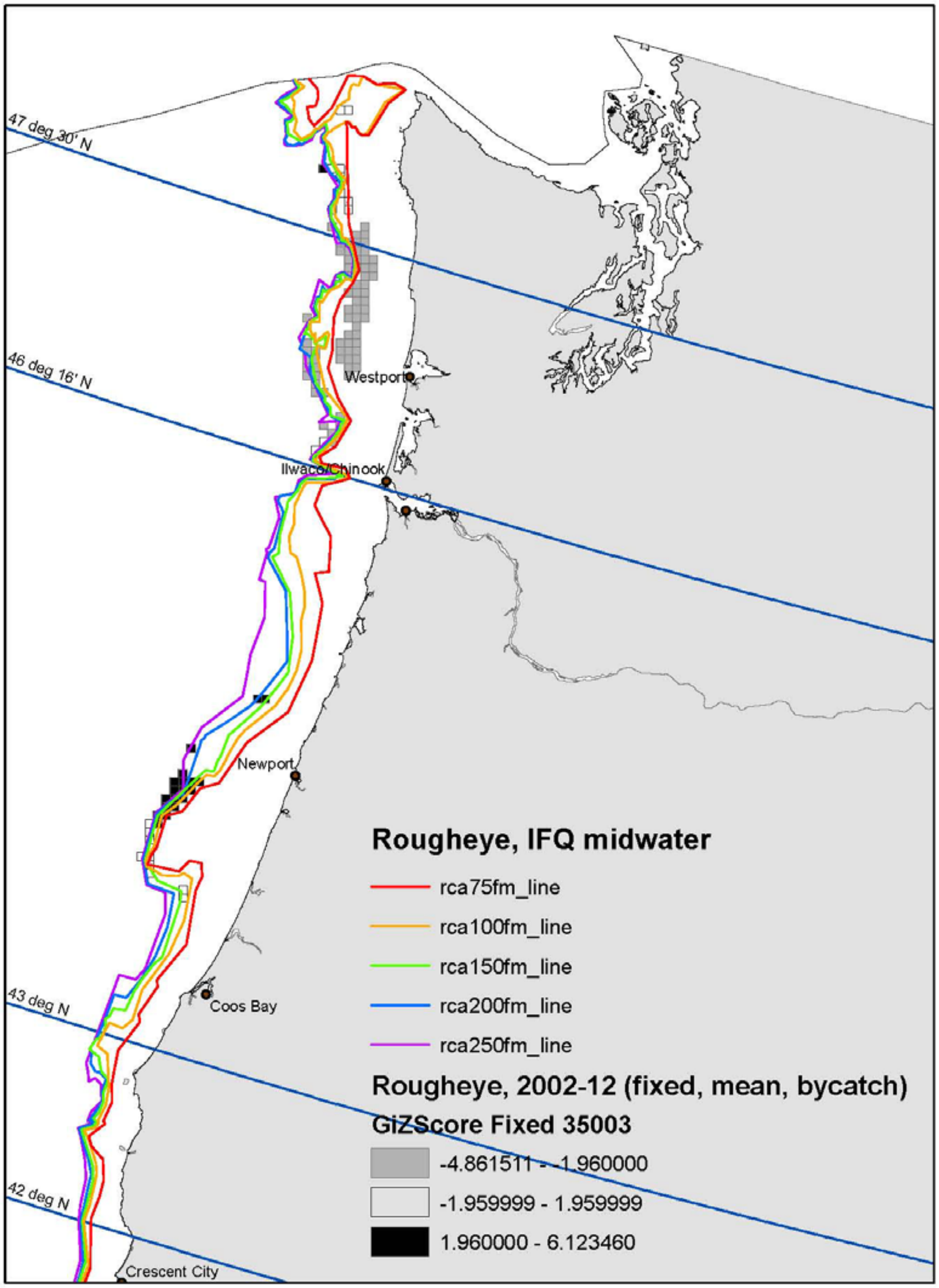

Figure B-4. Hot and cold spots of rougheye rockfish in the IFQ sector, midwater trawl, 2002-11.

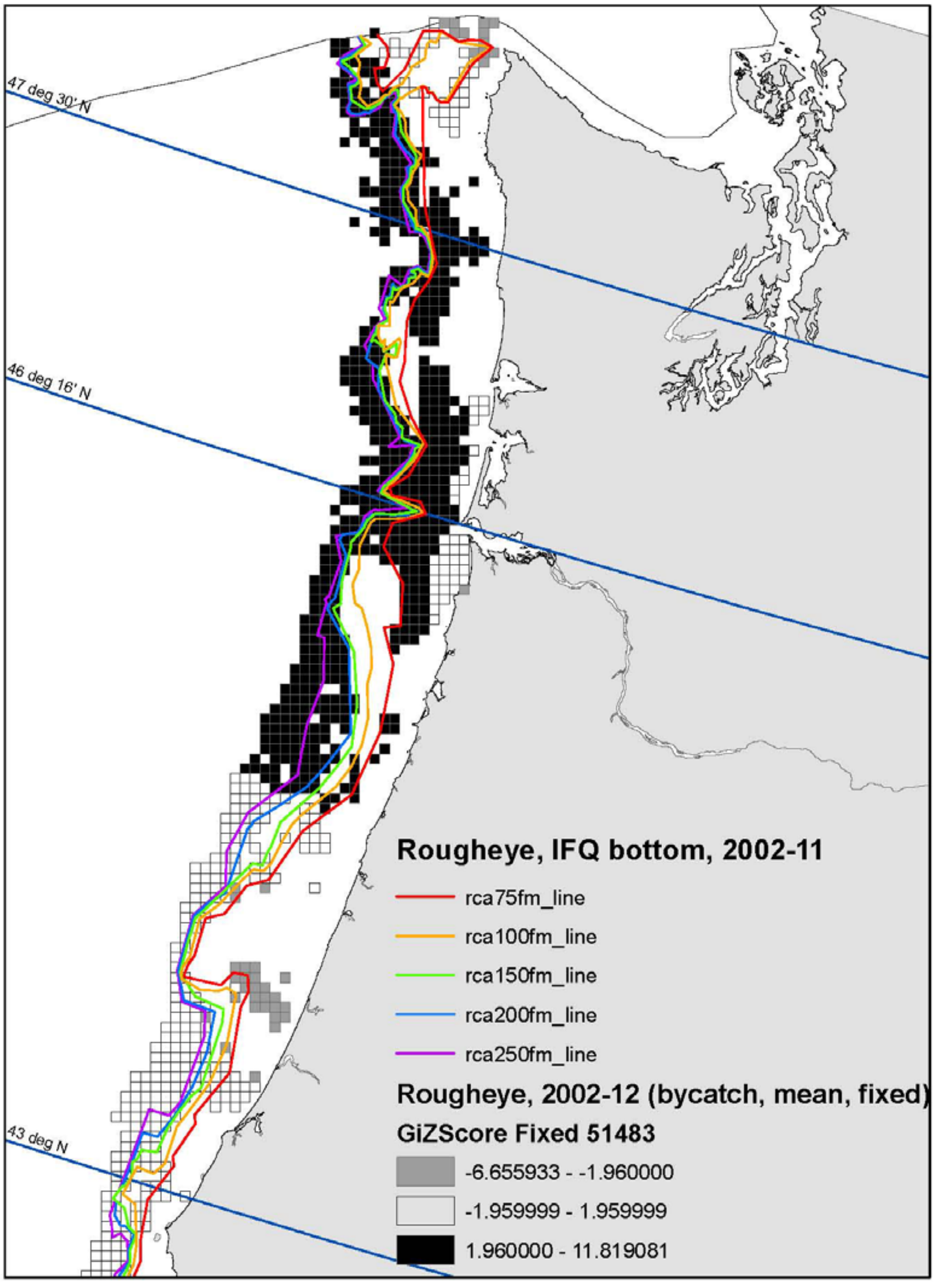

Figure B-5. Hot and cold spots of rougheye rockfish in the IFQ sector, bottom trawl, 2002-11.

B.2.2 Spiny dogfish shark groundfish closure area (GCA)

To aid consideration of groundfish closure area(s) for spiny dogfish shark, an analysis was conducted to identify areas where spiny dogfish may be caught in significantly higher proportion than in other areas. For identification of these “hot spots”, the method used to identify hot spots for rougheye rockfish was also used for spiny dogfish. Observer data collected from the following sectors were used: at-sea whiting and catch shares (individual fishing quota or IFQ) sectors. Focus was on midwater trawl gear (at-sea whiting and IFQ sectors), fixed gears (non-nearshore fixed gear sector), and bottom trawl gear (IFQ sector). Data relative to fixed gears used by the IFQ sector were not analyzed in time for this report. More detail about the data and methods used are found in Appendix A. In addition, our analysis up to this point includes exploration of different methods and assumptions for identifying hot spots. The resulting figures may vary in the location and size of these hot spots. This suggests that further exploration may be needed; also, these results should be considered in addition to other information about the behavior of spiny dogfish and these fishery sectors (e.g., from fisheries scientists, managers, and participants).

At-sea whiting sector

Areas where statistically significant clusters of high bycatch ratios (spiny dogfish-to-whiting) and low bycatch ratios are shown in Figure B-6. All data for this sector were located north of 40° 10’ N latitude.

Non-nearshore fixed gear sector

Areas where statistically significant clusters of high bycatch ratios (rougheye-to-sablefish) and low bycatch ratios are shown in Figure B-7. The area north of 42° N latitude was the focus of this figure due to the occurrence of hot spots in this area.

Individual fishing quota sector

Areas where statistically significant clusters of high bycatch ratios and low bycatch ratios are shown in Figure B-8 and Figure B-9. For midwater trawl observations, rougheye rockfish-to-Pacific whiting was the bycatch ratio used in the analysis. The area north of 43° N latitude was the focus of Figure B-8 due to the occurrence of hot spots in this area. For bottom trawl observations, rougheye-to-all other groundfish was the bycatch ratio used. This area north of 42° N latitude was the focus of Figure B-9 due to the occurrence of hot spots in this area.

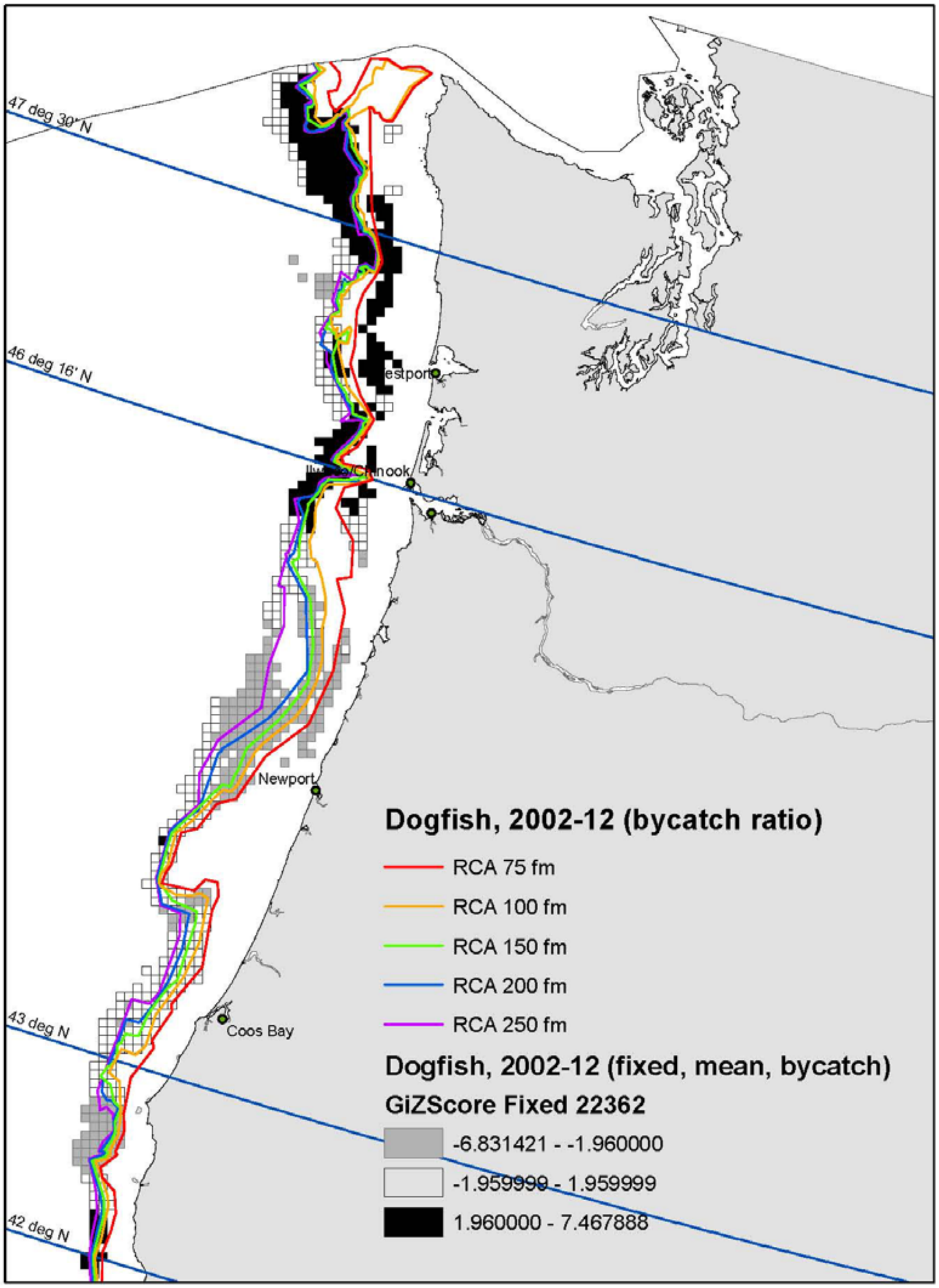

Figure B-6. Hot and cold spots of spiny dogfish in the at-sea whiting sector, 2002-12.

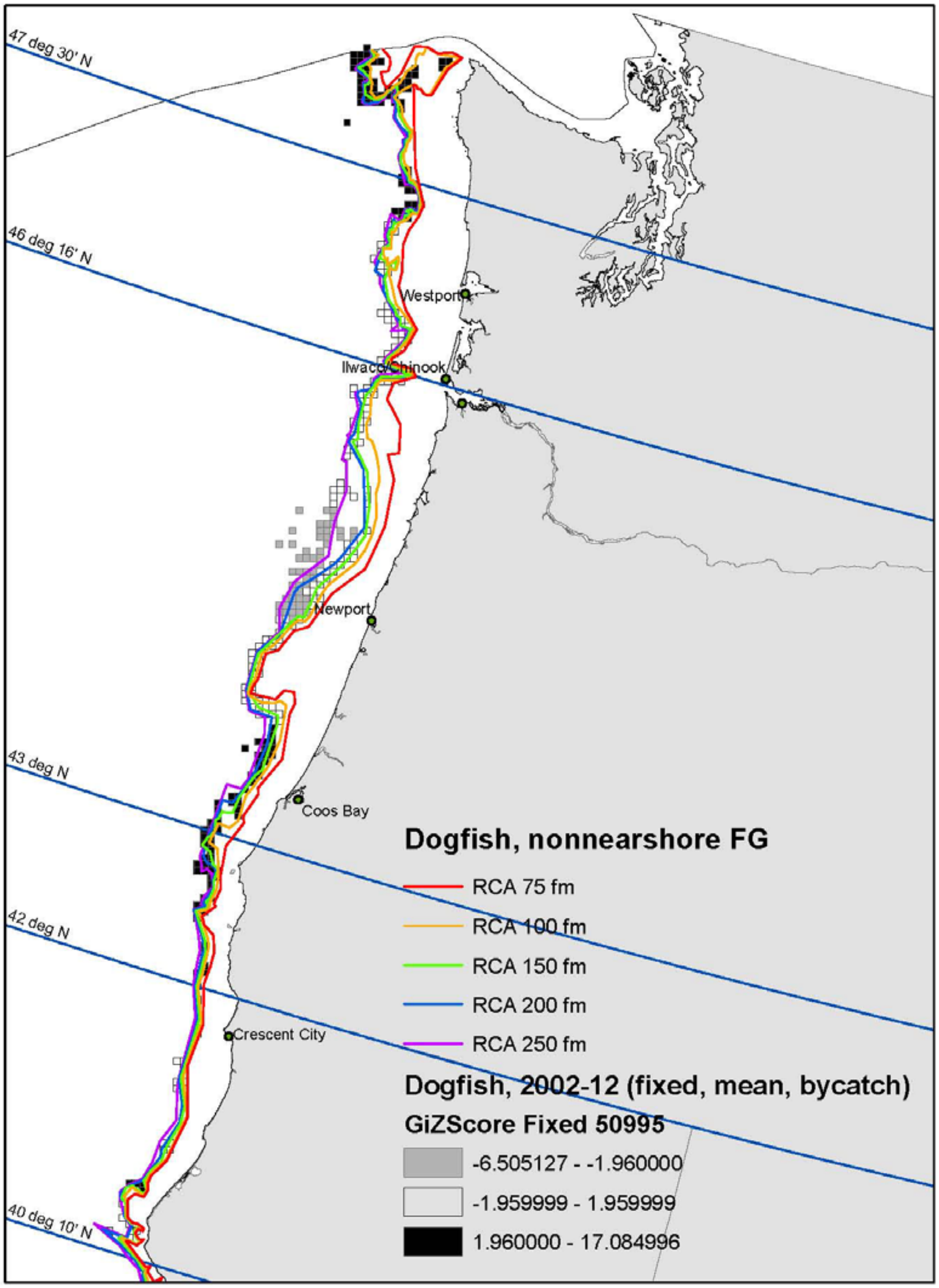

Figure B-7. Hot and cold spots of spiny dogfish in the non-nearshore fixed gear sector, 2002-12.

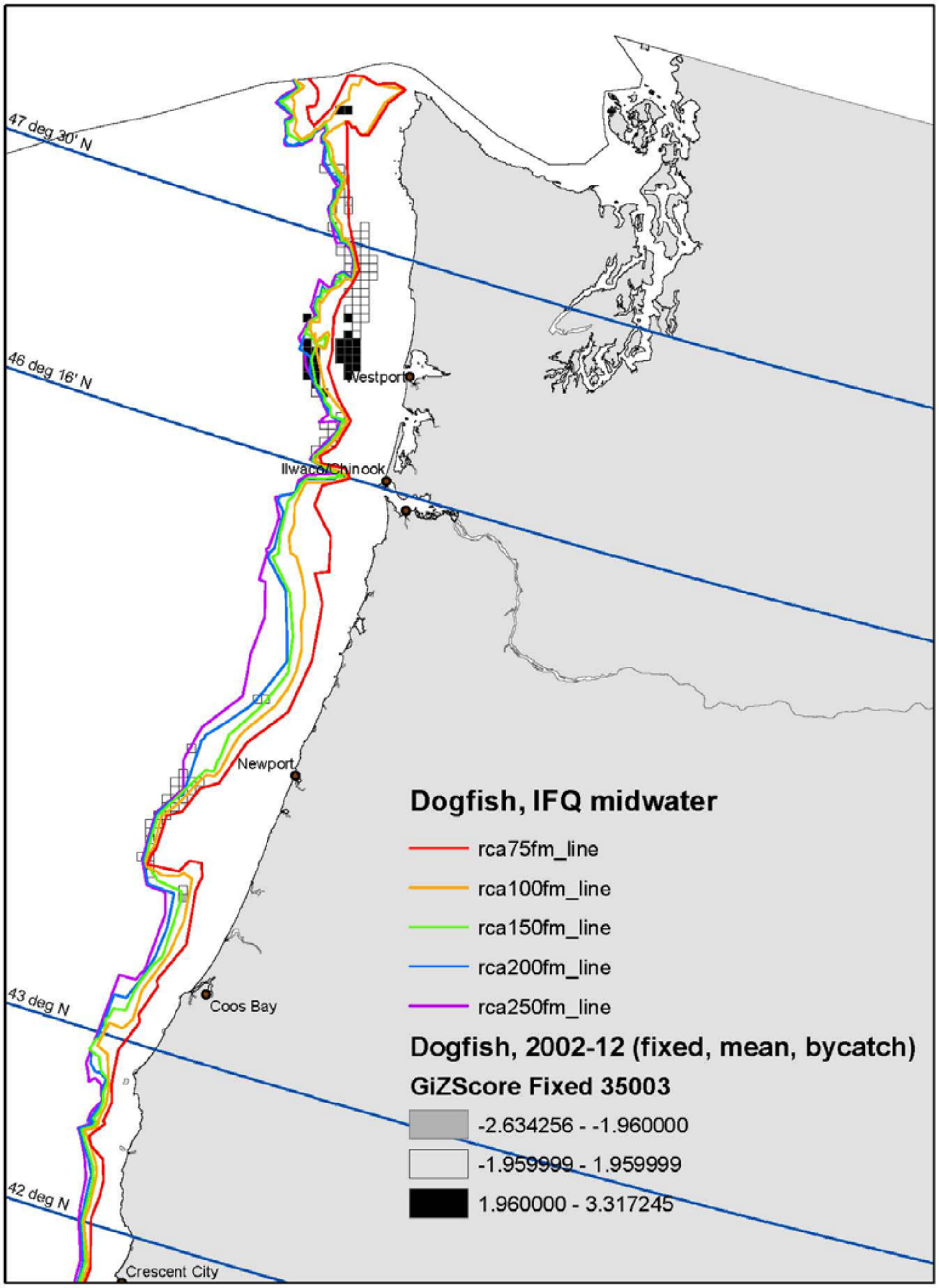

Figure B-8. Hot and cold spots of spiny dogfish in the IFQ sector, midwater trawl, 2002-11.

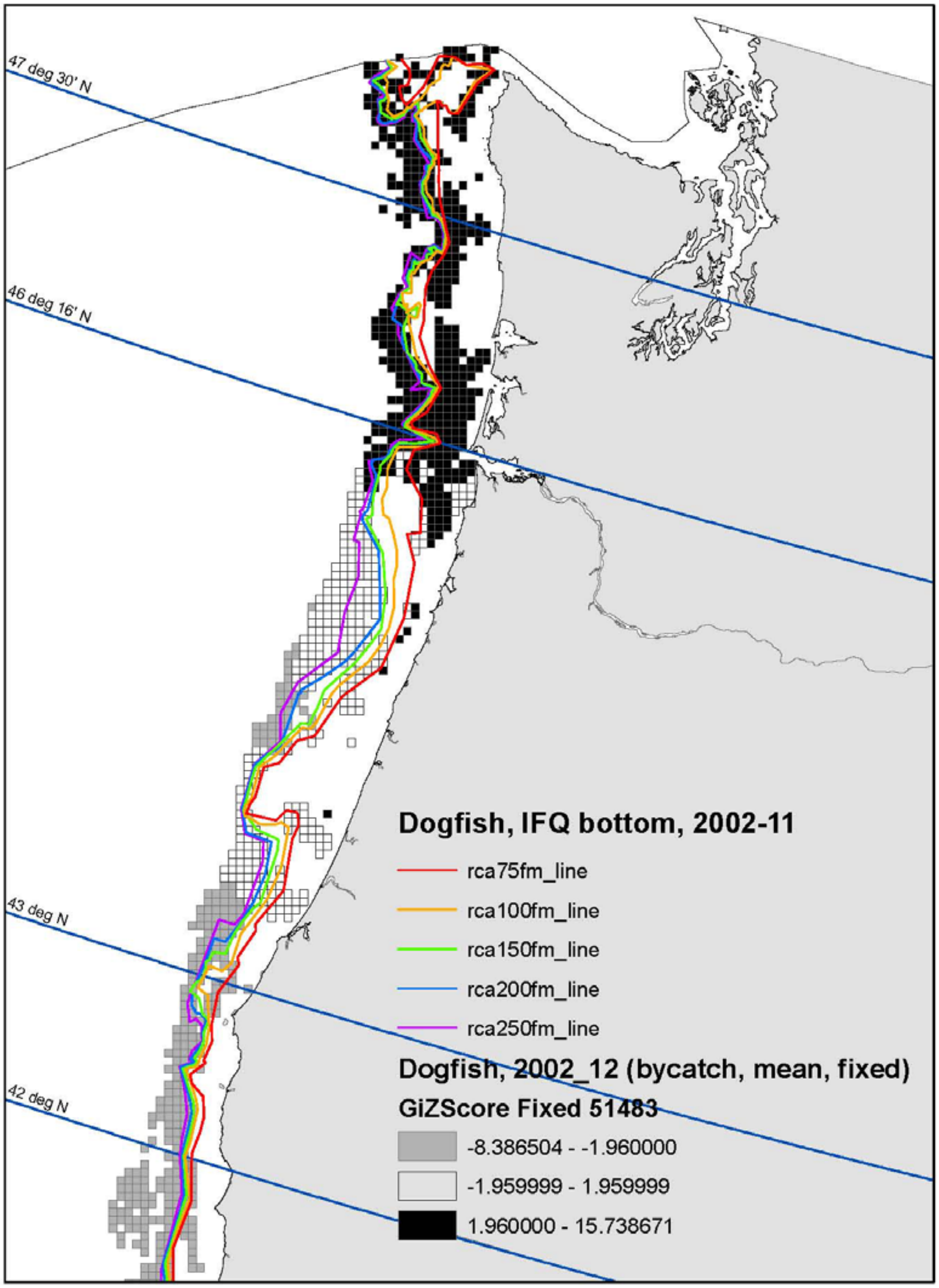

Figure B-9. Hot and cold spots of spiny dogfish in the IFQ sector, bottom trawl, 2002-11.

B.2.3 Description of hot and cold spot analysis: data and methods

Three datasets were made available for this analysis: a West Coast Groundfish Observer Program (WCGOP) dataset used as the input for the Fixed Gear Projection Model used by the GMT (non-nearshore fixed gear sector, 2002-12); a WCGOP dataset that provided information about the IFQ sector (2002-11); and a North Pacific Observer Program (NORPAC) dataset provided by the Pacific States Marine Fisheries Commission (PSMFC) specifically for this analysis (at-sea whiting sector, 1980-2012; 2002-12 were used for this analysis). Though the data were available, the IFQ sector using fixed gear was not analyzed for this report due to time limitations.

The available data were also subject to the following filter. For the IFQ sector using midwater trawl, only those hauls associated with a "Pacific whiting trip" were included in this analysis. A Pacific whiting trip was defined as a trip whose landings (pounds) comprised of at least 50 percent Pacific whiting. Additionally, some observations in the datasets were identified as either rougheye or shortraker rockfish ("UDW1" in the WCGOP datasets and "XXXX" in the NORPAC dataset). These observations were combined with the rougheye observations.

For the spatial analysis, each haul and associated catch were attributed to a point location. This location was defined as either the midpoint of each haul or set (for the NORPAC observations) or the average latitude and longitude coordinates of each haul (for the WCGOP observations).

Bycatch ratios (rougheye-to-target species or spiny dogfish-to-target species) were associated with each of these locations. Pacific whiting was defined as the target species for the at-sea whiting sector and IFQ sector using midwater trawl. Sablefish was defined as the target species for the non-nearshore fixed gear sector. For the IFQ sector using bottom trawl, all groundfish excluding rougheye and spiny dogfish were combined and defined as the target for this sector. The natural log of these bycatch ratios and their locations were used as the inputs for this spatial analysis. Hauls that caught the target species but did not catch either rougheye rockfish or spiny dogfish were assigned a bycatch ratio equal to one-half of the minimum bycatch ratio (0.5 * min bycatch ratio) for that bycatch species and sector. This was done to avoid invalid values when taking the natural log (i.e., ln(0) does not result in a valid value). Table B-2 shows the number of observations (hauls) available for this analysis and the number of hauls where no bycatch was reported.

Table B-2. Number of observations (hauls) in this analysis with no bycatch.

Sector	Years with bycatch obs.	Bycatch/Target ratio	Total # of hauls	Hauls with no bycatch	Hauls with no bycatch, %
At-sea whiting	2002-2012	Rougheye/Whiting	21,854	16,960	78%
		Dogfish/Whiting	21,854	10,227	47%
Non-nearshore fixed gear	2002-2012	Rougheye/Sablefish	11,542	8,940	77%
		Dogfish/Sablefish	11,542	7,366	64%
ITQ fixed gear*	2010-11	Rougheye/Sablefish	2,138	1,660	78%
		Dogfish/Sablefish	2,138	1,825	85%
ITQ midwater	2002-2011	Rougheye/Whiting	1,728	1,340	78%
		Dogfish/Whiting	1,728	352	20%
ITQ bottom	2002-2011	Rougheye/All groundfish	37,071	30,311	82%
		Dogfish/All groundfish	37,071	20,411	55%

*This sector was not included in time for this report but will be made available if requested.

A geographic information system software (ArcGIS 10.1) was then used to depict these points and values graphically. First, the west coast exclusive economic zone (EEZ) was divided into 5 km by 5 km grids. For each fishery sector, each haul location and corresponding attributes (e.g., bycatch ratio) were plotted with these grids. Only grids that contained haul locations were selected for further consideration. This grid size was considered to be an appropriate size for adhering to confidential data protocols (i.e., at least three distinct vessels were present within each grid that is depicted in each figure) in the final step of this analysis.

These grids and associated bycatch ratios were then used as inputs for the identification of hot spots. That is, the grid value was aggregated as the mean of the bycatch ratios within that grid. The Hot Spot Analysis (Getis-Ord Gi*) tool, part of the Spatial Analyst extension in ArcGIS, was used. The Getis-Ord Gi* statistic estimates the relationship between grids and identifies clusters of grids with high or low values. Z-scores and p-values are estimated for each grid and used to evaluate statistical significance.

The last step in the hot spot analysis evaluated and showed only those grids where at least three distinct vessels were present in each grid, to adhere to confidential data protocols. The resulting output (figure) shows only these grids and highlights where statistically significant clusters of high bycatch ratios are present (grids with z-scores of 1.96 or higher) and statistically significant clusters of low bycatch ratios are present (grids with z-scores of -1.96 or lower). That is, the pattern of bycatch ratios across these highlighted grids, relative to their neighbors, has a high probability (95 percent confidence level) of occurring due to non-random spatial processes. All other grids (z-scores between 1.96 and -1.96) indicate that the bycatch ratios within them are likely due to random spatial processes.

The relationship between grids can be conceptualized in different ways. For this report, figures that resulted from applying a fixed distance threshold were shown. That is, each grid and its attributes (e.g., bycatch ratio) were evaluated relative to all grids within a threshold distance. Grids outside of this threshold distance were not evaluated. Additional figures not shown in this report were generated using a different spatial conceptualization, an inverse distance threshold. This method also evaluates each grid and its attributes relative to all grids within a threshold distance. However, grids outside of this threshold are evaluated to have some degree of influence (weight) on the grid of interest. Figure B-10 is an example of a result when using this method for identifying hot and cold spots of rougheye rockfish in the at-sea whiting sector. Note that the pattern of hot spots is different than what is shown using a fixed distance method (Figure B-2); further evaluation is needed to better understand what is driving these differences in results.

In addition to exploring different spatial conceptualizations, we evaluated outputs resulting from the exclusion of hauls with no bycatch. As mentioned above, the number of hauls where this was the case is shown in Table B-2. Figure B-11 shows an example of a result of this evaluation, a hot spot off of southern California. This evaluation also identified hot spots off of Oregon and Washington but these are not shown in this figure.

Finally, we offer the following considerations. Figure B-2 through Figure B-9 are the result of this data processing and analysis process, and should be considered within this context. Further exploration of the data and methods to identify hot spots could include, but are not limited to, the following: 1) identify hot spots using inter-annual and intra-annual time frames; 2) further evaluate the sensitivity of the results to spatial relationships between observations (e.g., inverse distance); 3) evaluate different distance thresholds between observations (i.e., other than the minimum distance to ensure that each grid has at least one neighbor); 4) evaluate dogfish catch only (rather than the dogfish-to-sablefish bycatch ratio) due to some targeting of spiny dogfish in the fixed gear sectors; and 5) evaluate an alternative target (i.e., denominator for the bycatch ratio) for the IFQ sector such as only Dover sole, thornyheads, and sablefish combined, some other species (e.g., lingcod), or species group (e.g., slope rockfish).

Note that the decision to use catch ratios or simply catch as the metric will result in different conclusions. The GMT seeks guidance regarding the metric that is most applicable to the question being answered. For example, an alternative to using a denominator that represents the catch of target species is to simply overlay the significant clusters for the catch of bycatch species against the relative densities of target species catch (e.g., Figure B-12). This demonstrates that conclusions may be much different depending on the metric selected; Figure B-12 shows that highest catches of rougheye rockfish is off northern Washington, whereas and Figure B-2 demonstrates that the highest catch ratios (rougheye catch divided by whiting catch) may occur off central Washington, central Oregon, and southern Oregon).

For the IFQ sector using fixed gear that was not included in this report, the following subsequent analyses could be conducted: combine these observations with the non-nearshore fixed gear sector; evaluate this sector independently, noting that only two years of data are currently available to the GMT; and/or assume that the behavior of this sector is similar to the non-nearshore fixed gear sector and no further evaluation is necessary.

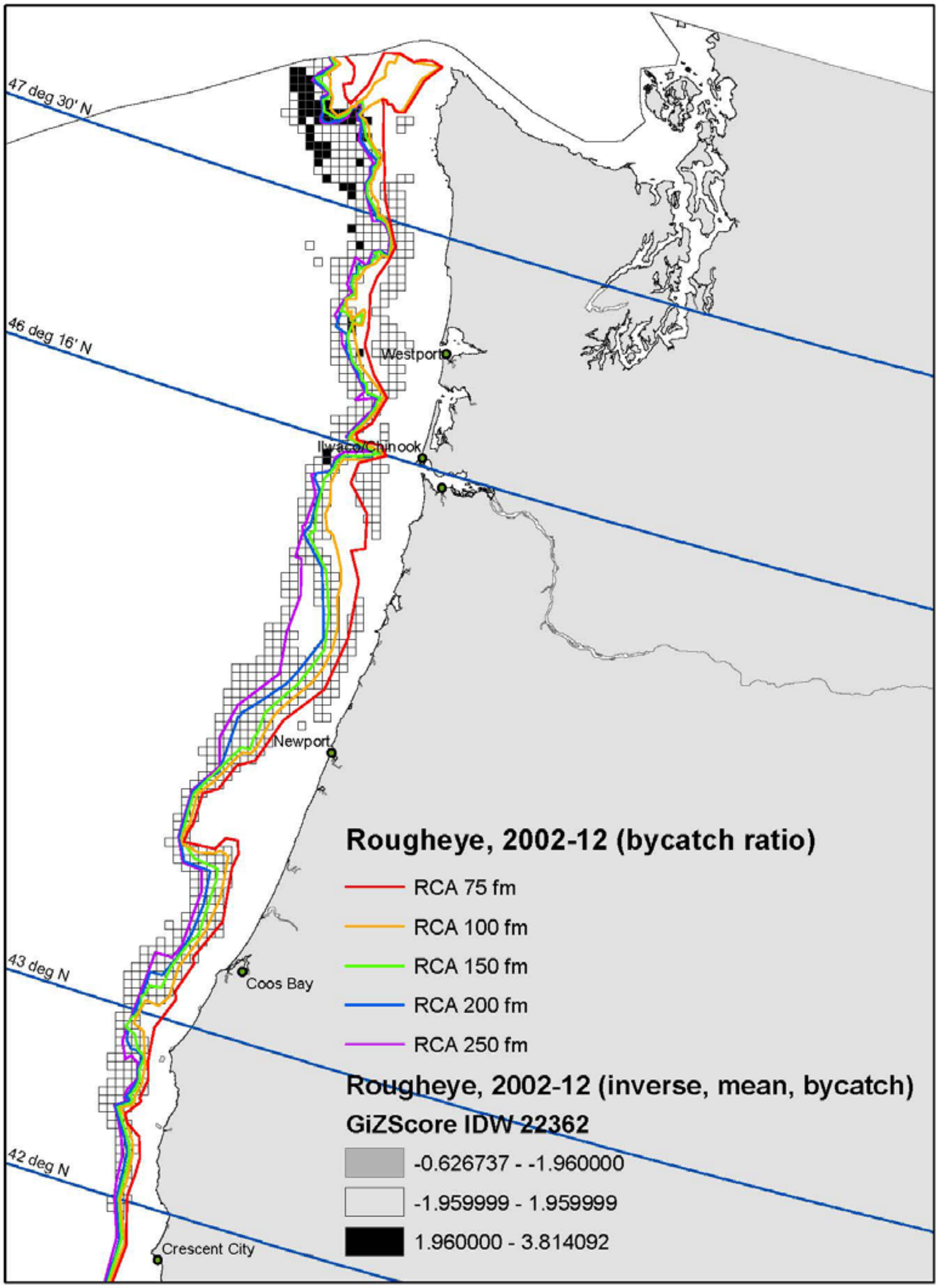

Figure B-10. Hot and colds spots of rougheye in the at-sea whiting sector, using the inverse distance method.

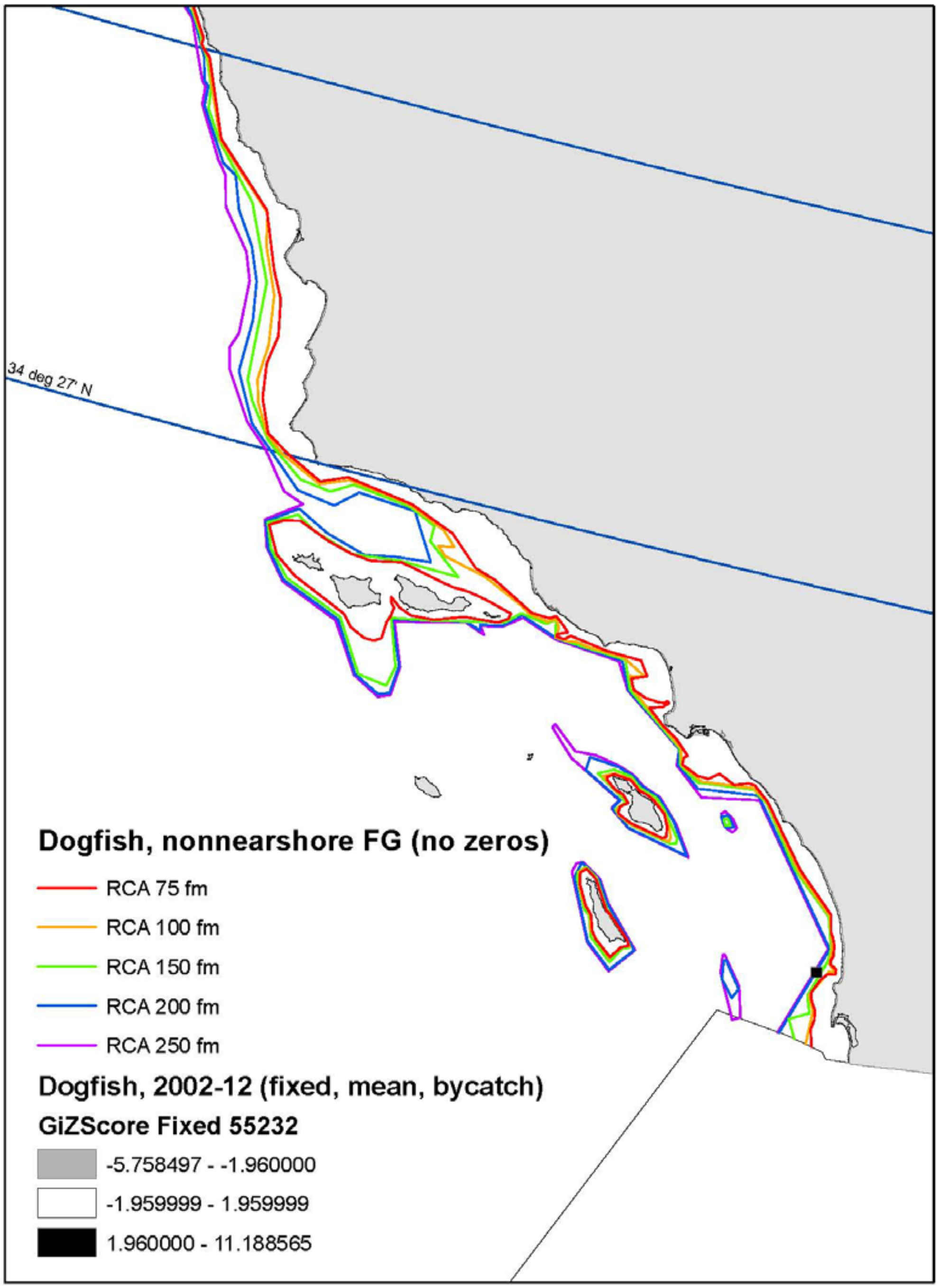

Figure B-11. Hot and colds spots of spiny dogfish in the non-nearshore fixed gear sector, using the fixed distance method and excluding hauls with zero bycatch; southern California only.

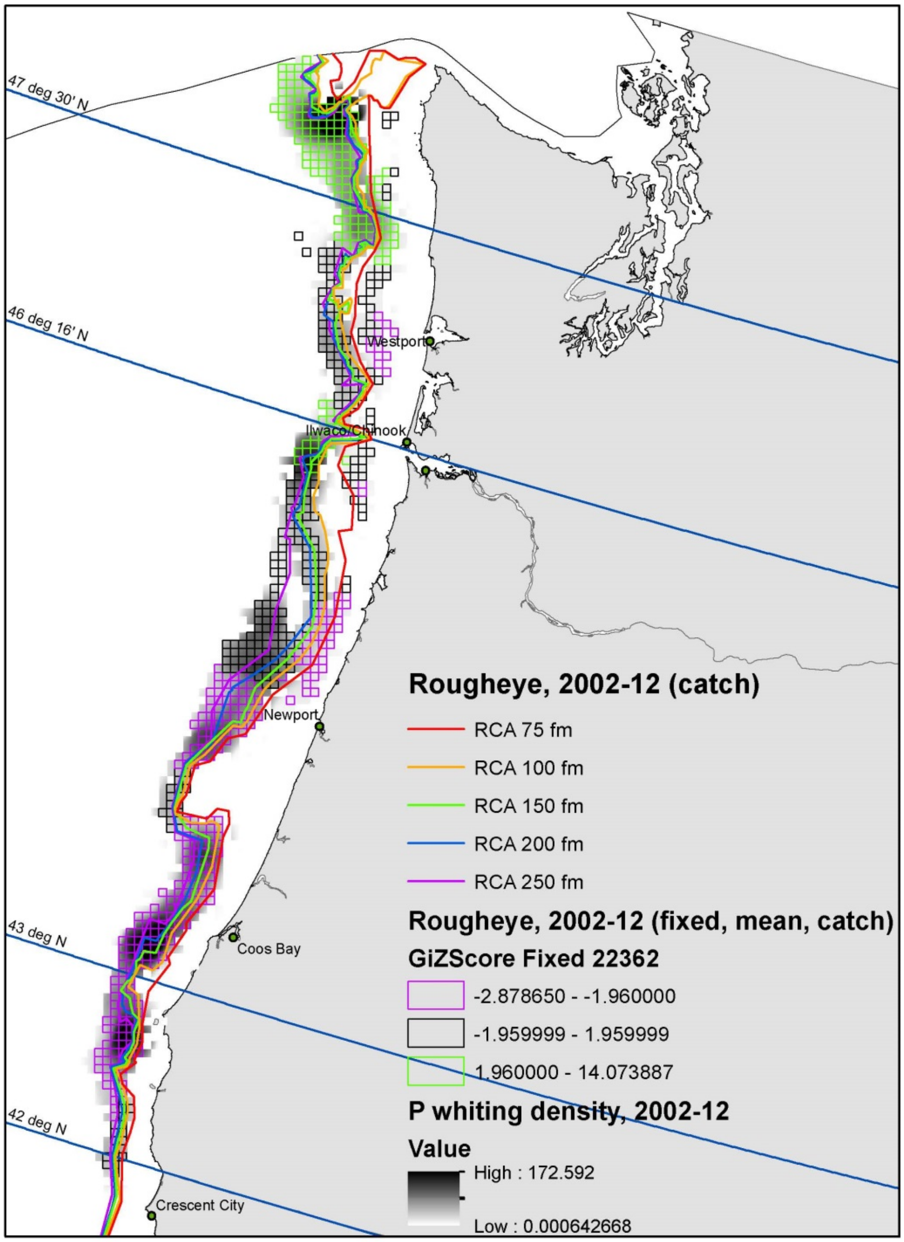

Figure B-12. Catch of rougheye rockfish north of 40º 10´ N latitude by the non-Tribal at-sea whiting sector. Data were acquired from NORPAC (2002-2012). Areas where high levels of catch are clustered are shown by the green-shaded boxes (i.e., north of 47º 30´ N latitude; z-scores greater than or equal to 1.96), moderate catches are shown by the empty boxes, and areas of low catches are shown by the solid purple boxes (z-scores less than or equal to -1.96). Density plots of Pacific whiting catch are shown in the background (i.e., darkest = highest catch of target species).

References

ESRI. 2013. "How Hot Spot Analysis (Getis-Ord Gi*) works." ArcGIS Help 10.1, ArcGIS Resources (accessed 3/5/14): http://resources.arcgis.com/en/help/main/10.1/index.html#/How_Hot_Spot_Analysis_Getis_Ord_Gi_works/005p00000011000000/.

Getis, A. and J.K. Ord. 1992. "The analysis of spatial association by use of distance statistics." *Geographical Analysis*, 24(3): 189-206.

B.3 Two-Year Trawl and Non-Trawl Allocation of Petrale Sole

In November 2013, the Council requested data to inform a two-year trawl and non-trawl allocation of petrale sole. Under the current action alternatives, the non-trawl sector is allocated 35 mt and the remaining amount is allocated to the trawl sector (2,544 mt). The Council expressed interest in an approach that would allocate 15 mt to the non-trawl sector and the remainder to the trawl sector (2,564 mt). Historical mortality by sector can be found in Table B-3. In recent years, both the trawl allocation and the ACL for petrale sole have been greater than 95 percent attained. As such, it may be logical to assume that an increased allocation of petrale sole to the trawl sector would be utilized. Recent year catches by the non-trawl sector have been less than 2 mt, therefore a 15 mt allocation could be sufficient.

Table B-3. Historical Mortality of Petrale Sole, by sector, from 2002-2012.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Set-Aside Total	**172.6**	**270.0**	**207.8**	**32.9**	**28.3**	**47.7**	**45.7**	**70.8**	**32.0**	**127.3**	**72.0**
California Halibut	0.2	0.4	3.4	1.0	1.6	0.4	0.2	0.1	0.1	0.1	0.4
Incidental	145.5	179.9	118.3	0.4	0.3	0.1	0.0	1.1	0.2	0.4	0.8
Pink Shrimp	6.2	5.7	2.3	1.9	0.0	2.3	1.5	0.3	1.2	1.8	1.1
Tribal Shoreside	20.6	83.9	83.8	29.7	26.4	45.0	44.0	69.4	30.5	125.1	69.7
Non-Trawl Total	**1.1**	**0.7**	**1.6**	**0.8**	**1.3**	**1.5**	**1.5**	**0.8**	**0.9**	**1.4**	**1.7**
Nearshore Fixed Gear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-nearshore Fixed Gear	0.9	0.5	1.2	0.4	0.7	0.5	0.9	0.2	0.4	0.7	0.8
WA Rec											
OR Rec	0	0.1	0.3	0.4	0.6	1	0.5	0.6	0.4	0.6	0.7
CA Rec	0.2	0.1	0.1	0	0	0	0.1	0	0.1	0.1	0.2
Trawl Total	**1,749.0**	**1,694.2**	**1,790.7**	**2,741.9**	**2,662.8**	**2,275.0**	**2,154.8**	**1,884.7**	**885.7**	**810.4**	**1,032.6**
LE Trawl Permit - Fixed Gear										0.1	0.4
LE Trawl Permit - Trawl Gear	1,748.5	1,694.2	1,790.0	2,741.9	2,662.8	2,275.0	2,154.8	1,884.7	885.6	810.3	1,032.2
Non-Tribal At-Sea Hake		0.0				0.0					
Shoreside Hake	0.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Grand Total	**1,922.4**	**1,964.7**	**1,999.7**	**2,775.3**	**2,691.7**	**2,323.2**	**2,201.4**	**1,955.7**	**918.1**	**938.4**	**1,105.4**

B.4 Overfished Species Impacts on Trips Targeting Bocaccio Rockfish South of 36° N. Latitude

At the June 2012 Council meeting, industry requested an increase for the limited entry (LE) fishery south of 34°27' N latitude to accommodate increased encounters as a result of the strong year class entering the fishery (http://www.pcouncil.org/wp-content/uploads/D8b_SUP_GMT_JUN2012BB.pdf). The Council recommended the increase and it was implemented September 1, 2012. At the June 2013 Council meeting, industry again asked for an increase, this time for both the non-trawl LE fixed gear (FG) and open access (OA) FG fisheries south of 34°27' N latitude (http://www.pcouncil.org/wp-content/uploads/F9b_SUP_GMT_JUN2013BB.pdf). The Council recommended the increase and it was implemented August 13, 2013. At the November 2013 Council meeting, the Council recommended that the GMT analyze trip limit adjustments for a number of fisheries, including the non-trawl fixed-gear bocaccio harvest south of 34°27' N latitude for the 2015-2016 biennial management cycle (http://www.pcouncil.org/wp-content/uploads/H10b_GMT_NOV2013BB.pdf).

Bocaccio mortality has been minimal south of 34°27' N latitude. Annual average landings from 2008 to 2013 for the LE and OA sectors were 0.2 mt and 1.08 mt, respectively (Table B-4). During this five-year period, a total of only six vessels participated in the LE fishery and 52 in the OA fishery where bocaccio was taken. Of the 52 vessels in the OA fishery, only two averaged more than 0.1 mt of bocaccio per year; one at 0.18 mt and the other at 0.13 mt.

Table B-4. Bocaccio landings (mt) by sector and year from 2008 – 2012 for the non-trawl, non-nearshore fixed-gear fisheries south of 34°27' N latitude. Data source: PacFIN.

Sector	Sector description	Year and landings (mt)					Total	5-yr avg.
		2008	2009	2010	2011	2012		
7	Non-nearshore LE			0.00	0.02	0.36	0.39	0.08
8	Non-nearshore OA	0.04		0.00	0.00	0.16	0.21	0.04
9	Non-nearshore non-sablefish LE	0.17	0.05			0.40	0.62	0.12
10	Non-nearshore non-sablefish OA	1.16	0.73	0.66	1.17	1.28	5.01	1.00
12	Incidental OA	0.08	0.02	0.03	0.05	0.02	0.20	0.04
	LE total						1.00	0.20
	OA total						5.42	1.08

Note: Since these are PacFIN amounts (table vdrfd) and not West Coast Groundfish Observer Program estimates, no discard mortality estimates are included.

A range of bocaccio trip limits and calculated projected mortality under three alternatives for both the LE and OA sectors was analyzed (Table B-5). The years 2011 and 2012 were used because they were the most representative of current and future fishing behavior, with the assumption that potential trip limit increases would not significantly change fishing behavior (i.e. the number of vessels increasing per fishery sector).

Table B-5 . Projected mortality for bocaccio under a range of alternative trip limits for the LE and OA fixed gear fisheries south of 34°27' N latitude.

No Action Alternative							Total estimated mortality (mt)
Sector	Period and trip limit (pounds)						
	1	2	3	4	5	6	
LE FG	300	closed	300	500	500	500	1.2
OA FG	100	closed	100	200	200	200	2.0

Alternative 2							Total estimated mortality (mt)
Sector	Period and trip limit (pounds)						
	1	2	3	4	5	6	
LE FG	750	closed	750	750	750	750	1.7
OA FG	250	closed	250	250	250	250	5.0

Alternative 3							Total estimated mortality (mt)
Sector	Period and trip limit (pounds)						
	1	2	3	4	5	6	
LE FG	1,000	closed	1,000	1,000	1,000	1,000	2.3
OA FG	500	closed	500	500	500	500	9.9

Currently, projected mortality for bocaccio in the GMT scorecard is informed by two sources of data – the sablefish bycatch projection model for the area between 40°10' N latitude and 36° N latitude and by trip limit models south of 34°27' N latitude. Mortality between 36° N latitude and 34°27' N latitude (i.e., Morro Bay port complex) in not currently accounted for.

WCGOP data were examined for the area south of 36° N latitude to estimate mortality of co-occurring overfished species (OFS; canary, darkblotched, and yelloweye rockfish) that may occur as a result of increases to the bocaccio rockfish trip limits in the LE and OA sectors. WCGOP data from 2011 to 2012 revealed that no OFS were encountered on the observed bocaccio trips during this time frame. Given the small sample size (5 vessels) informing the data and location of fishing, it is reasonable to assume that some OFS are encountered as bycatch, albeit in very small and unquantifiable amounts.

B.5 Coastwide Sablefish Trip Limits

This section discusses projected landings and associated cumulative landing limits ("trip limits") for the four fixed gear sablefish, daily trip limit (DTL) fisheries. They include limited entry (LE) and open access (OA) fisheries, north and south of 36° North latitude. Hereafter, they will be referred to as follows: LE North, LE South, OA North, and OA South. The two northern fixed gear sablefish DTL fisheries account for approximately 13.5 percent of the northern sablefish ACL, while the southern ones account for approximately 58 percent of the southern ACL (during 2015, under Alternative 3).

Proposed trip limits for 2015 and 2016 in these fisheries were produced GMT landing forecast models (described briefly below, and in detail in the 2011-2012 Groundfish Harvest Specifications Environmental Impact Statement; EIS).

While the tables show trip limits in this section as simply bimonthly, weekly, or daily, it is worth noting that the language in regulation applies each limit in a specific way when there is a mix of limits for the different time periods, within one fishery. This is the case for the two open access sablefish DTL fisheries. For example, the limits in regulation under No Action for the OA North fishery read as follows: "300 lb. per day or one landing per week of up to 800 lb., not to exceed 1,600 lb. per two months".

B.5.1 Analytical description

The purposes of this analysis are to produce and compare trip limits and predicted landings between the No Action Alternative and the other alternatives, for the four fixed gear, sablefish DTL fisheries. The ACLs, regional allocations, harvest guidelines and fishery landed shares vary among the alternatives.

Proposed trip limits under the alternatives for 2015 and 2016 were produced with the objective of keeping projected catch within the proposed management targets, which resulted from different values of the sablefish P-star (P*) and corresponding ACL, harvest guidelines, and shares for the areas north and south of 36° N. latitude. Forecasted landings under the action alternatives were intentionally constrained to between 90 and 95 percent of the landings share for each fishery, in order to produce trip limits which are likely to result in high attainment of the harvest guideline, while maintaining a sufficiently precautionary remainder; one that is appropriate for the uncertainty associated with use of the forecast models, and the accuracy of the estimated landings data used as model inputs. This strategy has been used over the past several years in inseason management, in the 2013-14 Groundfish Harvest Specifications EIS, and most recently in establishing trip limits for 2014, at the November, 2013 meeting of the Pacific Fishery Management Council (PFMC). These annual trip limit schedules can be adjusted through the inseason process as early as the preceding November meeting of the PFMC, as well as throughout the year, in order to account for updated data, or changes in science or policy.

B.5.2 Model description

The catch projection models used in this analysis are multiple linear regression models that relate trip limits and other predictor variables to bimonthly or monthly landings, separately for each fishery. They are also used for inseason management. Detailed descriptions of the models can be found in Appendix A. of the 2011-2012 harvest specifications EIS. Models were originally produced by members of the GMT, Oregon Department of Fish and Wildlife (ODFW), National Oceanic and Atmospheric Administration (NOAA) Southwest Fisheries Science Center (SWFSC) and Northwest Fisheries Science Center (NWFSC) in 2006 (limited entry) and 2009 (open access). Changes in model specification are made as needed over time, to increase accuracy of projections where possible. Changes since the 2013-14 harvest specifications include: Limited entry models were translated from SAS to R. In the LE North model, sablefish ex-vessel price (adjusted for inflation) was added as a predictor, separate regressions were carried out for each bimonthly period, and landings were predicted similarly to the open access models, where predicted landings equals predicted number of vessels participating, times the average landed catch per bimonthly period. The Producer Price Index from the U.S. Bureau of Labor Statistics for "fresh and frozen seafood" was used to deflate the time series of ex-vessel prices in the LE North model. New landings data through 2012 were added to all four models. The time range of data included in each model varies between from 2004-2012, to 2007-2012, depending on its information content for making projections. Accuracy of prediction varies among the four models. Of the four, the best fit of predicted to actual, bimonthly landings is produced by the LE North model, with an R^2 value of 0.956. Under the most recent data, the worst fit between predicted and actual landings comes from the LE South model, with an R^2 value of 0.528. We are still able to manage the LE South DTL fishery to a high level of attainment through inseason management and close tracking of data throughout the year, in spite of the relatively low model fit seen under the current data.

B.5.3 Model input data

Landings and catch data were acquired from PacFIN using the query "slct_ves_sabl_arid_DTL_tab_no_EFP.sql". This query pulls vessel-daily landings data from tables that separate fixed gear, sablefish DTL landings from sablefish primary landings, on a vessel-daily basis, using software and an algorithm and developed by PacFIN and NWR staff in 2010 and 2011. For the LE North fishery, the software tracks landings accumulation by vessel, against their sablefish endorsed tier permits. If the vessel has active sablefish endorsed primary tier permits attached, the season is open, and there is room on the attached permits, landings are counted as primary. When either the tier permits on the vessel are exhausted, or the season ends, landings are then counted as DTL. The algorithm in the software adheres to the specific federal regulations concerning primary and DTL landings in 50 CFR 660.232.

B.5.4 Accounting for discards and discard mortality

Harvest guidelines applicable the sablefish DTL fisheries were reduced in order to account for discard mortality, which resulted in landed shares for use in projection modeling to predict landings, and determine necessary trip limits. A harvest guideline is defined as numerical management harvest objective which is not a quota. These are either cited in regulation or calculated from other higher level numerical management objectives appearing in regulation.

The applicable harvest guideline was multiplied by 16.6 percent (discard rate estimate), and by 20 percent (discard mortality rate estimate). Then that product (estimated dead discarded sablefish) was subtracted from the harvest guideline, resulting in a "landed share", which projected landings should be beneath, in order to keep total catch within the harvest guideline. The estimated discard rate used by GMT was taken from the report "Estimated Discard and Catch of Groundfish Species in the 2012 US West Coast Fisheries", by the West Coast Groundfish Observer Program, of the NWFSC. The discard mortality rate estimate was taken from information in Davis (2001, LTtp://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2001.tb00495.x/abstract), Shirrippa and Colbert (2005, LTtp://www.pcouncil.org/wp-content/uploads/Sable05_complete.pdf), and Shirrippa (2007, LTtp://www.pcouncil.org/wp-content/uploads/Sable07v3_0.pdf). Shirrippa (2005) used experimental data and sea surface temperature to predict varying release mortality by gear. The GMT considered that Davis (2001) demonstrated high sensitivity to temperature and deck time, along with high variability of predicted discard mortality in Shirrippa (2005) informed by sea surface temperature data, and adopted an estimate of 20 percent. This value was also adopted by Taylor 2011 in the current sablefish stock assessment.

B.5.5 Values for landed shares among the alternatives

Landed share values for each of the DTL fisheries are shown by year, fishery and alternative below in Table B-6and Figure B-13.

Table B-6. Landed shares for each of the fixed gear sablefish, DTL fisheries, used for making projections, under each of the alternatives.

	LE N	OA N	LE S	OA S
No Action 2014	214	319	483	393
PPA 2015	236	388	531	432
PPA 2016	258	425	581	472
Alt. 1 2015	247	406	555	451
Alt. 1 2016	269	443	606	492
Alt. 2 2015	202	333	455	370
Alt. 2 2016	223	367	503	409

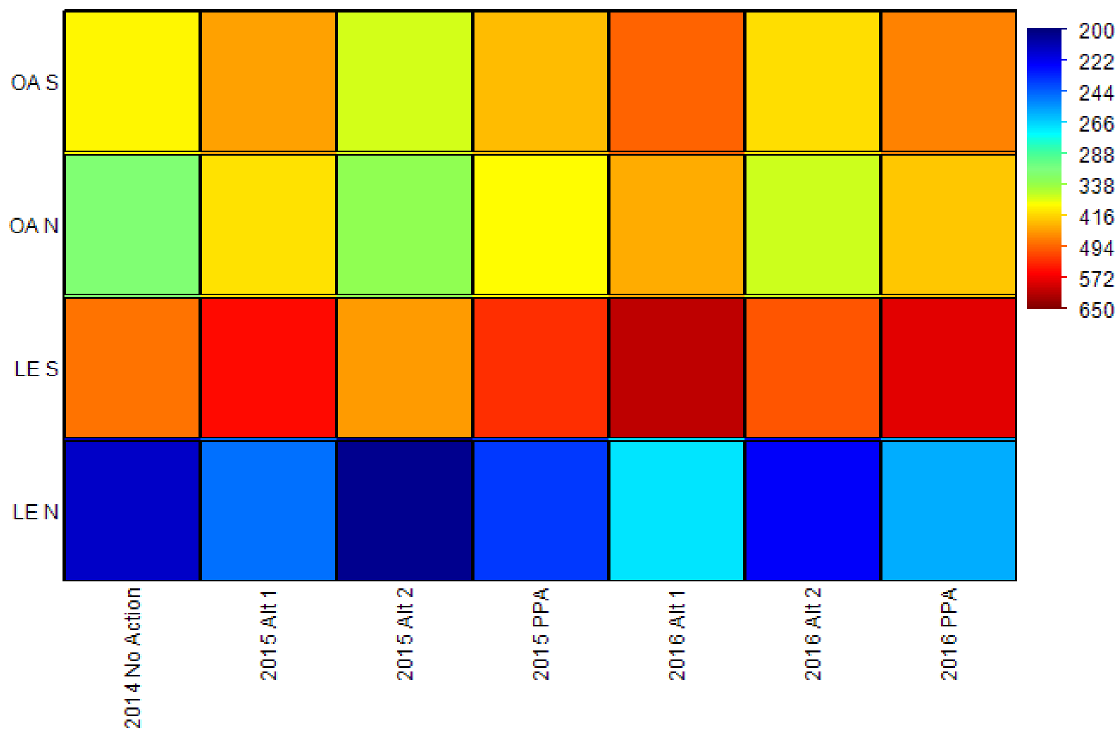

Figure B-13. Heatmap showing variation in potential landed shares used for making projections, for each of the fixed gear sablefish DTL fisheries, under each of the alternatives.

B.5.6 Results

B.5.6.1 No Action Alternative

Area restrictions

Under No Action, the following RCA boundaries for use of fixed gear, from 2014 regulations, would remain in place for 2015 and 2016 (Table B-7, from Table 2 North, and South, to Part 660, Subpart E, Codified Federal Regulations).

Table B-7. Rockfish Conservation Area (RCA) boundaries for fixed gear, under the No Action Alternative.

Area	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
North of 46° 16'	shoreline - 100 fm line					
42° - 46° 16’	30 fm line - 100 fm line					
40° 10’ - 42°	20 fm depth contour - 100 fm					
34° 27’ - 40° 10’	30 fm - 150 fm line					
South of 34° 27’ (w/islands)	60 fm line – 150 fm line (also applies around islands)					

Trip limits and projected impacts under No Action

The No Action trip limit structures for 2014 in each fishery are presented in Table B-8. The No Action Alternative resulted in projected attainments ranging between 71 and 99 percent, using the best available data, and 2014 trip limits set in the November, 2013 council meeting (Table B-9). The aim throughout all the alternatives was to enable harvest of a high proportion of the landed share, yet accommodate uncertainty. The GMT and the Council considered, while constructing and adopting them, respectively, the uncertainty in the landings data (in terms of correctly separating sablefish DTL fishery landings from those of the sablefish primary fishery, and IFQ landings) along with uncertainty associated with making model-based projections.

These trip limits can be adjusted as needed inseason, to influence higher or lower catch as the year progresses. We strove to produce trip limits with a predictable and temporally uniform structure, which was appreciated by the GAP in their statement at the November 2011 council meeting, and subsequent meetings.

Table B-8. Trip limits for sablefish DTL fisheries under the No Action Alternative (2014).

Fleet	Area	Bimonthly limit	Weekly limit	Daily limit
LE	**N**	2,850	950	NA
OA	**N**	1,600	800	300
LE	**S**	NA	2,000	NA
OA	**S**	3,200	1,600	300

Projected attainment values for the four sablefish DTL fisheries under the No Action Alternative are within the range generally recommended by the Council, of between 90 and 95 percent, with the exception of the OA North fishery, which has a projected attainment of 99 percent, and the OA South fishery, which has been maintained at a lower level in recent years, partially to allow some buffer for the LE South fishery (Table B-9). The reason for the higher than usual projected attainment in the OA North fishery under Alternative 1 is that actual landings have been running much lower than projected for the past two years, under recent poor sablefish market conditions.

Table B-9. Model-projected landings under the No Action Alternative, for the fixed-gear, sablefish DTL fisheries. Landed shares and projected impacts are in metric tons (mt) of landed catch.

No Action	LE N	OA N	LE S	OA S	South sum
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Difference	9.6	2.3	45.2	113.3	158.5

B.5.6.2 Alternative 1 – Sablefish Trip Limits

Alternative 1, P*0.45 for 2015

*Trip limits and projected impacts under Alternative 1, P*0.45 for 2015*

The trip limit structures in 2016 under Alternative 1 for each fishery are presented in Table B-10. Differences between the Alternative 1 and No Action limits also appear in the table. Trip limits are higher under Alternative 1 than for No Action. Higher limits were needed to influence similar attainment, under the higher shares. Differences range from zero for bimonthly and weekly limits and 20 pound higher daily limits in the OA South fishery, to 375 pounds per two months higher in the LE North fishery. The daily limit in the OA North fishery does not change among the alternatives.

Table B-10. Trip limits under Alternative 1, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in pounds of landed catch per time period listed.

		2015 Alt. 1, P*0.45			2014 No action trip limits			Difference		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	3,225	1,075	NA	2,850	950	NA	375	125	NA
OA	**N**	1,900	950	300	1,600	800	300	300	150	0
LE	**S**	NA	2,125	NA	NA	2,000	NA	NA	125	NA
OA	**S**	3,200	1,600	320	3,200	1,600	300	0	0	20

Projected landings, attainment, and remainder amounts under Alternative 1 are presented in Table B-11. The same values for the No Action Alternative are also presented in the table, as well as the differences between these two alternatives.

Attainment rates are very similar between Alternative 1 and No Action, with the exception of the OA North fishery, for reasons explained in the No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is consistently higher under Alternative 1 than No Action; between 25.9 mt and 73.8 mt higher, due to the higher trip limits which were produced, in order to influence similar attainment under the higher landed shares of Alternative 1.

Table B-11. Model-projected landings under Alternative 1, No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2015. Landed shares and projected landings are in metric tons (mt).

2015 Alt. 1, P*0.45	LE N	OA N	LE S	OA S	South sum
Projected landings	230.3	380.0	511.6	327.0	838.6
Landed share	247	406	555	451	1,006.0
Percent attainment	93%	94%	92%	72%	83%
Difference	16.7	26.0	43.4	124.0	167.4
No Action					
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Remainder	9.6	2.3	45.2	113.3	158.5
Difference					
Projected landings	25.9	63.4	73.8	47.3	121.1
Landed share	33.0	87.0	72.0	58.0	130.0
Percent attainment	-2%	-6%	2%	1%	1%
Remainder	7.1	23.6	-1.8	10.7	8.9

Alternative 1, P*0.45 for 2016

Trip limits and projected impacts under Alternative 1, P=0.45 for **2016***

The potential trip limit structures for 2016 under Alternative 1 are presented in Table B-12 for each fishery. Differences between the Alternative 1 and No Action limits also appear in the table. Trip limits are substantially higher under Alternative 1 than for No Action. Higher limits were needed to influence similar attainment, under the higher shares. Differences range from 30 pounds per day higher for the OA South, to 675 pounds per two months higher in the LE North fishery. The daily limit in the OA North fishery does not change among the alternatives.

Table B-12. Trip limits under Alternative 1, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in pounds of landed catch per time period listed.

		2016 P*=0.45			2014 No action trip limits			Difference		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	3,525	1,175	NA	2,850	950	NA	675	225	NA
OA	**N**	2,050	1,025	300	1,600	800	300	450	225	0
LE	**S**	NA	2,200	NA	NA	2,000	NA	NA	200	NA
OA	**S**	3,300	1,650	330	3,200	1,600	300	100	50	30

Projected landings, attainment, and remainder under the Alternative 1 are presented in Table B-13. The same values for the No Action Alternative, and the differences between these two alternatives, are also presented in the table.

Attainment rates are very similar between Alternative 1 and No Action, with the exception of the OA North fishery, for reasons explained in No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is consistently higher under the Alternative 1 than No Action; between 47.6 mt and 121.8 mt higher, due to the higher trip limits which were produced in order to influence similar attainment under the higher landed shares of the this alternative.

Table B-13. Model-projected landings under Alternative 1, No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2016. Landed shares and projected landings are in metric tons (mt).

2016 Alt. 1, P*0.45	LE N	OA N	LE S	OA S	South sum
Projected landings	252.0	413.9	559.6	361.9	921.6
Landed share	269	443	606	492	1,098.0
Percent attainment	94%	93%	92%	74%	84%
Difference	17.0	29.1	46.4	130.1	176.4
No Action					
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Remainder	9.6	2.3	45.2	113.3	158.5
Difference					
Projected landings	47.6	97.2	121.8	82.2	204.0
Landed share	55.0	124.0	123.0	99.0	222.0
Percent attainment	-2%	-6%	2%	2%	2%
Remainder	7.4	26.8	1.2	16.8	18.0

B.5.6.3 Alternative 2 – Sablefish Trip Limits

Alternative 2, P*=0.25 for 2015

Trip limits and projected impacts under Alternative 2, P=0.25 for* ***2015***

The trip limit structures in 2015 under Alternative 2 are presented in Table B-14 for each fishery. Differences between the Alternative 2 and No Action limits also appear in the table. Trip limits are generally lower under Alternative 2 than for No Action. Lower limits were needed to influence similar attainment, under the lower shares. Differences range from zero, no difference in weekly or bimonthly limits, for the OA North, to 225 pounds per two months lower in the LE North fishery. The daily limit in the OA North fishery does not change among the alternatives.

Table B-14. Trip limits under Alternative 2, the No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in pounds of landed catch per time period listed.

		2015 Alt. 2, P*0.25			2014 No action trip limits			Difference		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	2,625	875	NA	2,850	950	NA	-225	-75	NA
OA	**N**	1,600	800	300	1,600	800	300	0	0	0
LE	**S**	NA	1,975	NA	NA	2,000	NA	NA	-25	NA
OA	**S**	3,000	1,500	300	3,200	1,600	300	-200	-100	0

Projected landings, attainment, and remainder under the Alternative 1 are presented in Table B-15. The same values for the No Action Alternative, and the differences between these two alternatives, are also presented in the table.

Attainment rates are very similar between Alternative 2 and No Action with the exception of the OA North fishery, for reasons explained in the No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected ranges between slightly higher to slightly lower under Alternative 2 than No Action; between no difference and 17.2 mt lower, due to the similar to lower trip limits, which were produced in order to influence similar attainment under the different landed shares of the this alternative.

Table B-15. Model-projected landings under Alternative 2, the No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2015. Landed shares and projected landings are in metric tons (mt).

2015 Alt. 2, P*0.25	LE N	OA N	LE S	OA S	South sum
Projected landings	189.5	316.7	424.0	262.5	686.4
Landed share	202	333	455	370	825.0
Percent attainment	94%	95%	93%	71%	83%
Difference	13.0	16.8	31.0	107.5	138.6
No Action					
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Remainder	9.6	2.3	45.2	113.3	158.5
Difference					
Projected landings	-14.9	0.0	-13.9	-17.2	-31.1
Landed share	-11.5	14.5	-28.0	-23.0	-51.0
Percent attainment	-2%	-4%	3%	0%	1%
Remainder	3.4	14.5	-14.1	-5.8	-19.9

Alternative 2, P*=0.25 for 2016

Trip limits and projected impacts under Alternative 2, P=0.25 for* ***2016***

The trip limit structures for 2016 under Alternative 2 are presented in Table B-16 for each fishery. Differences between the Alternative 2 and No Action limits also appear in the table. Trip limits are lower in some cases, but more often are slightly higher under Alternative 2 than for No Action. Different limits were needed to influence similar attainment, under the different shares. Differences range from -100 pounds per two months for the OA South, to 100 pounds per two months lower in the LE North fishery. The daily limit in the OA North fishery does not change among the alternatives.

Table B-16. Trip limits under Alternative 2, the No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2016. Limits are in pounds of landed catch per time period listed.

		2016 Alt. 2, P*0.25			**2014 No action trip limits**			**Difference**		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	2,925	975	NA	2,850	950	NA	75	25	NA
OA	**N**	1,700	850	300	1,600	800	300	100	50	0
LE	**S**	NA	2,050	NA	NA	2,000	NA	NA	50	NA
OA	**S**	3,100	1,550	310	3,200	1,600	300	-100	-50	10

Projected landings, attainment, and remainder under the Alternative 1 are presented in Table B-17. The same values for the No Action Alternative, and the differences between these two alternatives, are also presented in the table.

Attainment rates are very similar between Alternative 2 and No Action with the exception of the OA North fishery, for reasons explained in the No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is slightly higher under Alternative 2 than No Action; between 5.1 mt and 28.6 mt higher. This is due to the trip limits which were produced in order to influence similar projected attainment under the higher landed shares of this alternative.

Table B-17. Model-projected landings under Alternative 2, the No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2016. Landed shares and projected landings are in metric tons (mt).

2016 Alt. 2, P*0.25	LE N	OA N	LE S	OA S	South sum
Projected landings	209.4	337.1	466.4	293.8	760.3
Landed share	223	367	503	409	912.0
Percent attainment	94%	92%	93%	72%	83%
Difference	13.6	29.9	36.6	115.2	151.7
No Action					
Projected landings	204.4	316.7	437.8	279.7	204.4
Landed share	214	319	483	393	214
Percent attainment	95%	99%	91%	71%	95%
Remainder	9.6	2.3	45.2	113.3	9.6
Difference					
Projected landings	5.1	20.5	28.6	14.1	42.7
Landed share	9.0	48.0	20.0	16.0	36.0
Percent attainment	-2%	-7%	2%	1%	1%
Remainder	3.9	27.5	-8.6	1.9	-6.7

Uncertainty surrounding future ex-vessel prices in the LE North fishery

The main axis of uncertainty in the LE North fishery was ex-vessel price. This is one predictor in the model, and projected landings depend upon assumptions regarding future prices. We addressed this by showing three scenarios for projected landings according to potential ex-vessel price, for each of the alternatives.

The current 2014 projection for the LE North fishery assumes a uniform seasonal ex-vessel price throughout 2014, at the current 2013 bimonthly average ex-vessel price of $2.57 per pound. Assumptions about ex-vessel price in the LE North fishery under the alternatives are shown in Table B-18 and Table B-19. From 2004 through 2011, the bimonthly price followed a predictable seasonal pattern, peaking with the highest prices ever in fall of 2011. However, during 2012 and 2013, that pattern disappeared, and was replaced with one of general decline, following the 2011 boom. However, current landings data show some small increases in prices, and some market reports tell of a potential recovery for the sablefish market, to an unknown degree. Thus, a working assumption of a uniform seasonal price was assumed for projections, since the beginning date, and extent of a potential recovery is not known with any certainty.

Uncertainty in the forecasted landings in this fishery is bracketed by using the lowest and highest bimonthly price during 2013. Projected attainment under the alternatives using the low price was between 86 and 88 percent, and for the high price, projected attainment was between 99 and 101 percent of the landed share (Table B-18 and Table B-19).

Table B-18. Forecasted landings and attainment for 2015, under different assumptions about ex-vessel sablefish price, for each of the alternatives, in the LE North DTL fishery.

	2013 low price	2013 avg. price	2013 high price
LE N, No Action	**2.38**	**2.57**	**2.71**
Projected landings	187.3	204.4	216.9
Landed share	214	214	214
Percent attainment	88%	95%	101%
Difference	26.7	9.6	-2.9
LE N, PPA			
Projected landings	202.0	219.7	232.8
Landed share	236	236	236
Percent attainment	86%	93%	99%
Difference	34.0	16.3	3.2
LE N, Alt. 1, P*0.45			
Projected landings	212.0	230.3	243.7
Landed share	247	247	247
Percent attainment	86%	93%	99%
Difference	35.0	16.7	3.3
LE N, Alt. 2, P*0.25			
Projected landings	173.1	189.5	201.5
Landed share	202	202	202
Percent attainment	86%	94%	100%
Difference	28.9	12.5	0.5

Table B-19. Forecasted landings and attainment for 2016, under different assumptions about ex-vessel sablefish price, for each of the alternatives, in the LE North DTL fishery.

	2013 low price	2013 avg. price	2013 high price
LE N, No Action	187.3	204.4	216.9
Projected landings	214	214	214
Landed share	88%	95%	101%
Percent attainment	26.7	9.6	-2.9
Difference	187.3	204.4	216.9
LE N, PPA			
Projected landings	222.3	241.0	254.8
Landed share	258	258	258
Percent attainment	86%	93%	99%
Difference	35.7	17.0	3.2
LE N, Alt. 1, P*0.45			
Projected landings	232.8	252.0	266.1
Landed share	269	269	269
Percent attainment	86%	93%	99%
Difference	37.2	18.0	3.9
LE N, Alt. 2, P*0.25			
Projected landings	192.1	209.4	222.2
Landed share	223	223	223
Percent attainment	86%	93%	99%
Difference	31.9	14.6	1.8

B.5.6.4 Alternative 3 – Sablefish Trip Limits

Alternative 3 for 2015

Trip limits and projected impacts under the Alternative 3 for 2015

The trip limit structures for each fishery in 2015 under Alternative 3 are presented in Table B-20. Differences between Alternative 3 and No Action limits also appear in the table. Trip limits are generally higher under Alternative 3 than for No Action. Higher limits were needed to influence similar attainment, under the higher shares. Differences range from 25 pounds per week smaller for the OA South, to 225 pounds per two months higher in the LE North fishery.

Table B-20. Trip limits under Alternative 3, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in pounds of landed catch per time period listed.

		2015 Alt 3			No Action			Difference		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	3,075	1,025	NA	2,850	950	NA	225	75	NA
OA	**N**	1,800	900	300	1,600	800	300	200	100	0
LE	**S**	NA	2,100	NA	NA	2,000	NA	NA	100	NA
OA	**S**	3,200	1,575	315	3,200	1,600	300	0	-25	15

Projected landings, attainment and remainder in 2015, under Alternative 3 are presented in Table B-21. The same metrics are also presented for the No Action Alternative, and the differences between these two alternatives, in the table.

Attainment rates are very similar between Alternative 3 and No Action with the exception of the OA North fishery for reasons explained in No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is consistently higher under Alternative 3 than No Action; between 15.4 mt and 58.4 mt higher, due to the higher trip limits, produced to influence similar attainment under the higher landed shares of Alternative 3.

Table B-21. Model-projected landings under Alternative 3, No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2015. Landed shares and projected landings are in metric tons (mt).

2015 Alt 3	**LE N**	**OA N**	**LE S**	**OA S**	**South sum**
Projected landings	219.7	358.3	496.3	310.2	806.4
Landed share	236	388	531	432	963.0
Percent attainment	93%	92%	93%	72%	84%
Remainder	16.3	29.7	34.7	121.8	156.6
No Action					
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Remainder	9.6	2.3	45.2	113.3	158.5
Difference					
Projected landings	15.4	41.6	58.4	30.5	88.9
Landed share	22.0	69.0	48.0	39.0	87.0
Percent attainment	-2%	-7%	3%	1%	2%
Remainder	6.6	27.4	-10.4	8.5	-1.9

Preliminary Preferred Alternative for 2016

Trip limits and projected impacts under Alternative 3 for 2016

The trip limit structures in 2016 under Alternative 3 for each fishery are presented in Table B-22. Differences between Alternative 3 and No Action limits also appear in the table. Trip limits are generally higher under Alternative 3 than for No Action. Higher limits were needed to influence similar attainment under the higher shares. Differences range from 25 pounds per week higher for the OA South, to 525 pounds per two months higher in the LE North fishery. The daily limit for the OA North fishery remains unchanged under all alternatives.

Table B-22. Trip limits under Alternative 3, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2016. Limits are in pounds of landed catch per time period listed.

		2016 Alt 3			**No Action**			**Difference**		
fleet	area	bimo	week	day	bimo	week	day	bimo	week	day
LE	**N**	3,375	1,125	NA	2,850	950	NA	525	175	NA
OA	**N**	2,000	1,000	300	1,600	800	300	400	200	0
LE	**S**	NA	2,175	NA	NA	2,000	NA	NA	175	NA
OA	**S**	3,250	1,625	325	3,200	1,600	300	50	25	25

Projected landings, attainment, and remainder under Alternative 3 (PPA) are presented in Table B-23. The same values for the No Action Alternative are also presented in the table, and the differences between these two alternatives.

Attainment rates are very similar between Alternative 3 and No Action with the exception of the OA North fishery, for reasons explained in No Action section; attainment rates are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is consistently higher under Alternative 3 than No Action; between 36.7 mt and 105.5 mt higher, due to the higher trip limits produced in order to influence the same attainment under the higher landed shares of Alternative 3.

Table B-23. Model-projected landings under Alternative 3, No Action Alternative, and comparison between them, in the fixed-gear, sablefish, DTL fisheries for 2016. Landed shares and projected landings are in metric tons (mt).

2016 Alt 3	LE N	OA N	LE S	OA S	South sum
Projected landings	241.0	402.5	543.3	344.2	887.5
Landed share	258	425	581	472	1,053.0
Percent attainment	93%	95%	94%	73%	84%
Difference	17.0	22.5	37.7	127.8	165.5
No Action					
Projected landings	204.4	316.7	437.8	279.7	717.5
Landed share	214	319	483	393	876.0
Percent attainment	95%	99%	91%	71%	82%
Remainder	9.6	2.3	45.2	113.3	158.5
Difference					
Projected landings	36.7	85.8	105.5	64.5	170.0
Landed share	44.0	106.0	98.0	79.0	177.0
Percent attainment	-2%	-5%	3%	2%	2%
Remainder	7.3	20.2	-7.5	14.5	7.0

B.6 Other Trip Limit Adjustments

For 2013-2014 groundfish fisheries, lingcod (north of 40°10' N latitude), shortspine thornyhead (north of 34°27' N latitude), bocaccio (south of 34°27' N latitude) and the minor shelf rockfish complex (south of 34°27' N latitude), have been managed, in part, by cumulative bi-monthly trip limits (Table B-24) designed to keep catches within the ACLs. The exceptions to this trip limit structure are open access lingcod (managed on a monthly trip limit method). As a result of inseason tracking patterns (higher/lower than projected), trip limits may be adjusted. For shortspine thornyheads (north of 34°27' N latitude), bocaccio (south of 34°27' N latitude), and the shelf rockfish complex (south of 34°27' N latitude) trip limit increases were implemented on August 13, 2013. Lingcod trip limits have not been modified since 2005 for limited entry and 2007 for open access. The fishery sectors considered for the following analyses are the non-trawl fixed-gear fisheries that were chosen for analysis by the Council at its November 2013 meeting.

The trip limit models used for these species/sectors are catch-based fleet capacity models, whereby the proportional take of the theoretical maximum (for the selected base years and species) that could have been made by each participating vessel is used to estimate what the estimated take for various trip limit amounts per vessel per period (monthly or bi-monthly). The sum of which represents the estimated annual catch. When possible, the final estimated mortality was adjusted by also adding the estimates of discard mortality for the respective fishery sectors. One assumption built into this model is that vessels participation does not vary significantly from the base years used in calculations. Another is that any vessel that landed at least 80 percent of its theoretical maximum period amount would probably take 100 percent of an increased period amount. This 20 percent buffer amount compensates for a form of within-fleet latent capacity. Additionally, estimated discard mortality amounts were calculated using the WCGOP Total Mortality Reports for 2011 and 2012 and factored into the final projected estimates.

Table B-24. No Action Alternative Limited Entry and Open Access trip limits (in pounds) in effect in 2014.

Fishery Sector	Fleet	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Lingcod (north 40°10')[a/]	LE	closed	closed	800	800	800	400/closed
	OA	closed	closed	400/month			400/closed
Shortspine Thornyhead (north 34°27')	LE	2,000	2,000	2,000	2,500	2,500	2,500
Bocaccio (south 34°27')	LE	300	closed	300	500	500	500
	OA	100	closed	100	200	200	200
Minor Shelf Rockfish Complex (south 34°27')	LE	3,000	closed	3,000	4,000	4,000	4,000
	OA	750	closed	750	1,000	1,000	1,000

[a/] The lingcod commercial fishery is closed from December 1st of a given year through April 30th of the subsequent year (five months total). Therefore, the Nov/Dec trip limit applies only to November.

2015-2016 Management Considerations:
For the 2015-2016 biennial management cycle, trip limit options for the above fishery sectors are analyzed relative to the No Action Alternative (based on the 2014 amounts) and two additional options, based on a P* of 0.45 and P* of 0.25, which establish fishery harvest guideline amounts for the non-trawl sectors. Attainment levels were calculated using the more conservative P* harvest guideline (HG). Estimated mortality is provided that also incorporates discard mortality using estimated amounts derived from WCGOP Groundfish Mortality Reports. Trip limits under any alternative could be adjusted inseason as needed to attain, but not exceed, a given catch limit.

Generally speaking, all but one of these fishery sectors have been underutilized in recent years (2011-2013); the exception being the shortspine thornyhead fishery north of 34°27' N latitude (Table B-25).

Table B-25. Comparison of estimated mortality and the non-trawl allocations (including the recreational sector) from 2011 through 2013 for the following non-trawl, fixed-gear fisheries: lingcod – north of 40°10' N latitude, shortspine thornyheads (SSTH) – north of 34°27' N latitude, bocaccio – south of 34°27' N latitude, and the minor shelf rockfish complex – south of 34°27' N latitude (note: limited entry and open access sectors are combined. All values are in metric tons. 2013 data are preliminary).

	2011			2012			2013		
	Non-trawl	**Est. mort.**	**% of non-trawl**	**Non-trawl**	**Est. mort.**	**% of non-trawl**	**Non-trawl**	**Est. mort.**	**% of non-trawl**
Lingcod	1,132	79.7	7.0%	1,034	88.1	8.5%	1,517	76.6	5.0%
SSTH	76	72.9	95.9%	76	63.2	83.2%	74	56.1	75.8%
Bocaccio	58.6	2.3	3.9%	58.6	3.3	5.6%	73.2	2.3	3.1%
Shelf RF	626.9	19.9	3.2%	626.9	23.1	3.7%	586.5	16.2	2.8%

Note: Estimated mortality for some sectors is derived from PacFIN extracted data due to the unavailability of WCGOP mortality estimates for certain fishery sectors and areas. Therefore, those amounts do not have discard mortalities factored in and will differ from what is published in the WCGOP mortality reports.

Lingcod North of 40°10' North Latitude

Background:

For 2013-14 west coast groundfish fisheries, lingcod have been managed to sector specific harvest guidelines (i.e., trawl and non-trawl). The HG for the non-trawl fixed gear fishery is expected to decrease slightly from 1,430 mt (in 2014) to 1,403.5 mt in 2015 and 1,342.5 mt in 2016. The most recent stock assessment indicates west coast lingcod stocks are healthy with the stock depletion estimated off Washington and Oregon to be at 62 percent of its unfished biomass, and off California estimated to be at 74 percent of its unfished biomass at the start of 2009. As a result, the Council requested analysis of higher trip limits for the LE and open access OA sectors north of 40°10' N latitude. The 2014 commercial management measures for lingcod are described in Table B-26.

Table B-26. Lingcod management measures north of 40°10' N latitude for the 2014 commercial fishery.

Fishery	
Commercial	Sorting requirement for all commercial landings
Limited Entry Trawl	Managed under IFQ
Limited Entry Fixed Gear	Bi-monthly limit management Current trip limits north of 40°10' N latitude are: Periods 1 and 2: "CLOSED" Periods 3 -5: "800 lb./ 2 months" Period 6: "400 lb. /month" (November), "CLOSED" in December Bi-monthly trip limits can be adjusted through routine in-season action
Open Access Fixed Gear	Bi-monthly limit management Current trip limits north of 40°10' N latitude are: Periods 1 and 2: "CLOSED" Periods 3 -5: "400 lb./month" Period 6: "400 lb./month" (November), "CLOSED" in December Bi-monthly trip limits can be adjusted through routine in-season action

2015-2016 Management Considerations:

A valuable contributor to both the commercial and recreational fisheries, the coastwide commercial take of lingcod, nevertheless, has been substantially less than the annual HGs in 2011 and 2012 (Table B-27). The non-trawl allocation is currently set at 55 percent of the annual fishery HG. However, lingcod landed in association with nearshore species landings are incorporated into the nearshore bycatch model to estimate mortality of OFS in the nearshore fishery. Increasing the trip limits may cause the estimated mortality of canary and yelloweye rockfish to exceed their directed nearshore allocations.

During the 2011-2012 management cycle, 76 limited entry vessels (85 percent of the LE fleet) landed less than 20 percent of the theoretical maximum amount they could have landed (Appendix A). In the open access sector, 279 vessels (80 percent) landed less than 20 percent of their theoretical maximum amount (Appendix A).

Table B-27. Total lingcod mortality (in metric tons) in the nearshore and non-nearshore non-trawl fixed gear sectors (LE and OA combined) north and south of 42° N latitude from 2011 and 2012. (source: West Coast Groundfish Observer Program)

Year	Mortality	HG	% HG
2011 (North 42° N lat.)	49.9	1,132	4.4 %
2011 (South 42° N lat.)	29.8	1,152	2.6 %
Total	79.7	2,284	3.5 %
2012 (North 42° N lat.)	55.1	1,034	5.3 %
2012 (South 42° N lat.)	33.0	1,186	2.8 %
Total	88.1	2,220	4.0 %

Note: Current management stratification now uses the 40°10' N latitude line even though WCGOP reports mortalities north and south of 42° N latitude.

Management Options

Option 1 – No Action: Maintain current trip limits for limited entry (LE) and open access (OA) sectors north of 40°10' N latitude.

Under Option 1, the 2014 trip limits would remain in place for both the LE and OA sectors.

Biological Impacts Under Option 1

Projected Mortality

Under No Action, projected mortality for lingcod north of 40°10' N latitude is 14.9 mt and 23.1 mt for the LE and OA sectors, respectively (Table B-28).

Stock Status

Formally designated as overfished in 1999, the current stock assessment indicates the stock to be healthy along the west coast (Hamel, *et al*. 2009). Under Option 1, no changes to stock status are expected.

Option 2: Increase trip limits for LE and OA sectors north of 40°10' N. latitude

Under Option 2, increased bi-monthly trip limits north of 40°10' N. latitude were investigated to accommodate increased opportunity for the nearshore and non-nearshore fixed-gear west coast fleets. Individual vessel landings reported in PacFIN from 2011-2012 for the limited entry and open access sectors were used to analyze catch limits by the fleet. The years 2011 and 2012 were chosen as the basis for this model because they are the most recent representative of current and future fishing behavior. Individual PacFIN landings records for all vessels were used in the model run.

Limited Entry Bi-monthly Trip Limit Options

The LE bi-monthly trip limit options for lingcod north of 40°10' N. latitude range from 1,200 lb./2 months and 600 lb. for November (Option 2a) to 1,600 lb./2 months and 800 lb. for November (Option 2b) (Table B-28). Option 2a represents a moderate increase between the No Action amount and the doubled No Action amount. The trip limit bi-monthly structure for a continued season closure during periods 1 and 2 and the second half of period 6 was maintained for all LE Options.

Open Access Bi-monthly Trip Limit Options

The OA bi-monthly trip limit options for lingcod north of 40°10' N. latitude range from 600 lb./month and 600 lb. for November (Option 2a) to 800 lb./month and 800 lb. for November (Option 2b). Option 2a represents a moderate increase between the No Action amount and the doubled No Action amount. Like the trip limit bi-monthly structure for LE, a continued season closure during periods 1 and 2 and the second half of period 6 was maintained for all OA Options.

Table B-28. Summary comparison of projected landings (mt) of lingcod in the LE and OA sectors under No Action (Option 1) moderate increase (Option 2a) and doubled the No Action trip limit amount (Option 2b). Projected landings north of 40°10' N. latitude are based on average landings during 2011-2012 and include the nearshore and non-nearshore fisheries combined. (Note: the more conservative 2016 HG was used.)

Alternatives	LE		OA		Total	% of HG
	Trip limit	Projected Landings	Trip limit	Projected Landings		
Option 1	Periods 1-2: closed Periods 3-5: 800 lb./2 mo. Period 6: 400 lb. Nov. only	14.9	Periods 1-2: closed Periods 3-5: 400 lb./ month Period 6: 400 lb. Nov. only	23.1	38.0	2.8%
Option 2a	Periods 1-2: closed Periods 3-5: 1,200 lb./2 mo. Period 6: 600 lb. Nov. only	22.3	Periods 1-2: closed Periods 3-5: 600 lb./month Period 6: 600 lb. Nov. only	34.6	56.9	4.2%
Option 2b	Periods 1-2: closed Periods 3-5: 1,600 lb./2 mo. Period 6: 800 lb. Nov. only	29.8	Periods 1-2: closed Periods 3-5: 800 lb./2 mo. Period 6: 800 lb. Nov. only	46.1	75.9	5.6%

Biological Impacts Under Option 2

Projected Mortality

Under Option 2a, projected mortality for lingcod north of 40°10' N latitude is 22.3 mt and 34.6 mt for the LE and OA sectors, respectively (Table B-28). Under Option 2b, projected mortality for lingcod north of 40°10' N latitude is 29.8 mt and 46.1 mt for the LE and OA sectors, respectively. Projected mortality amounts, under Option 2 are expected to keep the fishery well below the HGs.

Stock Status

Similar to Option 1, no changes to stock status are expected.

Impacts to Industry

Higher trip limits for lingcod north of 40°10' N latitude could increase access to healthy stocks, resulting in increased ex-vessel value, although the amount is difficult to quantify. However, as mentioned previously lingcod taken with nearshore species are incorporated into the nearshore bycatch model to estimate the mortality of OFS. As a result, lingcod trip limit increases may result in higher than projected mortality for canary and yelloweye rockfish. If this occurs, inseason adjustments may likely be needed to keep the directed nearshore fishery within its allocation of OFS. Inseason actions to restrict the fishery may be detrimental to the fishery and affect the stability of business planning and practices. A difficulty is inherent in the lingcod trip limit method in that there is no separation of the nearshore and non-nearshore fisheries – both sectors operate under the same trip limit structure. As a result, increased trip limits, while benefitting one sector, may have a negative effect on the other.

Shortspine Thornyhead North of 34°27' North Latitude

Background:

For 2013-14 west coast groundfish fisheries, shortspine thornyhead have been managed to sector specific harvest guidelines (trawl and non-trawl). Because the recreational sector does not utilize this species, all analyses and totals represent only the commercial fishery. The HG for the non-trawl fixed gear fishery is expected to increase from 73.3 mt (in 2014) to 84.3 mt in 2015 and 83.3 mt in 2016. The most recent assessment of shortspine thornyhead, completed in 2013 (Taylor 2013), indicates the stock is healthy with an estimated spawning stock biomass of 60.0 percent of its initial, unfished biomass. As a result, the Council requested analysis of higher trip limits for the limited entry (LE) sector north of 34°27' N latitude. The 2014 commercial management measures for shortspine thornyhead are described in Table B-29.

Table B-29. Shortspine thornyhead management measures north of 34°27' N latitude for the 2014 commercial fishery.

Fishery	
Commercial	Sorting requirement for all commercial landings
Limited Entry Trawl	Managed under IFQ
Limited Entry Fixed Gear	Bi-monthly limit management Current trip limits north of 34°27' N latitude are: Periods 1 -3: “2,000 lb./ 2 months” Periods 4 -6: “2,500 lb./ 2 months” Bi-monthly trip limits can be adjusted through routine in-season action
Open Access Fixed Gear	“CLOSED”

2015-2016 Management Considerations:

For 2011-2012 non-trawl sector (which is allocated 5 percent of the annual take north of 34°27' N latitude) catches were between 85 percent and approximately 90 percent of the allocation (Table B-30). The shortspine thornyhead non-trawl fixed-gear fishery north of 34°27' N latitude is restricted to the limited entry sector. During the 2011-2012 management cycle, 116 limited entry vessels (85 percent of the LE fleet) landed less than 20 percent of the theoretical maximum amount they could have landed (see Appendix A).

Table B-30. Total shortspine thornyhead mortality (in metric tons) in the non-trawl fixed gear limited entry fishery, north of 34°27' N latitude from 2011 and 2012 (source: West Coast Groundfish Observer Program)

Year	Mortality	HG	% HG
2011	72.9	76.4	95.4 %
2012	63.2	75.6	83.6 %

Management Options

Option 1 – No Action: Maintain current trip limits for the limited entry sector north of 34°27' N latitude.

Under Option 1, the 2014 trip limits would remain in place for the limited entry sector.

Biological Mortality Under Option 1

Projected Mortality

Under No Action, projected mortality for shortspine thornyhead north of 34°27' N latitude is 77.3 mt for the limited entry fixed-gear sector (with no open access fishery allowed). At this level of harvest, the projected mortality represents 92 percent of the 2015 HG and 93 percent of the 2016 HG. This mortality is expected to be within the HG at the current level of vessel participation, whereby the vast number of vessels take less than 20 percent of their theoretical maximum allowable amount (Appendix A).

Stock Status
The stock was determined to be healthy in the last stock assessment.

Under Option 1, no changes to stock status are expected.

Option 2 – Increase trip limits for the limited entry sector north of 34°27' N latitude
Under Option 2, increased bi-monthly trip limits north of 34°27' N latitude were investigated to determine what the projected morality would be compared to the modest increase to the 2015 and 2016 HG (compared to the 2014 HG).

Individual vessel landings reported in PacFIN from 2011-2012 for the limited entry sector were used to analyze catch limits by the fleet. The years 2011 and 2012 were ultimately chosen as the basis for this model because they are the most representative of current and future fishing behavior for the three states. Even though the vast majority of vessels take less than 20 percent of their theoretical maximum annual amount, a small increase in the bi-monthly trip limits could cause the fishery to reach or exceed the HG.

Limited Entry Bi-monthly Trip Limit Options
The limited entry trip limit options for the shortspine thornyhead non-trawl fixed gear fishery north of 34°27' N latitude range from an increase to 2,250 pounds per bi-monthly period for periods 1 -2 (Option 2a) to an increase of 2,500 pounds per bi-monthly period for the entire year (Option 2b). Table B-31 describes project landings under each of these Options. (Note: the more conservative 2016 HG was used.)

Table B-31. Comparison of projected landings of shortspine thornyhead in the limited entry non-trawl fixed-gear sector north of 34°27' N latitude under No Action (Option 1) and a modest increase for periods 1-3 only (Option 2a) and setting the trip limits to 2,500 pounds per period for all six periods (Option 2b).

	LE Shortspine Thornyhead North 34°27' N latitude			
Options	Bi-monthly Trip Limits (in pounds)	Projected landings (mt)	HG (mt)	% of HG
Option 1	2,000 for periods 1-3 and 2,500 for periods 4-5	77.3	83.3	92.8 %
Option 2a	2,250 for periods 1-3 and 2,500 for periods 4-5	80.3	83.3	96.4 %
Option 2b	2,500 for all six periods	83.4	83.3	100.1 %

Biological Impacts Under Option 2
Projected Mortality
Under Option 2a and Option 2b, the projected mortality of shortspine thornyhead north of 34°27' N latitude would result in the fishery nearly reaching its HG, if not exceeding it (Option 2b).

Stock status
While the stock is considered healthy, and no negative consequences would probably result from modest trip limit increases, nevertheless the concern not to exceed HGs and ultimately the ACLs is paramount. The IFQ mortality since 2011 ranged from 50 to 60 percent of its allocation. That, coupled with the non-trawl fixed-gear allocation of 5 percent indicates that the projected mortality would not likely jeopardize the stock’s health.

Impact to Industry

Higher trip limits for shortspine thornyhead could increase access to healthy stocks, resulting in increased ex-vessel value, although the amount is difficult to quantify. Changes as a result of this action may not have a large effect on the stock per se; the possibility of exceeding harvest limits could have a negative impact on the fishery, albeit a small impact because the take of shortspine thornyheads in this sector represents a bycatch amount of the sablefish fishery.

Bocaccio South of 34°27' North Latitude Management Measures

Background:

For 2013-14 California groundfish fisheries, bocaccio have been managed to sector specific harvest guidelines (i.e. trawl, non-trawl, recreational). The harvest guideline (HG) for non-trawl fixed gear is expected to increase in 2015 and 2016 to 80.1 mt and 83.1 mt respectively. The 2011 update assessment indicated that a strong 2010 year class is moving through the fishery (particularly south of 34°27' N. latitude) and as such, encounters (and discarding) have increased and can limit access to healthy stocks. As a result, the Council requested analysis of higher trip limits for the LE and OA sectors south of 34°27' N. latitude. The 2014 commercial management measures for bocaccio rockfish are described in Table B-32.

Table B-32. Bocaccio management measures south of 34°27' N. latitude for the 2014 commercial groundfish fisheries.

Fishery	
Commercial	Sorting requirement for all commercial landings
Limited Entry Trawl	Managed under IFQ
Limited Entry Fixed Gear	Bi-monthly limit management. Current limits south of 34°27' N. latitude are: Period 1: "*300 lb./2 months*" Period 2: Closed Period 3: "*300 lb./2 months*" Periods 4-6: *"500 lb./2 months"* Bi-monthly limits can be adjusted through routine in-season action.
Open Access	Bi-monthly limit management. Closed Period 2 Current limits south of 34°27' N. latitude are: Period 1: *"100 lb./2 months"* Period 2: Closed Period 3: *"100 lb./2 months"* Periods 4-6: *"200 lb./2 months"* Bi-monthly limits can be adjusted through routine in-season action.

2015-2016 Management Considerations:
Fewer than 10 LE vessels land bocaccio south of 34°27' N. latitude, while the number of OA vessels is roughly twice as large. Total mortality estimates reported from the West Coast Groundfish Observer Program (WCGOP) indicate that approximately six percent of the non-trawl fixed gear HG was attained in 2012 (Table B-33). Encounters are expected to increase as the bocaccio population continues to rebuild (i.e. rebuilding paradox). During the 2011-2012 management cycle, 5 limited entry vessels (83 percent of the LE fleet) landed less than 20 percent of the theoretical maximum amount they could have landed (Appendix A). In the open access sector, 28 vessels (72 percent) landed less than 20 percent of their theoretical maximum amount (Appendix A).

Table B-33. Total bocaccio mortality (in metric tons) in the non-trawl fixed gear sector (LE and OA combined) south of 40°10' N latitude from 2011-2012. (source: West Coast Groundfish Observer Program)

Year	Mortality	HG	% HG
2011	2.3	58.6	4 %
2012	3.3	58.6	6 %

Management Options

Option 1-No Action: Maintain current trip limits for LE and OA sectors south of 34°27' N latitude.

Under Option 1, the 2014 trip limits would remain in place for both LE and OA sectors.

Biological Impacts Under Option 1

Projected Impacts

Under No Action, projected mortality for bocaccio south of 34°27' N latitude is 1.1 mt and 2.5 mt for the LE and OA sectors, respectively. Between 40°10' and 34°27' N. latitude, average landings (2011 and 2012) for both sectors combined were 0.9 mt. The projected landings for the entire area south of 40°10' N. latitude under No Action is 4.5 mt, which is well below the HG (Table B-34).

Table B-34. Summary of bocaccio projected landings south of 40°10' N. latitude (by sector) under No action.

Area	Limited Entry	Open Access
40° 10' to 34° 27' N. lat.	0.9	
South of 34° 27' N. lat.	1.1	2.5
Total	4.5	

Stock Status

Formally designated as overfished in 1999, the current stock assessment indicates an increasing abundance trend and progress towards rebuilding (Field, 2011).

Under Option 1, no changes to stock status or progress towards rebuilding are expected.

Option 2: Increase trip limits for LE and OA sectors south of 34° 27' N latitude

Under Option 2, increased bi-monthly trip limits south of 34° 27' N. latitude were investigated to accommodate increased encounters and minimize discarding as the stock continues to rebuild.

Individual landings reported in PacFIN from 2011-2012 for LE and OA sectors were used to analyze catch limits by the fleet. Although the HG for bocaccio applies to the entire area south of 40°10' N latitude, only modifications to trip limits south of 34°27' N latitude were investigated (i.e., trip limits between 40°10' and 34°27' N. latitude were status quo). For analytical and managerial ease bi-monthly limits are assumed the same in each period. The years 2011 and 2012 were ultimately chosen as the basis for this model because they are the most representative of current and future fishing behavior. Average landings during this time period for the area between 40°10' and 34°27' N latitude were added to the analytical options to project landings for the entire area south of 40°10' N latitude.

Limited Entry Bi-Monthly Trip Limit Options

The LE bi-monthly trip limit options for bocaccio south of 34°27' N. latitude range from 750 lb./2 months (Option 2a) to 1,000 lb./2 months (Option 2b). In recent years the majority of vessels have taken less than half of the maximum trip limit during any given period.

Open Access Bi-Monthly Trip Limit Options
The OA bi-monthly trip limits range from 250 lb./2 months (Option 2a) to 500 lbs/2 months (Option 2b). Participation in the OA sector has traditionally been more unpredictable than LE, making it difficult to predict catch and fleet behavior; therefore it is possible that projected landings could be higher than expected.

Table B-35 describes projected landings under each Option for the LE and OA sectors. These Options are not mutually exclusive, that is, the Council could recommend a different Option for each sector.

Table B-35. Comparison of projected landings of bocaccio in the LE and OA sectors under No Action (Option 1) small increase (Option 2a) and large trip limit increase (Option 2b). Projected landings between 40°10' and 34°27' N. latitude are based on average landings during 2011-2012. (Note: the more conservative 2015 HG was used.)

Alternatives	LE S. 34° 27' N. lat.		OA S. 34° 27' N. lat.		Projected Landings 40°10' - 34°27' N. lat.	Total	% of HG
	Trip limit	Projected Landings	Trip limit	Projected Landings			
Option 1	500	1.1	100	2.5	0.9	4.5	6 %
Option 2a	750	1.7	250	6.2	0.9	8.8	11 %
Option 2b	1000	2.2	500	12.4	0.9	15.6	19 %

Biological Impacts
Under Option 2a, landings are projected to increase approximately 55 percent (0.6 mt) and 160 percent (3.7 mt) in the LE and OA sectors respectively compared to No Action (Option 1). While under Option 2b projected landings are expected to increase by 100 percent (1.1 mt) in the LE sector and 396 percent (9.9 mt) in the OA sector compared to No Action. Similar to Option 1, mortality for bocaccio south of 40°10' N. latitude is projected to be well below the non-trawl fixed gear HG.

Stock Status
Similar to Option 1, no changes to stock status or rebuilding progress are expected.

Impacts to Industry
Higher trip limits for bocaccio could increase access to healthy stocks, resulting in increased ex-vessel value, although the amount is difficult to quantify. Changes as a result of this action may not have a large effect on the sectors as a whole, but could be of importance to some individuals in each sector.

MINOR SHELF ROCKFISH COMPLEX SOUTH of 34°27' N. LATITUDE MANAGEMENT MEASURES

Background:

For 2013-14 California groundfish fisheries, the minor shelf rockfish complex has been managed to sector specific allocations (i.e. trawl, non-trawl). Shelf rockfish are not formally allocated within non-trawl sectors, that is, the non-trawl commercial LE and OA sectors, as well as the recreational sector share the non-trawl allocation. The non-trawl allocation is expected to increase substantially from 615 mt in 2014 to 1,381 mt in 2015-16. Based on an industry request, the Council requested analysis of higher trip limits for LE and OA sectors south of 34°27' N. latitude. The 2014 commercial management measures for shelf rockfish south of 34°27' N. latitude are described in Table B-36.

Table B-36. Shelf rockfish management measures for the 2014 commercial groundfish fisheries, south of 34°27' N. latitude.

Fishery	
Commercial	Sorting requirement for all commercial landings
Limited Entry Trawl	Managed under IFQ
Limited Entry Fixed Gear	Bi-monthly limit management. Current limits south of 34° 27' N. latitude are: Period 1: *"3,000 lb./2 months*" Period 2: Closed Period 3: *"3,000 lb./2 months*" Periods 4-6: *"4,000 lb./2 months"* Bi-monthly limits can be adjusted through routine in-season action.
Open Access	Bi-monthly limit management. Current limits south of 34° 27' N. latitude are: Period 1: *"750 lb./2 months"* Period 2: Closed Period 3: *"750 lb./2 months"* Periods 4-6: *"1,000 lb./2 months"* Bi-monthly limits can be adjusted through routine in-season action.

2013-2014 Management Considerations:
Participation in the fixed gear shelf rockfish fishery south of 34°27' N. latitude is limited, with fewer than 30 vessels operating in the OA sector and six vessels in the LE sector. Total mortality estimates reported from the West Coast Groundfish Observer Program (WCGOP) indicate that approximately 61 percent of the non-trawl allocation was attained in 2012. Had an intersector allocation (i.e. trawl, non-trawl allocations) been in place in 2009 and 2010, attainment would have been approximately 47 and 31 percent in each year respectively, although the recreational sector accounts for the majority of the total estimated mortality (Table B-37). During the 2011-2012 management cycle, 9 limited entry vessels (100 percent of the LE fleet) landed less than 20 percent of the theoretical maximum amount they could have landed (Appendix A). In the open access sector, 42 vessels (84 percent) landed less than 20 percent of their theoretical maximum amount (Appendix A).

Table B-37. Total Mortality (in metric tons) in the minor shelf rockfish complex non-trawl fixed gear sector (LE and OA combined) south of 40°10' N. latitude from 2009-2012. (source: West Coast Groundfish Observer Program)

Year	Commercial (non-trawl)	Recreational	Non-Trawl Allocation	% Non-trawl Allocation
2009	8.3	246	615	41%
2010	14.2	212	615	37%
2011	19.9	326	615	53%
2012	23.1	354	615	61%

Management Options
Option 1-No Action: No increase to trip limits for shelf rockfish south of 34°27' N. latitude
Under Option 1, the 2014 trip limits would remain in place for both LE and OA sectors.

Biological Impacts Under Option 1

Projected Impacts
Under No Action, projected mortality for minor shelf rockfish south of 34°27' N. latitude is 3.9 mt and 14.3 mt for the LE and OA sectors, respectively (Table B-38); between 40°10' N. and 34°27' N. latitude, average landings during 2011 and 2012 were 16.1 mt for both sectors combined. Assuming that take in the recreational fishery south of 40°10' N. latitude is unchanged from 2012 (354 mt; WCGOP Total Mortality Report, 2012); projected mortality of shelf rockfish south of 40°10' N. latitude is 389 mt.

Data indicate that few participants attained greater than half of the allowable limit, averaging approximately 240 lbs/2mo and 280 lbs/2mo in the LE and OA fleets respectively during 2011 and 2012.

Table B-38. Summary of commercial minor shelf rockfish landings south of 40°10' N. latitude (by sector) under No Action.

Area	Limited Entry	Open Access
40°10' to 34°27' N. lat.	16.1	
South of 34°27' N. lat.	3.9	14.3
Total	34.3	

Stock Status
The minor shelf rockfish complex south of 40°10' N. latitude is comprised mainly of unassessed stocks, with the exception of greenspotted rockfish and greenstriped rockfish. The greenspotted rockfish assessment indicated the stock is in the precautionary zone; greenstriped rockfish was considered healthy. Greenspotted rockfish have shown a substantial increase in biomass since the RCAs were implemented in 2003 (2013-2014 FEIS). Given that shelf rockfish are particularly well protected by the RCAs and the shelf rockfish ACL is expected to increase in 2015-16, no changes to stock status are expected under No Action.

Option 2: Increase trip limits for LE and OA sectors south of 34°27' N. latitude
Under Option 2, increased bi-monthly trip limits south of 34°27' N. latitude were investigated, which may afford greater opportunity under the increased non-trawl allocation.

Individual vessel landings reported in PacFIN from 2011-2012 for LE and OA sectors were used to analyze catch limits by the fleet. Although the allocation for the minor shelf rockfish complex applies to the entire area south of 40°10' N. latitude, only modifications to trip limits south of 34°27' N. latitude were investigated (i.e. trip limits between 40°10' and 34°27' N. latitude were status quo). For analytical and managerial ease bi-monthly limits are assumed the same in each period. The years 2011 and 2012 were ultimately chosen as the basis for this model because they are the most representative of current and future fishing behavior. Average commercial landings between 40°10' and 34°27' N. latitude during this time period and the 2012 recreational total mortality reported by WCGOP for the area south of 40°10' N. latitude were added to the analytical options to project mortality for the entire area south of 40°10' N. latitude.

Limited Entry Bi-Monthly Trip Limit Options
The LE bi-monthly trip limit options for minor shelf rockfish complex south of 34°27' N. latitude range from 4,000 lb./2 months (Option 2a) to 5,000 lb./2 months (Option 2b). In recent years the majority of vessels have taken less than half of the maximum trip limit during any given period.

Open Access Bi-Monthly Trip Limit Options
The OA bi-monthly trip limits range from 1,500 lb./2 months (Option 2a) to 2,500 lbs/2 months (Option 2b).

Although no effort shift occurred during previous inseason actions, participation in the OA sector has traditionally been more unpredictable than LE, making it difficult to predict catch and fleet behavior; therefore it is possible that projected landings could be higher than expected if the trip limit is increased sufficiently to encourage new participation.

Table B-39 describes projected landings under each Option for the LE and OA sectors. These Options are not mutually exclusive, that is, the Council could recommend a different option for each sector.

Table B-39. Comparison of minor shelf rockfish projected landings in the LE and OA sectors under No Action (Option 1) small increase (Option 2a) and large trip limit increase (Option 2b). Projected landings between 40°10' and 34°27' N. latitude are based on average landings during 2011-2012. (Note: recreational catches derived from the 2012 WCGOP Total Mortality Report.)

Alternatives	Limited Entry S. 34°27' N. lat.		Open Access S. 34°27' N. lat.		Projected Landings 40°10' -34°27' N. lat.	Projected Recreational Catch	Total	% of Non-Trawl Allocation
	Trip limit	Projected Landings	Trip limit	Projected Landings				
Opt. 1	3,000	3.9	750	14.3	16.1	354	387	28 %
Opt. 2a	4,000	4.3	1,500	24.0	16.1	354	399	29 %
Opt. 2b	5,000	5.4	2,500	39.9	16.4	354	416	30%

<u>Biological Impacts</u>
Projected Mortality
Under Option 2a, landings are projected to increase approximately 10 percent (0.4 mt) and 68 percent (9.7 mt) in the LE and OA sectors respectively compared to No Action (Option 1). Under Option 2b projected landings are expected to increase by 38 percent (1.5 mt) in the LE sector and 179 percent (25.6 mt) in the OA sector compared to No Action. Similar to Option 1, mortality of shelf rockfish south of 40°10' N. latitude is projected to be well below the non-trawl allocation.

Stock Status
Similar to Option 1, no changes to stock status are expected as a result of this action. The increase in projected landings will keep mortality well within the non-trawl allocation and no changes to the current RCAs structure have been proposed (i.e. the RCA protections afforded under option1 will remain in place).

<u>Impacts to Industry</u>
Higher trip limits could increase harvest given the sizeable increase in the non-trawl allocation; although difficult to quantify, increased ex-vessel value could be expected as a result. Given the relative size of the fleet, changes as a result of this action may not have a large effect on the sectors as a whole, but could be of importance to some individuals in each sector.

B.7 Analysis of lingcod retention in the nearshore and non-nearshore fixed gear fisheries in Periods 1, 2, and 6

Overview
Lingcod retention is prohibited in Periods 1, 2, and part of 6 for both limited entry and open access fixed gears under the status quo regulations. In recent years, lingcod mortality has been far below the ACL

north and south of 42° N. latitude with 25 percent and 13 percent attainment in 2011 and 34 percent and 16 percent in 2012, respectively. Public testimony was received from Mr. Jeff Miles at the September 2013 Council meeting requesting some level of retention during periods 1, 2, and 6. The request was made to land lingcod that are incidentally caught and discarded, with the suggestion that trip limits might be set low enough to prevent changes in fishermen’s behavior (i.e., prevent targeting). Higher trip limits than those needed to allow for incidental take may further increase attainment of the non-trawl allocation of the ACL, but bycatch of overfished species while targeting lingcod is a consideration. The proposed change would allow lingcod retention in the restricted access state permitted nearshore fishery in California and Oregon, the open access nearshore fishery in Oregon, and the limited-entry and open access non-nearshore fixed gear fisheries in California, Oregon and Washington.

Background

The prohibition on retention of lingcod during specific periods has been in effect for commercial fixed gear fisheries since the 1990s to improve the conservation of lingcod after being declared overfished. The closure was put in place to minimize impacts on lingcod during their spawning season, which is from December to April (Hamel et al. 2009). Females move in to depths shallower than 50 fm to spawn and males guard nests from predation. Although females do not spend much time in the spawning area, males are concentrated in these shallow waters guarding the eggs during winter and spring months (Love 1996). The season closure for the fixed gear fishery was presumably designed to reduce catch of these males while concentrated during the nest-guarding season to facilitate rebuilding of the stock.

Lingcod was declared rebuilt in 2009, when the status was determined to be 61.9 percent for the northern component and 73.7 percent for the southern component. The coastwide status was 67.0 percent at the beginning of 2009, well above the 40 percent target spawning stock biomass (Hamel *et al.* 2009). As a result, there is no longer a lingcod closed season for individual fishing quota (IFQ fisheries; trawl and fixed gear) or Oregon and California recreational fisheries. The Council is now considering eliminating the spawning season closures in the commercial fixed gear fishery since the lingcod stock has rebuilt and increasing season length may result in higher attainment of the ACL.

Current RCA closures prevent access to much of the lingcod stock, and length restrictions may already as short as they can be while maintaining desirable fillets. Trip limits that are appreciably higher than needed to accommodate bycatch may lead to increase targeting of lingcod, which co-occur with overfished rockfish species. Increasing the season length while maintaining moderate trip limits to allow incidental take may be the most viable means of increasing attainment of the ACL without increasing interactions with overfished species.

Lingcod predate on rockfish both as juveniles and adults. Rockfish and lingcod co-occur on rocky reef habitat and lingcod are currently discarded by participants in the fishery that encounter them while fishing for rockfish during the closed period for lingcod. While mortality on discarded lingcod is relatively low (~7 percent) reflecting hooking and handling mortality since they do not suffer from barotrauma, rockfish discarded by those targeting lingcod exhibit mortalities ranging from 30 – 54 percent in depths less than 30 fm and 100 percent mortality in depths greater than 30 fm. The main concern, therefore, is that targeting of lingcod will result in increased mortality for overfished rockfish species and the potential for the sector allocations to be exceeded.

One important consideration is that period 2 is closed for rockfish retention in the nearshore fishery south of 40°10′ N. latitude. Allowing any retention of lingcod during period 2 in the south may result in increased rockfish bycatch and discard. Maintaining a closure for lingcod during the corresponding months of March and April shoreward of the RCA may be considered under each of the options analyzed to prevent greatly increased rockfish discard mortality in the region in question.

In order to evaluate the potential benefits and impacts from retention by various fixed gear sectors (i.e. nearshore vs. non-nearshore, limited entry vs. open access) under the existing regulations, trip limits were developed to reflect current bycatch rates and to emulate trip limits that are currently allowed during other months. Based on these principals, the following options were analyzed:

Option 1: No Action – maintain prohibition on retention of lingcod in the commercial fixed gear fisheries in periods 1, 2 and 6 (December).

Option 2: Allow retention of lingcod in commercial fixed gear fisheries during periods 1, 2 and 6 at incidental-catch levels equivalent to average current encounters during the closed periods of 100 lb. per month in the open access fishery and 200 lb. per two month period in the limited entry fishery (i.e., to allow the retention of discarded bycatch).

Option 3: Allow retention of lingcod in commercial fixed gear fisheries during periods 1, 2 and 6 with trip limits of 400 lbs per month in the open access fishery and 800 lbs per two month period in the limited entry fishery (i.e., equivalent to the trip limits during current open months).

Data

Catch and effort for lingcod were estimated for the closed season (December – April) and the open season (May – November). Estimates were calculated and evaluated for the nearshore fixed gear commercial fishery and the non-nearshore fixed gear commercial fishery. Data from WCGOP from 2002-2011 provided lingcod catch (discard and retained) by trip. PacFIN data (2007-2012) provided the average number of trips per vessel per month, average number of vessels fishing per month, and recent landings by the fleet. Lingcod catch per trip (from WCGOP) was then expanded to estimate average lingcod catch per vessel per month (PacFIN data) used in deriving trip limits reflecting incidental catch levels.

Only WCGOP data from the nearshore fixed gear fishery were used to provide maximum bycatch-rate estimates during the current closed period. Encounters with lingcod seaward of the RCA during winter months (the current closed period) are infrequent relative to encounters by the nearshore fixed gear fishery (i.e., many of the larger lingcod are shallow during the spawning season). As such, allowing retention in the non-nearshore fishery that is far higher than their incidental encounter rates during December –April would likely not result in a substantial increase in lingcod targeting. Densities of lingcod seaward of the RCA are low during the December-April period and increased effort for lingcod (i.e., targeting) may not make economic sense for that fishery. For example, the average lingcod catch during the closed periods for the nearshore fishery is 35 lbs per trip, whereas the average lingcod catch for the non-nearshore fishery is 7.2 lbs per trip during the same periods (WCGOP data). Note that lingcod catch (discard + retained) during the open periods (May – November) are 39 lbs per trip for nearshore fixed gear and 43.2 pounds per trip for the non-nearshore fishery. The higher encounter rate during the open season makes sense, since this is during the non-spawning season and many larger adults migrate back to deeper waters.

Comparison of Options

Option 1: No Action

Under the No Action Option, retention of lingcod by the fixed gear fishery is prohibited in periods 1, 2 and 6 with the exception of November when a 400 lb. per month trip limit is allowed in both the limited entry and open access fisheries.

Fishing Activity in Commercial Fixed Gear Fisheries under Option 1

The nearshore fixed gear fishery in California and Oregon are subject to state-limited entry permits, while Washington does not allow a commercial fishery in the nearshore. The non-nearshore fixed gear fishery is prosecuted in all three states. Both nearshore and non-nearshore fishery trip limits are divided at 40°10′ N. latitude. The limited entry and open access (Federal) fixed gear trip limits in each period or month are provided in Table B-40.

It is important to point out that the nearshore rockfish fishery south of 40°10′ N. latitude is currently closed in period 2 (March and April), whereas the nearshore rockfish fishery is open year round to the north. The non-nearshore fishery operates year round and primarily targets sablefish. In the nearshore fishery, an average of 3.3 trips per month was taken during the closed season by a monthly average of 82 vessels during 2007-2012. During the open season, an average of 4.2 trips per month and 168 vessels per month took place during the open season. The higher effort during the open season coincides with months of relatively fair weather, allowing greater fishing opportunities.

Table B-40. Commercial fixed gear trip limit regulations for lingcod north and south of 40°10′ N. latitude by sector with closed periods (in gray) under Option 1.

<table>
<tr><th>Sector</th><th>Jan - Feb</th><th>Mar - Apr</th><th>May - Jun</th><th>Jul - Aug</th><th>Sep - Oct</th><th colspan="2">Nov - Dec</th></tr>
<tr><td>LE North</td><td colspan="2">Closed</td><td colspan="3">800 lb./ 2 months</td><td>400 lb.</td><td>Closed</td></tr>
<tr><td>LE South</td><td colspan="2">Closed</td><td colspan="3">800 lb./ 2 months</td><td>400 lb.</td><td>Closed</td></tr>
<tr><td>OA North</td><td colspan="2">Closed</td><td colspan="4">400 lb./ month</td><td>Closed</td></tr>
<tr><td>OA South</td><td colspan="2">Closed</td><td colspan="4">400 lb./ month</td><td>Closed</td></tr>
</table>

Biological Impacts under Option 1

Projected Lingcod Mortality

Under the no action alternative, lingcod mortality in the fixed gear fisheries during periods 1, 2 and 6 are expected to be the same as recent years in the past, assuming trip limits for other co-occurring target species do not change. If the trip limits for other target species during the closed season increase, the number of lingcod and overfished species encountered and discarded may increase. At present a 7 percent discard mortality rate reflecting rod and reel gear is anticipated for released lingcod[1]. The landings of lingcod in the last five years for each sector from Washington, Oregon and California are provided in the Table B-41. An average of 52.5 mt of lingcod mortality from the fixed gear fishery north of 42° N. latitude and 31.4 mt to the south are expected under the no action alternative based on the average mortality in 2011 and 2012 from WCGOP total mortality reports. The non-trawl allocations in 2014 were stratified at of 42° N. latitude and mortality from the non-trawl fishery in 2011 and 2012 were 21 percent and 49 percent of the respective allocations north and south, respectively indicating that the fishery has fallen far short of attainment under the current regulations.

[1]http://www.pcouncil.org/groundfish/current-season-management/past-management-cycles/2009-2010-final-environmental-impact-statement/, pg. 307.

Table B-41. Landings of lingcod in nearshore and non-nearshore fixed gear fisheries in California North and South of 40°10′ N. latitude, Oregon and Washington under status quo regulations (Option 1).

Period	Sector			
	Washington	Oregon	California North of 40°10′ N. latitude	California South of 40°10′ N. latitude
Nearshore LE	NA	2.85	0.47	0.52
Nearshore OA	NA	25.70	4.41	15.32
Non-Nearshore LE	3.26	5.10	1.60	0.62
Non-Nearshore OA	2.03	12.85	1.94	3.19

Projected Overfished Species Mortality

In 2011 and 2012 an average of 1.6 mt of yelloweye rockfish, 1.6 mt of canary rockfish, 0 mt of cowcod and 2.8 mt of bocaccio mortality were estimated to have occurred in the fixed gear fishery in pursuit of all targets both in the nearshore and non-nearshore. These estimates reflect the expected mortality under the no action alternative. However, for comparison of alternatives, we provide the no-action projected impacts by using the GMT Overfished Species Nearshore Model. These projected impacts, using 5-year average landed catches from PacFIN (2008-2012) as model inputs, are shown in Table B-42. The projected impacts under Option 1 (No Action) using the Nearshore Model for the Oregon and California nearshore fisheries north and south of 40°10' N latitude are provided in Table B-42. Note that the projected impacts are different than the average mortality shown by WCGOP. The inter-annual variability for overfished species impacts is high, and the projection model estimates long-term average impacts.

Table B-42. Projected mortality for OFS in metric tons from the nearshore bycatch projection model using the lingcod mortality from year round fishing projected from the 5-year average landings of lingcod and targeted nearshore species as inputs. California north and south reflects the management line separating them at 40°10' N latitude.

Species	Oregon	CA North	CA South	Total
Bocaccio	0.00	0.00	0.46	0.46
Canary rockfish	0.93	0.53	5.59	7.05
Cowcod	0.00	0.00	0.00	0.00
Darkblotched	0.12	0.00	0.07	0.18
Yelloweye rockfish	0.82	0.22	0.12	1.16

Stock Status

Lingcod

Though once overfished, the lingcod stock was deemed rebuilt after the most recent assessment in 2009 and are now considered healthy (>40 percent of historical biomass). The coastwide stock status was estimated to be 67 percent of historical spawning stock biomass, with the stock south of 42° N. latitude at 61.9 percent and north of 42° N. latitude at 73.7 percent. Current harvest is far below the non-trawl allocation and will not adversely affect the stock status.

Overfished Species

Under Option 1, the mortality of overfished species is projected to remain the same as recent years, which is expected to be below the sector specific fixed gear allocations. Thus the stock status of overfished species and rebuilding plans would be unaffected.

Socioeconomic Impacts under Option 1

Under the no action alternative, lingcod caught as bycatch during the closed months of the fishing season are discarded and revenues from landing them is forgone by participants in the fishery. In addition, no targeted fishery for lingcod is permitted during the closed months preventing effort from being exerted to increase attainment of the ACL, resulting in forgone revenue from directed effort. Thus fishery participants and coastal communities will continue to forgo potential revenue from converting lingcod discards to landings.

Option 2

Option 2 would allow retention of lingcod in fixed gear fishery during periods 1, 2 and 6 at incidental levels equivalent to the average encounter rates observed during the closed periods in recent years (WCGOP, 2002-2011) and expanded by recent fishing effort (PacFIN, 2008-2012). The trip limits would be 100 lb. per month for the open access fishery and 200 lb. per two month period in the limited entry fishery (Table B-43).

Change in Fishing Activity Compared to Option 1

The average estimates of discarded lingcod during the closed months in each sector from WCGOP provided the basis for the trip limits under Option 2 provided in

Table B-43. The intent of Option 2 is to allow retention and landings of lingcod that would otherwise be discarded during the closed season. The encounter rates in the nearshore fishery were much higher than the non-nearshore fishery during the closed period (35 pounds per trip versus 7 pounds per trip, respectively) since lingcod move onshore during the winter and spring months for spawning. Thus estimates from the nearshore fishery were used as the basis for discard rates to better accommodate incidental take and convert more discards to landings. An attempt was made to adjust trip limits to account for discarding due to length restrictions during the open season, but discarding may also be due to overages against the trip limits in open months, which were confounding. Given the average pounds of lingcod encountered with and without accounting for discarding of 80 and 117 lb. per month, respectively, we provide a bracketed value for trip limits of 100 lb. per month for the open access fishery and 200 lb. per two month period for the limited entry fishery (Table B-44).

Since the average encounters per month across all nearshore fishery participants were used as the basis for trip limits, many vessels encountered more lingcod than the average (Figure B-14). Thus many vessels would still incidentally encounter more lingcod than the trip limits would allow them to retain, which would still be discarded under Option 2. As seen in Figure B-14, with a trip limit of 100 lbs per month, 69.5 percent of the trips would not exceed the trip limit, but 30.5 percent of trips would continue to discard some of the encountered lingcod. Trends in the percent of trips with a given amount of catch per month were examined for both longline and vertical hook and line gear. While those fishing with longline gear encountered nearly 10 lb. per month more than vertical hook-and-line gear, the difference was not great enough to justify the added complexity of trip limits for each gear type. Thus the values for all nearshore participants combined were used to derive trip limits irrespective of gear type.

The landing restrictions under Option 2 are not expected to result in additional mortality of other target stocks or overfished rockfish species. While fisheries are expected to be prosecuted in a similar fashion to Option 1, the additional opportunity for lingcod south of 40°10′ N. latitude in period 2 when rockfish is closed presents the possibility of additional mortality of overfished rockfish as well as discarding of other healthy rockfish species while targeting lingcod. While this is a possibility, the landing restrictions may be low enough that participants in the fishery may not opt to target lingcod during the closed season for rockfish in period 2 as the revenue generated from lingcod alone may not be sufficient to be profitable on its own. Thus, the landing restrictions are expected to be sufficiently low to prevent an appreciable increase in overfished species mortality, even if trip limits are attained.

Table B-43. Average lingcod discard rates from WCGOP, fishing effort from PacFIN, and projected lingcod catch for open and closed seasons. The average number of trips per vessel per month, combined with the average lingcod catch rate, formed the basis for the lingcod trip limits under Option 2 intended to allow retention of incidental catch.

Fishery and Period	Metrics	Values
Nearshore fishery (Dec-April; "closed")	Average Lingcod Catch per Trip (All Discarded; lbs)	35.0 lbs
	Average Number of Trips/Vessel/Month	3.3
	Average Number of Vessels Making Landings / Month	82
	Average Expected Lingcod Catch/Vessel/Month =(35 lbs) x (3.3 trips/vessel/month) [a]	117 lbs / month, or 234 lbs / 2 mos
	Average Expected Landings / Vessel / Month, assuming 32% discard rate = (68%) x (117 lbs)[b]	80 lbs / month or 160 lbs / 2 mos

Table B-44. Proposed commercial fixed gear trip limits for north and south of 40°10′ N. latitude by sector, under Option 2.

Sector	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	
LE North	200 lb./2 months		800 lb./ 2 months			400 lb.	100 lb.
LE South	200 lb./2 months		800 lb./ 2 months			400 lb.	100 lb.
OA North	100 lb./ month		400 lb./ month				100 lb.
OA South	100 lb./ month		400 lb./ month				100 lb.

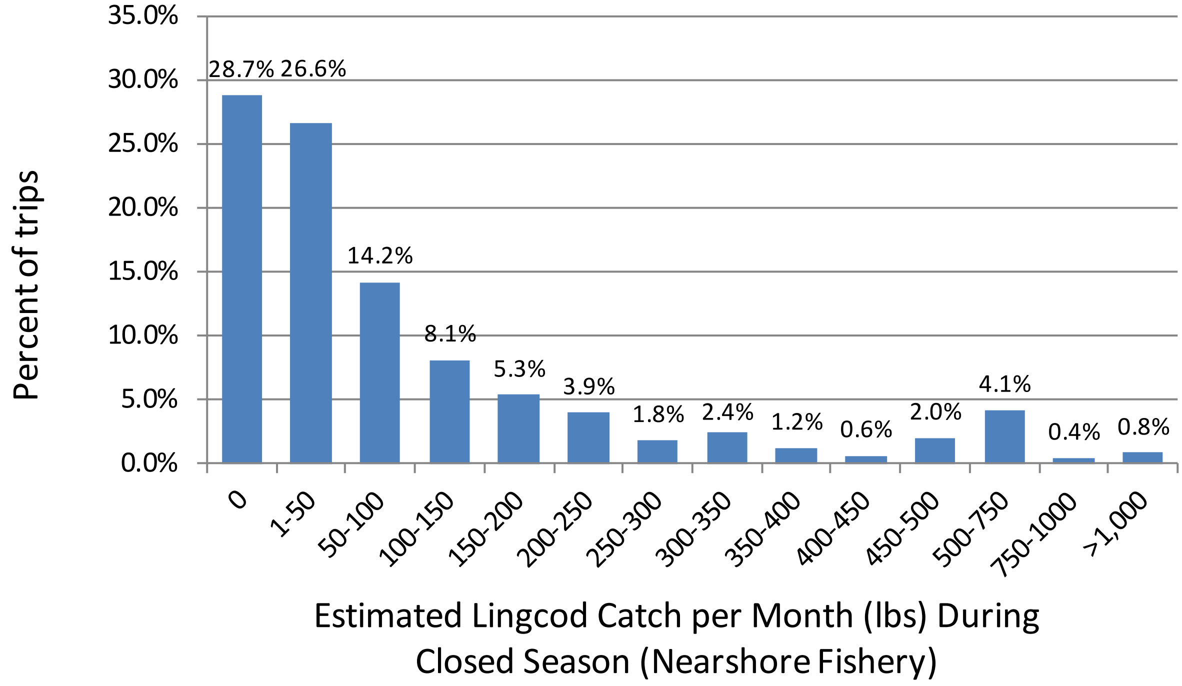

Figure B-14. Projected catch of lingcod per month during the closed season by individual vessels (percent) in the nearshore fixed gear fishery.

Biological Impacts Compared to Option 1

Lingcod Mortality

Lingcod mortality is expected to increase, though encounter rates are not, as participants in the fishery will retain some lingcod encountered (at 100 percent mortality) rather than discard all lingcod encountered (at 7 percent mortality). There would be no expected increase in lingcod encounter rates under this option relative to Option 1. Increased targeting during the closed period is not expected under Option 2, because trip limits were set to reflect incidental catch rates. The projected mortality of lingcod under this alternative is provided in Table B-45.

Table B-45. Projected landings of lingcod in nearshore and non-nearshore fixed gear fisheries in California North and South of 40°10′ N. latitude, Oregon and Washington under Option 2.

Period	Sector			
	Washington	Oregon	California South of 40°10′ N. latitude	California North of 40°10′ N. latitude
Nearshore LE	NA	3.49	0.55	1.70
Nearshore OA	NA	29.94	5.02	17.34
Non-Nearshore LE	3.67	5.91	1.70	0.70
Non-Nearshore OA	2.0	14.59	2.13	3.44

Overfished Species Mortality

Under Option 2, no additional mortality of overfished species is anticipated since trip limits are set low enough to only accommodate conversion of already encountered but discarded lingcod to landings while targeting other species. Only the nearshore fishery south of 40°10′ N. latitude would be expected to incur additional mortality in period 2 if trip limits of lingcod were targeted, since rockfish is closed during this period. Given that trip limits are set low enough that targeting of lingcod alone is unlikely to be profitable, overfished species mortality is expected to be similar to that under Option 1. If the open access fishery increases effort in nearshore waters to target lingcod, there may be a minor increase in rockfish bycatch including overfished species.

Data Uncertainty Compared to Option 1

Though the trip limits are set to allow retention of lingcod encountered as bycatch, it may encourage some additional effort from the open access fishery, presenting some uncertainty in the lingcod and overfished species mortality. If selective gear is employed, any increase in open access effort may be exerted with minimal unintended consequences in the form of overfished species bycatch. If period 2 remains closed south of 40°10′ N. latitude, there will be less uncertainty in mortality as any additional effort targeting lingcod during the rockfish closure would result in additional bycatch of rockfish relative to Option 1. Though opening lingcod retention for open access during period 2 south of Point Conception could result in increased uncertainty in lingcod and overfished species impacts relative to Option 1, it is expected that trip limits may be low enough to prevent lingcod targeting; therefore, rockfish mortality is expected to be similar to Option 1.

Stock Status

Lingcod

Under Option 2**,** no changes to lingcod stock status are expected compared to the no action alternative since lingcod mortality has been far below the non-trawl allocation and expected to remain so under Option 2. Given the projected increase in impacts, the level of increase is expected to be far below levels that would result in overfishing and are not expected to adversely affect stock status.

Overfished Species

Under Option 2**,** no changes to the stock status or rebuilding progress of overfished species are expected since mortality is projected to remain below the sector specific harvest limits for the nearshore and non-nearshore fisheries.

Socio-economic Impacts compared to Option 1

Allowing fishery participants to retain incidentally encountered lingcod that were previously discarded would increase revenue from current operations targeting other species within incidental lingcod encounters. In 2013, the average price per pound coast wide ranged from $0.36 to $3.62 per lb. depending on the month, state and sector providing $36 to $362 per month of potential revenue from lingcod assuming the trip-limit can be attained. While the low trip limits make it unlikely that fishery participants will choose to target lingcod, such targeting may become worthwhile if the price per pound makes the trip profitable, despite the relatively low trip limits. If the trip-limit cannot be attained or if fuel or other variable costs make it unprofitable, or alternatively opportunity costs are too high to justify changing targets, directed effort may not be economically viable and trips targeting lingcod may be unlikely.

Option 3

Option 3 would allow retention of lingcod in fixed gear fishery during periods 1, 2 and 6 with trip limits of 400 lbs per month in the open access fishery and 800 lbs per two month period in the limited entry fisheries.

Change in Fishing Activity Compared to Option 1

The intent of Option 3 is to allow trip limits for lingcod that are the same as the status quo in months currently open to fishing in both the open access and limited entry fisheries during periods 1, 2 and 6 (Table B-46). If effort is the same as the months currently open to fishing at the current trip limits, landings are expected to be lower than those observed in the open months as the trip limits would be the same, but effort is lower during the winter and early spring due to weather. The fishing effort for lingcod would be expected to increase during periods 1, 2 and 6 relative to the no action alternative. The magnitude of the increase in mortality depends on changes in fishing behavior of the limited entry fishery and the number of participants in the open access fishery which is difficult to predict.

Approximately eight percent of trips fishing for nearshore rockfish species during the closed months encountered more lingcod than can be retained under the 400 lb. per month open access trip limits and one percent encountered more than the 800 lb. per two month limited entry trip limits during open months (Figure B-14). It should be noted that even at the trip limit levels of 400 lb. per month for open access or 800 lb. per two months in the limited entry fishery, some participants would still be discarding lingcod even if the current trip limits during the open season were employed during the closed season (Figure B-14). Thus the trip limits under Option 3 will continue to limit landings for some trips and reduce lingcod mortality relative to an unregulated fishery.

The effort in the limited entry fishery is capped by the number of permit holders, thus the 800 lb. per two month trip-limit may increase targeting/harvest relative to other options, but the number of participants is fixed, limiting the magnitude of potential increase relative to the open access fishery. Both open access and limited entry non-nearshore fisheries primarily target sablefish, and the magnitude of the revenue generated by allowing retention of lingcod in this fishery is not expected to cause increased targeting of lingcod because the revenue they would generate is far lower than from sablefish landings. In addition, lingcod encounters are less common in the non-nearshore fishery than in the nearshore fishery during the closed season (see Table B-46), when lingcod move onshore to spawn during the winter and early spring (Love 1996). Lingcod encounters in the nearshore fishery peak during the summer month during the open season. In the nearshore fishery, the increased trip limits are expected to increase revenues and lingcod targeting. It is uncertain whether the increase would be sufficiently high to drive increased participation of latent capacity. Weather is also a factor in that the closed period coincides with a period of more inclement weather, which is expected to limit the amount of additional effort that may be exerted under Option 3.

Table B-46. Proposed commercial fixed gear trip limits for north and south of 40°10′ N. latitude by sector under Option 3.

Sector	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec
LE North	800 lb./ 2 months					
LE South	800 lb./ 2 months					
OA North	400 lb./ month					
OA South	400 lb./ month					

Biological Impacts Compared to Option 1

Lingcod mortality is expected to increase relative to the no action alternative, though it is difficult to determine the extent to which effort will increase. If additional entrants begin fishing in the open access fishery, impacts may increase further than shown here. The low increase in potential revenue makes extreme increases in effort unlikely especially considering that attainment is likely to fall short of the trip limit if targeting lingcod proves difficult. The 800 lb. per two month trip limit on the limited entry fishery may allow additional landings relative to other options, but the number of participants is limited by the number of permit holders.

To project lingcod mortality for the limited entry and open access sectors under Option 3, recent mortality during the open period was expanded to the currently closed periods (i.e., Periods 1, 2 and the second half of 6) using historical proportions of catch by time. The standard fleet capacity trip limit model documented under the analysis of trip limits for 2015-2016 was used to calculate the projected lingcod mortalities for the following fishery sectors per state including limited entry/nearshore open access (Oregon and California only) and Non-nearshore limited entry (all three states) /Non-nearshore open access (in all three states). Using the 1995-1997 period during which lingcod was open to fishing year round, the proportional take per period and/or month was calculated and used to emulate those proportions of catch by time for mortality projections. The projected annual mortalities (mt) were then calculated using the 2008-2012 set of landings as the trip limit base period. The proportions of catch by period and/or month were used to estimate the mortality during the closed months given the recent mortality during the base period. Assuming the trip limit is attained by all participants that landed lingcod during the open season, impacts on lingcod would increase in the nearshore fishery. The resulting lingcod mortalities for the fixed gear fisheries are provided in Table B-47.

Table B-47. Projected landings of lingcod in nearshore and non-nearshore fixed gear fisheries in California North and South of 40°10′ N. latitude, Oregon and Washington under Option 3.

Sector	Washington	Oregon	California	
			North of 40°10' N. Latitude	South of 40°10' N. Latitude
Nearshore LE	NA	3.89	0.71	0.69
Nearshore OA	NA	36.65	6.88	23.55
Non-nearshore LE	4.78	7.27	1.92	0.82
Non-nearshore OA	3.13	19.83	2.72	4.55

Overfished Species Mortality

The nearshore overfished species projection model was applied to calculate the OFS mortalities using five-year averages for Oregon (north of 42° N latitude) and California (between 42° N latitude and 40°10' N latitude and south of 40°10' N latitude). Under Option 3, the higher estimated catch of lingcod was imputed in the model to project the relative increase in overfished species impacts expected with trip limits shown in Table B-47. The result is an estimated percent increase in mortality in the nearshore fishery of 6.9 percent (0.08 mt) for yelloweye rockfish, 6.1 percent (0.43 mt) for canary rockfish, 6.5 percent (0.03 mt) for bocaccio and no increase in cowcod. The resulting overfished species mortality and magnitude of increase relative to status quo (in brackets) in Oregon and regions of California are presented in Table B-48.

There is no model for projecting the mortality of overfished species in the non-nearshore fishery using lingcod mortality. The assumption is made that overfished rockfish mortality will not increase in the non-nearshore fishery because it is unlikely that the trip limit will lead to additional targeting lingcod. Relatively few lingcod are encountered while targeting sablefish, especially during the winter and early spring when lingcod move onshore to spawn. If the open access fishery increases effort in nearshore waters to target lingcod, there may be an unanticipated increase in rockfish bycatch including overfished species, though the moderate trip limits for lingcod are expected to prevent excessive additional effort from the open access fishery. Relative to the contributions from the remainder of the year, the allocation to the fixed gear sectors and the ACL, the projected increase in overfished species mortality in Table B-48 are negligible.

Table B-48. Projected mortality for OFS from the nearshore bycatch projection model using the 5-year averages compared to what the OFS mortality projected increases would be with the addition of increased lingcod mortality amounts for periods 1, 2, and the second half of 6, applying the current trip limit structure (amounts) to the closed periods.

Species	Oregon	California North of 40°10' N latitude	California South of 40°10' N latitude	Total
Bocaccio	0.00 (+0.0)	0.00 (+0.0)	0.49 (+0.03)	0.49 (+0.03)
Canary rockfish	1.00 (+0.07)	0.55 (+0.02)	5.93 (+0.34)	7.48 (+0.43)
Cowcod	0.00	0.00	0.00	0.00
Darkblotched	0.13 (+0.01)	0.00 (+0.0)	0.07 (+0.0)	0.20 (+0.02)
Yelloweye rockfish	0.88 (+0.06)	0.23 (+0.01)	0.12 (+0.0)	1.24 (+0.08)

Data Uncertainty Compared to Option 1

Though the trip limits under Option 3 are set to allow retention of lingcod encountered as bycatch and facilitate attainment of the non-trawl allocation, it may encourage some additional effort from the open access fishery. The open access and limited entry fixed gear fisheries cannot retain rockfish in California waters during period 2 south of 40°10' N latitude, thus discarding of rockfish, including overfished species, may increase under Option 3. If the prohibition on retention of lingcod south of 40°10' N latitude in period 2 is maintained, uncertainty in overfished species bycatch projections and discard mortality of healthy rockfish stocks would be reduced. If selective gear is employed, open access effort may be exerted with less unintended consequences in the form of overfished species bycatch.

Stock Status

Lingcod

Under Option 3**,** no changes to lingcod stock status are expected since lingcod mortality is projected to be far below the non-trawl allocation. Given the projected increase in impacts, the level of increase is expected to be far below levels that would result in overfishing.

Overfished Species

The projected increase overfished species mortality under Option 3 is projected to result in mortality that is still below their respective harvest limits. Thus the stock status and rebuilding plans are not expected to be adversely affected by the regulations under Option 3.

Socio-economic Impacts compared to Option 1

Landing of fish previously discarded as bycatch would increase revenues for participants in the fishery and increase the profitability of existing operations by increasing marginal revenue per trip at no or limited additional cost. For those who choose to target lingcod, the revenue generated from landing lingcod may make a few trips per bi-monthly period worth taking to attain the moderate landings under the trip limit as long as the price per pound and landings make the trip economically viable. In 2013, the average price per pound coast wide ranged from $0.36 to $3.62 per lb. depending on the month, state and sector resulting in $144 to $1448 per month of potential revenue from lingcod assuming the trip-limit can be attained. If the trip-limit cannot be attained or if fuel and other variable costs exceed revenue or alternatively opportunity costs are too high to justify changing targets, directed effort may not be economically viable and trips targeting lingcod may be unlikely.

B.8 Analysis of removing gear restriction for Pacific sanddabs and "Other Flatfish" in the California fixed gear commercial fishery

Overview
The current commercial gear restriction for the "Other Flatfish" complex in the waters off California reads, "South of 42° N. lat., when fishing for "other flatfish," vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches)." The intent of this management measure was initially to prevent bycatch of overfished rockfish while fishing for members of the "Other Flatfish" complex including Pacific sanddab. Similar regulations in place in the recreational fishery, which uses similar vertical hook and line gear, were removed because they did not provide additional protection, as originally intended. Bycatch rates when targeting Pacific sanddabs and "Other Flatfish" are very low irrespective of the gear employed, thus gear restrictions are not needed to limit bycatch. Removal or liberalization of gear restrictions would simplify regulations and allow the fixed gear fleet to effectively target and attain trip limits of "Other Flatfish".

Background
Starting in 2004, gear restrictions were implemented for the commercial and recreational fisheries to allow some risk adverse targeted fishing opportunity for Pacific sanddabs inside the RCA, while minimizing bycatch of overfished species. In 2009, the analogous gear restriction on the recreational fishery was removed because encounter rates with overfished species in the fishery were so low that gear restrictions did not provide additional protection, as originally intended. In subsequent years removal of the gear restrictions in the recreational fishery have not resulted in a noticeable increase in overfished species impacts. The Council also considered removing the gear restriction from the commercial fishery in 2011, but it was not implemented due to initial concerns regarding potential for incidental take of petrale sole – a stock which had recently been declared overfished (Agenda Item I.4.b, Supplemental GMT Report 2, April 2010).

The Council has again requested analysis of removing the gear restriction in the California commercial fixed gear fishery south of 42° N latitude to enable fishery participants to more efficiently target "Other Flatfish", particularly Pacific sanddabs. In addition to the No Action Option, three other options were analyzed to bracket the potential range of regulatory modifications for Council consideration. These include maintaining the gear restriction but modifying the weight and number of hooks allowed (Option 2); eliminating the gear restriction and prohibiting access to the groundfish conservation areas (GCAs) (Option 3); and eliminating the gear restriction while still allowing fishing in GCAs, but adding a landing limit to prevent species other than "Other Flatfish" from being retained while fishing in the GCAs (Option 4).

Summary of Options

Option 1: No Action – maintain gear restrictions on fishing for "Other Flatfish" and maintain access to the Groundfish Conservation Areas (GCA), which includes the Cowcod Conservation Areas (CCA), Farallon Islands, Cordell Bank, and RCAs. Only allow "Other Flatfish" in the GCA to be retained when the specified gear is used.

Option 2: Modify the gear restriction to eliminate weight restriction and limit the number of hooks to no more than 300 hooks per set and use of a maximum of 600 hooks per vessel using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches). Maintain access inside the RCA. Prohibit access to the CCA, Farallon Islands and Cordell Bank when targeting the "Other Flatfish" complex. Only allow "Other Flatfish" to be retained in the RCA when the specified gear is used.

Option 3: Eliminate the gear restriction on fishing for "Other Flatfish", while prohibiting fishing within the GCAs.

Option 4: Eliminate the gear restrictions and allow fishing within the GCA when targeting "Other Flatfish". Add a landing restriction preventing the landing of any species other than the "Other Flatfish" complex while in possession of "Other Flatfish".

Data

Commercial fixed gear state landing receipt data from historical data (1995-1999) from California waters were used to examine catch composition prior to regulation and provide proxy bycatch rates for trips targeting Pacific sanddab (>50 percent of landings composed of Pacific sanddabs). Recent state landing receipt data (2008-2012) were used to evaluate recent catch composition and bycatch rates. Raw WCGOP onboard sampling data from (2003-2011) were examined, but insufficient data was available to inform recent bycatch rates.

Comparison of Options

Option 1: No Action

Under Option 1 (No Action), the current gear restrictions would remain in place. Fishing inside GCAs for "Other Flatfish" is only allowed when using this gear.

Fishing Activity in Commercial Fixed Gear Fisheries under Option 1

An average of 150 trips per year were made between 2008 and 2012 in California that targeted Pacific sanddabs[1]. California scorpionfish was the next most common species composing 9.6 percent of the landings, almost exclusively caught south of Point Conception. Examination of landing receipts from recent years 2008-2012 indicates that 86 percent of landings from trips that targeted Pacific sanddab were composed of Pacific sanddabs. The landings of each remaining species landed composed less than 0.8 percent of the total indicating that most other species were relatively uncommon when targeting Pacific sanddab. This indicates that the primary target within the "Other Flatfish" is Pacific sanddabs and limited bycatch accrues with the current fishing activity. In addition, the remaining species within the "Other Flatfish" are not common in the catch when targeting Pacific sanddab (<0.01 mt of any one species) and thus assumed to be relatively uncommon and/or primarily caught as incidental take while pursuing other species.

In part, the limited effort exerted in targeting "Other Flatfish" may be due to an inability to efficiently harvest Pacific sanddab under the current gear restrictions. Of the non-trawl sectors, the recreational fishery accounts for the majority (79.7 mt, 92 percent) of mortality; commercial and recreational fisheries combined 86.5 mt, less than 9 percent of the 986.5 mt non-trawl allocation on average. Under the current regulations on the "Other Flatfish" complex, mortality from the fixed gear fleet averaged 7.2 mt in 2011-2012, less than one percent of the total the non-trawl allocation of 986.5 mt. Currently the trip limit for the "Other Flatfish" complex in the limited entry fishery is "5000 lb./month", while in the open access fishery the trip limit is "3,000 lb./month, no more than 300 lb. of which may be species other than Pacific sanddabs". The hook and weight restrictions in place prevent the deployment of longline gear and relegate the fishery to vertical hook-and-line fishing, which limits the ability of the limited gear fishery to attain the trip limits.

No data on the distribution of effort in state vs. federal waters are available from Vessel Monitoring System (VMS) declarations or log books. Given the differences in bathymetry with distance from shore along the coast, fishing in state or federal waters may be more prevalent in some areas than others. The proportion of the grounds in state or federal waters depends on the distance of the primary depth distribution of "Other Flatfish" species from shore in each area. When depth changes abruptly with distance from shore, effort may be more focused in state waters; whereas gradual changes in bathymetry may result in more effort exerted in federal waters. The depth distribution of species in the "Other Flatfish" complex indicates that all species except rex sole are predominantly distributed in depths shallower than other federally-managed flatfish species including petrale sole (Table B-49, Love 1996).

The "Other Flatfish" are almost exclusively fished over soft bottoms where encounters with overfished rockfish species and other rocky reef species are exceedingly uncommon, negating concern regarding bycatch while fishing within the GCA, as long as gear is deployed over soft bottom when targeting members of the "Other Flatfish" complex. In addition, retention of groundfish species occurring over rocky reef habitat is prohibited in GCAs, thus removing the impetus to target them. Lastly, the hooking and handling discard mortality rate for petrale sole is expected to be 7 percent when rod and reel is used[2], thus flatfish discarded due to prohibition on retention in the RCA are expected to experience relatively low mortality.

Table B-49. Depth distribution and habitat preference of component species in the "Other Flatfish" complex (Love 1996).

Species	Common Depth	Depth Range	Habitat Preference
Sand Sole	<50 fm	1 - 284 fm	Soft
Rock Sole	<50 fm	0 - 316 fm	Pebble, semi-rocky
Butter Sole	25 - 60 fm	9 - 234 fm	Soft
Pacific Sanddab	25 - 75 fm	0 - 300 fm	Soft
Curlfin Sole	NA	24 - 291 fm	Soft
Flathead Sole	<100 fm	3 -300 fm	Soft
Rex Sole	50 -200 fm	0 - 475 fm	Soft

Biological Impacts under Option 1

Projected "Other Flatfish" Mortality

The fixed gear fishery took an average of 7.2 mt or 0.7 percent of the non-trawl allocation coastwide in 2011 and 2012 (Table B-50) and similar tonnage is expected to accrue in the fixed gear fisheries under the No Action Option. The majority of the mortality in the "Other Flatfish" complex is from Pacific sanddab comprising 89.6 percent of the total. Under the No Action option, mortality of "Other Flatfish" would be expected to be the same as in recent years, assuming trip limits for other co-occurring target species and fishing behavior do not change.

[2] http://www.pcouncil.org/groundfish/current-season-management/past-management-cycles/2009-2010-final-environmental-impact-statement/, pg. 307.

Table B-50. Average mortality the "Other Flatfish" complex coastwide in the recreational and commercial fixed gear fisheries by sector from 2011-2012. (source: West Coast Groundfish Total Mortality reports)

Species	Average Fixed Gear Mortality (mt)	Average Recreational Mortality (mt)	Ave Non- Trawl Mortality Total (mt)	Percent Mortality from Fixed Gear
Butter Sole	0.00	0.01	0.01	0%
Curlfin Turbot	0.00	0.00	0.00	NA
Flatfish Unid	0.12	3.87	3.99	3%
Flathead Sole	0.50	0.00	0.50	100%
Pacific Sanddab	5.12	72.34	77.46	7%
Rex Sole	0.18	0.00	0.18	100%
Rock Sole	0.08	1.24	1.32	6%
Sand Sole	0.28	2.28	2.55	11%
Sanddab Unid	0.97	0.00	0.97	100%
Total	7.24	79.73	86.47	8%

Projected Overfished Species Mortality

Commercial landings from fixed gear trips between 2008 and 2012 targeting Pacific sanddabs, indicate that less than 0.1 percent of the catch was composed of petrale sole (<0.01 mt on average) and bocaccio (<0.01 mt on average). The resulting bycatch rates relative to landings of sanddabs are 0.0005 mt of petrale sole per ton of sanddab and 0.001 mt of bocaccio per ton of sanddab. No canary rockfish, yelloweye rockfish or cowcod were observed in the landings in large part due to prohibition on their retention. Attempts to analyze discard data from the WCGOP were unsuccessful since very few records of sampled trips targeting Pacific sanddab were available. Historical landing receipt data from 1994 to 1999 when rockfish retention was allowed, showed that less than 0.01 mt each of canary rockfish, yelloweye rockfish, bocaccio or cowcod were landed when targeting Pacific sanddabs, and only 0.06 mt of petrale sole was taken on average. The contribution to overfished species impacts from fixed gear fishery participants targeting "Other Flatfish" are expected to be extremely low and compose a small fraction of the total given the bycatch rates observed in the absence of gear restrictions in the past.

Additional mortality on petrale sole is not expected to be negligible since they cannot be retained within the non-trawl RCA, are typically found in depths greater than those occupied by the "Other Flatfish" and discards are expected to have a low mortality rate since they do not suffer from barotrauma. In addition, bycatch rates for petrale sole in state landing receipt data (1994 to 1999) were exceedingly low while targeting sanddabs. This indicates that effort will be focused on shallower depths to target sanddabs and deeper waters where petrale sole are more commonly encountered will be avoided (Table B-49, Love 1996).

Fishery participants infrequently encounter overfished species while targeting sanddabs and species in the "Other Flatfish" complex since gear is deployed over soft bottoms where cowcod, canary rockfish, yelloweye rockfish and bocaccio are extremely rare and in depths shallower than the primary depth distribution of petrale sole.

Data Uncertainty

Historical landing receipt data from 1994 to 1999 for trips targeting Pacific sanddabs were used as a proxy for bycatch rates may over-project mortality due to the possibility that gear was set over rocky reef habitats in addition to sandy bottoms where Pacific sanddabs are found on the same set or different sets on the same trip. This would bias bycatch rates high compared to what might accrue when fishing only over soft bottom to target Pacific sanddabs. The landings data used to calculate these "bycatch rates" are from landings rather than total catch, so some of the small or unmarketable fish discarded on the trip may not accounted for in the landings. In addition, the recent landing receipts used to evaluate current bycatch rates do not provide an accurate projection of bycatch for prohibited species since their retention is prohibited and not reflected in landings data. The estimated mortality for 2011 and 2012 from WCGOP may be biased high relative to impacts from California since they are coastwide including mortality in Oregon and Washington as well.

Stock Status

<u>"Other Flatfish" Complex</u>

The "Other Flatfish" complex is comprised mainly of unassessed stocks. A full assessment conducted in 2013 for Pacific sanddab indicated the stock status was healthy at 96 percent of its unfished spawning stock biomass. Despite not being adopted for use in management, it was acknowledged that this stock was extremely healthy.

<u>Overfished Species</u>

The depletion of each overfished species in 2013 was as follows, cowcod (34 percent), bocaccio (31 percent), canary rockfish (24 percent), yelloweye rockfish (22.3 percent) and petrale sole (22 percent). While cowcod, bocaccio, canary and yelloweye rockfish, and petrale sole have been historically encountered while targeting Pacific sanddabs, bycatch rates have been extremely low. Thus mortality from the targeting of "Other Flatfish" does not contribute appreciably to the aggregate mortality of overfished species and is not expected to adversely affect their stock status or rebuilding progress.

Socioeconomic Impacts under Option 1

The current gear restrictions prevent the fixed gear fishery from being able to effectively harvest healthy "Other Flatfish" stocks. Thus gear restrictions would continue to prevent the fixed gear fishery from attaining monthly trip limits. Forgone yield of Pacific sanddabs or other species in the "Other Flatfish" complex due to the gear restrictions would prevent fishery participants and coastal communities from more fully benefiting from increased ex-vessel revenue.

Option 2

Under Option 2, the gear restriction would be modified to eliminate weight restriction and limit the number of hooks to no more than 300 hooks per set and use of up to 600 hooks per vessel using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches). In addition, access to the rockfish conservation area would be maintained, but prohibit access to the CCA, Farallon Islands and Cordell Bank when targeting the "Other Flatfish" complex. Lastly, only "Other Flatfish" could be retained when fishing in the RCA with the specified gear onboard.

Change in Fishing Activity Compared to Option 1

Hook size restrictions would still be less than size 2 hooks, which are not expected to affect efficiency, but will maintain selectivity for smaller mouthed flatfish species. As a result of removing the weight restriction fishery participants may employ longline gear instead of or in addition to vertical hook-and-line gear deployed with rod and reel as the primary means of fishing. The 12 hook per line restriction would be replaced with a more liberal restriction of no more the 300 hooks per set and use of no more than 600 hooks per vessel. The gear restriction changes are intended to increase efficiency in targeting "Other Flatfish" while maintaining an impetus to focus effort where the target species is likely to reside, on soft bottom, which might be otherwise lost if a hook restriction on the number of hooks was removed completely making placement of gear less discriminant. The restriction on the number of hooks may also motivate participants to check their gear frequently to retrieve their catch, which may reduce mortality on encountered bycatch species. Vessels would still have access to fish in the RCA where adult sanddab habitat is often distributed depending on the bathymetry of the region. Fishing in the waters around the Farallon Islands and Cordell Bank as well as the CCA would be prohibited. Allowing only retention of other flatfish while fishing in the RCA with the proscribed gear will remove the impetus to fish near hard substrate where bycatch of overfished species may occur.

The proposed actions would increase the efficiency of vessels targeting "Other Flatfish" while maintaining precautionary limitations on the number of hooks, areas that can be fished and species that can be retained to focus effort on areas with soft bottoms where overfished species are uncommon. Under this alternative, effort is expected to increase as the opportunity would be more profitable than under the No Action alternative. The magnitude of the increase in participation is difficult to anticipate since there is an open access component to the fishery. The sub-trip limit of no more than 300 lbs per month for "Other Flatfish" species other than Pacific sanddabs may not provide much of an incentive to target the remaining species. Thus effort is expected to be focused on Pacific sanddabs, which data indicate can be targeted with negligible bycatch. Closure of the small areas around the Farallon Islands, Cordell Banks and habitat residing within the CCA are unlikely to adversely affect participation since areas in the RCA hold sufficient adult Pacific sanddab biomass to allow productive targeting. Closure of these smaller areas is intended to focus effort on areas with large expanses of soft bottom habitat, preventing bycatch of rocky reef species.

Biological Impacts Compared to Option 1

Other Flatfish Mortality

The mortality of component species in the "Other Flatfish" complex under Option 2 is expected to increase relative to Option 1, given the increase in the number of allowable hooks. If participation also increases, mortality would be expected to be even higher but still within the non-trawl allocation. "Other Flatfish" effort from the fixed gear fishery would have to increase by more than 10 fold to exceed the non-trawl allocation assuming a twelve fold increase in capacity with 48 hooks (for four rods with 12 hooks each) vs. a 600 hook restriction, while accounting for recent mortality in the recreational fishery in 2011 and 2012. The projection may be biased high considering that some of the catch expanded by the increased capacity originated from Oregon and Washington where the current gear restrictions would not change.

Overfished Species Mortality

Under this option, overfished species mortality was estimated using a combination of historical and recent landings data to inform how much, if any, increase in mortality would be expected as a result of increasing the number of allowable hooks. Given the paucity of WCGOP data and the biases with recent data (i.e., non-retention of some OFS), historical data from a time period when rockfish and sanddabs could be retained on the same trip was used as a proxy to estimate bycatch rates of OFS. This historical bycatch rate was then applied to the allowable take of sanddabs to estimate the OFS mortality that could be expected assuming the entire non-trawl allocation of 327.7 mt Pacific sanddabs after subtracting recent recreational mortality is taken by the commercial fixed gear fishery. Since retention of bocaccio and petrale sole is currently allowed, recent bycatch rates were calculated and used to estimate OFS mortality assuming the entire Pacific sanddab contribution to the non-trawl allocation of is utilized.

Historical data revealed higher bycatch rates of rockfish taken with Pacific sanddabs in recent years though the rates were still negligible. This is not unexpected given that regulations at the time permitted mixed trips (i.e., targeting hard bottom and soft bottom species on the same trip). Applying these higher bycatch rates to recent data increases impacts of OFS relative to No Action (Table B-51). The actual mortality may be lower since these estimates assume attainment of the entire sanddab non-trawl allocation. This analysis is simply meant to highlight the maximum bycatch expected given target species allocations and even under this extreme example, OFS impacts would still be low, especially when compared to sources of mortality from other sectors.

Although projected mortality using recent bycatch rates could only be calculated for bocaccio rockfish and petrale sole, these projections better inform what is more likely to occur out on the water for these two species. Projected mortality for both of these stocks, assuming full attainment of Pacific sanddabs, is at least half of that calculated using historical bycatch rates.

Overall, mortality of overfished species under Option 2 is expected to be similar to Option 1. Though the total mortality may increase slightly due to the increase in number of hooks, bycatch rates on a per hook basis are extremely low and not expected to increase; therefore any increased mortality if realized is expected to be negligible.

Table B-51. Comparison of projected mortality of overfished species in the fixed gear fishery while targeting Pacific sanddabs and other flatfish in recent years (2008-2012) and historically (1994-1999) prior to gear restrictions. Projected mortality is based on full attainment of the non-trawl allocation (after accounting for recreational mortality).

Species	Recent Bycatch Rate	Projected Mortality assuming recent bycatch rate(mt)	Historical Bycatch Rate	Projected Mortality assuming historical bycatch (mt)
Canary	NA	NA	0.00056	0.18
Yelloweye	NA	NA	0.00011	0.04
Bocaccio	0.00116	0.38	0.00197	0.65
Cowcod	NA	NA	0.00087	0.29
Petrale	0.00047	0.16	0.01703	5.58

Data Uncertainty Compared to Option 1

The uncertainties noted under Option 1 relative to the data also apply under Option 2. In addition, there is greater uncertainty in participation. While it was assumed that all of the remaining non-trawl allocation of Pacific sanddabs is taken after accounting for recreational catch, mortality may be lower as market conditions may prevent sufficient effort from being exerted to reach attainment.

Stock Status

Other Flatfish

Mortality of other flatfish would be expected to increase compared to Option 1, but is expected to be far below the non-trawl allocation, let alone the ACL. Thus, the stock status is not expected to be affected.

Overfished Species

Under Option 2 no changes in stock status and rebuilding progress are expected compared to Option 1.

Socio-economic Impacts compared to Option 1

Allowing greater capacity through an increase in the number of hooks and eliminating weight restrictions allowing the use of longlines, would make the fishery more efficient and increase revenue. This would provide an additional facet to the portfolio of fishing opportunities available to the fixed gear fleet during periods when more profitable opportunities are unavailable. The revenue from additional landings would provide increased income to coastal communities.

Option 3

Under Option 3 the gear restrictions on fishing for "Other Flatfish" would be eliminated and fishing within the GCAs would be prohibited.

Change in Fishing Activity Compared to Option 1

Under Option 3, there would be no restriction on the number or size of hooks or the weights used in targeting "Other Flatfish," but access inside the GCAs would not be permitted. Since most adult sanddabs are found in depths deeper than those open the shoreward RCA line in most management regions (except south of Point Conception), fleet behavior would likely be affected under this option. Although vessels could catch sanddabs more efficiently if the gear restriction is removed, they would not be able to access waters inside the RCA where the target species is found; thus fishing activity is likely to be lower compared to Option 1.

Biological Impacts Compared to Option 1

Other Flatfish Mortality

In areas north of Point Conception the shoreward fixed gear RCA is 30 fm or shallower, and grounds in deeper waters where adult sanddabs are available would be inaccessible. Thus the ability to harvest sanddabs efficiently with hook-and-line gear would be limited by a lack of access to adult Pacific sanddab habitat in deeper waters within the RCA north of Point Conception. Though the magnitude of reduction is difficult to determine, if RCAs are closed to fishing, effort and mortality are expected to decrease under this option.

Overfished Species Mortality

Mortality of overfished species under Option 3 is expected to be lower than Option 1 because vessels would be excluded from fishing inside RCAs where the few encounters would be expected to occur. If effort were directed to shallower depths, in targeting members of the other flatfish complex, mortality rates of what few overfished rockfish are encountered are expected to be reduced due to the lower barotrauma experienced in shallower depths. Any increase in mortality resulting from eliminating the gear restriction would be offset by lack of access inside the RCAs north of Point Conception. South of Point Conception, the shoreward RCA line is 60 fm allowing access to adult Pacific sanddab, thus mortality of cowcod and bocaccio may increase slightly compared to Option 1 as a result of increased efficiency with the elimination of gear restrictions. The aggregate mortality is expected to increase only slightly as the encounter rates are extremely low in any case.

Data Uncertainty Compared to Option 1

An additional uncertainty relative to Option 1 is whether effort would decrease substantially due to a lack of access to the RCA or whether effort would shift shoreward of the RCA in targeting "Other Flatfish" that occur in shallower depths. Current catch data indicates that the other species are relatively uncommon in the fixed gear fishery compared to Pacific sanddabs, making it unlikely that effort would be exerted in shallower waters. In addition, the greater capacity of the fishery in the absence of a limit on the number hooks that can be deployed increases uncertainty in the mortality that will result from this alternative.

Stock Status

Other flatfish

The mortality of "Other Flatfish" under Option 3 is projected to be far below the non-trawl allocation, thus the stock status is not expected to be affected.

Overfished Species

Bycatch rates for overfished species are expected to be sufficiently low as not to contribute appreciably to aggregate mortality from the fixed gear fishery. Under Option 3 no changes in stock status and rebuilding progress are expected compared to Option 1.

Socio-economic Impacts compared to Option 1

Under this alternative, assuming the current RCA restrictions north of Point Conception, fishery participants would not be able to access the primary depth distribution of adult Pacific sanddabs. While removal of the gear restrictions would allow deployment of an unlimited number or size of hooks or weights, the primary depth distribution of adult Pacific sanddabs would be inaccessible. This would adversely affect fishery participants that would otherwise benefit from landings of primary target species available within the RCA. Allowing the needed gear to be employed while denying access to adult Pacific sanddab is expected to result in a barrier to harvest that is more detrimental than Option 1, in which access is available, but not sufficient means to harvest given the current gear restrictions.

Option 4

Under Option 4, the gear restriction on fishing for members of the "Other Flatfish" complex would be eliminated, while allowing fishing within the GCAs when targeting them. A landing restriction would also be implemented that prohibits landings of species that are not "Other Flatfish" when members of the "Other Flatfish" complex are onboard.

Change in Fishing Activity Compared to Option 1

Under Option 4, fishery participants would not be subject to gear restrictions and could fish both inside and outside the GCAs, but the landing restriction would prohibit landing of any other species when "Other Flatfish" are onboard. The intent is to address enforcement concerns to prevent participants from landing fish for which retention is prohibited within the RCA while fishing for "Other Flatfish" within the GCAs. This would also have the consequence of prohibiting incidental catch of "Other Flatfish" when targeting other species outside the GCAs.

As a result of removing gear restrictions, fishery participants may deploy longline gear instead of or in addition to vertical hook-and-line gear deployed with rod and reel. Vessels would still be allowed to fish in the RCA, GCA, around the Farallon Islands and Cordell Banks to access marketable sized adult sanddabs, which are expected to be the primary target of fishing activity. The main concern is that if thousands of hooks are deployed in the RCA, it is more likely they will be deployed inadvertently over rocky reefs resulting in overfished species bycatch, since targeting may not be as focused on soft bottom habitat as it would be if a gear restriction was imposed. In the absence of gear restrictions, a landing restriction would be put in place as a disincentive to fish in the GCAs except where "Other Flatfish" are caught. This would help ensure that effort targeting "Other Flatfish" within the GCAs does not result in targeting of other species likely to reside on rocky reefs. Retention of such species in the GCAs is already prohibited, but the landing restriction would eliminate the impetus to target them within the GCAs under the guise of targeting "Other Flatfish".

Fishing effort for "Other Flatfish" would be expected to increase under Option 3 as participants would have both access to the fishing grounds and the means to harvest the target stock. As long as the market demand will support an adequate price per pound to make the target worth pursuing relative to other opportunities due to equal or greater profit, additional entrants may participate. Once the market is saturated, the price per pound could decline and reduce the number of participants. The actual participation is difficult to predict, but is expected to increase relative to Option 1.

Biological Impacts Compared to Option 1

Other Flatfish Mortality

The mortality of component species in the "Other Flatfish" complex is expected to increase relative to Option 1 and be similar to that presented in Option 2. Removing gear restrictions would make it more likely that trip limits would be attained by participants if they had access to the primary depth distribution of adult Pacific sanddabs within the GCAs. While aggregate landings would be expected to increase as a result of eliminating gear restrictions, prohibition of landing "Other Flatfish" caught as bycatch while targeting other species, would moderate the increase in impacts to some degree since incidental "Other Flatfish" catch would have to be discarded in order to land other species.

Overfished Species Mortality

The potential overfished species impacts would be similar to projections provided under Option 2, with increased mortality relative to Option 1 as a result of eliminating gear restrictions while maintaining access to fishing grounds within the GCAs. Without a limitation on the number of hooks that can be deployed, targeting may be less discriminant relative to the habitat they set their gear, increasing the potential for fishing over rocky reef habitat where encounters with overfished rockfish species are more common.

In addition, the lack of a hook size restriction may increase the effectiveness of the gear in hooking larger overfished species and other non-target stocks should the gear be deployed near rocky substrate where bycatch species are likely to be encountered. Retention of groundfish species occurring over rocky reef habitat is prohibited in the GCAs, removing the impetus to target them, yet bycatch may still occur while fishing in the GCAs, especially if gear is not placed on soft bottom. Prohibition on landing other species when landing species in the "Other Flatfish" complex with fixed gear would further dissuade fishery participants from targeting rocky reef species and focus effort on soft bottom where the "Other Flatfish" are commonly found.

Data Uncertainty Compared to Option 1

If fishery participants are indiscriminant in the placement of their longline gear relative to small outcrops of rocky reef habitat in the absence of hook restrictions, uncertainty in the bycatch of overfished rockfish would be expected to increase relative to Option 1. The inability to land species other than members of the "Other Flatfish" complex would decrease the impetus to fish within the GCAs for species that inhabit rocky reef habitat, reducing uncertainty regarding encounters with overfished rockfish species, in part mitigating this concern.

Stock Status

Other Flatfish

The projected mortality of "Other Flatfish" under Option 4 is below the non-trawl allocation, thus the stock status is not expected to be affected.

Overfished Species

Under Option 4 no changes in stock status and rebuilding progress are expected compared to Option 1. Bycatch rates for overfished species are expected to be sufficiently low as not to contribute appreciably to aggregate mortality from the fixed gear fishery, thus the stock status and rebuilding plans of overfished species are not expected to be adversely affected.

Socio-economic Impacts compared to Option 1

Elimination of gear restrictions while allowing access to depths where adult Pacific sanddabs are encountered will increase the ability of fishery participants to attain trip limits. Increased landings of other flatfish would result in increased economic benefit to coastal communities. The prohibition on landing "Other Flatfish" with other species would reduce revenues from landings of incidental catch of "Other Flatfish" while targeting other species that would have to be forgone, but may be compensated for by increased harvest within the GCAs when targeting adult Pacific sanddabs and the remaining "Other Flatfish".

B.9 At-Sea Set-Asides: Spiny Dogfish Shark

Introduction

The Council requested that 163 mt to 725 mt be analyzed as a range of potential set aside levels of Spiny Dogfish be analyzed for the at sea whiting sectors ("At Sea" sectors). Here we use a basic Monte Carlo simulation approach to evaluate that range in the context of annual Spiny Dogfish bycatch as a whole.

The goal of the simulations is to provide a look at patterns of total annual dogfish mortality under the No Action scenario; and, then to describe how those patterns might be affected if an At Sea set aside were established at a particular level. This second goal also allows for an evaluation of how often catch in the At Sea sectors might reach the various set aside levels and thereby require action by the Council, by the sector participants, or both to avoid an overage of the set aside. In addition to the 163 mt and 725 mt amounts requested by the Council, we look at intermediate values of 300 mt and 500 mt as At Sea set asides to provide additional contrast.

The ACL and harvest guidelines (HG) the Council is considering for 2015-2016 are displayed in Table B-52. To simplify the simulations, we focused only the lower of the preliminary preferred ACLs ("PPA ACLs"), which is 1,897 mt. And we focused on the ACL instead of the HG because the simulations take into account the amounts deducted from the ACL to produce the Fishery HG (i.e. tribal catches are part of the simulations and other amounts, e.g. research, are assumed to be fixed yet still added to the total simulated catch).

The high variability of Spiny Dogfish catch makes the choice of a set aside challenging. As shown below, the At Sea sectors, primarily the catcher processor sector, can be major sources of Spiny Dogfish catch. In turn, set asides for the At Sea sectors could be effectively used to lower the probability of an ACL overage. However, the high variability in catch across all sectors means that in some years the At Sea set aside levels would not prevent overages that would be caused primarily by high catch years in other sectors. In addition, the high variability means that in many years the At Sea sectors could reach their set aside level and be negatively affected while catch in total remains below the ACL. The same would be true for other sectors. The simulation results shown below help demonstrate this dynamic.

The factors leading to high and low catches of Spiny Dogfish in each sector are uncertain. We therefore explored multiple simulations based on different assumptions about the frequency of annual Spiny Dogfish catch rates. All approaches considered, however, suggest that total Spiny Dogfish catch is more likely than not to remain below the PPA ACLs proposed for 2015 and 2016 whether new set asides are established or not. While not recommending the simulation results as precise forecasts, we do interpret the results as suggesting that overages of the Spiny Dogfish ACL would be expected to occur with low to moderate frequency, from less than 10 percent to less than 30 percent of the time, depending on assumptions about current conditions in the bottom trawl and non-nearshore fixed gear sectors. Furthermore, under these low to moderate probabilities of an annual overage we can conclude with some confidence that that there is less than a 50 percent probability that Spiny Dogfish catch would fail the performance standard of exceeding an ACL more than once in four years suggested by the National Standard 1 (NS1) Guidelines.

The analysis presented in this section was not reviewed by the full GMT. The full GMT will review the analysis at the April meeting and will advise the Council accordingly.

Table B-52. The Spiny Dogfish annual catch limit (ACL) and harvest guideline (HG) amounts under consideration for 2015 and 2016.

	2015 ACL	2015 HG	2016 ACL	2016 HG
PPA	1,912	1,737	1,897	1,722
P-star = 0.25	1,552	1,377	1,540	1,365
P-star = 0.45	2,303	2,128	2,285	2,110

Spiny Dogfish Catch and Outline of the Data and Simulation Approach

The patterns and management history of Spiny Dogfish catch were evaluated in the 2013-14 EIS. An extra year of catch estimates, as well as some revisions to past years' estimates, have become available since that analysis was completed. However, the Council recommended no new management measures for Spiny Dogfish in the current 2013-2014 management period and the management circumstances for Spiny Dogfish remain largely unchanged from last cycle. Here we focus on the most salient aspects of Spiny Dogfish catch to the simulations and the At Sea set aside consideration. The 2013-14 EIS can be consulted for a more thorough treatment of the history of the Council's management of Spiny Dogfish. The total mortality estimates used in this analysis are displayed in Table B-53.

A few key characteristics of Spiny Dogfish catch led the GMT to explore this simulation approach for this cycle. First, catch of Spiny Dogfish has been highly variable across a number of sectors (Figure B-15). With such variability, point estimates and focus on single sectors is of limited value for forecasting. The reality is that Spiny Dogfish catch is unpredictable and may fall over a wide range both at the sector level and in total. The simulations provide a means of exploring this range of outcomes and the relative frequency of catch events across sectors.

Second, in most years total mortality on the stock has remained below the ACLs being considered for 2015-2016. Catch only exceeded those levels twice since 2003 and approached them in two other years (Table B-53). And in those years catch was considerably over the average in one or more sectors. So it is the combination of variability across a sector that appears to be key to evaluating the risk of ACL overages for Spiny Dogfish. The simulation approach is a convenient method of evaluating the variability in sectors in combination.

Lastly, Spiny Dogfish have been caught mostly as incidental bycatch in recent years. Targeting and marketability have been on the decline. No management measures are thought to directly affect incentives to target or avoid Spiny Dogfish and so it appears that variations in catch rates have been the result of outside factors like management measures targeted at other stocks. The high and low catch years in each sector very much appear to be behaving as stochastic, random variables whose pattern can be described with simple statistical/phenomenological models.

The input data for the simulation is based on the total mortality estimates shown in Table B-53and Table B-55. The simulations focus on the sectors where catch has been relatively high and variable. Those where catch has been relatively low and stable are combined into an Other category. The catch estimates from these combined sectors are displayed elsewhere in the 2015-2016 analysis. The simulations fix the catch from these sectors at the 2009-2012 average of 36 mt.

To account for variations in fishing activities in each sector from year to year, the ratio of Spiny Dogfish to total catch of all species is the main unit of analysis used in the simulations (Table B-55). For the At Sea commercial and tribal sectors, the denominator used to calculate the ratio is total catch of all species. For the other sectors, we used total landings of all species as the denominator.

Table B-53. Total annual estimated fishing mortality (mt) of Spiny Dogfish by sector (sources: PacFIN npac4900 for the At Sea landings, WCGOP's GMMultiYr_DataProduct (23-Dec-2013 version), state recreational data). Note that total fishing mortality assumes 50 percent survival of fish discarded in the fixed gear sectors.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Bottom trawl (BT)	625.8	643.8	1,591.3	736.9	637.0	1,024.4	663.3	522.6	366.9	340.3
Fixed gear (FG)	183.3	246.8	298.5	346.8	342.1	286.1	119.9	132.7	89.6	111.2
Catcher processors (CP)	10.1	331.0	42.2	6.0	63.2	488.2	28.2	110.3	640.5	147.9
Mothership (MS)	1.0	9.9	27.9	16.9	23.2	23.9	6.8	45.4	85.0	30.0
Shoreside whiting (SS)	4.3	30.3	95.6	34.3	51.4	59.5	20.7	151.5	181.0	160.1
Tribal at sea (TAS)	259.5	274.5	285.2	35.3	68.9	159.4	128.2	122.0	58.6	0.6
Tribal shoreside (TSS)	3.8	40.1	5.7	76.8	119.2	302.9	125.4	6.9	127.7	1.8
Other (OTR)	181.6	139.8	46.1	27.8	21.9	40.4	21.6	33.2	46.2	39.0
Total	1,269.4	1,716.3	2,392.5	1,280.8	1,326.9	2,384.8	1,114.2	1,124.6	1,595.5	831.0

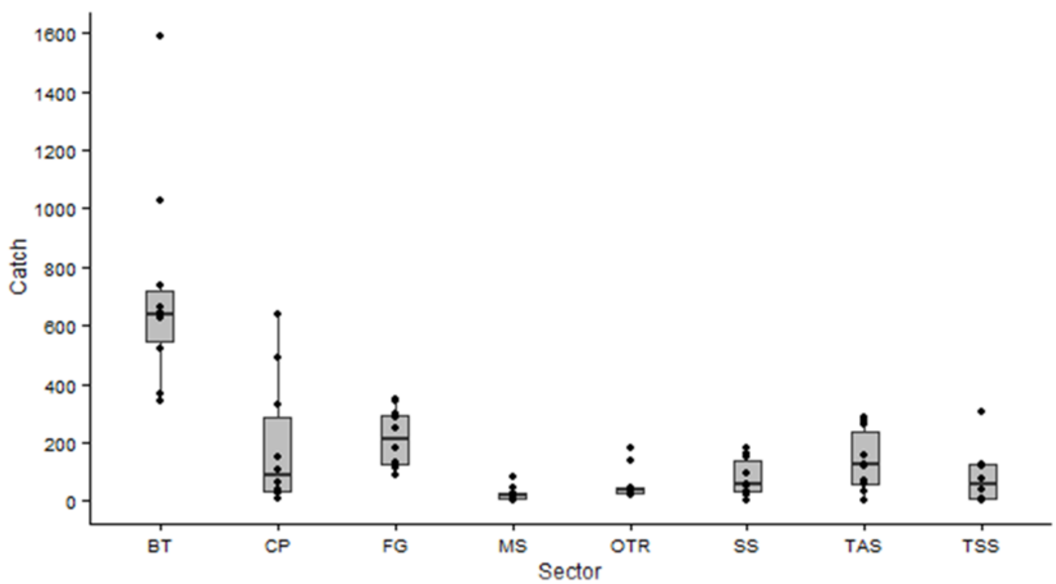

Figure B-15. Variation of annual catches (mt) of Spiny dogfish by sector over the ten year period 2003-2012. Boxplots are used to show location of 25th percentile, median, and 75th percentile catch levels by sector (corresponding to the lower edge, middle line, and upper edge of the box respectively) and outliers. Order of the sectors is alphabetical. See Table B-54 for abbreviations.

Table B-55. The upper panel shows total catch, for at sea deliveries, and total landings, for all other sectors, used in this analysis to standardize the Spiny Dogfish catch by annual fishing activity in each sector. The lower panel shows the ratio between total Spiny Dogfish catch and the numbers in given in the upper panel. See Table B-53 for abbreviations.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BT	18,506.1	17,716.4	19,321.4	17,838.2	20,473.8	24,117.7	26,081.5	22,655.1	17,298.9	17,142.4
FG	3,189.7	3,222.2	3,713.2	3,647.5	2,830.5	3,099.4	3,967.2	4,083.1	4,784.8	3,743.7
CP	41,214.4	73,175.3	78,890.0	78,864.0	73,262.3	108,199.6	34,800.4	54,291.6	71,678.8	55,262.7
MS	26,021.3	24,101.9	48,636.3	55,355.3	47,809.9	57,497.2	24,089.6	35,713.5	50,050.9	38,480.3
SS	51,530.3	90,201.8	98,515.3	97,637.1	73,878.1	51,951.3	40,605.0	63,085.7	91,117.3	66,267.0
TAS	19,373.3	23,459.2	23,541.8	5,568.5	5,166.9	14,943.3	13,459.2	16,308.8	6,343.6	32.1
TSS	6,905.6	10,812.3	16,234.9	33,048.8	21,895.1	20,435.5	12,877.7	5,504.8	15,968.7	5,159.3

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BT	0.03382	0.03634	0.08236	0.04131	0.03111	0.04248	0.02543	0.02307	0.02121	0.01985
FG	0.05747	0.07659	0.08039	0.09508	0.12086	0.09231	0.03022	0.03250	0.01873	0.02970
CP	0.00025	0.00452	0.00053	0.00008	0.00086	0.00451	0.00081	0.00203	0.00894	0.00268
MS	0.00004	0.00041	0.00057	0.00031	0.00048	0.00042	0.00028	0.00127	0.00170	0.00078
SS	0.00008	0.00034	0.00097	0.00035	0.00070	0.00115	0.00051	0.00240	0.00199	0.00242
TAS	0.01339	0.01170	0.01212	0.00633	0.01333	0.01067	0.00953	0.00748	0.00923	0.02011
TSS	0.00055	0.00370	0.00035	0.00232	0.00544	0.01482	0.00974	0.00125	0.00800	0.00036

Table B-56. The assumed sector-level landings and total catch estimates applied to the Spiny Dogfish annual catch ratios to total fishing mortality (mt).

Sector	Projected	Source
CP	77,950	EIS projection
MS	52,450	EIS projection
SS	97,940	EIS projection
BT	20,765	EIS projection with 2011-12 avg. discard applied
FG	3,630	Projection based on the percentage increase of the sablefish ACL from 2014 to 2015-16, includes IFQ fixed gear.
TAS	10,217	2008-2012 average
TSS	11,989	2008-2012 average

Simulation methods and Scenarios

We performed all simulations with the R statistical program.[3] For each sector, we took the natural logarithm of the annual Spiny Dogfish catch ratios shown in Table B-55, calculated the means and standard deviations for each sector, and then inputted those into R's function for generating lognormal random variables. The lognormal parameters used for each sector are shown in Table B-57, displayed as means and coefficients of variation (CVs). To produce simulated catch in metric tons for each sector, we used the function to generate 100,000 estimates of annual catch ratios and then multiplied them by the total catch amounts displayed in Table B-56.

[3] R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/. Boxplots and time series plots were produced using the ggplot2 package: H. Wickham. ggplot2: elegant graphics for data analysis. Springer New York (2009).

We chose the lognormal probability distribution to model the annual catch ratios in each sector because higher rates of catch in a year would tend to have a multiplicative effect on deviations from average. In addition, the catch ratios only take non-negative values; and, for multiple sectors, the observed catches have large coefficients of variation and are skewed toward higher values than would be expected under a normal, bell-curve. Lognormal distributions are commonly used for random variables having these two characteristics.

Simulating catch in this manner is a statistical/phenomenological approach where the goal is to describe the observed pattern rather than to identify and model the factors or causal process that produce the pattern. The fundamental assumption is that the pattern can described by parameters of a statistical distribution (e.g. mean and standard deviation) and that future annual catches will be drawn from this distribution. In essence, the main assumption is that the future as has the past. This approach is common in many methods used by the GMT and others yet it is an oversimplification to say that Spiny Dogfish bycatch is a random variable that will simply follow a fixed probability distribution over time.

Because of this and the uncertainty in the drivers of Spiny Dogfish bycatch, we explored multiple simulations scenarios based on different probability distributions and parameters. Two are presented here. The first ("Simulation 1") uses all 10 years of data for every sector. The second ("Simulation 2") uses only a subset of those years for sectors where we saw evidence for more recent change in the patterns of Spiny Dogfish catch. The intent of Simulation 2 is to reflect possible change in recent conditions in a few key sectors. The years and corresponding lognormal estimates for the annual Spiny Dogfish catch ratios used in Simulation 2 are displayed in Table B-57.

To arrive at the set of years used in Simulation 2, we evaluated patterns across the ten year time series for each sector (Figure B-16). Welches t-tests were used to compare the Spiny Dogfish catch ratios over the 2003-2007 and 2008-2012 periods as well as a number of other splits of earlier and later time periods where visual evaluation of the time series suggested such differences might exist. Statistically significant differences in the later-year average catch ratios of Spiny Dogfish exist for the non-nearshore fixed gear (2009-2012), bottom trawl (2009-2012), and shoreside whiting sectors (2008-2012).[4]

Other indications of changed trends in these sectors were apparent as well. First, discard patterns of Spiny Dogfish changed substantially after 2008 in the non-nearshore fixed gear sectors. The percentage of total mortality coming from discarded Spiny Dogfish increased in those sectors from an average of 31.5 percent over 2003-2008 to 87.4 percent over 2009-2012. Such a change suggests a major change in the marketability of Spiny Dogfish in that sector after 2008. In addition, log-linear regression on the time series data shows decreasing trends in the bottom trawl and non-nearshore fixed gear sector over 2008-2012. The shoreside whiting sector shows an increasing trend over the full ten years.[5] Based on this evidence, we selected the Simulation 2 set of years with the intent of contrasting the full set of full 2003-2012 period with patterns that may better reflect recent conditions in the fisheries.

[4] *Non-nearshore fixed gear*: -7.04, df = 6.5, p-value < 0.001*; bottom trawl*: t = -4.16, df = 6.3, p-value = 0.005; *shoreside whiting*: t = 2.66, df = 7.11, p-value = 0.03.

[5] *Bottom trawl*: -12.5% per year over 2008-2012, Adj. $R^2 = 0.62$, p = 0.03; *non-nearshore fixed gear sector*: -33.5% per year over 2008-2012, Adj. $R^2 = 0.67$, p = 0.04; *shoreside whiting sector*: +29.8% per year over 2003-2012, Adj. $R^2 = 0.68$, p = 0.002.

Table B-57. Years used in the two simulation scenarios and observed lognormal means and coefficients of variation for each sector.

	Scenario 1	Mean	CV	Scenario 2	Mean	CV
Bottom trawl (BT)	2003 - 2012	0.03568	44.3%	2009-2012	0.02242	33.6%
Fixed Gear (FG)		0.06583	70.3%	2009-2012	0.02806	25.5%
Catcher Processor (CP)		0.00354	272.7%	2003-2012	Same as Scenario 1	
Mothership (MS)		0.00074	136.1%	2003-2012	Same as Scenario 1	
Shoreside Whiting (SS)		0.00130	146.2%	2008-2012	0.00183	74.4%
Tribal At Sea (TAS)		0.01144	33.5%	2003-2012	Same as Scenario 1	
Tribal Shoreside (TSS)		0.00615	244.4%	2003-2012	Same as Scenario 1	

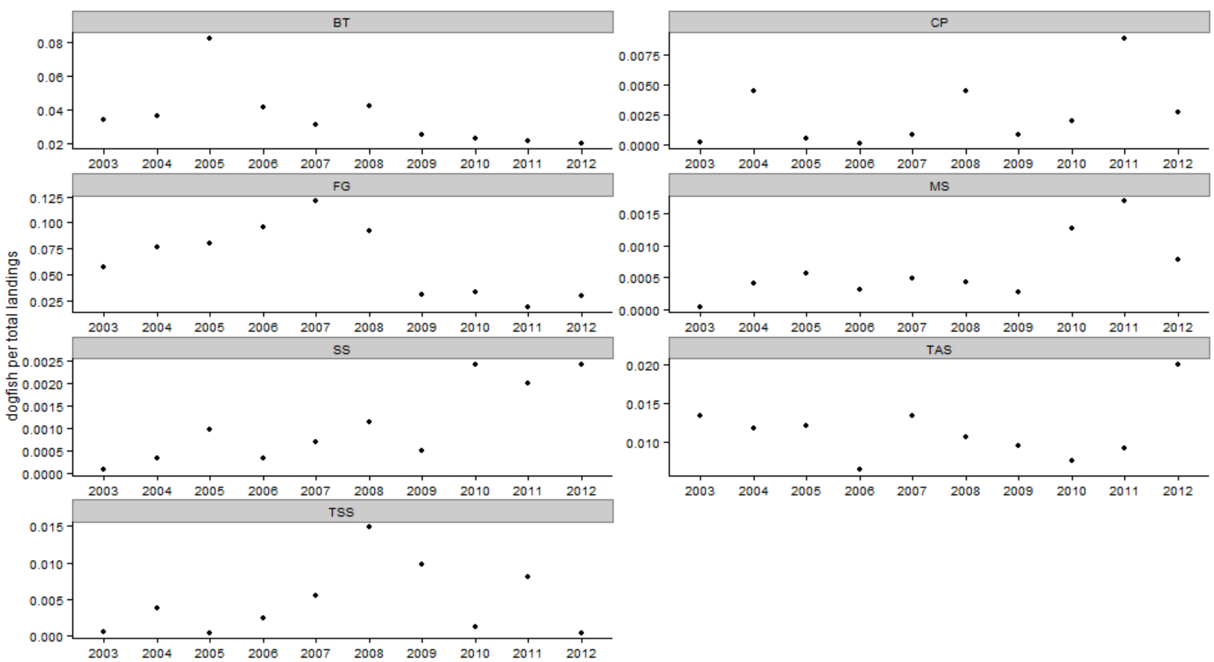

Figure B-16. Ratios of total Spiny Dogfish catch per landings of all stocks by year and sector, 2003-2012, displayed as time series. More recent years in the bottom trawl (2009-2012), non-nearshore fixed gear (2009-2012) and shoreside whiting sectors (2008-2012) show statistically significant differences from the respective early years. No such differences were detected for the other four sectors.

We also evaluated the 2003-2012 time series for correlation between sectors and for serial (a.k.a. auto-) correlation within sectors. As to the latter, the only sector showing serial correlation over 2003-2012 was the non-nearshore fixed gear sector (Durbin-Watson statistic, d = 1.079, p-value = 0.03). Serial correlation describes the situation where difference from the mean value tend follow a pattern across time (i.e. high catch years would be likely to follow one another). This would be of interest here because ACL overages could occur in streaks and mean that, in some periods, overages would occur more often the average probability of an overage would suggest. At the same time, catch would remain below the ACL for streaks as well. The serial correlation in the non-nearshore fixed gear sector is likely due to the change seen after 2008 in discarding (i.e. the above average catch ratios appear in the early part of the 2003-2012 time period and below average values in the later period). We did not attempt to incorporate the serial correlation into the simulations. Comparing Simulation 1 with Simulation 2 allows exploration of the impact of the changed discarding behavior in the sector.

As to correlation in catch among sectors, this too could make overages more likely as high catch years in sectors would tend to occur together. Evaluating the time series, statistically significant correlation did exist between the mothership and shoreside whiting sectors (r = 0.93, $p < 0.001$) over 2003-2012. And marginally significant (at the alpha = 0.05 level) moderately high positive correlation was detected between the At Sea sectors (r = 0.611, p = 0.06) and between the catcher processor sector and shoreside whiting sector (r = 0.610, p = 0.06). We explored the sensitivity of the simulations to these correlation coefficients using a multivariate random number generator. However, the results differed only by roughly 0.5 percent from the results in Simulation 1 and Simulation 2 and so are not shown here as to simplify the presentation.

Simulation Results and Discussion

The results for the No Action scenario for Simulation 1 and Simulation 2 are summarized in Table B-58. The performance metrics shown that table and the tables below include:

- *Avg. total catch (mt)*: the average annual total catch over all simulation runs.
- *% with overages*: the percentage of simulation runs were the annual total catch was greater than 1,897 mt.
- *Avg. overage amount*: the average size of overages in metric tons.
- *Avg. At Sea catch when overage*: the average total catch from the At Sea sectors in runs where there was an overage.
- *% of years At Sea catch >= Set Aside*: the percentage of runs with a total catch greater than 1,897 mt if the At Sea sector was capped e set aside amount (e.g., 163, 300, 500, 725)
- *% of years where 4-year average At Sea Catch >= 1,897*: we computed rolling averages with a window period of 4 years. This statistic reports the number of years where that rolling average was over the ACL.

Table B-58. Simulation results for the No Action scenario. See text for explanation.

	"No Action"				
	Avg. total catch (mt)	% with overages	Avg. overage amount (mt)	Avg. At Sea catch when overage (mt)	% of years where 4-year avg >= 1,187
Sim. 1	1,583	22.6%	421	566	10.9%
Sim. 2	1,212	6.5%	303	1,186	0.1%

While we do not view the simulations as providing precise forecasts, the general pattern they show suggests that overages of the ACL would occur with low to moderate frequency. Under both Simulation 1 and Simulation 2, the total catch of Spiny Dogfish remains below the PPA ACL levels for 2015 and 2016 on average. And the frequency of overages in both Simulation 1 and Simulation 2 is lower than the level at which ACL averages of more than one per four-year period become of concern.

To elaborate, considering just the number of overages (i.e. not the magnitude of the overage), the expectation for seeing overages in a 4 year period can be evaluated as binomial probabilities. Table B-59 displays the theoretical binomial probabilities of observing 0-4 overages over a four year period for a range of probabilities of experiencing an annual overage. For example, if the probability of annual overage is 30 percent then we would expect to see exactly one overage 26.5 percent of the time over the four years. And we would expect to see more than one overage 34.8 percent of the time. Therefore, based on the frequency of annual overages in Simulation 1, we would expect to see more than 1 overage less than 20 percent of time in a four year period. And for Simulation 2, we would expect less than a 5 percent chance of seeing more than 1 overage.

The 4-year rolling average statistic reported above was also inspired by the NS1 Guidelines ACL performance standard. More than a simple count of overages, the rolling average gives some sense of the magnitude of overages and is more in line with the SSC's advice about average catch over a multi-year period being the important mark for preventing overfishing. This advice applies especially to a stock like Spiny Dogfish where the harvest control rule takes into account the stock's relatively "slow" population dynamics. Annual overages of the ACL would not be expected to affect the stock's status much. As long as catch stays at or below the ACL on average then the expectations for harvest control rule remain unaffected. As reported in Table B-58, in Simulation 1 the 4-year rolling average is above the ACL only 11 percent of the runs, and in Simulation 2, in only 0.1 percent of the runs. Under the assumptions of the simulation models, we would not expect average catch to deviate too far from the ACL.

To explore the effect of the At Sea set side, we capped the total At Sea catch at each level and calculated the same performance statistics as for the No Action scenario (Table B-60). The general impact of each set aside level can be evaluated by comparing the results to the No Action scenario and to one another. For example, if the At Sea set aside were set at 500 mt then the frequency of overages in Simulation 1 drops by around 5 percent. The other consideration shown is that the At Sea sectors reached that set aside level in roughly 14 percent of the simulation runs. Then at the 300 mt set aside scenario, the percentage of overages drops roughly 3 percent from 500 mt scenario yet the At Sea sectors reached that level in 10 percent more of the simulation runs. The GMT can expand this initial set of performance metrics if the Council wishes to explore the issue further.

Lastly, a portion of the simulation runs produced what we deemed implausibly high results (e.g., catches of Spiny Dogfish reached into the 10,000+ range). We therefore capped the highest value in the simulations at twice the observed maximum catch of Spiny Dogfish, in terms of metric ton, for each sector. The doubling of the maximum catch was thought to be a conservative assumption, yet it does affect the simulation results. As an illustration of the effect, the capping affected roughly 4 percent of the simulation runs for the catcher processor sector. While the capping affected the estimate of the average size of an overage and the average catch for each sector, we do not see much effect on the number of simulated overages. For instance, of the 100,000 runs in the base Simulation 1 only 12 of the catcher processor's capped runs were under the ACL (i.e. 0.012 percent). The GMT may further discuss this capping of the lognormal results at the April meeting.

Table B-59. Theoretical binomial probabilities for the number of overages over a four-year period at various probabilities of an annual overage (e.g., if the annual probability of an overage is 0.25 then the probability of observing more than 1 overage in four years is 26.2 percent).

	Annual prob. of an ACL overage									
Prob. of # of overages:	**0.05**	**0.10**	**0.15**	**0.20**	**0.25**	**0.30**	**0.35**	**0.40**	**0.45**	**0.50**
0	81.5%	65.6%	52.2%	41.0%	31.6%	24.0%	17.9%	13.0%	9.2%	6.3%
1	17.1%	29.2%	36.8%	41.0%	42.2%	41.2%	38.4%	34.6%	29.9%	25.0%
2	1.4%	4.9%	9.8%	15.4%	21.1%	26.5%	31.1%	34.6%	36.8%	37.5%
3	0.0%	0.4%	1.1%	2.6%	4.7%	7.6%	11.1%	15.4%	20.0%	25.0%
4	0.0%	0.0%	0.1%	0.2%	0.4%	0.8%	1.5%	2.6%	4.1%	6.3%
Prob. > 1 overage	1.4%	5.2%	11.0%	18.1%	26.2%	34.8%	43.7%	52.5%	60.9%	68.8%

Table B-60. Simulation results where the simulated At Sea catch was capped at the four set aside levels examined in this analysis. See text for explanation.

	if set aside = 725 mt			if set aside = 500 mt		
	% with overages	% of years At Sea Catch >= set aside	% of years where 4-year avg >= 1,187	% with overages	% of years At Sea Catch >= set aside	% of years where 4-year avg >= 1,187
Sim. 1	20.2%	8.7%	6.7%	17.7%	14.0%	4.8%
Sim. 2	1.1%	8.9%	0.0%	0.4%	14.3%	0.0%

	if set aside = 300 mt			if set aside = 163 mt		
	% with overages	% of years At Sea Catch >= set aside	% of years where 4-year avg >= 1,187	% with overages	% of years At Sea Catch >= set aside	% of years where 4-year avg >= 1,187
Sim. 1	14.9%	24.7%	3.2%	12.6%	44.0%	2.0%
Sim. 2	0.1%	24.8%	0.0%	0.0%	44.4%	0.0%

Sector-level Patterns and Comparing Simulation 1 and Simulation 2

As shown above, the results between Simulation 1 and Simulation 2 are markedly different. The difference is attributable largely to the changed patterns in the bottom trawl and fixed gear sectors. The magnitude and variability of catch in both to decrease substantially in Simulation 2 as can be seen by comparing the distributions of simulation runs shown in Figure B-17 and Figure B-18. Looking to the bottom trawl sector, the median simulated catch hardly shifts in Simulation 2 (Figure B-17) relative to Simulation 1 (Figure B-18).

The catcher processor sector, in comparison, shows much larger differences in Simulation 2 than Simulation 1 demonstrating that catch in that sector is largely responsible for overage years in Simulation 2. In overage years, the 25th percentile of simulated catcher processor catches is above 1,000 mt. And a large portion of the catcher processor simulated catches in overage years is pushed up against the level at which catch for the sector was capped. This suggests that in the conditions modeled in Simulation 2 extreme catch events in the catcher processor sector are largely what drive total catch above the ACL. Yet overages are less than half as frequent in Simulation 2 as they are in Simulation 1, again, because of the major differences in the mean and standard deviations used for the bottom trawl and non-nearshore fixed gear sectors.

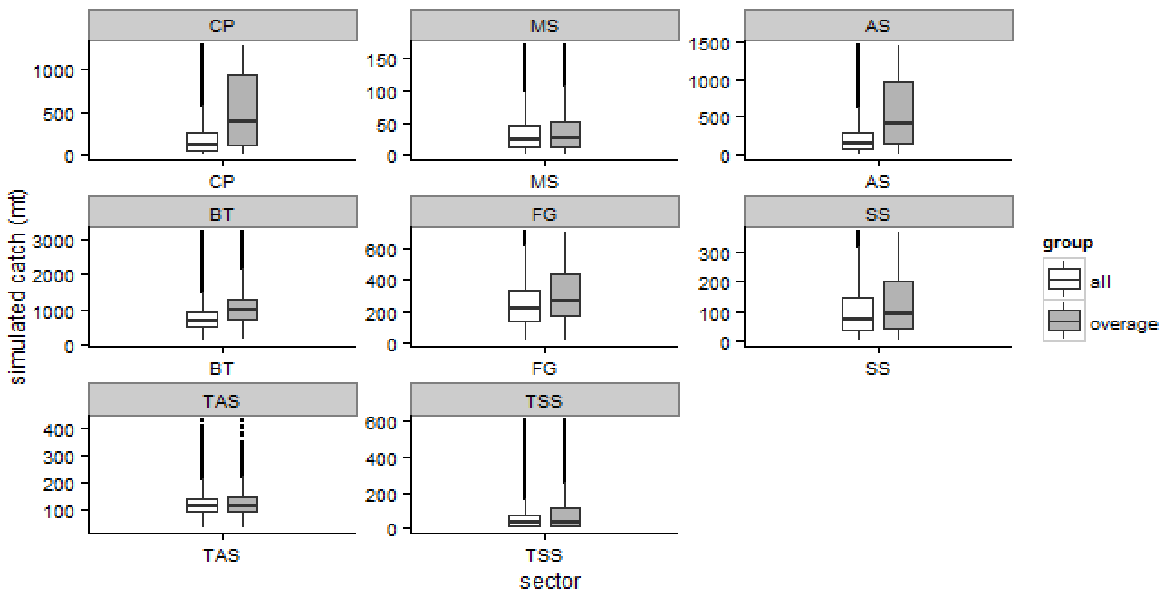

Figure B-17. Simulated catches by sector, including the At Sea sectors combined, for Simulation 1. The shaded boxes include only the simulation runs where the total catch was over the proposed ACL. See Figure B-15 for explanation of boxplots.

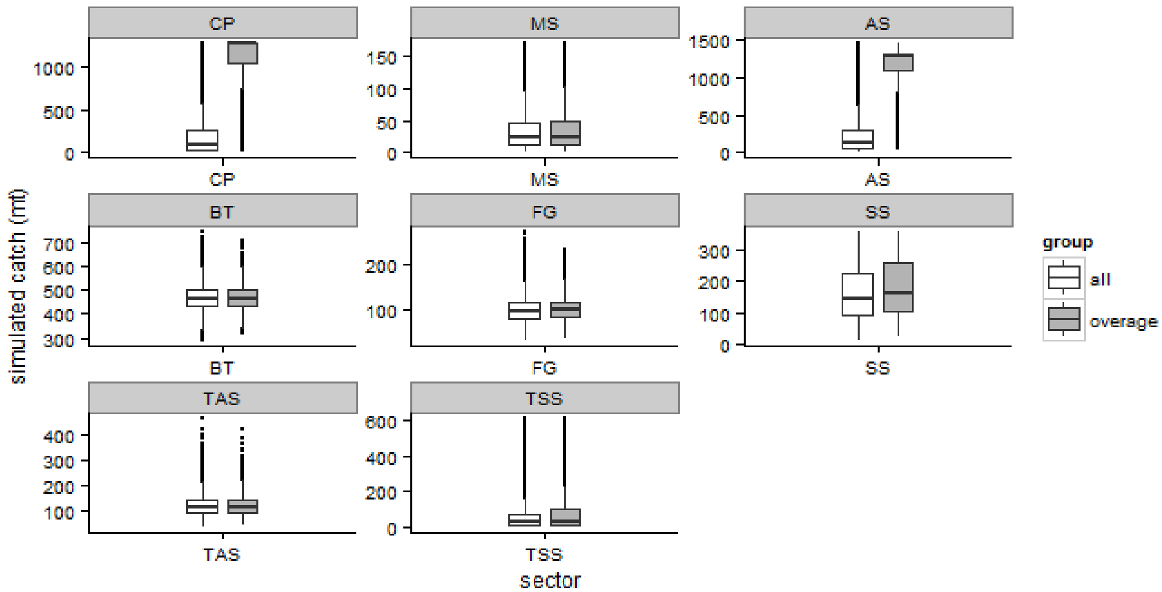

Figure B-18. Simulated catch by sector, including the At Sea sectors combined, for Simulation 2. The shaded boxes include only the simulation runs where the total catch was over the proposed ACL. See Figure B-15 Error! Reference source not found. **for explanation of boxplots.**

Other Analyses Explored

The results presented here are based on the idea that Spiny Dogfish catch in each sector follows a lognormal distribution following the means and standard deviations observed in the past. We also explored using the Gamma probability distribution as the basis for the simulations. The Gamma distribution is also commonly used where coefficients of variation are greater than 50 percent.[6] Without capping the simulated catches as was done in Simulation 1 and Simulation 2, the gamma based simulation using all 2003-2012 observations showed 19 percent of the runs reaching the overage level. This is largely consistent with the Simulation 1 results.

The Gamma and lognormal distributions assume that high catch events are less likely to occur than events closer to the mean. To explore sensitivity to that assumption, we also consider basing the simulations on uniform probability distributions where observed catches were as likely to occur in a year as any other. This approach also showed results that were consistent with Simulation 1 with overages occurring in ~17 percent of the runs. The implied assumption is that annual catch in each sector could be no larger than already observed. While this may be problematic when evaluating sector-level simulated catches, when focused on total catch across all sectors the method is akin to the widely used bootstrap method for evaluating uncertainty in data where the probability distribution is unknown. Again, however, all are based on the assumption that the future will continue to follow the same pattern as in the past.

Lastly, while we did not run multiple simulations to explore the sensitivity to the assumed whiting catches to which the simulated catch ratios are applied, we did explore the issue for the At Sea sectors using the bootstrap methods for calculating confidence intervals. The results are reported in Table B-61 and displayed graphically in Figure B-19 and Figure B-20. The bootstraps and confidence intervals were

[6] Benjamin M. Bolker, Ecological Models and Data in R (2005).

computed using the boot package in R.[7] As in the simulations, the ratios were assumed to follow a lognormal distribution (i.e. the bootstrap replicates calculated the lognormal mean). The confidence intervals shown in Table B-61 were calculated with the BCa method.[8] As that table shows, large whiting catches can push the expected Spiny Dogfish catch higher with the upper 95th percentile intervals skewed high. Initial explorations of the data did not show a statistically significant relationship between total whiting catch and the ratio of Spiny Dogfish catch to total whiting catch (i.e. the average bycatch ratio does not appear to change as a function of how much whiting is caught).

The GMT can incorporate different assumptions about the whiting catch in each sector at or after the April meeting after the 2015 Total Allowable Catch for whiting is determined.

Table B-61. Bootstrap 95 percentile confidence intervals for the ratio of Spiny Dogfish to whiting catch in the catcher processor and mothership sectors applied to four levels of possible whiting catches. See text for explanation.

		Whiting Catch Scenarios			
		2003-12 Avg.	**2003-12 Max.**	**2013**	**2013 + 50%**
CP	**ratio**	*66,964*	*108,200*	*77,950*	*116,925*
Mean	0.0035	237	383	276	414
Lower 95th	0.0016	107	173	125	187
Upper 95th	0.0096	643	1,039	748	1,122
MS	**ratio**	*40,776*	*57,497*	*52,450*	*78,675*
Mean	0.0007	29	40	37	55
Lower 95th	0.0005	20	29	26	39
Upper 95th	0.0014	57	80	73	110
At Sea Combined	Mean	266	423	313	469
	Lower 95th	128	202	151	226
	Upper 95th	700	1,119	822	1,233

7 Angelo Canty and Brian Ripley (2013). boot: Bootstrap R (S-Plus) Functions. R package version 1.3-9.
8 DiCiccio, Thomas J., and Bradley Efron. "Bootstrap confidence intervals." Statistical Science (1996).

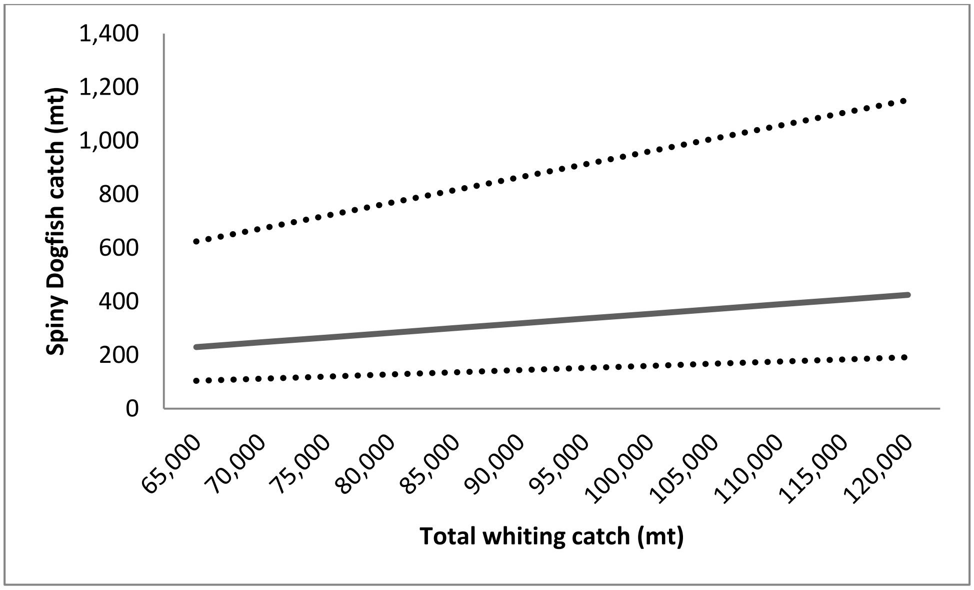

Figure B-19. Spiny Dogfish catch in the catcher processor sector at the mean and 95th percentile levels shown in Table B-60 applied to a range of possible total whiting catches.

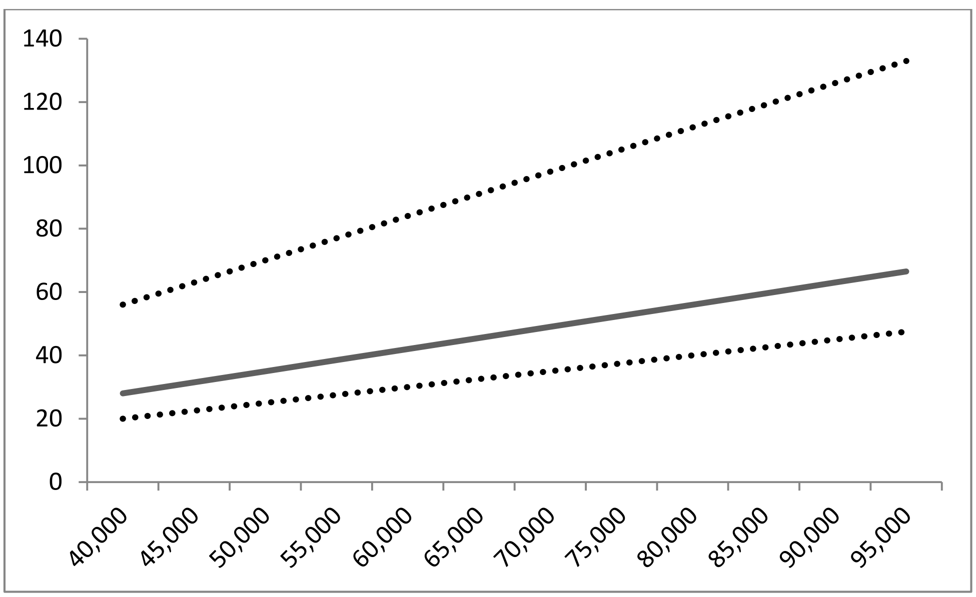

Figure B-20. Spiny Dogfish catch in the mothership sector at the mean and 95th percentile levels shown in Table B-60 applied to a range of possible total whiting catches.

Conclusion

Choosing sector set asides for Spiny Dogfish in such circumstances of high catch variability is challenging compared to situations when catch is stable relative to average levels. These simulations were intended to given the Council a thorough evaluation of variability in catch and how that variability affects: (1) the probability that the Spiny Dogfish will be exceeded and (2) how often the At Sea sector might be expected to reach given levels of an At Sea set aside. The simulation results suggest that the At Sea sectors, mainly the catcher process sector, are major contributors to the risk of ACL overages. However, the simulations also suggest that the risk should be weighed against the variability of catch seen in other sectors with the bottom trawl and non-nearshore fixed gear sectors in particular. If the catches observed in those sectors over 2009-2012 are indicative of what is likely to occur in 2015-2016, then the likelihood of a Spiny Dogfish ACL overage would be low. The GMT may discuss these results and further advise the Council at the April meeting.

B.10 Use of excluder devices to reduce catch of rougheye rockfish in non-tribal at-sea and shoreside Pacific whiting fisheries

Abstract
This analysis evaluates the potential mandatory use of excluder devices for reducing the catch of rougheye rockfish in the non-Tribal at-sea and shoreside Pacific whiting trawl sectors. Alternatives ranged from mandatory use for all trips north of 40º 10´ N latitude, to mandatory use only within limited areas (e.g., areas with highest rougheye rockfish catches). Although this analysis shows that use of excluder devices in these midwater Pacific whiting trawl sectors may reduce the catch of rougheye rockfish, it also shows that these reductions alone may not be enough to prevent exceeding the 2015 component OFL. Numerous assumptions were necessary to perform this analysis. Guidance is sought from various advisory groups (e.g., SSC, GAP, and EC) and the Council regarding these assumptions and to further refine this analysis.

Overview
The National Marine Fisheries Service (NMFS) recommended that the Council analyze removing or reorganizing blackgill, rougheye, and shortraker rockfishes from the minor slope complexes (north and south) because recent average catches (2007-2012) would have exceeded the 2015 OFL contributions for these component species (Agenda Item H.4.b, Supplemental NMFS Report, November 2013). The NMFS believed that management measures applied to address these OFL-contribution overages without removing these species from or reorganizing the slope rockfish complexes may be unnecessarily disruptive to fisheries and result in more complicated regulations. Subsequent Council discussion during the November 2013 meeting resulted in motions to analyze various management measures for reducing catch of rougheye rockfish by west coast commercial fisheries. If proven effective, some of these management measures may reduce the catch of rougheye rockfish (and other slope-rockfish species) with or without removing them from the complexes. One motion was to evaluate the use of excluder devices to reduce the catch of rougheye rockfish in shoreside and at-sea Pacific whiting fisheries (PFMC, Motion 30, November 2013). This analysis focuses on that motion. A hot-spot analysis, designed to identify areas with high catch ratios of rougheye-to-Pacific whiting is also included within this group of management measures, see above. These analyses may be considered collectively.

Background
This report focuses on reducing catch of rougheye rockfish in the non-Tribal at-sea and shoreside-whiting fisheries using bycatch reduction devices (BRDs) that are commonly referred to as excluder devices (e.g., mesh or grid ramps installed in trawls that lead to escape windows). Use of excluder devices to reduce catch addresses species selectivity based on a gear change (i.e., a change in fishing gear that promotes differential selectivity for different species). In this case, the theory is that trawl-gear modifications (e.g., the installation of excluder devices and escape windows) may reduce the catch of rougheye rockfish while minimizing escapement (or loss) of Pacific whiting.

Excluder Devices (general)
Excluder devices, along with escape windows, may be installed in trawls to “sort” fish (and invertebrates) by size and/or species while towing at fishing depth. These devices may take on various designs and shapes, such as rigid or flexible grids/grates/meshes, that “block” the trawl somewhere in front of the codend (e.g., at the fore end of the intermediate), thereby forcing larger individuals or species out of the net through escape windows (e.g., at the top of the trawl) while allowing smaller individuals or species to pass between the bars or meshes and into the codend. Some examples of excluder devices include those placed in shrimp trawls to exclude fishes (Hannah and Jones 2007), bottom trawls to exclude Pacific halibut while retaining groundfish (Lomeli and Wakefield 2013a, 2014), bottom trawls to exclude rockfishes and large roundfishes (e.g., sablefish) while retaining flatfishes (Lomeli (PSMFC) and Wakefield (NMFS-NWFSC), personal communication), and pelagic trawls to exclude salmon and rockfish while retaining most Pacific whiting (Lomeli and Wakefield 2012).

Excluder Devices Tested in Pacific Whiting Fisheries
<u>Initial Trial</u>: Lomeli and Wakefield (2012) described two excluder-device designs that were developed to increase escapement of rockfish and salmon while maintaining the catch of Pacific whiting in pelagic trawls. Although results of this study suggested the potential of these designs for reducing Chinook salmon bycatch, the designs were less effective for reducing the catch of widow rockfish. In addition, the authors described other limitations to this study that included small sample sizes of bycatch species and fishing under non-commercial conditions (i.e., trials were primarily conducted with the terminal end of the codend open).

<u>Second Trial with Improved Results</u>: A pilot study was conducted in 2013 that implemented recommendations made at a collaborative workshop by vessel owners, captains and crew, seafood company operators, regional net manufacturers, and gear researchers (Lomeli and Wakefield 2013b). The workshop participants concluded that a flexible sorting grid showed most promise for an excluder device designed for reducing rockfish bycatch from pelagic trawls targeting Pacific whiting.

The pilot study (Lomeli and Wakefield 2013b) was conducted during 2012 off Oregon and Washington on board a commercial trawl vessel. Results were relatively successful: one design (Design-B) retained a relatively high proportion of Pacific whiting (>93 percent by weight) while reducing the catch of rougheye rockfish by 95 percent, widow rockfish by 83 percent, and yellowtail rockfish by 69 percent (by weight). Note that although the size (length) of Pacific whiting was similar for retained and “escaped” individuals, Pacific whiting encountered during the study were relatively small (mean fork lengths ranged from 36.4 to 40.0 grams, approximately 300 gram fish).

It is important to note that Lomeli and Wakefield (2013b) showed that excluder designs used during this trial were effective only under low-to-moderate fish volumes. When whiting volumes were large, the designs tended to clog and the hauls were aborted early. Tows in this fishery may exhibit catch volumes exceeding 75 mt in less than 30 minutes. For these cases, the excluder design described by Lomeli and Wakefield (2013b) may be ineffective at reducing rougheye rockfish bycatch while maintaining catch levels of target species. This excluder design may be useful for Pacific whiting fishermen during low-to-moderate catch rates, but the authors noted that further refinement of the excluders would be needed to properly function under heavy fish volumes.

<u>Third Trial - Most Promising Results</u>: Additional sea trials were conducted in 2013 to evaluate a new BRD design (Design C) developed to exclude rockfish from pelagic trawls targeting Pacific whiting (Lomeli and Wakefield 2013c; personal communication). During these trials, widow rockfish was the primary rockfish species caught. Results showed their overall bycatch was reduced 26.6 percent by weight. The retention of Pacific whiting was 92.3 percent by weight. Single haul catches of Pacific whiting ranged from 40 to 100 mt. Catches producing over 90 mt of Pacific whiting were observed for

haul durations less than 2.5 hours. However, clogging would occur under heaviest fish volumes (i.e., when over 90 mt of Pacific whiting were caught in less than 45 minutes of towing). This excluder design could potentially be useful for Pacific whiting fishermen during moderate-to-high catch rates, but further refinement of the excluder would be needed to properly function under heavy fish volumes.

It was unfortunate that rougheye rockfish and other rockfish species larger than widow rockfish were not encountered during the 2013 trials. The authors of this study suggest that escapement would likely be higher than 26.6 percent for rougheye and other rockfish species that are larger than widow rockfish. Further refinements and testing are needed to improve the performance of this excluder-device design under highest fish volumes (i.e., > 90 mt in less than 45 minutes of towing).

Catch of Rougheye Rockfish – By sector

In order to evaluate any potential effect of this measure to rougheye rockfish mortality, the average catch by sector north of 40° 10′ N latitude was calculated using 2008-2012 WCGOP data (Table B-62). Using these data, non-Tribal at-sea whiting and shoreside whiting catch represent 18.8 percent and 4.7 percent (totaling 23.5 percent) of the rougheye rockfish catch across all sectors. The annual average catch of rougheye rockfish for these sectors combined was 58.8 mt north of 40° 10′ N latitude. Of this 58.8 mt caught by non-Tribal whiting fisheries, 80.1 percent was caught by the at-sea sectors while 19.9 percent was caught by the shoreside whiting fishery. Note that for some cases, inter-annual variation is high within sectors (Table B-62).

Table B-62. Five-year average, minimum, and maximum mortality (mt; 2008-2012) of rougheye rockfish by sector. Data were from WCGOP and includes retained and discarded fish. Note that some landings included a rougheye/shortraker combined category. These combined landings had little effect on sector-specific results, except for the Non-nearshore Fixed Gear sector, where average catch was 72.0 mt (including the rougheye/shortraker category) and 55.9 mt (without the rougheye/shortraker category). These landings do not include blackspotted rockfish.

Sector	5-year Average Catch (mt; 2008-2012)	Min – Max (mt; 2008-2012)
Incidental	0.9	0.3 – 2.2
LE shoreside trawl	90.2	47.7 – 143.8
IFQ Fixed Gear (2011-2012)	18.7	15.6 – 21.7
Nearshore Fixed Gear	0.1	0.0 – 0.05
Non-nearshore Fixed Gear	72.0	41 – 89.1
Non-Tribal At-Sea Pacific Whiting	47.1	8.7 – 78.6
Pink Shrimp	0.0	0 – 0.02
Shoreside Pacific Whiting	11.7	0.6 – 47.1
Tribal At-Sea Pacific Whiting	1.2	0 – 2.9
Tribal shoreside trawl	19.7	15.2 – 33.5

Area of Rougheye Catch by the Non-Tribal At-Sea Whiting Fishery

Table B-62 provides an example of an ongoing analysis intended to identify areas where high or low values of rougheye catch may be clustered spatially during the 2002-2012 time period. More refined results of this analysis and more detail about the methods can be found in section B.2 herein. In Figure

B-21, any rougheye rockfish caught on a haul was attributed to a point location, the midpoint of that haul, and hauls that did not catch rougheye were excluded. These points were then evaluated spatially to determine whether there were areas where high catch levels of rougheye were clustered. Figure B-21 shows areas where higher levels of catch are clustered (boxes outlined in green) seaward of 150 – 200 fm and north of the Oregon-Washington border. The largest area with higher catch densities is north of 47^{o} 30’ N latitude. Areas with moderate catch densities (empty boxes) are generally seen off the Oregon coast. Areas where lower levels of catch are clustered (boxes outlined in purple) were found to occur south of the Oregon-California border. Relative catch densities of Pacific whiting are also shown in Figure B-21, with highest densities occurring in areas with the darkest shading. Pacific whiting catch is typically highest off of northern Washington and numerous areas along the Oregon coast.

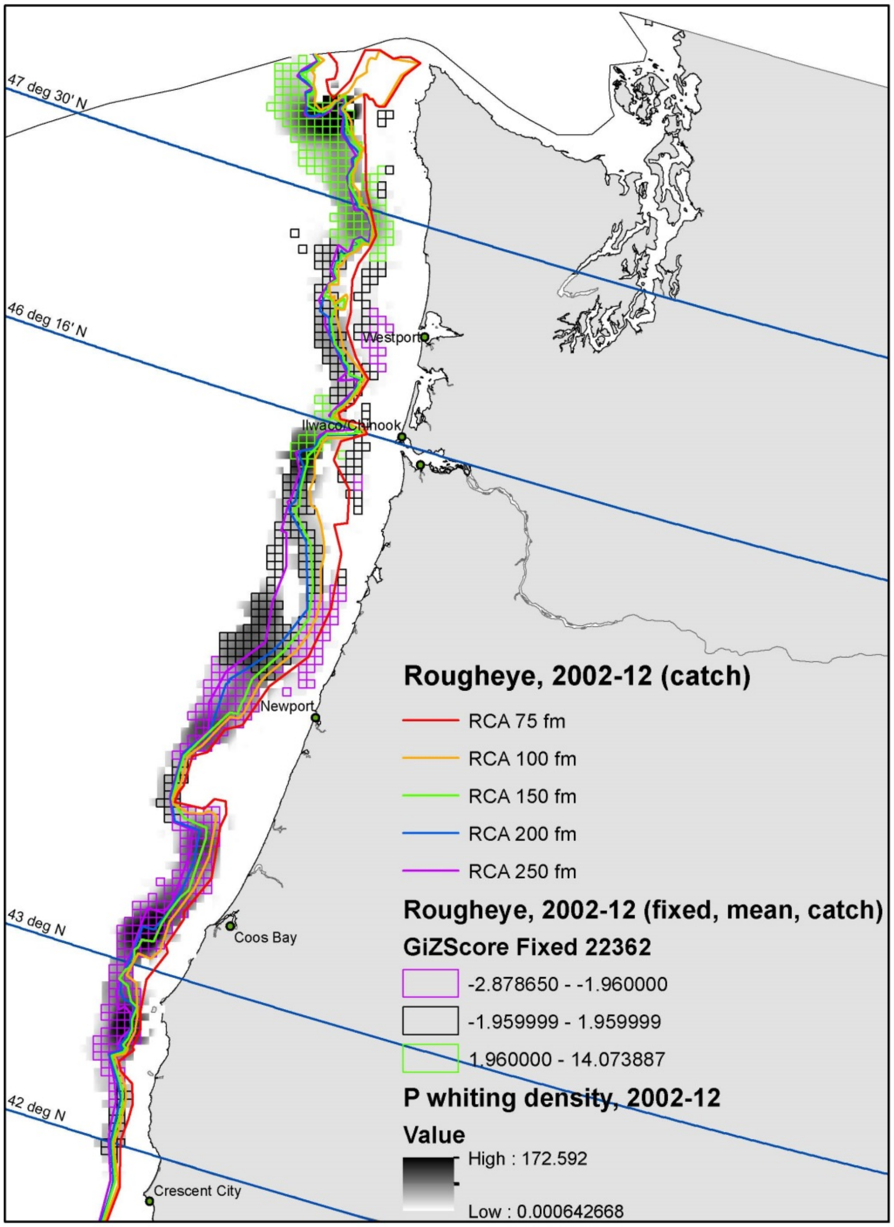

Figure B-21. Catch of rougheye rockfish north of 40º 10´ N latitude by the non-Tribal at-sea whiting sector. Data were acquired from NORPAC (2002-2012). Areas where high levels of catch are clustered are shown by the boxes outlined in green (i.e., north of 47º 30´ N latitude; z-scores greater than or equal to 1.96), moderate catches are shown by the empty boxes, and areas of low catches are shown as boxes outlined in purple (z-scores less than or equal to -1.96). Density plots of Pacific whiting catch are shown in the background (i.e., darkest = highest catch of target species).

More recent catches for rougheye rockfish and Pacific whiting (2008-2012) are shown by depth and area for the non-tribal at-sea whiting sectors (2008-2012) in Table B-63 and Table B-64, respectively. During these years, most rougheye rockfish were caught between 200 fm and 400 fm by the at-sea sectors (Table B-62). Conversely, most whiting catch was also caught over bottom depths ranging from 200 fm and 400 fm (Table B-64). Similar to that shown in Table B-62, although most rougheye rockfish catch by the non-Tribal at-sea whiting sectors occurred off the Washington coast (81.8 percent; Table B-63), whiting catches by these sectors were more evenly distributed between Washington (46.6 percent) and Oregon (51.5 percent; Table B-64).

Table B-63. Rougheye rockfish catch (2008-2012) by area and depth for non-Tribal at-sea Pacific whiting sectors, north of 40º 10´ N. latitude. Average catch (mt) and percentage of catch are shown by depth and area. Data were acquired from NORPAC and include only one code for rougheye rockfish. NoCAL = California north of north of 40º 10´ latitude; NoWA = Washington north of 47º 30´ N. latitude; SoWA = Washington between the Oregon-Washington border and 47º 30´ N. latitude.

(A) Average Rougheye Rockfish Catch (mt), 2008-2012

Bottom depth (fm)	Area				TOTAL
	NoCAL	OR	SoWA	NoWA	
< 100	0.0	0.0	0.0	0.0	0.0
100-200	0.0	0.4	0.0	0.2	0.6
200-300	0.0	4.7	1.7	15.2	21.6
300-400	0.0	2.4	3.4	13.8	19.5
> 400	0.0	1.3	1.1	4.0	6.4
TOTAL	0.0	8.7	6.2	33.2	48.2

(B) Percent Rougheye Rockfish Catch (mt), 2008-2012

Bottom depth (fm)	Area				TOTAL
	NoCAL	OR	SoWA	NoWA	
< 100	0.0%	0.0%	0.0%	0.0%	0.0%
100-200	0.0%	0.8%	0.0%	0.5%	1.3%
200-300	0.0%	9.8%	3.6%	31.5%	44.9%
300-400	0.0%	4.9%	7.0%	28.7%	40.5%
> 400	0.0%	2.7%	2.3%	8.2%	13.2%
TOTAL	0.0%	18.1%	12.9%	68.9%	100.0%

Table B-64. Percentage of Pacific whiting catch by area and depth (2008-2012) for non-Tribal at-sea Pacific whiting sectors, north of 40º 10´ N. latitude. Data were acquired from NORPAC. NoCAL = California north of north of 40º 10´ latitude; NoWA = Washington north of 47º 30´ N. latitude; SoWA = Washington between the Oregon-Washington border and 47º 30´ N. latitude.

Percent Whiting Catch (mt), 2008-2012

	Area				
Bottom depth (fm)	**NoCAL**	**OR**	**SoWA**	**NoWA**	**TOTAL**
< 100	0.0%	0.1%	1.5%	0.9%	2.4%
100-200	0.0%	10.3%	0.9%	5.2%	16.4%
200-300	0.3%	32.0%	3.9%	11.6%	47.9%
300-400	0.6%	7.9%	4.1%	9.4%	22.0%
> 400	0.0%	2.3%	3.7%	5.4%	11.4%
TOTAL	1.0%	52.5%	14.0%	32.6%	100.0%

Management Options

Data shown above was used to evaluate alternatives. The baseline catch (mt) for rougheye rockfish north of 40° 10´ N latitude is shown in Table B-62 for non-Tribal at-sea sectors (47.1 mt) and the shoreside whiting sector (11.7 mt). Proportions of rougheye rockfish catch shown in Table B-63 B were then applied to both the non-Tribal shoreside whiting and at-sea whiting catches (Table B-62) to estimate the contribution of catches by depth and area. Although these percentages were based only on at-sea sector catches, we applied them to the shoreside whiting sector to estimate their catch by area and depth. We were unable to analyze depth- and area-specific WCGOP data for the shoreside whiting sector prior to the deadline for this analysis. If requested by the Council, we can provide more accurate depth-area catches of rougheye rockfish for the shoreside whiting sector by June.

Since shoreside whiting is part of the shoreside IFQ sector (IFQ whiting and non-whiting trawl; IFQ fixed gear), for this analysis, we assumed that vessels declaring Pacific whiting mid-water trawl were part of the shoreside-whiting "sector".

For the action alternatives, we assumed that reductions of rougheye rockfish catch when using excluder devices would be similar among all non-Tribal whiting sectors (i.e., non-Tribal shoreside whiting and non-Tribal at-sea whiting sectors).

Lomeli and Wakefield (2013b; personal communication) provided two "rougheye rockfish escapement percentages", depending on gear design and trial (see above). The most effective design resulted in a 95 percent reduction of rougheye rockfish catch (Lomeli and Wakefield, 2013b); however, that design was prone to clogging at high Pacific whiting catch rates. A second design showed 26.6 percent reduction in catch of widow rockfish, even under high catch rates of Pacific whiting (Lomeli and Wakefield 2013c; personal communication). Unfortunately these latter trials were conducted in areas with no rougheye rockfish. It is likely that exclusion of rougheye rockfish would have been greater than that shown by widow rockfish, because rougheye are typically larger. Hence, for this analysis, we assumed that rougheye rockfish reduction would be 50 percent for non-Treaty at-sea whiting and shoreside whiting sectors (which is between 26.6 percent and 95 percent, but weighted closer to the lower escape percentage). This analysis will assume that that the excluder design (and specifications) are similar to that shown by Lomeli and Wakefield (2013c; personal communication) during the third trial. Specifications for the most appropriate design can be provided by Lomeli (PSMFC) and Wakefield (NOAA).

No Action: Midwater trawl design would be implemented as specified in current regulations, and would be allowed in all areas and periods specified in current regulations. Declaration reports would also be filed as shown in current regulations.

Current regulations do not preclude the use of excluder devices and escape windows by any trawl fishery along the U.S. west coast. Hence, under No Action, excluder devices may be used voluntarily by any of the trawl sectors, if so desired. This voluntary action may reduce the catch of rougheye rockfish by midwater trawl sectors targeting Pacific whiting without additional regulation. However, for this analysis, it is assumed that voluntary use of excluder devices in the various Pacific whiting trawl sectors does not occur, and that fishing behavior will emulate that seen during 2008-2012. It is likely that some voluntary use will occur, and that fishing behavior may change in 2015-2016 relative to the recent past. These changes cannot be easily quantified, however, and are therefore not included in this analysis.
Under no action, it is assumed that the 5-year average (2008-2012) catch of rougheye rockfish will occur, with no impact to whiting catch (Table B-65).

Table B-65. Projected rougheye rockfish catch (mt) under No Action. Catch was estimated as the 5-year average (2008-2012) from WCGOP data.

Variable	Non-Tribal At-Sea Whiting	Non-Tribal Shoreside Whiting	Total
Rougheye Rockfish Catch (mt)	47.1	11.7	58.8 mt
Relative Impact to Whiting Fisheries	None	None	

Option 1 (most restrictive): For all non-Tribal midwater whiting trawl sectors for the area North of 40^{o} 10´ N. latitude, the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
(2) Non-Tribal midwater whiting fisheries (all sectors) shall be allowed in all areas and periods as specified in current regulations, with trawl modifications described in Option 1, (1) above.
(3) Declaration reports would be filed as shown in current regulation.

Under Option 1, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries would escape at fishing depth and survive. Hence, rougheye rockfish catch by these sectors would be 50 percent lower than the 5-year average (or 29.4 mt; Table B-66).

This action would result in some loss of Pacific whiting during each haul (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be needed to fully attain quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 8 percent. This is likely a low estimate, because a much higher percentage of Pacific whiting might escape the trawl at fishing depth (or released (bled) from the trawl at the surface) when clogging of the excluder device occurs. Finally, although it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, impacts would be highest under this alternative (Table B-66).

Table B-66. Projected rougheye rockfish catch (mt) under Option 1, where excluder devices would be used for all non-Tribal whiting trips (at-sea and shoreside) north of 40º 10´ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data). Pacific whiting loss may be > 8 percent per haul. Potential impact to whiting fisheries is demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	23.5	5.9	29.4
Relative Impact to Whiting Fisheries	(----)	(----)	

Option 2: For all non-Tribal midwater whiting trawl sectors and the area North of 40º 10´ N. latitude, if any fishing occurs between the 200 fathom RCA and 400 fathom "GCA" (to be specified at a later date), then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
   a. Midwater trawl specifications shown in current regulations (unmodified) would be allowed only if fishing occurred outside of the 200 fathom – 400 fathom "GCA" (to be determined at a later date) for all hauls during a Pacific whiting declared trip.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 2, (1) above.

(3) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 2, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within the 200 – 400 fm "GCA" north of 40º 10´ N. latitude is conducted with excluder devices installed (and these trips would not venture outside of the "GCA"). Consequently, it follows that all sets made outside of the "GCA" would be conducted without an excluder device. In actual practice, those declaring to fish inside the "GCA" with an excluder would likely make some tows outside of the GCA with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders even if no hauls are made inside a "GCA". Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside the "GCA"), 33.6 mt of rougheye rockfish would be caught (Table B-67): 26.9 mt by the at-sea whiting sectors and 6.7 mt by the shoreside whiting trips (see Table B-63 for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul when excluders are used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to fully attain the whiting quota. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table B-64 shows that 69.6 percent of the Pacific whiting is caught between 200 and 400 fathoms. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 5.6 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl when clogging of the excluder device occurs. In addition, some hauls will likely be made outside of the 200 – 400 fm "GCA" with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely (Table B-67).

Table B-67. Projected rougheye rockfish catch (mt) under Option 2, where excluder devices would be used for non-Tribal whiting trips (at-sea and shoreside) made between 200 – 400 fm and north of 40º 10′ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 5.6 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	26.9	6.7	33.6
Relative Impact to Whiting Fisheries	(--)	(--)	

Option 3: For all non-Tribal midwater whiting trawl sectors, if any fishing occurs between the 200 fathom RCA and 400 fathom GCA (to be specified at a later date) and north of 46º 16′ N. latitude, then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
    a. Midwater trawl specifications shown in current regulations (unmodified) would be allowed only if fishing occurred outside of the 200 fathom – 400 fathom "GCA" (to be determined at a later date) for all hauls during a Pacific whiting declared trip.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 3, (1) above.

(4) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 3, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within the 200 – 400 fm "GCA" north of 46º 16′ N. latitude would be conducted with excluder devices installed (and these trips would not venture outside of the “GCA”). Consequently, it follows that all sets made outside of the “GCA” would be conducted without an excluder device. In actual practice, those declaring to fish inside the “GCA” off Washington with an excluder would likely make some tows outside of the GCA with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders even if no hauls are made inside of a “GCA”. Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside the “GCA”), 38.0 mt of rougheye rockfish would be caught (Table B-68): 30.4 mt by the at-sea whiting sectors and 7.6 mt by the shoreside whiting trips (see Table B-63 for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul that excluder devices were used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to catch quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table B-64 shows that 29 percent of the Pacific whiting is caught north of 46^o 16´ N latitude and between 200 and 400 fathoms. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 2.3 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl when clogging of the excluder device occurs. In addition, some hauls will likely be made outside of the 200 – 400 fm “GCA” when fishing north of 46^o 16´ N latitude with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely (Table B-68).

Table B-68. Projected rougheye rockfish catch (mt) under Option 3, where excluder devices would be used for non-Tribal whiting trips (at-sea and shoreside) made between 200 – 400 fm for declared trips north of 46^o 16´ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 2.3 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	30.4	7.6	38.0
Relative Impact to Whiting Fisheries	(-)	(-)	

Option 4: For all non-Tribal midwater whiting trawl sectors, if any fishing occurs north 47^o 30´ N. latitude (all depths), then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.

  a. Any declared trips south 47^o 30´ N. latitude (where all tows during the declared trips would be made) would not require a rockfish excluder.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 4, (1) above.
(3) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 4, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within "GCA" (i.e., north of 46º 16´ N. latitude) would be conducted with excluder devices installed (and these trips would not venture outside of the "GCA"). Consequently, it follows that all sets made outside of the "GCA" would be conducted without an excluder device. In actual practice, those declaring to fish inside the "GCA" off Washington with an excluder would likely make some tows outside of the "GCA" with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders, even if no hauls are made inside a "GCA". Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside of "GCAs"), 38.6 mt of rougheye rockfish would be caught (Table B-69): 30.9 mt by the at-sea whiting sectors and 7.7 mt by the shoreside whiting trips (see Table B-63 for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul that excluder devices were used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to catch quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table B-64 shows that 32.6 percent of the Pacific whiting is caught north of 47º 30´ N latitude at all depths. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 2.6 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl (or be released (bled) from the trawl at the surface) when clogging of the excluder device occurs. In addition, some hauls will likely be made outside "GCA" with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely and would be lowest among the action alternatives (Table B-69).

Table B-69. Projected rougheye rockfish catch (mt) under Option 4, where excluder devices would be used for non-Tribal whiting sector (at-sea and shoreside) trips declared north of 47º 30´ N. latitude (all depths). Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 2.6 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.

	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	30.9	7.7	38.6
Relative Impact to Whiting Fisheries	(-)	(-)	

Biological Impacts
This analysis demonstrated that rougheye rockfish caught by non-Tribal at-sea and shoreside Pacific whiting sectors may range from 58.8 mt (No Action) to 29.1 mt (Option 1; Table B-70). Other options

were explored, where excluders would be required only on trips where at least one haul was conducted within specific depth ranges exhibiting highest rougheye rockfish catch (i.e., between 200 and 400 fm, "GCA") and/or within specific latitude ranges (i.e., north of 47º 30' N latitude; Table B-70) regardless of depth. Option 1 provided the largest rougheye rockfish savings but would also result in the most wide-spread use of excluder devices and highest escapement of Pacific whiting across the fleets (i.e., excluders would be required for all trips north of 40º 10′ N latitude). Rougheye rockfish catch for Options 2 – 4 are up to 9 mt higher than that shown for Option 1, but substantially lower than shown under No Action. It is important to note that there is virtually no difference in rougheye rockfish catch (or whiting escapement) between Options 3 and 4 (Table B-70). Option 3 would require excluders along the entire Washington coast when fishing is anticipated to occur between 200 and 400 fm (within the "GCA"), whereas Option 4 would require excluders only be used when fishing occurs north of 47º 30' N latitude (all depths).

The 2015 and 2016 component OFLs for rougheye rockfish north of 40º 10' N latitude are 201.9 mt and 206.8 mt. The five-year average catch (2008-2012) by all fisheries (250.1 mt; Table B-62) would exceed this 2015 component OFL by 48.2 mt under No Action. Options 1 – 4 may reduce the catch of rougheye rockfish by 20.2 mt (Option 4) to 29.4 mt (Option 1). These reductions alone may not be enough to prevent exceeding the 2015 component OFL for rougheye rockfish north of 40º 10' N latitude (i.e., 201.9 mt), or the 2015 component OFL coastwide (i.e., 206 mt). It is important to note that these projections are based on 5-year average catches. Annual projections could be much higher (or lower), if minimum or maximum historical catch values were used, or if some upper or lower percentile for catches were applied to the projection. In addition, including more or fewer years for the baseline average may change interpretations.

Impacts to whiting and bycatch species that escape the trawl under Options 1 –4 relative to No Action are uncertain. The potential mortality for those species escaping the trawl through the escape windows is unknown and would be unaccounted. Escapement at fishing depth of both whiting and bycatch species could be much higher than shown under Options 1 – 4 if clogging of the BRD occurs. Furthermore, if clogging occurs, it is likely that some fish may have to be bled at the surface before bringing the net up the trawl ramp. Mortality for fish bled at the surface would likely approximate 100 percent. These fish would be accounted for by 100 percent observer coverage.

Table B-70. Summary of biological and socio-economic impacts by alternative. The "relative impact to whiting fisheries" is a subjective measure, with no quantitative basis.

Alternative	Excluder Requirement	Rougheye Rockfish Catch (mt)	Projected Additional Whiting Escapement (%)	Relative Impact to Whiting Fisheries
No Action	None	58.8	0.0%	No Impact
1	North 40º 10′ N latitude (all depths)	29.4	> 8.0%	(----)
2	North 40º 10′ N latitude (200-400 fm)	33.6	> 5.6%	(---)
3	North 46º 16′ N latitude (200-400 fm)	38.0	> 2.3%	(--)
4	North 47º 30′ N latitude (all depths)	38.6	> 2.6%	(-)

Socioeconomic Impacts

The expense incurred by purchasing flexible excluders for shoreside midwater trawls (and trawls for catcher vessels in the at-sea whiting fishery) may approximate $22,000, based on research gear-related expenses (Lomeli (PSMFC) and Wakefield (NOAA), personal communication). These BRDs are built within a straight tube of netting designed to be inserted (i.e., zippered) between the intermediate section of the trawl and the packer/stuffing tube forward of the codend. The price for catcher-processor (C/P) trawls will likely be higher, because the trawls are larger.

Relative impacts by alternative are shown in Table B-70. Implementation of a new gear regulation requiring use of excluder devices in midwater whiting trawls for non-Tribal at-sea and shoreside whiting sectors may reduce the catch efficiency for whiting (i.e., there will be some additional escapement), increase net handling time (e.g., if fish and debris need to be removed forward of or from the excluder after each haul), and require net modifications. For example, when clogging occurs, the vessel may have to bleed or release fish from the net until the volume at the clog can be brought up the stern ramp without further damaging the intermediate section of the trawl net in front of the excluder. The time required to bleed fish, the economic loss of fish bled from the net, and repair costs to the net will likely represent economic impacts. Since these trips are 100 percent observed, fish bled from the net at the surface would be deducted from the quota. It is uncertain how often this may occur. At any rate, each of these outcomes may increase the operating costs of fishing operations. In addition, reduced efficiency may result in additional hauls and time at sea to attain the quota of Pacific whiting. Additional time at sea equates to not only additional expense, but also additional exposure to hazards.

The most complex regulations may be the most difficult (and expensive) to enforce. Note that some analyses focused on use of excluders only under a single condition (i.e., north or south of a specific latitude), whereas others incorporated both latitudinal split and depth requirements (i.e., 200 – 400 fm). The latter requirements would clearly be the most complex to manage.

Discussion and Considerations

For this report, five options were provided for consideration (including No Action). Additional options may be considered after input from the public and advisory groups (e.g., GAP, EC, SSC, and GMT). Council guidance is needed to refine this analysis (i.e., add and/or delete options). For example, gear regulations are difficult to define and enforce, hence, comments from the EC (and all advisory groups) must be weighed when considering regulatory changes to fishing gear. In addition, regulatory complexity is highest when regulating by latitude and depth, versus regulating by latitude only.

For options where midwater trawls with excluders are required for fishing within specific areas or depths (i.e., to legally fish within a "GCA"), the Council may consider recommending measures to minimize complexity for enforcement. Some examples include: (a) intended fishing trips within these special "GCAs" must be declared prior to leaving port, which would require a new declaration category in regulation, and (b) only a midwater trawl with a legal excluder device installed may be onboard during trips where any hauls occur inside a "GCA" (i.e., no other trawl may be onboard).

If regulations are adopted that define new fishing gear (i.e., installation of an excluder device and escape windows), the regulation could be specific only where needed to ensure adequate escapement of rockfishes at fishing depth. Specificity could be minimal and only apply to the most important aspects of the excluder and escape windows (e.g., length and width of grids within a panel that allow passage of whiting while blocking the passage of larger rockfish). Different sizes of vessels and different operators may require different designs (i.e., placement within the trawl due to different types of nets, etc.). It may be advantageous if fishermen were allowed the flexibility to fine-tune the device for their specific net and fishing operations to ensure that whiting escapement is minimal while maximizing escapement of rockfish. It would be beneficial for experts to convene to help draft regulatory language that ensures appropriate escapement along with adequate flexibility. In addition to NMFS regulatory writers and

Council staff, these experts may include Pacific whiting vessel owners/operators (shoreside whiting vessels, catcher vessels, and catcher/processors), net manufactures, and researchers.

For this draft, impacts were estimated using a 5-year average catch of rougheye rockfish in non-Tribal at-sea and shoreside Pacific whiting fisheries. Other averages could be used (e.g., 6-year average, which would reduce the baseline value for rougheye rockfish catch). It has also been suggested that the average and a range (e.g., minimum and maximum catches over a longer time period) be used to estimate rougheye rockfish impacts. This would provide some measure of risk that the Council may evaluate when selecting alternatives. If this measure moves forward, we seek guidance from the SSC and the Council regarding bycatch amounts that may be most appropriate for projecting catches of rougheye rockfish among alternatives (i.e., 5-year average, 6-year average, 75th percentile, etc.).

Interannual variability may result in different outcomes than predicted here. Annual catches of rougheye rockfish are highly variable (see Table B-62). This variability may be due to areas and times that fishing occur (e.g., fishing occurs where Pacific whiting may be most abundant, and this may change from year to year depending on environmental conditions). In addition, Pacific whiting ACLs vary annually, which may directly impact the amount of fishing effort. Finally, sizes of Pacific whiting may vary annually. For example, the majority of the Pacific whiting catch in 2013 was age 3, which approximates individual weights of about 360 grams and lengths of 36-38 cm. In 2014, the majority of Pacific whiting catch is expected to be age 4, which are typically 40-43 cm and may average approximately 500 g. It is likely that larger Pacific whiting may exhibit higher escapement than smaller individuals when using excluder devices. This information collectively illustrates that encounter rates with rougheye rockfish will likely vary from year to year, and retention (or escapement) of Pacific whiting may vary depending on clogging rates and sizes of Pacific whiting available (e.g., larger Pacific whiting may exhibit highest escapement when using excluder devices).

Fishermen behavior should be considered when selecting alternatives. Fishing strategies may change if stock complexes are reorganized, or if consequences of exceeding component OFLs become recognized. Fishermen may voluntarily use excluder devices when fishing in areas with known high concentrations of rougheye rockfish, or may avoid these areas all together if consequences of catching rougheye rockfish are high. On the other hand, fishermen may be more inclined to fish within areas of high rougheye rockfish concentrations if excluder devices selectively enhance their escapement from trawls.

It is important to note that research results are always tenuous. Sample sizes are typically small (i.e., number of vessels, types of vessels, fishing areas, bycatch species encountered, etc.). The effectiveness of a new gear design is uncertain until applied to the commercial fishery under purely commercial conditions. Furthermore, research results described here were conducted on shoreside-whiting vessels. The net types used by these vessels are similar to those used by catcher vessels in the mothership sector. However, nets used by C/Ps are much larger. The design, cost, and effectiveness may be much different for C/Ps. Input from the GAP and others is necessary to help elucidate potential costs and benefits among sectors.

Finally, the potential escapement rate for rougheye rockfish using excluders was assumed to be 50 percent, which was less than the midpoint between rougheye rockfish escapement during Trial 2 (= 95 percent escapement by weight) and widow rockfish escapement during Trial 3 (= 26 percent escapement by weight). There were no rougheye rockfish available to the trawl during Trial 3. The authors of the excluder research projects point out that rougheye rockfish, which are generally larger than widow rockfish, would exhibit higher escapement than widow rockfish using the excluder devices. Guidance is sought from the SSC regarding the most appropriate assumption for rougheye rockfish escapement when excluder devices are used.

To summarize, the socio-economic and biological impacts may be more (or less) than described here. The pros and cons of applying research results to regulation should be considered. Input from the public and advisory groups will be paramount when considering this management measure.

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B.11 Set-asides to cover carryover if trawl allocation exceeded

B.12 Allow retention of canary rockfish in the recreational fisheries

Background

The West Coast canary rockfish stock is a poorly understood groundfish stock managed by the Pacific Fisheries Management Council (Council), despite being declared “overfished”, and severely limiting to fisheries. The current stock abundance is relatively uncertain because the only measure of relative abundance does not occur in the primary habitat (rocky reef) of canary, and many other, rockfish. Future stock abundances are also uncertain because the bottom trawl survey primarily catches very large (and old) canary rockfish, which means recruitment events (of young individuals) are difficult to determine or verify.

Uncertainties of the current and future abundance of the canary rockfish stock could be resolved using Recreational groundfish (hereafter, ‘sport fishery’) data. Since the sport fishery occurs almost entirely over rocky reef habitats, sport fishery catch rates could be used to provide an index of relative abundance (catch per unit effort; CPUE) of canary rockfish from their primary habitat. Additionally, since sport fishery gears catch smaller canary rockfish than trawls, biological data from the sport fishery could be used to better detect recruitment events.

Although the sport fishery could aid in the data used for future canary rockfish stock assessments, retention of canary rockfish would have to be permitted for sport fishery. Since anglers are currently required to discard all canary rockfish catch, biological samples can only be obtained from infrequent illegal landings. Furthermore, the quantity of canary rockfish anglers report they discarded is too uncertain to be used as a CPUE index in an assessment. However, allowing retention could resolve some of this uncertainty, as at least some of the catches would instead be landed, and verified by dockside creel samplers (and biological samples could be obtained). Therefore, permitting retention of canary rockfish in the sport fishery could be a method to provide new data sources for the assessment, to enhance the understanding of the canary rockfish stock.

Retention of an overfished species from the recreational fishery has been allowed for bocaccio south of 40° 10’ N lat., even though it was declared overfished in 1999. The sub-bag limit for bocaccio in that area has ranged from 3 in 1999 and 2000 to no retention in 2003 and a 1 fish sub-bag limit in 2004. The 2011 assessment (which was used to inform the 2013-2014 harvest specifications and management measures) bocaccio was estimated to have a depletion of 26.0 percent (Field, 2011). For 2013-2014 the bocaccio bag limit was increased and the minimum size limit was decreased, allowing for more retention of bocaccio. In the 2011 canary rockfish status update (the most current assessment), the depletion was estimated to be at 25.5 and 26.2 percent for 2015 and 2016 respectively (Wallace and Cope 2011). Given that the canary rockfish depletion level is similar to that of bocaccio; there is precedent for allowing at least limited retention of canary rockfish.

B.12.1 Washington

Background

Retention of canary rockfish has been prohibited in Washington recreational fisheries since 2004. Management measures are in place to keep total impacts of canary rockfish to state specific harvest guidelines (HG). The presumptive HGs are 3.4 mt for 2015 and 3.5 mt for 2016. Management measures vary by management area to reflect increasing encounters with canary rockfish as you move from south to north along the Washington coastline. Canary rockfish total mortality often falls well under the Washington HG a result of restrictive management measures in place to keep yelloweye rockfish total mortality under the state specific HG.

<u>Alternatives</u>

No Action: Retention of canary rockfish will remain prohibited

Under the No Action Alternative anglers will continue to be required to discard all canary rockfish encountered during all recreational fishing.

Projected Impacts under the No Action Alternative

Under the No Action Alternative management measures would be the same as those analyzed under the Preferred Alternative harvest specifications for canary rockfish. The projected canary rockfish mortality would be 0.75 mt. The Washington recreational HG of 3.4 (2015) and 3.5 (2016) would not be attained.

Alternative 1: One canary rockfish per day as a sub-limit to the rockfish bag limit of ten and the total groundfish bag limit of 12.

Under Alternative 1, anglers would be allowed to retain one rockfish per day as part of the rockfish sub-bag limit of 10 and the total bottomfish bag limit of 12. Management measures would be the same as those analyzed under the Preferred Alternative harvest specifications for canary rockfish.

Table B-71. Projected mortality (mt) of canary rockfish under canary sub-bag limit Alternative 1 and management measures under the Preferred Alternative.

Washington canary HG 2015/2016	3.4 / 3.5
Projected Mortality	2.5

Alternative 2: Up to 10 canary rockfish per day as part of the rockfish sub-bag limit.

Under Alternative 2, anglers would be allowed to retain up to 10 rockfish per day as part of the rockfish sub-bag limit of 10 and the total bottomfish bag limit of 12. Management measures would be the same as those analyzed under the Preferred Alternative harvest specifications for canary rockfish

Table B-72. Projected mortality (mt) of canary rockfish under canary sub-bag limit Alternative 2 and management measures under the Preferred Alternative.

Washington canary HG 2015/2016	3.4 / 3.5
Projected Mortality	2.6

Methods
Washington Ocean Sampling Program (OSP) data as provided to RecFIN from 2009-2013 was used to project canary rockfish mortality for both alternative sub-bag limit alternatives. All canary rockfish encounters up to one (Alternative 1) or ten (Alternative 2) per angler were assumed to be retained. Canary per angler of more than one (or 10) was assumed discarded. Mortality for the discarded canary was estimated based on the proportion of canary caught by depth based on angler interview data with the corresponding surface release mortality rates applied. Mortality from the one canary bag limit analysis was added to the projected mortality for the Preferred Alternative management measures to project the total canary mortality for the canary sub-bag limit alternatives. The highest estimate of canary mortality over the 2009-2013 time period was used to project mortality for the sub-bag limit alternatives.

Discussion
If canary retention is allowed, actual estimates of canary mortality may be higher that what is estimated in this analysis due to the difficulty in projecting changes in angler behavior. Anglers that normally wouldn't encounter a canary rockfish during the course of their typical fishing trip under current regulations prohibiting canary retention may be inclined to fish longer with the hope of catching a canary rockfish or may seek out areas where canary rockfish abundance is higher if canary retention is allowed.

B.12.2 Oregon

Alternatives
Status Quo: Retention of canary rockfish will remain prohibited.
Alternative 1: One canary rockfish per day, which will be a sub-bag limit of the miscellaneous groundfish daily bag limit of ten (includes rockfish, cabezon, greenlings, elasmobranchs)
Alternative 2: Up to ten canary rockfish per day, as part of the miscellaneous groundfish daily bag limit

Rationale

Increase accuracy of removals
Allowing retention of canary rockfish in the sport fisheries could improve the accuracy of canary rockfish removal estimates because catches could then be landed and verified by dockside creel samplers. In

contrast, anglers are currently required to discard all canary rockfish encountered, and angler reported data is consequently needed to determine discard mortality. Potential sources of uncertainty in discard mortality estimates from angler reported data include: (1) misidentification of the species discarded (2) misreporting of the quantity released and (3) misreporting of the factors that affect which discard mortality rate will be applied to their discards (i.e., depth of capture and if a descending device was used).

Allowing retention of canary rockfish may be a cost-effective and, viable solution to improving removal estimates. For example, it would be impractical and unsafe to require small private recreational boats (generally less than 22 feet) to carry observers to monitor discards.

Abundance index of canary rockfish from their primary habitat (rocky reef)
Currently, the only index of relative abundance used in the canary rockfish stock assessment (for adults), the NWFSC bottom trawl survey, occurs in marginal habitat utilized by the species (i.e., sand or flat bottom; Love 2002; Johnson et al. 2003) and does not appear to be detecting a possibly increasing population trend occurring in their primary habitat (i.e., rocky reef). Since 2008 catch frequencies on Oregon recreational groundfish trips, which occurs over rocky reef in all depths, have increased while they have remained stable for trawl survey tows (Figure B-22).

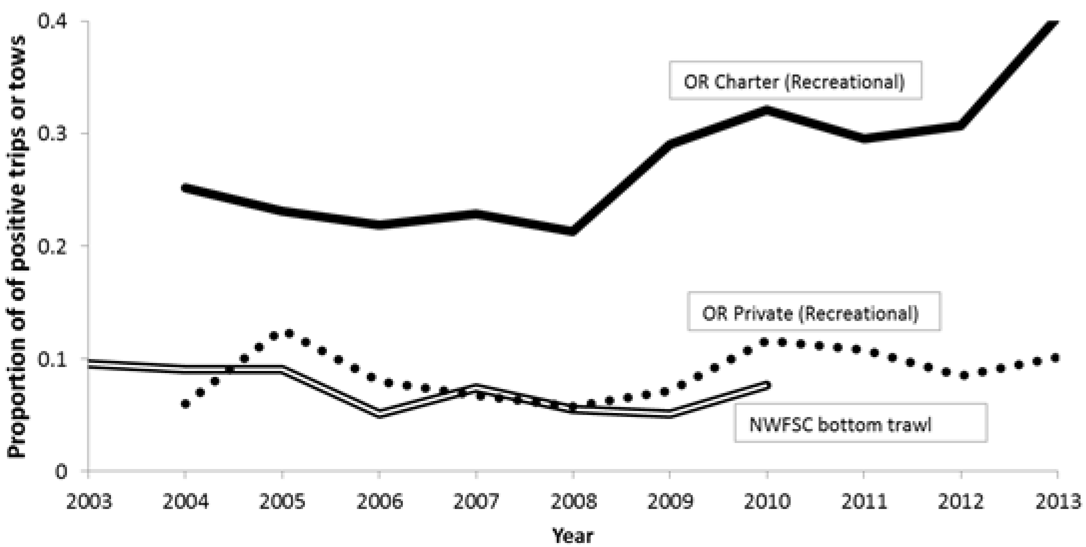

Figure B-22. Comparison of canary rockfish relative abundances from marginal habitat (sand and flat bottom; NWSFC bottom trawl survey) and primary habitat (rocky reef; OR charter and OR recreational groundfish fisheries).

Although the Oregon recreational groundfish fishery provides a measure of relative abundance of canary rockfish in their primary habitat, it has not been used as an index in assessments because it is based on uncertain data (David Sampson, Oregon State University, personal communication). If this uncertainty were resolved by allowing retention of canary rockfish (catches would be landed and verified by creel samplers), then a recreational index of abundance could potentially be incorporated into the canary rockfish assessment, in a similar fashion as used in the black rockfish assessment (logistic regression; Sampson 2007).

There would be minimal to no additional costs to develop a recreational CPUE index of abundance for canary rockfish, as the marine recreational creel survey already obtains the necessary data (assuming retention was allowed) for catch and effort accounting. Further, a recreational canary rockfish index of abundance would be robust due to high sample sizes (~9,000-10,000 recreational groundfish interviews per year), year-round coverage, and fine spatial data (i.e., by depth and reef quadrant). Given this wide-scale temporal and fine spatial coverage, it may be possible to apply a post-hoc survey design to the data (e.g., randomly selecting 100 samples from each reef area by a time period).

In order for a recreational canary rockfish catch per unit effort (CPUE) index to be indicative of population trends (and therefore useful to the assessment), fishing behavior would have to be relatively standardized (e.g., would be difficult to determine population trends if some targeted canary rockfish while others did not). By limiting the canary rockfish to one per angler per day, there would less incentive for anglers to target them, and a relatively standardized fishing behavior would be expected (harvests would be from incidental catches). Additionally, post-hoc methods could be used to standardize fishing behavior by limiting catch rate comparison to similar locations (reef block and depth), times, boat types (charter or private), and even by individual vessels (sample data contains unique vessel information; name of boat for charters and registration number for private boats).

Determine or verify future canary rockfish abundances (recruitment)
Since there is a large gap in sizes and ages of canary rockfish caught by trawl surveys used in the assessment, it takes at least ten years to verify recruitment signals using survey data alone; the SWFSC pre-recruit pelagic trawl survey catches Age-0 fish and the NWFSC bottom trawl survey is selective for 40-50 cm fish (based on peak of length frequency distributions), which roughly corresponds to females Age-10 and older (Wallace and Cope 2011).

Since recreational gears are selective for intermediate size and age fish relative to the trawl surveys (> 30 cm; Figure B-23), recruitment signals from the pre-recruit survey could be verified in as few as three to five years (corresponding ages for 30 cm females) by using biological data from the recreational fishery (instead of ten years for the bottom trawl).

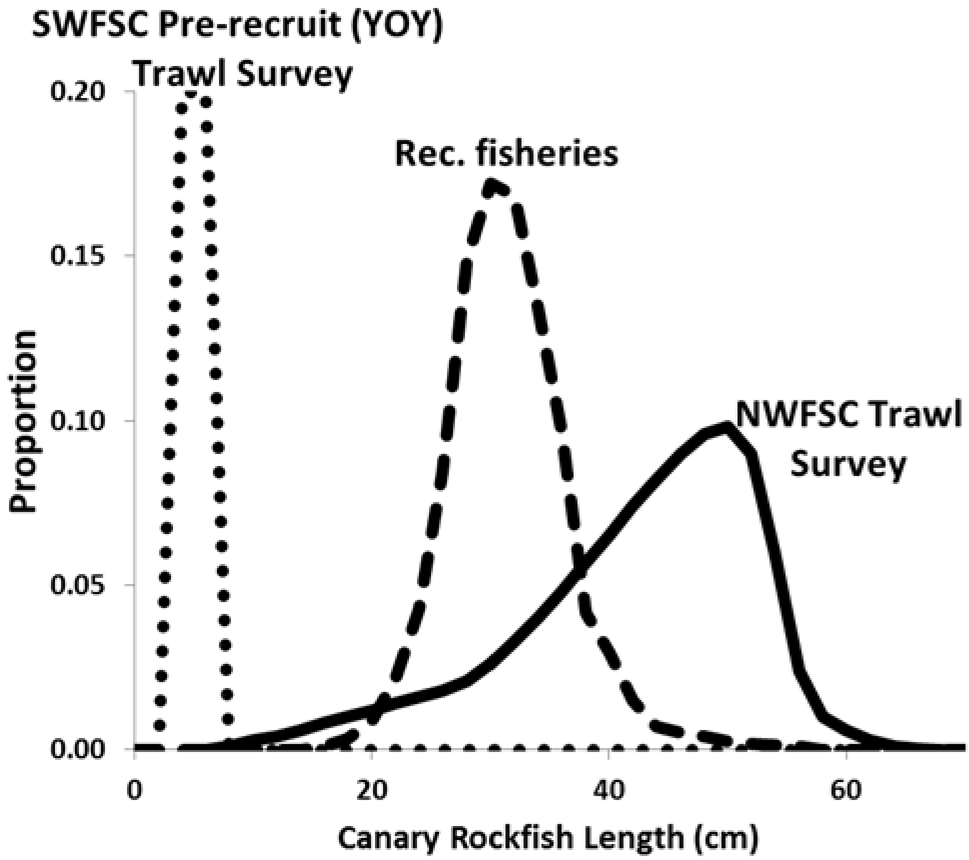

Figure B-23 Canary rockfish length frequency comparison for the trawl surveys and the recreational fisheries. NFWSC curve is an approximation for combined sexes from 2003-2010, from Figure 11 of the Canary rockfish assessment (Wallace and Cope 2011). Recreational data from RecFIN query, 2006-2013; OR, WA, and CA (pooled due to infrequency of (illegal) catches).

No increase to the projected rebuilding time

The sport fishery is projected to remain within the most recent canary rockfish HG (11.1 mt in 2014) for all canary rockfish harvest alternatives (Table B-73), and by doing so, no delays to the projected rebuilding time would occur (assume full attainment of ACLs). The projected difference in mortality between non-retention (3.1 mt; bag limit=0) and a one fish sub-bag limit (8.1 mt) is attributed to the infrequency of canary rockfish catches by sport anglers. Since 2009, 73 percent (13,536 of 18,703) of canary rockfish caught by sport anglers has been from trips where the number of anglers outnumbered the canary rockfish catch (Figure B-24). Accordingly, all of those canary rockfish would have been legal to harvest had the bag limit been one. And had they kept their catch, the discarded mortality impacts from released fish would have been greatly reduced (3.0 mt vs. 0.8 mt, respectively), since their discarded dead catch would have been converted to harvested dead catch.

Since most of the catch comes from trips where anglers catch fewer than one canary rockfish per person, an increase in the bag limit from one to seven[9] (8.1 mt vs. 9.5 mt, respectively) is projected to have much less effect on mortality (Table B-73); only 24 percent (4,548 of 18,703) of past canary rockfish catch has been from trips where anglers caught greater than one but less than or equal to seven canary rockfish

[9] The current bag limit specified in Oregon state regulations, in federal regulations the bag limit is ten.

(Figure B-24). A bag limit of seven would result in the conversion of near all discarded catch to harvested, as 97 percent of canary rockfish caught by sport anglers have been from those who caught seven of fewer. The only remaining discards would come from the very infrequent large volume catches 'lightning strikes'.

Projections of catch if retention were permitted are based on the assumption that no targeting would have occurred, as anglers did not have incentive to catch them in the past due to the harvest prohibition. While it is unrealistic to assume that no targeting will occur, targeting is expected to be minimal because canary rockfish catches are greater in deep depths (>30 fathoms; Figure B-25), and to maximize their catch rates, they would have to leave the shallower depths where the catch rates of their primary target species (black rockfish) and others are greatest. Further, the majority of sport anglers tend to fish seaward of 30 fathoms (76 percent) when they are permitted to fish all-depths. In short, in order to target canary rockfish, they would be paying more in fuel, driving further, and leaving the most productive shallow depths.

Table B-73. Projected canary rockfish total (grey boxes), discard, and harvest mortality for each harvest alternative. Projected harvests (# of fish) are shown to demonstrate sample sizes of biological samples that may be attained by allowing retention.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
	Projected (fish)	237	298	714	803	1455	1887	2300	2584	1081	535	124	77	12096	
Bag=0	Discard Mortality	0.07	0.09	0.21	0.17	0.41	0.47	0.53	0.62	0.23	0.16	0.04	0.02	3.0	Total=3.1 mt
	Harvest Mortality	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	
	# Harvested													125	
Bag=1	Discard Mortality	0.02	0.02	0.05	0.04	0.10	0.12	0.13	0.16	0.06	0.04	0.01	0.01	0.8	Total=8.1 mt
	Harvest Mortality	0.14	0.18	0.43	0.48	0.87	1.13	1.38	1.55	0.65	0.32	0.07	0.05	7.3	
	# Harvested	178	224	536	602	1091	1415	1725	1938	811	401	93	58	9072	
Bag=7	Discard Mortality	<0.01	<0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	<0.01	<0.01	0.1	Total=9.5 mt
	Harvest Mortality	0.18	0.23	0.55	0.62	1.13	1.46	1.78	2.00	0.84	0.41	0.10	0.06	9.4	
	# Harvested	229.49	288.56	690.91	776.62	1407.2	1824.7	2223.7	2498.9	1045.5	517.33	119.95	74.509	11697	

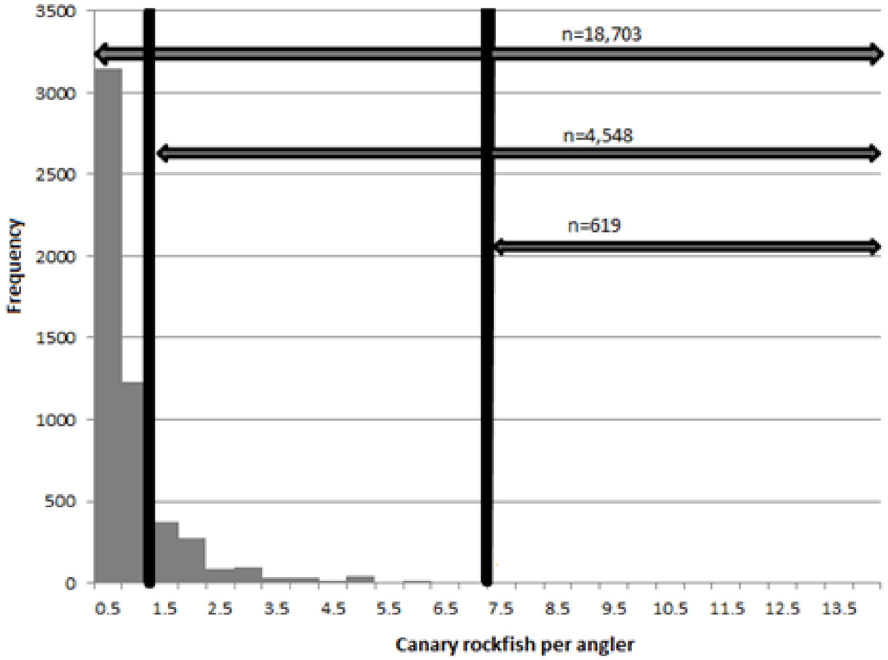

Figure B-24. Canary rockfish catch rate (bars) frequencies for trips that caught one or more and the corresponding quantity of canary rockfish associated with those trips (numbers by arrows), 2009-current.

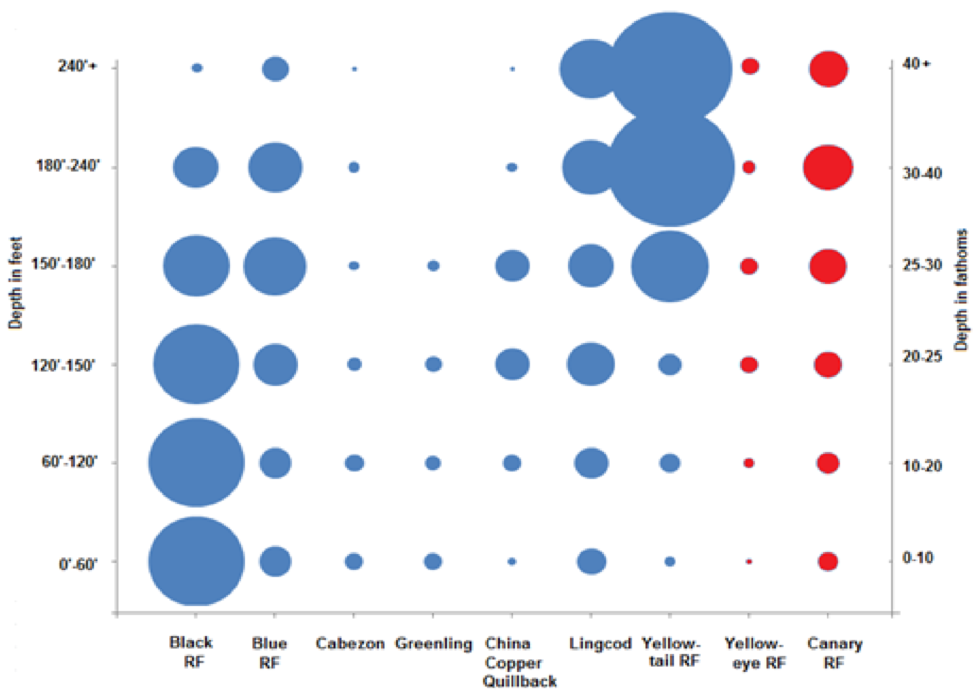

Figure B-25. Relative catch rates by depth of overfished species and harvestable species constituting the bulk of sport fishery landings.

Projection methods
Canary rockfish mortality was projected for the harvest alternative via application of a conversion factor (Formula 1) to the output of the canary rockfish mortality model (of the Oregon recreational groundfish model). The conversion factor converted discarded catch of canary rockfish from historic trips to harvested catch up to the boat limit (aggregate of individual bag limits) and any catch in excess of the boat limit remained as discarded (retention was modeled at a boat level because anglers continue to fish and share their catch until the bag limits of all have been caught). For example, if the bag limit was one and seven anglers discard five canary rockfish, then five were converted to harvested (boat limit) and two remained as discarded (excess of boat limit).

Formula 1: Conversation factor applied to the canary rockfish mortality model to project mortality of canary rockfish if harvest (H) were permitted. M=Mortality; H=harvested (1 or 7); CR=Canary rockfish per angler.

$$M_{Baglimit(H)} = \text{Discard } M_{BagLimit=0}\left[\frac{\#Fish_{CR > Baglimit(H)}}{\#Fish_{Baglimit=0}}\right] + \#Fish_{Baglimit=0}\left[\frac{\#Fish_{CR \leq Baglimit(H)}}{\#Fish_{Baglimit=0}}\right]\left[\frac{\text{FishWeight (kg)}}{\text{.001 (kg to mt)}}\right]$$

Reduces discarded catch due to harvest

Converts discarded catch to harvest catch

Reduce waste of the resource
As previously described in the projected impact section, allowing harvest converts discard mortality (waste) to harvest mortality. Instead of wasting 3.0 mt of canary rockfish by prohibiting retention, this could be reduce to 0.8 mt with a bag limit of one and 0.1 mt with a bag limit of seven.

Possible reduction of impact to healthy species
The following rationale has been proposed by anglers: canary rockfish are “abundant”, and if allowed to keep one, impacts to other harvested groundfish species would be reduced by 14 percent; as anglers could substitute one of the seven fish they are allowed to catch (current bag limit) with a canary rockfish (thereby reducing impacts by $1/7^{th}$ or 14 percent).

This reduction *would only apply to trips in which both a bag limit attainment and catch of canary rockfish occurred*. Since limits only occur in less than 20 percent of trips (19.4 percent; 6,371 of 32,769 trips; Figure B-26) and canary rockfish are only caught during 13 percent of trips that had limited (828 of 6,371), the projected reduction in catch of harvestable species by allowing canary retention is only 0.3 percent (19.4 percent x 13 percent x 14 percent), not the hypothesized 14 percent. In short, the $1/7^{th}$ reduction in catch from allowing canary retention would only apply to the 2.5 percent of trips that limit and have canary rockfish catch.

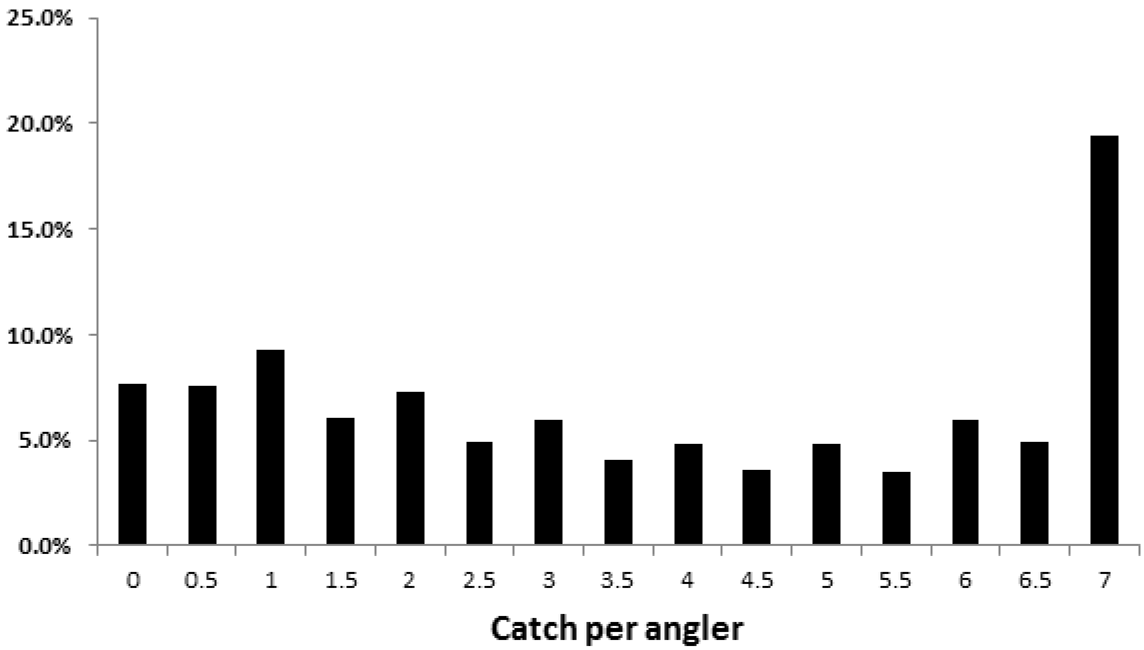

Figure B-26. Percentage of angler trips that caught 0-7 miscellaneous groundfish bag limit. Data is from 32,769 bottomfish trips that occurred from 2009-2013.

Summary

The potential new sport fishery data sources could be acquired without additional monetary costs (i.e., dockside creel survey needed to collect the data already exists) or delays to the projected rebuilding times of canary rockfish. No delays to the projected rebuilding times would be expected because the sport fishery currently only obtains a fraction of the harvest guideline (e.g., 29 percent of the Oregon recreational HG in 2013) and could therefore continue to stay within the harvest guideline even if several thousand canary rockfish were landed (rebuilding analyses assume 100 percent of ACLs harvested).

In summary, allowing retention of canary rockfish in the sport fishery could be a simple, cost-effective, and impact neutral (to projected rebuilding times) method to increase the understanding of canary rockfish, and therefore provide the Council better information to manage of one the most important groundfish stocks.

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B.12.3 California

Background

For canary rockfish, the California recreational fishery is currently managed to a harvest guideline (HG), of 23.0 mt in 2014; the presumptive HGs are expected to increase to 24.3 mt (2015) and 25.0 mt (2016; Table B-74). Retention of canary rockfish in the California recreational fishery is prohibited. The majority of canary encounters occur in the San Francisco Management Area, which is open six months of the year to depths of 30 fm, and in Central Management Area where access is allowed seven months of the year to depths of 40 fm.

Because canary rockfish have a high susceptibility to barotrauma [10], non-retention results in regulatory discarding and associated mortality that increases with depth of capture. Rather than adding the extra canary rockfish to their bag, anglers must discard them and fish longer to achieve their 10 fish Rockfish, Cabezon and Greenling (RCG) complex bag limit, which may increase the likelihood of encounters with other overfished species.

2015-2016 Management Considerations

Anglers have reported that “they can’t get away from canary rockfish” and that encounters are becoming more frequent in shallow waters. These encounters are not unexpected and are expected to increase as the population continues to rebuild (i.e. the rebuilding paradox). Due to barotrauma, a portion of discarded canary rockfish will not survive and anglers are forced to discard dead (or dying) fish rather than adding them to the 10 fish RCG complex bag limit. In order to minimize discards of canary rockfish, the Council requested analysis of a one fish sub-bag limit of canary rockfish within the 10 fish RCG complex bag limit. If retention were allowed angler behavior could change, as anglers may continue fishing in locations where canary rockfish are encountered rather than moving.

Range of Options for Consideration

Option 1-No Action: Maintain prohibition on retention of canary rockfish

Under Option 1, retention of canary rockfish would continue to be prohibited and the season structure would be the same as in 2014. Anglers will be required to discard all canary rockfish while in pursuit of other fish, increasing time on the water and therefore the chance of encounters with other overfished species. Under No Action, the recreational HG will not be attained.

Biological Impacts under No Action

Projected Impacts

[10] Canary rockfish have a surface discard mortality of 100 percent in waters 30 fathoms or greater (Agenda Item D.5.b. GMT Report, April 2013)

The projected mortality to canary rockfish would be 16.4 mt under Option 1; Table B-74summarizes projected mortality to all overfished species. As the canary rockfish stock continues to rebuild some increased encounters (and discarding) would be expected, although the amount cannot be quantified.

Table B-74. Projected mortality to overfished species under No Action

Species	Projected Mortality (mt)
Bocaccio	100.1
Canary Rockfish	16.3
Cowcod	1.0
Yelloweye Rockfish	1.7

Stock Status
The stock was declared overfished in 1999 and harvest has been severely restricted in both the commercial and recreational fisheries since 2000. The latest assessment indicates stock biomass is increasing, and that recent management actions have curtailed removals such that overfishing has not occurred since before 1999 (Wallace and Cope, 2011).

Under Option 1, no changes to stock status or rebuilding progress are expected.

Option 2: Increase the sub-bag limit to one fish within the RCG complex bag limit under the PPA season structure Option 1
Under Option 2, anglers would be allowed a sub-bag limit of one canary rockfish within the RCG complex bag limit, with the PPA season structure[11] in place (

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed		Mar 1 – Dec 31 <20 fm									
Mendocino	Closed		Mar 1 – Dec 31<20 fm									
San Francisco	Closed		Mar 1 – Dec 31 <30 fm									
Central	Closed		Mar 1 – Dec 31<40 fm C									
Southern	Closed		Mar 1 – Dec 31 <60 fm									

Figure B-27). See Section XXXX for a description of season structure analyses.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed		Mar 1 – Dec 31 <20 fm									
Mendocino	Closed		Mar 1 – Dec 31<20 fm									
San Francisco	Closed		Mar 1 – Dec 31 <30 fm									
Central	Closed		Mar 1 – Dec 31<40 fm C									
Southern	Closed		Mar 1 – Dec 31 <60 fm									

Figure B-27. Preliminary Preferred Alternative season structure in 2015-2016.

RecFIN data from 2011 to 2012 was used to project canary rockfish mortality as a result of establishing a one fish sub-bag limit. Using the RecFIN Hypothetical Bag Limit Analysis tool, estimates of increased

[11] The PPA season structure corresponds to Alternative 1 (Option 1).

mortality of canary rockfish were calculated using A+B1+B2 fish. For the purpose of this analysis, A fish include sampled dead fish, B1 fish includes both fillets and dead discarded fish, while B2 fish includes mainly live discarded fish. As the most conservative estimate, the analysis also assumes that all B2 fish would be available if retention was permitted. All possible bags were set to the hypothetical limit to calculate increased mortality.

Biological Impacts under Option 2

Projected Impacts

Under Option 2, canary rockfish mortality is projected to increase by 62 percent (10.3 mt) compared to Option 1. The HG is expected to be exceeded by 2.4 mt, given the cumulative projected mortality from both increased season length under PPA season structure and a one fish sub-bag limit (Table B-75). If angler behavior changes as a result of allowing limited retention, actual mortality may be greater than projected, though the amount cannot be quantified.

Table B-75. Projected mortality (in metric tons) compared by option and percent of presumptive 2015 harvest guideline.

	Option 1	**Option 2**
Projected Mortality	16.4	26.7
% HG	67.5%	109.4%

Impacts on Overfished Species

Table B-76 summarizes projected mortality to all overfished species under Option 2. Due to increases in season length, some increased mortality is expected compared to No Action. Increased mortality to other overfished species as a result of the one fish canary sub-bag limit is expected to be minimal; yelloweye rockfish tend to be more solitary and are not known to school with canary rockfish, while bocaccio rockfish and cowcod are primarily distributed south of Point Conception where canary rockfish encounters are comparatively less common.

Table B-76. California recreational projected mortality of overfished species for 2015-2016 under Option 2.

Species	**Projected Mortality (mt)**
Bocaccio	117.5
Canary Rockfish	26.7
Cowcod	1.2
Yelloweye Rockfish	2.9

Stock status

Under Option 2, no changes to stock status or rebuilding progress are expected compared to Option1.

Socioeconomic Impacts

Given uncertainty in angler behavior, inseason action may be necessary to keep within the projected impacts. This may result in area closures, increased depth restrictions or early closure of the recreational fishery. Loss in revenue and opportunity can be expected, although the degree is difficult to quantify. However, some increased opportunity may be realized as a result of allowing limited retention of canary rockfish, it would not compensate for losses (in revenue and opportunity) due to early closures.

<u>Option 3: Increase the sub-bag limit to one fish within the RCG complex bag limit under a decreased season length</u>

Under Option 3, the season length was decreased to keep the projected mortality within the HG (Figure B-28). Because encounters with canary rockfish are highest in the San Francisco and Central Management Areas, reductions to season length in these regions are necessary to keep projected mortality within the HG. Conversely, projected mortality of canary rockfish is sufficiently low in the Northern and Mendocino Management Areas that, compared to No Action, increased season length can be afforded in those areas Encounters with canary rockfish are relatively uncommon south of Point Conception such that a 60 fm depth restriction can be accommodated. Increased mortality due to changes in angler behavior is not easily quantifiable; as a result, a buffer was included in modeling to accommodate mortality that may arise from changes in angler behavior.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 1 – Dec 31 <20 fm							
Mendocino	Closed				May 1 – Dec 31 <20 fm							
San Francisco	Closed				May 1 – Oct 30 <30fm						Closed	
Central	Closed				May 1 – Oct 30 <40fm						Closed	
Southern	Closed		Mar 1 – Dec 31 <60fm									

Figure B-28. Season structure required to accommodate a one fish canary rockfish sub-bag limit within the 10 fish RCG complex bag limit in 2015-2016.

<u>Biological Impacts under Option 3</u>

Projected Impacts

Under Option 3, mortality of canary rockfish is projected to increase by 20 percent (3.2 mt) compared to No Action (Table B-77). The HG is not expected to be exceeded, given the buffer to accommodate any changes of angler behavior. Given reductions in season length, attainment of non-overfished species harvest targets may not be realized, resulting in lost opportunity.

Table B-77. Projected mortality (in metric tons) compared by option and percent of presumptive 2015 harvest guideline.

	Option 1	Option 2	Option 3
Projected Mortality	16.4	26.7	20.7
% HG	67.5%	109.4%	85.2%

Impacts on Overfished Species

Table B-78 summarizes mortality to all overfished species under Option 3. Similar to Option 2, increased mortality to other overfished species as a result of a one canary rockfish sub-bag limit is expected to be minimal. Between the Options, differences in projected mortality of other overfished species are primarily due to the variation in the analyzed season lengths.

Table B-78. California recreational projected mortality of overfished species for 2015-2016 under Option 3.

Species	Projected Mortality (mt)
Bocaccio	117.6
Canary Rockfish	20.7
Cowcod	1.2
Yelloweye Rockfish	1.8

Stock status
Under Option 3**,** no changes to stock status or rebuilding progress are expected.

Socioeconomic Impacts
Under Option 3, reduced season length would result in forgone fishing opportunity with negative effects to the revenues of coastal communities in the central region of the state. While some increased opportunity can be expected as a result of allowing limited retention of canary rockfish, it is difficult to quantify and is not expected to offset the increased opportunity that would have been available given the season lengths that could be afforded with retention remaining prohibited (i.e. PPA season structure Alternative 1, Option 1).

B.13 Retain groundfish, lingcod only, or flatfish only during the Pacific halibut fisheries

Background

Recreational Pacific halibut anglers have expressed a desire to change the regulation that prohibits them from harvesting groundfish on "all-depth" days (while in possession of a halibut). Many anglers have stated that they travel 15-30 miles offshore for halibut and fish in waters 100 fathoms (600 feet) or greater. Going that far, they would like to be able to retain more than just one halibut (e.g. other species incidentally encountered) Additionally, after reeling up a lingcod, or other bottomfish, from those depths they would like to be able to retain them, for their efforts. Anglers participating in the groundfish fishery are allowed to keep halibut incidentally encountered on days when the nearshore halibut fishery is open. The reasoning for the groundfish retention prohibition on "all-depth" days is unclear to anglers because it does not pertain to groundfish that can be harvested, but rather as a means to reduce discard (catch-and-release) mortality of overfished species, specifically yelloweye rockfish.

In order to keep yelloweye rockfish mortality within sector-specific limits, regulations to limit how often recreational anglers fish deep water reefs (>40 fathoms; 240 feet) are used as the primary management tool; anglers fishing deep reefs more commonly encounter yelloweye rockfish than those fishing shallower reefs, and a higher percentage of those released die due to barotrauma inflicted injuries. The additive effects of high catch rates and high discard mortality rates are too excessive to provide anglers much opportunity to fish deep water reefs, and still keep the groundfish fishery open year round.

Since groundfish anglers target reefs, depth restrictions are used to prevent groundfish anglers from fishing deep reefs during the greatest effort months (April-September). Halibut anglers are permitted to fish beyond the groundfish depth restrictions because this is where the fishery has historically occurred, and because halibut anglers actively avoid reefs (to prevent gear loss and because halibut fishing is better over gravel or sand habitat). The regulation prohibiting retention of groundfish is used to prevent anglers from also targeting groundfish (over the deep reefs) during their halibut trip. Allowing retention of groundfish by halibut anglers on “all-depth” days while intended to allow retention of incidentally encountered groundfish while halibut fishing, could also create a loophole allowing anglers to target groundfish any depth they choose under the guise of ‘halibut fishing’ on “all-depth” days, and reducing the effectiveness of the groundfish depth restrictions.

If allowed to retain groundfish, some halibut anglers would be expected to (and have told state agency staff that they would) target deep water reefs because they are already in the area and because there is a perception that trophy lingcod (highly desirable to recreational anglers) are more common over deep reefs than shallow water reefs.

Due to somewhat different regulations and fishing behaviors between the Washington and Oregon Pacific halibut fisheries, analysis for each state are separated below.

B.13.1 Washington

Overview

Recreational halibut fisheries in Washington are restricted to reduce encounters with overfished species, particularly yelloweye rockfish. Depth restrictions are the primary tool used to reduce encounters with overfished species. Depth by management area become more prohibitive as you move from south to north along the coast due to increasing rocky relief habitat along the northern Washington coast and the increased likelihood of encounters with yelloweye and canary rockfish. While groundfish fisheries are restricted to the nearshore area, recreational halibut fisheries are permitted in the deeper water because this is where the largest concentrations of halibut occur. To reduce encounters with yelloweye and canary rockfish during the recreational halibut fishery, groundfish retention restrictions are in place; these restrictions vary by management area. In the North Coast management area (Neah Bay and La Push), groundfish retention is prohibited seaward of 20 fathoms from May 1 through September 30 with the exception that lingcod, Pacific cod and sablefish can be retained on days open to recreational halibut fishing. In the south coast (Westport), lingcod retention is allowed seaward of the 30 fathom depth restriction, which is in place from March 15 through June 15, on days the recreational halibut fishery is open. In the Columbia River management area (Ilwaco/Chinook), only sablefish and Pacific cod are allowed with halibut on board from May 1 through September 30.

Season length also varies by management area (Table B-79). Recreational halibut seasons in recent years in the North Coast (Neah Bay and La Push) and South Coast (Westport) management areas typically last fewer than 10 days; the halibut season lasted four days in the North Coast and five days in the South Coast in 2013. In contrast, the Columbia River area recreational halibut season has lasted from May through September for the most recent seasons. Even though the North and South Coast management areas include more habitat typically associated with yelloweye and canary rockfish, the short season length limits the opportunity for encounters with overfished species during the recreational halibut fishery.

Table B-79. Recreational halibut season length (days) by management area.

	2009	2010	2011	2012	2013
North Coast (Neah Bay / La Push)	6	7	8	7	4
South Coast (Westport)	11	7	7	5	5
Columbia River	37	48	40	60	66

Management Measures by Area

Recent changes to groundfish retention management measures associated with the recreational halibut fisheries in the North and South Coast management areas may provide insight when considering groundfish retention during the recreational halibut fishery in areas such as the Columbia River where it is currently prohibited (with exception of Pacific cod and sablefish).

South Coast (Westport)

In 2010, changes to the Pacific Fishery Management Council's Pacific Halibut Catch Sharing Plan were implemented that allowed lingcod retention in the area seaward of the 30 fathom depth restriction on days open to the recreational halibut fishery. Prior to 2010, only Pacific cod and sablefish could be retained seaward of 30 fathoms from May 1 through June 15 (reflecting the time period that the primary halibut fishery would likely be open). An additional management measure change that permitted rockfish retention seaward of the 30 fathom depth restriction was analyzed in the 2011-2012 Harvest Specification and Management Measures Environmental Impact Statement and implemented in 2011. Table B-80 summarizes the most common groundfish encountered (retained and released groundfish) on recreational halibut trips in the South Coast (Westport) management area from 2006 through 2013. Black rockfish and lingcod make up the bulk of groundfish encountered during recreational halibut trips in the South Coast region.

Table B-80. Groundfish encounters (retained + released) per 100 recreational halibut angler trips in the South Coast management area.

Species	2006	2007	2008	2009	2010	2011	2012	2013
Black RF	273	134	100	157	95	73	84	151
Lingcod	35	23	59	43	73	135	119	82
Spiny dogfish	2	23	6	11	28	4	3	3
Yellowtail RF	6	4	6	6	15	13	8	2
Misc.	3	3	5	6	5	6	2	2
Quillback RF	5	3	6	3	0	1	2	1
Flatfish	1	1	1	1	6	2	1	4
Canary RF	0	0	4	1	1	2	3	2
Yelloweye RF	0	0	2	2	1	1	2	3
Bocaccio	0	0	3	0	0	1	0	0

Average groundfish encounters during the four years prior (2006-2009) to the management change allowing lingcod retention on halibut trips is compared groundfish encounters during the four years after (2010-2013) (Table B-81). Allowing lingcod retention seaward of the 30 fathom depth restriction on days open to the recreational halibut fishery increased the number of lingcod retained as expected but following the management change, encounters with yelloweye and canary rockfish doubled on average.

Table B-81. Groundfish encounters (retained + released) per 100 recreational halibut angler trips in the South Coast management area.

Species	Avg. 2006-2010	Avg. 2010-2013
Black RF	166	101
Lingcod	40	102
Spiny dogfish	11	10
Yellowtail RF	6	9
Misc.	4	4
Quillback RF	4	1
Flatfish	1	3
Canary RF	1	2
Yelloweye RF	1	2
Bocaccio	1	0

North Coast (Neah Bay and La Push)
In 2013, groundfish regulations were changed through inseason action to address increased yelloweye rockfish encounters in the North Coast management area. The change revised the time period that groundfish retention seaward of 20 fathoms is prohibited from June 1 through September 30 to May 1 through September 30. In addition, because encounters with yelloweye rockfish primarily increased in the recreational halibut fishery, groundfish retention during the recreational halibut fishery was changed from allowing all groundfish seaward of 20 fathoms on days open to halibut fishing to limiting groundfish retention to lingcod, sablefish and Pacific cod on days open to the recreational halibut fishery.

Similar to the South Coast management area, black rockfish and lingcod are the most common groundfish encountered on recreational halibut trips. Changes in 2013 to revise the length of time the depth closure is in place and limit the amount of groundfish that can be retained on halibut trips did reduce encounters with yelloweye rockfish compared to the average per angler encounter rate between 2009 and 2012 (Table B-82). In addition to somewhat lower encounter rates of yelloweye rockfish after the management change, in 2013 61 percent of the yelloweye rockfish were encountered in waters deeper than 20 fathoms compared to 83 percent in 2012, reducing the total morality of yelloweye on recreational halibut trips.

Table B-82. Groundfish encounters (retained + released) per 100 halibut angler trips in the North Coast management area.

Species	2009	2010	2011	2012	Avg. 09-12	2013
Lingcod	123	139	166	149	*144*	131
Black RF	134	124	122	138	*130*	149
Yelloweye RF	9	9	9	14	*10*	9
Yellowtail RF	7	9	9	8	*8*	3
China RF	5	6	6	8	*6*	8
Bocaccio	8	3	7	7	*6*	6
Cabezon	5	6	6	8	*6*	5
Kelp greenling	4	10	3	5	*6*	7
Quillback RF	3	6	5	5	*5*	2
Canary RF	3	3	4	6	*4*	5
Spiny dogfish	4	3	3	3	*3*	2
Flatfish	3	3	2	2	*3*	1
Blue RF	1	7	3	1	*3*	1
Copper RF	2	1	2	3	*2*	2
Misc.	2	3	2	2	*2*	2
Vermillion RF	1	1	1	2	*1*	1
Pacific cod	0	1	3	2	*1*	1

Columbia River

Management measures associated with groundfish retention on recreational halibut trips in the Columbia River area have remained unchanged since 2005 with only Pacific cod and sablefish allowed when a halibut is on board from May 1 through September 30. There are no depth restrictions associated with the recreational groundfish fishery in this area as there are in the North Coast and South Coast management areas. In 2012, a lingcod restriction was implemented to reduce encounters with yelloweye rockfish associated with anglers targeting lingcod in deep water in the Columbia River area.

The species composition of groundfish encountered on recreational halibut trips in the Columbia River area is different than what is reported in the North Coast and South Coast management areas with Spiny dogfish and flatfish comprising a large proportion of the groundfish encountered (Table B-83). Overfished species encounters on recreational halibut trips are lower in the Columbia River area than in the North Coast and South Coast management area (Table B-84).

Recently, anglers have expressed interest in revising regulations to allow lingcod retention during the recreational halibut fishery in this area.

Table B-83. Groundfish encounters (retained + released) per 100 halibut angler trips in the Columbia River management area.

Species	2009	2010	2011	2012	2013
Spiny dogfish	25.45	50.13	11.66	20.64	11.91
Flatfish	20.49	14.89	2.60	8.21	8.98
Lingcod	4.90	8.04	9.10	17.97	11.40
Misc.	2.83	5.87	8.53	13.05	10.27
Black RF	0.19	2.69	0.69	3.62	12.52
Yellowtail RF	1.70	2.91	9.52	3.53	0.31
Gen RF	1.81	5.98	0.63	2.14	0.00
Bocaccio	0.00	0.17	0.69	0.17	0.16
Cabezon	0.37	0.00	0.00	1.15	0.00
Canary RF	0.37	3.23	0.47	1.46	0.78
Gen cod	2.43	1.52	0.62	0.89	0.00
Pacific cod	0.72	0.17	1.62	1.27	0.00
Yelloweye RF	0.33	0.70	0.46	0.99	0.31
Vermillion RF	0.00	0.56	0.00	0.44	0.63
Kelp greenling	0.66	0.00	0.00	0.18	0.31
Quillback RF	0.00	0.00	0.00	0.77	0.00

Table B-84. Overfished species encounters (retained + released) per 100 halibut angler trips by management area (average 2009-2013).

	Yelloweye	Canary
North Coast	10	4
South Coast	2	2
Columbia River	0.56	1.26

Summary

In Washington, due to the regional variability in encounters with all groundfish species, including overfished species and regional differences in the length of the recreational halibut season, consideration for allowing groundfish retention during recreational halibut fishing should be evaluated on a management area basis.

Encounters with yelloweye and canary rockfish on recreational halibut trips is lower in the Columbia River management area than in other areas and expanding the groundfish species allowed on halibut trips might be a viable alternative for the recreational halibut fishery that occurs in this area along the Washington coast. However, this management area extends to Cape Falcon, Oregon and so it is important to consider groundfish encounters in the Oregon recreational halibut fishery which may be different from the Washington recreational fishery. In addition, each state has separate harvest guidelines for yelloweye and canary rockfish and allowing retention of these overfished species would have to be evaluated to include trade-offs to other fishing opportunities in other management regions in both sates depending on each states projected attainment of their state specific harvest guidelines.

It is difficult to project whether or not anglers would spend more time fishing in deepwater areas targeting groundfish such as lingcod where encounters with overfished species is higher if retention were allowed on recreational halibut trips. But, analysis of the recent changes to management measures in the North Coast and South Coast suggest that encounters with overfished species is likely to increase.

B.13.2 Oregon

Although many halibut anglers would be expected to target groundfish is allowed to do so (and some have told ODFW staff that they would), the actual percentage that would is unknown. Therefore, additional yelloweye rockfish impacts by allowing retention of groundfish were projected across a wide range of percentages (of halibut anglers that would also target groundfish; Figure B-29). If none of the halibut anglers targeted groundfish, no additional yelloweye rockfish impacts would be expected to occur from the halibut fishery; however, the impacts could be substantial if a greater percentage of targeting occurs. For example, yelloweye rockfish mortality from the Oregon halibut fishery would be expected to increase to 1.4 mt (from 0.8 mt) if as few as 20 percent of anglers targeted groundfish during halibut trips. If this percentage increases to 75 percent, then yelloweye rockfish impacts from the halibut fishery alone are expected to exceed the 2013 harvest guideline level (similar to the HG for 2015 and 2016) for all Oregon recreational fisheries.

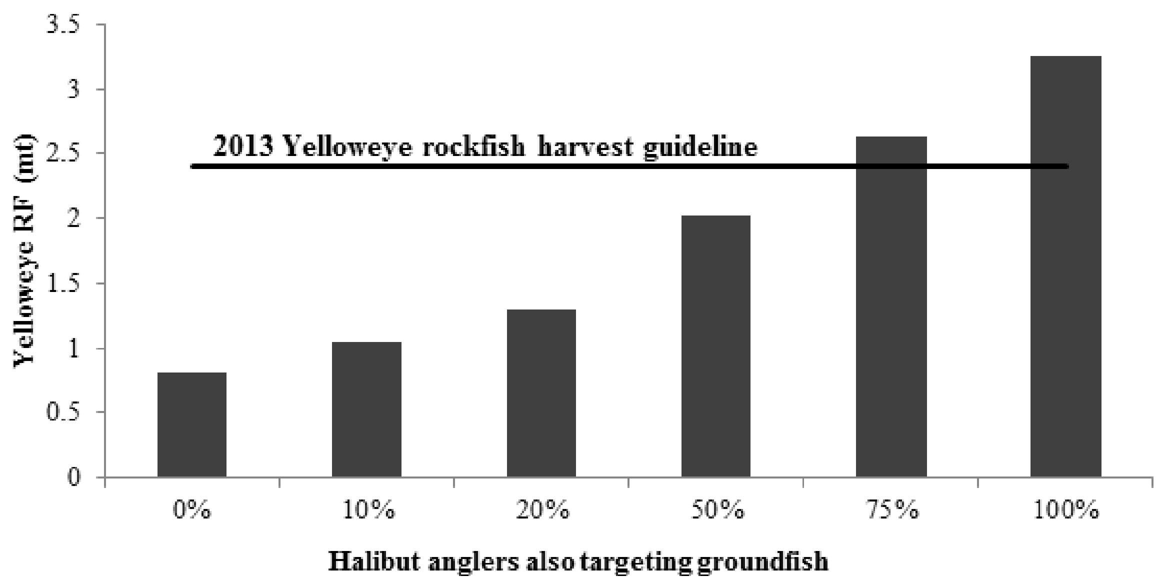


Figure B-29. Projected mortality of yelloweye rockfish from the Oregon recreational halibut fishery if halibut anglers were allowed to retain groundfish during halibut trips for various degrees of targeting of groundfish by halibut anglers. Since the percentage of anglers that would target groundfish during their halibut trip is unknown, mortality is shown for a wide range of targeting. The horizontal black line represents the 2013 harvest guideline for all Oregon recreational fisheries.

Since there is currently little room for any additional yelloweye rockfish mortality, sacrifices would likely have to be made to the recreational groundfish fishery, in the form of more restrictive regulations, in order to allow retention of groundfish by halibut anglers. While further regulations would come at great costs to groundfish anglers (e.g., shorter seasons, lesser bag limits, more restrictive depths), the benefits to halibut anglers are expected to be minimal. Allowing halibut anglers to retain incidental groundfish catches does not provide much benefit because these catches are infrequent (based on angler reports to ORBS to be 0.3 fish per halibut trip) and primarily consist of species that are overfished or non-desired (e.g., sharks, skates, and arrowtooth flounder; Figure B-30). Although anglers would be pleased if allowed to retain desirable species, such as lingcod or petrale sole, their trip satisfaction is much more dependent on whether or not they catch a halibut, their primary target. Further, allowing retention of groundfish would not increase halibut effort (the best measure of value of recreational fisheries) because the fishery is already at full capacity (quotas always caught).

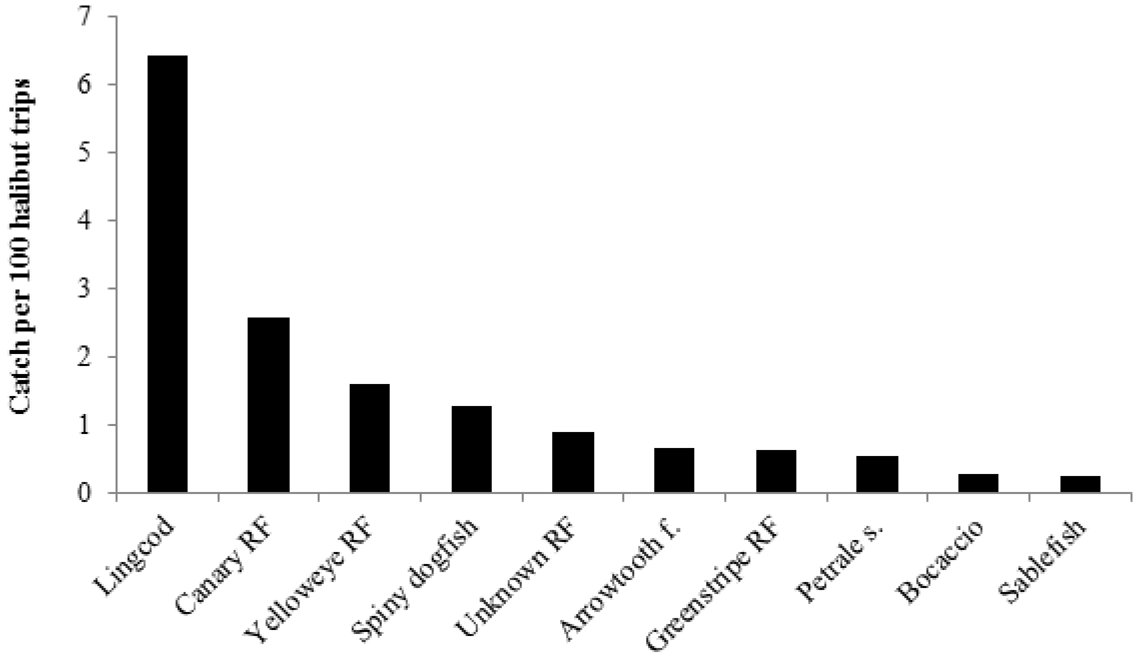


Figure B-30. Catch rates of the top ten most commonly encountered groundfish species by recreational halibut anglers in Oregon.

A modification to allow halibut anglers to harvest groundfish species that are not associated with reef habitat (i.e. other flatfish species), and thereby extending the current rule which allows sablefish and Pacific cod has also been requested. Lingcod and rockfish would remain prohibited as they are primarily associated with reef habitat. This modification could reduce the risk (incentive for anglers to target deep reefs) and may provide some additional harvest opportunities and increase angler satisfaction.

Adoption of the any change to these regulations would also have to be implemented via the Pacific Halibut Catch Share Plan, wherein the regulatory language for incidental groundfish retention for halibut fisheries is housed.

<u>**Alternatives**</u>**:**

No action: No groundfish except for sablefish and Pacific cod can be retained during all-depth halibut season while in possession of a halibut

Alternative 1: All groundfish can be retained during all-depth halibut season

Alternative 2: No groundfish except for sablefish, Pacific cod, and flatfish may be retained during all-depth halibut season while in possession of a halibut --or-- specify the groundfish can be retained except for rockfish and lingcod

B.14 Modify Depth Restriction for the Oregon Recreational Fishery

In March 2014, the Council approved new mortality rates for canary and yelloweye rockfish (along with cowcod) for use when descending devices are used to release recreationally caught rockfish. These new mortality rates are the same between 30 and 50 fm, for surface released fish anything deeper than 30 fm had 100 percent mortality applied (Table B-85). Given the new mortality rate out to 50 fm, Oregon would like to have the management line at 50 fm[12] available for possible use in management.

Table B-85. Surface and descending device mortality rates for canary and yelloweye rockfish by depth bin

Species	Depth (fm)	Surface Mortality Rate	Descending Device Mortality Rate
Canary Rockfish	0-10	21%	21%
	10-20	37%	25%
	20-30	53%	25%
	30-50	100%	48%
	50-100	100%	57%
	>100	100%	100%
Yelloweye Rockfish	0-10	22%	22%
	10-20	39%	26%
	20-30	56%	26%
	30-50	100%	27%
	50-100	100%	57%
	>100	100%	100%

During the peak summer fishing months anglers have been restricted to inside of 40 fm since 2004. Therefore, there is a lack of data to inform this analysis, no data on how many angler trips might be expected nor what sort of species interactions may occur. Data does exist for the "winter" or off-season months (October-March) however that data is very limited and is likely only from avid anglers, not representative of all anglers.

Staff from ODFW are still looking into how to model/analyze this----

ODFW would likely use this line if impacts to yelloweye and/or canary rockfish inseason are tracking lower than projected, to provide some relief to more nearshore species and provide additional angler opportunities. It is anticipated that this would be an inseason tool, rather than part of the normal season structure.

[12] The 50 fm management line is defined by waypoints in Federal regulations at 50 CFR §660.72(a)

GROUNDFISH MANAGEMENT TEAM REPORT ON FISHERIES IN 2015-2016 AND BEYOND: ADOPT BIENNIAL SPECIFICATIONS FINAL PREFERRED ALTERNATIVES

The Groundfish Management Team (GMT) discussed many of the materials provided under Agenda Item C.4 and offers the following comments. Comments are grouped into four sections:

- Section 1: Harvest Specifications for Non-Overfished Species
- Section 2: Overfished Species Rebuilding Plans and Harvest Specifications
- Section 3: Considerations for Amendment 24 to the Fishery Management Plan (FMP)
- Section 4: Recommendations and Requests for Council Guidance on Management Measures for 2015-2016 (Agenda Item C.9)

Section 1: Harvest Specifications for Non-Overfished Species

The Council action under Agenda Item C.4 is to decide a final preferred alternative for 2015 and 2016 harvest specifications for groundfish stocks and stock complexes.

Other Fish Complex and Reconsideration and Modification of the Shallow Water Complex

In November 2013, the Council recommended restructuring the Other Fish complex by removing spiny dogfish from the Other Fish complex and implementing stock-specific harvest specifications. The Council also designate the following species as Ecosystem Component (EC) species: finescale codling (aka Pacific flatnose), soupfin shark, spotted ratfish, all endemic skates, and all endemic grenadiers. The GMT notes that longnose skate have been managed with stock specific harvest specifications since 2009 and are currently analyzed in the draft Environmental Impact Statement (DEIS) with stock specific harvest specifications – i.e., not as an EC species (Agenda Item C.4.a, Attachment 3, April 2014). This is consistent with the GMT analysis and recommendations. The Council also assigned further analysis of two options for managing kelp greenling and the Washington stock of cabezon. Option 1 contemplated stock-specific harvest specifications for kelp greenling (WA, OR, CA), cabezon (WA), and leopard shark (coastwide) if overfishing levels (OFLs) could be determined (Agenda Item C.4.a, Attachment 6, April 2014). Option 2 would manage these stocks together in a newly created Shallow Water complex.

A report was provided by Oregon Department of Fish and Wildlife (ODFW; Agenda Item C.4.b, ODFW Report, April 2014) that raised issues with the assessment results which compelled discussion in the Scientific and Statistical Committee (SSC) relative to the preferred kelp greenling OFL in Oregon (see Table 2, Agenda Item C.4.a, Supplemental REVISED Attachment 2, April 2014). Numerous public comments were also received that demonstrate impacts that the OFL and resulting management measures may have on the nearshore commercial and recreational fisheries (Agenda Item C.4.c, Public Comment, April 2014; Agenda Item C.4.c, Public Comment 2, April 2014; Agenda Item C.4.c, Supplemental Public Comment 3, April 2014). The GMT understands the SSC indicated that the Council-adopted kelp greenling OFLs for both Oregon and Washington may not be the best available science for use in management this cycle (Agenda Item C.4.a, Supplemental **REVISED** Attachment 2, April 2014). The GMT further understands that the SSC proposes providing the Council with new OFLs for kelp greening in Oregon and Washington at the June 2014 Council meeting.

The delays in receiving final OFLs will delay the GMT's analysis of management measures and impacts to the nearshore and recreational fisheries. Time is needed for the states to meet with industry to discuss and develop management measures in response to the OFL. The GMT subsequently needs time to run models and evaluate the impacts of those management measures, which cannot be accomplished without final OFLs. Results from the GMT model-runs are needed by Council staff, Dr. Ed Waters, and the Northwest Fisheries Science Center to evaluate economic impacts of the various alternatives to the recreational and nearshore fisheries and communities. The schedule for implementing the 2015-2016 and beyond specifications, adopted in June 2013 (Agenda Item C.4.a, Attachment 8), anticipated final OFLs in September, and final ABCs and PPA ACLs in November. The adopted process is similar to that used in previous cycles to increase the likelihood of a January 1 implementation. The GMT notes that the harvest specifications for some species have been significantly delayed (~5 months after the recommended schedule).

In order to increase the likelihood of implementing regulations on January 1, 2015, **the GMT recommends that the Council consider adopting a modified version of Option 2 (Agenda Item C.4.a, Attachment 6, April 2014), which would create a new Shallow Roundfish Complex comprised of kelp greenling (coastwide) and cabezon (WA) and implement stock-specific harvest specifications for leopard shark**.

Based on the National Standard 1 Guidelines on stock complexes and the GMT's method for applying them (Agenda Item F.8.b, GMT Report, June 2013 and Agenda Item F.8.b, Supplemental GMT Report 2, June 2013), leopard shark should not be included in the newly created Shallow Roundfish complex. Leopard shark are primarily found in California waters over soft bottom habitat and therefore does not likely co-occur to a great extent with kelp greenling and cabezon, which are primarily found over rocky reef habitats. In addition, the life history for leopard shark is much different from that of kelp greenling and cabezon. On the other hand, kelp greenling and cabezon strongly co-occur throughout their range and exhibit more similar life history characteristics.

Recent combined catches of kelp greenling (coastwide) and cabezon (WA) have remained well below the OFL and ABC contributions by kelp greenling (CA) and cabezon (WA) to the proposed Shallow Roundfish complex (Figure 1 and Agenda Item C.4.a, Supplemental **REVISED** Attachment 2). Catches of leopard shark have also remained well below the proposed OFL and ABC (Agenda Item F.8.b, Supplemental GMT Report 2, June 2013 and Agenda Item C.4.a, Supplemental **REVISED** Attachment 2)

The GMT feels that creating this new Shallow Roundfish complex would be least disruptive to the fishery and makes most sense regarding co-occurrence and life histories. This action would demonstrate progress addressing the mismatch in co-occurrence and life history characteristics between leopard shark and kelp greenling and cabezon. If in future biennial cycles, harvest specifications are available for kelp greenling in Washington and Oregon, the Council could request further analysis of this complex, including Option 1.

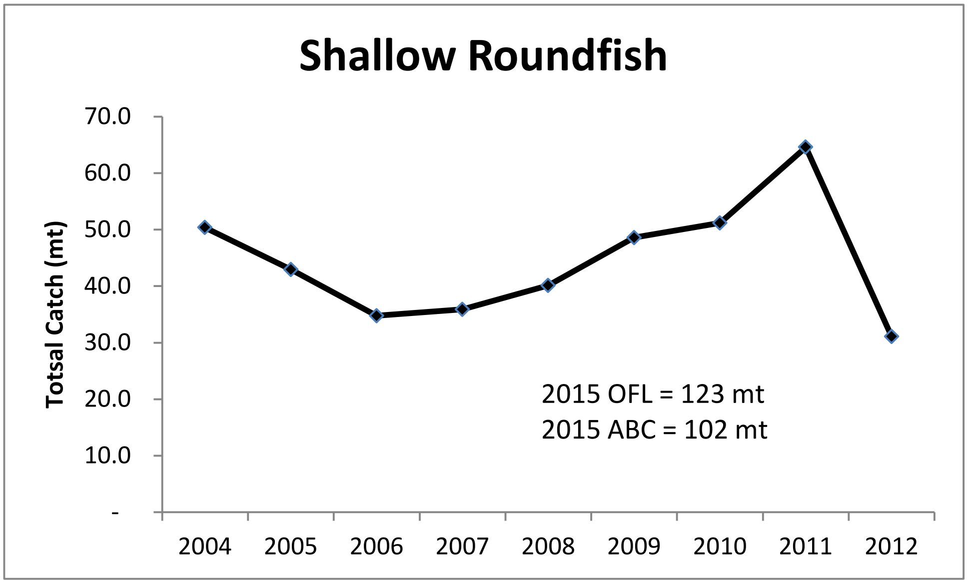


Figure 1. Estimated total catch of the GMT-proposed Shallow Roundfish complex (comprised of kelp greenling and Washington cabezon but excluding leopard shark).

Nearshore Rockfish and China Rockfish North of 40°10 N. Latitude

The Council requested analysis of a Nearshore Rockfish harvest guideline (HG) north of 40°10 N. latitude for California (between 40°10 and 42° N. lat.). The Council also requested a range of China rockfish HGs north of 40°10 N. latitude be analyzed. Further, the Council requested consideration of the harvest specifications associated with the China rockfish stock assessment stratified at 42° N. latitude. The broad range of allocation options listed below and associated management measures analysis represents a daunting task for the GMT. **The GMT requests the Council consider narrowing the scope of alternatives to ensure the GMT is able to complete the analysis in time for final Council action in June.** The GMT also notes that analysis for these alternatives under Agenda Item C.9 may be limited due to time constraints.

China Rockfish Alternatives: All alternatives start with the preliminary preferred OFL from the assessment stratified at 40°10’ N. latitude.

1. Historical catch (1916-2012)
    a. Allocation based on the proportion of commercial and recreational catch
    b. Allocation based on the proportion of highest commercial catch
    c. Allocation based on the proportion of highest recreational catch

Nearshore Rockfish Alternatives:

1. North of 40°10 N. latitude for California (between 40°10 and 42° N. lat.) based on stock assessment information and/or historical catch
2. Historical catch (1916-2012)
   a. Allocation based on the proportion of commercial and recreational catch
   b. Allocation based on the proportion of highest commercial catch
   c. Allocation based on the proportion of highest recreational catch
3. Allocation based on miles of coastline in each state north of 40°10' N. Latitude
4. 10 mt allocated to the Washington recreational fishery with the remainder allocated between Oregon and California
5. Accommodate the highest recent mortality for component stocks in the Washington Recreational Fishery from 2004-2013 with the remainder allocated between Oregon and California

The GMT provides the following considerations for the Council with the intent of facilitating selection of a narrower range for analyses. Realizing that there are real world implications of these decisions for the commercial nearshore and recreational sectors in each state, that make this a contentious issue, there are scientific principles that can help inform sound decisions in the selection of OFLs and allocations resulting in harvest guidelines, some examples of which we provide below.

Nearshore Management at a Species Level vs. Complex Level

None of the assessed nearshore stocks have been found to be in an overfished status requiring removal from the complex to facilitate rebuilding. Currently, OFL contributions are summed to provide a complex level annual catch limit (ACL). Recognizing the overharvest of China rockfish resulting in a downward trend in the index of abundance in the northern assessment and the precautionary status, concern has been raised that action is needed to prevent further decline of the stock toward the minimum stock size threshold. Given the constraints posed on the fisheries from management at the species level and the availability of data to allow a full stock assessment to confirm trends identified in the data-moderate assessment, keeping China rockfish within the Nearshore Rockfish complex until a better understanding of the status of the stock and an appropriate species specific ACL may be prudent. Should the Council see the need to take interim management measures to reduce impacts, implementing a China rockfish HG while keeping it within the Nearshore Rockfish complex may be sufficient to take steps to curtail mortality until a full stock assessment is completed. Alternatively, the Council may consider postponing changes to management of nearshore stocks until fully vetting a framework for consistent management of complexes. This would allow for the development of consistent criteria for the management of component species under various categories of assessments and resulting stock status. Under the mixed stock exception, continued mortality exceeding F_{MSY} is permissible in the interim if the appropriate conditions are met as stated in the National Standard Guidelines (e.g., the stock is not overfished).

Considerations Regarding Alternate China Rockfish Assessments

There are questions about the applicability of the China rockfish assessment stratified at 40°10 N. latitude to the area north 40°10 N. latitude in California. The GMT highlighted these issues, including using the indices of abundance primarily from ODFW commercial passenger fishing vessel fishery and the different management approach taken by the three states, in June 2013 (Agenda Item F.5.b., Supplemental GMT Report, June 2013).

SSC Statements and Advice Provided Regarding Selection of OFLs
Initially, the SSC stated that the OFL stratification should be consistent with the management and assessment lines (Agenda Item H.6.b, Supplemental SSC Report, November 2013). The SSC has since provided further clarification that the "OFLs and ABCs are set for entire management areas; therefore it is important that these quantities reflect the status of the stock in the entire area (Agenda Item D.5.b., Supplemental SSC Report, March 2014)."

Considerations Regarding Allocations
Table 1 contains the average landings (mt) in the commercial fishery from PacFIN and recreational mortality (mt) of Nearshore Rockfish stocks north of 40°10′ N. Latitude from 2004-2012

The SSC advised that "historical catches of nearshore species by state may not reflect biomass by state because of major differences in the management among states (Agenda Item D.5.b., Supplemental SSC Report, March 2014)." In previous statements, the SSC indicated that ideally an index multiplying catch-per-unit effort by habitat area for each state or region would inform an allocation in proportion to relative abundance, though these data are not currently available. In the absence of these data, two proxy methods of allocating have been discussed; historical catch from 1916-2012 and the miles of coastline within the assessed area. Allocation using historical catch assumes that catch is proportional to abundance, which may not be the case due to differences in management between states. In addition, data is unavailable from some states or sectors prior to 1980, states differed in the degree of development of their nearshore commercial fisheries between 1980 and 2000 and overfished species constraints limited harvest to varying degrees between states from 2000 to 2012. A more recent time period with more consistent regulations and effort may be more representative, though no period is ideal. Allocation of China rockfish using miles of coastline within each assessed area avoid potential over-allocation to over-harvested areas that can result when historical catch is used.

Allocation by miles of coastline assumes the relative abundance is consistent along the coast, which may not be the case for species that decline in abundance toward the ends of their range, or if habitat is not proportional to coastline distance or if stocks have been overharvested in a given sub-region. China rockfish is relatively common throughout the assessed range and there is no indication that this assumption is violated, though the distribution of habitat is unlikely to be perfectly uniform between states. While this method may still over-allocate to areas by assuming equal relative abundance, the potential for over-allocation is greater than when historical catch is employed, in which states that harvested the most fish would receive the highest allocations, potentially perpetuating overharvest and localized depletion. Future off-year scientific research designed to quantify catch and abundance relative to available habitat would greatly approve allocation methods.

While either method may deviate from the true relative abundance along the coast, which is unknown, consideration of which assumptions are violated for a given species may be helpful in deciding which method is more appropriate. Allocation by historical catch may be preferred in instances where a strong natural decline in abundance from the center of a species range occurs, in which case use of miles of coastline alone would cause an over-allocation to areas at the edge of their range where they are less common. This is the case for some of the Nearshore Rockfish species, for which abundance may naturally decline or become non-existent north or south of 40°10′ N. Latitude (e.g., gopher, olive, black and yellow, brown, kelp and grass rockfish; Table 1). Miles of coastline may be more appropriate for those species that are more uniformly distributed within the entire region over which allocations are being made (e.g., copper, China, and quillback rockfishes). Blue rockfish may be allocated according the stratifications of assessments at 42° N. Latitude since two stocks have been identified and are predominantly distributed on either side with further allocation using appropriate methods discussed above depending on the trends in abundance in the region in question.

Allocations based on the historical high catch such as with the alternative that allocates 10 mt to the Washington recreational fishery may not reflect the relative abundance of the species. The GMT recommends that the Council use methods that best approximate the relative abundance of component species given the assumptions implicit in their application to provide a scientific basis for allocation beyond the needs of the fishery.

Table 2. Average landings (mt) in the commercial fishery from PacFIN and recreational mortality (mt) of Nearshore Rockfish stocks north of 40°10′ N. Latitude from 2004-2012.

Species	**CA Comm. N. 40°10**	**CA Rec. N. 40°10**	**OR Comm.**	**OR Rec.**	**WA Rec.**	**Total**
Blue RF	8.32	5.33	4.82	20.98	2.02	41.46
Copper RF	1.33	1.90	0.90	4.07	2.05	10.26
China RF	0.86	1.03	6.54	2.74	3.14	14.31
Quillback RF	2.67	1.97	1.40	4.65	3.01	13.71
Total Common	*13.18*	*10.23*	*13.66*	*32.44*	*10.23*	*79.74*
Brown RF	0.39	0.53	0.01	0.07	0.00	1.00
Grass RF	0.24	0.28	0.47	0.02	0.00	1.01
Black and Yellow RF	0.08	0.03	0.03	0.00	0.00	0.14
Gopher RF	0.03	0.09	0.05	0.00	0.00	0.16
Kelp RF	0.00	0.00	0.00	0.00	0.00	0.00
Olive RF	0.12	0.20	0.00	0.01	0.00	0.33
Treefish	0.00	0.00	0.00	0.00	0.00	0.00
Total Uncommon	*0.86*	*1.13*	*0.55*	*0.10*	*0.00*	*2.65*
Total	14.05	11.36	14.21	32.54	10.23	82.39

Analysis of Options in Light of Considerations

A table of the alternatives proposed in motions by the Council and state reports are provided below along with some initial thoughts on pros and cons reflecting the considerations regarding allocation provided above (Table 3). The GMT did not have sufficient time to fully discuss the pros and cons and there may be additional pros and cons that are not represented here.

Table 3. A draft comparison of the pros and cons of each allocation option.

Allocation Option	Pro	Con
China Rockfish		
Proportion of Commercial and Recreational Catch	Reflects the historical pattern of commercial and recreational fisheries.	Potential for over-allocation to areas that are more depleted. Doesn't address areas where commercial fisheries have been prohibited.
Proportion of Commercial Catch	Reflects the historical pattern of the commercial fisheries.	Potential for over-allocation to areas that are more depleted. Does not reflect the pertinent recreational contribution. Doesn't address areas where commercial fisheries are prohibited.
Proportion of Recreational Catch	Reflects the historical pattern of the recreational fisheries.	Potential for over-allocation to areas that are more depleted. Does not reflect the pertinent commercial contribution.
Minor Nearshore Rockfish Complex		
Proportion of Commercial and Recreational Catch	Reflects the historical pattern of commercial and recreational fisheries.	Potential for over-allocation to areas that are more depleted. Doesn't address areas where commercial fisheries are prohibited.
Proportion of Commercial Catch	Reflects the historical pattern of the commercial fisheries.	Potential for over-allocation to areas that are more depleted. Does not reflect the pertinent recreational contribution. Doesn't address areas where commercial fisheries are prohibited.
Proportion of Recreational Catch	Reflects the historical pattern of the recreational fisheries.	Potential for over-allocation to areas that are more depleted. Does not reflect the pertinent commercial contribution.
Allocation based on miles of coastline in each	Less potential for over allocation to depleted areas than historical	Some species are far less common to the north at the

Allocation Option	Pro	Con
state north of 40°10’ N. latitude	catch	edge of their range and would be over allocated to the north since the method assumes abundance is proportional to miles of coastline.
Allocated 10 mt to the Washington recreational fishery with the remainder allocated between other states according to the preferences of the other states.	Accommodates the needs of the Washington recreational fishery.	Does not rely on a scientific basis for allocation between states. May strand allocation if catch is below the 10 year average but would result in a deficit based on 10 year high catch.
Accommodate the highest recent mortality for component stocks in the Washington Recreational Fishery from 2004-2013 with the remainder allocated between other states according to the preferences of the other states	Accommodates the needs of the Washington recreational fishery.	Does not rely on a scientific basis for allocation between states. Potential to strand allocation if catch is below the highest years catch.

ACL Decisions for Non-Overfished Species
The PPA ACL decision was to set the ACL equal to the ABC for all non-overfished species except maintain a constant catch for black rockfish (OR/CA) of 1,000 mt and constant catch for longnose skate (2,000 mt). The GMT has no additional considerations to add.

The Council also recommended a range ACLs for Dover sole (25,000 to 50,000 mt) and widow rockfish (1,500 to 3,000 mt) be analyzed. The GMT has heard that industry is interested in exploring ACL levels for these two species higher than the current range, but still below the ABC. The GMT intends to discuss and comment on this later in the week under Agenda Item C.9. **The GMT recommends that the Council consider postponing final decisions on ACLs for widow rockfish and Dover sole until Agenda Item C.9.**

Section 2. Overfished Species Rebuilding Plans and Harvest Specifications

The GMT reviewed the cowcod rebuilding plan parameters and preferred ACLs provided in Agenda Item C.4.a Supplemental REVISED Attachment 2. The GMT reviewed the harvest specifications, which are summarized below in Table 2, and offers the following comments.

Comments on Stock Status

The OFLs for the stock of cowcod south of 40°10' N. Latitude are based on estimates from the 2013 assessment, which covered the area from 34°27' N. Latitude south to the U.S.-Mexico border, and an OFL estimate based on the XDB-SRA analysis for the area from 34°27' north to 40°10' N. Latitude. These OFL estimates and associated acceptable biological catches (ABCs) associated with overfishing probabilities (P*s) of 0.45 and 0.25 are provided in Table 4 (Agenda Item D.5.a Attachment 1, March 2014).

The SSC recommended the ACL contribution for cowcod in the Monterey area should consider the method of employing DB-SRA using depletion prior based on the Conception area depletion estimate from the assessment. While this results in an ACL of 10 mt, which is lower than initially anticipated, the preliminary preferred annual catch target (ACT) is only 4 mt with the remainder between the ACT and ACL being used for research. The 4 mt ACT is designed to take into account the needs of the fishery.

The GMT thinks the cowcod rebuilding approach is reasonable and will allow the prosecution of fisheries and accommodate new research.

Table 4. 2015 and 2016 Harvest Specifications (in mt) for Cowcod South of 40º10' N. Latitude.

Stock	Cat.	2014 OFL	2015 OFL	2015 ABC	2015 ABC	2016 OFL	2016 ABC	2016 ABC
				P*= 0.45	P* = 0.25		P* = 0.45	P* = 0.25
COWCOD S. of 40°10' N. Latitude			66.6	59.9	38.2	66.1	59.4	37.8
COWCOD (Conception)	2	7	55.0	50.2	33.8	54.1	49.4	33.3
COWCOD (Monterey)	3	5	11.6	9.7	4.4	12.0	10.0	4.5

Section 3. Considerations for Amendment 24

Under Agenda Item C.4, the Council is scheduled to adopt a final preferred alternative for Amendment 24, if possible, and provide guidance on the FMP language necessary for Amendment 24.

Default Harvest Control Rules

The GMT continues to support Alternative 3 as being most reflective of how the Council has operated and will most likely continue to operate in upcoming cycles. On that note, we discussed briefly whether the Council could or would wish to choose a final preferred alternative without having the full long-term analysis in hand. As we understand it, the Council staff position is that the "and beyond" analysis is more appropriately placed within the harvest specifications. This is very similar to the position of the GMT over the course of Amendment 24 (e.g., Agenda Item H.4.b, Supplemental GMT Report, March 2013). In brief, the FMP Amendment has no environmental impact in and of itself. The Amendment language has a clarifying benefit but, as we understand it, the "and beyond" analysis could have been conducted without it. The environmental impact comes when the Council actually sets harvest specifications each cycle. That the "and beyond" analysis are simply a broad look at the range of possible outcomes over the 10-year analysis timeframe. When new science and information is received each cycle, the broad analysis should reduce the amount of additional National Environmental Policy Act analysis needed to implement harvest specifications. We continue to strongly support the approach. **The GMT thinks that the Council could take final action on the Amendment 24 alternatives in June without impacting the ongoing analysis.**

Updating Key Rebuilding Parameters

The proposed changes to Section 4.6.3.4 of the Groundfish FMP (Agenda Item C.4.a Attachment 4) are meant to clarify whether changes in the probability of rebuilding require changing a rebuilding plan. It is the GMTs understanding that the intent of this clarification is to make sure that the FMP does not require us to spend valuable time and resources, or cause undue restrictions on fisheries, by chasing noise.

While understanding that this proposed change to the FMP language is meant to clarify existing language, some on the GMT think it would be better to wait until the Management Strategy Evaluation (MSE) on rebuilding revision rules are completed and fuller discussions can be had before altering the FMP language. As a reminder, this MSE is currently under development at the Council's request and its very purpose is to explore how to respond to changed assessments and rebuilding forecasts during rebuilding. The MSE and rebuilding revision rules were contemplated as part of Amendment 24 but were put off for workload savings. In addition to the many initiatives being analyzed this cycle, cowcod is the only rebuilding species being considered for changes this cycle. The MSE should be ready to inform broader consideration of how to react to changed rebuilding estimates before the next harvest specifications cycle. The GMT notes that there may be additional changes to the FMP once the MSE process is complete.

Ecosystem Component Species in the FMP

The GMT notes that the final rule implementing the National Standard 1 Guidelines states, "As a default, all stocks in an FMP are considered to be 'in the fishery,' unless they are identified as EC species (see § 600.310(d)(5)) through an FMP amendment process." **If the Council takes final action to designate EC species, the GMT recommends the appropriate draft FMP language be brought forward for June 2014 Council meeting.**

Section 4. Recommendations and Requests for Council Guidance on Management Measures (Agenda Item C.9)

Achieving January 1, 2015 Implementation of the 2015-2016 Harvest Specifications and Management Measures

In March, the Council was informed that the EIS analysis was behind schedule due to delays in receiving harvest specifications. During discussions under Agenda Item D.5, the Council expressed the desire to explore ways to get back on track and ensure a January 1, 2015 implementation. Further, the National Marine Fisheries Service requested that the Council consider tasking the GMT with categorizing management measures with the potential outcome of narrowing the range included in the 2015-2016 EIS (Agenda Item C.4.b, Supplemental NMFS Report, April 2014).

In November, the Council adopted modifications to Council Operating Procedure (COP) 9 (Agenda Item I.5.a, Supplemental Attachment 3, November 2013) that stated the criteria by which the Council select management measures for inclusion in the biennial process. The COP states that in November the Council will:

> "…*provide initial fishery management guidance, including a preliminary range of management measures necessary to keep catch within or attain a specification or to address a habitat or protected resources concern for analysis and implementation in Years 3 and 4*."

In addition to COP 9, the Council also considers guidance in the FMP about the types of management measures that are appropriate for consideration under the biennial harvest specifications and management measures process. For example, Sections 6.8.4 and 6.8.5 describe how long-term bycatch mitigation in closed areas, such as Cowcod Conservation Areas, and habitat closed areas are usually not modified through biennial management actions.

The GMT believes that all management measures adopted in November 2013 fit the criteria adopted by the Council under COP 9. Despite this, we understand the workload concerns and desire to achieve the January 1, 2015 implementation date. As we noted during discussions on COP 9, the trade-off with broadening the criteria for eligible management measures is increased discussion of workload capacity and priorities. We do not have a good sense of how much can be done, how much NMFS would be comfortable reviewing, and how much time is available for analysis authors to consider revisions.

On the request to review the proposed list against the criteria in NMFS letter, some of us would reiterate our discomfort with the "necessary" and "conservation concern" criteria because they are difficult to apply and involve more gray than black and white.

In the event the Council wishes to narrow the range of management measures included in the 2015-2016 and beyond EIS, we would recommend looking to additional criteria for setting priorities this cycle. The circumstances have been somewhat extraordinary this cycle given delays in harvest specifications and the Amendment 24 efforts. Some measures could be moved to the June 2014 Omnibus Management Measures package. Possible factors to consider in prioritizing would be the complexity and completeness of the current analysis and of what could be completed by June, and taking into account whether some analyses may need further vetting of assumptions. The GMT can identify those measures that need additional dialogue and or analysis; however the GMT notes that ultimately NMFS must determine whether the analysis adequately supports Council decision-making.

Another approach might be to postpone those measures that can be effectively implemented after January 1, 2015 (or conversely, where it is not necessary to have them in place by January 1). **Given appropriate guidance from the Council under this agenda item, the GMT can provide feedback on prioritizing management measures under Agenda Item C.9.**

Apportionment of Sablefish North/South of 36^{o} N. Latitude

The GMT was consulted by members of the GAP about apportionment of coastwide sablefish harvest specifications to north and south of 36° N. latitude. Dr. Jim Hastie was able to provide a preliminary indication of the Northwest Fisheries Science Center (NWFSC) shelf/slope trawl survey swept area biomass estimates for the years 2003-2013. The survey results indicate that the coastwide biomass available to the survey has been relatively stable since 2008. Although the estimates for individual areas are noisier, there is no clear trend in any stratum. The 2011 sablefish stock assessment estimated the proportions of available biomass based on the years 2003-2010. Estimates of the proportions from recent years are relatively close to the estimates from the 2003-2010 period. The GMT notes that the trawl survey does not have the same selectivity as commercial fishing gear, especially fixed gear, and that the 2011 sablefish assessment described the use of trawl survey biomass for apportionment as a "rough approximation of the sablefish stock."

GMT Recommendations:

1. The GMT recommends that the Council consider adopting a modified version of Option 2 (Agenda Item C.4.a, Attachment 6, April 2014), which would create a new Shallow Roundfish Complex comprised of kelp greenling (coastwide) and cabezon (WA) and implement stock-specific harvest specifications for leopard shark.
2. The GMT requests the Council consider narrowing the scope of Nearshore Rockfish and China rockfish allocation alternatives to ensure the GMT is able to complete the analysis in time for final Council action in June.
3. The GMT recommends that the Council consider postponing final decisions on ACLs for widow rockfish and Dover sole until Agenda Item C.9.
4. The GMT thinks that the Council could take final action on the Amendment 24 alternatives in June without impacting the ongoing analysis.
5. If the Council takes final action to designate EC species, the GMT recommends the appropriate draft FMP language be brought forward for June 2014 Council meeting.
6. Given appropriate guidance from the Council under this agenda item, the GMT can provide feedback on prioritizing management measures under Agenda Item C.9.

PFMC
04/06/14

OREGON DEPARTMENT OF FISH AND WILDLIFE COMMENTS REGARDING THE RECENT MODEL DEVELOPMENT AND OFL DETERMINATION FOR KELP GREENLING FOR 2015-2016 HARVEST SPECIFICATIONS

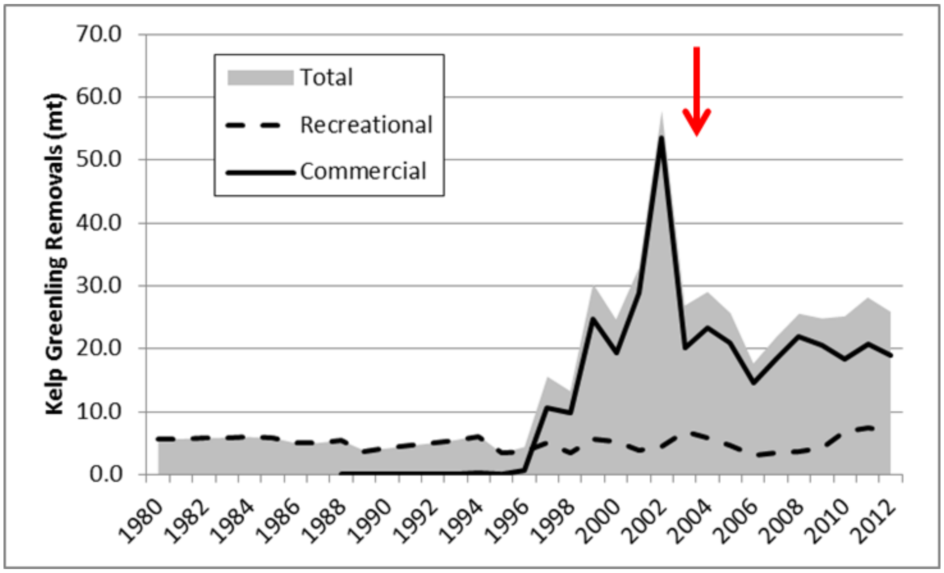
The Oregon Department of Fish and Wildlife (ODFW) is concerned with the recent process used to develop harvest specifications for kelp greenling in Oregon for the 2015-2016 cycle. We believe the results are conservative and inherently uncertain for several reasons addressed in this state report. We strongly recommend that the Council consider managing kelp greenling as part of the Shallow-water Roundfish complex[1] until further model evaluation can be conducted in the next harvest specifications cycle. We also recommend that the process for the development and implementation of data poor models be revisited and revised, to include consideration of additional models when they are available relatively early in the process, as they were for kelp greenling. Finally, we request increased state participation in the development of assessment models, particularly with nearshore species for which the states can contribute both local expertise and valuable data.

Recent kelp greenling landings and effort in the Oregon

The ODFW has been proactive in its approach to managing nearshore groundfish, which include kelp greenling, in both the commercial and recreational fisheries. Following an increase in landings that peaked in 2002, a limited-entry permit system, annual harvest caps and trip landing limits were implemented for the commercial nearshore fishery. Recreational harvest caps were also implemented concurrently. Since the implementation of the state permit program, commercial landings of kelp greenling have stabilized at an average of 19.8 mt (2003-2012; Figure 1). A new data stream for recreational catch was developed for kelp greenling in 2012 (1980-2012), due to concerns with extremely inflated estimates from the Marine Recreational Fisheries Statistics Survey program, with Oregon Recreational Boat Survey estimates. These recent efforts reveal that the sport landings have been very consistent as well, averaging 5.3 mt over the last decade (2003-2012; Figure 1). Commercial landings are closely monitored with weekly updates and actively managed in-season. Recreational landings are monitored monthly, with periodic biweekly preliminary updates as necessary. The ODFW is committed to careful and sustainable management of these nearshore species.

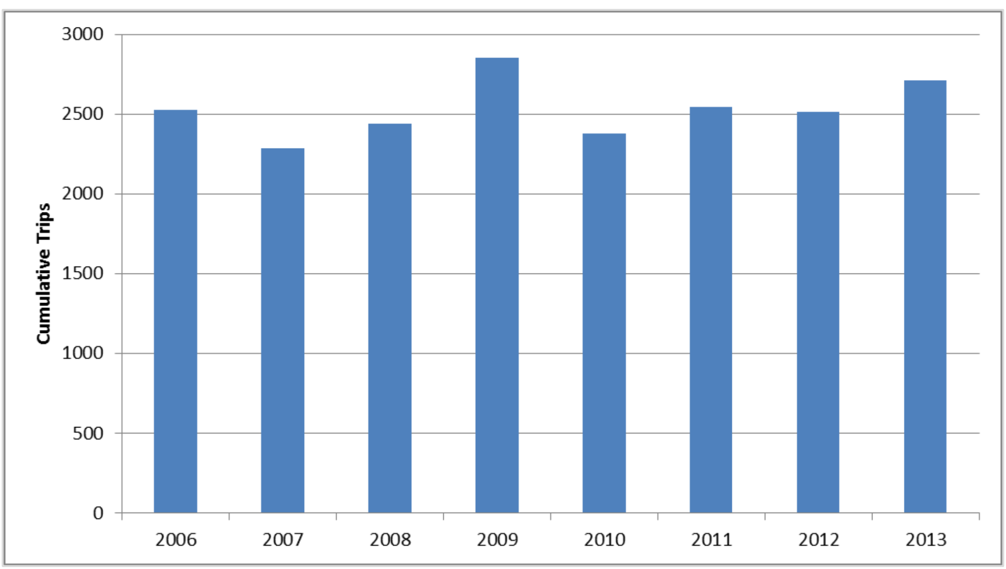
[1] The Shallow-water Roundfish complex, as proposed in November 2013 Council motion H.4, is suggested to include kelp greenling (Oregon, Washington and California), leopard shark, and cabezon (Washington only).

Figure 1: Total landings of kelp greenling in Oregon from 1980-2012. Note the decrease in landings following the implementation of the nearshore limited entry permit fishery and the harvest caps for commercial and recreational (2003, red arrow).



Effort in the commercial fishery has also stabilized, averaging 2530 daily trips per year (2006-2013; Figure 2), with only 2009 as a relatively high year in terms of participation. Effort in the commercial nearshore fishery is also monitored weekly. Anecdotal information from commercial fishermen suggests that kelp greenling are relatively abundant among the nearshore species they target and that trip limits can be met easily.

Figure 2: Cumulative number of landings (all species) in the Oregon nearshore commercial fishery (2006-2013).



This close monitoring of both sport and commercial fisheries enables the state to use active in-season management in order to ensure annual harvest caps are not exceeded. Given the relative stability of the total kelp greenling catch averaging 25.0 mt per year over the previous decade, an

OFL of 14.0 mt is difficult to justify to coastal communities and will require extreme management measures with severe impacts to fisheries and coastal economies.

Model Selection Process

In December 2013, at the time the DB-SRA model used for 2015-2016 harvest specifications was initially presented to the Scientific and Statistical Committee - Groundfish Subcommittee (SSCGF), the ODFW had been working closely with another federal stock assessor (J. Cope, NWFSC) to develop a data moderate assessment (an exSSS model) for kelp greenling in Oregon waters. Preliminary results from this assessment were presented to the SSCGF during its December 2013 meeting. The ODFW was seeking a data moderate assessment for Oregon as a proactive approach to managing kelp greenling in state waters, after it was not included in the list of stock assessments to be completed during the 2015-2016 cycle at the September 2012 Council meeting (Agenda Item H.3.b NMFS Report).

Yet, the SSCGF chose not to review the exSSS model, even when the assessor who developed the DB-SRA model (E. Dick, SWFSC) proposed to develop a data moderate model for 2015-2016 specifications (March 2014 Agenda Item D.5.b Supplementary SSC Report). At the time, the SSCGF stated that a comprehensive review of a data moderate model could not be completed in time to finalize harvest specifications. It is unfortunate that other data moderate models (e.g. China rockfish) were able to be reviewed and that the kelp greenling exSSS model was not a part of this process. ODFW is concerned about that inconsistency and the impact of considering results from only the DB-SRA model. When a data poor model known to produce relatively more conservative OFL estimates is selected, additional justification is needed for the selected model category (e.g. data moderate versus data poor), especially when there is a clear alternative to consider. In order to manage to the best available science, as is federally mandated, all data and models should be considered during this process.

Additional Population Models for Kelp Greenling

Though exSSS models have been accepted as a data moderate assessment method (September 2012 Agenda Item H.3.a), we would like to note that the kelp greenling exSSS model has not been formally reviewed and, at this stage, should not be used for harvest specifications. The kelp greenling exSSS model results are not directly comparable to those from the DB-SRA model, primarily due to differences with internal productivity models and the inclusion of abundance indices. However, with identical catch inputs, the exSSS model results in a much different picture of the kelp greenling population in Oregon compared to the DB-SRA model. General trends in status of the stock are very similar (Figure 3), although the magnitude of the difference is extremely important when translating results into active management. Projected OFLs for 2015-2016 biennium using the exSSS model are over 20 mt (Figure 4), much closer to average catches from the last decade

Figure 3: Stock status (depletion) for kelp greenling with a preliminary exSSS data-moderate model.

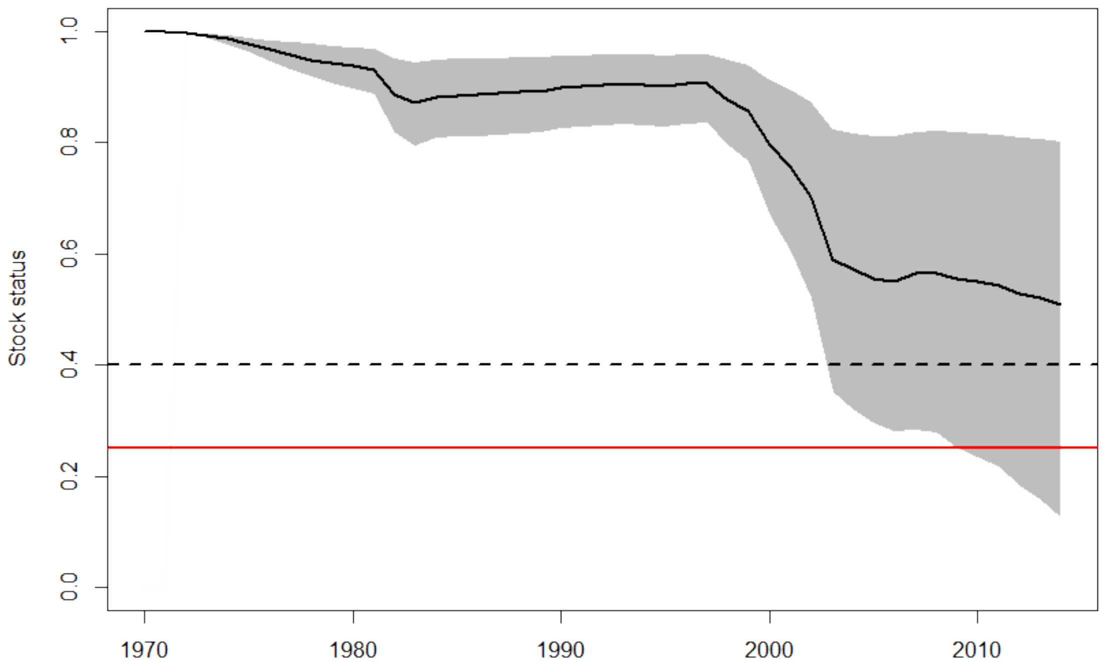
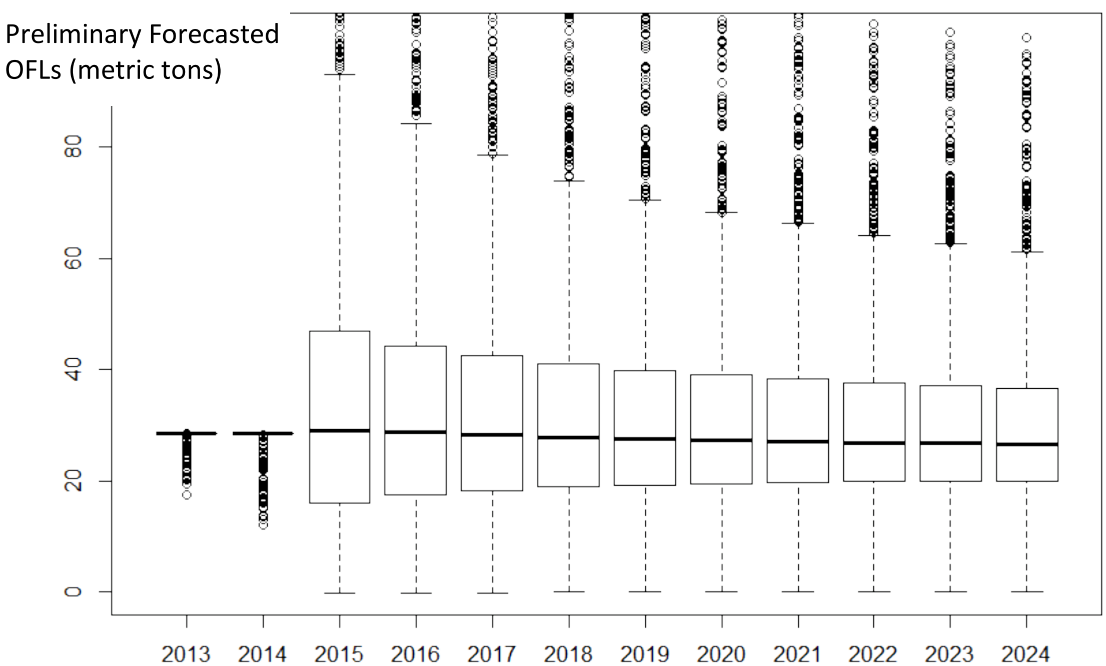


Figure 4 : Forecasted OFLs for kelp greenling with a preliminary exSSS data- moderate model.



Over the last two years, a group of researchers from the Heppell Lab at Oregon State University has been evaluating the applicability of data poor models at smaller, regional management scales (Oregon Sea Grant #NA10OAR4170059-NB223D), again working closely with ODFW staff. Though emphasizing the preliminary nature of this work, the results support the sensitivity of DB-SRA models to specific parameter selections, particularly for the depletion parameter and the year of application of that parameter (Wetzel and Punt 2011). Their work also suggests that OFL estimates tend to be more sensitive to changes in depletion than other parameters necessary to run DB-SRA, and to a greater degree with kelp greenling than with other nearshore groundfish, such as black rockfish or cabezon (pers. comm. S. Heppell). For these reasons, relatively small decisions regarding these parameters can have dramatic impacts on management outcomes.

The choice of using the depletion estimate from the 2005 kelp greenling stock assessment was a critical factor in the development of the current DB-SRA model. Default parameter values for DB-SRA have been developed for specific life histories, and it is recommended that these be used unless there is justification for other values (Dick and MacCall 2010). Use of default depletion parameters (delta = 0.6) and a different depletion year (most recent year of catch data available at the time, 2011) results in OFLs higher than with the 0.49 prior from the 2005 assessment (pers. comm. S. Heppell), and a relatively small absolute difference could potentially result in a dramatically different situation for coastal communities. The heavy reliance on catch data, which is strongly confounded by state management practices over time in this case, and the common practice of borrowing information from other assessments or areas other than the west coast reduces overall confidence in the results of these models. More consideration needs to be given to the selection of these parameters, as with any other stock assessment, and justification for the use of specific, non-default parameters needs to be presented along with the assessment. The ODFW would like to work more closely with federal assessors to continue to investigate these issues and assist with the development of the best possible information specific to the kelp greenling population within Oregon waters.

Revision of the process for model development and selection

The process by which these data-poor models are developed needs to be reviewed and potentially revised. More state involvement in the development of the models is needed, not only for the catch data but also the additional parameters that go into the model. This is especially relevant for nearshore species for which the state is most knowledgeable, as noted by the March 2014 Agenda Item D.5.b Supplemental Report from the state agencies.

The ODFW would like to note that the assessor for kelp greenling did incorporate multiple ODFW suggestions after the model had been initially presented (i.e., sensitivity analyses regarding the age at maturity and the incorporation of the equilibrium catches), and it was clear that our input was highly valued. The ODFW appreciated the ability to be actively involved and requests that this involvement begin earlier in the process in the future. In this case, improved communication through more formalized channels might have resulted in a different model brought forward during this specification process. As suggested in the March 2014 Agenda Item D.5.b Supplemental Report from the state agencies, model development could even be delegated to the state for specific nearshore species. The ODFW strongly agrees with the recommendations presented in the SSC Supplemental Report on the 2015-16 harvest specifications (March 2014 Agenda Item D.5.b) – that more help from the states is needed, both for workload and for local knowledge of the resource and fisheries, to improve the process by which data poor models are implemented into management.

Recommendations

Given the sensitivity of data poor models to changes in parameters and catch streams, a modification of the procedure by which models are selected may be warranted. In the North Pacific Fishery Management Council, it is standard practice for many species to have assessors present a range of models, with different parameters and multiple catch streams, in order to directly compare results among the models. This is might be considered a more formalized and extensive set of sensitivity analyses through which the states could actively contribute both expertise and data. The Scientific and Statistical Committee could then select the model in which they have the most confidence from those available, and could request additional models for the following cycle with specific changes. This would improve assessment accuracy and benefit both state fishery managers and federal stock assessors by increasing confidence in the models' ability to track real changes in the population over time, and to diminish the perception of "results-based management".

With the inherent uncertainty in the DB-SRA model and the ad-hoc process to implement into management, the ODFW believes it is premature to manage the species in the Shallow-water Roundfish complex[2], such as kelp greenling, individually. The DB-SRA model used for 2015-2016 harvest specifications was developed as a substitute for a more comprehensive assessment. The SSCGF has recommended developing a data moderate model for the following specification cycle for kelp greenling. The ODFW supports this recommendation, but would further suggest that NMFS consider kelp greenling as a priority species for a full assessment during the next cycle. The ODFW also has additional data that could be incorporated into a full or data moderate assessment, including several suggestions for appropriate indices of abundance, such as the newly completed state observer database or nearshore commercial logbook data, fisheries-dependent length and age data, and maturity information. The ODFW is dedicated to continuing to work with federal assessors to improve the assessment of kelp greenling in Oregon waters. However, we are now faced with serious management challenges for the 2015-2016 biennial cycle that have dramatic implications for our coastal economies and communities.

References:

Dick, E.J., and A. D. MacCall. 2010. Estimates of sustainable yield for 50 data-poor stocks in the Pacific coast groundfish fishery management plan. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-460.

Wetzel, C.R. and A.E. Punt. 2011. Model performance for the determination of appropriate harvest levels in the case of data-poor stocks. Fisheries Research 110 (2): 342-355.

[2] The Shallow-water Roundfish complex, as proposed in November 2013 Council motion H.4, is suggested to include kelp greenling (Oregon, Washington and California), leopard shark, and cabezon (Washington only).

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON BIENNIAL SPECIFICATIONS FOR FISHERIES IN 2015-2016 AND BEYOND

Hotspot analysis

Ms. Rosemary Kosaka (Groundfish Management Team, GMT) briefed the Scientific and Statistical Committee (SSC) on a preliminary analysis of spatial patterns of rougheye bycatch in the Pacific whiting fishery. The GMT is considering whether this type of analysis could be used to establish spatial closures as an in-season tool to manage bycatch. Spatial management is just one of the potential tools that could be used for this purpose. The data are based on observer sampling, and the SSC noted some concerns regarding the use of observer data, including how discard that occurs before the net is brought on board is identified to species, and whether sub-sampling of the catch leads to highly variable estimates of tow-by-tow bycatch. The SSC considers this approach to be worth further development as a management tool, and made a number of recommendations on how to improve the analysis.

Mr. Dave Fraser gave a presentation on the spatial analysis tools that are being used by the Pacific whiting mothership fleet to manage bycatch. The focus is on easy-to-interpret spatial displays with color-coding to indicate spatial cells with high bycatch. The spatial displays use real-time high-resolution data from on-board observers and vessel monitoring systems. High resolution tow-by-tow data is confidential, but the mothership fleet has waived the confidentiality restrictions to make these data available to SeaState. The SSC encourages a discussion of the tradeoffs between self-management of bycatch by risk-pools and the more formal regulatory approaches being considered by the GMT. In addition, spatial closures may be more effective for controlling bycatch for some species than others, depending on how consistently the species is distributed spatially and seasonally.

Review proposed 2015-2016 OFLs

The SSC recommends the 2015 and 2016 overfishing limits (OFLs) for Washington cabezon (Table 3 of Supplemental Revised Attachment 2) and the 2016 OFLs for brown, China, and copper rockfish (Table 1 of Supplemental Revised Attachment 2). The SSC also recommends the revised green-spotted rockfish OFLs for 2015 and 2016 that were obtained by assuming that catch for 2013 and 2014 (and 2015 for the 2016 OFL) will be equal to the recent average rather than assuming the full annual catch limit will be taken. The SSC endorses all the other OFLs in Table 1 of Agenda Item C.4.a, Supplemental REVISED Attachment 2, with the exception of the following.

For kelp greenling OFLs in Oregon and Washington, the approach that was recommended by the SSC groundfish subcommittee in December was to condition both the Oregon and Washington DB-SRA analysis on the depletion estimates from the 2005 kelp greenling stock assessment for Oregon. At this meeting, the SSC discovered that the best current estimates of kelp greenling historical catches in Oregon are very different than the catches that were used in the 2005 assessment. This raises a major concern about reliability of the 2005 assessment. The SSC concluded that it could no longer support the OFLs for kelp greenling in Oregon and Washington that were obtained from DB-SRA analyses conditioned on the 2005 assessment.

The SSC discussed two options for Council consideration for moving forward. One option would be to request that Dr. E.J. Dick conduct new DB-SRA analyses for kelp greenling in Oregon and Washington that are not conditioned on the 2005 assessment, and to provide those results to the SSC at the June meeting for review and to set OFLs. This option would not take advantage of the information available on stock trends and age composition in Oregon, and is likely to give results that are similar to the OFL values that were previously endorsed. The second option, which would not cause further delay in the specifications process, is for the SSC to not make any further attempts to specify new kelp greenling OFLs, and for the Council to continue to manage these stocks under a stock complex for 2015-2016. Kelp greenling would be given high priority for full assessment in the next assessment cycle.

Review Atlantis model results

An analysis using the Atlantis model for the California current ecosystem is being considered for inclusion in the Tier 1 Groundfish Environmental Impact Statement. Dr. Isaac Kaplan presented preliminary Atlantis results that followed SSC recommendations on how to structure the analysis using the decision tables in groundfish stock assessments. Initial results suggested that there do not appear to be large impacts of the groundfish fishery on other components of the ecosystem across a broad range of catch levels. Results presented to the SSC indicate that a good start has been made in evaluating the cumulative impacts of the groundfish fishery using the Atlantis model. The SSC communicated a number of recommendations to the analysts. The SSC is planning to conduct a methodology review of the Atlantis model in July.

PFMC
04/06/14

GROUNDFISH ADVISORY SUBPANEL REPORT ON BIENNIAL HARVEST SPECIFICATIONS FOR 2015-16 AND BEYOND

The Groundfish Advisory Subpanel (GAP) heard a presentation by Mr. John DeVore on biennial harvest specifications for the 2015-16 cycle and offers the following comments.

In this statement, the GAP addresses only numbers 1 through 7 of the checklist found at Agenda Item C.4.a, Attachment 1, Action Item, for the following recommendations and refers to Agenda Item C.4.a, Supplemental REVISED Attachment 2 as a basis for most of our recommendations.

Preferred Harvest Specifications

1. OFL: Adopt remaining OFLs, as recommended by the SSC

   The GAP agrees with adopting the 2015-16 overfishing limits (OFLs), as recommended by the Scientific and Statistical Committee (SSC), including those for California kelp greenling, leopard shark, and Washington cabezon.

2. ABC: Confirm or modify P* and adopt ABCs

   The GAP reviewed Agenda Item C.4.a, Supplemental REVISED Attachment 2 and, as in the GAP's November 2013 statement, recommends adopting a P* of 0.45 for all stocks and complexes to determine 2015 and 2016 acceptable biological catches (ABCs), recognizing that for some stocks, this is a departure from the default ABC harvest control rules (HCRs) adopted for the 2013-14 management cycle.

3. ACL - Confirm or modify PPA ACLs

   As in our November 2013 report, the GAP is recommending the default HCRs be applied to most stocks and stock complexes for the next management cycle. Those stocks where the GAP is recommending a departure from the default Annual Catch Limit (ACL) HCRs are listed below.

   - **Arrowtooth flounder**: The GAP recommends setting the ACL equal to the ABC. However, the GAP recommends the ABC be specified using a P* of 0.45, which is a departure from the status quo P* of 0.4. The West Coast arrowtooth stock is healthy and increasing in abundance. They are a top level predator on the shelf and compete with Pacific halibut. Further, this is a trawl-dominant stock and targeted by some members of the fleet, some of whom are close to attaining their vessel cap for arrowtooth.

   - **Dover sole**: The Council chose for analysis two ACL alternatives for Dover sole: a 25,000 mt and 50,000 mt ACL; the GAP prefers the higher ACL of 50,000 mt to help develop the Dover market. This is a healthy stock with an abundance much higher than the target B_{MSY} level; the stock is projected to remain above target at a level of removals higher than the 50,000 mt ACL (see Table 4-2 in Agenda Item C.4.a, Attachment 3). The potential of developing a more robust Dover market depends on the certainty of the potential of a higher volume of landings enabled with higher ACLs.

- **Lingcod south of 40º10’ N lat**.: The GAP recommends setting the ACL equal to the ABC. However, the GAP recommends the ABC (and ACL) be specified using a P* of 0.45, which is a departure from the status quo P* of 0.4. This is a healthy and well managed stock targeted by every non-whiting sector of the West Coast groundfish fishery. The slight increase in yield afforded by a higher ACL will directly benefit the industry and affected fishing communities in California.

- **Longspine thornyhead:** The GAP recommends specifying the longspine ACLs by apportioning the coastwide ABCs determined using a P* of 0.45. The recommended ACLs for north and south of 34º27’ N lat. are 3,474 mt and 1,097 mt, respectively, in 2015 and 3,305 mt and 1,044 mt, respectively, in 2016.

- **Sablefish north of 36º N lat.:** The GAP recommends setting the ABC using a P* of 0.45 rather than the status quo P* of 0.4. We note the P* of 0.4 was used only for the 2013-14 biennial specifications and a P* of 0.45 was the expected default at the time. The GAP further recommends application of the default 40-10 ACL HCR to determine the ACL to manage this important stock. Sablefish is a critically important stock to west coast commercial fisheries. It is the main target in offshore limited entry (LE) and open access (OA) fixed gear fisheries, as well as the bottom trawl fishery. Ex-vessel prices for sablefish are increasing and a higher ACL directly benefits the industry and affected fishing communities. Further, the LE trawl fleet needs a higher quota of sablefish to optimize their Dover/thornyheads/sablefish (DTS) and shelf fishing strategies. A higher sablefish quota allows trawlers to better attain their Dover sole quota, a stock that is the subject of developing markets. A higher sablefish quota would also benefit fixed-gear fisheries that, in recent years, have also been significantly constrained by lower catch limits.

- **Sablefish south of 36º N lat**.: The GAP makes the same recommendation for this stock as made for sablefish north of 36º N lat.

- **Shortspine thornyhead**: The GAP has the same recommendation as that made for longspine thornyhead: to specify ACLs north and south of 34º27’ N lat. by apportioning the coastwide ABCs determined using a P* of 0.45. The GAP-recommended ACLs for north and south of 34º27’ N lat. are 1,913 mt and 1,012 mt, respectively, in 2015 and 1,892 mt and 1,001 mt, respectively, in 2016.

- **Spiny dogfish**: The current state of our understanding leads the GAP to believe that a P* higher than 0.35 is more than adequately supported by recent science: the SSC recommended a more conservative proxy rate for setting the OFL to address the conservation concerns in September 2013. Moreover, the greatest concern about uncertainty during the last cycle was the question of what is the most appropriate F_{MSY} harvest rate for setting the dogfish OFL. The F_{MSY} range at that time was between an SPR of 45% and 76%, which was the axis of uncertainty that led the Council down a precautionary path. The SSC's September action to use a proxy SPR harvest rate of 50% for spiny dogfish and other elasmobranchs dealt with that uncertainty. Therefore, the Council has the information it needs to move forward and consider a P* of 0.45 for setting the ABC and ACL.

- **Starry flounder:** The GAP recommends setting the ACL equal to the ABC. However, the GAP recommends the ABC (and ACL) be specified using a P* of 0.45, which is a departure from the status quo P* of 0.4. This is a healthy stock far above its B_{MSY} target and is caught in nearshore commercial and recreational fisheries. There are no biological risks associated with a higher ACL.

- **Widow rockfish:** The GAP recommends an ACL of 3,000 mt, which is higher than the default 1,500 mt ACL specified for 2013 and 2014. The GAP notes the stock assessment is uncertain, but with a 3,000 mt ACL, the stock is still predicted to remain above the B_{MSY} level for the next 10 years. The non-whiting trawl fishery needs a higher widow ACL to gain greater access to the healthy yellowtail rockfish resource. Further, this is a constraining stock for the at-sea whiting sectors. A higher widow quota will allow greater flexibility to target whiting while avoiding other species of concern such as canary and rougheye rockfish. The GAP notes that annual average widow landings in the three years immediately prior to the 2002 widow shutdown (1999 to 2001) were below 3,900 mt. It is hoped the regulations for 2015-16 will allow midwater gear to be used outside of the whiting season; specifically, a 12-month non-whiting midwater fishery to target yellowtail.

4. <u>ACT: Confirm or modify the 4 mt ACT for cowcod</u>

The GAP recommends the 4 mt Annual Catch Target (ACT) for cowcod and understands most of the remaining 6 mt of the proposed ACL could be used for research. Moreover, a 25 percent increase in the harvestable amount of cowcod may allow more fishing opportunity, since this species limit constrains access to target species. For example, a higher harvest limit may allow a return to recreational fishing in the 50- to 60-fathom zone in the southern California Bight.

5. Rebuilding: Confirm PPA rebuilding plan parameters. Adopt new T_{TARGET} for cowcod

   The GAP does not have a recommendation for a new target year for the cowcod rebuilding plan.

6. Confirm EC species' designations

   Referencing Table 4 in Agenda Item C.4.a, Supplemental REVISED Attachment 2, the GAP recommends the species in that table for ecosystem component designations.

7. Confirm PPA to manage CA kelp greenling, OR kelp greenling, WA kelp greenling, WA cabezon and leopard shark with stock-specific specifications or decide to manage these stocks in a Shallow Roundfish complex

   The GAP agrees with the Groundfish Management Team (GMT) recommendation to manage leopard shark on its own. With regard to kelp greenling, the GAP recommends a coastwide management scheme that would manage these stocks, along with cabezon in Washington, and create a Shallow Roundfish complex. Waiting until June to make these decisions should be avoided because it would disrupt the development of management measures and delay completion of harvest specifications. Furthermore, and most importantly, any interruption here would risk the delay of regulation implementation past Jan. 1, 2015.

The remaining items on the checklist, such as issues regarding China rockfish and the Nearshore Complex, will be addressed under Agenda Items C.8 and C.9.

Rougheye/Blackspotted Rockfish Category Designation

The GAP continues to be concerned by policy decisions that reduced the 2015/2016 rougheye rockfish ABC and OFL values. The GAP recommends the Council task the SSC with reviewing their rationale for changing the rougheye/blackspotted rockfish stock assessment from category 1 to category 2.

Our rationale is the apparent discontinuity between the reason provided by the SSC in their November 2013 report and information about slope rockfish productivity and vulnerability in the Council record.

In November 2013, the SSC reported: "Category Designation for the Rougheye / Blackspotted Rockfish Assessment – The SSC revisited the decision that was made at the September meeting to designate the new stock assessment for rougheye rockfish as a category 1 assessment. Given that the assessment is for a complex of two species (rougheye and blackspotted rockfish) and given that there is insufficient information available to confirm that these species have similar vulnerability to the fishery and rates of biological productivity, the SSC recommends that the assessment be classified as a category 2 assessment. Both the ABCs and decision table will be updated to reflect this change." (Agenda Item H.6.b, Supplemental SSC, Report, November 2013)

However, in direct contrast to the SSC statement that insufficient information is available, the Council record contains information provided by the GMT to the Council in April 2013 (Agenda Item D.3.a, Attachment 1, April 2013).

Table 10. Slope rockfish stocks ranked by relative productivity. Productivity (P) and vulnerability (V) scores are from the GMT's PSA analysis.

Stock	P	Relative P	V	Relative V
Yellowmouth rockfish	1.61	High	1.96	Med
Longspine Thornyhead	1.47	High	1.54	Low
Pacific ocean perch	1.44	High	1.69	Low
Aurora rockfish	1.33	Low	2.1	High
Shortspine thornyhead	1.33	Low	1.8	Low
Redbanded Rockfish	1.28	Low	2.02	High
Splitnose rockfish	1.28	Low	1.82	Med
Blackgill rockfish	1.22	Low	2.08	High
Shortraker rockfish	1.22	Low	2.25	Highest
Blackspotted rockfish	1.17	Low	1.97	Med
Rougheye rockfish	1.17	Low	2.27	Highest

It is clear from the April 2013 table that information about productivity and vulnerability is available for both rougheye rockfish and blackspotted rockfish. The Productivity and Susceptibility Assessment (PSA) analysis is apparently sufficient for making a variety of management and policy decisions. Why then is it inadequate to inform whether rougheye and blackspotted have comparable vulnerability to the fishery and rates of biological productivity? The GMT's PSA analysis indicates that rougheye and blackspotted have identical P-scores. Moreover, rougheye has the "highest" V-score, which means it is much more vulnerable to the fishery than blackspotted with a "medium" V-score. Therefore, the GAP strongly recommends the Council task the SSC with reviewing their November 2013 decision about this issue. It is critical that this question be addressed. There is a direct link between the OFL and ABC values for 2015/2016 and the stock assessment category designation. In general, adopting lower harvest levels without adequate rationale, especially when there is no compelling conservation risk to the stock, is inappropriate. Specifically, given the significant ramifications of the rougheye/blackspotted ABC to all commercial fisheries, it is critical we get it right.

Amendment 24

To provide some background, in March 2013 the Council voted to pursue two alternatives: one suggested by the GAP and one that included recommendations from the GMT and the SSC. The GAP alternative was developed to maintain the P*=0.45 "cap" in the groundfish Fishery Management Plan (FMP) while allowing the Council some flexibility to suggest a different P* value if appropriate. (See March 2013 Agenda Item H.4.b Supplemental GAP report and March 2013 minutes, pages 46 – 51).

In June 2013 the Council voted to pursue a slightly different alternative based on recommendations of the GMT (see June 2013 Agenda Item F.7.b Supplemental GMT report and June 2013 minutes, pages 40- 42). The effect of the June decision was to remove the proposed Amendment 24 wording recommended by the GAP and previously recommended by the Council but to leave in place some of the flexibility that the GAP believes is necessary.

Looking at the draft FMP amendments that are presented at this meeting under Agenda Item C.4.a Attachment 4, the GAP believes that the draft Alternative 3 language most closely follows the GAP recommendation for last year and therefore we support that language.

However, we are concerned that the 2013–14 Dover sole ACL of 25,000 mt *not* be characterized as a "constant catch" HCR, which would presumably be carried over into the future. The 25,000 mt ACL was established in the 2011–12 biennium in response to uncertainty over market conditions and how the newly implemented trawl rationalization program would operate. That ACL, along with most others for healthy species, was rolled over in 2013-14 in an effort to reduce workload associated with development of annual specifications in spite of testimony about the potential for new market development if a sufficient ACL was available. We do not believe that Dover sole should be characterized as being managed under a "constant catch" strategy and want to make clear that our support for Alternative 3 does not imply that Dover sole should be managed under anything other than a normal healthy stock strategy using a P* =0 .45 and an ACL=ABC.

PFMC
04/06/14

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
7600 Sand Point Way N.E.
Seattle, Washington 98115

April 3, 2014

Ms. Dorothy M. Lowman
Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chair Lowman:

The National Marine Fisheries Service (NMFS) shares the Pacific Fishery Management Council's (Council) goal, as NMFS understood it, of a January 1, 2015 implementation date for the 2015-2016 groundfish harvest specifications and management measures regulations.

NMFS understood the Council to be contemplating an initial focus on the harvest specifications and management measures necessary to achieve the specifications or address conservation concerns as a strategy to narrow issues in order to achieve the January 1 objective. NMFS believes the decisions of the Council in November, 2013 went beyond this scope.

NMFS believes the Council would benefit from increased clarity on the current scope of proposals so that there is no misunderstanding about its effect on the schedule for completion. We request that you task the Groundfish Management Team (GMT) to provide a report to the Council on the current range of management measures to determine which measures are needed to meet harvest specifications or address conservation concerns, and which measures do not meet this criterion.

This report could provide the Council important information to consider in determining whether the original January 1, 2015 objective remains a priority. If January remains important, the GMT report will provide a useful tool in decision-making to narrow the range of analyses to allow completion of a draft environmental impact statement in time to support a final Council decision on 2015-2016 harvest specifications and management measures during the June meeting.

Thank you for your consideration of this request.

Sincerely,

Frank Lockhart
Groundfish Program Manager
Sustainable Fisheries Division

cc: Bob Turner
Don McIsaac
Dan Erickson

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW) REPORT ON GROUNDFISH BIENNIAL HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES FOR 2015-2016 AND BEYOND

As mentioned at the Council meeting in March, WDFW has some concerns about the “data moderate” assessments for minor nearshore rockfish north of 40°10’ N. latitude, the “data poor” calculations for cabezon and kelp greenling off Washington, and how they be used for management in 2015 and 2016. Our apprehensions stem primarily from the variations in nearshore management approaches among the three states that have led to significant differences in the recent catch histories for these stocks, which form the basis of these “data moderate” assessments and “data poor” calculations.

Other factors to consider include the different management approaches described in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (i.e., harvest specifications at the stock complex vs. individual stock levels), differences in the abilities of the three states to take independent action to conserve and manage nearshore stocks, and the effects of various alternatives for allocation of nearshore stocks among the states relative to conservation and economic return. The purpose of this report is provide information for background and management context, alternatives for nearshore harvest guidelines, and our recommendations.

Background – Washington Nearshore Management

The recreational and commercial nearshore rockfish fisheries developed in the late 1970s and early 1980s as charter boats and commercial hook-and-line fishers diversified their target strategies from salmon to bottomfish and Pacific halibut. Commercial fishers used surface hook-and-line and jig gear—most targeting black rockfish while one individual targeted yellowtail rockfish. Landings were recorded as “rockfish” on fish tickets, and species composition data were very sparse. Many recreational charter boats also fished commercially for rockfish when they were not taking passengers for hire.

WDFW began its black rockfish tagging program in the 1980s and survey catch-per-unit-of-effort (CPUE) began to decline in the early 1990s. With reports from commercial fishers also indicating that it was taking them longer to find black rockfish, WDFW suspected overfishing may be occurring. In 1992, WDFW imposed a trip limit of 100 pounds on black rockfish and reduced recreational rockfish bag limits from 15 to 12. In an effort to avoid localized depletion and conserve Washington’s nearshore rockfish resources to provide sustainable recreational fisheries in the future, WDFW closed its directed nearshore commercial fisheries in 1995 and further reduced its recreational rockfish bag limit to 10 in 1996.

In 1997, the Council became aware of commercial nearshore harvesters delivering live groundfish into the states of California and Oregon. The California Department of Fish and Wildlife (CDFW) reported that landings of commercial nearshore rockfish increased by 518% from 1997 to 1998, as a result of the live fish fishery, and the Oregon Department of Fish and Wildlife (ODFW) reported similar increases. The live fish fishery had not yet developed off Washington; therefore, as a proactive measure to avoid some of the problems we had heard about down south, WDFW prohibited landings of live groundfish beginning in 1999.

Minor Nearshore Rockfish Complex North of 40°10' N. latitude

The minor nearshore rockfish complex north of 40°10' N. latitude is comprised of the following rockfish stocks: black and yellow, blue, brown, calico, China, copper, gopher, grass, kelp, olive, quillback, and treefish.

Of these, the only stocks that have been assessed are blue rockfish south of 42° N. latitude, and China, copper, and brown rockfish in the recent coastwide data moderate assessments. Blue rockfish were assessed south of 42° N. latitude in 2007 and a component overfishing limit (OFL) was calculated for the portion of the stock estimated to be between 40°10' N. latitude and 42° N. latitude. Blue rockfish north of 42° N. latitude and all of the other minor nearshore rockfish stocks north of 40°10' N. latitude (except China, copper, and brown) have data poor calculations, which are based on catch history without indices of abundance; these calculations were done in 2011 in preparation for the 2013-2014 biennial management process and have not been updated.

Of these stocks, the only ones with significant catches recorded off Washington are: blue, China, copper, and quillback rockfish. There have been rare reports of brown rockfish and grass rockfish caught off Westport in the last decade, and no catches of the other minor nearshore rockfish stocks have ever been reported.

Data Moderate Assessments and Data Poor Calculations

As we noted in March, the use of data moderate assessments began in preparation for the 2015-2016 biennial management cycle. Prior to this cycle, Stock Assessment Teams (STATs) would either complete full assessments or update prior full assessments. Full assessments attempt to comprehensively investigate all available information on a stock. They involve a time-consuming process with the STAT Team reviewing fishery independent survey data (e.g., the Northwest Fisheries Science Center annual trawl survey) and working with the individual states to mine their respective data relative to surveys, catch history, CPUE, and biological data (e.g., ages, lengths). Stock Synthesis can incorporate parameters such as growth and maturity, composition of ages or sized in the population, the stock-recruitment relationship, and gear selectivity and is reviewed by a Stock Assessment Review (STAR) Panel. A STAR Panel will usually review only one full assessment as the discussion includes multiple model iterations and sensitivity runs. During an update, none of the parameters specified in the previous full assessment are changed, but the latest survey and/or catch data are included.

Data moderate assessments, on the other hand, do not incorporate the parameters listed above for Stock Synthesis, and use catch history and an index of abundance in the XDB-SRA model, which is also reviewed by a STAR Panel. However, in the case of these minor nearshore rockfish stocks, there are no fishery independent surveys, so fishery-dependent CPUE is typically used. As noted previously, WDFW's concerns with the data moderate assessment for China rockfish are rooted in the use of Oregon's recreational CPUE to the entire northern area without considering the significant differences between the Washington and Oregon recreational fisheries, including CPUE, bag limits, discard rates, lengths, and competition for resources from commercial fisheries. While there have been other situations when stock assessments produced unanticipated results, we do not believe that these data moderate assessments nearshore stocks do not reflect the reality off our coast. We hope this can be addressed through state-specific full assessments for minor nearshore rockfish in the next cycle.

Data poor calculations are estimates of harvestable fish based mainly on catch history without any indices of abundance using the DB-SRA model. While the Washington recreational fishery has remained relatively stable in terms of fishing regulations since around 2007, there is inter-annual variability in catches, particularly of minor nearshore rockfish, which are not targeted and, in many cases, discarded. Depending on which years are used to produce the estimate and the lack of routine updates to the data poor calculations, fisheries may have limits that are not responsive to changing conditions for several years.

Management Approaches Under the MSA

The Council's Scientific and Statistical Committee (SSC) has pointed out in the past that the it is a matter of policy associated with risk tolerance, to manage stocks at the complex level (i.e., to manage to one OFL for the entire complex comprised of multiple stocks), rather than at the stock-specific component OFL. However, as the National Marine Fisheries Service (NMFS) stated again in March, they expect the Council and the states to monitor catches at the stock-specific level and, if overfishing of a particular component stock occurs on a regular basis, NMFS would recommend that the Council remove that stock from the complex and manage it individually.

To aid the Council's deliberations on the SSC's and NMFS' guidance, WDFW is recommending a range of allocation alternatives for state-specific harvest guidelines for analysis that includes retaining management at the complex level as well as stock-specific harvest guidelines.

In general, WDFW is an advocate for the MSA and the National Standard Guidelines. We believe they are appropriately conservation-oriented and provides the flexibility to Councils, through fishery management plans, to make sound management decisions that take into account biological and socio-economic effects. However, while WDFW agrees with the conservation approach of stock-specific management as a matter of principle, we recognize the management challenge presented by the results, believe that there are likely important differences in the biology and management history of nearshore stocks among the states, and see that there are important scientific questions left unanswered by the data moderate assessments, as well as fundamental questions about the Council's jurisdiction over the nearshore stocks. For these reasons, WDFW joined the other two states in recommending the Council analyze and consider delegating the authority to manage nearshore stocks to the state fish and wildlife agencies.

Again, as was pointed out in March, the states of Washington, Oregon, and California have different viewpoints about the desirability of nearshore management delegation. The differences at this time, however, are more a matter of administrative feasibility and practicality. WDFW and ODFW have very streamlined rulemaking processes with their agency directors having respective authority to take emergency action. CDFW, on the other hand, does not have that management authority and, while CDFW can take action to keep harvest levels within a federal quota or harvest guideline, the agency could not take such action absent a federally established limit. In addition, CDFW has advised that it does not have the budgetary resources to take on management at this time. Therefore, for purposes of conservation, it is in the Council's and California's best interest to keep nearshore stocks south of 40°10' N. latitude managed through the Council process.

WDFW sees pros and cons associated with state management of nearshore stocks north of 40°10' N. latitude. We are confident that we have the tools needed to conduct state-specific fishery-independent surveys, monitor catches, take inseason action to keep harvest at appropriate levels, and coordinate our regulations with the other states for shared stocks, as needed. However, to the extent that nearshore rockfish are biologically connected across state boundaries, we are concerned about how we would coordinate the sharing of the harvest of those stocks with the other states to ensure stock-wide conservation is achieved.

Washington Harvest Guideline Alternatives

In March, WDFW identified two harvest guideline alternatives for minor nearshore rockfish north of 40°10' N. latitude for Council consideration that are not based on catch history—one approach uses the miles of coastline for each state north of 40°10' N. latitude and the other has a Washington-specific harvest guideline of 10 mt of minor nearshore rockfish applied at the complex level. We have also added an alternative that is based on catch history—one that accommodates Washington's highest catch amount of each component stock for the last ten years (2004-2013).

We describe all of the alternatives in more detail below and, as noted above, include sub-options for each alternative, as appropriate—one that allows for continued management at the complex level and the other for managing to stock-specific component limits. In all cases, we used the proposed ACLs for 2015 with a P* value of 0.45; these values can be adjusted as a result of Council decision-making and updated to reflect ACLs for 2016, as appropriate.

Alternative 1 – Length of Coastline

Using Geographic Information Systems software, we calculated the length of the three nautical mile state boundary, which is projected out from the official shoreline of each state, north of 40°10’ N. latitude (Table 1).

Washington’s coastline extends from the U.S./Canada border to 46°15’ N. latitude; Oregon’s coastline is from 46°15’ N. latitude to 42° N. latitude; and California’s coastline is from 42° N. latitude to 40°10’ N. latitude. In all cases, continuous north-south lines were drawn along the coast, excluding the bays and estuaries.

Table 1. Miles of coastline adjacent to Pacific Ocean waters for Washington, Oregon, and California north of 40°10’ N. latitude.

State	Miles	% Coast
Washington	166.14	24.78%
Oregon	330.93	49.64%
California	173.34	25.86%

Sub-option A – Apply the coastline percentages for each state to the entire minor nearshore rockfish north of 40°10’ N. latitude complex annual catch limit (ACL) to determine state-specific harvest guidelines; management would occur at the complex level (Table 2).

Table 2. State-specific harvest guidelines for minor nearshore rockfish complex north of 40°10’ N. latitude, based on miles of coastline applied to an ACL of 69 mt for 2015.

State	% Coast	HG (mt)
Washington	24.78%	17
Oregon	49.64%	34
California	25.86%	18

Sub-option B – Apply the coastline percentages for each state to each component stock caught in that state’s fisheries (Note: For stocks that are only caught in two states, divide the stock proportionally between those two states); sum to a total; the total would be a state-specific harvest guideline; management would occur at the complex level (Table 3).

Table 3. State-specific harvest guidelines for minor nearshore rockfish complex north of 40°10' N. latitude, applying coastline percentage to component ACLs for stocks caught in each state. (Note: Shaded cells represent "trace" amounts.)

Stock	ACL	WA	OR	CA
Black and yellow	0.0		0.0	0.0
Blue (CA)	17.0			17.0
Blue (OR & WA)	26.9	9.0	17.8	
Brown	1.7	0.4	0.8	0.4
Calico				
China	6.2	1.5	3.1	1.6
Copper	9.7	2.4	4.8	2.5
Gopher				
Grass	0.5	0.1	0.2	0.1
Kelp	0.0		0.0	0.0
Olive	0.3		0.2	0.1
Quillback	6.2	1.5	3.1	1.6
Treefish	0.2		0.1	0.1
Total HG (mt)	**69**	**15**	**30**	**23**

Sub-option C – Apply the coastline percentages for each state to each component stock caught in that state's fisheries; have state-specific harvest guidelines for each component stock; management would occur at the component stock level (Table 4).

Table 4. State- and stock-specific harvest guidelines for minor nearshore rockfish complex north of 40°10' N. latitude, applying coastline percentage to component ACLs for stocks caught in each state. (Note: Shaded cells represent "trace" amounts.)

Stock	ACL	Harvest Guidelines (mt)		
		WA	OR	CA
Black and yellow	0.0		**0.0**	**0.0**
Blue (CA)	17.0			**17.0**
Blue (OR & WA)	26.9	**9.0**	**17.8**	
Brown	1.7	**0.4**	**0.8**	**0.4**
Calico				
China	6.2	**1.5**	**3.1**	**1.6**
Copper	9.7	**2.4**	**4.8**	**2.5**
Gopher				
Grass	0.5	**0.1**	**0.2**	**0.1**
Kelp	0.0		**0.0**	**0.0**
Olive	0.3		**0.2**	**0.1**
Quillback	6.2	**1.5**	**3.1**	**1.6**
Treefish	0.2		**0.1**	**0.1**

For Alternatives 2 and 3, the remaining complex ACL could apply to Oregon and California jointly (i.e., from 40°10' N. latitude to 46°15'N. latitude), or they may choose to have state-specific harvest guidelines either at the complex or component stock level.

Alternative 2 – 10 mt Harvest Guideline for Washington

In March, WDFW arbitrarily selected 10 mt as an alternative for a harvest guideline of minor nearshore rockfish north of 40°10' N. latitude as a complex ACL for Washington; management would occur at the complex level.

Alternative 3 – Harvest Guideline for Washington (Ten-Year Highest Catch)

Sub-option A **–** Identify the highest catch amounts for each component stock caught in Washington's fisheries for the last ten years (2004-2013) and sum to a total; the total would be a Washington harvest guideline; management would occur at the complex level (Table 5).

We note that in our Ocean Sampling Program there is a category for "unspecified" or "general" rockfish caught in our recreational fishery with varying amounts each year; to the extent that some of these minor nearshore rockfish species are in this general category, we have included it as a component in Table 5.

Table 5. Washington's highest recreational catches of identified minor nearshore rockfish and unspecified rockfish, 2004-2013.

Stock	ACL	WA Catch
Blue (OR & WA)	26.9	2.9
China	6.2	3.3
Copper	9.7	2.2
Quillback	6.2	2.8
Unspecified NS		0.8
Total Harvest Guideline (mt)		**12**

Sub-option B **–** Set harvest guidelines for each component stock caught in Washington's fisheries at amounts equal to the highest catch for the last ten years (2004-2013); management would occur at the component stock level (Table 6). For the "unspecified" nearshore rockfish, we used the catch composition percentages to distribute catch from that general category among the component stocks listed.

Table 6. Washington's highest catches of minor nearshore rockfish component stocks for the last ten years (2004-2013), including a distribution of "unspecified" nearshore rockfish based on catch composition data.

Stock	ACL	WA HGs (mt)
Blue (OR & WA)	26.9	**3.2**
China	6.2	**3.6**
Copper	9.7	**2.3**
Quillback	6.2	**3.0**

Discussion of Alternatives

For the most part, Alternatives 1 and 3 would accommodate recent catches of minor nearshore rockfish in Washington, especially when applied at the complex level, providing flexibility for minor inter-annual variability in harvest. However, we do not think it would be appropriate to use Alternative 1, Sub-option A, as it would include a portion of the blue rockfish stock from south of 42° N. latitude. Component stock harvest guidelines would also work provided they were set at high enough levels; however, this may be difficult to do with the substantial reduction in minor nearshore rockfish ACLs in 2015 and 2016, compared to 2014 and previous years.

Alternative 2, which is a complex harvest guideline of 10 mt, would not accommodate the highest catches of these component stocks in the most recent five years (2009-2013) or the last ten years (2004-2013). While the complex approach described in Alternative 2 would provide some flexibility, we note that when one of these component stocks has higher than average catches, other component stocks tend to have a similar trend. So, a harvest guideline of 10 mt could arbitrarily impose a constraining limit in years of higher nearshore rockfish abundance.

As mentioned previously, minor nearshore rockfish stocks are not targeted and anglers cannot avoid them when targeting other healthy stocks, such as black rockfish, lingcod, and Pacific halibut. Minor nearshore rockfish stocks are caught in all recreational target strategies, or trip types (Table 7), and from the port sampling data it is difficult to determine which catches are truly incidental to a particular target strategy.

Table 7. Percentage of minor nearshore rockfish catches by target strategy in Washington recreational fisheries, 2009-2013.

Stock	Recreational Target Strategy		
	Halibut	Bottomfish	Salmon
Blue	7%	69%	25%
China	8%	64%	28%
Copper	11%	58%	31%
Quillback	19%	58%	22%

In reviewing the geographic distribution of Washington's minor nearshore rockfish catches by recreational marine catch area, the vast majority (88%) of catch occurs in the north coast (Areas 3 and 4). This is to be expected as the bottom habitat in this area is hard substrate and high rocky relief, where these species tend to congregate. There are some minor nearshore rockfish caught in the northern portion of Area 2 around Cape Elizabeth, but little to no catches in the areas off Grays Harbor and further south where the bottom habitat is a mixture of sand and mud.

However, to avoid overfished canary and yelloweye rockfish, north coast recreational anglers have been prohibited from retaining bottomfish seaward of 20 fathoms since 2005; as a result, more fishing pressure has been placed on nearshore rockfish stocks. If management is applied at the component stock level and harvest limits are set severely low (e.g., at 1-2 mt), then minor nearshore rockfish would be more constraining than canary or yelloweye rockfish.

Applying non-retention measures for minor nearshore rockfish stocks inseason would be an option; however, we would then lose our only opportunity to collect biological samples for these stocks for a future full assessment.

While the recent development and usage of descending devices would help increase survivability of released nearshore rockfish, harvest limits may be set so low that reduced seasons or bag limits may need to be considered. Such drastic measures would be detrimental to Washington's recreational fisheries and the coastal communities whose businesses depend upon them.

Finally, the outreach and communication that is key to persuading anglers to use descending devices is also hampered by the determination that these minor nearshore rockfish stocks are deemed to be "healthy" (i.e., at a depletion of B40% or higher). Trying to explain to stakeholders the rationale for reducing catch to 25% of the average catch level, in the context of the stock being "healthy," is particularly challenging. While anglers are more than willing to "do the right thing" to rebuild stocks that are overfished, it is viewed as a temporary measure. With the determination that these stocks are at B40%, the reduced catch level is the maximum amount that anglers would be available to harvest in the future. Again, this does not seem reasonable given the proactive measures that Washington has already taken to limit harvest of nearshore stocks.

Adding to these already difficult conversations is the underlying tension associated with basing these data moderate assessments on catch history. Washington recreational stakeholders believe that, as a result of these assessments, they may be unfairly paying the price for WDFW's management actions to close commercial fisheries while other areas may be "rewarded" for harvesting more fish.

Recommendation

We think that data moderate assessments may be applicable for areas, such as the slope, which are managed under regulations that apply to a broader area; however, their use in informing management decisions for the nearshore rockfish fishery that has vastly different regulations among the states may be limited.

In general, we believe that there are likely more discrete subpopulations of nearshore rockfish stocks distributed along the West Coast than the data can demonstrate. However, we also believe that these data moderate assessments for minor nearshore rockfish do not accurately reflect their status off Washington as the estimates of biomass are likely more reflective of fishing regulations, rather than abundance.

We understand the process and timing constraints associated with finalizing the harvest specifications and management measures to facilitate a January 1, 2015, implementation date. Therefore, for the purposes of moving forward with the 2015-2016 management process, WDFW recommends Alternative 1, Sub-option B, to set a Washington harvest guideline of 15 mt for the minor nearshore rockfish complex north of 40°10’ N. latitude for 2015 and 2016, as a short-term measure until we can complete full assessments for these stocks. We believe that keeping management at the complex level for minor nearshore rockfish off Washington for a few years represents relatively low risk from a conservation perspective.

Given where are in the process and the options available, WDFW believes that Alternative 1, Sub-option B represents a “fair and equitable” sharing of minor nearshore rockfish; however, if NMFS’ guidance is to manage at the component stock level, then WDFW would recommend component stock limits consistent with Alternative 3, Sub-option B, as described in Table 6. As mentioned previously, we have begun a nearshore hook-and-line survey this year, which we hope will provide data for full assessments for minor nearshore rockfish off Washington in the future.

Buck & Ann Fisheries, LLC
POB 579
Ilwaco, Wa. 98624

March 10, 2014

Ms. Dorothy Lowman, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Ste. 101
Portland, Or 97220

RE: Agenda Item H-7

Dear Chair Lowman and Council Members:

Our company, Buck & Ann Fisheries, owns 2 vessels on the west coast that participate in the West Coast IFQ fishery with fixed gear. We have been fishing sablefish in the north and the south since 2011 when the program was initiated. We have been fishing with pots.

While fishing has been good and remains that way north of 36 degrees north, we are getting concerned about the waters south of 36 degrees. Catch rates have declined dramatically since 2011.

We have attached the Shorebased IFQ Sector Balance pages from NOAA's IFQ website for the years that the program has been running.

In 2011, the TAC was 1.17M. Fishing was great and the fleet harvested over a million pounds of southern sablefish that amounted to 86% of the TAC for that area.

In 2012, the TAC dropped slightly by 35k lbs. The fleet still only caught 500K, or 44% of the TAC. A lot of people have felt the reason for the low catch was economical as this was the year that the price took a big hit. Where there may be a little truth in this, the people I know down there were all still fishing hard to try and make up for the decline in price by catching volume. The fishing was very scratchy and we ventured into more grounds in search of more fish. We fished from the 36 degree line down to Los Angeles and from 200 to 800 fathoms deep. There was just a sharp decline in volume from 2011.

In 2013, the TAC rose sharply to 1.3M. Fishing had declined farther and the fleet was only able to harvest 200K or 15% of the TAC. No matter where we went, we just could not find any volume of fish. The general feeling in Morro Bay was "What's going to happen next year"? Also of note is that the price had rebounded quite a bit over the year before and had developed a renewed interest in sablefish.

In 2014, the TAC rose again to over 1.4M.

We are getting very concerned that the TAC of southern sablefish at these levels is not sustainable.

We understand that the next possible stock assessment for sablefish could be in 2015 and would affect management in 2017. Will this possibly be too late?

We have asked for trawl survey data for the southern sable area from 2009 until now. We don't have it in time for this letter, but hope to have it before the April Council meeting; however, talking to one of the survey boats captain, the indication is that the southern sablefish stocks are in decline.

At this time, we just want to give the Council a report from the boots on the ground. We ask that you take a look at all the available data and be conservative in your approach to setting the TAC's in the future until you can get a full stock assessment on the southern sablefish area.

Thank you,

John Corbin
Member/Manager
Buck & Ann Fisheries, LLC
503-791-2135
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Generated from NOAA West Coast Groundfish IFQ Application on 02/27/2014 11:15 AM

Quota Year	IFQ Species	Sector Quota Pounds	Catch to Date	Quota Pounds Remaining
2011	Arrowtooth flounder	27,406,105	5,576,000	21,830,105
2011	Bocaccio rockfish South of 40Ã‚Â°10' N.	132,277	11,715	120,562
2011	Canary rockfish	57,100	8,125	48,975
2011	Chilipepper rockfish South of 40Ã‚Â°10' N.	3,252,370	688,187	2,564,183
2011	Cowcod South of 40Ã‚Â°10' N.	3,968	39	3,929
2011	Darkblotched rockfish	552,997	200,264	352,733
2011	Dover sole	49,018,682	17,269,411	31,749,271
2011	English sole	41,166,808	302,936	40,863,872
2011	Lingcod	4,107,873	639,244	3,468,629
2011	Longspine thornyheads North of 34Ã‚Â°27' N	4,334,839	2,119,804	2,215,035
2011	Minor shelf rockfish North of 40Ã‚Â°10' N.	1,150,813	34,225	1,116,588
2011	Minor shelf rockfish South of 40Ã‚Â°10' N.	189,598	6,633	182,965
2011	Minor slope rockfish North of 40Ã‚Â°10' N.	1,828,779	319,938	1,508,841
2011	Minor slope rockfish South of 40Ã‚Â°10' N.	831,958	113,337	718,621
2011	Other flatfish	9,253,683	1,527,767	7,725,916
2011	Pacific cod	2,502,247	556,691	1,945,556
2011	Pacific halibut (IBQ) North of 40Ã‚Â°10' N.	257,524	70,839	186,685
2011	Pacific ocean perch North of 40Ã‚Â°10' N.	263,148	101,433	161,715
2011	Pacific whiting	204,628,442	201,030,361	3,598,081
2011	Petrale sole	1,920,226	1,789,627	130,599
2011	Sablefish North of 36Ã‚Â° N.	5,613,719	5,287,802 94%	325,917
2011	Sablefish South of 36Ã‚Â° N.	1,170,390	1,009,286 86%	161,104
2011	Shortspine thornyheads North of 34Ã‚Â°27' I	3,156,138	1,574,518	1,581,620
2011	Shortspine thornyheads South of 34Ã‚Â°27' I	110,231	18,653	91,578
2011	Splitnose rockfish South of 40Ã‚Â°10' N.	3,045,245	88,523	2,956,722
2011	Starry flounder	1,471,586	25,936	1,445,650
2011	Widow rockfish	755,348	303,703	451,645
2011	Yelloweye rockfish	1,323	128	1,195
2011	Yellowtail rockfish North of 40Ã‚Â°10' N.	6,821,455	1,629,184	5,192,271

Generated from NOAA West Coast Groundfish IFQ Application on 02/27/2014 11:13 AM

Quota Year	IFQ Species	Sector Quota Pounds	Catch to Date		Quota Pounds Remaining
2012	Arrowtooth flounder	20,861,131	5,497,232		15,363,899
2012	Bocaccio rockfish South of 40Ã,Â°10' N.	132,277	19,461		112,816
2012	Canary rockfish	57,761	15,942		41,819
2012	Chilipepper rockfish South of 40Ã,Â°10' N.	2,934,904	642,329		2,292,575
2012	Cowcod South of 40Ã,Â°10' N.	3,968	204		3,764
2012	Darkblotched rockfish	548,808	197,918		350,890
2012	Dover sole	49,018,682	16,063,162		32,955,520
2012	English sole	21,037,611	324,291		20,713,320
2012	Lingcod	3,991,800	839,509		3,152,291
2012	Longspine thornyheads North of 34Ã,Â°27' N	4,219,648	2,010,604		2,209,044
2012	Minor shelf rockfish North of 40Ã,Â°10' N.	1,150,813	88,221		1,062,592
2012	Minor shelf rockfish South of 40Ã,Â°10' N.	189,598	28,522		161,076
2012	Minor slope rockfish North of 40Ã,Â°10' N.	1,828,779	486,088		1,342,691
2012	Minor slope rockfish South of 40Ã,Â°10' N.	831,958	271,674		560,284
2012	Other flatfish	9,253,683	1,514,202		7,739,481
2012	Pacific cod	2,502,247	873,698		1,628,549
2012	Pacific halibut (IBQ) North of 40Ã,Â°10' N.	232,856	100,647		132,209
2012	Pacific ocean perch North of 40Ã,Â°10' N.	263,441	118,146		145,295
2012	Pacific whiting	151,373,798	144,759,024		6,614,774
2012	Petrale sole	2,324,995	2,332,199		-7,204
2012	Sablefish North of 36Ã,Â° N.	5,438,797	4,928,150	91%	510,647
2012	Sablefish South of 36Ã,Â° N.	1,133,352	503,511	44%	629,841
2012	Shortspine thornyheads North of 34Ã,Â°27' I	3,120,533	1,571,037		1,549,496
2012	Shortspine thornyheads South of 34Ã,Â°27' I	110,231	803		109,428
2012	Splitnose rockfish South of 40Ã,Â°10' N.	3,206,513	130,462		3,076,051
2012	Starry flounder	1,480,404	18,404		1,462,000
2012	Widow rockfish	755,352	340,220		415,132
2012	Yelloweye rockfish	1,323	76		1,247
2012	Yellowtail rockfish North of 40Ã,Â°10' N.	6,850,556	2,194,139		4,656,417

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Quota Year	IFQ Species	Sector Quota Pounds	Catch to Date		Quota Pounds Remaining
2013	Arrowtooth flounder	8,479,264	5,365,841		3,113,423
2013	Bocaccio rockfish South of 40Ã‚Â°10' N.	165,126	28,332		136,794
2013	Canary rockfish	87,964	22,526		65,438
2013	Chilipepper rockfish South of 40Ã‚Â°10' N.	2,423,983	870,774		1,553,209
2013	Cowcod South of 40Ã‚Â°10' N.	2,205	486		1,719
2013	Darkblotched rockfish	587,976	256,485		331,491
2013	Dover sole	49,018,682	17,583,083		31,435,599
2013	English sole	14,032,486	486,273		13,546,213
2013	Lingcod North of 40Ã‚Â°10' N.	2,695,305	749,955		1,945,350
2013	Lingcod South of 40Ã‚Â°10' N.	1,089,993	36,814		1,053,179
2013	Longspine thornyheads North of 34Ã‚Â°27' N	4,100,267	2,400,808		1,699,459
2013	Minor shelf rockfish North of 40Ã‚Â°10' N.	1,119,948	65,686		1,054,262
2013	Minor shelf rockfish South of 40Ã‚Â°10' N.	178,574	44,443		134,131
2013	Minor slope rockfish North of 40Ã‚Â°10' N.	1,712,835	431,244		1,281,591
2013	Minor slope rockfish South of 40Ã‚Â°10' N.	829,181	258,778		570,403
2013	Other flatfish	9,236,501	1,767,468		7,469,033
2013	Pacific cod	2,480,830	339,657		2,141,173
2013	Pacific halibut (IBQ) North of 40Ã‚Â°10' N.	236,660	72,707		163,953
2013	Pacific ocean perch North of 40Ã‚Â°10' N.	241,241	108,062		133,179
2013	Pacific whiting	216,707,790	215,218,207		1,489,583
2013	Petrale sole	5,110,315	4,695,933		414,382
2013	Sablefish North of 36Ã‚Â° N.	4,030,050	4,080,318	101%	-50,268
2013	Sablefish South of 36Ã‚Â° N.	1,327,800	200,064	15%	1,127,736
2013	Shortspine thornyheads North of 34Ã‚Â°27' I	3,054,183	1,825,663		1,228,520
2013	Shortspine thornyheads South of 34Ã‚Â°27' I	110,231	8,150		102,081
2013	Splitnose rockfish South of 40Ã‚Â°10' N.	3,346,838	101,757		3,245,081
2013	Starry flounder	1,656,774	7,705		1,649,069
2013	Widow rockfish	2,191,016	907,513		1,283,503
2013	Yelloweye rockfish	2,205	139		2,066
2013	Yellowtail rockfish North of 40Ã‚Â°10' N.	5,809,905	1,585,755		4,224,150

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Quota Year	IFQ Species	Sector Quota Pounds	Catch to Date	Quota Pounds Remaining
2014	Arrowtooth flounder	7,643,603	716,748	6,926,855
2014	Bocaccio rockfish South of 40Ã,Â°10' N	174,165	959	173,206
2014	Canary rockfish	90,610	258	90,352
2014	Chilipepper rockfish South of 40Ã,Â°1(	2,352,883	92,883	2,260,000
2014	Cowcod South of 40Ã,Â°10' N.	2,205	40	2,165
2014	Darkblotched rockfish	613,789	26,302	587,487
2014	Dover sole	49,018,682	2,545,025	46,473,657
2014	English sole	11,586,593	23,614	11,562,979
2014	Lingcod North of 40Ã,Â°10' N.	2,539,020	69,555	2,469,465
2014	Lingcod South of 40Ã,Â°10' N.	1,042,522	1,536	1,040,986
2014	Longspine thornyheads North of 34Ã,/	3,993,453	592,422	3,401,031
2014	Minor shelf rockfish North of 40Ã,Â°1(	1,119,948	2,764	1,117,184
2014	Minor shelf rockfish South of 40Ã,Â°1(	178,574	699	177,875
2014	Minor slope rockfish North of 40Ã,Â°1	1,712,837	51,862	1,660,975
2014	Minor slope rockfish South of 40Ã,Â°1	834,736	28,376	806,360
2014	Other flatfish	9,236,509	146,239	9,090,270
2014	Pacific cod	2,480,840	1,175	2,479,665
2014	Pacific halibut (IBQ) North of 40Ã,Â°1(	107,805	11,107	96,698
2014	Pacific ocean perch North of 40Ã,Â°10	247,535	11,813	235,722
2014	Pacific whiting	28,947,797	34,870	28,912,927
2014	Petrale sole	5,242,593	1,167,153	4,075,440
2014	Sablefish North of 36Ã,Â° N.	4,382,790	414,233	3,968,557
2014	Sablefish South of 36Ã,Â° N.	1,439,839	15,530	1,424,309
2014	Shortspine thornyheads North of 34Ã,	3,022,802	279,867	2,742,935
2014	Shortspine thornyheads South of 34Ã,	110,231	1,440	108,791
2014	Splitnose rockfish South of 40Ã,Â°10' I	3,472,501	20,997	3,451,504
2014	Starry flounder	1,665,592	32	1,665,560
2014	Widow rockfish	2,191,020	22,131	2,168,889
2014	Yelloweye rockfish	2,205	7	2,198
2014	Yellowtail rockfish North of 40Ã,Â°10'	5,817,668	40,186	5,777,482

Council Members:

Please give favorable consideration to authorizing a 12-month lingcod commercial fishery for small day boat fishers.

I fish nearshore black/blue rockfish and lingcod. My buyers are small restaurants that sell and serve fresh-caught seafood to the public. Allowing year-round harvest of lingcod will not result in and overharvest of the species, will allow small boats to make additional profits, and produce and economic benefit to small businesses that service the tourism industry, particularly during the offseason months. Due to ocean conditions during the winter months, allowing small boats to harvest lingcod year-round will not negatively affect the sustainability of the lingcod population.

Thank you for your consideration.

Terry Obteshka
Skipper, FV STALKER
OR 758 WG
Newport, Oregon
541-961-4553

To: Pacific Fishery Management Council
From: Gene Fowler, Claudia Fowler and Mike Fowler; we have been commercial near shore fishermen in Port Orford, Bandon, Charleston and Gold Beach for the last ten years.

This is a response to the hearing that PFMC is proposing to dramatically reduce harvest levels of Kelp Greenling and China rockfish.

We have thought for many years those population assessments for Kelp Greenling have been ridiculously low and have felt that, through our communication with ODFW; we would be seeing a sizeable increase in this quota, by next year. When we start out a two- month period of fishing, we fish to catch other species that are easier to catch and that the quotas are higher on. We catch Kelp Greenling everywhere we go- deep, shallow and in between. If weather, water conditions and or bite keep us from catching our quota of Sea Trout during most of the quota period, we can go out and catch the quota of 300 pounds, easily, in one or two days. We have talked to our local ODFW representative for years about raising the harvest level for Kelp Greenling. They have agreed that the assessment was definitely not reflecting the populations. The three of us scuba dive this area and Sea Trout are seen everywhere. Where we fish, predominately in Port Orford, is far and away the heaviest near shore fishing pressure in the state. We have a high catch rate of Sea Trout and according to Federal Observers that accompany us on our boats, the highest catch of China Rockfish of anywhere. This is not because they caught all the fish in these other places; it is because they don't have as much habitat. The commercial fishermen don't fish there in the numbers that they do here in Port Orford because they don't have the fish populations because of less habitat. Commercial fishermen that don't catch the quotas of near shore fish, in our area, are either fishing other fisheries or not fishing.

Sport fishermen don't keep Sea Trout as one of their seven fish unless they cannot catch something like Black Rockfish that have far larger fillets. The same situation goes for China Rock fish; you need to catch one that is 4+ pounds to have a good sized fillet. Another thing is that Sea Trout don't show on your fish finder as a school of Black and Blue rockfish do. Not saying that sport fishers are not capable of catching Sea Trout, but they are less likely to catch them and keep them unless they are fishing from a jetty or rocky shoreline. Maybe you should reduce how many fish jetty fishermen can keep. The ocean is a big place, it is full of fish, and we are already restricted from fishing most of it.

Reducing the harvest levels of Sea Trout and China Rockfish will be financially damaging to a fishery that is already taking hits from reductions in closed areas to fish. We have limitations from conservation areas and marine reserves, along with species harvest levels being reduced.

This proposed reduction of Sea Trout and China Rockfish with poor or no data is not the way to manage our fishery. We are limited in our ability to catch fish by ocean conditions and management of fisheries. Each species of fish has its own biological plan of where it goes, when it eats, when and where they have their young. All these things affect our ability of where and when we can expect to catch a fish, and sometimes there are so many fish our lure can not reach the bottom without ricocheting off fish that don't want to bite. Possibly, the next day our fish finder doesn't see a fish and if that is the day you choose make your assessment of stock, you get bad information. Assessments of fishing stock can not be expected to be accurate based on going fishing on a specific date, for a specific species, in a specific location.

If you reduce Sea Trout quotas, we will be catching and releasing 50-100 a day. Weather and ocean conditions permitting, we could catch the quota in one or two days of the quota period. In this same scenario, on days they are biting, we would be releasing 20 to 50 China Rock. Large amounts of China Rockfish live predominately in water deeper and we usually can not keep them alive for live markets, so we do not normally target them in waters deeper than 20 fathoms.

Please do not reduce or ruin our livelihood based on non-existent or poor data.

Commercial F/V's Sea Hunt, C/Dawn, Providence III
Gene Fowler
Claudia Fowler

Mike Fowler

Dear sirs,I have been working in the live fish industry for about 11-12 years,as a fisherman ,buyer,hoist operator,etc.So I have seen alot of data being recorded by ODFW over the years.And it is very confusing as to why we as tax payers are having all this done at our expense and then when it comes time to assess this 'data' we overlook all this hard work done and just ask the sport fishermen[who dont target greenling anyway]and base our harvest numbers on their opinions.   Scott Spencer.

Hi my name is a Joel matthew purkey I am a commercial fisherman that fishes out of a small port called port orford I fish for nearshore fish and make a liveing at it my concerns are that the assessment methods to determine stock abundance are not good data I have personally been fishing for nearshore fish for close to 20 years I have been involved in juvenile rockfish studys and seen with my own observation that there is an abundance of greenling and china rockfish in the ocean through my own observation of the stocks I have been fishing for 20 years I am concerned that if the board reduces catch allotment of nearshore fish mainly greenling and china rockfish that it will put allot of people out of buisness that rely on those fish to make a liveing and support there family and community the economic impact would be great in my community of Port orford it would put alot of families out of buisness and not to mention that there is alot of people including myself who have invested alot of money buying the permits and boats and gear to stay in a fisherie that may be shut down do to bad data I plead with the board to really take a look at how your data is being acquired and base it on fish tickets fisherman's observation and observer data not just data poor so shut us down because there is no data I plead with you and the board please dont take my lively hood away sincerely Joel Matthew Purkey owner operator of fishing vessel Desertstorm Port Orford Oregon

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From: **oregonwrestlers** <oregonwrestlers@yahoo.com>
Date: Fri, Mar 14, 2014 at 12:24 PM
Subject: Live fish concerns
To: pfmc.comments@noaa.gov

I recently purchased 2 live fish boats in port orford oregon. I am hereing rumors of a meeting concerning china cod and greenling quoatas. I have concerns if the rumors are true it would make it near impossible for me to continue to make a living. I have one employee whom is a father of two young children. I would like you to consider whom may be affected by any such decisions. And ask yourselfs what information you are using to base your decision. As fisherman we have made many strides to ensure our sustainable future with projects like red fish rocks reserve. I am asking that you please look at both sides of the coin before making a decision.

Thank you
Gary Jantzer
541 441 2534

From: **Craig W** <ccwwood55@gmail.com>
Date: Fri, Mar 14, 2014 at 1:53 PM
Subject: Oregon Nearshore Fishery
To: pfmc.comments@noaa.gov

Concerning the proposal in the reduction of the Oregon Kelp Greenling landing cap.
I feel that the data that has been provided to you is poor and very inaccurate. Data from the Oregon Nearshore mandatory log books and the data from the mandatory Noaa observer program and also data from ODFG research need to be included. Oregon Kelp Greenling is found in all kinds of bottom structure and depths in Oregon. Also they reproduce at a young age even before reaching legal twelve inch size limit.
I feel there is no need to cut the landing cap, the Kelp Greenling stocks are healthy and thriving and if anything the cap should be increased.
Also any reduction would financially hurt all nearshore fishermen. It is one of the higher priced fish provided to the live market.

Assessments for all nearshore species need to be based on actual data.
As an Oregon nearshore fisherman we must provide daily log book information, take Federal Noaa observers, also dockside sampling is done byODFW for size and age structure. Please use all data that is available not just sport fishermen dockside interviews.

As a life long fisherman I feel that the Oregon nearshore stocks are healthy.

Thanks,
Craig Will
Oregon Nearshore Fisherman

From: **jon wieder** <jswieder@charter.net>
Date: Fri, Mar 14, 2014 at 4:21 PM
Subject: rock greenling quota reduction
To: pfmc.comments@noaa.gov

To Whom it May Concern,

I am a near shore ground fish commercial fisherman operating out of Gold Beach, OR and fishing off the Rogue River Reef fishing grounds. I have recently become aware of the new rules to be enacted (or under consideration) that will further limit and reduce substantially our annual quota for some species of fish that we catch. I do not know the hard numbers under consideration, but I understand the Rock Greenling (sea trout) will have substantially reduced numbers for harvesting.

I object to this reduction of catch. This fish is an important asset to our lively hood and not only will the fewer fish mean less income, but we can assume that this will depress the value of our permit.

This reduction is a sudden decision on NOAA's part and to my knowledge not very public. If there were meetings and discourse, we fisherman were not notified. I think our voices should be heard.

Respectfully,

Jonathan Wieder
FV OR344ADE
Black/Blue rockfish w/ nearshore endorsement Permit #59040

From: **Sean** <fvaimlesswanderer@gmail.com>
Date: Fri, Mar 14, 2014 at 9:45 PM
Subject: Nearshore rockfish quotas
To: pfmc.comments@noaa.gov

Hello my name is Sean Roberts owner operator of the f/v Irish sea I am concerned about the current prospect of loseing kelp greenling and China rockfish quota for several reasons first the species is extremely abundant 2 month quotas are regularly caught in. One 6 hour day trip and second this could devistate the fishery fisherman and communitys and third by decreasing quota on a very obviously abundant species it will increase pressure dramatically on other fisheries and species I believe that there is a problem with these assessments and that can be proven by state logbook information and I believe that this should be addressed before huge quota cuts ruin peoples lives and communitys thank you Sean Roberts 541-661-9913. Ps ling cod are also very healthy in population and should be opened quota all year roundbefore they eat all the kelp greenling

From: **Mark** <info@5starcharters.com>
Date: Sun, Mar 16, 2014 at 10:32 AM
Subject: agenda items C-4/C-9
To: pfmc.comments@noaa.gov

Pacific Fisheries
Attn: Dorothy Lowman

We are a family of seven, ages 2yrs to 62yrs. that own and operate two boats that charter and commercial fish for near shore rock fish – Blacks & Blues and Lingcod. We fish eight months of the year and have depended on that for our livelihood for over twelve years. So we know of what we speak and ask your reception of this letter with all due respect.

It has come to our attention that the Council is considering reducing the allowable catch of Chine rock fish and Kelp Greenling to levels that will severely impact negatively the near shore commercial fishers as well as the sport and charter fishing groups.
The data and science that is being used is highly inaccurate and no stock assessments and surveys have been done that are consistent with past procedures. Using charter boat catch effort and success for China rock fish abundance is in no way an indicative measure. Those fish are not even fished for by charter boats. Due to their smaller size that does not make for nice fillets and their random location and not schooling like Black rock fish. Plus they are not fishable with light tackle are just some of the reasons that China rock fish are only an occasional by catch and with current tools and informational education most are released by fishermen so they can keep fishing for a more desirable fish and not retained to be brought in to be counted in creel surveys.

The very same situation also applies to Kelp Greenling. In summery neither one of these fish are targeted and fished for with tackle and gear that catches them in any numbers. They are not desirable fish for the charter boat fisherman or private sport fleet and not often caught much less brought in. Their value is in the near shore live fish commercial fishery which is highly regulated both in participants and catch quotas. To reduce to lower level of these two fishes the negative impacts will be huge. They will make it no economically feasible for the commercial fishers in the live fish fishery to be able to operate and catch the varieties of fish the market needs to be viable. It will reduce the value of investments, permits, boats and equipment by fishers and businesses to the point of putting them out of business. Many of these have recently sold and transferred with the current regulations in place and to change now so unexpectedly would be a huge hit to the new business both personal and corporate. This in turn will severely hurt the small coastal communities that rely heavily on this economic income. In several of these this fishery is the main source of income and employs the highest number of people. The charter sport and recreational fishery would also be impacted as with reduces bag limits, seasons, etc. People would do other things than bottom fish.

In summery this action is not justified for lots of reasons. Poor data, no real surveys, highly inaccurate based on catch effort that does not fish for these fish and or keep them when caught. There would be a very high negative economic impact to one man/family operations that have spent lots of time and dollars to buy boats, permits, etc. to participate in a fishery available to them in a tough economic area.

We ask you to no go through with these changes until such time a proper process has been in place to accurately determine the status of the fish. To use them with the information being considered is bad management.

From: **Ryan Sherman** <shermanem18@gmail.com>
Date: Sun, Mar 16, 2014 at 10:02 PM
Subject: PFMC Topics for thought
To: pfmc.comments@noaa.gov

I have attached a little thoughtful paper I have written regarding the way that you have attempted to take data from catch records and extrapolate any scientific data from it. Without taking into account the weather, the amount of permits fished in one area, the ability of fishermen to catch specific species with hook and line etc.
Thank you for your time,
Ryan Sherman

To Whom it may concern,

My name is Ryan Sherman and I have been fishing in Oregon for the past twenty five years and I am 32 years old. I would like to tell you about my experiences in those years of fishing. When I was twelve years old my father and I would fish commercially for the nearshore species of rockfish mainly black rockfish. We would catch them by hook and line only. At that point in time there were only fifteen to twenty boats fishing out of our Port for the nearshore species. Without a cap on how many fish we could catch it wasn't inconceivable for us to catch 2000 lbs of rockfish a day. We would sometimes go out to deeper water and catch the china rockfish because they were worth more or the yelloweye rockfish because we knew where they all liked to be.

Then the 20 fathom line restriction was put into place. This served many purposes that weren't expected by the fishery program. The intent as I have been informed was to prevent the accidental retention or by-catch of the yelloweye rockfish. It actually allowed the fish in a lot of our favorite fresh fishing areas to not be at risk of being caught saving a large population of fish from exposure to fisherman. The other thing it did was force the fisherman into a different type of fishing. We as commercial businesses were forced to explore different types and more refined fishing techniques as a result. We dabbled in long lining off shore before we were forced to start long lining more often as the quota system has gotten tighter and tighter. If the nearshore fishing quotas get dropped from the low quota that the commercial fleet is allowed now the fisherman won't be able to afford to run their boats causing many fisherman and businesses to cease to exist.

As for data collection from sport and commercial harvest information. You must realize that fisherman won't go and try to catch whatever bites and throw back the other fish they can't keep. We as commercial fisherman have found that certain species of fish are more prevalent in certain areas than others. We have also found that color patterns of lures make a difference on what certain species of fish will bite. For example, Sea trout aka greenling are more prevalent on rocky bottoms than sandy bottoms it isn't to say that some greenling don't live in sandy areas but the kelp they live in and around supports them with food as well as camouflage. We also understand that greenling aren't veracious predators like a ling cod so they will be more likely to bite something that is smaller and looks like a wounded fish or a glob of eggs which they predate on when eggs are available. Another misconception is the amount of china rock fish caught isn't showing the amount of fish that are out in the ocean. It is very difficult to keep deeper water fish with swim bladders alive for the market than shallower fish. China rockfish are one of these species of fish if you are to fish for just china rockfish you should be fishing in 16 fathoms or deeper in a rocky or heavy coral area. We as fisherman have a hard time keeping these fish alive turning their value from $6.75lb to $1.00lb I am not sure about you but that doesn't seem like something I would want to do just to make a buck.

I feel that if I had an infinite quota allowed for one day I could get you the same thing I did 25 years ago 1500 to 2000lbs of fresh rockfish. I also feel that if anything some species were helped by the closer of the 20 to 100 fathom curve sections of the ocean because the fish in those areas spilled over into the lesser fished areas. In closing I ask you to get real scientific data with backing before you destroy our lives forever. These little towns on the coast can't take another blow we are barely surviving now.

From: **Aaron Longton** <aaron@oceanresourceteam.org>
Date: Mon, Mar 17, 2014 at 12:37 PM
Subject: Testimony concerning Unwarranted reductions in Oregon Nearshore Fishery.
To: pfmc.comments@noaa.gov

Dear Council Members.

The recreational data driving Reductions in the Kelp Greenling and China Rockfish has no relation to reality. Recreational data is greatly flawed by the difference in fishing methods and species targeted. Recreational fishers particularly aboard charter boats are instructed to minimize contact with the bottom as to reduce loss of gear. This results in catching species that are suspended or are less reluctant to leave the security of their high relief habitat. This method used by recreational fishers across the coast deliberately targets Lingcod and Black Rockfish. By targeting these two species in particular fishers are able to maximize the lbs of fillet they take home in a bag limit. The recovery ratio of a China Rockfish is consistently 22-24% while Black Rockfish yield 35-37% and are much larger to start with. As for Kelp Greenling they are discarded in the recreational fishery due to the smallness and their inseperatable orientation with the bottom.

We have in the commercial fishery constantly reached our Kelp Greenling Quota easily due to the Vast population in the nearshore. As for China Rockfish, We have just enacted a Marine reserve (Redfish Rocks) That moves toward mitigation of any commercial impacts. That in addition to over half of the nearshore habitat from 30 Fm to

70Fm is locked up in the RCA. All this protection insures sustainable harvest of nearshore species.

While mo be pursued in the nearshore, existing data in the form of ODFW length frequency data,age data and maturity data as well as data generated in the State logbook program could serve as more representative of the commercial fishery. The best data in my opinion would be Federal observer data that records the magnitude of Kelp Greenling discards in the Oregon Nearshore Fishery.

Please pursue better data. China Rockfish and Kelp Greenling are an abundant and valuable resource depended on by many fishermen in Oregon. Lets get this right.

Aaron Longton
F/V Goldeneye
Port Orford Oregon.

From: **brett webb** <brettwebb13@yahoo.com
Date: Tue, Mar 18, 2014 at 8:37 AM
Subject: rockfish comments

To: "pfmc.comments@noaa.gov" <pfmc.comments@noaa.gov

council,
the recent proposed cuts to greenling and china rockfish are alarming. i am an advisor to the state of oregon sitting on the commercial nearshore fishery advisory council..i am aware of this fisheries significant importance to coastal communities.
the data used to determine these cuts is not derived from the industry. i strongly object to the path chosen as it has no scientific merit, and causes a serious threat to the economic well being of fishing communities.
i must insist the council reconsider its source of data , make adjustments then proceed with caution.
respectfully, brett webb 541 366 1888

To Pacific Fisheries Management Council;

I am a commercial fisherman in Port Orford, Oregon where I estimate 70% of the nearshore permits in the state of Oregon are fished. We have hoped to have our bi-monthly quota for Greenling raised for the last few years because the, seemingly, abundance of them. Instead, the quota has been reduced without a formal assessment of the species. Currently we bi-monthly receive 300# and can catch them in 2-3 days if we fish where they are abundant. China Rock fish live predominately where deeper water fish live that we don't regularly target. When we do target China's we are usually fishing 80-120' and catch 30-50 China's a day, several days a month.

Deleting these species from our quota will cost each permit holder about $1900 per two month period. And these are some of the easiest fish to catch so it would be a direct reduction in our livelyhood.

I ask that you complete a full assessment of Greenling and China Rockfish before you consider reducing our quotas.

We have already had our quotas reduced in recent years without correct assessments of fish stocks. Fishing on a given date, in my opinion, is not a reliable method of assessing fish stocking. Fish that move around or do not bite are factors as is ocean conditions.

We in this area have thought Greenling and Colored fish quotas were due to increase and that our over restrictive quota levels are causing explosions of these species.

Gene Fowler
Commmercial Fisherman Port Orford
541-282-3281

layne layneb@charter.net

Im a commercial fisherman in Port Orford,I understand that sea trout will be reduced because of false records. They are he easiest fish to retain that I fish for. If you reduce these fish it will be a financial.hardship as I'm a single parent raising my daught now on my own for 15 years,please do some studies on our boats so we can prove there is an abundance of this fish

From: **brian trotter** <casey253@gmail.com>
Date: Tue, Mar 18, 2014 at 4:23 PM
Subject: Fwd: Public comments from Garibaldi Fishermen
To: pfmc.comments@noaa.gov

Greetings to the PFMC from the Black and Blue Rockfishermen of Garibaldi,
I'm forwarding you the email I sent to Jeff Miles our representative.

Attached are the comments a few of us would like the council to hear from us.

Thank you,
Brian Trotter
503-812-6056

March 14, 2014

Greetings from the Garibaldi, Oregon Rock Fishermen,

Please accept this letter as our written public comments and a request for an incidental catch trip limit during the months of December through April of 50 pounds.

Commercial fishing in small vessels in the Pacific Northwest is greatly affected by wind, seas, tides, and currents especially during the winter months. We struggle every month to find a few days in which we can fish. In addition, we are encompassed by Black Rockfish management areas which restrict us to 300 pounds per trip. For example, during the first two weeks of March only one of our fishermen was able to get out for a fishing trip. Two other trips were attempted but had to be aborted due to rapidly deteriorating conditions. That one trip was also cut very short due to changing tides and worsening bar conditions. It produced less than 125 pounds of rockfish. Those fishermen also had to release about 25 pound of lingcod. That extra released revenue may seem minor to some, but with the high cost of fuel and weather limiting opportunities, every little bit is vital to us.

We are all affected in slightly different ways by a few different regulations, but all agree that an incidental catch trip limit would be very beneficial during these months that fishing is so limited and tough. If the population of lingcod is stable or on the rise, please consider the positive impact this could make for the fishermen and adopt a new incidental trip limit for those already fishing during these months.

Thank You for your consideration.
Ken Jewell, F/V Hooksalot
Paul Meyer, F/V After Shock
Leonard Trotter, F/V Silver Girl
Bryan Smith, F/V Cold Track
Brian Trotter, F/V Silver Girl II

Gene Fowler <geneandclaudia@gmail.com>

PFMC members; Attached is a letter discussion my opinions of a reduction in Greenling and China rockfish quotas.

To: Pacific Fishery Management Council
From: Gene Fowler, Claudia Fowler and Mike Fowler; we have been commercial near shore fishermen in Port Orford, Bandon, Charleston and Gold Beach for the last ten years.

This is a response to the hearing that PFMC is proposing to dramatically reduce harvest levels of Kelp Greenling and China rockfish.

We have thought for many years those population assessments for Kelp Greenling have been ridiculously low and have felt that, through our communication with ODFW; we would be seeing a sizeable increase in this quota, by next year. When we start out a two- month period of fishing, we fish to catch other species that are easier to catch and that the quotas are higher on. We catch Kelp Greenling everywhere we go- deep, shallow and in between. If weather, water conditions and or bite keep us from catching our quota of Sea Trout during most of the quota period, we can go out and catch the quota of 300 pounds, easily, in one or two days. We have talked to our local ODFW representative for years about raising the harvest level for Kelp Greenling. They have agreed that the assessment was definitely not reflecting the populations. The three of us scuba dive this area and Sea Trout are seen everywhere. Where we fish, predominately in Port Orford, is far and away the heaviest near shore fishing pressure in the state. We have a high catch rate of Sea Trout and according to Federal Observers that accompany us on our boats, the highest catch of China Rockfish of anywhere. This is not because they caught all the fish in these other places; it is because they don't have as much habitat. The commercial fishermen don't fish there in the numbers that they do here in Port Orford because they don't have the fish populations because of less habitat. Commercial fishermen that don't catch the quotas of near shore fish, in our area, are either fishing other fisheries or not fishing.

Sport fishermen don't keep Sea Trout as one of their seven fish unless they cannot catch something like Black Rockfish that have far larger fillets. The same situation goes for China Rock fish; you need to catch one that is 4+ pounds to have a good sized fillet. Another thing is that Sea Trout don't show on your fish finder as a school of Black and Blue rockfish do. Not saying that sport fishers are not capable of catching Sea Trout, but they are less likely to catch them and keep them unless they are fishing from a jetty or rocky shoreline. Maybe you should reduce how many fish jetty fishermen can keep. The ocean is a big place, it is full of fish, and we are already restricted from fishing most of it.

Reducing the harvest levels of Sea Trout and China Rockfish will be financially damaging to a fishery that is already taking hits from reductions in closed areas to fish. We have limitations from conservation areas and marine reserves, along with species harvest levels being reduced.

This proposed reduction of Sea Trout and China Rockfish with poor or no data is not the way to manage our fishery. We are limited in our ability to catch fish by ocean conditions and management of fisheries. Each species of fish has its own biological plan of where it goes, when it eats, when and where they have their young. All these things affect our ability of where and when we can expect to catch a fish, and sometimes there are so many fish our lure can not reach the bottom without ricocheting off fish that don't want to bite. Possibly, the next day our fish finder doesn't see a fish and if that is the day you choose make your assessment of stock, you get bad information. Assessments of fishing stock can not be expected to be accurate based on going fishing on a specific date, for a specific species, in a specific location.

If you reduce Sea Trout quotas, we will be catching and releasing 50-100 a day. Weather and ocean conditions permitting, we could catch the quota in one or two days of the quota period. In this same scenario, on days they are biting, we would be releasing 20 to 50 China Rock. Large amounts of China Rockfish live predominately in water deeper and we usually can not keep them alive for live markets, so we do not normally target them in waters deeper than 20 fathoms.

Please do not reduce or ruin our livelihood based on non-existent or poor data.

Commercial F/V's Sea Hunt, C/Dawn, Providence III
Gene Fowler
Claudia Fowler
Mike Fowler

Harry Whisman <telsta860@gmail.com>

To Pacific Fisheries Management Council;

I am a commercial fisherman in Port Orford, Oregon where I estimate 70% of the nearshore permits in the state of Oregon are fished. We have hoped to have our bi-monthly quota for Greenling raised for the last few years because the, seemingly, abundance of them. Instead, the quota has been reduced without a formal assessment of the species. Currently we bi-monthly receive 300# and can catch them in 2-3 days if we fish where they are abundant. China Rock fish live predominately where deeper water fish live that we don't regularly target. When we do target China's we are usually fishing 80-120' and catch 30-50 China's a day, several days a month.

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We in this area have thought Greenling and Colored fish quotas were due to increase and that our over restrictive quota levels are causing explosions of these species.

This page blank intentional.

From: Gary Anderson <portoffice@frontier.com>
Date: Wed, Mar 19, 2014 at 1:40 PM
Subject: OFL
To: pfmc.comments@noaa.gov

This letter is to request the Council take into consideration the economic impact of the proposed reductions for Kelp Greenling and China Rock-cod for 2015-16. The lack of scientific data regarding such a drastic reduction to these two species does not warrant the major economic impact this decision could have on the local Port Orford fishing fleet. Over half of the near-shore permits in Oregon are based in Port Orford, where fully 29% of the workforce is engaged directly or indirectly in commercial fishing, decisions of this magnitude have a domino effect and eventually effect the entire financial health of not just Port Orford but all communities on the coast. Thank you for your consideration.

Gary Anderson
Port Manager
Port of Port Orford

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MAR 20 2014

PFMC

To: Pacific Fishery Management Council

Subj: (1) Kelp Greenling (Sea trout) and China Rock Fish assessments.
(2) LingCod

(1) A reduction in Catch limits For these two Fish Will Seriously impact the Economy of Our nearshore Fisheries. The Lack of Data For these Fish is Very inaccurate Due to methodology. Both fish are in abundance. In fact We have been trying to get the Quota Raised on Kelp Greenling. Perhaps you should ask Oregon Department of fish and Wildlife (ODFW) For actual Data Collected From the Observer Program. The Data will Clearly Show the two Fish Very important Financially and are not in any Danger of being overfished. A reduction in Quota Could Cause Some buyers to Leave the market.

(2) We would Very much like the lingCod Season For Commercial Fishermen the Same as Sport Fishermen. Presently We must Discard Hundreds of Dollars and a large Number of lingcod while the Sport Fishermen Keep Two Per Day Year around. Where We Fish there is an abundance of LingCod.

I would like to thank You in advance for your Consideration on the Issues Presented.

Very Respectfully

Wesley King
Comercial Fisherman, Near Shore Fishery
Brookings Oregon

P.O. Box 398
Brookings, OR. 97415

RECEIVED
MAR 17 2014
PFMC

March 11, 2014

To: PFMC
committe chairman;

Subject: Year round Ling cod fishery

First let me say a bit about myself. I have been a commercial fishermen for the better part of 15 years. I have participated in many fisheries. I have worked on a dragger in the Bering Sea all the way down to a Jig boat fishing for Rock fish. I have supported my family off this industry. I have over the years worked my way to owning and operating my own Vessel. I still have youth on my side and would like nothing more than to continue supporting my family this way.

The main reason for my letter is to support the consideration of a year round ling cod fishery. The ling cod stock is very strong and at present producing lots of quality fish. I would be very supportive of a sustained 400 lbs a/month quota year round Jan 1 - Dec 31. This would do a few different things for us as fisherman. Ling cod are very plentiful possibly increasing. Our activity in harvest would help control some predation on the juviniell stocks of other Rock fish species. Also gives us an accountable source of income thru winter months.

To close I think all parties involved would benifet from a year round fishery. Thank you for your time.

Paul H Garratt Jr
F/V Fantasy

[signature]

RECEIVED

MAR 17 2014

PFMC

I have Just Learned about the plans to cut our kelp greenling & China Rock quota's. The data you used for the kelp greenling and China Rock was a joke. None of the correct data was used. Commercial fisherman that are out there trying to make a Living, are also keeping Log book on what they catch and Release. If you Look at the Log books and or talk to commercial fisherman that are out there everyday. Please do not make changes on Quota's by using poor data. this will affect the Livelyhood of many.

Sportfishing is not the same as commercial fishing, they do not put the time in nor do they keep Log books.

You are Looking at commercial Fisherman Livelyhood but asking Sportfisherman for the answers.

Please check other data before you make a decission on our Future.

Thank You
Vickie Nowlin
Seafood buyer

I am a Seafood Buyer For NoR Cal Seafood in Port Orford OR. as we all watch the RockFish Quota dropping it makes it hard to keep Fishing and most of the time not covering expenses. So I am writing to you to ask for a Ling Cod Quota for the winter month to help the Fisherman out financial. There are alot of Ling Cod out there. If you look at the fisherman Log book you can See the Number of fish Released. A small Quota would help Compensate the other Low quota's that they are trying to deal with.

RECEIVED

MAR 18 2014

PFMC

Thank you

[illegible signature]

NoR Cal Seafood Buyer

SIRS: & LADY'S OF PFMC.

PFMC

I AM WRITING YOU CONCERNING YOUR PREPOSED CUT IN THE NEARSHORE FISHERY TO GREENLING & CHINA ROCKFISH. I AM NOT FOR THIS FOR FOLLOWING REASONS

1. HERE IN OREGON BOTH SPECIE ARE ABUNDANT.

2. CUTTING QUOTA WOULD DAMAGE MY FINANCES A LOT. THERE FOR MAKING MY PERMITS LESS VALUEABLE AND ME & MY FELLO FISHERS WOULD NOT BE ABLE TO HELP OUR FISHING TOWN.

3. YOUR DATA IS FLAWED - YOU SHOULD USE OREGON'S DATA; THEY CHECK & RECORD ALL INFO ON BOTH SPECIE. WE FISHERS HAVE NO PROBLEM'S CATCHING OUR COMMERCIAL QUOTA. PLEASE CONSIDER OUR POSITION. THANK YOU MIKE ASHBOWN.

REPRESINTING F/V'S CURRY - IRISH-ROSE - FRIENDSHIP - WAVE ON - ANDRE MARIE - SPECK II - SOUTH-WIND - ASH - SPRITE - GUNNER - ORION -

THANKS

2014

March 14, 2014

RECEIVED

MAR 18 2014

PFMC

Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Dear Council Members,

My name is Evan Locke, and I have been a commercial fisherman for seven years fishing from Charleston to Brookings, primarily fishing out of Port Orford along the Port Orford Reef. The Port Orford Reef has been the most heavily fished area by commercial fishermen for years and years; yet, Sea Trout and China Rockfish continue to be plentiful, which demonstrates their sustainability.

I typically release double the quota of Sea Trout during the two-month quota period because I catch them without trying to, which demonstrates the abundance of this species. Also, less than five percent of what I catch have to be released due to being under the legal size of 12 inches. I am far more likely to catch the legal-size fish than not because the guidelines that are already in place as to size limits mean the younger fish are returned to the ocean to grow to maturity. I am able to catch the current quota of 300 pounds per 2-month period in four to five days, which again demonstrates the abundance of Sea Trout. Sea Trout are a fast-growing and fast-reproducing species with a relatively short life span of about seven years. These fish live at depths of one to forty fathoms in a wide range of habitats, all of which is based on my hands-on experience as a commercial fisherman.

The data the council is using based on sport catch per unit effort is not a valid assessment of the health and welfare of either the Sea Trout or China Rockfish populations. Sport fishermen do not seek out Sea Trout or China Rockfish—they fish for Ling Cod and Black Snapper, and they do not fish over the rocky areas where the Sea Trout and China Rockfish are found because they are very likely to lose their fishing equipment as they are not skilled in fishing in such a formidable environment. Therefore, data relative to the sport fishing industry is not a true measure of the health and well-being of the Sea Trout and China Rockfish populations, and I haven't seen any reduction in either fish population. It is important to note that the depth range from beyond 20 fathoms was closed for several years with it just re-opening for commercial fishing in 2013. Most China Rockfish are found in the waters off of Port Orford and Gold Beach due to those areas having the best near-shore habitats within 20 fathoms.

I have logbook data and fish tickets which support my statements relative to the live fish I catch, and I feel that the fish tickets and logbooks of commercial fishermen as well as observer data should be the basis for assessing the health and welfare of the Sea Trout and China Rockfish populations. A reduction in quotas would be very detrimental to the livelihoods of commercial fishermen as well as the buyers of these fish. These types of restrictions not only impact the fishermen and the buyers, but always have a trickle-down effect on the economic welfare of many others employed in this industry.

Please understand that it is imperative to all commercial fishermen that the habitat is sustainable, and it has been and continues to be so. It benefits everyone from the fishermen to the consumer to maintain this status quo, and there are no signs it is in any danger of changing. I urge the council to refrain from reducing the quotas on Sea Trout or China Rockfish without accurate scientific data that definitively demonstrates that these species are in danger. The council needs to take the time to thoroughly analyze data from a variety of sources before making such a monumental decision.

Respectfully,

Evan Locke

Evan Locke
830 Allegany Ave. SW
Bandon, OR 97411
(541)-670-3219
E-Mail: EvanLocke96@yahoo.com

Dear Pacific Management Council Member

I am writing to request a incidental lingcod limit for Dec-April So I don't have to throw the lingcod I am catching back while I'm engaged in my nearshore rock Fish Fishery. It has become a growing problem as the lingcod stocks appear to be growing substantialy. Our markets would love to have them and the extra money would make a huge difference in our Fishery. I'm really tired of wasting effort that time of year by throwing them back while a recreational Fisherman or an IFQ Fisherman fishing next to me can keep them.

RECEIVED

MAR 17 2014

PFMC

Sincerely,

Paul Meyer

F/V Aftershock
Port of Garibaldi, Or

Buck & Ann Fisheries, LLC
POB 579
Ilwaco, Wa. 98624

March 10, 2014

Ms. Dorothy Lowman, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Ste. 101
Portland, Or 97220

RE: Agenda Item C.4.c

Dear Chair Lowman and Council Members:

Attached is the last ten years of trawl survey data for the southern sablefish area. This was supplied by the Northwest Fisheries Science Center. While this data indicates an uptick in biomass of sablefish over the last couple years, our CPUE on the grounds indicates the other way around. Our CPUE for the last three years using traps is as follows:

2011: 35.8 lbs. per pot
2012: 24.6 lbs. per pot
2013: 16.9 lbs. per pot

The one issue that is not addressed in the trawl survey is size. The fish coming on in the last couple years may be small enough to escape from our pots. If this is the case, that would be good news, that there is fish coming in the future. What we have seen on the grounds has been very worrisome.

Once again, we ask the council to be conservative in their approach to the southern sablefish until we can get a full stock assessment done.

Thank you,

John E Corbin

John Corbin
Buck & Ann Fisheries, LLC
503-791-2135
jgcorbin@charter.net

Sablefish Trawl Survey Swept-area Biomass (mt)

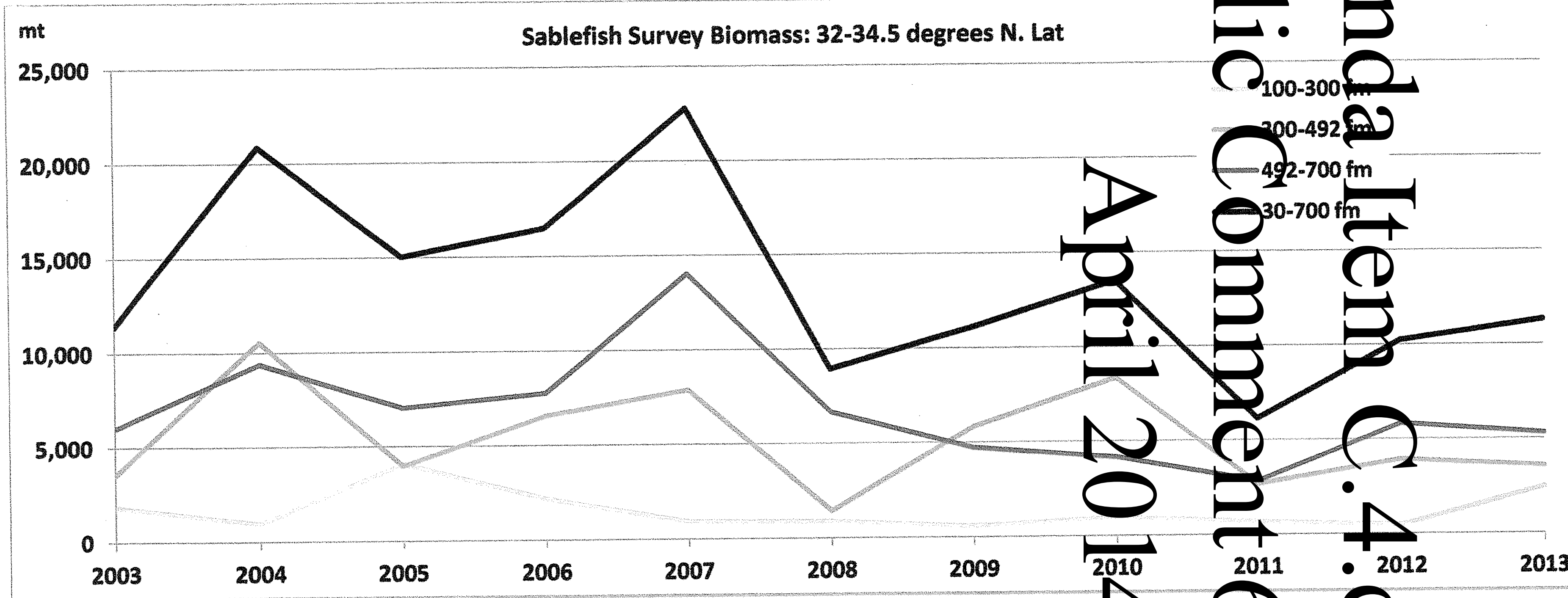
Depth range (fm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 *
32-34.5° N. Lat											
30-100	22	13	0	0	0	2	5	38	3	31	23
100-300	1,856	957	4,070	2,182	924	887	578	985	680	487	2,472
300-492	3,545	10,553	3,946	6,572	7,884	1,444	5,836	8,353	2,662	3,924	3,559
492-700	6,003	9,387	7,044	7,776	14,009	6,656	4,716	4,149	2,830	5,836	5,305
30-700	**11,427**	**20,910**	**15,060**	**16,531**	**22,817**	**8,989**	**11,136**	**13,526**	**6,175**	**10,278**	**11,359**
34.5-36° N. Lat											
30-100	184	28	81	1	10	27	65	95	258	44	5
100-300	1,614	4,020	4,137	4,377	3,788	3,789	3,715	1,165	2,835	2,972	3,724
300-492	3,909	3,345	6,865	4,558	5,536	3,974	4,600	2,491	2,307	1,480	3,060
492-700	1,151	3,730	2,492	3,667	5,072	3,231	3,449	1,085	2,792	1,616	3,954
30-700	**6,857**	**11,123**	**13,575**	**12,603**	**14,406**	**11,022**	**11,829**	**4,836**	**8,191**	**6,111**	**10,743**

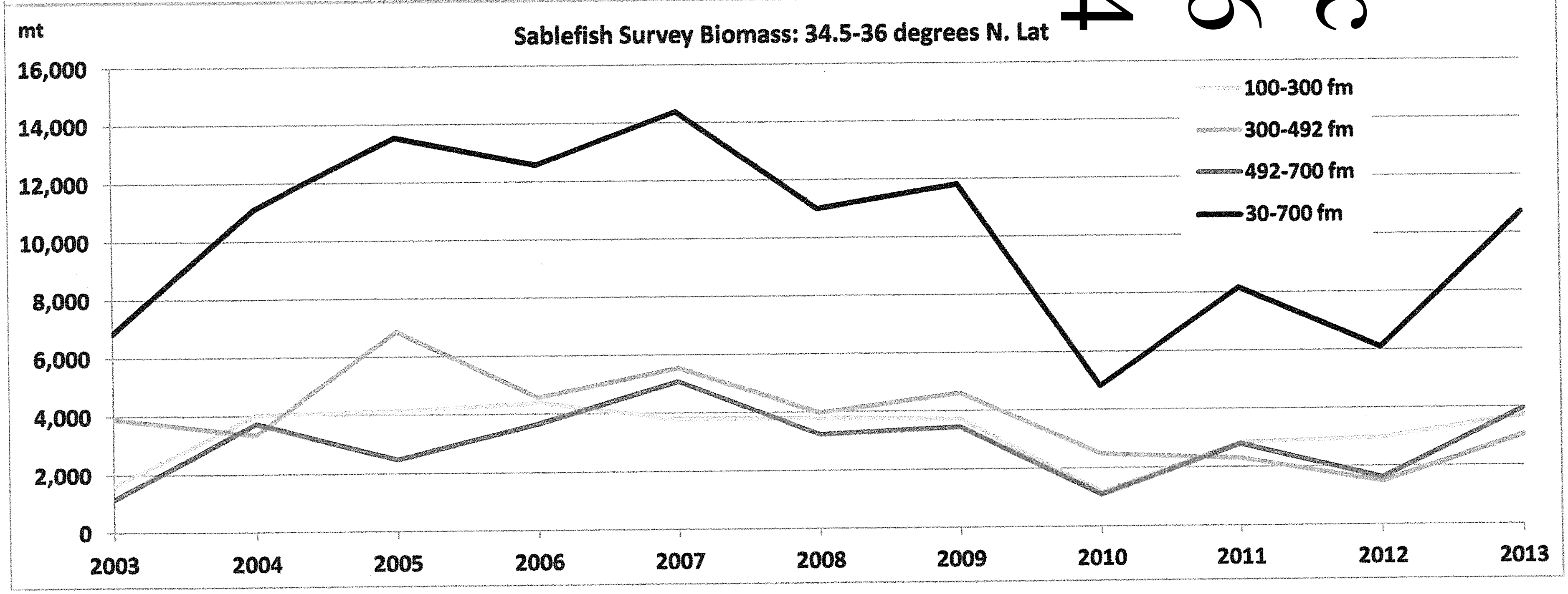
Sablefish Trawl Survey Catch-per-unit-effort (kg/hectare)

Depth range (fm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 *	Stratum Area (hectares)
32-34.5° N. Lat												
30-100	0.06	0.03	0.00	0.00	0.00	0.00	0.01	0.10	0.01	0.08	0.06	385,134
100-300	1.86	0.96	4.09	2.19	0.93	0.89	0.58	0.99	0.68	0.49	2.48	995,526
300-492	2.26	6.73	2.52	4.19	5.03	0.92	3.72	5.33	1.70	2.50	2.27	1,568,399
492-700	3.80	5.95	4.46	4.93	8.87	4.22	2.99	2.63	1.79	3.70	3.36	1,578,873
30-700	**2.52**	**4.62**	**3.33**	**3.65**	**5.04**	**1.99**	**2.46**	**2.99**	**1.36**	**2.27**	**2.51**	**4,527,932**
34.5-36° N. Lat												
30-100	0.53	0.08	0.23	0.00	0.03	0.08	0.19	0.27	0.74	0.13	0.02	347,206
100-300	4.64	11.55	11.89	12.58	10.88	10.89	10.68	3.35	8.15	8.54	10.70	348,020
300-492	10.09	8.64	17.72	11.77	14.29	10.26	11.88	6.43	5.96	3.82	7.90	387,355
492-700	3.47	11.26	7.52	11.07	15.31	9.75	10.41	3.28	8.43	4.88	11.93	331,292
30-700	**4.85**	**7.87**	**9.60**	**8.91**	**10.19**	**7.80**	**8.37**	**3.42**	**5.79**	**4.32**	**7.60**	**1,413,873**

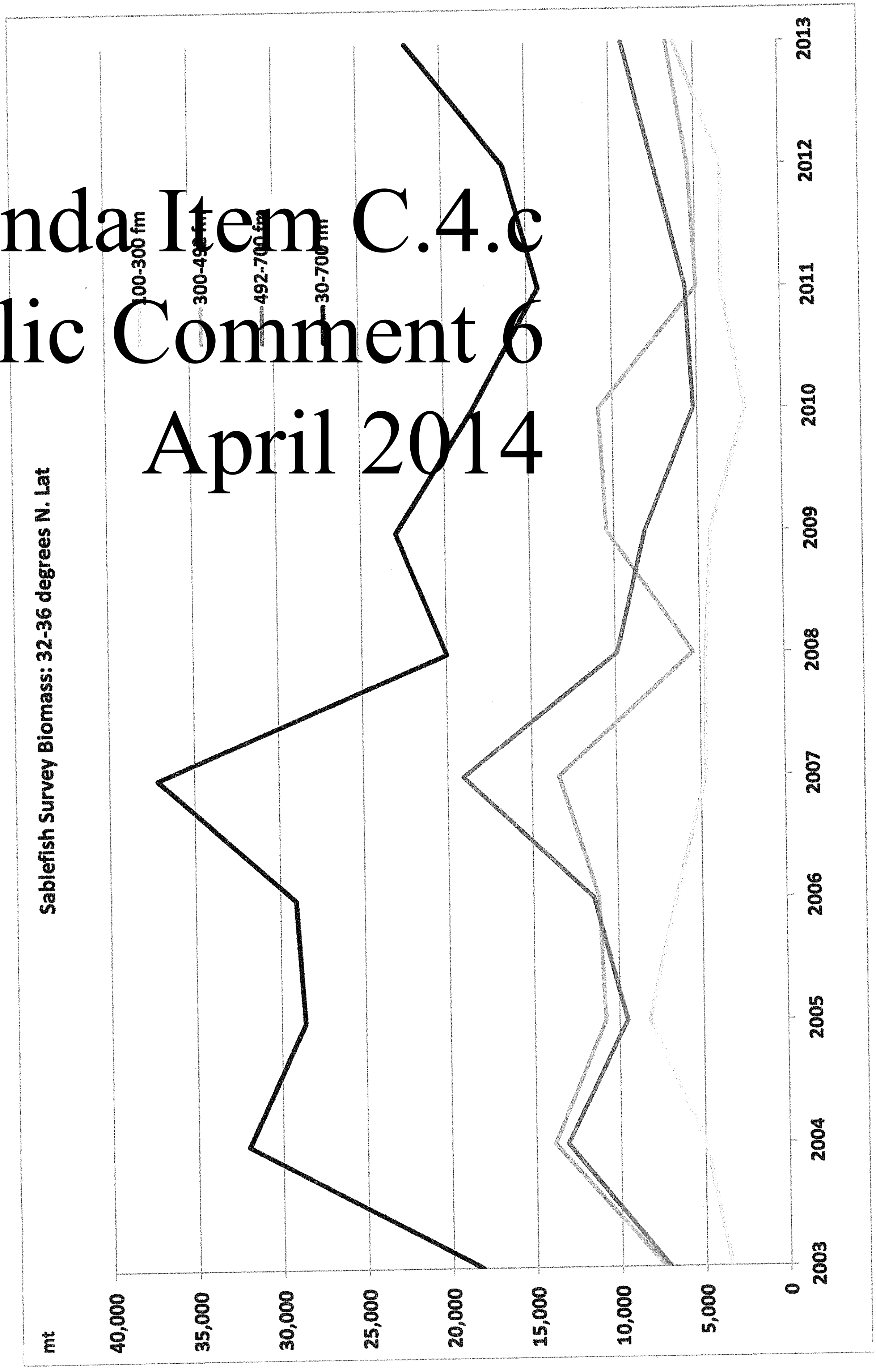
* 2013 data in this region include only one survey pass, as the 2nd pass of the survey was halted due to the October 2013 Federal furlough.

Agenda Item C.4.c
Public Comment 6
April 2014





Agenda Item C.4.c
Public Comment 6
April 2014



From: **Gary Anderson** <portoffice@frontier.com>
Date: Wed, Mar 19, 2014 at 1:40 PM
Subject: OFL
To: pfmc.comments@noaa.gov

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Gary Anderson
Port Manager
Port of Port Orford

Harry Whisman telsta860@gmail.com

To Pacific Fisheries Management Council;

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We in this area have thought Greenling and Colored fish quotas were due to increase and that our over restrictive quota levels are causing explosions of these species.

From: **Bart Lewellyn** <bartbigfish@gmail.com>
Date: Wed, Mar 19, 2014 at 10:38 AM
Subject: Testimony OFL China Rock and Kelp Greenling
To: pfmc.comments@noaa.gov

Dear Fisheries Council,

I was just recently informed by Craig Good in the Brooking ODFW office that there have been some changes to the harvest caps for China Rock Fish and Kelp Greenling on the West Coast. Forgive me for the lack of knowledge about these new laws as I only have the commentary from Mr. Good to rely. I do not understand the speed of these changes, and I certainly do not understand Data Core or Date Poor test results. What I do possess is a lifetime of fishing the Oregon Coast for rockfish and currently hold a Black and Blue Permit with Nearshore endorsement, permit #59053.

I have fished from Port Orford Reef to the California Border for 40 years. I have never caught as many Kelp Greenling as I have in the last three years, the stock is abundant and plentiful. China rockfish are by no means as plentiful as the Greenling, but still as robust as they were 20 to 30 years ago, if not better. This Data Core testing is miss-information. Ling cod and kelp greenling are plentiful. On my last trip to Mac Arch I released over 50 undersize greenling and harvested 30. 42 Ling cod were landed on that trip as well, which involved about 6 hrs of fishing with only one other fisherman and myself with rod and reel jig fishing.

The economic impact of this miss-information will be devastating. Nearshore fishing is not my primary occupation, but for many it is. Kelp Greenling provide the foundation for many of those fisherman mainly due to their robust populations and good pricing at the buyers dock. Please listen to Jeff Miles, as I know of no one more knowledgeable or present in a fishery than Jeff. He is either on the dock at Port Orford helping other fishers or in the environment himself…harvesting and monitoring.

I purchased my permit for $25,000 four years ago. I recently had an offer for $33,000. My Son, who is 20, begged me to never sell the permit as it is very important to him. Law changes, particularly based on unfounded research, will kill this industry and the desire for younger fisherman to continue what they have grown to love. The economic impact, which I am told is part of your mandate, would be disastrous. I have been at the meetings on Halibut catch limits, Marine Reserves, and salmon seasons. Please do not let this legislation take place. It is again another unfounded restriction with adverse consequences.

I fish 40 to 60 days a year on the Oregon Coast from Brookings to Charleston as a commercial fisher and sport fisher. I have only seen consistent ODFW interviews at the Port of Brookings. The other ports are rarely to never interviewed, so how can that data be accurate. Listen to folks like Jeff Miles and Craig Good; it is what they get paid to do. Do Not rely on some computer model or Sport Fisherman who may or may not be interviewed correctly. I cannot imagine the frustration of good folks like Craig Good who perform their work only to have it cast aside for a computer model at a Federal level.

It is flat wrong information ---gentleman.

Best Regards,

Bart Lewellyn
Lewellyn Financial Management
541-772-1380 Office
541-772-0176 Fax
bart@lewellynfinancial.com
www.lewellynfinancialmanagement.com

From: **Walter Chuck** <the4chucks@aol.com>
Date: Sun, Mar 30, 2014 at 11:34 PM
Subject: Nearshore Rockfish Management
To: pfmc.comments@noaa.gov

Council Members,

At your upcoming meeting I would like you to consider keeping management of nearshore rockfish species as a Complex. The decision to take species out of complex with populations based on data poor assessments could adversely impact opportunity and the economic viability of coastal communities. Some of the populations of these nearshore species are based solely on catch based data that do not give a true indicator of population. In the case of greenling important data, otolith data and length were not considered in their Management Plan which could have affected their OFL. When considering of management stocks out of complex please consider the relative uncertainty of data informing specifications on those stocks.

I would also like to support the letter submitted to the Council by ODFW/WDFW/CDFW addressing Agenda Item D.5.b. and the ODFW submitted Option 2 and ammendment.

For the next Council cycle the trasferral of management of the Nearshore Rockfish to the States should be cosidered as most of these species occur in state waters.

Thank you for your time,

Walter Chuck
166 NE 71st St
Newport, OR 97365

541-574-9078

the4chucks@aol.com

From: **Ron Mason** <ronlmason@comcast.net>
Date: Sat, Mar 29, 2014 at 5:18 PM
Subject: April agenda item C.4
To: pfmc.comments@noaa.gov

Members of the Council

Re: Agenda Item C.4

Your March agenda item D.5.a included a statement that the decision of keeping category 2 and 3 stocks in or out of a complex is a policy decision, not a scientific one. That being the case, it's inconceivable that a group of responsible people will make a policy decision to separate china rockfish from the nearshore species complex without solid reasons to do so nor should the WA and OR kelp greenling be separated without solid reasons. A "data poor" stock assessment on kelp greenling should not have been done when more good and accurate data was easily available. Then to use that "data poor" stock assessment to make policy decisions that will seriously affect the economy of a state, especially the economy on the coast, is also inconceivable.

Please leave china rockfish as part of the nearshore complex and keep the WA and OR kelp greenling combined.

Additionally, please consider delegating the management of the nearshore fisheries to the individual states.

Respectfully
Ron Mason
Corvallis and Newport, OR

From: Garibaldi Charters [mailto:norwester@garibaldicharters.com]
Sent: Saturday , March 29 , 2014 4:05 PM

Chair Lowman and Council members

We understand that the Council is considering reducing the China Rockfish and Kelp Greenling levels of catch that would severly impact the nearshore commercial, charter and recreational fisheries. Reductions in quota would cause great economic harm to the charter fleet, especially if shorter seasons are implemented due to quota restraints. We have approximately six months in which to make a living that must last us all year long. The fact that charter and recreational fishermen catch few of these species because they do not target them makes it hard to accept decisions based on poor or basically non-existent data. Fishermen have always been willing to help the Council gather the scientific data needed to manage our fisheries sustainably, but they did not sign on to managing our fisheries by policy decisions made due to a lack of scientific data. Decreasing quotas on these two minor stocks, with little real scientific evidence that they are in danger, does not warrant the major economic impacts this policy decision could have on the charter, recreational and commercial fleets. To take these two stocks out of the nearshore complex seems to be a political tool, not to stop them from being overfished, but more to stop fishermen from fishing at all. The Kelp Greenling "data poor" assessments for all three states totaled around 140 MT, but the overall catch data was not that high. If the Council takes them out of their Stock Complex, and manages them seperately, a problem is being created, not solved.

Using "data poor" or "data moderate" non-scientific terms to take a species away from the nearshore stock complex is unacceptable. These two terms seem to simply create poor management. What little science that was used ignored many other scientific research resources such as the use of length data from ODFW's dock sampling program. Many fishermen believe that these fish are getting bigger. Charter caught fish are sampled at the at the docks in Oregon, as are many recreational fish, but that data tells you little about commercial fishing. Many mistakes have been made, and we would like to request that the Council correct them before any drastic actions are taken that could literally destroy so many fishermen's livelihoods. The economic problems multiply many times over for all of our Coastal Communities if our charter and recreational fleets are impacted . There will be far reaching consequences to our tourism businesses and trades if our fisheries are shut down or seasons shortened. While we know that Oceana and other NGO's often threaten NMFS with a lawsuit if the Council does not agree to their numerous fishery "crises" management schemes, NMFS needs to understand that they could just as easily be sued for major unwarrented economic impacts to the fishing fleets and coastal communities as well.

National Standard #8 of the MSA is to "Consider fishing communities to provide for their sustained participation and to minimize adverse impacts". We implore you to consider this important standard before you make your decision. We have been imformed that a socio-economic impact statement is to be brought forward at the April Cpuncil. We hope that this is not another rushed, "data poor" assessment. A few years ago, at a Marine Reserves meeting, participents were informed that the states economic analysis report showed that it cost recreational fishermen only $47/day to bring a small boat from Portland to Garibaldi to fish for a day on the ocean. So forgive us if we are skeptical.

Many Oregon fishermen support a request by the Oregon and Washington Depts of Fish and Wildlife to remove these small,nearshore fisheries from federal management and turn it over to the states . Both states have a proven track record in managing species for the benefit of all, even the fishermen. Turning this responsibility over to the state agencies would benefit a Council who, evidently, has neither the time nor the money to do proper assessments for these smaller fisheries.

Respectfully, Captain Mick Buell & Linda Buell

Garibaldi Charters, Garibaldi, OR

PORT OF GOLD BEACH

P.O. Box 1126 * 29891 Harbor Way * Gold Beach, OR 97444 (541) 247-6269 * Fax (541) 247-6268
Email: portmanager@portofgoldbeach.com ~ portoffice@portofgoldbeach.com

March 19, 2014

Pacific Fisheries Management
Attn: Chair, Dorothy Lowman

Dear Ms. Lowman,

It has come to the attention of the Port of Gold Beach by the commercial fishing fleet and Charter Fisheries that a drastic reduction in allowable catch is on the table. The specific fish being proposed are China Rock and Kelp Greenling. This is troublesome in many ways. The financial impact this could have on fishermen's livelihood, fish buyers and processors, and both the City and the Port of Gold Beach may be unrecoverable.

Over the past several days I have conducted research on the proposed cuts and it is quite a substantial reduction from the current Annual Catch Limit of 99 MT to a proposed limit of 69 MT in 2015-2016 (for China Rockfish alone) as a best case scenario. I have also found the basis for the China Rockfish decision was derived from a Data Moderate Stock Assessment and the Kelp Greenling from a Data Poor Assessment, since there were not enough resources for a full assessment. When making such a significant and drastic cut in what would be the livelihood of people, businesses, towns and communities there should be more efforts put into gathering all of the information to make a solid decision and have the statistics to back the decision.

I have learned the decision is done in part by charter, sport and commercial totals. It would seem that those different types of fishermen target different species of fish. Talking with people from the different areas of fishing they would agree that China Rockfish is the least desirable and more often than not released. In talking to ODF&W I was told that there is a history of no China being thrown back or released and that the retainage is high. I find that interesting in it self. My question then was that if there was so many China kept when they were not targeted fish that there must be a substantial amount of China to catch.

My next area of concern is that the limits are not just for the state of Oregon but from Northern California clear up through Washington. Now how are these limits going to be set? State by State? Each State with their own quota? Commercial %, Charter % and Sport %? There are so many things to consider and I'm asking that all questions and concerns be addressed. This decision has the potential to be catastrophic to small coastal communities that are already struggling. Many coastal towns not only in Oregon but also California and Washington are fighting a federal budget for dredging funds to keep their ports going. The Port of Gold Beach has already suffered one year of not being dredged which caused a significant drop in the amount of days the Rogue River Bar was open to the Sport Fishermen and calm enough for the Commercial and Charter boats to even get out. Another year of such a limited access to the ocean would be very devastating to the fishing industries, businesses, City and Port of Gold Beach.

I understand that there will be a Council Meeting in April where the adoption of limits will be brought up and also whether state specific guidelines will be imposed. If I am correct after the meeting in April there will be information published and public comments will be taken until the June Meeting for a final decision. I would like to request that before any kind of adoption or decision is made, a Full Assessment, not a Data Moderate or Data Poor Assessment be done on the limits. Please keep in mind the lack of data collected to this point could have a huge impact on many Coastal Communities.

Thank you for your time and consideration.

Regards,

Debbie Collins

Debbie Collins, Manager
Port of Gold Beach

Page 1 Picking up Hitchhiking lingcod

To Pacific Fishery Management Council
In regard to the poor data that has been presented to you on the Kelp Greenling I would like to bring to your attention a newspaper article published in the Oregon Curry Pilot on March 21, 2014 In the sports column.

It shows that sport fishermen use kelp greenling as bait for fishing For lingcod. This is a grey area in the Oregon fishing regulations because kelp greenling are not considered a game fish so it can be used as live bait, but it must be retained unmutilated for part Of your seven rockfish bag limit in Oregon.

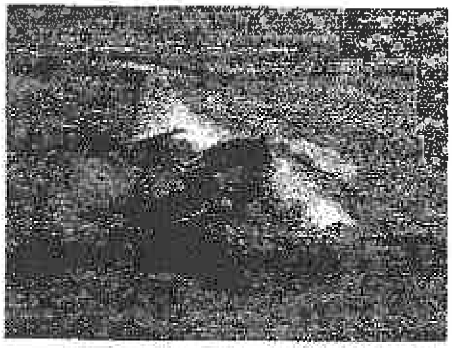
I feel many kelp greenling go unreported due to this practice. Another point that the assessment is not accurate.

Thank You, Craig Will
Oregon Nearshore fisherman

Page 2

Picking up hitchhiking lingcod

print this



It's a rare opportunity to get a photo of a lingcod hitchhiking on its favorite meal - a kelp greenling, also known as a sea trout.

If you want to make a gazillion dollars in the fishing industry, all you have to do is one thing — make a swimbait that looks just like a female kelp greenling. In all the years I've been fishing, I have yet to see a swimbait that looks like a female kelp greenling — maybe you'll be the one to do it!

Today's photo shows what a female lingcod looks like inside of a lingcod's mouth. It has a light olive-gray body with brightly-colored yellow or orange fins. Yellow — or orange —tinged round spots are evenly spaced throughout its body.

The males on the other hand have a light-to-dark brown body with unevenly-shaped blue spots that resemble worm-like vermiculations. These unique markings are irregularly interspersed throughout their body. Make no mistake — the males will still catch their fair share of lingcod, but it's the females that garner the most strikes.

Lingcod, like people, have their own eating preferences. They will swim over 100 perfect-looking live herring just to get one whiff of an old dilapidated greenling. This kind of ling behavior has led many anglers to fish either near the kelp beds or around rock piles that are known to harbor starfish, shellfish and mollusks. In these places, kelp greenling abound.

It's a common practice for anglers to catch a kelp greenling and immediately take it to deeper water to use as live bait for lingcod. Since greenling have small mouths, it helps to use small hooks in size 4 and 6, especially if you're using bait like small pieces of shrimp, although I've caught plenty of greenling while jigging 2-ounce jig heads-and-plastic tails or by jigging leadfish.

There are many ways of rigging up a greenling for live bait, but most anglers use lead jigs ranging between 4 and 10 ounces.

To rig up, push the jig hook from the center of the bottom of its jaw up through its upper jaw and right through the front of its head — the hardest part of the greenling's body. But be careful not to pierce the hook near its eyes or you will also hit its brain and render the fish lifeless. It will still be useful, but it's always better to have a feisty greenling to attract a lingosaur's attention. Send the greenling to the bottom, reel it up about five cranks, put your rod in a rod holder and wait for a take-down.

Most of the lings that are caught this way are called hitchhikers because they are not actually hooked by the jig's hook, but are holding onto the greenling by their teeth. The trick is to reel the ling in at an agonizingly-slow pace. In doing so, the ling will actually think that it is following the fish up to the surface.

In fact, a lingcod cannot let go of the fish even if it wanted to, due to the fact that it possesses long and sharp, inwardly-curved teeth. As long as an angler maintains a tight line, the continuing pressure of reeling in the greenling keeps the lingcod hooked onto its prey.

Be ready with a gaff or a net when the ling comes to the surface because any sudden thrashing can allow the line to suddenly become slack, at which time the ling will then be able to open its mouth, let go of the greenling and then head straight back to the bottom.

If this happens however — no worries! The same ling can often be caught again. So here's a trick that a lot of fishin' folk don't know about. If a lingcod should suddenly let go of your sea trout, immediately kick your reel into free-spool and lower the fish back to the bottom. But perform this maneuver slowly to give the fish the appearance that it is lazily swimming back to the bottom as well. Nine times out of 10, the same lingcod will be waiting and ready to pounce on the same sea trout, and they will usually be within 10 feet from the surface.

The weather report as of Thursday was looking very favorable for fishing in the ocean this weekend or into the first part of the week. So if you've never caught a lingcod (minimum size 22 inches) on a live greenling (minimum size 10 inches), consider treating yourself to a thrill that cannot be topped. Just remember that if you catch a greenling, it is considered part of your seven-fish daily groundfish limit.

Tight lines!

Close Window

Written Public Comment for April 2014 Meeting

TO: Pacific Fisheries Management Council

pfmc.comments@noaa.gov

FROM: Rogue King Seafood (DBA) Fishermen Direct Seafood

29975 Harbor Way

PO Box 547

Gold Beach, OR 97444

e-mail: fishermendirect@gmail.com

Pacific Fishery Management Council Members

My name is Dixie Boley. I am a co-owner of Rogue King Seafoods. We do business as Fishermen Direct Seafood, a retail/wholesale/processing fish business, located at the Port of Gold Beach in southern Oregon at the mouth of the Rogue River. These comments concern the restructuring of stock complexes for ground fish stocks and adoption of preliminary preferred alternatives for management measures for groundfish fisheries in 2015-2016 and beyond. Any change to the commercial rockfish regulations affects our business. Changing this fish complex, specifically kelp greenling and China rockfish, to 12 MT has a high probability of increasing our current price of $7.95/ lb. for rockfish fillets. If the live-fish commercial fishers' allowable catch of kelp greenling and China rockfish is cut in half, these fishers will turn to black-blue rockfish. Rogue King Seafood buys bled/dead black, blue and vermillion rockfish. There will be less bled rockfish for sale. This combined with the proposed revision of blue rock ACL's will result in our public being less and less likely to be able to purchase south Oregon coast rockfish fillets for a reasonable price. Rockfish is our local affordable fish for sale. We are not convinced that the data-poor assessment used to reduce this complex of fishes from 23 MT to 12 MT is justified.

Recommendations:

-This reduction needs to be done with actual survey data. Data-poor and data-moderate assessment methods based on catch and sport catch per unit effort are not valid and not good science.

-Use available rockfish ear-bone data when available. Oregon State University will soon have an otolith lab to make this new tool more readily available in Oregon.

-Since these stocks are caught in shallow water, give credit for successful recompression. Fishers need credit for successful proceedure. At Fishermen Direct we have samples of barotraumas release devises to introduce this process to our customers. There was also an ODFW R&E project that mailed a barotraumas release device to rockfish license holders. The fishery needs to raise the importance of this practice.

–Fishers will hate this one, but consider releasing the BFF (Big Fat Females). Release kelp greenling 18 inches and over, or whatever size would keep these BFF's in the ocean.

-Work toward managing kelp greening with state-specific limits based on assessment results. This species is located in shallow near-shore waters. I know this can only happen in the future, but this will be worthwhile for better management.

Sincerely,

Dixie Boley
Rogue King Seafood (DBA) Fishermen Direct Seafood
29975 Harbor Way
PO Box 547
Gold Beach, OR 97444

Dear Pacific Marine Fisheries Coun̄sel.

Just when I thought the trout quotas couldn't get any more restrictive or rediculous, here we go again. When I started line fishing 18 years ~~old~~ ago there were no quotas. We caught 50 to 100 lbs of trout on a good day, just like we do now.

Time and time again thru these 18 years, the data collected by O.D.F.W., has bolstered everyones beliefe that the trout populations are strong and robust.

If I'm fishing for bottomfish instead of snapper 4 out of 5 fish will be seatrout. Take away our trout and you will drastically change our fishery. It will become, basically a snapper fishery.

I'm not going to jig on the bottom all day for a half dozen cabazon and 60 lbs of lingcod. I'm going to go chase snapper. Then the buyers tanks will be ~~maxed~~ maxed out

after just 3 days of fishing.
~~A~~ ~~I~~ not sure how you came to the decision to drastically cut our trout quotas, but I can honestly say with full conviction you have made a miscalculation.

The china cod on the other hand do seem to have been over fished. In the past it was fairly easy to catch 25-50 pounds on a good day. Now-a-days its more like 5-20 lbs.

But the trout are a whole different story, I can catch my 300 lb, 2 month quota, in 3 days. My deck hand and I try to not catch trout just so the quota might last for 2 or 3 weeks.

There are mass quantities of trout. Please dont cut our tiny quota down to almost nothing,

F.V
Rock N Reel
HANK

Thank You
Linden Skoog

CITY OF FORKS
500 E. Division St. • Forks, Washington 98331-8618
(360) 374-5412 • Fax: (360) 374-9430 • TTY: (360) 374-2696
forkswashington.org

April 2, 2014

Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

RE: Agenda Item C Groundfish Management

Dear Council Members:

City of Forks is the base for Washington Ocean Area 3, and together with Neah Bay make up the Washington North Coast management region. A distance of 50 miles to the north and over 100 miles to the south to reach another town makes for economic isolation. Citizens in these areas are heavily reliant on resource and tourism based income that is provided through fisheries and timber.

The North Coast of Washington is a rockfish habitat rich area containing robust stocks of lingcod, black rockfish and Pacific halibut, the target species of the majority of fishermen. WDFW prohibited all commercial fishing in state waters including the near shore commercial hook and line fishery in 1996 as a conservation measure to ensure healthy groundfish stocks for the sport fishery.

A large yelloweye rockfish conservation area (YRCA) has been in place in the north coast region since the early 1990's. This area is closed to recreational halibut and bottom fish fishing as a conservation measure to protect yelloweye rockfish which are managed under a rebuilding plan by the Pacific Fishery Management Council.

WDFW has taken additional management measures to protect yelloweye and canary rockfish including restricting recreational fishing to the area shoreward of 20 fathoms from May 1 through September 30.

In a time of National Economic Recovery, implementation of highly restrictive Ground fish Harvest Specification and Management Measures for 2015-2016 that is not backed up by a Full Assessment of all stocks in the Complex will bring unnecessary Hardship to our Community.

given the economic vulnerability of these remote coastal communities, we do not support implementation of highly restrictive harvest specifications and management measures for nearshore rockfish until more data is available to do a stock assessment that takes into account Washington specific data and historical management measures.

Sincerely,

Bryon Monohon, Mayor
City of Forks

Dorothy Lowman, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

April 3, 2014

RE: Agenda Item C.4. Fisheries in 2015-2016 and Beyond; C.8. Stock Complex Restructuring; C.9. Adopt Management Measures

Dear Chairwoman Lowman,

Please accept these comments on behalf of United Catcher Boats, Midwater Trawlers Cooperative, Oregon Trawl Commission, Coos Bay Trawlers Association, Fishermen's Marketing Association, Pacific Whiting Conservation Cooperative, West Coast Seafood Processors Association, Point Conception Groundfishermen's Association and the Fishing Vessel Owners Association. Collectively we represent the majority of at-sea and shoreside whiting fishermen and processors as well as a major portion of traditional bottom trawlers, shoreside seafood processors and members of the fixed gear fleet utilizing longline gear.

In late March we took the extraordinary step to meet as an industry-wide group representing the affected sectors to consider the recent action on this issue from the March Pacific Fishery Management Council (PFMC) meeting. Attached is the agenda from that meeting. It was a thorough and well-attended discussion.

As a result of that meeting we collectively recommend the following actions with regards to management of Rougheye rockfish during the 2015-2016 management cycles:

1. PFMC Preliminary Preferred Alternative (PPA) to retain rougheye rockfish in the minor slope complex
2. PFMC recommendation to allow the affected fleets to utilize ***voluntary*** measures to reduce their catches of Rougheye rockfish during the 2015-2016 management cycle

We believe that both of these recommendations are well justified and a strong rationale for each can be demonstrated.

Retain Rougheye Rockfish in the Minor Slope Complex

At the September 2013 PFMC meeting the Council decided to defer further consideration of reorganizing the minor slope species complex after consideration of several GMT reports as well as other stakeholder input. At that time National Marine Fisheries Service (NMFS) stated its intent to review the Council's determination and report back its findings at the November PFMC meeting. NMFS subsequently concluded that further analysis on removing Blackgill, Rougheye, and Shortraker rockfish from the complex was warranted along with consideration of management measures that would be analyzed to keep catch of these stocks within their contributory Overfishing Levels (OFLs) within the Minor Slope complex. The Council is faced once again with determining whether or not to retain rougheye rockfish in the Minor Slope complex at the April meeting.

There is no apparent reason why Rougheye rockfish should be removed from the Minor Slope complex. There is an OFL as well as a proposed acceptable biological catch (ABC) and an annual catch limit (ACL) for the stock as it exists within the complex. These numbers do not change if the species is pulled out of the complex. There are no additional tools available to managers to keep catches below the OFL if the stock is removed from the complex – that is, the same tools are available regardless of whether the stock is contained in the complex or not.

Removing the species from the complex appears to create more unnecessary disruption and usurp limited resources for little or no obvious benefit. Further, existing scientific information does not appear to warrant removal of the stock.

The burden on the Council and NMFS is to ensure overfishing is not occurring – this can be done while rougheye rockfish remains within the current complex. The considerable analysis compiled by the Groundfish Management Team over the last several months and considered by the Council during this process shows the strong commitment to ensuring overfishing is not occurring – the obligation to meet National Standard 1 guidelines has been met in terms of consideration and reorganization of complexes to ensure overfishing is not occurring. We see no immediate or obvious need to remove rougheye from the Minor Slope complex.

While NMFS has indicated they believe a conservation concern exists, we believe that this concern is mitigated by several factors:

First, the assessment as well as GMT documents and draft EIS all report that the rougheye rockfish found off of the west coast is a "fringe" stock and that the majority of the population is found further north in British Columbia and the Gulf of Alaska. The stock assessment states, "The West Coast is the southern portion of the range of rougheye rockfish, and it is likely that the population north of the U.S. – Canada border is not a separate stock." Page 33 of the DEIS reports, "The center of distributions for rougheye and blackspotted rockfish is the Gulf of Alaska and these species are at the fringe of their distributions on the U.S. west coast," and "It is likely the small proportion of removals in west coast fisheries will have little effect on overall stock status." The stock has been repeatedly assessed in the Gulf of Alaska and is deemed healthy with no overfishing occurring.

Second, the determination that the rougheye stock assessment is a category 2 stock versus a category 1 (as initially proposed by the SSC in September) seems to be an arbitrary policy designation rather than one based in scientific reality. The SSC reconsidered their determination "Given that the assessment is for a complex of two species (rougheye and blackspotted rockfish) and given that there is insufficient information available to confirm that these species have similar vulnerability to the fishery and rates of biological productivity, the SSC recommends that the assessment be classified as a category 2 assessment." Curiously, the North Pacific Fishery Management Council also conducts their rougheye assessment in conjunction with blackspotted rockfish seemingly without the added constraints of uncertainty surrounding the assessment of two stocks together.

The risk of overfishing the stock in the next two years is non-existent. Based on the recent assessment, the risk of overfishing over the next ten years is likely none. As the SSC has stated previously – the 10 year average is much more relevant and important than the catch in any one year. Nations Standard Guidelines also support this premise.

Lastly, it seems that there are only two options for consideration here – the first is status quo and the other is removing rougheye/shortraker from the complex. This does not appear to be the reasonable range of alternatives that is required by the National Environmental Policy Act (NEPA).

We believe that for all these reasons Rougheye rockfish should remain in the Minor Slope complex for the 2015-2016 management cycle. We are open to exploring a non-binding harvest guideline (HG) equal to the ABC/ACL that would trigger a mandatory sorting requirement. The non-binding HG and sorting requirement would result in greater information on rougheye catches in real time to help industry refine voluntary measures to reduce catches. This will also give us additional and more specific information to determine if removing the stock from the complex in a future management cycle is appropriate. Until we have this additional information we do not believe that removing the stock from the complex at this time is scientifically justified or appropriate.

Allow Affected Fleets to Utilize Voluntary Measures to Reduce Rougheye Rockfish Catches for the 2015-2016 Management Cycles

For all the reasons listed above we believe that letting the industry use voluntary methods to reduce catch is the most appropriate approach to the 2015-2016 management cycle versus mandatory management measures that will potentially have significant socio-economic implications for all of the sectors that catch Rougheye rockfish.

The first Rougheye stock assessment was completed in 2013. The assessment demonstrated that the stock was healthy and at approximately 47% of unfished biomass. The SSC initially recommended that the Council accept the full assessment and deemed it a category 1 stock. Subsequently, in November 2013 the SSC reconsidered the stock determination and recommended that the Council categorize the stock as a category 2 assessment, which the Council ultimately endorsed with little discussion.

While the "category" of a stock assessment does not affect the OFL level it does affect the ABC and ACL levels. The change in "category" reduced the possible ABC and associated ACL for 2015 by several metric tons to 184.3 mt. Between 2004 and 2012 there have been five years that the total fishery mortality has exceeded the proposed 2015 contributory OFL. Some of these years occurred prior to implementation of the trawl rationalization program, which should be taken into consideration as fishing behavior and strategies under the catch share program has obviously changed. For example, since the ITQ program the traditional bottom trawl fleet has reduced their catches of rougheye rockfish dramatically.

There is also considerable variability between the different sectors depending on the years. For example, in the years when the whiting sectors have caught higher amounts of rougheye it was associated with years of lower whiting abundance and fishing on younger fish. These conditions do not currently exist in the whiting fishery and will not likely exist over the next several years.

The affected industry sectors (at-sea whiting, shoreside whiting, traditional bottom trawl and limited entry fixed-gear longliners) have heard the call from NMFS regarding the conservation concern. As stated above, representatives from all of these sectors have met jointly to discuss the issue, attempt to determine the extent that industry members are aware of the problem and to begin discussions about what each industry sector is able to do on a voluntary basis to reduce rougheye catches.

Each of the affected sectors has committed to an outreach and education campaign targeting the fishermen within the sector about the importance of reducing Rougheye rockfish catches. Many industry members were really not aware of the problem. In fact, we would submit that many fishermen and managers alike were not aware of the extent of the problem prior to the designation of the rougheye rockfish assessment as a category 2 assessment or there would have been more discussion around changing that designation. We would like to work with NMFS to develop the outreach materials.

Additionally, several of the sectors have previously demonstrated the ability to voluntarily implement measures to change behaviors. The industry has identified continued exploration of various voluntary measures in addition to outreach and education efforts, such as information sharing, hot spot identification and avoidance, closed areas, and excluder development and use to help reduce rougheye rockfish catches. The at-sea whiting sectors as well as a portion of the shoreside whiting fleet have cooperative structures in place that can assist in facilitating voluntary measures. While the bottom trawl fleet and fixed gear fleet do not have formal cooperative programs, representatives have indicated a strong willingness to consider and implement voluntary measure to reduce catches.

Individual sectors will report to the Council and NMFS which voluntary efforts they are exploring as well as provide responses to some of the materials presented in the briefing materials such as the option for mandatory use of excluder devices which we do not favor at this time as they are still under development.

We are all in agreement that determining a formal allocation for the sectors that utilize rougheye rockfish in time for the 2015 season is not possible and should be avoided at this time. The potential negative socio-economic effects of establishing an allocation at this time with little or no biological benefit is unreasonable and a poor choice of limited resources – especially when the Rougheye rockfish stock is healthy and not really in danger of being overfished in the short or long term based on the best available scientific information available.

Conclusion

The undersigned organizations represent a majority of the industry that is affected by changes to Rougheye rockfish management. We do not believe the science or range of options adequately support removing Rougheye rockfish from the Minor Slope complex at this time. We believe that any conservation concern can be addressed through voluntary measures implemented through each of the fleets. We also support exploring a non-binding harvest guideline that will trigger a mandatory sorting requirement and will facilitate additional and real-time information sharing on rougheye catches.

Thank you for your consideration.

Heather Mann, Midwater Trawlers Cooperative
Brent Paine, United Catcher Boats
Brad Pettinger, Oregon Trawl Commission
Bob Alverson, Fishing Vessel Owners Association
Pete Leipzig, Fishermen's Marketing Association
Steve Bodnar, Coos Bay Trawlers Association
Gerry Richter, Point Conception Groundfishermen's Association
Rod Moore, West Coast Seafood Processors Association
Dan Waldeck, Pacific Whiting Conservation Cooperative

PFMC / West Coast Rougheye Rockfish Issue
Industry Meeting -- Proposed Agenda

Tuesday, March 25th - 9am

In person at United Catcher Boats (Seattle) and Midwater Trawlers Cooperative (Newport) offices
Or call-in at 800-791-2345, participant code 20569#

9:00 AM ***Call to order, identify participants***

9:05 AM ***Discussion of the Existing Problem***

- Recent catches of rougheye (GMT graphs)
- Recent PFMC action regarding rougheye
- Reporting issues (fish tickets & landings receipts)
- MSA mandate to prevent overfishing and what that means here

9:45 AM ***Recap of March Council Meeting***

- Set final overfishing levels (OFLs) for the 2015 – 2016 Groundfish Specifications
- Discussion was held on removing rougheye from complex
- Discussion around possible hard caps to keep catch of rougheye low in 2015-2016
- Discussion around possible allocation of rougheye to be determined by industry

10:15 AM ***Status Report by Industry Sector*** (Catcher Processors, Motherships, Shoreside whiting, traditional bottom trawl, fixed gear long line)

- How knowledgeable is your sector about this problem?
- What (if anything) is currently being done by your sector to reduce catch of rougheye?
- What can be done by your sector to reduce rougheye catches in the future?

10:45 AM ***Management Measure Alternatives***

- Hard caps (hard allocations to sectors)
  - Determined by industry
  - Determined by Groundfish Allocation Committee
- Harvest guidelines
- Mandatory closed areas (such as an RCA within the RCA)
- Voluntary measures
- Other?

11:15 AM ***Next Steps and Timing*** – At the April PFMC meeting the Council will take PRELIMINARY action on removing rougheye and shortraker from the complex with final action in June; Council will take PRELIMINARY action on identifying management measures to meet any alternatives with final action in June

- Decide on strategy for April PFMC meeting
  - Council / NMFS wants to hear from industry on where discussions are
  - Fight removal of Rougheye from Minor Slope complex?
    - Hire outside scientific research for June decision?
  - Embrace Rougheye / Shortraker as new complex and what this means for management measures?

IMPLEMENT THE 2014 PACIFIC WHITING FISHERY UNDER THE U.S.-CANADA PACIFIC WHITING AGREEMENT

A new stock assessment for Pacific whiting has been conducted (Agenda Item C.5.a, Attachment 1), reviewed, and used for decision-making in the international whiting treaty process. The Joint Management Committee (JMC) met on March 18-20 to formalize their recommendations on the 2014 coastwide total allowable catch for Pacific whiting. Mr. Phil Anderson and Mr. Frank Lockhart will brief the Council on the JMC's recommendations.

The Council should consider the estimated mortality of Pacific whiting in 2007-2012 research activities and in historical pink shrimp fisheries (Agenda Item C.5.a, Attachment 2) before deciding how much Pacific whiting yield to set aside for 2014. The Council should consider advisory body and public comment before deciding on any actions necessary regarding the 2014 U.S. annual catch limit for Pacific whiting and other associated issues.

Council Action:

1. **Determine yield set-asides of whiting to accommodate 2014 research activities and incidental catch in the pink shrimp fishery.**
2. **Consider any other necessary action for implementation of the 2014 Pacific whiting fishery.**

Reference Materials:

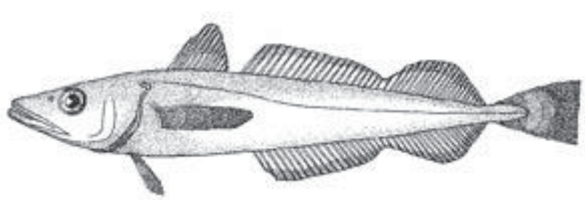
1. Agenda Item C.5.a, Attachment 1: Executive Summary of Status of the Pacific Hake (Whiting) Stock in U.S. and Canadian Waters in 2014 with a Management Strategy Evaluation. (***Full Version Available on Briefing Book Website and CD Only***).
2. Agenda Item C.5.a, Attachment 2: Table 1. Estimates of Pacific whiting mortality from 2007-2012 for Research and the Pink Shrimp Fishery.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Joint Management Committee Report — Phil Anderson and Frank Lockhart
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action:** Consider any Necessary Action for Implementation of the 2014 Pacific Whiting Fishery

PFMC
03/21/14

Status of the Pacific Hake (whiting) stock in U.S. and Canadian waters in 2014 with a management strategy evaluation



International Joint Technical Committee for Pacific Hake

Final Document
2/28/2014

This document reports the collaborative efforts of the official U.S. and Canadian JTC members.

Authors of this document are (In no particular order):

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Executive Summary

Stock

This assessment reports the status of the coastal Pacific Hake (or Pacific Whiting, *Merluccius productus*) resource off the west coast of the United States and Canada. This stock exhibits seasonal migratory behavior, ranging from offshore and generally southern waters during the winter spawning season to coastal areas between northern California and northern British Columbia during the spring, summer and fall when the fishery is conducted. In years with warmer water temperatures the stock tends to move farther to the North during the summer and older hake tend to migrate farther than younger fish in all years with catches in the Canadian zone typically consisting of fish greater than four years old. Separate, and much smaller, populations of hake occurring in the major inlets of the northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California, are not included in this analysis.

Catches

Coast-wide Pacific Hake landings averaged 223,238 mt from 1966 to 2013, with a low of 89,930 mt in 1980 and a peak of 363,157 mt in 2005. Prior to 1966, total removals were negligible compared to the modern fishery. Over the early period, 1966-1990, most removals were from foreign or joint-venture fisheries. Over all years, the fishery in U.S. waters averaged 167,171 mt, or 74.88% of the average total landings, while catch from Canadian waters averaged 56,067 mt.

In this stock assessment, the terms catch and landings are used interchangeably. Estimates of discard within the target fishery are included, but discarding of Pacific Hake in non-target fisheries is not. Discard from all fisheries is estimated to be less than 1% of landings in recent years. Recent coast-wide landings from 2010–2013 have been above the long term average of 223,238 mt. Landings between 2001 and 2008 were predominantly comprised of fish from the very large 1999 year class, with the cumulative removal from that cohort exceeding 1.2 million mt.

Recent coast-wide catches have been dominated by a small number of year classes. Catches in 2009 were dominated by the 2005 year class with some contribution from an emergent 2006 year class, and relatively small numbers of the 1999 cohort. The 2010 and 2011 fisheries caught very large numbers of the 2008 year-class, while continuing to see some of the 2005 and 2006 year-classes as well as a small proportion of the 1999 year class. Of the 2013 total coast-wide catch, 67% came from the 2010 year class. However, catch age-composition differed between the U.S. and Canada: in 2012, U.S. fisheries caught mostly 4 and 2-year old fish from the 2008 and 2010 year classes, while the Canadian fisheries caught older fish from the 2005, 2006, and 2008 year classes. In 2013, more than 70% of the U.S. catch was from the 2010 year class whereas Canadian catches were dominated by older fish from 2008, 2006, 2005, and 1999 year classes.

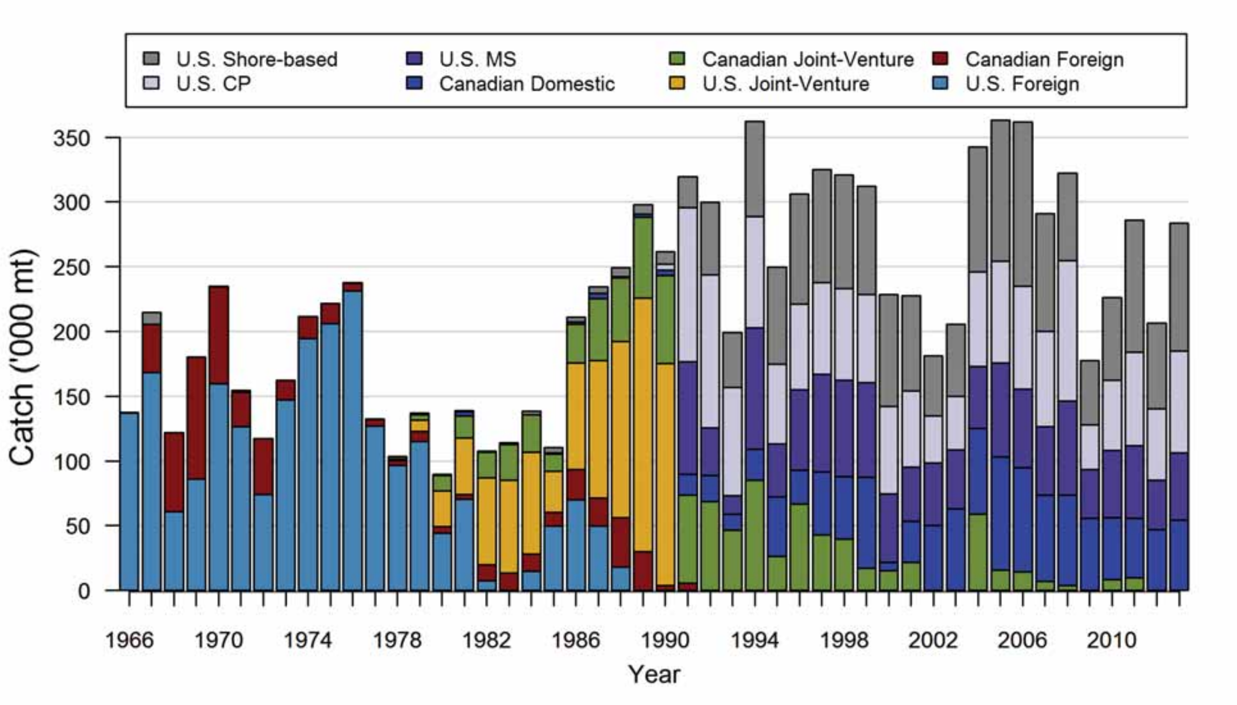

Figure a. Total Pacific Hake catch used in the assessment by sector, 1966-2013. U.S. tribal catches are included.

Table a. Recent commercial fishery catch (1,000's mt). U.S. tribal catches are included where applicable.

Year	US Mothership	US Catcher-Processor	US shore-based	US Total	Canadian joint-venture	Canadian domestic	Canadian total	Total
2004	48	73	97	217	59	66	125	342
2005	72	79	109	260	16	87	103	363
2006	61	79	127	267	14	80	95	362
2007	53	73	91	218	7	67	73	291
2008	72	108	68	248	4	70	74	322
2009	38	35	49	121	0	56	56	177
2010	52	54	64	170	8	48	56	226
2011	56	72	102	230	10	46	56	286
2012	39	55	66	160	0	47	47	206
2013	52	78	99	229	0	54	54	284

Data and assessment

New data include the 2013 acoustic survey biomass estimate as well as the 2013 fishery and acoustic survey age compositions. In addition, some histological analyses of hake ovaries have been undertaken, contributing to a preliminary re-examination of the Dorn and Saunders (1997) maturity estimates that were based on visual maturity determinations by observers during 1990–1992.

The Joint Technical Committee (JTC) assessment depends primarily on the fishery landings (1966-2013), acoustic survey biomass estimates and age-composition (1995-2013; Figure b), as well as fishery age-composition. While the 2011 survey index value was the lowest in the time-series, the index increased more than 2.5 times that value in 2012, and is now within 5% of the highest (2003) biomass estimate (2.42 million mt). Age-composition data from the aggregated fisheries (1975—2013) and the acoustic survey contribute to the assessment model's ability to resolve strong and weak cohorts: over 65% of the proportions at age from each source consisted of 2010 year class fish.

The assessment uses a Bayesian estimation approach, sensitivity analyses, and closed-loop simulations to evaluate the potential consequences of uncertainty in parameter estimates, alternative structural models, and management system performance, respectively. The Bayesian approach combines prior knowledge about natural mortality, stock-recruitment steepness (a parameter for stock productivity), and several other parameters with likelihoods for acoustic survey biomass indices and age-composition, as well as fishery age composition data. Integrating the joint posterior distribution over model parameters (via Markov Chain Monte Carlo simulation) provides probabilistic inferences about uncertain model parameters and forecasts derived from those parameters. Sensitivity analyses are used to identify alternative structural models that may also be consistent with the data. Finally, the closed-loop simulations provide an assessment of how alternative combinations of survey frequency, assessment model selectivity assumptions, and harvest control rules affect expected management outcomes given repeated application of these procedures over the long-term.

For the 2013-14 assessment, the JTC changed the structural form of the base assessment model to include time-varying fishery selectivity. The model retains many of the previous elements as configured in Stock Synthesis (SS3). Time-varying fishery selectivity was implemented by estimating random annual deviations from the estimated base selectivity parameters. We used the Laplace approximation with SS3 to estimate the random effects variance, ϕ, which controls the magnitude of year-to-year selectivity changes. In addition, we used both retrospective analysis and closed-loop simulations to compare expected performance of assessment models with or without time-varying selectivity.

Both retrospective and closed-loop simulation analyses support time-varying fishery selectivity as the new base assessment model. Retrospective analyses of estimated cohort strength (e.g., squid plots from 2013 assessment) showed that the time-varying selectivity assessment model reduced the magnitude of extreme cohort strength estimates. In closed-loop simulations, assessment models with time-varying fishery selectivity had higher median average catch, lower risk of falling below 10% of unfished biomass (B_0), smaller probability of fishery closures, and lower inter-annual variability in catch compared to assessment models with time-invariant fishery selectivity. It was found that even a small degree of flexibility in the assessment model fishery selectivity could reduce the effects of errors caused by assuming selectivity is constant over time.

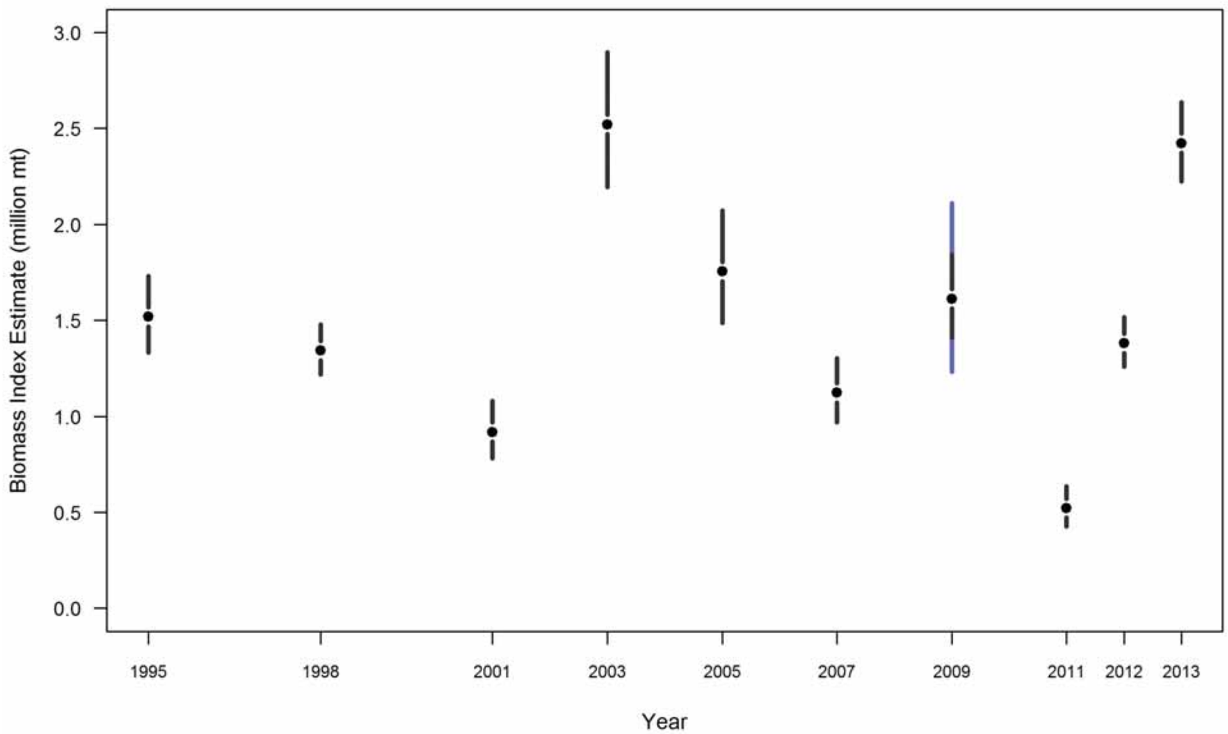

Figure b. Acoustic survey biomass index (millions of metric tons). Approximate 95% confidence intervals are based on only sampling variability (1995–2007, 2011–2013) in addition to squid/hake apportionment uncertainty (2009, in blue).

Stock biomass

The base model estimates indicate that since the 1960s, Pacific Hake female spawning biomass has ranged from well below to near unfished equilibrium biomass. The model estimates that the stock was below the unfished equilibrium in the 1960s and 1970s, increased toward the unfished equilibrium after two or more large recruitments occurred in the early 1980s, and then declined steadily through the 1990s to a low in 2000. This long period of decline was followed by a brief peak in 2003 as the large 1999 year class matured and subsequently supported the fishery for several years. Estimated female spawning biomass declined to an all-time low of 0.479 million mt in 2009 because of low recruitment between 2000 and 2007, along with a declining 1999 year class. Spawning biomass estimates have increased since 2009 on the strength of a large 2010 cohort and above average 2008 and 2009 cohorts. The 2014 female spawning biomass is estimated to be 81.8% of the unfished equilibrium level (B_0) with 95% posterior credibility intervals ranging from 41.6% to 168%. The median of the forecast for 2014 female spawning biomass is 1.72 million mt.

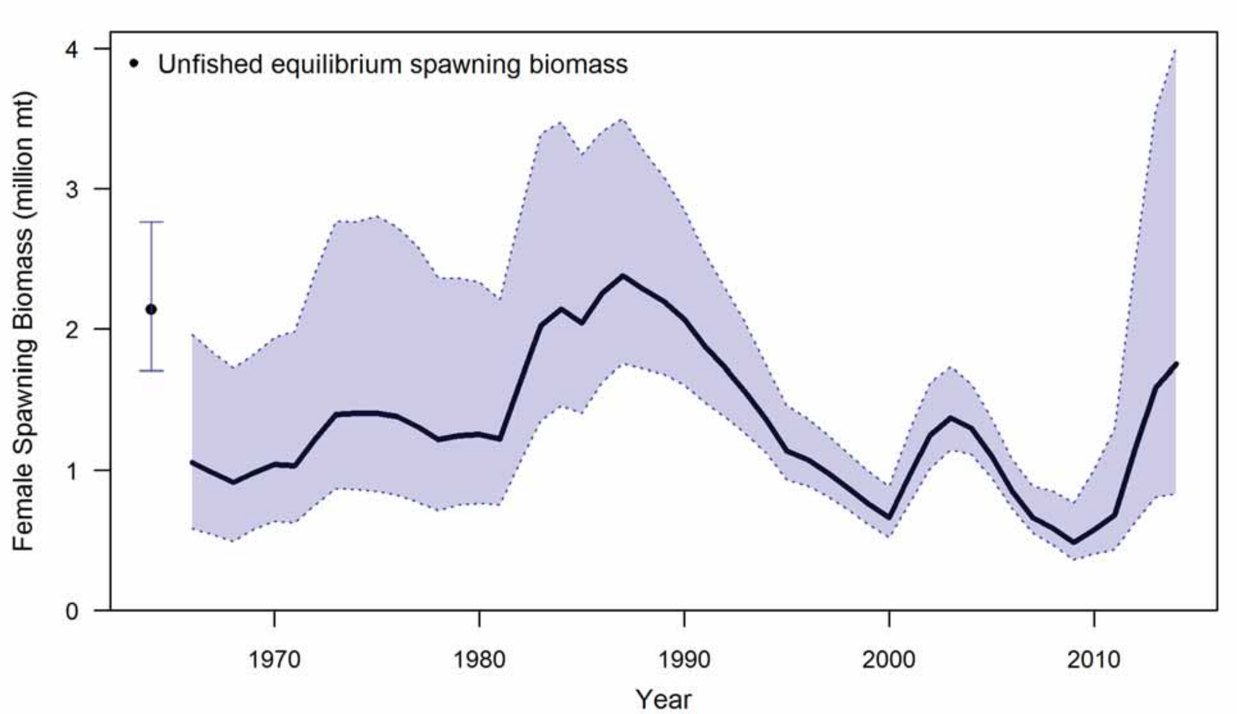

Figure c. Median of the posterior distribution for female spawning biomass through 2013 (solid line) with 95% posterior credibility intervals (shaded area).

Table b. Recent trends in estimated Pacific Hake female spawning biomass (million mt) and depletion level relative to estimated unfished equilibrium.

Year	Spawning biomass (mt)			Depletion (B_t/B_0)		
	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2005	0.951	1.090	1.343	0.418	0.517	0.647
2006	0.726	0.843	1.052	0.323	0.400	0.503
2007	0.553	0.656	0.867	0.247	0.311	0.401
2008	0.470	0.579	0.825	0.211	0.274	0.366
2009	0.365	0.479	0.746	0.169	0.228	0.327
2010	0.406	0.568	0.964	0.193	0.269	0.420
2011	0.443	0.669	1.271	0.215	0.317	0.543
2012	0.635	1.139	2.445	0.316	0.540	1.042
2013	0.813	1.566	3.499	0.410	0.745	1.526
2014	0.835	1.722	3.932	0.416	0.818	1.688

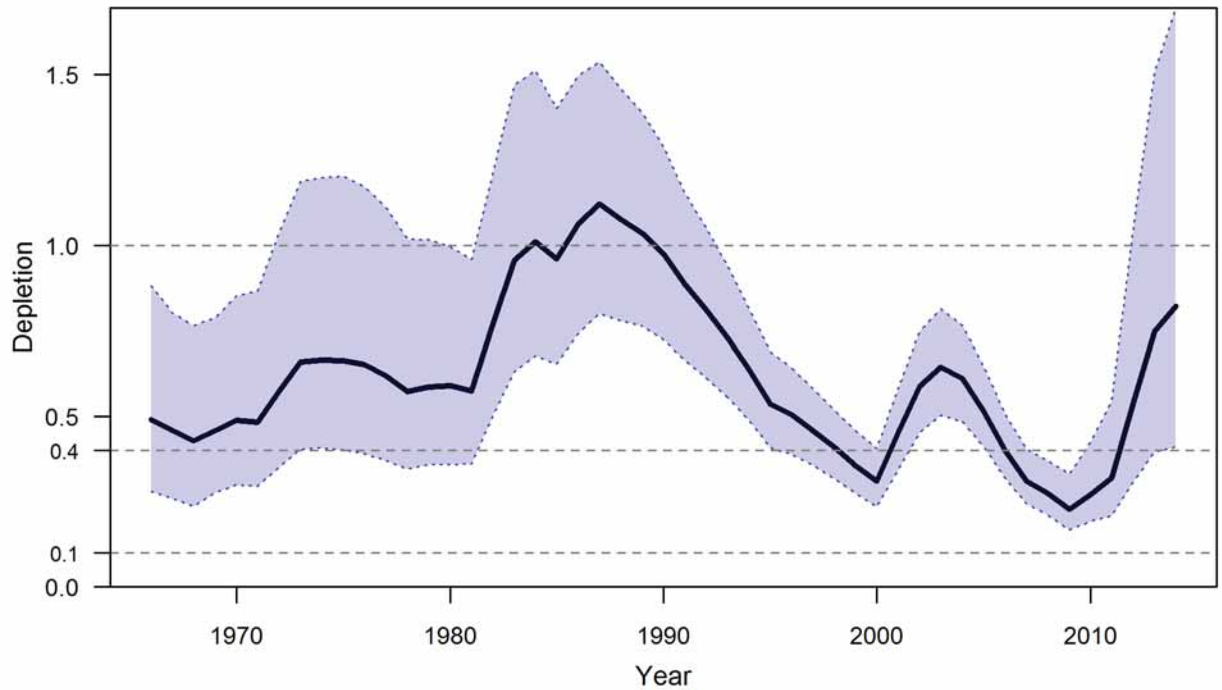

Figure d. Median (solid line) of the posterior distribution for spawning depletion (B_t/B_0) through 2013 with 95% posterior credibility intervals (shaded area). Dashed horizontal lines show 10%, 40% and 100% depletion levels.

Recruitment

Pacific Hake are estimated to have low average recruitment with occasional large year-classes. Very large year classes in 1980, 1984, and 1999 supported much of the commercial catch from the 1980's to the early 2000's. In the last decade, estimated recruitment has been at some of the lowest values in the time-series as well as some of the highest. The current assessment estimates a strong 2010 year class comprising 67% of the 2013 commercial catch. However, due to the small number of years it has been observed, its size is still uncertain. The model currently estimates a lower than average 2011 year class. The sizes of 2013 and 2014 year classes remain uninformed and are therefore characterized by the underlying stock recruitment assumption because these cohorts have not yet been observed in survey or commercial age-composition data. Retrospective analyses of year class strength for young fish consistently indicate that estimates of the most recent year classes are the least reliable.

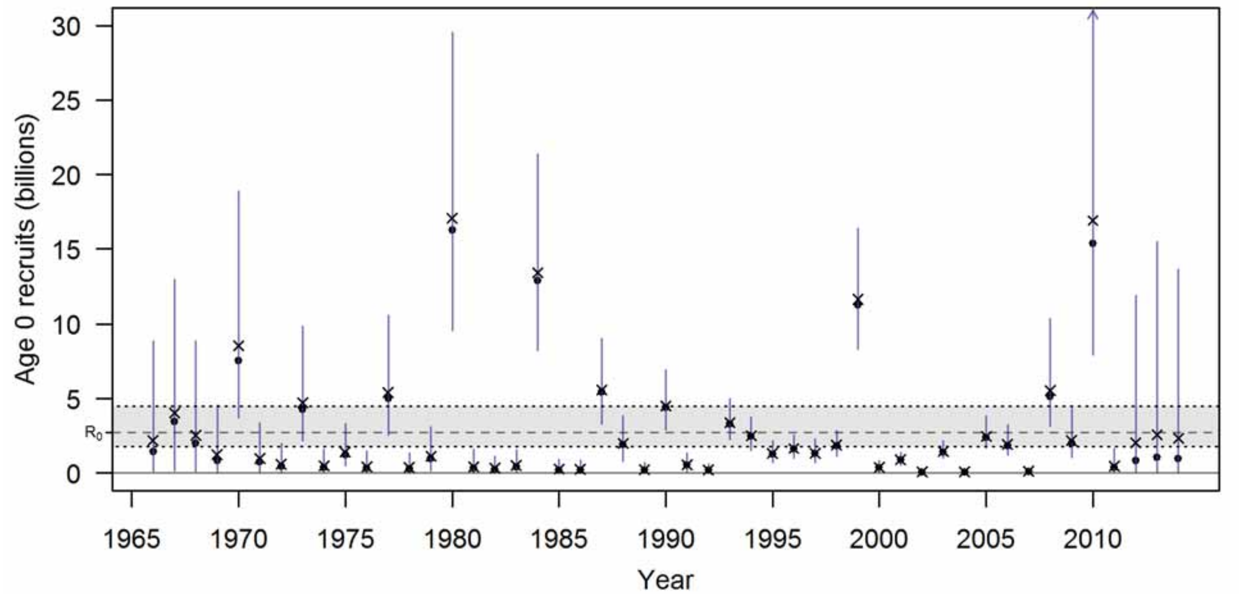

Figure e. Medians (solid circles) and means (x) of the posterior distribution for recruitment (billions of age-0) with 95% posterior credibility intervals (blue lines). The median of the posterior distribution for mean unfished equilibrium recruitment (R_0) is shown as the horizontal dashed line with a 95% posterior credibility interval shaded between the dotted lines.

Table c. Estimates of recent Pacific Hake recruitment (billions of age-0) and recruitment deviations (deviations below zero indicate less than average recruitment and deviations above zero indicate above average recruitment).

	Absolute recruitment			Recruitment deviation		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2003	0.99	1.41	2.16	0.02	0.36	0.67
2004	0.01	0.07	0.25	-4.35	-2.62	-1.49
2005	1.68	2.37	3.86	0.60	0.91	1.21
2006	1.21	1.84	3.23	0.32	0.69	1.07
2007	0.01	0.09	0.30	-4.11	-2.28	-1.12
2008	3.14	5.15	10.38	1.40	1.78	2.26
2009	1.06	2.01	4.37	0.34	0.87	1.42
2010	7.91	15.36	36.13	2.31	2.88	3.50
2011	0.04	0.37	1.64	-3.07	-0.90	0.49
2012	0.06	0.84	11.87	-2.79	-0.11	2.44

Exploitation status

Estimated fishing intensity on the stock was consistently below the $F_{40\%}$ target until recently when the target was likely exceeded in 2008, 2010 and 2011. The exploitation fraction does not necessarily correspond to fishing intensity because fishing intensity accounts for the age-structure: for example, fishing intensity remained nearly constant and above target from 2010 to 2011 but exploitation fraction declined in these years because of high estimated abundances of 1 year old fish. Fishing intensity for 2013 is highly likely to be below the management target.

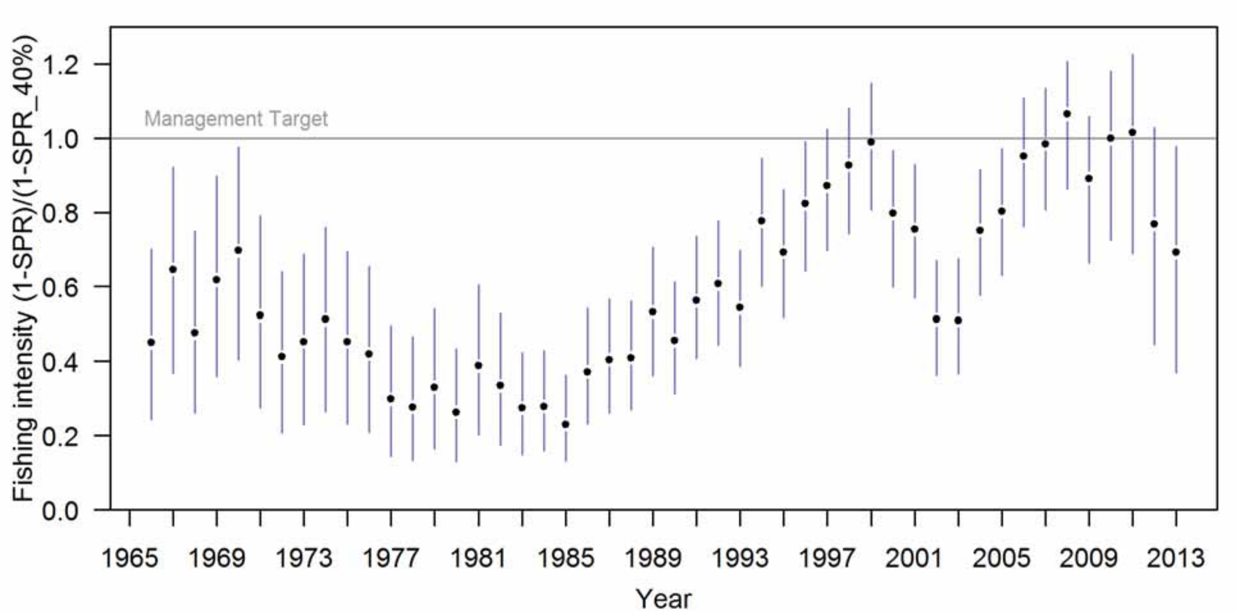

Figure f. Trend in median fishing intensity (relative to the SPR management target) through 2013 with 95% posterior credibility intervals. The management target defined in the Agreement is shown as a horizontal line at 1.0.

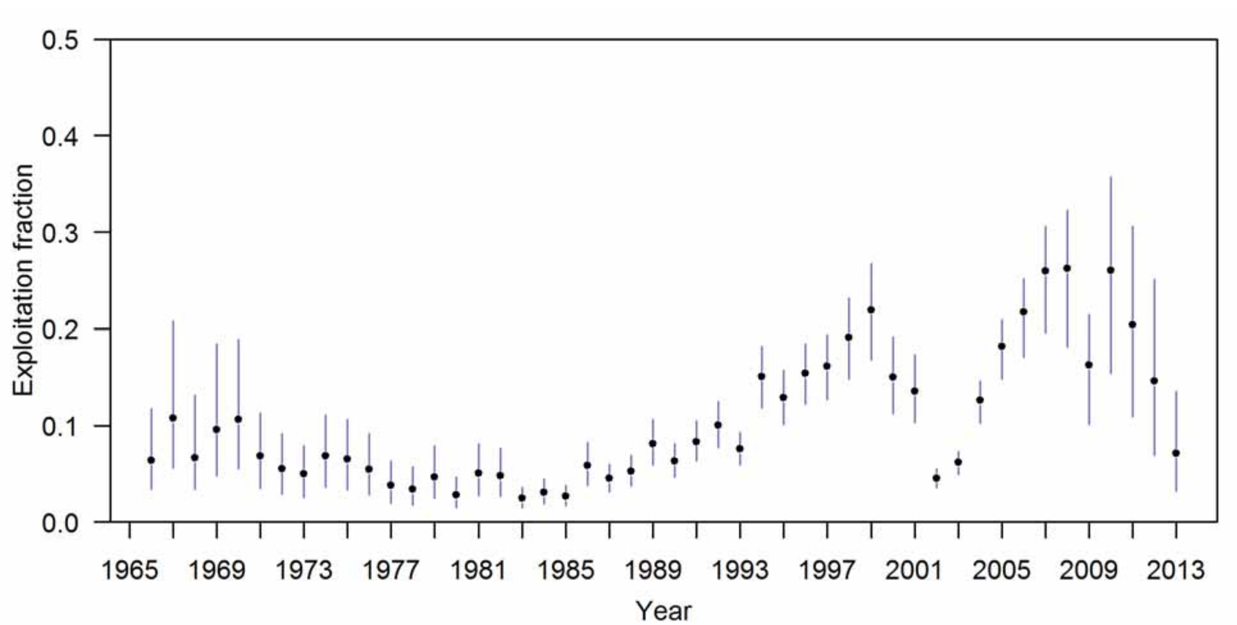

Figure g. Trend in median exploitation fraction through 2013 with 95% posterior credibility intervals.

Table d. Recent trend in fishing intensity (relative spawning potential ratio; (1-SPR)/(1-$SPR_{40\%}$)) and exploitation rate (catch divided by vulnerable biomass).

Year	Fishing intensity			Exploitation fraction		
	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2004	57.71%	74.95%	90.97%	10.31%	12.62%	14.59%
2005	63.47%	80.48%	96.47%	14.87%	18.21%	20.95%
2006	76.35%	95.26%	110.68%	17.18%	21.73%	25.23%
2007	80.39%	98.61%	113.44%	19.68%	25.91%	30.77%
2008	87.22%	106.41%	120.58%	18.62%	26.19%	32.42%
2009	67.03%	89.31%	105.88%	10.49%	16.24%	21.49%
2010	73.82%	100.00%	118.09%	15.78%	26.06%	35.87%
2011	69.50%	101.39%	122.51%	10.91%	20.49%	31.24%
2012	45.60%	76.88%	103.69%	6.97%	14.63%	25.18%
2013	37.91%	69.37%	98.87%	3.21%	7.20%	13.96%

Management performance

Over the last decade, the average coast-wide utilization rate (i.e., utilization = landings/quota) has been 86%. Over the 2009–2013 period, utilization rates differed between the United States (85%) and Canada (76%). Total landings last exceeded the coast-wide quota in 2002 when utilization was 112%.

Before 2007, estimated fishing intensity and biomass were below and above their respective targets, respectively (Figure h). Between 2007 and 2011, fishing intensity ranged from 89 to 106% and spawning biomass depletion (relative spawning biomass) between 23% and 32% of unfished levels (Tables d and b, respectively). Recent biomass estimates are higher and fishing intensities are lower than 2011 levels mainly because of contributions by the 2008 and 2010 cohorts (Figure e., Figure h). For 2013, there is an estimated 1% chance that fishing intensity estimates will be above the 100% target and spawning biomass depletion below the 40% target.

Table e: Recent trends in Pacific Hake landings and management decisions.

Year	Total Landings (mt)	Coast-wide (US+Canada) catch target (mt)	Proportion of catch target removed
2004	342,323	501,073	68.3%
2005	363,157	364,197	99.7%
2006	361,760	364,842	99.2%
2007	291,129	328,358	88.7%
2008	322,144	364,842	88.3%
2009	177,209	184,000	96.3%
2010	226,195	262,500	86.2%
2011	285,850	393,751	72.6%
2012	206,350	251,809	82.0%
2013	283,510	365,112	77.7%

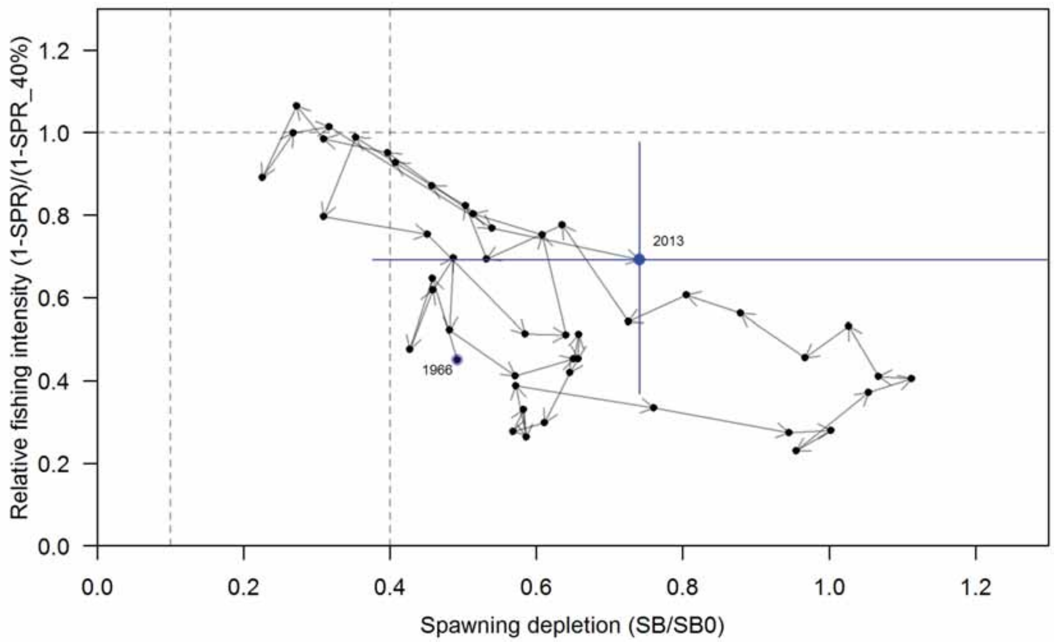

Figure h. Estimated historical path followed by fishing intensity and spawning biomass depletion for Pacific Hake over years 1966-2013, inclusive. Blue bars span the 95% credibility intervals for 2013 fishing intensity (vertical) and spawning biomass depletion (horizontal). The dashed lines indicate the fishing intensity target (horizontal) and the 40:10 harvest control rule (vertical) 10% and 40% depletion points.

Reference points

We report estimates of the 2014 base model reference points with posterior credibility intervals in Table f. The estimates differ very little from the 2013 assessment: the maximum difference between the 2013 and 2014 median reference point estimates is 3.66%, for the SB_{MSY} estimate.

Table f. Summary of median and 95% credibility reference points for the Pacific Hake base assessment model. Reference points were computed using 1966-2013 averages for mean size at age and selectivity at age.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female *B* (B_0, thousand mt)	1,690	2,132	2,748
Unfished recruitment (R_0, billions)	1,788	2,720	4,496
Reference points based on $F_{40\%}$			
Female spawning biomass ($B_{F40\%}$ thousand mt)	592	769	968
$SPR_{MSY\text{-}proxy}$	—	40%	—
Exploitation fraction corresponding to SPR	18.3%	21.6%	25.6%
Yield at $B_{F40\%}$ (thousand mt)	252	342	489
Reference points based on $B_{40\%}$			
Female spawning biomass ($B_{40\%}$ thousand mt)	676	853	1,099
$SPR_{B40\%}$	40.6%	43.2%	49.6%
Exploitation fraction resulting in $B_{40\%}$	14.9%	19.1%	23.2%
Yield at $B_{40\%}$ (thousand mt)	248	334	479
Reference points based on estimated MSY			
Female spawning biomass (B_{MSY} thousand mt)	347	519	844
SPR_{MSY}	18.9%	28.4%	43.4%
Exploitation fraction corresponding to SPR_{MSY}	18.9%	34.2%	57.1%
MSY (thousand mt)	263	363	524

Unresolved problems and major uncertainties

Uncertainty measures in the base model underestimate the total uncertainty in the current stock status and projections because they do not account for alternative structural models for hake population dynamics and fishery processes (e.g., selectivity), the effects of data-weighting schemes, and the scientific basis for prior probability distributions. To address structural uncertainties, the JTC investigated a broad range of alternative models, and we present a subset of key sensitivity analyses in the main document. The posterior distribution of derived parameters from the base model encompasses the median estimates of most sensitivity tests. We use the closed-loop simulation component of the Management Strategy Evaluation (MSE) to illustrate the long-term average management performance of alternative assessment models.

The Pacific Hake stock displays the highest degree of recruitment variability of any west coast groundfish stock, resulting in large and rapid biomass changes. This volatility adds to the uncertainty in estimates of current stock status and stock projections because of the dynamic fishery, which potentially targets strong cohorts resulting in time-varying fishery selectivity and limited data to estimate incoming recruitment in a timely manner (i.e., until the cohort is age 2 or greater). Within-model uncertainty in this assessment's spawning stock biomass is largely a function of the potentially large 2010 year class being observed twice in the acoustic survey and for the third year in the fishery data.

At the JMC's direction, we continued to develop the Management Strategy Evaluation (MSE) approach to explore the expected performance of alternative harvest policies involving annual or biennial surveys using more challenging operating models (Appendix A). Of the wide range of recommendations made by the 2013 SRG, the MSE steering group and the 2014 JTC meeting, we focused on: the effects of operating models with time-varying selectivity; increasing the frequency of a survey to annual from biennial, management procedures (MPs) using assessment models with and without time-varying selectivity, and the default harvest control rule with floors and ceilings on TAC recommendations. We also addressed last year's SRG recommendation of continuing work on the MSE by expanding the operating model to investigate the performance of a suite of assessment models with more complicated hypotheses about the dynamics of the Pacific Hake fishery, but this topic remains germane.

Developing alternative operating dynamics complicates analyses greatly. For example this year's closed-loop simulations only examined a single implementation of time-varying selectivity: there are many possible hypotheses about how this process is best modelled and statistical methods with which to estimate parameters describing these dynamics. How to determine estimation and simulation methods for time-varying selectivity is only a small subset of choices that are possible for modeling Pacific Hake; other hypotheses that might change our perception of stock status (spatial dynamics, time-varying changes in life-history parameters) will also involve complicated and difficult analyses. Decisions about what operating models to pursue with MSE will have to be made carefully. Furthermore, the JTC would like to continue the involvement of the JMC, SRG, and AP to further refine management objectives, as well as, determine scenarios of interest, management actions to investigate, and hypotheses to simulate.

Forecast decision table

A decision table showing predicted population status and fishing intensity relative to target fishing intensity is presented with uncertainty represented from within the base model. The decision table (split into Tables g.1 and g.2) is organized such that the projected outcomes for each potential catch level (rows) can be evaluated across the quantiles (columns) of the posterior distribution. The first table (g.1) shows projected depletion outcomes, and the second (g.2) shows projected fishing intensity outcomes relative to the target fishing intensity (based on SPR; see table legend). Fishing intensity exceeding 100% indicates fishing in excess of the $F_{40\%}$ default harvest rate.

Management metrics that were identified as important to the Joint Management Committee (JMC) and the Advisory Panel (AP) in 2012 are presented for projections to 2015 and 2016 (Tables g.3 and g.4). These metrics summarize the probability of various outcomes from the base model given each potential management action. Although not linear, probabilities can be interpolated from this table for intermediate catch values.

At all catch levels above 190,000 mt, the spawning biomass is predicted to decline with greater than 50% probability. The model predicts high biomass levels and the predicted probability of dropping below 10% is effectively zero and the maximum probability of dropping below B40% is 13% for all catches explored. It should be noted that in addition to the effects of natural morality, another reason that the model predicts declining spawning biomass even at relatively low catch levels, is that the model estimates below average recruitment of the 2011 and 2012 cohorts that would begin maturing in 2014.

Until cohorts are five or six years old, the model's prediction of cohort strength is uncertain. The size of the 2010 year class is certainly above average, but is a major source of uncertainty in future projections of spawning biomass and catch. Therefore, following the 2013 assessment of Pacific Hake, additional forecast decision tables were created given three states of nature about the size of the 2010 year class: low 2010 recruitment, medium 2010 recruitment, and high 2010 recruitment. Each state of nature is defined to have a probability of 10%, 80%, and 10%, respectively, defined by the corresponding range of quantiles for estimates of 2010 recruitment.

Tables h.1 and h.2 show the median depletion and fishing intensity within each state of nature, and it can be seen that in the low-2010 recruitment state of nature the fishing intensity would be slightly above target with a 2014 catch of 375,000 mt, and a projected biomass of 40% in 2016. Median depletion is predicted to decline in 2016 across all states of nature for all catches above 190,000 mt.

Tables h.3 and h.4 show the probability metrics in 2015 and in 2016 for each state of nature. Across all states of nature there are approximately equal probabilities that the spawning biomass in 2015 will be less than or greater than the spawning biomass in 2014 with a catch near 190,000 mt. For the low state of nature, there is less than a 50% probability that the 2015 spawning biomass will be below 40% of unfished equilibrium spawning biomass with a catch near 500,000 mt, but a constant catch of 375,000 mt in 2014 and 2015 results in a 50% probability that the spawning biomass in 2016 is less than 50% of unfished equilibrium spawning biomass.

An additional source of uncertainty was the 2013 estimate of biomass from the acoustic survey. Due to the presence of hake schools extending far offshore, the survey biomass estimate included an extrapolated area that contained at least 25% of the estimated biomass. No observations occurred in this extrapolated area, thus there was a concern that the biomass was overestimated. A sensitivity run using a 2013 acoustic survey biomass estimate without the extrapolated area resulted in a lower 2014 spawning biomass and a 12% reduction in the predicted 2014 default harvest rate catch.

Table g.1. Forecast quantiles of Pacific Hake spawning biomass depletion at the beginning of the year before fishing. Catch alternatives are based on: constant catch levels (rows a, e, g), the catch level that results in an equal probability of the population increasing or decreasing from 2014 to 2015 (row b), the approximate average catch over the last 5 years (row c), the catch level that results in the median spawning biomass to remain unchanged from 2014 to 2015 (row d), the approximate maximum historical catch (row f), the approximate maximum catch target (row h), the catch level that results in a 50% probability that the median projected catch will remain the same in 2015 (row i), the catch values that result in a median SPR ratio of 1.0 (row j), and the median values estimated via the default harvest policy ($F_{40\%}$ – 40:10) for the base (row k).

Within model quantile			5%	25%	50%	75%	95%
Management Action			**Beginning of year depletion**				
	Year	Catch (mt)					
a: No catch	2014	0	48%	64%	82%	102%	147%
	2015	0	52%	70%	88%	110%	158%
	2016	0	54%	72%	91%	112%	168%
b: B2014=B2015	2014	190000	48%	64%	82%	102%	147%
	2015	190000	47%	65%	84%	105%	154%
	2016	190000	45%	63%	82%	104%	159%
c: average historical catch	2014	235000	48%	64%	82%	102%	147%
	2015	235000	46%	64%	82%	104%	153%
	2016	235000	43%	61%	80%	102%	157%
d: med(B2014)=med(B2015)	2014	275000	48%	64%	82%	102%	147%
	2015	275000	45%	63%	82%	103%	153%
	2016	275000	41%	59%	78%	100%	156%
e	2014	325000	48%	64%	82%	102%	147%
	2015	325000	44%	62%	80%	102%	151%
	2016	325000	39%	57%	76%	98%	154%
f: near max historical catch	2014	375000	48%	64%	82%	102%	147%
	2015	375000	43%	61%	79%	101%	150%
	2016	375000	36%	55%	74%	96%	151%
g	2014	425000	48%	64%	82%	102%	147%
	2015	425000	42%	60%	78%	100%	149%
	2016	425000	33%	52%	71%	94%	149%
h: near max catch target	2014	500000	48%	64%	82%	102%	147%
	2015	500000	40%	58%	76%	98%	147%
	2016	500000	30%	49%	68%	90%	146%
i: highest C2014=C2015	2014	727000	48%	64%	82%	102%	147%
	2015	727000	35%	53%	71%	94%	141%
	2016	727000	20%	38%	58%	81%	135%
j: fishing intensity = 100%	2014	825000	48%	64%	82%	102%	147%
	2015	660000	32%	51%	69%	91%	139%
	2016	600000	19%	38%	57%	80%	135%
k: default harvest rule	2014	872424	48%	64%	82%	102%	147%
	2015	691686	31%	50%	68%	90%	139%
	2016	604762	17%	36%	55%	78%	133%

Table g.2. Forecast quantiles of Pacific Hake fishing intensity (1-SPR)/(1-SPR$_{40\%}$) for the 2014-2016 catch alternatives presented in Table g.1 Values greater than 100% indicate fishing intensities greater than the $F_{40\%}$ harvest policy.

Within model quantile			5%	25%	50%	75%	95%
Management Action			**Fishing Intensity**				
	Year	Catch (mt)					
a: No catch	2014	0	0%	0%	0%	0%	0%
	2015	0	0%	0%	0%	0%	0%
	2016	0	0%	0%	0%	0%	0%
b: B2014=B2015	2014	190000	23%	34%	42%	50%	66%
	2015	190000	23%	34%	42%	52%	68%
	2016	190000	21%	32%	40%	50%	67%
c: average historical catch	2014	235000	27%	40%	49%	59%	75%
	2015	235000	28%	40%	50%	61%	78%
	2016	235000	26%	39%	48%	60%	78%
d: med(B2014)=med(B2015)	2014	275000	31%	45%	55%	65%	82%
	2015	275000	32%	46%	56%	68%	86%
	2016	275000	30%	44%	55%	67%	87%
e	2014	325000	36%	51%	61%	72%	89%
	2015	325000	37%	52%	64%	76%	94%
	2016	325000	34%	51%	62%	76%	96%
f: near max historical catch	2014	375000	40%	56%	67%	78%	95%
	2015	375000	41%	58%	70%	83%	102%
	2016	375000	39%	57%	69%	84%	105%
g	2014	425000	44%	61%	72%	83%	101%
	2015	425000	46%	63%	76%	89%	108%
	2016	425000	43%	63%	76%	91%	113%
h: near max catch target	2014	500000	49%	67%	79%	90%	107%
	2015	500000	52%	71%	84%	97%	115%
	2016	500000	50%	71%	85%	101%	122%
i: highest C2014=C2015	2014	727000	63%	83%	95%	105%	121%
	2015	727000	68%	89%	102%	116%	132%
	2016	727000	67%	92%	107%	124%	138%
j: fishing intensity = 100%	2014	825000	68%	88%	100%	110%	125%
	2015	660000	65%	86%	100%	114%	132%
	2016	600000	59%	84%	100%	118%	136%
k: default harvest rule	2014	872424	71%	91%	102%	112%	127%
	2015	691686	67%	88%	103%	116%	134%
	2016	604762	60%	85%	102%	120%	137%

Table g.3. Probabilities of related to spawning biomass, fishing intensity, and 2015 catch limits for alternative 2014 catch options (catch options explained in Table g.1).

Catch in 2014	Probability $B_{2015}<B_{2014}$	Probability $B_{2015}<B_{40\%}$	Probability $B_{2015}<B_{25\%}$	Probability $B_{2015}<B_{10\%}$	Probability Fishing intensity in 2014 > 40% Target	Probability 2015 Catch Target < 2014 Catch
0	8%	1%	0%	0%	0%	0%
190,000	50%	2%	0%	0%	0%	0%
235,000	58%	3%	0%	0%	0%	0%
275,000	64%	3%	0%	0%	0%	1%
325,000	70%	3%	0%	0%	1%	3%
375,000	75%	4%	0%	0%	2%	5%
425,000	79%	4%	0%	0%	5%	9%
500,000	83%	5%	0%	0%	11%	18%
727,000	91%	9%	2%	0%	37%	50%
825,000	92%	12%	2%	0%	50%	62%
872,424	92%	13%	3%	0%	55%	68%

Table g.4. Probabilities of related to spawning biomass, fishing intensity, and 2016 catch limits for alternative 2015 catch options conditioned on specific catches in 2014 (catch options explained in Table g.1).

Catch in 2015	Probability $B_{2016}<B_{2015}$	Probability $B_{2016}<B_{40\%}$	Probability $B_{2016}<B_{25\%}$	Probability $B_{2016}<B_{10\%}$	Probability Fishing intensity in 2015 > 40% Target	Probability 2016 Catch Target < 2015 Catch
0	46%	1%	0%	0%	0%	0%
190,000	73%	3%	0%	0%	0%	0%
235,000	75%	4%	0%	0%	0%	0%
275,000	77%	5%	1%	0%	1%	2%
325,000	80%	6%	1%	0%	3%	4%
375,000	83%	7%	1%	0%	6%	7%
425,000	85%	10%	2%	0%	10%	13%
500,000	87%	14%	3%	0%	21%	24%
727,000	92%	27%	9%	1%	55%	58%
660,000	91%	28%	10%	2%	50%	54%
691,686	91%	30%	12%	2%	54%	57%

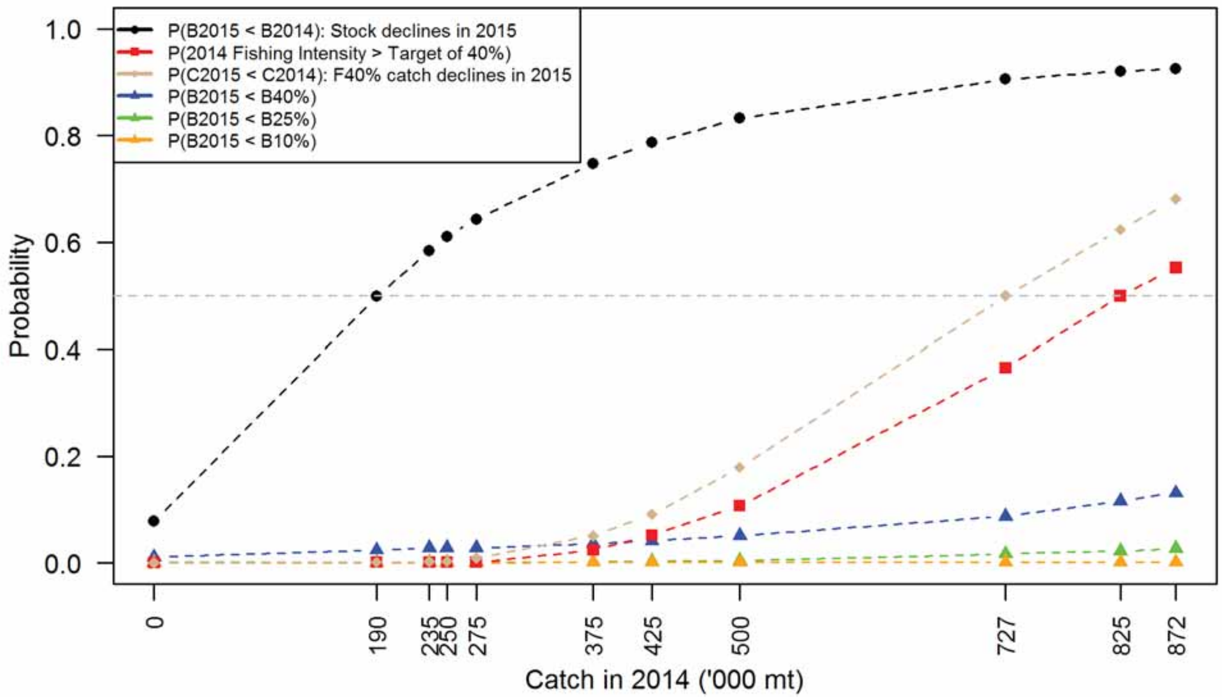

Figure i: Graphical representation of the results presented in Table g.4 for catch in 2014. The symbols indicate points that were computed directly from model output and lines interpolate between the points.

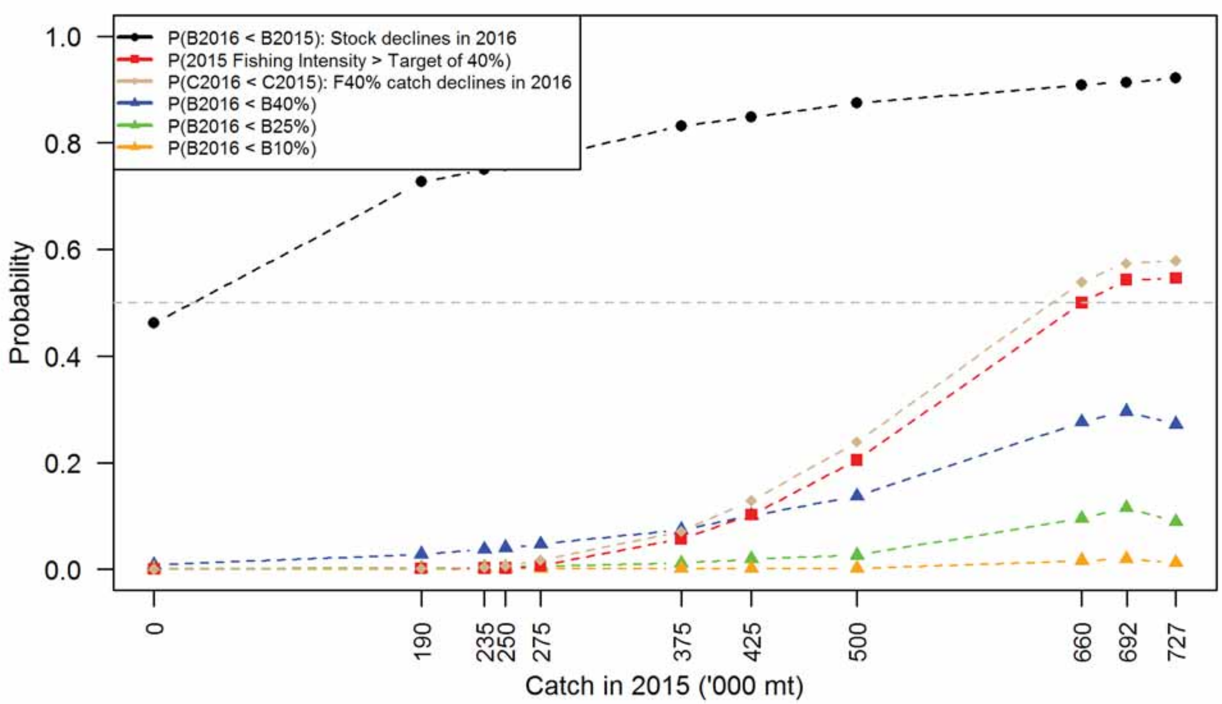

Figure j: Graphical representation of the results presented in Table g.4 for catch in 2015. The symbols indicate points that were computed directly from model output and lines interpolate between the points. These catches are conditional on the catch in 2014, and 2014 catch levels corresponding to the 2015 catches of 660 and 692 were higher (see Table g.1).

Table h.1. Forecast quantiles of Pacific Hake beginning of year depletion for the 2014-2016 catch alternatives presented in Table g.1.

Quantile range of 2010 recruitment			0–10%	10–90%	90–100%
Probability of state of nature			10%	80%	10%
Management Action			**Median Beginning of year depletion**		
	Year	Catch (mt)			
a: No catch	2014	0	49%	82%	141%
	2015	0	55%	88%	149%
	2016	0	59%	90%	145%
b: B2014=B2015	2014	190000	49%	82%	141%
	2015	190000	50%	83%	144%
	2016	190000	49%	82%	138%
c: average historical catch	2014	235000	49%	82%	141%
	2015	235000	49%	82%	143%
	2016	235000	47%	80%	136%
d: med(B2014)=med(B2015)	2014	275000	49%	82%	141%
	2015	275000	48%	82%	142%
	2016	275000	45%	78%	135%
e	2014	325000	49%	82%	141%
	2015	325000	47%	80%	141%
	2016	325000	43%	76%	133%
f: near max historical catch	2014	375000	49%	82%	141%
	2015	375000	46%	79%	140%
	2016	375000	40%	73%	131%
g	2014	425000	49%	82%	141%
	2015	425000	44%	78%	139%
	2016	425000	37%	71%	129%
h: near max catch target	2014	500000	49%	82%	141%
	2015	500000	43%	76%	138%
	2016	500000	34%	68%	126%
i: highest C2014=C2015	2014	727000	49%	82%	141%
	2015	727000	37%	71%	133%
	2016	727000	22%	57%	117%
j: fishing intensity = 100%	2014	825000	49%	82%	141%
	2015	660000	34%	69%	130%
	2016	600000	21%	57%	116%
k: default harvest rule	2014	872424	49%	82%	141%
	2015	691686	33%	68%	129%
	2016	604762	19%	55%	115%

Table h.2. Forecast quantiles of Pacific Hake fishing intensity for the 2014-2016 catch alternatives presented in Table g.1 Values greater than 100% indicate fishing intensities greater than the $F_{40\%}$ harvest policy.

Quantile range of 2010 recruitment			0–10%	10–90%	90–100%
Probability of state of nature			10%	80%	10%
Management Action			**Median Fishing Intensity**		
	Year	Catch (mt)			
a: No catch	2014	0	0%	0%	0%
	2015	0	0%	0%	0%
	2016	0	0%	0%	0%
b: B2014=B2015	2014	190000	66%	42%	23%
	2015	190000	68%	42%	24%
	2016	190000	66%	41%	22%
c: average historical catch	2014	235000	75%	49%	27%
	2015	235000	78%	50%	29%
	2016	235000	77%	48%	27%
d: med(B2014)=med(B2015)	2014	275000	82%	55%	31%
	2015	275000	86%	56%	33%
	2016	275000	86%	55%	31%
e	2014	325000	89%	61%	36%
	2015	325000	94%	64%	38%
	2016	325000	96%	63%	36%
f: near max historical catch	2014	375000	96%	67%	40%
	2015	375000	102%	70%	42%
	2016	375000	104%	70%	40%
g	2014	425000	101%	72%	44%
	2015	425000	108%	76%	46%
	2016	425000	112%	76%	45%
h: near max catch target	2014	500000	107%	79%	49%
	2015	500000	116%	84%	52%
	2016	500000	121%	85%	51%
i: highest C2014=C2015	2014	727000	121%	95%	63%
	2015	727000	132%	102%	68%
	2016	727000	137%	108%	69%
j: fishing intensity = 100%	2014	825000	125%	100%	68%
	2015	660000	132%	100%	65%
	2016	600000	135%	101%	62%
k: default harvest rule	2014	872424	127%	102%	70%
	2015	691686	134%	103%	67%
	2016	604762	136%	102%	62%

Table h.3. Probabilities related to spawning biomass, fishing intensity, and 2015 catch limits for alternative 2014 catch options (catch options explained in Table g.1) and low, mid, and high state of nature. States of nature are defined on the lower 10%, middle 80%, and high 10% quantiles of 2010 recruitment.

	Catch in 2014	Probability SB2015< SB2014	Probability SB2015< SB40%	Probability SB2015< SB25%	Probability SB2015< SB10%	Probability Fishing intensity in 2014 > 40% Target	Probability 2015 Catch Target < 2014 Catch
Lower 10% of 2010 recruitment	0	0%	10%	1%	0%	0%	0%
	190,000	53%	22%	1%	0%	1%	1%
	235,000	65%	26%	1%	0%	1%	2%
	275,000	71%	26%	1%	0%	1%	9%
	325,000	78%	28%	1%	0%	5%	26%
	375,000	83%	32%	2%	1%	24%	50%
	425,000	88%	35%	3%	1%	52%	75%
	500,000	90%	43%	4%	1%	92%	94%
	727,000	93%	60%	16%	1%	100%	99%
	825,000	96%	71%	21%	1%	100%	99%
	872,424	96%	75%	26%	1%	100%	99%
Middle 80% of 2010 recruitment	0	7%	0%	0%	0%	0%	0%
	190,000	49%	0%	0%	0%	0%	0%
	235,000	58%	0%	0%	0%	0%	0%
	275,000	64%	0%	0%	0%	0%	0%
	325,000	69%	1%	0%	0%	0%	0%
	375,000	74%	1%	0%	0%	0%	0%
	425,000	78%	1%	0%	0%	0%	2%
	500,000	84%	1%	0%	0%	2%	11%
	727,000	91%	3%	0%	0%	33%	50%
	825,000	92%	6%	0%	0%	50%	66%
	872,424	93%	7%	0%	0%	57%	73%
Upper 10% of 2010 recruitment	0	26%	0%	0%	0%	0%	0%
	190,000	54%	0%	0%	0%	0%	0%
	235,000	59%	0%	0%	0%	0%	0%
	275,000	63%	0%	0%	0%	0%	0%
	325,000	68%	0%	0%	0%	0%	0%
	375,000	70%	0%	0%	0%	0%	0%
	425,000	73%	0%	0%	0%	0%	0%
	500,000	74%	0%	0%	0%	0%	0%
	727,000	84%	0%	0%	0%	0%	0%
	825,000	88%	0%	0%	0%	0%	0%
	872,424	88%	0%	0%	0%	0%	0%

Table h.4. Probabilities related to spawning biomass, fishing intensity, and 2016 catch limits for alternative 2015 catch options (catch options explained in Table g.1) and low, mid, and high state of nature. States of nature are defined on the lower 10%, middle 80%, and high 10% quantiles of 2010 recruitment.

	Catch in 2015	Probability SB2016< SB2015	Probability SB2016< SB40%	Probability SB2016< SB25%	Probability SB2016< SB10%	Probability Fishing intensity in 2015 > 40% Target	Probability 2016 Catch Target < 2015 Catch
Lower 10% of 2010 recruitment	0	23%	7%	1%	0%	0%	0%
	190,000	67%	24%	2%	0%	1%	1%
	235,000	70%	30%	3%	1%	2%	4%
	275,000	72%	38%	6%	1%	6%	17%
	325,000	74%	45%	7%	1%	30%	35%
	375,000	77%	50%	10%	1%	56%	62%
	425,000	80%	60%	18%	1%	80%	78%
	500,000	85%	69%	24%	1%	97%	93%
	727,000	93%	90%	58%	12%	99%	98%
	660,000	91%	90%	61%	16%	99%	98%
	691,686	91%	90%	62%	19%	99%	98%
Middle 80% of 2010 recruitment	0	46%	0%	0%	0%	0%	0%
	190,000	73%	1%	0%	0%	0%	0%
	235,000	75%	1%	0%	0%	0%	0%
	275,000	77%	1%	0%	0%	0%	0%
	325,000	80%	2%	0%	0%	0%	0%
	375,000	84%	3%	0%	0%	0%	1%
	425,000	85%	5%	0%	0%	3%	6%
	500,000	88%	9%	0%	0%	14%	18%
	727,000	92%	23%	4%	0%	56%	60%
	660,000	91%	23%	4%	0%	50%	55%
	691,686	92%	26%	7%	0%	55%	59%
Upper 10% of 2010 recruitment	0	69%	0%	0%	0%	0%	0%
	190,000	78%	0%	0%	0%	0%	0%
	235,000	81%	0%	0%	0%	0%	0%
	275,000	83%	0%	0%	0%	0%	0%
	325,000	84%	0%	0%	0%	0%	0%
	375,000	86%	0%	0%	0%	0%	0%
	425,000	87%	0%	0%	0%	0%	0%
	500,000	88%	0%	0%	0%	0%	0%
	727,000	92%	0%	0%	0%	0%	0%
	660,000	90%	0%	0%	0%	0%	0%
	691,686	91%	0%	0%	0%	0%	0%

Research and data needs

There are many research projects that could improve the stock assessment for Pacific Hake. The following prioritized list of topics might appreciably improve biological understanding and decision-making:

1. Examine statistical methods to parameterize time-varying fishery selectivity in assessment and forecasting.

2. Continue development of the management strategy evaluation (MSE) tools to evaluate major sources of uncertainty relating to data, model structure and the harvest policy for this fishery and compare potential methods to address them. Work with the JMC, SRG, and AP to develop scenarios to investigate, management performance metrics to evaluate the scenarios, and hypotheses related to the life-history, fishery, spatial dynamics, and management of Pacific Hake.

3. Continue to explore alternative indices for juvenile or young (0 and/or 1 year old) Pacific Hake. Initially, the MSE should be used to investigate whether an age-0 or -1 index could reduce stock assessment and management uncertainty enough to improve overall management performance.

4. Finalize the analysis of recently collected maturity samples and explore ways to include new maturity estimates in the assessment.

5. Routinely collect and analyze life-history data, including maturity and fecundity for Pacific Hake. Explore possible relationships among these life history traits as well as with body growth and population density. Currently available information is limited and outdated.

6. Conduct further exploration of ageing imprecision and the effects of large cohorts via simulation and blind source age-reading of samples with differing underlying age distributions – with and without dominant year classes.

7. Continue to explore process-based operating and assessment models that may be able to capture more realistic life-history variability (changes in size at age, M, fecundity at size etc.), as well as future fishery selectivity patterns.

8. Conduct research to improve the acoustic survey estimates of age and abundance. This includes, but is not limited to, species identification, target verification, target strength and alternative technologies to assist in the survey, as well as improved and more efficient analysis methods.

9. Maintain the flexibility to undertake annual acoustic surveys for Pacific Hake under pressing circumstances in which uncertainty in the hake stock assessment presents a potential risk to or underutilization of the stock.

10. Evaluate the quantity and quality of historical biological data (prior to 1988 from the Canadian fishery, and prior to 1975 from the U.S. fishery) for use as age-composition and weight-at-age data, and/or any historical indications of abundance fluctuations.

11. Investigate meta-analytic methods for developing a prior on degree of recruitment variability (σ_r), and for refining existing priors for natural mortality (M) and steepness of the stock-recruitment relationship (h).

12. Apply bootstrapping methods to the acoustic survey time-series to incorporate more of the relevant uncertainties into the survey variance calculations. These factors include the target strength relationship, subjective scoring of echograms, thresholding methods, the species-mix and demographic estimates used to interpret the acoustic backscatter, and others.

13. Coordinate our MSE research with other scientists in the region engaging in similar research.

14. Examine variation (annual and seasonal) in key life-history quantities (i.e., length at age).

15. Examine alternative ways to model and forecast recruitment.

16. Investigate the utility of additional data sources (bottom trawl surveys, length data, etc.) for use in assessment and simulation models.

1 Introduction

The Joint US-Canada Agreement for Pacific Hake (called the Agreement) was formally ratified in 2006 (signed in 2007) by the United States as part of the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act. Although the Agreement has been considered to be in force by Canada since June 25, 2008, an error in the original U.S. text required that the Agreement be ratified again before it could be implemented. This second ratification occurred in 2010. Under the Agreement, Pacific Hake or Whiting (*Merluccius productus*) stock assessments are to be prepared by the Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists, and reviewed by the Scientific Review Group (SRG), consisting of representatives from both nations. Additionally, the Agreement calls for both of these bodies to include industry-nominated scientists, who are selected and appointed jointly by both nations.

This assessment reports a base model representing the collective work of the JTC. The assessment depends primarily upon the acoustic survey biomass index time-series for information on the scale of the current hake stock. Age-composition data from the aggregated fishery and the acoustic survey provide additional information allowing the model to resolve strong and weak cohorts. Both sources show a moderately strong 2008 cohort and a very strong 2010 cohort.

This assessment is fully Bayesian, with the base model incorporating prior information on several key parameters (including natural mortality, *M*, and steepness of the stock-recruit relationship, *h*) and integrating over estimation and parameter uncertainty to provide results that can be probabilistically interpreted. From a range of alternate models investigated by the JTC, a subset of sensitivity analyses are also reported in order to provide a broad qualitative comparison of structural uncertainty with respect to the base. These sensitivity analyses are thoroughly described in this assessment document. The structural assumptions of the 2014 base model are mostly similar to the 2013 base model. The most important change between the two is that the 2014 base model includes estimation of time-varying selectivity in the fishery.

1.1 Stock structure and life history

Pacific Hake, also referred to as Pacific Whiting, is a semi-pelagic schooling species distributed along the west coast of North America generally ranging from 25° N. to 55° N. latitude (see Figure 1 for an overview map). It is among 18 species of hake from four genera (being the majority of the family *Merluccidae)*, which are found in both hemispheres of the Atlantic and Pacific oceans (Alheit and Pitcher 1995, Lloris et al. 2005). The coastal stock of Pacific Hake is currently the most abundant groundfish population in the California Current system. Smaller populations of this species occur in the major inlets of the Northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California. Genetic studies indicate that the Strait of Georgia and the Puget Sound populations are genetically distinct from the coastal population (Iwamoto et al. 2004; King et al. 2012). Genetic differences have also been found between the coastal population and hake off the west coast of Baja California (Vrooman and Paloma 1977). The coastal stock is also distinguished from the inshore populations by larger body size and seasonal migratory behavior.

The coastal stock of Pacific Hake typically ranges from the waters off southern California to northern British Columbia and in some years to southern Alaska, with the northern boundary related to fluctuations in annual migration. In spring, adult Pacific Hake migrate onshore and northward to feed along the continental shelf and slope from northern California to Vancouver Island. In summer, Pacific Hake often form extensive mid-water aggregations in association with the continental shelf break, with highest densities located over bottom depths of 200–300 m (Dorn 1991, 1992).

Older Pacific Hake exhibit the greatest northern migration each season, with two- and three-year old fish rarely observed in Canadian waters north of southern Vancouver Island. During El Niño events (warm ocean conditions, such as 1998), a larger proportion of the stock migrates into Canadian waters, apparently due to intensified northward transport during the period of active migration (Dorn 1995, Agostini et al. 2006). In contrast, La Niña conditions (colder water, such as in 2001) result in a southward shift in the stock's distribution, with a much smaller proportion of the population found in Canadian waters, as seen in the 2001 survey (Figure 2).

Additional information on the stock structure for Pacific Hake is available in the 2013 Pacific Hake Stock Assessment document (JTC 2013).

1.2 Ecosystem considerations

Pacific Hake are an important contributor to ecosystem dynamics in the Eastern Pacific due to their relatively large total biomass and potentially large role as both prey and predator in the Eastern Pacific Ocean. A more detailed description of ecosystem considerations is given in the 2013 Pacific Hake stock assessment (JTC 2013).

1.3 Management of Pacific Hake

Since implementation of the Magnuson-Stevens Fishery Conservation and Management Act in the U.S. and the declaration of a 200 mile fishery conservation zone in both countries in the late 1970s, annual quotas (or catch targets) have been used to limit the catch of Pacific Hake in both zones. Scientists from both countries historically collaborated through the Technical Subcommittee of the Canada-U.S. Groundfish Committee (TSC), and there were informal agreements on the adoption of annual fishing policies. During the 1990s, however, disagreements between the U.S. and Canada on the allotment of the catch limits between U.S. and Canadian fisheries led to quota overruns; 1991-1992 national quotas summed to 128% of the coast-wide limit, while the 1993-1999 combined quotas were 107% of the limit, on average. The Agreement between the United States and Canada, establishes U.S. and Canadian shares of the coast-wide allowable biological catch at 73.88% and 26.12%, respectively, and this distribution has been adhered to since ratification of the Agreement.

Throughout the last decade, the total coast-wide catch has tracked harvest targets reasonably well (Table 2). Since 1999, catch targets have been determined using an $F_{SPR=40\%}$ default harvest rate with a 40:10 control rule that decreases the catch linearly from the catch target at a depletion (relative spawning biomass) of 40% and above, to zero catch at a depletion of 10% or less (called the default harvest policy in the Agreement). Further considerations have often resulted in catch targets to be set lower than the recommended catch limit. In the last decade, total catch has never exceeded the quota, but harvest rates have approached the $F_{SPR=40\%}$ target, and based upon this assessment, may have exceeded the target in a few years. Overall, management appears to be effective at maintaining a sustainable stock size, in spite of uncertain stock assessments. However, management has been precautionary in years when very large quotas were predicted by the stock assessment.

1.3.1 Management of Pacific Hake in Canada

Canadian groundfish managers distribute their portion (26.12%) of the Total Allowable Catch (TAC) as quota to individual license holders. In 2013, the Canadian Hake fleet was given its TAC plus 7,724 mt of uncaught carryover from the 2012 season. This total allocation was high enough that Canadian fisheries managers allotted a portion of it (19,230 mt) to a Joint Venture (JV) fishery. Despite the allocation of quota to the JV fishery, there was insufficient catch by domestic vessels to entice any JV motherships to enter Canadian waters in 2012 or 2013.

In 2013, all Canadian Pacific Hake trips remained subject to 100% observer coverage, by either electronic monitoring (EM) or on-board observer. All shoreside Hake landings are also subject to 100% coverage by the groundfish Dockside Monitoring Program (DMP). Retention of all catch, with the exception of prohibited species, is mandatory. The retention of groundfish other than Sablefish, Mackerel, Walleye Pollock, and Pacific Halibut on non-observed but electronically monitored, dedicated Pacific Hake trips cannot exceed 20% of the landed catch weight.

For the 2013 fishing season, the Canadian Hake industry asked that vessels document, in their logbooks, any instance of contact of their mid-water nets with the ocean bottom, in order to address a condition of the Marine Stewardship Certification (MSC).

1.3.2 Management of Pacific Hake in the United States

In the U.S. zone, participants in the directed fishery are required to use pelagic trawls with a codend mesh that is at least 7.5 cm (3 inches). Regulations also restrict the area and season of fishing to reduce the bycatch of Chinook salmon and several depleted rockfish stocks. The at-sea fisheries begin on May 15, but processing and night fishing (midnight to one hour after official sunrise) are prohibited south of 42° N. latitude (the Oregon-California border). Shore-based fishing is allowed after April 1 south of 42° N. latitude, but only 5% of the shore-based allocation is released prior to the opening of the main shore-based fishery (June 15). The current allocation agreement, effective since 1997, divides the U.S. non-tribal harvest guideline among catcher-processors (34%), motherships (24%), and the shore-based fleet (42%). Since 2011, the non-tribal U.S. fishery has been fully rationalized with allocations in the form of IFQs to the shore-based sector and group shares to cooperatives in the at-sea mothership and catcher-processor sectors. Starting in 1996, the Makah Indian Tribe has conducted a separate fishery with a specified allocation in its "usual and accustomed fishing area”. Since 2009 there has also been a Quileute tribal allocation, which has never been fished.

Shortly after the 1997 allocation agreement was approved by the PFMC, fishing companies owning catcher-processor (CP) vessels with U.S. west coast groundfish permits established the Pacific Whiting Conservation Cooperative (PWCC). The primary role of the PWCC is to distribute the CP allocation among its members in order to achieve greater efficiency and product quality, as well as promoting reductions in waste and bycatch rates relative to the former “derby” fishery in which all vessels competed for a fleet-wide quota. The mothership fleet (MS) has also formed a cooperative where bycatch allocations are pooled and shared among the vessels.

1.4 Fisheries

The fishery for the coastal population of Pacific Hake occurs along the coasts of northern California, Oregon, Washington, and British Columbia primarily during May–November. The fishery is conducted almost exclusively with mid-water trawls. Foreign fleets dominated the fishery until 1991, when domestic fleets began taking the majority of the catch. Catches were occasionally above 200,000 mt prior to 1986, and have been mostly above that level since.

A more detailed description of the history of the fishery is provided in the 2013 Pacific Hake stock assessment (JTC 2013).

1.4.1 Overview of the fisheries in 2013

The Joint Management Committee (JMC) determined an adjusted coast-wide catch target of 365,112 mt for 2013, with a U.S. allocation of 269,745 mt (73.88%) and a Canadian allocation of 95,367 mt (26.12%). A review of the 2013 fishery is given below.

1.4.1.1 Canada
The 2013 Pacific Hake domestic fishery removed 54,096 mt from Canadian waters, or 57% of the Canadian TAC. The low catches by the domestic fishery dissuaded the Joint Venture vessels from participating in the fishery, even though there was a quota allocated to them. The 2010 year class was nearly completely absent in Canada, where it only made up 0.9% of the catch numbers. The most abundant year classes (by number) in the Canadian catch were age 5 at 17.2%, age 7 at 18.2%, age 8 at 11.4%, and age 14 at 16.3%, being the 2008, 2006, 2005, and 1999 year classes, respectively. Remarkably, the 1999 cohort, now age 14, is still making up a significant portion of the catch in Canada.

The distribution of catch by month remained similar to other years, with the summer months showing the greatest catch. When compared to recent years, September 2013 was slightly more productive for vessels but the catches dropped off quickly in October and were all but finished in November, approximately a month earlier than in recent years (2008-2012).

In 2008 there was a significant change in the spatial distribution of the fishery, with many vessels taking more of their catch than usual from Queen Charlotte Sound (Area 5B). Since then, there has been a marked reversal of that trend, and a regrowth of the fishery off the West Coast of Vancouver Island (WCVI), which is the traditional area in which the Hake fishery operates.

For an overview of catch by year and fleet, see Table 1. For 2002, 2003, 2009, 2012, and 2013 there was no JV fishery operating in Canada and this is reflected as zero catch in that sector for those years in Table 1.

1.4.1.2 United States
The U.S. adjusted allocation of 269,745 mt is further divided to research, tribal, catcher-processor, mothership, and shore-based sectors. After the tribal allocation of 17.5% plus 16,000 mt, and a 2,500 mt allocation for research catch and bycatch in non-groundfish fisheries, the 2013 non-tribal U.S. catch limit of 204,040 mt was allocated to the catcher/processor (34%), mothership (24%), and shore-based (42%) commercial sectors. Therefore, the CP fleet was allocated 69,373 mt, the MS fleet was allocated 48,970 mt, and the shore-based fleet was allocated 85,697 mt. The at-sea fleet encountered larger fish in May and mainly smaller fish from the 2010 year class after May. The catches from the shore-based fleet were dominated by the 2010 year class. Tribal fisheries landed approximately 4,500 mt, but 30,000 mt were reapportioned from the tribal fisheries to the non-tribal fisheries on September 18, 2013. Both the at-sea and shore-based fleets nearly caught their respective total catch targets, leaving 40,332 mt, 15.0%, of the catch target uncaught.

A more detailed description of the 2013 fishery may be obtained from JTC meeting notes.

2 Data
Primary fishery-dependent and fishery-independent data sources used here (Figure 3) include:

- Total catch from all U.S. and Canadian target fisheries (1966-2013).
- Age compositions composed of data from the U.S. fishery (1975-2013) and the Canadian fishery (1990-2013).
- Biomass indices and age compositions from the Joint U.S. and Canadian integrated acoustic and trawl survey (1995, 1998, 2001, 2003, 2005, 2007, 2009, 2011–2013).

The assessment model also used biological relationships derived from external analysis of auxiliary data. These include:

- Mean observed weight-at-age from fishery and survey catches, 1975-2013.
- Aging-error matrices based on cross-read and double-blind-read otoliths.
- Proportion of female hake maturity by age (Dorn and Saunders 1997).

Some data sources were not included but have been explored, were used for sensitivity analyses, or were included in previous stock assessments, but not in this stock assessment (these data are discussed in more detail in the 2013 stock assessment document (JTC 2013)).

- Fishery and acoustic survey length composition information.
- Fishery and acoustic survey age-at-length composition information.
- Biomass indices and age compositions from the Joint U.S. and Canadian integrated acoustic and trawl survey (1977, 1980, 1983, 1986, 1989, 1992).
- NWFSC/SWFSC/PWCC coast-wide juvenile hake and rockfish survey (2001–2009).
- Bycatch of Pacific Hake in the trawl fishery for pink shrimp off the coast of Oregon, 2004–2005, 2007–2008.
- Historical biological samples collected in Canada prior to 1990, but currently not available in electronic form.
- Historical biological samples collected in the U.S. prior to 1975, but currently not available in electronic form or too incomplete to allow analysis with methods consistent with more current sampling programs.
- CalCOFI larval hake production index, 1951–2006. The data source was previously explored and rejected as a potential index of hake spawning stock biomass, and has not been revisited since the 2008 stock assessment.
- Joint-U.S. and Canada acoustic survey index of age-1 Pacific Hake.
- Histological analysis of ovary samples collected during the 2010, 2012 and 2013 NWFSC bottom trawl surveys, the 2012 and 2013 acoustic surveys, and the at-sea fishery in 2013.

2.1 Fishery-dependent data

2.1.1 Total catch

The catch of Pacific Hake for 1966–2013 by nation and fishery sector is shown in Table 1 and Figure 4. Catches in U.S. waters prior to 1978 are available only by year from Bailey et al. (1982) and historical assessment documents. Canadian catches prior to 1989 are also unavailable in disaggregated form. For more recent catches, haul or trip-level information was available to partition the removals by month, during the hake fishing season, and estimate bycatch rates from observer information at this temporal resolution. This has allowed a more detailed investigation of shifts in fishery timing (see Figure 5 in Stewart et al. 2011). Although the application of monthly bycatch rates differed from previous, simpler analyses, it resulted in less than a 0.3% change in aggregate catch over the time-series. The U.S. shore-based landings are from the Pacific Fishery Information Network (PacFIN). Foreign and joint-venture catches for 1981–1990 and domestic at-sea catches for 1991–2013 are estimated from the AFSC's and, subsequently, the NWFSC's at-sea hake observer programs stored in the NORPAC database. Canadian joint-venture catches from 1989 are from the Groundfish Biological (GFBio) database, the shore-based landings from 1989 to 1995 are from the Groundfish Catch (GFCatch) database, from 1996 to March 2007 from the Pacific Harvest Trawl (PacHarvTrawl) database, and from April 2007 to present from the Fisheries Operations System (FOS) database. Discards are nominal relative to the total fishery catch. The majority of vessels in the U.S. shore-based fishery carry observers and are required to retain all catch and bycatch for sampling by plant observers. All U.S. at-sea vessels and Canadian joint-venture catches are monitored by at-sea observers. Observers use volume/density methods to estimate total catch. Domestic

Canadian landings are recorded by dockside monitors using total catch weights provided by processing plants.

One of the concerns identified in recent assessments has been the presence of shifts in the within-year distribution of catches during the time series (Figure 5). During the 1990's, subsequent to the ascension of the domestic fleet in the U.S. and both the domestic and Joint-Venture fleets in Canada, most of the catch was taken in the spring. The fishery gradually spread out over the summer and fall, and in recent years has seen some of the largest catches in the fall through early winter (Figure 5). This pattern has allowed the fishery to reduce the impact of some bycatch constraints and is likely to continue in U.S. waters under the individual trawl quota system adopted in 2011, as long as bycatch quotas remain stable and similarly constraining.

2.1.2 Fishery biological data

Biological information from the U.S. at-sea commercial Pacific Hake fishery was extracted from the NORPAC database. This included length, weight, and age information from the foreign and joint-venture fisheries from 1975-1990, and from the domestic at-sea fishery from 1991–2013. Specifically, these data include sex-specific length and age data which observers collect by selecting fish randomly from each haul for biological data collection and otolith extraction. Biological samples from the U.S. shore-based fishery, 1991–2013, were collected by port samplers located where there are substantial landings of Pacific Hake: primarily Eureka, Newport, Astoria, and Westport. Port samplers routinely take one sample per offload (or trip) consisting of 100 randomly selected fish for individual length and weight and from these, 20 for otolith extraction. The Canadian domestic fishery is subject to 100% observer coverage on the two processing vessels *Viking Enterprise* and *Osprey*, which together make up a fair portion of the Canadian catch. The joint-venture fishery has 100% observer coverage on their processing vessels, which in 2011 made up 16% of the Canadian catch, but was non-existent in 2012 and 2013. On observed trips, otoliths (for aging) and lengths are sampled from Pacific Hake caught in the first haul of the trip, with length samples taken on subsequent hauls. Sampled weight from which biological information is collected must be inferred from year-specific length-weight relationships. For electronically observed trips, port samplers obtain biological data from the landed catch. Observed domestic haul-level information is then aggregated to the trip level to be consistent with the unobserved trips that are sampled in ports. For the Canadian joint-venture fishery, an observer aboard the factory ship estimates the codend weight by measuring the diameter of the codend and doing a spherical volume calculation for each delivery from a companion catcher boat. Length samples are collected every second day of fishing operations, and otoliths are collected once a week. Length and age samples are taken randomly from a given codend. Since the weight of the sample from which biological information is taken is not recorded, sample weight must be inferred from a length-weight relationship applied to all lengths taken and summed over haul.

The sampling unit for the shore-based fisheries is the trip, while the haul is the primary unit for the at-sea fisheries. Since detailed haul-level information is not recorded on trip landings documentation in the shore-based fishery, and hauls sampled in the at-sea fishery cannot be aggregated to a comparable trip level, there is no least common denominator for aggregating at-sea and shore-based fishery samples. As a result, samples sizes are simply the summed hauls and trips for fishery biological data. The magnitude of this sampling among sectors and over time is presented in Table 3.

Biological data were analyzed based on the sampling protocols used to collect them, and expanded to estimate the corresponding statistic from the entire landed catch by fishery and year when sampling occurred. In general, the analytical steps for a specific year can be summarized as follows:

1. Count the number of fish at each age within each trip (or haul), generating "raw" frequency data.
2. Expand the raw frequencies from the trip (or haul) based on the fraction of the total haul sampled.

3. Estimate total numbers-at-age ($\hat{N}_{a,f}$) by expanding sampled numbers-at-age ($n_{a,f}$) by fishery sector landings (C_f) divided by the sampled weight for fleet f (b_f). The raw frequency at age data ($p_{a.f}$), landings, and mean weight-at-age (w_a) can be used to estimate the total numbers at age in the catch for each sector.

$$\hat{N}_{a,f} = \frac{C_f}{b_f} n_{a,f} = \frac{\sum_a w_a N_{a,f}}{\sum_a w_a n_{a,f}} n_{a,f} = \frac{n_{a,f} \sum_a w_a N_{a,f} \Big/ \sum_a n_{a,f}}{\sum_a w_a n_{a,f} \Big/ \sum_a n_{a,f}} = \frac{p_{a,f} C_f}{\sum_a w_a p_{a,f}}$$

4. Sum fleet specific total numbers-at-age across sectors to aggregate and normalize to proportions that sum to one.
5. Determine sample sizes (number of trips or hauls).

To complete step (2), the expansion factor was calculated for each trip or haul based on the ratio of the total estimated catch weight divided by the total weight from which biological samples were taken. In cases where there was not an estimated sample weight, a predicted sample weight was computed by multiplying the count of fish in the sample by a mean individual weight, or by applying a year-specific length-weight relationship to the length of each fish in the sample, then summing these predicted weights. Anomalies can emerge when very small numbers of fish are sampled from very large landings; these were avoided by constraining expansion factors to not exceed the 95th percentile of all expansion factors calculated for each year and fishery. The total number of trips or hauls sampled is used as either the initial multinomial sample size input to the SS stock assessment model (prior to iterative reweighting) or as a relative weighting factor among years.

The aggregate fishery age-composition data (1975–2013) confirm the well-known pattern of very large cohorts born in 1980, 1984 and 1999, with a small proportion from the 1999 year class (14 years old in 2013) still present in the fishery (Figure 6). The more recent age-composition data consisted of high proportions of 2008 and 2010 year classes in the 2013 fishery (Figure 6). The above average 2005 and 2006 year classes declined in proportion in the 2011 fishery samples, but remained persistent in the 2012 and 2013 fisheries, although were overwhelmed by the strong 2008 and 2010 cohorts. We caution that proportion-at-age data contains information about the relative numbers-at-age, and these can be affected by changing recruitment, selectivity or fishing mortality. The estimated absolute size of incoming cohorts becomes more precise after they have been observed several times (i.e., encountered by the fishery and survey over several years).

Both the weight- and length-at-age information suggest that hake growth has changed markedly over time (see Figure 7 in (Stewart et al. 2011)). This is particularly evident in the frequency of larger fish (> 55 cm) before 1990 and a shift to much smaller fish in more recent years. The treatment of length-at-age and weight-at-length are described in more detail in sections 2.3.3 and 2.3.4 below. Although length composition data are not fit explicitly in the base assessment models presented here, the presence of the 2008 and 2010 year classes are clearly observed in length data from both of the U.S. fishery sectors.

2.1.3 Catch per unit effort

Calculation of a reliable fishery CPUE metric is particularly problematic for Pacific Hake and it has never been used as a tuning index for assessment of this stock. There are many reasons that fishery CPUE would not index the abundance of Pacific Hake, which are discussed in the 2013 stock assessment (JTC 2013).

2.2 Fishery-independent data

An acoustic survey of age 2+ hake was included in this assessment, while bottom trawl, pre-recruit, and age 1 acoustic data sources were not used. See the 2013 stock assessment (JTC 2013) for a more thorough description and history of these fishery-independent data sources.

2.2.1 Acoustic survey

The joint U.S. and Canadian integrated acoustic and trawl survey has been the primary fishery-independent tool used to assess the distribution, abundance and biology of coastal Pacific Hake, along the west coasts of the United States and Canada. A detailed history of the acoustic survey is given in Stewart et al (2011). The acoustic surveys performed in 1995, 1998, 2001, 2003, 2005, 2007, 2009, 2011, 2012 and 2013 were used in this assessment (Table 4). The acoustic survey includes all waters off the coasts of the U.S. and Canada thought to contain all portions of the hake stock age 2 and older. Age-0 and age-1 hake have been historically excluded from the survey efforts, due to largely different schooling behavior relative to older hake and concerns about different catchability by the trawl gear.

Distributions of hake backscatter plotted for each acoustic survey since 1995 illustrate the variable spatial patterns of age-2+ hake among years (Figure 2). The 1998 acoustic survey is notable because it shows an extremely northward occurrence that is thought to be related to the strong 1997-1998 El Niño. In contrast, the distribution of hake during the 2001 survey was compressed into the lower latitudes off the coast of Oregon and Northern California. In 2003, 2005 and 2007 the distribution of Pacific Hake did not show an unusual coast-wide pattern, but in 2009, 2011, and 2012 the majority of the hake distribution was again found in U.S. waters, which is more likely due to age-composition than the environment. The 2013 survey found and similar distribution of hake as in 2012, except that few aggregations of fish were found north of Vancouver Island. Older Pacific Hake tend to migrate farther north, but the distribution is variable among years.

Acoustic survey data from 1995 onward have been analyzed using geostatistical techniques (kriging), which accounts for spatial correlation to provide an estimate of total biomass as well as an estimate of the year-specific sampling variability due to patchiness of hake schools and irregular transects (Petitgas 1993; Rivoirard et al. 2000; Mello & Rose 2005; Simmonds and MacLenann, 2005). Advantages to the kriging approach are discussed in the 2013 stock assessment (JTC 2013).

During the acoustic surveys, mid-water trawls are made opportunistically to determine the species composition of observed acoustic sign and to obtain the length data necessary to scale the acoustic backscatter into biomass (see Table 4 for the number of trawls in each survey year). Biological samples collected from these trawls were post-stratified, based on similarity in size composition, and the composite length frequency was used to characterize the hake size distribution along each transect and to predict the expected backscattering cross section for Pacific Hake based on the fish size-target strength (TS) relationship. Biases, such as alternative TS relationships are partially accounted for in catchability, but variability in the estimated biomass due to uncertainty in target strength is not explicitly accounted for.

Results from research done in 2010 on representativeness of the biological data (i.e. repeated trawls on the same aggregation of hake) and sensitivity analyses of stratified data showed that trawl sampling and post-stratification is only a small source of variability among all of the sources of variability inherent to the acoustic analysis (see Stewart et al 2011).

The 2013 survey was successful at providing a biomass estimate of Pacific Hake as well as an age composition of the surveyed population. The U.S. portion of the survey was operated jointly with a sardine survey, as in 2012, except that the NOAA Ship Bell Shimada performed all of the trawling for hake rather than a separate catcher vessel. Survey protocols were similar to past protocols, except that some previously collected environmental data was not collected.

Figure 7 shows the relative backscatter of age-2+ hake as observed in the 2013 survey. Many hake were observed off of Central California, Cape Mendocino, and Oregon. Backscatter was relatively low off of Vancouver Island and few aggregations of hake were observed around Haida Gwaii. Comparing the distribution of backscatter in 2012 and 2013 to the distribution of backscatter in previous surveys (Figure 2) shows that the stock was distributed more southerly in 2012 and 2013, which is partly due to the young age structure of the population. The distribution of hake in 2011–2013 was most similar to the distribution of hake in 2001, when the population was also dominated by young fish.

The 2013 survey biomass estimate is 2,422,661 metric tons, which is approximately 1.8 times the 2012 survey biomass estimate and 4.6 times the 2011 acoustic survey biomass estimate (Figure 9). 4.6% of this biomass was observed in Canadian waters in 2013. No Humboldt squid were observed in 2013, although considerable numbers were caught in both the survey and fishery in 2009. The estimated biomass was greatest off the coast of central California, northern California, and Oregon (Figure 8).

The estimated variability of the 2013 biomass estimate, measured as a coefficient of variance (CV), is 4.33% (Figure 9 and Table 4). This estimate of uncertainty accounts for sampling variability calculated using the geostatistical methods, but several additional sources of observation error are likely. For example, haul-to-haul variation in size and age, target strength uncertainty of hake as well as the presence of other species in the backscatter and inter-annual differences in catchability likely comprise additional sources of uncertainty in the acoustic estimates. In the future, it is possible that a bootstrapping analysis that incorporates many of these sources of variability can be conducted and the estimation of variance inflation constants in the assessment may become less important (O'Driscoll 2004). At present, though, there is strong reason to believe that all survey variance estimates are underestimated relative to the true variability.

As it was with the fishery data, age-composition data were used to describe the age structure of hake observed by this survey. Proportions-at-age for the ten acoustic surveys are summarized in Figure 6 and show large proportions of the 1999, 2008, and 2010 year classes. The 2013 survey attributed 76.2% of the estimated number of hake observed to the 2010 year-class. The acoustic survey data in this assessment do not include age-1 fish, although a separate age-1 index has been developed in the past. This age-1 index has not been used in the stock assessment because more time is needed to develop the index, but preliminary estimates seem to track the estimated recruitment reasonably well (Figure 10). The JTC encourages a continuation of the effort to calculate an age-1 index from past surveys and to keep protocols in place such that a consistent age-1 index can be calculated in the future. The 2013 stock assessment provides a more detailed description of the age-1 index (JTC 2013).

2.2.2 Other fishery-independent data

Fishery-independent data from the Alaska Fisheries Science Center (AFSC) bottom trawl survey, the Northwest Fishery Science Center (NWFSC) bottom trawl survey, the NWFSC and Pacific Whiting Conservation Cooperative (PWCC) pre-recruit survey were not used in this assessment. More information on these data sources is given in the 2013 stock assessment (JTC 2013).

2.3 Externally analyzed data

2.3.1 Maturity

The fraction mature, by size and age, is based on data reported in Dorn and Saunders (1997) and has remained unchanged in the base models since the 2006 stock assessment. These data consisted of 782 individual ovary collections based on visual maturity determinations by observers. The highest variability in the percentage of each length bin that was mature within an age group occurred at ages 3 and 4, with virtually all age-1 fish immature and age 4+ hake mature. Within ages 3 and 4, the proportion of mature hake increased with larger sizes, such that only 25% were mature at 31 cm while 100% were mature at 41 cm.

Histological samples have been collected during the 2009, 2012, and 2013 U.S. bottom trawl surveys, during the 2012 and 2013 joint U.S/Canada Hake/Sardine acoustic surveys, and from At-Sea hake Observer Program (ASHOP) observers aboard at-sea fishing vessels in 2013 (Table 5). Samples collected from the 2013 bottom trawl survey, the 2013 acoustic survey and during the autumn months in 2013 from ASHOP observers aboard at-sea fishing vessels were not available at the time of this assessment for analysis. It is expected that the maturity will be determined for these fish during 2014. In the course of the surveys, length bins were targeted for ovary collection to ensure an even coverage. The protocol for collection from at-sea fishery vessels was to randomly sample one ovary from the three fish randomly sampled for otoliths. Fish were randomly sampled for otoliths every third haul.

Tissue from each individual ovary was embedded in paraffin, thin-sectioned to 4 µm, mounted on slides, and stained with hematoxylin and eosin (H&E) stain. Microscopic examination was done to determine oocyte development and maturity (pers. comm., Melissa Head, NWFSC). Ovary samples were marked as mature when yolk was present in a healthy viable oocyte. A visual estimate of the percentage of the sample that showed atresia was also noted. Size and age of the fish was not used in the determination of maturity.

Oocytes exhibiting atresia were noted with a visual estimate of the percent atresia. If an ovary sample did not have yolk present in a healthy viable oocyte, then it was marked as immature. Specimens were classified as mature if they contained large oocytes with dark-stained vitellogenin yolk or characteristics associated with more advanced stages. Although not encountered, spent ovaries would also be defined as mature and would be characterized by the presence of large numbers of post ovulatory follicles (POFs), atresia, and typically small groups of immature oocytes. Fish that did not have yolk present but were large or older were not changed to a mature status because of these biological factors (Fig. 4). For this analysis, a fish was determined as spawning if it was marked mature and the percent atresia was less than 25%. Reader error in the determination of maturity for Pacific Hake was negligible (pers. comm., Melissa Head).

Maturity-at-age and length observations show differences across years (Figure 11), but it is difficult to determine if these difference are due to the source (bottom trawl, acoustic survey, or ASHOP) or the year. Some bottom trawl samples were available in 2012, but the majority of samples were from the acoustic survey. All age-2 fish were mature in 2009, while the majority of age-2 fish were immature in 2012. No age-2 fish were observed in the spring ASHOP samples.

Another interesting observation in Figure 11 is that there are large, old fish classified as immature. It is believed that these fish are “skip spawners” and will be spawning in the upcoming year. Figure 12 shows the proportion mature at length for each source and year, with a fitted logistic curve and the maturity-at-length from Dorn & Saunders (1997) shown for comparison. The logistic fits are forced to asymptote at one. With the few large fish classified as mature, the fitted line is less steep than expected, and the fits to the large number of observations of large fish affects the predictions of maturity-at-length for smaller fish due to the symmetry of the logistic curve.

Immature large and old fish indicate that 100% of these fish may not be mature. To account for this possibility, a logistic curve was fit to maturity at length from all years combined with and without an asymptote estimated (Figure 13). Estimating an asymptote improved the overall fit, especially for smaller fish.

The maturity-at-age was estimated using similar methods to those described by Dorn & Saunders (1997). Because length-stratified sampling design was used in the trawl and acoustic surveys, the small and large fish in a specific age group would be sampled disproportionally compared to their total abundance in the population, potentially causing bias in the estimated maturity-at-age if these fish showed different maturity characteristics than the more typical sizes of that age group. Using an age-length key reduces this bias when estimating maturity-at-age. An age-length key was calculated using acoustic survey data from 2009, and 2011–2013, overlapping with the collection of ovaries. All years were simply pooled before calculating the age-length key. Figure 14 shows the proportions of length-at-age, which sum to one across lengths for a specific age.

The proportion mature at length and age was estimated using a logistic regression of maturity against length and age with and without an estimated asymptote. The observations of mature and immature fish are shown in Figure 15 with contour lines showing the estimated proportion mature at length and age from the logistic model with an asymptote estimated. These predictions were passed through the age-length key to produce the estimates in Figure 16 and Table 7. The maturity-at-age with an asymptote of one does not actually asymptote to one because the prediction of maturity-at-length and age slowly approaches one, resulting in small fish of older ages having a small probability of being immature.

The estimated maturity-at-age using a logistic model with an estimated asymptote and data combined for all years is similar in trend to the predicted values for ages 1 through 4, but is slightly greater at ages 1 through 3. The most obvious difference is that less than 100% of old fish are predicted to be mature. We did not use this new maturity curve in the base assessment model because accurate year and source effects cannot be determined, and more data will be available soon. However, we do supply a sensitivity analysis to this new maturity-at-age ogive and show the effect it has on predictions of spawning biomass and management advice (see Section 3.5).

2.3.2 Aging error

The large inventory of Pacific Hake age determinations include many duplicate reads of the same otolith, either by more than one laboratory, or by more than one age-reader within a lab. Recent stock assessments have utilized the cross- and double-reads to generate an ageing error vector describing the imprecision and bias in the observation process as a function of fish age. New data and analysis were used in the 2009 assessment to address an additional process influencing the ageing of hake: cohort-specific ageing error related to the relative strength of a year-class. This process reflects a tendency for uncertain age determinations to be assigned to predominant year classes. The result is that the presence of strong year classes is inflated in the age data while neighboring year-classes are under-represented relative to what would be observed if ageing error were consistent at age across cohorts.

To account for these observation errors in the model, year-specific ageing-error matrices (or vectors of standard deviations of observed age at true age) are applied, where the standard deviations of strong year classes were reduced by a constant proportion. For the 2009 and 2010 assessments this proportion was determined empirically by comparing double-read error rates for strong year classes with rates for other year classes. In 2010, a blind double-read study was conducted using otoliths collected across the years 2003–2009. One read was conducted by a reader who was aware of the year of collection, and therefore of the age of the strong year classes in each sample, while the other read was performed by a reader without knowledge of the year of collection, and therefore with little or no information to indicate which ages would be more prevalent. The resulting data were analyzed via an optimization routine to estimate both ageing error and the cohort effect. The resultant ageing error was similar to the ageing error derived from the 2008 analysis. This approach has been unchanged since the 2011 assessment and has been retained for 2013, with the ageing-error standard deviation reduced by a factor of 0.55 for the 1980, 1984, 1999, 2008, and 2010 cohorts.

2.3.3 Weight-at-age

A matrix of empirically derived population weight at age by year is used in the current assessment model to translate numbers-at-age directly to biomass-at-age. Mean weight at age was calculated from samples pooled from all fisheries and the acoustic survey for the years 1975 to 2013 (Figure 17). Ages 15 and over for each year were pooled and assumed to have a constant weight at age. The combinations of age and year with no observations were assumed to change linearly over time between observations at any given age. For those years before and after all the observations at a given age, mean weights were assumed to remain constant prior to the first observation and after the last observation. The number of samples is generally proportional to the amount of catch, so the combinations of year and age with no samples should have relatively little importance in the overall estimates of the population dynamics. The use of empirical weight at age is a convenient method to capture the variability in both the weight-at-length relationship within and among years, as well as the variability in length-at-age, without requiring parametric models to represent these relationships. However, this method requires the assumption that observed values are not biased by strong selectivity at length or weight and that the spatial and temporal patterns of the data sources provide a representative view of the underlying population.

2.3.4 Length-at-age

In 2011 assessment models (Stewart et al. 2011), and in models used for management prior to the 2006 stock assessment, temporal variability in length-at-age was included in stock assessments via the calculation of empirical weight-at-age. In the 2006 and subsequent assessments that attempted to estimate the parameters describing a parametric growth curve, strong patterns have been identified in the observed data indicating sexually dimorphic and temporally variable growth. In aggregate, these patterns result in a greater amount of process error for length-at-age than is easily accommodated with parametric growth models, and attempts to explicitly model size-at-age dynamics have not been very successful for hake. Models have had great difficulty in making predictions that mimic the observed data. This was particularly evident in the residuals to the length-frequency data from models prior to 2011. We have not revisited the potential avenues for explicitly modeling variability in length- and weight-at age in this model, but retain the empirical approach to weight-at-age described above.

2.4 Estimated parameters and prior probability distributions

The estimated parameters and prior probability distributions used in this stock assessment are reported in Table 8. Several important distributions are discussed in detail below.

2.4.1 Natural Mortality

Since the 2011 assessment, and again this year, a combination of the informative prior used in recent Canadian assessments and results from analyses using Hoenig's method (Hoenig 1983) support the use of a log-normal distribution with a median of 0.2 and a log-standard deviation of 0.1. Historical treatment of natural mortality is discussed in the 2013 stock assessment (JTC 2013). Sensitivity to this prior has been evaluated extensively in many previous hake assessments (JTC 2013). Alternative prior distributions for M typically have a significant impact on the model results, but in the absence of new information on M, there has been little option to update the prior and the sensitivities have not been repeated this year.

2.4.2 Steepness

The prior for steepness is based on the median (0.79), 20th (0.67) and 80th (0.87) percentiles from Myers et al. (1999) meta-analysis of the family Gadidae, and has been used in previous U.S. assessments since 2007. This prior is distributed β(9.76, 2.80) which translates to a mean of 0.777 and a standard deviation of 0.113. Sensitivities to the variance on the prior on steepness were evaluated in the 2013 and 2012 assessments (JTC 2013, JTC 2012).

2.4.3 Variability on fishery selectivity deviations

Time-varying fishery selectivity was introduced in this assessment and was modelled with yearly deviations applied individually to the parameters for selectivity-at-age (more detail on the parameterization is provided in Appendix C). A penalty function in the form of a normal Gaussian distribution is applied to each deviation to keep the deviation from straying far from zero, unless the data are overwhelming. The amount of deviation from zero is controlled by a fixed standard deviation, ϕ.

A standard deviation of 0.03 for this penalty function was used for each age and was estimated externally by treating the deviations as random effects and integrating over them using the Laplace method, as described by Thorson et al. (2014). The most likely estimate of the standard deviation (0.03 as seen in Figure 18) was then fixed in the base assessment model.

This parameterization allows for the estimation of time-varying selectivity without allowing large year-to-year changes. However, the current selectivity parameterization is limiting because each individual selectivity-at-age is correlated with the selectivity of other ages. In other words, it is difficult to disentangle the correlations. Therefore, we recommend that future research be expended on investigating alternative selectivity patterns that allow for easily interpretable annual variations.

3 Assessment

3.1 Modeling history

A large variety of age-structured stock assessment models have been used for Pacific Hake. Initially, a cohort analysis tuned to fishery CPUE was used (Francis et al. 1982). Later, the cohort analysis was tuned to NMFS triennial acoustic survey estimates of absolute abundance at age (Hollowed et al. 1988). Since 1989, stock synthesis models using fishery catch-at-age data and acoustic survey estimates of population biomass and age composition have been the primary assessment method (Dorn and Methot 1991).

While the age-structured assessment form has remained similar since 1991, management procedures have been modified in a variety of ways. There have been alternative data choices, post-data collection processing routines, different data weighting schemes, a huge number of structural assumptions for the stock assessment model, and alternative control rules.

Data processing, choices, and weighting have been modified several times in historical hake assessments. For example, acoustic data processing has been modified over the years through modifications to target strength calculations (Dorn and Saunders 1997) or the introduction of kriging(Stewart and Hamel 2010). While survey data have been the key index for abundance since 1988, which surveys have been used have varied considerably: the AFSC/NWFSC triennial bottom trawl survey was used from 1988 before being discarded from the 2009 assessment by (Hamel and Stewart 2009). While used for assessments in the early 1990s, (Stewart et al. 2011) reviewed pre-1995 acoustic survey data and deemed that their sampling had been insufficient to be comparable with more recent data; Various recruitment indices have been considered, but subsequently rejected (Helser et al. 2002, Helser et al. 2004, Stewart and Hamel 2010). Even where data have been consistently used, their weighting in the statistical likelihood has varied through various emphasis factors(e.g., Dorn 1994, Dorn et al. 1999); multinomial sample size on age-composition (Dorn et al. 1999, Helser et al. 2002, Helser et al. 2005, Stewart et al. 2011) and survey variance assumptions. The list of changes discussed above is for illustrative purposes only; it is only a small fraction of the different data choices analysts have made (and that reviewers/panels have required).

The structure of assessment models has perhaps had the largest number of changes. In terms of spatial models since 1994, analysts have considered explicitly spatial forms (Dorn 1994, Dorn and Saunders 1997), spatially implicit forms (Helser et al. 2006) and single-area models(JTC 2012). Predicted recruitment has been modeled by sampling historical recruitment (e.g., Dorn 1994, Helser et al. 2005), using a stock recruitment relationship parameterized using Fmsy/MSY (Martell 2010), and using several alternative steepness priors (JTC 2012, 2013). Selectivity has also been modeled in several ways: It has been both time varying with a random walk (Helser et al. 2002) and without (Dorn 1994, Dorn and Saunders 1997, JTC 2012, 2013) and invariant (JTC 2012, 2013); and it has been age-based (Dorn 1994, Dorn and Saunders 1997, JTC 2012, 2013) and length-based(Helser and Martell 2007).

Several harvest control rules have been explored as well. Pacific Hake stock assessments have presented decision makers with constant F, variable F and hybrid control rules: $F_{35\%}$, $F_{40\%}$, $F_{40\%}$-40:10, $F_{45\%}$, F45%-40:10, $F_{50\%}$ (e.g., Dorn 1996, JTC 2013) The above is only a small fraction of the number of management procedures that have actually been investigated. There have been many others combinations of data, assessment model and harvest control rule. In addition to the cases examined in the assessment documents, there have been many more requested at assorted review panel meetings.

While there have been many changes to Pacific Hake management procedures, they have not been capricious. Available data have changed over the years, and there have been many advances in the discipline of Fisheries Science. In some ways, the latter has evolved considerably over the course of the historical hake fishery: new statistical techniques and software have evolved (Bayesian vs. maximum likelihood methods for example); and the scientific literature has suggested potentially important biological dynamics to consider (explicit modelling of length at age for example). Policies requiring the application of specific control rules have also changed such as the United States' National Standards Guidelines in 2002 and the $F_{40\%}$-40:10 harvest control rule in The Agreement. Analysts making changes to Pacific Hake management procedures have been trying to improve the caliber and relevance of the assessments by responding to new scientific developments, policy requirements, and different reviewers. Until this year's MSE, none of these management procedure changes have been evaluated in simulation and quantitatively compared with performance measures.

3.2 Response to recent review recommendations

3.2.1 2014 Scientific Review Group (SRG) review

The Scientific Review Group (SRG) was held in Seattle, WA from February 18–21, 2014. The SRG investigated many aspects of the 2013 acoustic survey estimate and the model. The base model presented by the JTC was unchanged and endorsed by the SRG for use by the JMC when considering the 2013 catch quota, with the understanding that the 2013 acoustic survey biomass estimate was potentially biased due to extrapolation into unsurveyed areas. A sensitivity to a lower survey estimate resulted in a 16% reduction in the default harvest rate catch. The SRG also reviewed the Management Strategy Evaluation (MSE), and felt that progress has been made and it is proving to be a useful tool to investigate assessment model behavior and potentially could be used to understand management decisions.

Many recommendations were made by the SRG and are summarized in their 2014 report. A few of the high priority recommendations were to continue research on the acoustic survey including research on the methods to calculate a biomass estimate, continuing research on hake biology and ecology, and expanding the MSE operating model to test how the assessment model performs under alternative stock and recruitment assumptions.

3.2.2 2013 SRG review

The 2013 SRG panel (19–22 February, 2013 in Vancouver, BC) conducted a thorough review of the data, analyses and modeling conducted by the JTC (a full summary can be found in the SRG panel report). The SRG endorsed the use of the base model for 2013. Other recommendations for this assessment made during the SRG review were: investigate time-varying selectivity, analyze the recent maturity data that has been collected, and collect ovaries for maturity determination from fishery catches. Specific responses to recommendations are given below.

3.2.3 2013 SRG recommendations and responses from the JTC

The 2013 SRG made several broad research recommendations. Unlike previous years, these included recommendation for both stock assessment and MSE development. Table 9 is a summary of the SRG 2013's broad research recommendations for acoustic research, life-history data, assessment model configuration, and MSE. In addition to these, the range of technical recommendations related to the MSE from SRG 2013 has been refined through subsequent May 2013 JMC, August 2013 MSE Steering Group, and January 2014 JTC meetings; Table 9 also summarizes the proposed and completed research activities specific to the MSE.

3.3 Model description

3.3.1 Base model

This year, the JTC changed the structural form of the base model. The model retains the 2013 base assessment configuration, except we have adopted a base model with time-varying fisheries selectivity. It was implemented using Stock Synthesis version 3.24s (Methot and Wetzel 2012) to estimate random deviations from the estimated base selectivity parameters. The flexibility of the time-varying selectivity is determined by the standard deviation (ϕ) on a Gaussian penalty function. The value of this standard deviation is not estimable in SS directly, but we estimated this variance using the methods described by assuming that the deviations are random effects and using the methods described by Thorson et al. (2014), which we call "the Laplace approximation" since it uses a Laplace approximation to integrate over the random effects. The combination of the Laplace approximation and closed-loop simulations allowed us to justify the choice of the random effects variance, ϕ=0.03 (as discussed above). Furthermore simulations showed that it may produce reasonable management performance even if the data come from a fishery that exhibits larger annual changes in year-to-year selectivity (see Table A.4 in Appendix A).

The structure of the base model, including parameter specifications, bounds and prior distributions (where applicable) is summarized in Table 8. The assessment model includes a single fishery representing the aggregate catch from all sectors in both nations. In response to the 2010 STAR panel recommendations, (Stewart et al. 2011) examined the effect of modeling the U.S. foreign, joint-venture, at-sea and shore-based fisheries, as well as the Canadian foreign, joint-venture and domestic fisheries as separate fleets and showed that a simpler model was able to mimic models parameterized with these more complex dynamics and concluded that increased model complexity could not be justified. We assume that acoustic survey selectivity does not change over time, but, as explained above, we treat commercial selectivity as time-varying. Selectivity curves were modeled as non-parametric functions estimating age-specific values for each age beginning at age 2 for the acoustic survey (since age-1 fish are excluded included from the design) and age-1 for the fishery as small numbers are observed in some years.

Growth is represented via the externally and empirically derived matrix of weight-at-age, described above. Alternate models, including a time-varying von Bertalanffy function, dimorphic growth and seasonally explicit growth within years were compared via sensitivity analyses during the 2011 assessment (Stewart et al. 2011) but did not provide substantially different results. The inclusion of length data to model growth directly provides more complexity due to both the considerable growth of hake during the May through December fishing season and the variability in growth rates among cohorts and years, as investigated in Stewart et al. (2011).

Prior probability distributions and fixed values are used for several parameters. For the base model, the instantaneous rate of natural mortality (M) is estimated with a lognormal prior having a median of 0.2 and a standard deviation (in log-space) of 0.1 (described above). The stock-recruitment function is a Beverton-Holt parameterization, with the log of the mean unexploited recruitment freely estimated. This assessment uses the same Beta-distributed prior for stock-recruit steepness (h), based on Myers et al. (1999) that was applied in previous assessments (Stewart et al. 2011, JTC 2012, 2013). Year-specific recruitment deviations were estimated from 1946–2013. The standard deviation, σ_r, for recruitment variability, serving as both a recruitment deviation constraint and bias-correction, is fixed at a value of 1.4 in this assessment. This value is based on consistency with the observed variability in the time-series of recruitment deviation estimates, and is the same as assumed in 2013. Survey catchability was freely estimated with a uniform (noninformative) prior in log-space. Maturity and fecundity relationships are assumed to be time-invariant and fixed values remain unchanged from recent assessments.

Statistical likelihood functions used for data fitting are typical of many stock assessments. The acoustic survey index of abundance was fit via a log-normal likelihood function, using the observed (and extra 2009) sampling variability, estimated via kriging, as year-specific weighting. An additional constant and additive log(SD) component is included, which was freely estimated to accommodate unaccounted for sources of process and observation error. A multinomial likelihood was applied to age-composition data, weighted by the sum of the number of trips or hauls actually sampled across all fishing fleets, and the number of trawl sets in the research surveys. Input sample sizes were then iteratively down-weighted to allow for additional sources of process and observation error. This process resulted in tuned input sample sizes roughly equal to the harmonic mean of the effective sample sizes after model fitting, and tuning quantities have been unchanged since the 2012 assessment, even with the inclusion of time-varying selectivity.

3.4 Modeling results

3.4.1 Changes from 2013

A set of 'bridging' models in SS version 3.24s was constructed to clearly illustrate the component-specific effects of all changes to the base model from 2013 to 2014. Updating the 2012 catch, proportions at age and weight at age had no observable effects on spawning depletion. Likewise, updating from SS version 3.24j used in 2012 to 3.24s caused no change in the results.

The next bridging step was to include 2013 catches then separately fit fishery 2013 age-composition data and the 2013 survey data (Table 10). The former is similar to what the assessment (with time-invariant selectivity) would have been without a 2013 acoustic survey. Fit to fishery age-composition data alone, the current 2014 model predicts an increase in the 2012 stock size compared to the 2013 assessment. To explain the age-composition data, the model predicts a large 2010 year class but uncertainty in both depletion and 2010 year-class strength is large (Figure 19). Fits to 2013 survey data alone produced estimates of spawning depletion and 2010 recruitment levels that were smaller than when fitting fishery age-composition data alone (Figure 19).

The final bridging step was to add the 2013 acoustic survey biomass estimate and fishery age-compositions (all 2013 data, Figure 19). The main result of including all data sources was that uncertainty was reduced. In other words, without the 2013 acoustic survey data, the 2014 assessment would be much more uncertain.

3.4.2 Assessment model results

Model Fit

For the base model, the MCMC chain was run for 12,000,000 iterations with the first 2,010,000 discarded to eliminate 'burn-in' effects. Each 10,000th value thereafter was retained, resulting in 999 samples from the posterior distributions for model parameters and derived quantities. Stationarity of the posterior distribution for model parameters was assessed via a suite of standard diagnostic tests. The objective function, as well as all estimated parameters and derived quantities, showed good mixing during the chain, no evidence for lack of convergence, and low autocorrelation (Figure 20 and Figure 21). Correlation-corrected effective sample sizes were sufficient to summarize the posterior distributions and neither the Geweke nor the Hiedelberger and Welch statistics for these parameters exceeded critical values more frequently than expected via random chance (Figure 22). Correlations among key parameters were generally low, with the exception of natural mortality (M) and the average unexploited equilibrium recruitment level (R_0), as well as recent recruitment, depletion in 2014, and predicted catch in 2014 (Figure 23).

We show the base model fit to the acoustic survey biomass index in Figure 24. The 2001 data point continues to be well below any model predictions that we evaluated, and no direct cause for this is known, however it was conducted about one month earlier than all other surveys between 1995 and 2009 (Table 4), which may explain some portion of the anomaly, along with El Niño conditions and age structure. The 2009 index is much higher than any predicted value observed during model evaluation. The uncertainty of this point is also higher than in other years, due to the presence of large numbers of Humboldt squid during the survey. The MLE slightly underfits the 2013 survey index.

Fits to the age-composition data show close correspondence to the dominant cohorts observed in the data and also identification of small cohorts, where the data give a consistent signal (Figure 25, Figure 26 and Figure 27). Because of the time-varying survey selectivity, the fit to commercial age-composition data is particularly good. Residual patterns to the fishery and survey age data do not show patterns that would indicate systematic bias in model predictions (Figure 28).

Posterior distributions for both steepness and natural mortality are strongly influenced by priors (Figure 29). The posterior for steepness was not updated much by the data, as expected given the low-sensitivity to steepness values found in previous hake assessments. The natural mortality parameter, on the other hand, is shifted to the right of the prior distribution and the prior may be constraining the posterior distribution. All other parameters showed substantial updating from non-informative priors to stationary posterior distributions.

Fishery selectivity varies mostly in recent years (Figure 30). Fishery selectivity in 2010 shows a high selectivity on age-4 fish, corresponding to the 2006 year class, and in 2011 age-3 selectivity is increased, corresponding to the 2008 year class. Even though the survey selectivity is time invariant, the posterior shows a broad band of uncertainty between ages 2 and 5 (Figure 32). The commercial selectivity is likewise very uncertain (Figure 31 and Figure 32), but in spite of this uncertainty, changes in year to year patterns are still evident, particularly for age 3 and 4 fish though these patterns might also reflect time-varying mortality processes.

Stock biomass

The base stock assessment model indicates that since the 1960s, Pacific Hake female spawning biomass has ranged from well below to near unfished equilibrium (Figure 33 and Figure 34). The model predicts that it was below the unfished equilibrium in the 1960s and 1970s (due to low recruitment). The stock is estimated to have increased rapidly after two or more large recruitments in the early 1980s to near unfished equilibrium, and then declined steadily after a peak in the mid- to late-1980s to a low in 2000. This long period of decline was followed by a brief increase to a peak in 2003 as the large 1999 year class matured. The 1999 year class largely supported the fishery for several years due to relatively small recruitments between 2000 and 2007 entering the fishery to replace catches being removed during this period. With the aging 1999 year class, median female spawning biomass declined throughout the late 2000's, reaching a time-series low of 0.479 million mt in 2009. The assessment model estimates that since 2009, spawning biomass has been increasing on the strength of a large 2010 cohort and above-average 2008 and 2009 year classes. The 2014 median posterior spawning biomass is estimated to be 81.79% of the unfished equilibrium level (B_0) with 95% posterior credibility intervals ranging from 41.55% to 168.79% (Table 11 and Table 12). The median estimate of 2014 female spawning biomass is 1.722 million mt (Table 11).

Recruitment

Pacific Hake appear to have low average recruitment with occasional large year-classes (Figure 35). Very large year classes in 1980, 1984, and 1999 supported much of the commercial catch from the 1980's to the mid 2000's. In the last decade, estimated recruitment has been at some of the lowest values in the time-series as well some of the highest (Figure 35). The current assessment estimates a strong 2010 year class comprising 67% of the coast-wide 2013 commercial catch. Due to the small number of years it has been observed, its size is still more uncertain than older cohorts, although it is highly likely one of the five largest recruitments seen in the last three decades. The model currently estimates a lower-than average 2011 year class, and a slightly lower than average 2012 year class, although the only observations of the 2012 year class are the catch of age-1 fish in the fishery data. The sizes of the 2013 and 2014 year classes are unknown and are characterized by the underlying stock recruitment relationship assumptions (Figure 36) because they have not yet been observed in survey or commercial age-composition data. Retrospective analyses of year class strength for young fish have shown the estimates of recent recruitment to be unreliable (JTC 2013)

The estimated recruitments with uncertainty for each predicted point and the overall stock recruit relationship are provided in Figure 36. Extremely large variability about the expectation and about the joint uncertainty of individual recruitment and spawning biomass pairs are clearly evident in this plot. High and low recruitment has been produced throughout the range of observed spawning biomass (Figure 36).

The standard deviation of the time series of median recruitment estimates for the years 1971–2010, which are well informed by the age compositions, is 1.50. The standard deviation of the MCMC samples of all recruitment deviations for the years 1946–2013, combining both the variability between years and the uncertainty within each year, is 1.51. These values are roughly consistent with the base model value of σ_r = 1.4 and suggest that, if anything, σ_r could be even higher.

Exploitation status

Median fishing intensity on the stock is estimated to have been consistently below the $F_{40\%}$ target until recently. The base model estimates of fishing intensity indicate that the SPR target was exceeded with a greater than 50% chance in 2008 and 2011 (Figure 38). It should be noted, however, that the harvest in those years did not exceed the catch limits that were specified, based on the best available science and harvest control rules in place at the time. The exploitation fraction does not necessarily correspond to fishing intensity because fishing intensity accounts for the age-structure. For example, fishing intensity remained nearly constant from 2010 to 2011 but the exploitation fraction declined in these years because of the large estimated proportion of 1-year-old fish in the latter year. Fishing intensity for 2013 appears to have a 98.4% probability of being below the management target.

Management performance
Recent catches have generally been below coast-wide targets. Total catches last exceeded the coast-wide catch target in 2002 when landings were 112% of the catch target. Over the last ten years, the average coast-wide utilization rate has been 86%. In the last five years (2009–2013), mean utilization rates between have differed between the United States and Canada at 85% and 76%, respectively. The underutilization in the United States is mostly a result of the unrealized catch in the tribal apportionment, while reports from stakeholders in Canada suggest that the Canadian fishery has changed in recent years and it is taking larger boats with greater horsepower to maintain catches.

Exploitation history in terms of joint biomass and *F*-target reference points shows that before 2007, median fishing intensity was below target and female spawning biomass was near or above target (Figure 33 and Figure 38 and Figure 40). Between 2007 and 2011, however, fishing intensity ranged from 89 to 106% and depletion between 0.23 and 0.32 (Table 11). Biomass has risen recently with the 2008 and 2010 recruitments (Figure 33) and correspondingly, fishing intensity has fallen below targets, and depletion above targets for 2012 and 2013 (Figure 40). While uncertainty in the 2013 fishing intensity estimates and depletion is large, the model predicts a 1% joint probability of being both above the target fishing intensity and below 40% depletion.

3.4.3 Model uncertainty
The base assessment model integrates over the substantial uncertainty associated with several important model parameters including: acoustic survey catchability (q), the productivity of the stock (via the steepness parameter, h, of the stock-recruitment relationship), the rate of natural mortality (M), the selectivities, and recruitment deviations. The uncertainty portrayed by the posterior distribution is a better representation of the uncertainty when compared to maximum likelihood estimates (MLE) because it allows for asymmetry (see Stewart et al 2012 for further discussion and examples). Table 14 compares the median of the posterior to the MLE, showing that median biomass, recruitment, and depletion estimates from the posterior distribution are all larger in value. Figure 41 shows the MLE and Bayesian estimates as well as the skewed uncertainty in the posterior distributions for spawning biomass and recruitment

Uncertainty measures in the base model underestimate the total uncertainty in the current stock status and projections because they do not account for alternative structural models for hake population dynamics and fishery processes (e.g., recruitment, selectivity), the effects of data-weighting schemes, and the scientific basis for prior probability distributions. To address structural uncertainties, the JTC investigated a broad range of alternative models, and we present a subset of key sensitivity analyses in the main document. The posterior distribution of derived parameters from the base model encompasses the median estimates of most sensitivity models. We use the closed-loop simulation component of the Management Strategy Evaluation (MSE, see Appendix A) to illustrate the long-term average management performance of alternative assessment models.

The Pacific Hake stock displays the highest degree of recruitment variability of any west coast groundfish stock, resulting in large and rapid biomass changes. This volatility, coupled with a dynamic fishery, which potentially targets strong cohorts resulting in time-varying selectivity, and little data to inform incoming recruitment until the cohort is age 2 or greater, will, in most circumstances, continue to result in highly uncertain estimates of current stock status and even less-certain projections of the stock trajectory. Within-model uncertainty in this assessment's spawning stock biomass is largely a function of the potentially large 2010 year class now having been observed for the second year in the acoustic survey and for the third year in the fishery data.

At the JMC's direction, we continued to develop the Management Strategy Evaluation (MSE) approach to explore the expected performance of alternative harvest policies involving annual or biennial surveys using more challenging operating models (Appendix A). Of the wide range of recommendations made by the 2013 SRG, the MSE steering group and the 2014 JTC meeting, we focused on: the effects of operating models with time-varying selectivity; increasing the frequency of a survey to annual from biennial, management procedures (MPs) using assessment models with and without time-varying selectivity, and the default harvest control rule with floors and ceilings on TAC recommendations. Addressing last year's SRG recommendation of continuing work on the MSE by expanding the operating model to investigate the performance of a suite of assessment models with more complicated hypotheses about the dynamics of the Pacific Hake fishery remains germane.

Developing alternative operating dynamics complicates analyses greatly. For example this year's closed-loop simulations only examined a single implementation of time-varying selectivity: there are many possible hypotheses about how this process is best modelled and statistical methods with which to estimate parameters describing these dynamics. How to determine estimation and simulation methods for time-varying selectivity is only a small subset of choices that are possible for modeling for Pacific Hake; other hypotheses that might change our perceptions of stock status (spatial dynamics, time-varying changes in life-history parameters) will also involve complicated and difficult analyses. Decisions about what operating models to pursue with MSE will have to be made carefully. Furthermore, the JTC would like to continue the involvement of the JMC, SRG, and AP to further refine management objectives, as well as determine scenarios of interest, management actions to investigate, and hypotheses to simulate.

3.4.4 Reference points

We report estimates of the 2014 base reference points with posterior credibility intervals in Table 15. The estimates differ very little from the 2013 assessment: the maximum difference between the 2013 and 2014 median reference point estimates is 3.66%, for the B_{MSY} estimate.

3.4.5 Model projections

The median catch for 2014 based on the default harvest policy ($F_{40\%}$ – 40:10) is 872,424 mt, but has a wide range of uncertainty (Figure 42). The 95% posterior credibility interval ranges from 393,369 mt to 2,226,633 mt.

A decision table showing predicted population status and fishing intensity relative to target fishing intensity is presented with uncertainty represented from within the base model. The decision table (split into Table 16 and Table 17) is organized such that the projected outcomes for each potential catch level (rows) can be evaluated across the quantiles (columns) of the posterior distribution. The first table (Table 16) shows projected depletion outcomes, and the second (Table 17) shows projected fishing intensity outcomes relative to the target fishing intensity (based on SPR; see table legend). Fishing intensity exceeding 100% indicates fishing in excess of the $F_{40\%}$ default harvest rate.

Management metrics that were identified as important to the Joint Management Committee (JMC) and the Advisory Panel (AP) in 2012 are presented for projections to 2015 and 2016 (Table 18 and Table 19). These metrics summarize the probability of various outcomes from the base model given each potential management action. Although not linear, probabilities can be interpolated from this table for intermediate catch values. Figure 43 shows the predicted depletion trajectory through 2016 for several of these management actions.

At all catch levels above 190,000 mt, the spawning biomass is predicted to decline with greater than 50% probability (Figure 44). The model predicts high biomass levels and the predicted probability of dropping below 10% is effectively zero and the maximum probability of dropping below B40% is 13% for all catches explored. It should be noted that in addition to the natural morality rate overtaking the growth rate for the 2010 year class, the model estimated below average recruitment for the 2011 and 2012 cohorts entering the 2014 spawning biomass, which also contributes to the relatively low catch (190,000 mt) that will result in a reduction in spawning biomass from 2014 to 2015. Probabilities for these metrics given specific catches in 2015 are shown in Table 19 and Figure 45.

Until cohorts are five or six years old, the model's prediction of cohort strength is uncertain. The size of the 2010 year class is certainly above average, but is a major source of uncertainty in future projections of spawning biomass and catch. Therefore, following the 2013 assessment of Pacific Hake, additional forecast decision tables were created given three states of nature about the size of the 2010 year class: low 2010 recruitment, medium 2010 recruitment, and high 2010 recruitment. Each state of nature is defined to have a probability of 10%, 80%, and 10%, respectively.

Table 20 and Table 21 show the median depletion and fishing intensity within each state of nature, and it can be seen that in the low-recruitment state of nature the fishing intensity would be slightly above target with a 2014 catch of 375,000 mt, and a projected biomass of 40% in 2016. Median depletion is predicted to decline in 2016 across all states of nature for all catches above 190,000 mt.

Table 22 and Table 23 show the probability metrics in 2015 and in 2016 for each state of nature. Across all states of nature there are approximately equal probabilities that the spawning biomass in 2015 will be less than or greater than the spawning biomass in 2014 with a catch near 190,000 mt. For the low state of nature, there is a less than 50% probability that the 2015 spawning biomass will be below 40% of unfished equilibrium spawning biomass with a catch near 500,000 mt, but a constant catch of 375,000 mt in 2014 and 2015 results in a 50% probability that the spawning biomass in 2016 is less than 50% of unfished equilibrium spawning biomass.

An additional source of uncertainty was the 2013 estimate of biomass from the acoustic survey. Due to the presence of hake schools extending far offshore, the survey biomass estimate included an extrapolated area that contained at least 25% of the biomass. No observations occurred in this extrapolated area, thus there was a concern that the biomass was overestimated. A sensitivity run using a 2013 acoustic survey biomass estimate without the extrapolated area resulted in a lower 2014 spawning biomass and a 12% reduction in the predicted 2014 default harvest rate catch.

3.5 Sensitivity analyses

Sensitivity analyses were conducted to investigate structural uncertainty of the base model by investigating how changes to the model affected the estimated values and derived quantities. The sensitivities include the following:

1. Update the maturity ogive with recently collected data from 2009, 2012 and 2013.
2. Remove the 2012 survey data and index from the assessment to look at the effects of the annual surveys since 2011.
3. Increase the standard deviation on the time-varying selectivity parameters.
4. Estimate time-varying selectivity from 1975 to present.
5. Estimate fishery and survey selectivity to age 10.
6. Use a 2013 acoustic survey biomass estimate without extrapolation off of CA.

An update of the maturity ogive (Figure 16) results in very similar parameter estimates and derived quantities when compared to the base model (Figure 46 and Table 24). The base model in this assessment does not show large changes with the new maturity-at-age ogive, but because the new ogive estimates a larger proportion of young fish being mature, the model is most sensitive when large year classes are moving through the young ages (as seen in recent estimates of depletion in Figure 46).

Removal of the 2012 survey data and index from the assessment results in little difference in most parameter estimates from the model (Table 24). The depletion time series is slightly affected in the

1980's, but the largest changes are in the recruitment estimates for the 2008 and 2010 cohorts, especially with regard to uncertainty (Figure 46). This increase in uncertainty is expected because a critical year with observations of the 2008 and 2010 year classes when they were young has been removed. The estimates of the 2008 and 2010 year classes increased when removing the 2012 survey, which was a result of the fitting the 2013 index better. The closer fit to the 2013 index resulted in a larger increase in predicted biomass from the 2011 index to the2013 index which produced a higher value for depletion (Table 24).

Increasing the standard deviation on the time-varying selectivity parameters to 0.2 has a small effect on the depletion trajectory, with only a slight departure from the base in the early years and a more significant departure in recent years (Figure 47). This recent reduction in biomass is a result of a reduced estimate of the 2010 year class, due to the model interpreting the large proportion of the 2010 year class observed in the fishery data as changes in selectivity (Figure 47). With more observations of this year class, especially from the survey, the size of it should become more certain.

Estimating time-varying selectivity from 1975 to 2013 instead of 1991 to 2013 as in the base model, had little effect on the results. The estimates of selectivity were nearly identical to the base model for the 1991-2013 period, and from 1975-1990 the estimated selectivities showed little change from one year to the next (Figure 48.

Bayesian posterior distributions were estimated to compare additional sensitivities related to selectivity. These are 1) estimating non-parametric selectivity for both the fishery and acoustic survey to age-10 with selectivity deviations on each estimated age for the fishery, and 2) forcing fishery selectivity to be time-invariant and mimicking the base model from 2013 (JTC 2013). A comparison of the estimated selectivity at age and year is shown in Figure 49. When extending the estimates of selectivity-at-age to age 10, the acoustic survey begins to show large variability and unrealistic patterns past age 6 and the medians for fishery selectivity nearly linearly increase to age 11 (Figure 50). The stock is more depleted in the early years of the assessment, and then similar until recently when the stock is estimated to be less depleted, but wth greater uncertainty (Figure 51). This is mainly due to estimates of recruitment with larger estimates in recent years (Figure 51 and Table 25). Interestingly, the uncertainty in historical recruitment estimates is less prior to about 1980, and greater in recent years. This suggests that the historical age-structure is greatly influencing the estimates of selectivity-at-older ages.

Mimicking the base model from the 2013 assessment and not estimating time-varying selectivity resulted in little difference to the estimates of depletion except in recent years, which is a result of larger estimates for 2008 and 2010 recruitment (Table 25). Uncertainty was also slightly greater with time-invariant selectivity.

The 2013 acoustic survey biomass estimate of 2.42 million mt was comprised of at least 650,000 mt of extrapolated biomass in areas that were not surveyed, mostly off of northern California and southern Oregon. Therefore, a sensitivity run was done with a 2013 estimate of 1.8 million mt to investigate the effect of this value. The age compositions were not changed for this sensitivity, although it is likely that they would be affected. The model predicted a more depleted stock in 2015 with the lower 2013 survey estimate, resulting in a 12% reduction in the default harvest catch for 2014.

These sensitivities reflect current investigations into the Pacific Hake stock. The removal of the 2012 acoustic survey index and age composition data suggests that the estimation of recruitment of recent year-classes is more uncertain with a biennial survey than it would be with an annual survey. The relaxation of the standard deviation on the selectivity parameters has a pronounced effect on those parameters, but not on the overall results. Research into alternative parameterizations for time-varying selectivity would be useful to provide a more flexible framework, and investigating fisheries cohort targeting may lead to a better understanding of time-varying selectivity parameterization for future models.

3.6 Retrospective analyses

Retrospective analyses were performed by iteratively removing the terminal years' data and estimating the parameters under the assumptions of the base model. Overall, there is little retrospective change to the depletion trajectory up to the early 2000's, and most retrospective change occurs in the final years of the retrospective model (Figure 53). A consistent retrospective pattern is not apparent over the last 5 years. Over the last 3 years, the stock assessment has retrospectively underestimated the status, but removing 3 or more years of data resulted in the assessment over-estimating the status in the terminal year, which is likely related to the high 2009 acoustic survey estimate.

This pattern of high estimated uncertainty in the terminal year and variable retrospective estimates suggests that this model is unable to accurately estimate recruitment until the cohort has been observed for several years (Figure 53). For example, two cohorts that are currently estimated to be above average (2008 and 2010) show this pattern in Table 26. Without data informing the strength of these cohorts, the median value is near 1, and then the 'Retro -3 years' case in Table 26 shows a 2008 recruitment of 11.36 billion, which is subsequently reduced to 3.88, 4.75, and 5.15 billion with data from additional years. In contrast, the estimated size of the 2010 cohort consistently increases with the addition of new data and does not appear to be overestimated when it was age 2. The retrospective estimates of the 2008 year class are likely influenced by a unique situation of a high 2009 acoustic survey estimate and the presence of Humboldt Squid in 2009, which may have resulted in a high mortality on young hake.

Figure 54 shows the retrospective patterns of estimated recruitment deviations for various cohorts. The magnitude of the deviation is not well estimated until several years of catch-at-age data have been collected, incorporated into the model, and the cohort is older (Table 27). There is no particular pattern across cohorts, though. For example, the 1999, 2002, 2009 and 2010 cohorts monotonically increase in absolute magnitude for many years. Conversely, the 2000, 2001, 2003, 2005, 2006, and 2008 cohorts are estimated at a higher magnitude when they are young compared to when they are older, although there is no particular age at which there seems to be a bias. The standard deviation of the estimated deviations at a particular age across the cohorts (Table 27) suggests that the estimates begin to stabilize when the cohort is approximately 4 years old. This illustrates that multiple observations of each cohort are needed in order to more accurately determine their recruitment strength and/or that mean recruitment dynamics currently modelled in the stock assessment do not reflect realized recruitment very well.

Estimating time-varying selectivity for the fishery is new for the base model in this assessment, and that decision was partly based on the retrospective pattern of estimated recruitment deviations. Figure 55 and Table 27 show the retrospective estimates of recruitment deviations. The patterns are very similar for both time-varying and time-invariant models, but the introduction of time-varying selectivity reduced the occurrence of large absolute deviations at age 2 for many of the cohorts (Table 27). Adding more flexibility to time-varying selectivity by increasing ϕ to 0.20 reduced the magnitude of the deviations at age 2 even more. With few observations of the cohort when it is young, the model has little information to differentiate a change in selectivity that resulted in an unusual observation of proportions-at-age or if it is indeed a strong cohort. This may actually increase the bias of the model, both positively and negatively. It reduces the risk when incoming cohorts are strong, but may be overly optimistic when incoming cohorts are weak. The inclusion of time-varying selectivity was investigated further in the MSE (Appendix A) and showed favorable results.

A comparison of the actual assessment models used in each year since 1991 is shown in Figure 56. There has been a large difference in the models submitted each year, which can clearly be seen by looking at the spawning biomass trajectories. The variability between models, especially early on in the time series, is larger than the uncertainty (95% C.I.) reported in any single model in recent years. One important avenue which was investigated between 2004 and 2007 was the inclusion of several different, but fixed, survey catchability (q) values; and in the following years 2008 to present, it was allowed to be freely estimated by the model. In all the years prior to 2004, the survey catchability was fixed at 1.0. The fixing of survey catchability had the effect of driving the estimate of initial biomass upward, which in turn scaled the entire biomass trajectory up, leading to higher estimates of depletion than what we see today. The 2014 estimates of spawning biomass appear consistent with recent years, although the model structure has remained consistent, and the uncertainty intervals associated with them bracket the majority of the historical estimates.

4 Research and data needs

There are many research projects that could improve the stock assessment for Pacific Hake. The following prioritized list of topics might appreciably improve biological understanding and decision-making:

1. Examine statistical methods to parameterize time-varying fishery selectivity in assessment and forecasting.

2. Continue development of the management strategy evaluation (MSE) tools to evaluate major sources of uncertainty relating to data, model structure and the harvest policy for this fishery and compare potential methods to address them. Work with the JMC, SRG, and AP to develop scenarios to investigate, management performance metrics to evaluate the scenarios, and hypotheses related to the life-history, fishery, spatial dynamics, and management of Pacific Hake.

3. Continue to explore alternative indices for juvenile or young (0 and/or 1 year old) Pacific Hake. Initially, the MSE should be used to investigate whether an age-0 or -1 index could reduce stock assessment and management uncertainty enough to improve overall management performance.

4. Finalize the analysis of recently collected maturity samples and explore ways to include new maturity estimates in the assessment.

5. Routinely collect and analyze life-history data, including maturity and fecundity for Pacific Hake. Explore possible relationships among these life history traits as well as with body growth and population density. Currently available information is limited and outdated.

6. Conduct further exploration of ageing imprecision and the effects of large cohorts via simulation and blind source age-reading of samples with differing underlying age distributions – with and without dominant year classes.

7. Continue to explore process-based operating and assessment models that may be able to capture more realistic life-history variability (changes in size at age, M, fecundity at size etc.), as well as future fishery selectivity patterns.

8. Conduct research to improve the acoustic survey estimates of age and abundance. This includes, but is not limited to, species identification, target verification, target strength and alternative technologies to assist in the survey, as well as improved and more efficient analysis methods.

9. Maintain the flexibility to undertake annual acoustic surveys for Pacific Hake under pressing circumstances in which uncertainty in the hake stock assessment presents a potential risk to or underutilization of the stock.

10. Evaluate the quantity and quality of historical biological data (prior to 1988 from the Canadian fishery, and prior to 1975 from the U.S. fishery) for use as age-composition and weight-at-age data, and/or any historical indications of abundance fluctuations.

11. Investigate meta-analytic methods for developing a prior on degree of recruitment variability (σ_r), and for refining existing priors for natural mortality (*M*) and steepness of the stock-recruitment relationship (*h*).

12. Apply bootstrapping methods to the acoustic survey time-series to incorporate more of the relevant uncertainties into the survey variance calculations. These factors include the target strength relationship, subjective scoring of echograms, thresholding methods, the species-mix and demographic estimates used to interpret the acoustic backscatter, and others.

13. Coordinate our MSE research with other scientists in the region engaging in similar research.

14. Examine structured variation in key life-history quantities (i.e., length at age).

15. Examine alternative ways to model and forecast recruitment.

16. Investigate the utility of additional data sources (bottom trawl surveys, length data, etc.) for use in assessment and simulation models.

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7 Tables

Table 1: Annual catches of Pacific Hake (1000s mt) in U.S. and Canadian waters by sector, 1966-2013. Tribal catches are included in the sector totals.

	U.S.					Canada				
Year	Foreign	JV	At-sea	Shore-based	Total U.S.	Foreign	JV	Domestic	Total Canada	Total
1966	137,000	0	0	0	137,000	700	0	0	700	137,700
1967	168,700	0	0	8,960	177,660	36,710	0	0	36,710	214,370
1968	60,660	0	0	160	60,820	61,360	0	0	61,360	122,180
1969	86,190	0	0	90	86,280	93,850	0	0	93,850	180,130
1970	159,510	0	0	70	159,580	75,010	0	0	75,010	234,590
1971	126,490	0	0	1,430	127,920	26,700	0	0	26,700	154,620
1972	74,090	0	0	40	74,130	43,410	0	0	43,410	117,540
1973	147,440	0	0	70	147,510	15,130	0	0	15,130	162,640
1974	194,110	0	0	0	194,110	17,150	0	0	17,150	211,260
1975	205,650	0	0	0	205,650	15,700	0	0	15,700	221,350
1976	231,330	0	0	220	231,550	5,970	0	0	5,970	237,520
1977	127,010	0	0	490	127,500	5,190	0	0	5,190	132,690
1978	96,827	860	0	690	98,377	3,450	1,810	0	5,260	103,637
1979	114,910	8,830	0	940	124,680	7,900	4,230	300	12,430	137,110
1980	44,023	27,537	0	790	72,350	5,270	12,210	100	17,580	89,930
1981	70,365	43,557	0	838	114,760	3,920	17,160	3,280	24,360	139,120
1982	7,089	67,465	0	1,027	75,581	12,480	19,680	0	32,160	107,741
1983	0	72,100	0	1,051	73,151	13,120	27,660	0	40,780	113,931
1984	14,772	78,889	0	2,721	96,382	13,200	28,910	0	42,110	138,492
1985	49,853	31,692	0	3,894	85,439	10,530	13,240	1,190	24,960	110,399
1986	69,861	81,640	0	3,465	154,966	23,740	30,140	1,770	55,650	210,616
1987	49,656	105,997	0	4,795	160,448	21,450	48,080	4,170	73,700	234,148
1988	18,041	135,781	0	6,867	160,689	38,080	49,240	830	88,150	248,839
1989	0	195,636	0	7,414	203,050	29,750	62,718	2,562	95,030	298,080
1990	0	170,972	4,537	9,632	185,141	3,810	68,314	4,021	76,145	261,286
1991	0	0	205,819	23,970	229,789	5,610	68,133	16,174	89,917	319,706
1992	0	0	154,702	56,127	210,829	0	68,779	20,043	88,822	299,651
1993	0	0	98,024	42,108	140,132	0	46,422	12,351	58,773	198,905
1994	0	0	179,861	73,616	253,477	0	85,162	23,775	108,937	362,414
1995	0	0	102,162	74,962	177,124	0	26,191	46,180	72,371	249,495
1996	0	0	128,031	85,128	213,159	0	66,779	26,363	93,142	306,301
1997	0	0	145,960	87,416	233,376	0	42,565	49,227	91,792	325,168
1998	0	0	145,063	87,856	232,919	0	39,728	48,074	87,802	320,721
1999	0	0	141,095	83,470	224,565	0	17,201	70,156	87,357	311,922
2000	0	0	120,915	85,854	206,769	0	15,059	6,382	21,441	228,210
2001	0	0	100,529	73,412	173,941	0	21,650	31,938	53,588	227,529
2002	0	0	84,746	45,708	130,454	0	0	50,239	50,239	180,693
2003	0	0	86,610	55,335	141,945	0	0	63,230	63,230	205,175
2004	0	0	120,737	96,504	217,241	0	58,892	66,191	125,083	342,324
2005	0	0	151,068	109,052	260,120	0	15,695	87,342	103,037	363,157
2006	0	0	139,790	127,165	266,955	0	14,319	80,486	94,805	361,760
2007	0	0	126,240	91,441	217,681	0	6,780	66,667	73,447	291,128
2008	0	0	180,635	67,760	248,395	0	3,592	70,157	73,749	322,144
2009	0	0	72,102	49,223	121,325	0	0	55,885	55,885	177,210
2010	0	0	106,306	63,795	170,101	0	8,081	48,012	56,093	226,194
2011	0	0	128,072	102,147	230,219	0	9,717	45,913	55,630	285,849
2012	0	0	93,776	65,797	159,573	0	0	46,776	46,776	206,349
2013	0	0	130,396	99,017	229,413	0	0	54,096	54,096	283,509
Mean					167,171				56,067	223,238

Table 2: Recent trend in Pacific Hake landings and management.

Year	Total Landings (mt)	Coast-wide (US+Canada) catch target (mt)	Proportion of catch target removed
2004	342,323	501,073	68.3%
2005	363,157	364,197	99.7%
2006	361,760	364,842	99.2%
2007	291,129	328,358	88.7%
2008	322,144	364,842	88.3%
2009	177,209	184,000	96.3%
2010	226,195	262,500	86.2%
2011	285,850	393,751	72.6%
2012	206,350	251,809	82.0%
2013	283,510	365,112	77.7%

Table 3: Annual summary of U.S. and Canadian fishery sampling included in this stock assessment. Canadian, foreign, joint-venture and at-sea sectors are in number of hauls sampled for age-composition, the shore-based sector is in number of trips.

	U.S.				Canada		
Year	Foreign (hauls)	Joint-venture (hauls)	At-sea (hauls)	Shore-based (trips)	Foreign	Joint-venture (hauls)	Domestic (hauls)
1975	13	—	—	—	—	—	—
1976	142	—	—	—	—	—	—
1977	320	—	—	—	—	—	—
1978	336	5	—	—	—	—	—
1979	99	17	—	—	—	—	—
1980	191	30	—	—	—	—	—
1981	113	41	—	—	—	—	—
1982	52	118	—	—	—	—	—
1983	0	117	—	—	—	—	—
1984	49	74	—	—	—	—	—
1985	37	19	—	—	—	—	—
1986	88	32	—	—	—	—	—
1987	22	34	—	—	—	—	—
1988	39	42	—	—	—	—	—
1989	—	77	—	—	—	—	—
1990	—	143	—	15	—	5	—
1991	—	—	116	26	—	18	—
1992	—	—	164	46	—	33	—
1993	—	—	108	36	—	25	—
1994	—	—	143	50	—	41	—
1995	—	—	61	51	—	35	—
1996	—	—	123	35	—	28	—
1997	—	—	127	65	—	27	3
1998	—	—	149	64	—	21	9
1999	—	—	389	80	—	14	31
2000	—	—	413	91	—	25	—
2001	—	—	429	82	—	28	2
2002	—	—	342	71	—	—	37
2003	—	—	358	78	—	—	21
2004	—	—	381	72	—	20	28
2005	—	—	499	58	—	11	45
2006	—	—	549	83	—	21	67
2007	—	—	524	68	—	1	36
2008	—	—	680	63	—	—	51
2009	—	—	594	66	—	—	26
2010	—	—	774	75	—	—	24
2011	—	—	987	81	—		13
2012	—	—	631	76	—	—	144
2013	—	—	665	96	—	—	110

Table 4: Summary of the acoustic surveys from 1995 to 2012.

Year	Start date	End date	Vessels	Biomass index (million mt)	Sampling CV[1]	Number of hauls with bio. samples
1995	1 July	1 Sept.	Miller Freeman, Ricker	1.518	0.067	69
1998	6 July	27 Aug.	Miller Freeman, Ricker	1.343	0.049	84
2001	15 June	18 Aug	Miller Freeman, Ricker	0.919	0.082	49
2003	29 June	1 Sept.	Ricker	2.521	0.071	71
2005	20 June	19 Aug.	Miller Freeman	1.755	0.085	49
2007	20 June	21 Aug.	Miller Freeman	1.123	0.075	130
2009	30 June	7 Sept.	Miller Freeman, Ricker	1.612	0.137[2]	61
2011	26 June	10 Sept	Bell Shimada, Ricker	0.521	0.1015	59
2012	23 June	7 Sept	Bell Shimada, Ricker, F/V Forum Star	1.381	0.0475	94
2013	13 June	11 Sept	Bell Shimada, Ricker	2.423	0.0433	68

[1]Sampling CV includes only error associated with kriging of transect-based observations.
[2]Also includes bootstrapped estimates of uncertainty associated with delineation of Humboldt squid from hake.

Table 5: Number of Pacific Hake ovaries collected for histological analysis. The numbers in italics for the 2013 trawl survey, the 2013 acoustics survey, and the 2013 ASHOP Fall samples were not available for analysis in this assessment.

Length bin (cm)	Trawl Survey 2009	Trawl Survey 2012	*Trawl Survey 2013*	Acoustics Survey 2012	*Acoustics Survey 2013*	ASHOP 2013 - Spring	*ASHOP 2013 - Fall*	Total
<20	12	0	*0*	0	*0*	0	*0*	12
20-21	6	0	*0*	0	*0*	0	*0*	6
22-23	17	0	*2*	0	*0*	0	*0*	19
24-25	16	2	*1*	3	*4*	0	*0*	26
26-27	8	2	*1*	7	*8*	0	*0*	26
28-29	4	2	*3*	11	*10*	0	*0*	30
30-31	5	2	*1*	21	*1*	0	*0*	30
32-33	13	4	*3*	12	*5*	0	*0*	37
34-35	4	1	*3*	24	*15*	5	*0*	52
36-37	9	4	*4*	14	*36*	15	*5*	87
38-39	19	3	*4*	8	*15*	16	*34*	99
40-41	17	3	*5*	14	*51*	16	*41*	147
42-43	17	1	*3*	9	*14*	12	*8*	64
44-45	13	3	*1*	11	*14*	14	*2*	58
46-47	18	5	*8*	8	*23*	7	*1*	70
48-49	20	5	*2*	6	*10*	6	*2*	51
50-51	15	4	*4*	9	*17*	7	*0*	56
52-53	5	7	*5*	10	*13*	3	*0*	43
54-55	9	2	*3*	9	*6*	4	*0*	33
56-57	5	7	*3*	6	*7*	1	*0*	29
58-59	5	2	*2*	7	*2*	0	*0*	18
60-61	7	3	*1*	4	*0*	0	*0*	15
>61	19	9	*11*	6	*3*	0	*0*	48
Total	**263**	**71**	***70***	**199**	***254***	**106**	***93***	**1056**

Table 6: Number of Pacific Hake ovary samples with maturity assigned.

Length (cm)	Trawl 2009	Trawl 2012	Acoustic 2012	ASHOP Spring 2013	Total
<20	12	0	0	0	**12**
20–21	6	0	0	0	**6**
21–23	17	0	0	0	**17**
23–25	16	2	3	0	**21**
25–27	8	2	7	0	**17**
27–29	4	2	11	0	**17**
29–31	5	2	21	0	**28**
31–33	11	4	12	0	**27**
33–35	4	1	24	5	**34**
35–37	7	4	14	15	**40**
37–39	19	3	8	16	**46**
39–41	16	3	14	15	**48**
41–43	17	1	9	12	**39**
43–45	13	3	11	14	**41**
45–47	18	5	8	7	**38**
47–49	20	5	6	6	**37**
49–51	15	4	9	7	**35**
51–53	5	7	10	3	**25**
53–55	9	2	9	3	**23**
55–57	5	7	6	1	**19**
57–59	5	2	7	0	**14**
59–61	7	3	4	0	**14**
>61	19	9	6	0	**34**
Total	**258**	**71**	**199**	**104**	**632**

Table 7: Estimated proportion mature-at-age from Dorn & Saunders (1997), a logistic model with an asymptote fixed at one, and a logistic model with an asymptote estimated (in the generalized linear model with length and age as covariates).

Age	Dorn1997	Asymptote = 1	Asymptote estimated
1	0	0.1864	0.0553
2	0.18	0.3702	0.2752
3	0.66	0.7061	0.7245
4	0.89	0.7594	0.8730
5	0.97	0.7945	0.9130
6	0.99	0.9033	0.9230
7	1	0.8962	0.9244
8	1	0.9004	0.9247
9	1	0.9346	0.9248
10	1	0.9077	0.9248
11	1	0.9376	0.9248
12	1	0.9357	0.9248
13	1	0.9115	0.9248
14	1	0.9046	0.9248
15	1	0.8782	0.9248

Table 8: Summary of estimated model parameters and priors in the base model. The Beta prior is parameterized with a mean and standard deviation. The lognormal distribution (LN) is parameterized with the median and standard deviation in log space.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD) (single value = fixed)
	Stock dynamics		
Ln(R_0)	1	(13,17)	uniform
Steepness (*h*)	1	(0.2,1.0)	~Beta(0.777,0.113)
Recruitment variability (σ_R)	-	NA	1.40
Ln(Rec. deviations): 1946-2013	68	(-6, 6)	~LN(0, σ_r)
Natural mortality (*M*)	1	(0.05,0.4)	~LN(0.2,0.1)
	Catchability and selectivity (double normal)		
Acoustic survey:			
Catchability (*q*)	1	NA	Analytic solution
Additional value for acoustic survey log(SE)	1	(0.0, 1.2)	Uniform
Non parametric age-based selectivity: ages 3–6	4	(-5,9)	Uniform in scaled logistic space
Fishery:			
Non parametric age-based selectivity: ages 2–6	5	(-5,9)	Uniform in scaled logistic space
Selectivity deviations (1991-2013, ages 2-6)	115	NA	Normal(0,0.03)
Total: 14 + 67 recruitment deviations+115 selectivity deviations = 197 estimated parameters.			
See Appendix A for all parameter estimates.			

Table 9 Summary of SRG 2013 research recommendations and responses

Broad Recommendation	Response
Acoustic Research - Record more information on the decision process used for assigning locations for trawl sites. Age-1 index development Inter-vessel calibrations Investigate hake moving north as the survey is progressing from south to north, thus causing a Doppler effect	Deferred due to 2013 survey operations Deferred due to 2013 survey operations Deferred due to 2013 survey operations Deferred due to 2013 survey operations
Life-history data improvements, especially maturity	Maturity data analyzed, new ogive used in assessment sensitivity case
Assessment model configuration: More constant selectivity at age Declining natural mortality at age Consider alternatives to lognormal survey error Investigate recruitment correlations Time-varying selectivity	 Deferred Deferred Deferred Deferred Examined using MSE, comparative retrospective analyses, and presented as base model
Provide a summary of annual fishery operations	To be included in the future
Continue MSE development with input of JMC, JTC, AP and SRG for guidance	MSE workplan discussed at May 2013 JMC meeting MSE steering group formed MSE steering group teleconference September 2013 Questions to guide objective setting posed and discussed January 2013 JTC meeting

Table 10: Maximum likelihood estimates (MLE) of important quantities from the models bridging the 2013 base model to the 2014 model with the same assumptions as the 2013 base model, including time-invariant selectivity.

MLE results	2013 base model	2013 fishery data only	2013 survey data only	All 2013 data
B0 (thousand mt)	1,924	1,960	1,924	1,961
Spawning biomass 2013 (thousand mt)	932	1,156	1,056	1,176
Spawning biomass 2014 (thousand mt)	1,313	1,650	1,508	1,675
Depletion 2012	48.4%	59.0%	54.9%	60.0%
Depletion 2013	68.2%	84.2%	78.4%	85.4%
Depletion 2014	72.1%	94.7%	88.5%	95.9%
Age-0 recruits 2008 (billions)	4.77	5.16	4.79	5.18
Age-0 recruits 2010 (billions)	11.62	16.06	14.87	16.41

Table 11: Time-series of median posterior population estimates from the base model.

Year	Female spawning biomass (millions mt)	Depletion	Age-0 recruits (billions)	(1-SPR) / (1-$SPR_{40\%}$)	Exploitation fraction
1966	1.046	0.489	1.426	0.449	0.064
1967	0.967	0.455	3.470	0.643	0.107
1968	0.899	0.423	2.003	0.475	0.067
1969	0.962	0.456	0.813	0.616	0.096
1970	1.031	0.485	7.529	0.697	0.105
1971	1.023	0.479	0.742	0.524	0.069
1972	1.218	0.570	0.448	0.412	0.056
1973	1.388	0.651	4.280	0.452	0.050
1974	1.405	0.659	0.375	0.512	0.069
1975	1.405	0.658	1.207	0.453	0.065
1976	1.376	0.647	0.332	0.420	0.054
1977	1.295	0.614	4.995	0.299	0.038
1978	1.203	0.567	0.270	0.277	0.034
1979	1.241	0.582	0.963	0.330	0.047
1980	1.242	0.584	16.282	0.263	0.028
1981	1.215	0.569	0.301	0.388	0.051
1982	1.618	0.761	0.239	0.335	0.048
1983	2.013	0.948	0.410	0.275	0.024
1984	2.122	1.008	12.880	0.279	0.031
1985	2.020	0.958	0.207	0.231	0.027
1986	2.248	1.061	0.198	0.375	0.059
1987	2.367	1.123	5.444	0.405	0.045
1988	2.277	1.079	1.897	0.414	0.052
1989	2.190	1.039	0.182	0.532	0.081
1990	2.063	0.975	4.395	0.457	0.064
1991	1.876	0.887	0.531	0.563	0.084
1992	1.723	0.810	0.181	0.609	0.101
1993	1.550	0.731	3.305	0.546	0.076
1994	1.354	0.642	2.475	0.779	0.151
1995	1.136	0.536	1.265	0.693	0.129
1996	1.077	0.505	1.607	0.824	0.153
1997	0.977	0.458	1.295	0.873	0.161
1998	0.869	0.409	1.836	0.926	0.192
1999	0.752	0.354	11.262	0.990	0.219
2000	0.660	0.311	0.348	0.797	0.150
2001	0.961	0.453	0.880	0.754	0.135
2002	1.242	0.587	0.073	0.513	0.045
2003	1.362	0.643	1.409	0.510	0.062
2004	1.294	0.611	0.071	0.750	0.126
2005	1.090	0.517	2.370	0.805	0.182
2006	0.843	0.400	1.843	0.953	0.217
2007	0.656	0.311	0.091	0.986	0.259
2008	0.579	0.274	5.148	1.064	0.262
2009	0.479	0.228	2.010	0.893	0.162
2010	0.568	0.269	15.364	1.000	0.261
2011	0.669	0.317	0.372	1.014	0.205
2012	1.139	0.540	0.841	0.769	0.146
2013	1.566	0.745	1.048	0.694	0.072
2014	1.722	0.818	0.983	NA	NA

Table 12: Time-series of ~95% posterior credibility intervals for female spawning biomass, relative depletion estimates, age-0 recruits, relative spawning potential ratio[(1-SPR)/(1-SPRTarget=0.4)] and exploitation fraction from the base model

Year	Female spawning Biomass (millions mt)	Depletion	Age-0 recruits (billions)	(1-SPR) / (1-SPR_{target})	Exploitation fraction
1966	0.591-1.931	0.280-0.872	0.101-8.870	0.245-0.694	0.034-0.119
1967	0.545-1.808	0.260-0.792	0.139-12.970	0.379-0.920	0.056-0.205
1968	0.477-1.711	0.239-0.748	0.122-8.867	0.262-0.746	0.034-0.129
1969	0.587-1.759	0.284-0.760	0.062-4.586	0.364-0.892	0.048-0.185
1970	0.630-1.877	0.302-0.826	3.708-18.880	0.417-0.957	0.056-0.189
1971	0.614-1.912	0.301-0.845	0.067-3.376	0.292-0.790	0.036-0.113
1972	0.756-2.364	0.357-1.035	0.049-1.995	0.209-0.643	0.029-0.091
1973	0.869-2.703	0.414-1.209	2.170-9.881	0.233-0.687	0.026-0.080
1974	0.860-2.718	0.416-1.217	0.044-1.595	0.267-0.760	0.036-0.111
1975	0.850-2.738	0.408-1.223	0.479-3.347	0.234-0.697	0.034-0.108
1976	0.823-2.689	0.394-1.192	0.042-1.490	0.212-0.656	0.028-0.092
1977	0.769-2.550	0.372-1.117	2.548-10.579	0.145-0.499	0.020-0.064
1978	0.711-2.334	0.347-1.015	0.034-1.360	0.137-0.472	0.018-0.058
1979	0.747-2.324	0.360-1.004	0.135-3.111	0.169-0.546	0.025-0.080
1980	0.759-2.279	0.368-0.992	9.556-29.538	0.133-0.442	0.015-0.047
1981	0.746-2.161	0.364-0.956	0.035-1.590	0.210-0.614	0.029-0.083
1982	1.056-2.757	0.502-1.193	0.035-1.119	0.176-0.536	0.027-0.078
1983	1.364-3.308	0.643-1.469	0.046-1.561	0.149-0.427	0.015-0.036
1984	1.474-3.409	0.692-1.493	8.230-21.364	0.160-0.433	0.019-0.044
1985	1.417-3.153	0.664-1.381	0.024-0.917	0.130-0.362	0.017-0.038
1986	1.635-3.348	0.765-1.473	0.027-0.867	0.229-0.541	0.038-0.083
1987	1.761-3.434	0.812-1.520	3.264-9.059	0.260-0.565	0.031-0.060
1988	1.720-3.210	0.791-1.436	0.779-3.850	0.269-0.561	0.037-0.069
1989	1.698-3.006	0.778-1.370	0.022-0.698	0.362-0.705	0.059-0.106
1990	1.619-2.794	0.736-1.271	2.909-6.945	0.312-0.615	0.047-0.082
1991	1.503-2.478	0.677-1.154	0.071-1.330	0.408-0.736	0.063-0.105
1992	1.391-2.251	0.627-1.051	0.029-0.619	0.441-0.780	0.077-0.125
1993	1.264-2.014	0.563-0.939	2.260-4.993	0.392-0.697	0.059-0.093
1994	1.131-1.730	0.493-0.816	1.521-3.770	0.601-0.945	0.118-0.181
1995	0.944-1.453	0.411-0.684	0.713-2.166	0.518-0.858	0.101-0.157
1996	0.899-1.361	0.393-0.648	1.011-2.549	0.640-0.989	0.121-0.184
1997	0.816-1.253	0.360-0.588	0.713-2.300	0.692-1.018	0.127-0.194
1998	0.721-1.123	0.319-0.526	1.124-2.863	0.745-1.079	0.148-0.231
1999	0.614-0.989	0.275-0.462	8.324-16.381	0.800-1.147	0.168-0.267
2000	0.520-0.882	0.240-0.407	0.079-0.835	0.607-0.970	0.112-0.192
2001	0.771-1.258	0.353-0.584	0.548-1.384	0.572-0.929	0.102-0.173
2002	1.020-1.593	0.458-0.750	0.011-0.232	0.363-0.669	0.035-0.055
2003	1.148-1.711	0.512-0.814	0.988-2.165	0.367-0.671	0.049-0.074
2004	1.118-1.585	0.494-0.765	0.013-0.247	0.577-0.91	0.103-0.146
2005	0.951-1.343	0.418-0.647	1.677-3.858	0.635-0.965	0.149-0.210
2006	0.726-1.052	0.323-0.503	1.208-3.225	0.763-1.107	0.172-0.252
2007	0.553-0.867	0.247-0.401	0.015-0.303	0.804-1.134	0.197-0.308
2008	0.470-0.825	0.211-0.366	3.144-10.376	0.872-1.206	0.186-0.324
2009	0.365-0.746	0.169-0.327	1.059-4.371	0.67-1.059	0.105-0.215
2010	0.406-0.964	0.193-0.420	7.914-36.131	0.738-1.181	0.158-0.359
2011	0.443-1.271	0.215-0.543	0.039-1.639	0.695-1.225	0.109-0.312
2012	0.635-2.445	0.316-1.042	0.057-11.867	0.456-1.037	0.070-0.252
2013	0.813-3.499	0.410-1.526	0.063-15.498	0.379-0.989	0.032-0.140
2014	0.835-3.932	0.416-1.688	0.054-13.635	0.969-1.071	0.175-0.299

Table 13: Estimated numbers at age at the beginning of the year from the base model (MLE; billions).

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1966	1.60	1.17	0.77	0.56	0.44	0.36	0.30	0.26	0.22	0.19	0.17	0.14	0.12	0.11	0.09	0.39
1967	2.89	1.29	0.95	0.62	0.44	0.34	0.27	0.23	0.19	0.17	0.15	0.13	0.11	0.09	0.08	0.36
1968	2.12	2.33	1.04	0.76	0.47	0.33	0.25	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.07	0.31
1969	1.04	1.71	1.89	0.84	0.59	0.36	0.25	0.18	0.14	0.12	0.10	0.09	0.08	0.07	0.06	0.28
1970	6.39	0.84	1.38	1.50	0.64	0.44	0.26	0.18	0.13	0.10	0.08	0.07	0.06	0.05	0.05	0.24
1971	0.81	5.17	0.68	1.10	1.13	0.46	0.31	0.18	0.12	0.09	0.07	0.06	0.05	0.04	0.04	0.19
1972	0.47	0.65	4.17	0.54	0.85	0.85	0.35	0.23	0.13	0.09	0.06	0.05	0.04	0.04	0.03	0.17
1973	3.68	0.38	0.53	3.35	0.42	0.65	0.65	0.26	0.17	0.10	0.06	0.05	0.04	0.03	0.03	0.15
1974	0.40	2.97	0.31	0.42	2.60	0.32	0.49	0.48	0.19	0.12	0.07	0.05	0.04	0.03	0.02	0.13
1975	1.16	0.33	2.40	0.25	0.33	1.96	0.24	0.36	0.35	0.14	0.09	0.05	0.03	0.03	0.02	0.11
1976	0.33	0.93	0.26	1.92	0.19	0.25	1.47	0.18	0.26	0.26	0.10	0.07	0.04	0.03	0.02	0.10
1977	4.39	0.27	0.75	0.21	1.50	0.15	0.19	1.10	0.13	0.19	0.19	0.08	0.05	0.03	0.02	0.09
1978	0.27	3.55	0.22	0.61	0.17	1.17	0.11	0.14	0.84	0.10	0.15	0.15	0.06	0.04	0.02	0.08
1979	0.92	0.22	2.87	0.17	0.48	0.13	0.91	0.09	0.11	0.65	0.08	0.11	0.11	0.04	0.03	0.08
1980	14.14	0.74	0.18	2.30	0.14	0.37	0.10	0.69	0.07	0.08	0.49	0.06	0.09	0.09	0.03	0.08
1981	0.32	11.43	0.60	0.14	1.83	0.11	0.29	0.08	0.53	0.05	0.06	0.38	0.05	0.07	0.07	0.09
1982	0.25	0.25	9.24	0.48	0.11	1.41	0.08	0.22	0.06	0.40	0.04	0.05	0.28	0.03	0.05	0.12
1983	0.43	0.20	0.21	7.42	0.38	0.09	1.08	0.06	0.17	0.04	0.30	0.03	0.04	0.22	0.03	0.13
1984	11.55	0.35	0.16	0.17	5.88	0.30	0.07	0.84	0.05	0.13	0.03	0.23	0.02	0.03	0.17	0.12
1985	0.20	9.33	0.28	0.13	0.13	4.60	0.23	0.05	0.64	0.04	0.10	0.03	0.18	0.02	0.02	0.22
1986	0.22	0.16	7.54	0.23	0.11	0.10	3.61	0.18	0.04	0.50	0.03	0.08	0.02	0.14	0.01	0.19
1987	4.82	0.18	0.13	6.05	0.18	0.08	0.08	2.72	0.14	0.03	0.38	0.02	0.06	0.02	0.11	0.15
1988	1.86	3.90	0.14	0.11	4.74	0.14	0.06	0.06	2.03	0.10	0.02	0.28	0.02	0.04	0.01	0.19
1989	0.18	1.50	3.15	0.11	0.08	3.63	0.10	0.05	0.04	1.52	0.08	0.02	0.21	0.01	0.03	0.15
1990	3.97	0.15	1.22	2.52	0.09	0.06	2.69	0.07	0.03	0.03	1.09	0.05	0.01	0.15	0.01	0.13
1991	0.56	3.21	0.12	0.97	1.96	0.07	0.05	1.98	0.06	0.02	0.02	0.81	0.04	0.01	0.11	0.10
1992	0.19	0.46	2.59	0.09	0.74	1.45	0.05	0.03	1.42	0.04	0.02	0.02	0.58	0.03	0.01	0.15
1993	3.05	0.15	0.37	2.07	0.07	0.55	1.06	0.03	0.02	1.00	0.03	0.01	0.01	0.41	0.02	0.11
1994	2.26	2.46	0.12	0.29	1.59	0.05	0.40	0.76	0.02	0.02	0.72	0.02	0.01	0.01	0.29	0.10
1995	1.19	1.83	1.99	0.10	0.22	1.13	0.04	0.26	0.48	0.02	0.01	0.46	0.01	0.01	0.01	0.25
1996	1.47	0.96	1.48	1.58	0.07	0.16	0.80	0.02	0.17	0.33	0.01	0.01	0.31	0.01	0.00	0.17
1997	1.20	1.19	0.78	1.16	1.16	0.05	0.11	0.50	0.02	0.11	0.21	0.01	0.00	0.19	0.01	0.11
1998	1.64	0.97	0.96	0.61	0.84	0.78	0.03	0.07	0.31	0.01	0.07	0.13	0.00	0.00	0.12	0.07
1999	10.34	1.33	0.78	0.75	0.43	0.54	0.49	0.02	0.04	0.18	0.01	0.04	0.07	0.00	0.00	0.11
2000	0.36	8.36	1.07	0.61	0.51	0.27	0.33	0.28	0.01	0.02	0.10	0.00	0.02	0.04	0.00	0.06
2001	0.80	0.29	6.75	0.85	0.45	0.36	0.18	0.20	0.17	0.01	0.01	0.06	0.00	0.01	0.03	0.04
2002	0.07	0.65	0.24	5.38	0.64	0.32	0.25	0.12	0.13	0.11	0.00	0.01	0.04	0.00	0.01	0.04
2003	1.29	0.06	0.52	0.19	4.20	0.48	0.24	0.18	0.08	0.10	0.08	0.00	0.01	0.03	0.00	0.04
2004	0.07	1.04	0.05	0.42	0.15	3.18	0.36	0.17	0.13	0.06	0.07	0.06	0.00	0.00	0.02	0.03
2005	2.13	0.06	0.84	0.04	0.31	0.10	2.20	0.24	0.11	0.08	0.04	0.05	0.04	0.00	0.00	0.03
2006	1.63	1.72	0.05	0.67	0.03	0.22	0.07	1.39	0.15	0.07	0.05	0.03	0.03	0.02	0.00	0.02
2007	0.10	1.32	1.39	0.04	0.47	0.02	0.13	0.04	0.80	0.09	0.04	0.03	0.01	0.02	0.01	0.01
2008	4.42	0.08	1.07	1.08	0.03	0.29	0.01	0.07	0.02	0.44	0.05	0.02	0.02	0.01	0.01	0.02
2009	1.71	3.58	0.06	0.83	0.72	0.01	0.16	0.01	0.04	0.01	0.21	0.02	0.01	0.01	0.00	0.01
2010	12.76	1.38	2.89	0.05	0.60	0.48	0.01	0.09	0.00	0.02	0.01	0.12	0.01	0.01	0.00	0.01
2011	0.44	10.32	1.11	2.24	0.03	0.34	0.28	0.01	0.05	0.00	0.01	0.00	0.07	0.01	0.00	0.01
2012	1.87	0.35	8.32	0.85	1.40	0.02	0.21	0.16	0.00	0.03	0.00	0.01	0.00	0.04	0.00	0.01
2013	2.30	1.51	0.28	6.55	0.62	0.97	0.01	0.13	0.11	0.00	0.02	0.00	0.00	0.00	0.03	0.01
2014	2.32	1.86	1.22	0.23	4.90	0.45	0.68	0.01	0.09	0.07	0.00	0.01	0.00	0.00	0.00	0.02

Table 14: Select parameters, derived quantities, and reference point estimates for the base model MLE and posterior medians

	MLE	Posterior median
Parameters		
R_0 (billions)	2.35	2.72
Steepness (h)	0.863	0.826
Natural mortality (M)	0.213	0.222
Acoustic catchability (Q)	1.060	
Additional acoustic survey SD	0.294	0.360
Derived Quantities		
2008 recruitment (billions)	4.424	5.148
2010 recruitment (billions)	12.764	15.364
B_0 (thousand mt)	1,993	2,132
2013 Depletion	0.670	0.745
2012 Fishing intensity: (1-SPR)/(1-SPR40%)	0.852	0.769
Reference points based on $F_{40\%}$		
Female spawning biomass ($B_{F40\%}$ million mt)	748	769
$SPR_{MSY\text{-}proxy}$		
Exploitation fraction corresponding to SPR	0.207	0.216
Yield at $B_{F40\%}$ (million mt)	322	342
Reference points based on $B_{40\%}$		
Female spawning biomass ($B_{40\%}$ million mt)	797	853
$SPR_{B40\%}$	0.424	0.432
Exploitation fraction resulting in $B_{40\%}$	0.190	0.191
Yield at $B_{40\%}$ (million mt)	315	334
Reference points based on estimated MSY		
Female spawning biomass (B_{MSY} million mt)	456	519
SPR_{MSY}	0.259	0.284
Exploitation fraction corresponding to SPR_{MSY}	0.363	0.342
MSY (million mt)	346	363

Table 15: Summary of median and 95% credibility base reference points for Pacific Hake. Mean size at age and selectivity at age were averaged from 1966-2013.

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female *B* (B_0, thousand mt)	1,690	2,132	2,748
Unfished recruitment (R_0, billions)	1,788	2,720	4,496
Reference points based on $F_{40\%}$			
Female spawning biomass ($B_{F40\%}$ thousand mt)	592	769	968
$SPR_{MSY\text{-}proxy}$	—	40%	—
Exploitation fraction corresponding to SPR	18.3%	21.6%	25.6%
Yield at $B_{F40\%}$ (thousand mt)	252	342	489
Reference points based on $B_{40\%}$			
Female spawning biomass ($B_{40\%}$ thousand mt)	676	853	1,099
$SPR_{B40\%}$	40.6%	43.2%	49.6%
Exploitation fraction resulting in $B_{40\%}$	14.9%	19.1%	23.2%
Yield at $B_{40\%}$ (thousand mt)	248	334	479
Reference points based on estimated MSY			
Female spawning biomass (B_{MSY} thousand mt)	347	519	844
SPR_{MSY}	18.9%	28.4%	43.4%
Exploitation fraction corresponding to SPR_{MSY}	18.9%	34.2%	57.1%
MSY (thousand mt)	263	363	524

Table 16: Forecast quantiles of Pacific Hake spawning biomass depletion at the beginning of the year before fishing. Catch alternatives are based on: constant catch levels (rows a, e, g), the catch level that results in an equal probability of the population increasing or decreasing from 2014 to 2015 (row b), the approximate average catch over the last 5 years (row c), the catch level that results in the median spawning biomass to remain unchanged from 2014 to 2015 (row d), the approximate maximum historical catch (row f), the approximate maximum catch target (row h), the catch level that results in a 50% probability that the median projected catch will remain the same in 2015 (row i), the catch values that result in a median SPR ratio of 1.0 (row j), and the median values estimated via the default harvest policy ($F_{40\%}$ – 40:10) for the base (row k).

Within model quantile			5%	25%	50%	75%	95%
Management Action			**Beginning of year depletion**				
	Year	Catch (mt)					
a: No catch	2014	0	48%	64%	82%	102%	147%
	2015	0	52%	70%	88%	110%	158%
	2016	0	54%	72%	91%	112%	168%
b: B2014=B2015	2014	190000	48%	64%	82%	102%	147%
	2015	190000	47%	65%	84%	105%	154%
	2016	190000	45%	63%	82%	104%	159%
c: average historical catch	2014	235000	48%	64%	82%	102%	147%
	2015	235000	46%	64%	82%	104%	153%
	2016	235000	43%	61%	80%	102%	157%
d: med(B2014)=med(B2015)	2014	275000	48%	64%	82%	102%	147%
	2015	275000	45%	63%	82%	103%	153%
	2016	275000	41%	59%	78%	100%	156%
e	2014	325000	48%	64%	82%	102%	147%
	2015	325000	44%	62%	80%	102%	151%
	2016	325000	39%	57%	76%	98%	154%
f: near max historical catch	2014	375000	48%	64%	82%	102%	147%
	2015	375000	43%	61%	79%	101%	150%
	2016	375000	36%	55%	74%	96%	151%
g	2014	425000	48%	64%	82%	102%	147%
	2015	425000	42%	60%	78%	100%	149%
	2016	425000	33%	52%	71%	94%	149%
h: near max catch target	2014	500000	48%	64%	82%	102%	147%
	2015	500000	40%	58%	76%	98%	147%
	2016	500000	30%	49%	68%	90%	146%
i: highest C2014=C2015	2014	727000	48%	64%	82%	102%	147%
	2015	727000	35%	53%	71%	94%	141%
	2016	727000	20%	38%	58%	81%	135%
j: fishing intensity = 100%	2014	825000	48%	64%	82%	102%	147%
	2015	660000	32%	51%	69%	91%	139%
	2016	600000	19%	38%	57%	80%	135%
k: default harvest rule	2014	872424	48%	64%	82%	102%	147%
	2015	691686	31%	50%	68%	90%	139%
	2016	604762	17%	36%	55%	78%	133%

Table 17: Forecast quantiles of Pacific Hake fishing intensity (1-SPR)/(1-SPR$_{40\%}$) for the 2014-2016 catch alternatives presented in Table 16 Values greater than 100% indicate fishing intensities greater than the $F_{40\%}$ harvest policy.

Within model quantile			5%	25%	50%	75%	95%
Management Action			**Fishing Intensity**				
	Year	Catch (mt)					
a: No catch	2014	0	0%	0%	0%	0%	0%
	2015	0	0%	0%	0%	0%	0%
	2016	0	0%	0%	0%	0%	0%
b: B2014=B2015	2014	190000	23%	34%	42%	50%	66%
	2015	190000	23%	34%	42%	52%	68%
	2016	190000	21%	32%	40%	50%	67%
c: average historical catch	2014	235000	27%	40%	49%	59%	75%
	2015	235000	28%	40%	50%	61%	78%
	2016	235000	26%	39%	48%	60%	78%
d: med(B2014)=med(B2015)	2014	275000	31%	45%	55%	65%	82%
	2015	275000	32%	46%	56%	68%	86%
	2016	275000	30%	44%	55%	67%	87%
e	2014	325000	36%	51%	61%	72%	89%
	2015	325000	37%	52%	64%	76%	94%
	2016	325000	34%	51%	62%	76%	96%
f: near max historical catch	2014	375000	40%	56%	67%	78%	95%
	2015	375000	41%	58%	70%	83%	102%
	2016	375000	39%	57%	69%	84%	105%
g	2014	425000	44%	61%	72%	83%	101%
	2015	425000	46%	63%	76%	89%	108%
	2016	425000	43%	63%	76%	91%	113%
h: near max catch target	2014	500000	49%	67%	79%	90%	107%
	2015	500000	52%	71%	84%	97%	115%
	2016	500000	50%	71%	85%	101%	122%
i: highest C2014=C2015	2014	727000	63%	83%	95%	105%	121%
	2015	727000	68%	89%	102%	116%	132%
	2016	727000	67%	92%	107%	124%	138%
j: fishing intensity = 100%	2014	825000	68%	88%	100%	110%	125%
	2015	660000	65%	86%	100%	114%	132%
	2016	600000	59%	84%	100%	118%	136%
k: default harvest rule	2014	872424	71%	91%	102%	112%	127%
	2015	691686	67%	88%	103%	116%	134%
	2016	604762	60%	85%	102%	120%	137%

Table 18: Probabilities of related to spawning biomass, fishing intensity, and 2015 catch limits for alternative 2014 catch options (catch options explained in Table 16).

Catch in 2014	Probability SB2015<SB2014	Probability SB2015<SB40%	Probability SB2015<SB25%	Probability SB2015<SB10%	Probability Fishing intensity in 2014 > 40% Target	Probability 2015 Catch Target < 2014 Catch
0	8%	1%	0%	0%	0%	0%
190,000	50%	2%	0%	0%	0%	0%
235,000	58%	3%	0%	0%	0%	0%
275,000	64%	3%	0%	0%	0%	1%
325,000	70%	3%	0%	0%	1%	3%
375,000	75%	4%	0%	0%	2%	5%
425,000	79%	4%	0%	0%	5%	9%
500,000	83%	5%	0%	0%	11%	18%
727,000	91%	9%	2%	0%	37%	50%
825,000	92%	12%	2%	0%	50%	62%
872,424	92%	13%	3%	0%	55%	68%

Table 19: Probabilities of related to spawning biomass, fishing intensity, and 2016 catch limits for alternative 2015 catch options (catch options explained in Table 16).

Catch in 2016	Probability SB2016<SB2015	Probability SB2016<SB40%	Probability SB2016<SB25%	Probability SB2016<SB10%	Probability Fishing intensity in 2015 > 40% Target	Probability 2016 Catch Target < 2015 Catch
0	46%	1%	0%	0%	0%	0%
190,000	73%	3%	0%	0%	0%	0%
235,000	75%	4%	0%	0%	0%	0%
275,000	77%	5%	1%	0%	1%	2%
325,000	80%	6%	1%	0%	3%	4%
375,000	83%	7%	1%	0%	6%	7%
425,000	85%	10%	2%	0%	10%	13%
500,000	87%	14%	3%	0%	21%	24%
727,000	92%	27%	9%	1%	55%	58%
660,000	91%	28%	10%	2%	50%	54%
691,686	91%	30%	12%	2%	54%	57%

Table 20: Forecast quantiles of Pacific Hake beginning of year depletion for the 2014-2016 catch alternatives presented in Table 16.

Probability of state of nature			10%	80%	10%
Management Action			Beginning of year depletion		
	Year	Catch (mt)			
a: No catch	2014	0	49%	82%	141%
	2015	0	55%	88%	149%
	2016	0	59%	90%	145%
b: B2014=B2015	2014	190000	49%	82%	141%
	2015	190000	50%	83%	144%
	2016	190000	49%	82%	138%
c: average historical catch	2014	235000	49%	82%	141%
	2015	235000	49%	82%	143%
	2016	235000	47%	80%	136%
d: med(B2014)=med(B2015)	2014	275000	49%	82%	141%
	2015	275000	48%	82%	142%
	2016	275000	45%	78%	135%
e	2014	325000	49%	82%	141%
	2015	325000	47%	80%	141%
	2016	325000	43%	76%	133%
f: near max historical catch	2014	375000	49%	82%	141%
	2015	375000	46%	79%	140%
	2016	375000	40%	73%	131%
g	2014	425000	49%	82%	141%
	2015	425000	44%	78%	139%
	2016	425000	37%	71%	129%
h: near max catch target	2014	500000	49%	82%	141%
	2015	500000	43%	76%	138%
	2016	500000	34%	68%	126%
i: highest C2014=C2015	2014	727000	49%	82%	141%
	2015	727000	37%	71%	133%
	2016	727000	22%	57%	117%
j: fishing intensity = 100%	2014	825000	49%	82%	141%
	2015	660000	34%	69%	130%
	2016	600000	21%	57%	116%
k: default harvest rule	2014	872424	49%	82%	141%
	2015	691686	33%	68%	129%
	2016	604762	19%	55%	115%

Table 21: Forecast quantiles of Pacific Hake beginning of year depletion for the 2014-2016 catch alternatives presented in Table 16. Values greater than 100% indicate fishing intensities greater than the $F_{40\%}$ harvest policy.

Probability of state of nature			10%	80%	10%
Management Action			**Fishing Intensity**		
	Year	Catch (mt)			
a: No catch	2014	0	0%	0%	0%
	2015	0	0%	0%	0%
	2016	0	0%	0%	0%
b: B2014=B2015	2014	190000	66%	42%	23%
	2015	190000	68%	42%	24%
	2016	190000	66%	41%	22%
c: average historical catch	2014	235000	75%	49%	27%
	2015	235000	78%	50%	29%
	2016	235000	77%	48%	27%
d: med(B2014)=med(B2015)	2014	275000	82%	55%	31%
	2015	275000	86%	56%	33%
	2016	275000	86%	55%	31%
e	2014	325000	89%	61%	36%
	2015	325000	94%	64%	38%
	2016	325000	96%	63%	36%
f: near max historical catch	2014	375000	96%	67%	40%
	2015	375000	102%	70%	42%
	2016	375000	104%	70%	40%
g	2014	425000	101%	72%	44%
	2015	425000	108%	76%	46%
	2016	425000	112%	76%	45%
h: near max catch target	2014	500000	107%	79%	49%
	2015	500000	116%	84%	52%
	2016	500000	121%	85%	51%
i: highest C2014=C2015	2014	727000	121%	95%	63%
	2015	727000	132%	102%	68%
	2016	727000	137%	108%	69%
j: fishing intensity = 100%	2014	825000	125%	100%	68%
	2015	660000	132%	100%	65%
	2016	600000	135%	101%	62%
k: default harvest rule	2014	872424	127%	102%	70%
	2015	691686	134%	103%	67%
	2016	604762	136%	102%	62%

Table 22: Probabilities related to spawning biomass, fishing intensity, and 2015 catch limits for alternative 2014 catch options (catch options explained in Table 16) and low, mid, and high state of nature. States of nature are defined on the lower 10%, middle 80%, and high 10% quantiles of 2010 recruitment.

	Catch in 2014	Probability SB2015< SB2014	Probability SB2015< SB40%	Probability SB2015< SB25%	Probability SB2015< SB10%	Probability Fishing intensity in 2014 > 40% Target	Probability 2015 Catch Target < 2014 Catch
Lower 10% of 2010 recruitment	0	0%	10%	1%	0%	0%	0%
	190,000	53%	22%	1%	0%	1%	1%
	235,000	65%	26%	1%	0%	1%	2%
	275,000	71%	26%	1%	0%	1%	9%
	325,000	78%	28%	1%	0%	5%	26%
	375,000	83%	32%	2%	1%	24%	50%
	425,000	88%	35%	3%	1%	52%	75%
	500,000	90%	43%	4%	1%	92%	94%
	727,000	93%	60%	16%	1%	100%	99%
	825,000	96%	71%	21%	1%	100%	99%
	872,424	96%	75%	26%	1%	100%	99%
Middle 80% of 2010 recruitment	0	7%	0%	0%	0%	0%	0%
	190,000	49%	0%	0%	0%	0%	0%
	235,000	58%	0%	0%	0%	0%	0%
	275,000	64%	0%	0%	0%	0%	0%
	325,000	69%	1%	0%	0%	0%	0%
	375,000	74%	1%	0%	0%	0%	0%
	425,000	78%	1%	0%	0%	0%	2%
	500,000	84%	1%	0%	0%	2%	11%
	727,000	91%	3%	0%	0%	33%	50%
	825,000	92%	6%	0%	0%	50%	66%
	872,424	93%	7%	0%	0%	57%	73%
Upper 10% of 2010 recruitment	0	26%	0%	0%	0%	0%	0%
	190,000	54%	0%	0%	0%	0%	0%
	235,000	59%	0%	0%	0%	0%	0%
	275,000	63%	0%	0%	0%	0%	0%
	325,000	68%	0%	0%	0%	0%	0%
	375,000	70%	0%	0%	0%	0%	0%
	425,000	73%	0%	0%	0%	0%	0%
	500,000	74%	0%	0%	0%	0%	0%
	727,000	84%	0%	0%	0%	0%	0%
	825,000	88%	0%	0%	0%	0%	0%
	872,424	88%	0%	0%	0%	0%	0%

Table 23: Probabilities related to spawning biomass, fishing intensity, and 2016 catch limits for alternative 2015 catch options (catch options explained in Table 16) and low, mid, and high state of nature. States of nature are defined on the lower 10%, middle 80%, and high 10% quantiles of 2010 recruitment.

	Catch in 2015	Probability SB2016< SB2015	Probability SB2016< SB40%	Probability SB2016< SB25%	Probability SB2016< SB10%	Probability Fishing intensity in 2015 > 40% Target	Probability 2016 Catch Target < 2015 Catch
Lower 10% of 2010 recruitment	0	23%	7%	1%	0%	0%	0%
	190,000	67%	24%	2%	0%	1%	1%
	235,000	70%	30%	3%	1%	2%	4%
	275,000	72%	38%	6%	1%	6%	17%
	325,000	74%	45%	7%	1%	30%	35%
	375,000	77%	50%	10%	1%	56%	62%
	425,000	80%	60%	18%	1%	80%	78%
	500,000	85%	69%	24%	1%	97%	93%
	727,000	93%	90%	58%	12%	99%	98%
	660,000	91%	90%	61%	16%	99%	98%
	691,686	91%	90%	62%	19%	99%	98%
Middle 80% of 2010 recruitment	0	46%	0%	0%	0%	0%	0%
	190,000	73%	1%	0%	0%	0%	0%
	235,000	75%	1%	0%	0%	0%	0%
	275,000	77%	1%	0%	0%	0%	0%
	325,000	80%	2%	0%	0%	0%	0%
	375,000	84%	3%	0%	0%	0%	1%
	425,000	85%	5%	0%	0%	3%	6%
	500,000	88%	9%	0%	0%	14%	18%
	727,000	92%	23%	4%	0%	56%	60%
	660,000	91%	23%	4%	0%	50%	55%
	691,686	92%	26%	7%	0%	55%	59%
Upper 10% of 2010 recruitment	0	69%	0%	0%	0%	0%	0%
	190,000	78%	0%	0%	0%	0%	0%
	235,000	81%	0%	0%	0%	0%	0%
	275,000	83%	0%	0%	0%	0%	0%
	325,000	84%	0%	0%	0%	0%	0%
	375,000	86%	0%	0%	0%	0%	0%
	425,000	87%	0%	0%	0%	0%	0%
	500,000	88%	0%	0%	0%	0%	0%
	727,000	92%	0%	0%	0%	0%	0%
	660,000	90%	0%	0%	0%	0%	0%
	691,686	91%	0%	0%	0%	0%	0%

Table 24: Select parameters, derived quantities, and reference point estimates for the MLE base model and sensitivity runs. Likelihood components in grey are not directly comparable to the base model.

	Base model	New maturity	No 2012 survey	High TV sel	TV Sel from 1975
Likelihoods					
Total	181.61	181.61	180.30	157.86	180.03
Survey Index	-4.59	-4.59	-3.48	-4.53	-4.59
Survey age compositions	45.81	45.81	43.35	45.50	45.79
Fishery age compositions	97.89	97.89	98.02	76.74	94.98
Parameters					
R_0 (billions)	2.35	2.35	2.37	2.36	2.34
Steepness (h)	0.863	0.863	0.864	0.863	0.863
Natural mortality (M)	0.213	0.213	0.213	0.213	0.213
Acoustic catchability (Q)	1.060	1.060	1.061	1.053	1.059
Additional acoustic survey SD	0.294	0.294	0.320	0.297	0.294
Derived Quantities					
2008 recruitment (billions)	4.424	4.423	4.808	4.428	4.427
2010 recruitment (billions)	12.764	12.764	15.776	11.517	12.790
B_0 (thousand mt)	1,993	1,901	1,997	1,995	1,982
2014 Depletion	74.0%	78.0%	88.7%	68.7%	74.5%
2013 Fishing intensity (1-SPR/1-SPR40%)	77.8%	78.1%	73.1%	83.4%	77.6%
Reference points based on $F_{40\%}$					
Female spawning biomass ($B_{F40\%}$ thousand mt)	748	713	750	749	744
Equilibrium exploitation fraction corresponding to SPR	20.7%	20.7%	20.8%	20.7%	20.8%
Yield at $B_{F40\%}$ (thousand mt)	322	322	324	322	321

Table 25: Medians of the Bayesian posterior for select parameters, derived quantities, and reference points for the base model and sensitivity runs of 1) estimating non-parametric selectivity to age 10, or 2) not estimating time-varying fishery selectivity.

	Base model	Estimate selectivity to age 10	Time invariant fishery selectivity	2013 survey 1.8 mmt
Parameters				
R_0 (billions)	2.72	2.69	2.86	2.69
Steepness (h)	0.826	0.823	0.821	0.825
Natural mortality (M)	0.222	0.224	0.226	0.224
Acoustic catchability (Q)	0.962	1.518	0.934	0.970
Additional acoustic survey SD	0.360	0.374	0.394	0.359
Derived Quantities				
2008 recruitment (billions)	5.148	5.506	5.865	4.828
2010 recruitment (billions)	15.364	17.107	19.073	13.607
B_0 (thousand mt)	2132	2083	2181	2102
2014 Depletion	81.8%	92.8%	96.1%	73.5%
2013 Fishing intensity (1-SPR/1-SPR40%)	69.4%	66.8%	60.3%	73.2%
Reference points based on $F_{40\%}$				
Female spawning biomass ($B_{F40\%}$ thousand mt)	769	754	780	758
Equilibrium exploitation fraction corresponding to SPR	21.6%	21.9%	22.0%	21.8
Yield at $B_{F40\%}$ (thousand mt)	342	338	354	338

Table 26: Select parameters, derived quantities, and reference point estimates for retrospective analyses using the base model. Values in italics are implied since they occur after the ending year of the respective retrospective analysis.

	Base model	-1 year	-2 years	-3 years	-4 years	-5 years
Parameters						
R_0 (billions)	2.72	2.65	2.41	2.99	2.82	2.77
Steepness (h)	0.826	0.829	0.817	0.812	0.813	0.814
Natural mortality (M)	0.222	0.223	0.219	0.225	0.222	0.223
Acoustic catchability (Q)	NA	NA	NA	NA	NA	NA
Additional acoustic survey SD	0.360	0.400	0.467	0.285	0.283	0.312
Derived Quantities						
2008 recruitment (billions)	5.15	4.75	3.88	11.36	1.11	0.80
2010 recruitment (billions)	15.36	11.96	1.70	1.10	1.03	0.99
B_0 (thousand mt)	2,132	2,087	1,960	2,312	2,241	2,191
2009 Depletion	22.8%	19.8%	16.4%	43.0%	49.7%	35.1%
2014 Depletion	81.8%	*69.7%*	*26.3%*	*70.4%*	*42.6%*	*32.2%*
2013 Fishing intensity (1-SPR/1-SPR40%)	69%	*77%*	*112%*	*57%*	*77%*	*90%*
Reference points based on $F_{40\%}$						
Female spawning biomass ($B_{F40\%}$ thousand mt)	769	752	705	821	792	785
Equilibrium exploitation fraction corresponding to SPR	21.6%	21.7%	21.3%	22.0%	21.7%	21.8%
Yield at $B_{F40\%}$ (thousand mt)	342	335	308	372	357	349

Table 27: Retrospective estimates of recruitment devs at age for cohorts from 1999 to 2012 from the base model with time-varying selectivity (TV) and the model with time-invariant selectivity (noTV).

Cohort	Model	0	1	2	3	4	5
1999	TV	NA	-0.169	1.125	1.437	2.211	2.292
	noTV	NA	-0.155	1.102	1.399	2.184	2.254
2000	TV	-0.234	-0.576	-1.406	-1.470	-1.006	-0.827
	noTV	-0.157	-0.657	-1.448	-1.503	-1.077	-0.834
2001	TV	0.006	-0.553	-1.331	-0.849	-0.378	-0.087
	noTV	0.161	-0.467	-1.275	-0.877	-0.394	-0.097
2002	TV	0.053	-0.312	-1.060	-1.844	-2.059	-2.265
	noTV	0.108	-0.260	-0.974	-1.846	-2.082	-2.225
2003	TV	-0.058	-0.277	0.676	0.673	0.624	0.617
	noTV	0.014	-0.206	0.642	0.584	0.584	0.634
2004	TV	-0.009	-0.331	-0.507	-1.597	-2.105	-2.202
	noTV	0.087	-0.353	-0.563	-1.599	-2.061	-2.211
2005	TV	-0.128	-0.269	1.387	1.402	1.645	1.449
	noTV	-0.027	-0.196	1.408	1.428	1.630	1.391
2006	TV	-0.024	-0.301	0.479	1.447	1.499	0.453
	noTV	-0.078	-0.165	0.638	1.454	1.511	0.408
2007	TV	-0.182	-0.253	-1.813	-2.144	-2.624	-2.327
	noTV	-0.056	-0.126	-1.787	-2.091	-2.619	-2.292
2008	TV	-0.158	0.129	2.391	1.657	1.740	1.782
	noTV	-0.203	0.016	2.632	1.572	1.781	1.875
2009	TV	-0.101	-0.392	0.784	0.851	0.870	NA
	noTV	-0.148	-0.337	0.748	0.954	0.990	NA
2010	TV	0.057	0.927	2.664	2.883	NA	NA
	noTV	0.022	0.917	2.859	3.045	NA	NA
2011	TV	-0.089	-0.142	-0.899	NA	NA	NA
	noTV	-0.051	-0.119	-0.798	NA	NA	NA
2012	TV	0.038	-0.114	NA	NA	NA	NA
	noTV	-0.032	-0.107	NA	NA	NA	NA
SD	**TV**	**0.0940**	**0.3663**	**1.4735**	**1.6866**	**1.7525**	**1.7345**
	noTV	**0.1069**	**0.3530**	**1.5199**	**1.7040**	**1.7590**	**1.7249**

8 Figures

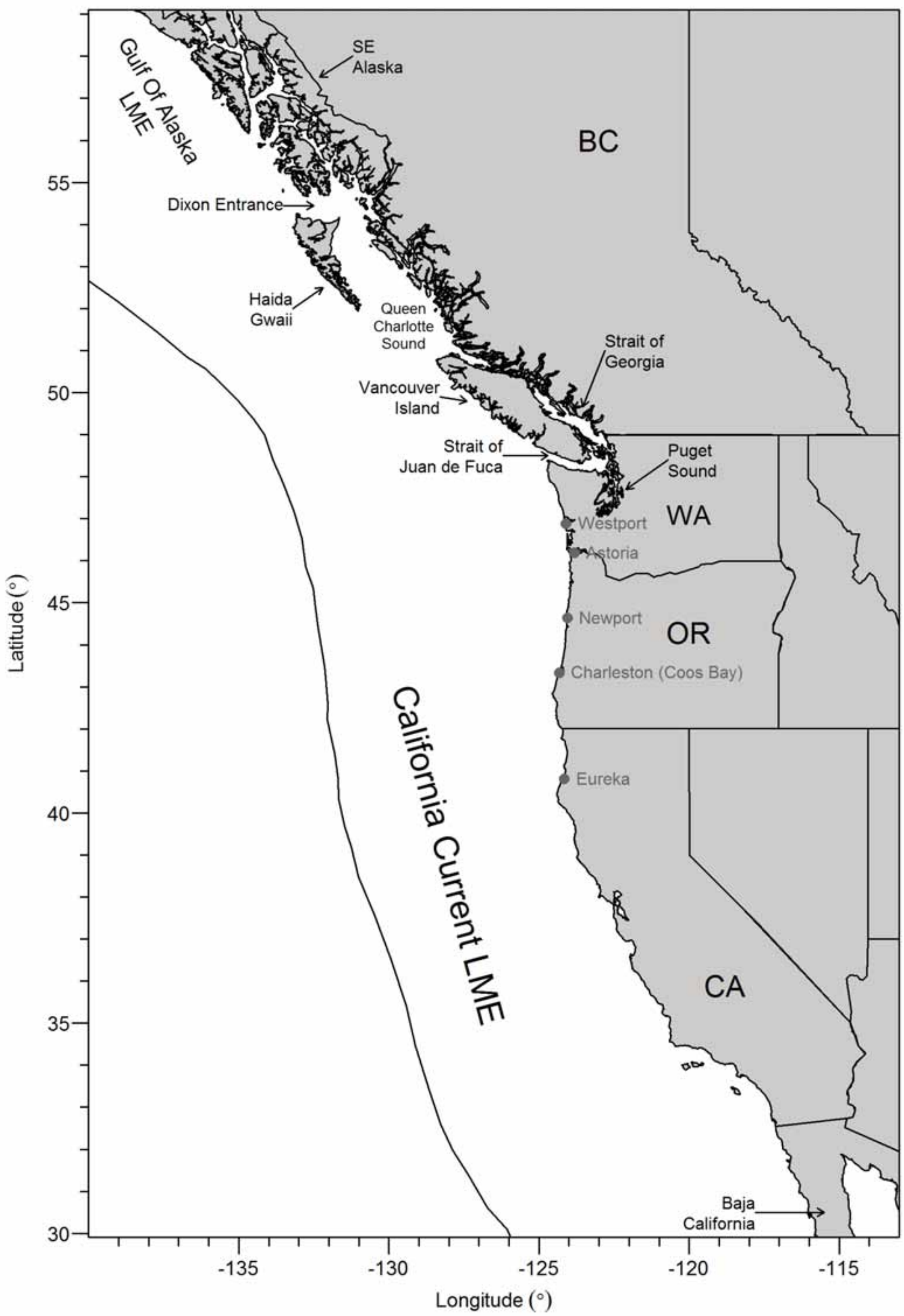


Figure 1: Overview map of the area in the Northeast Pacific Ocean occupied by Pacific Hake. Common areas referred to in this document are shown.

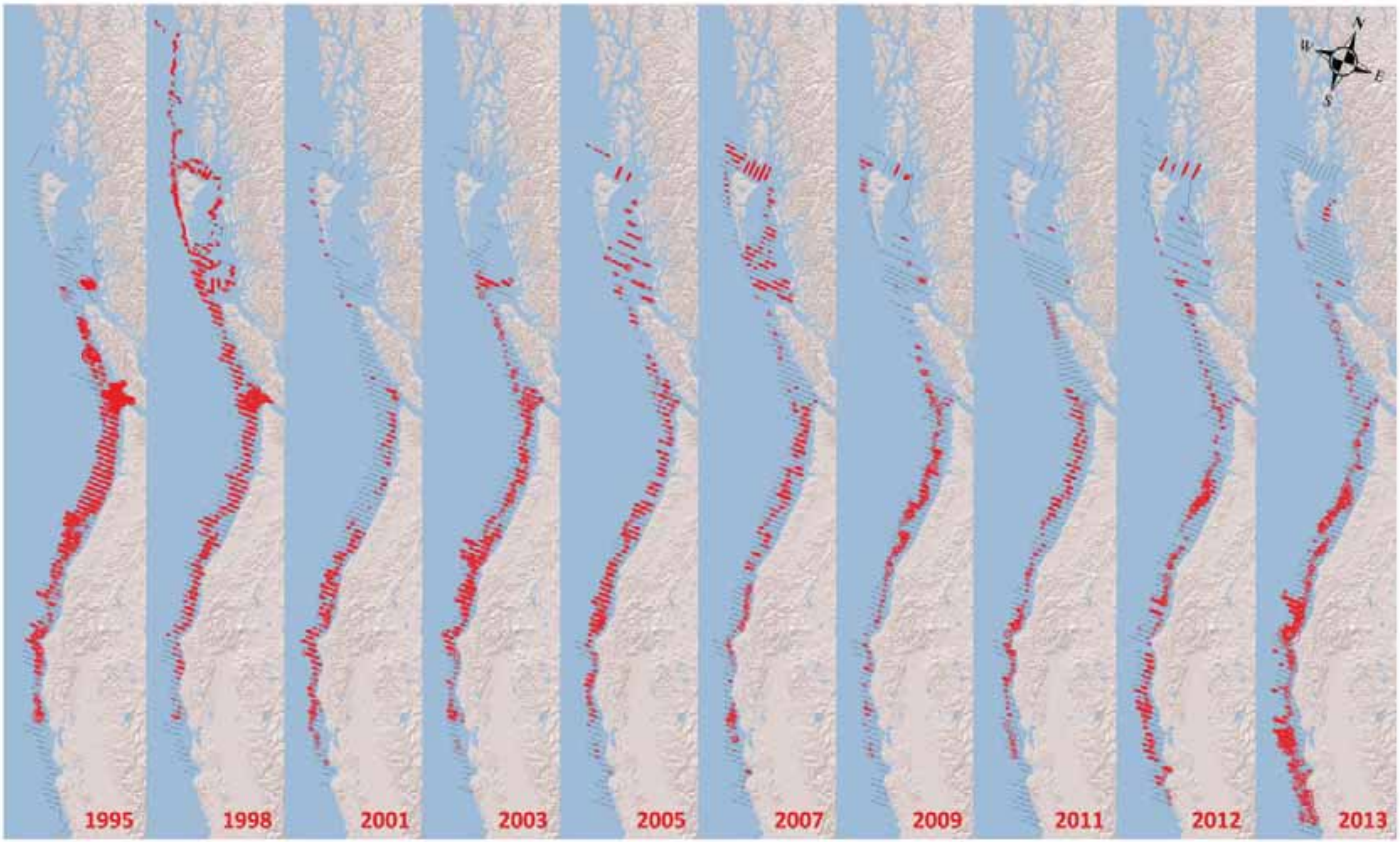


Figure 2: Spatial distribution of acoustic backscatter attributable to Pacific Hake from joint US-Canada acoustic surveys 1995-2013. Area of the circle is roughly proportional to observed backscatter.

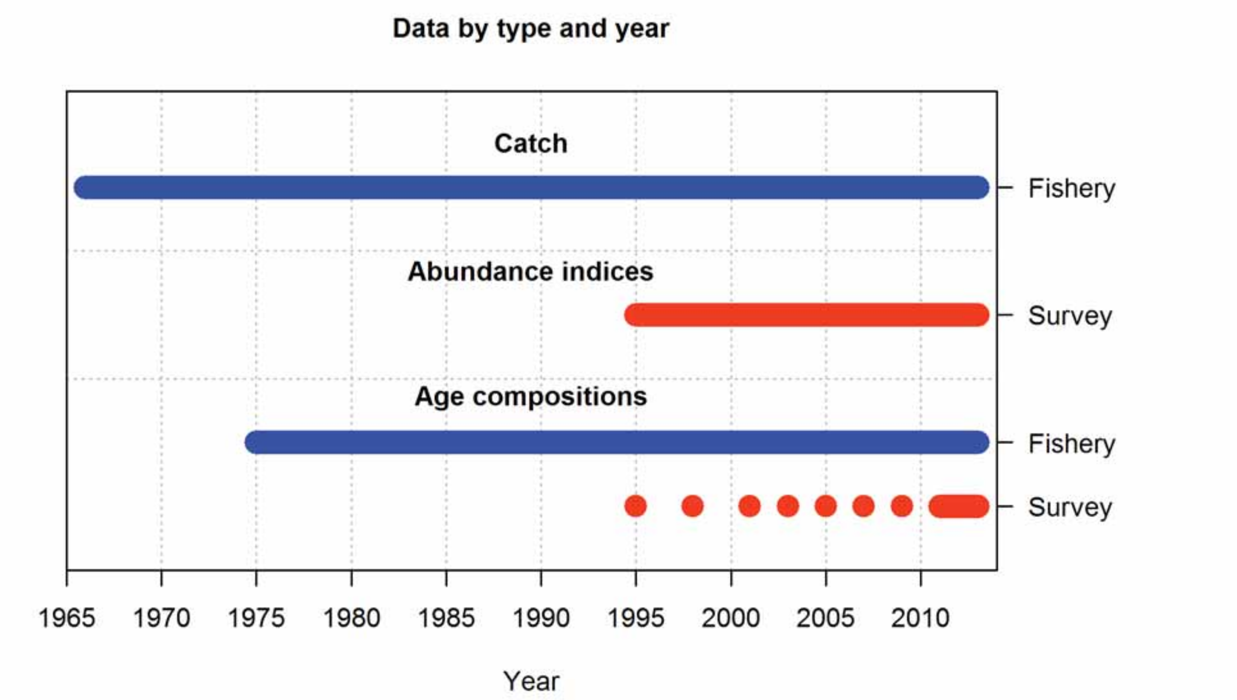


Figure 3: Overview of data used in this assessment, 1966-2013.

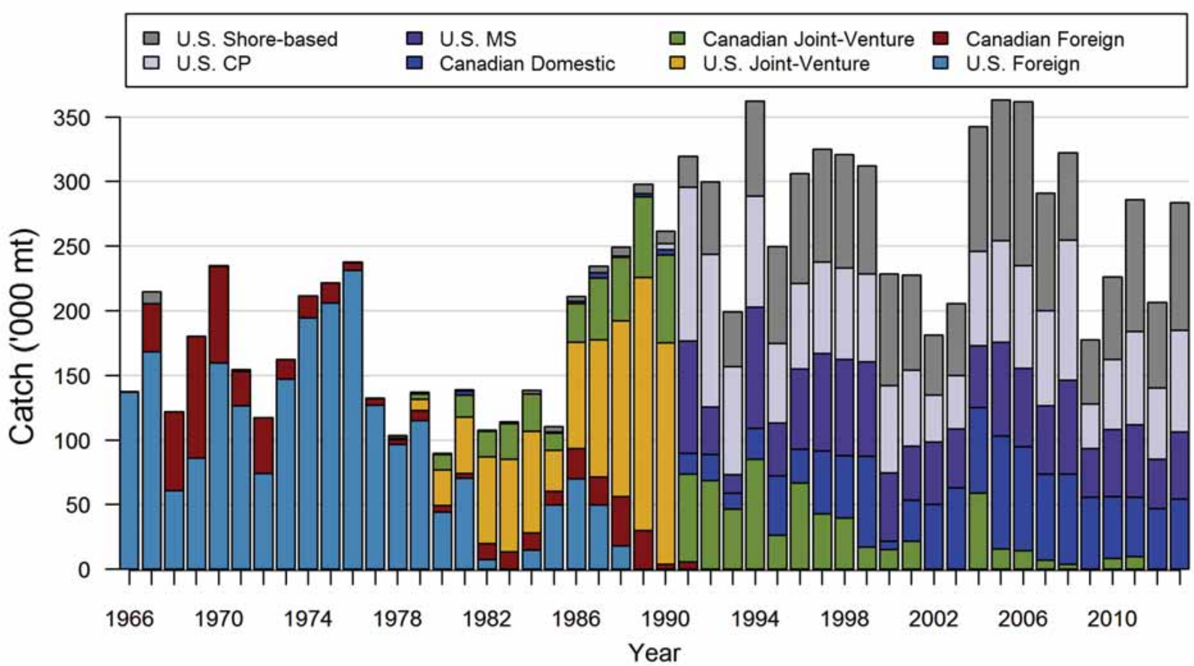


Figure 4: Total Pacific Hake landings used in the assessment by sector, 1966-2013

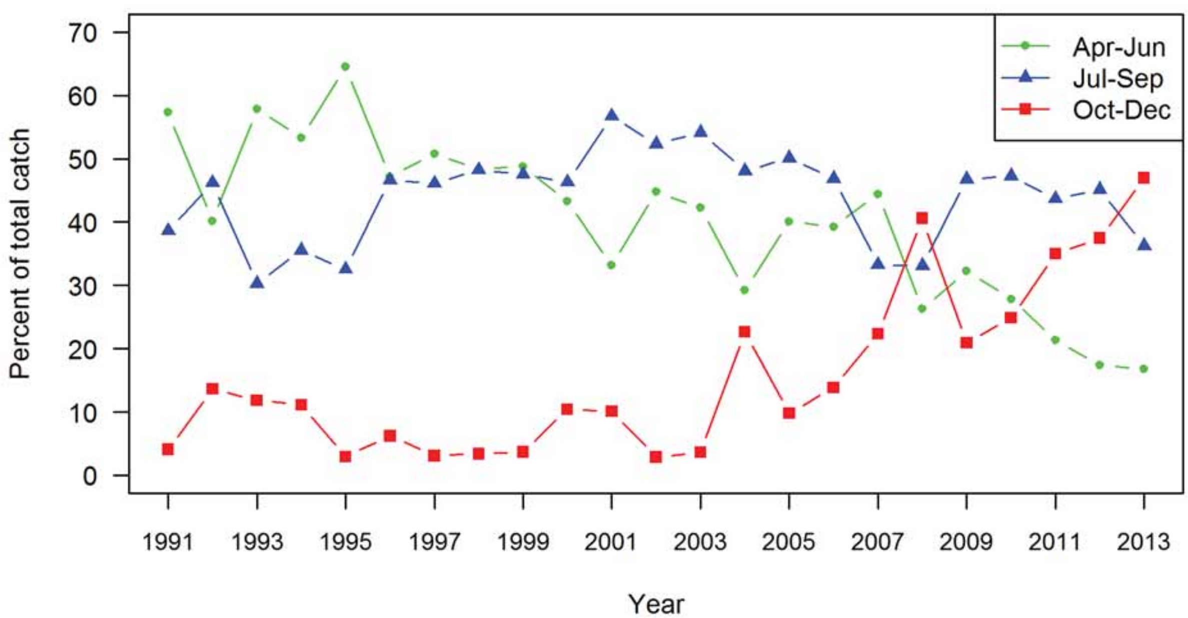


Figure 5: Proportion of catch for the U.S. and Canada combined occurring in each season from April through December.

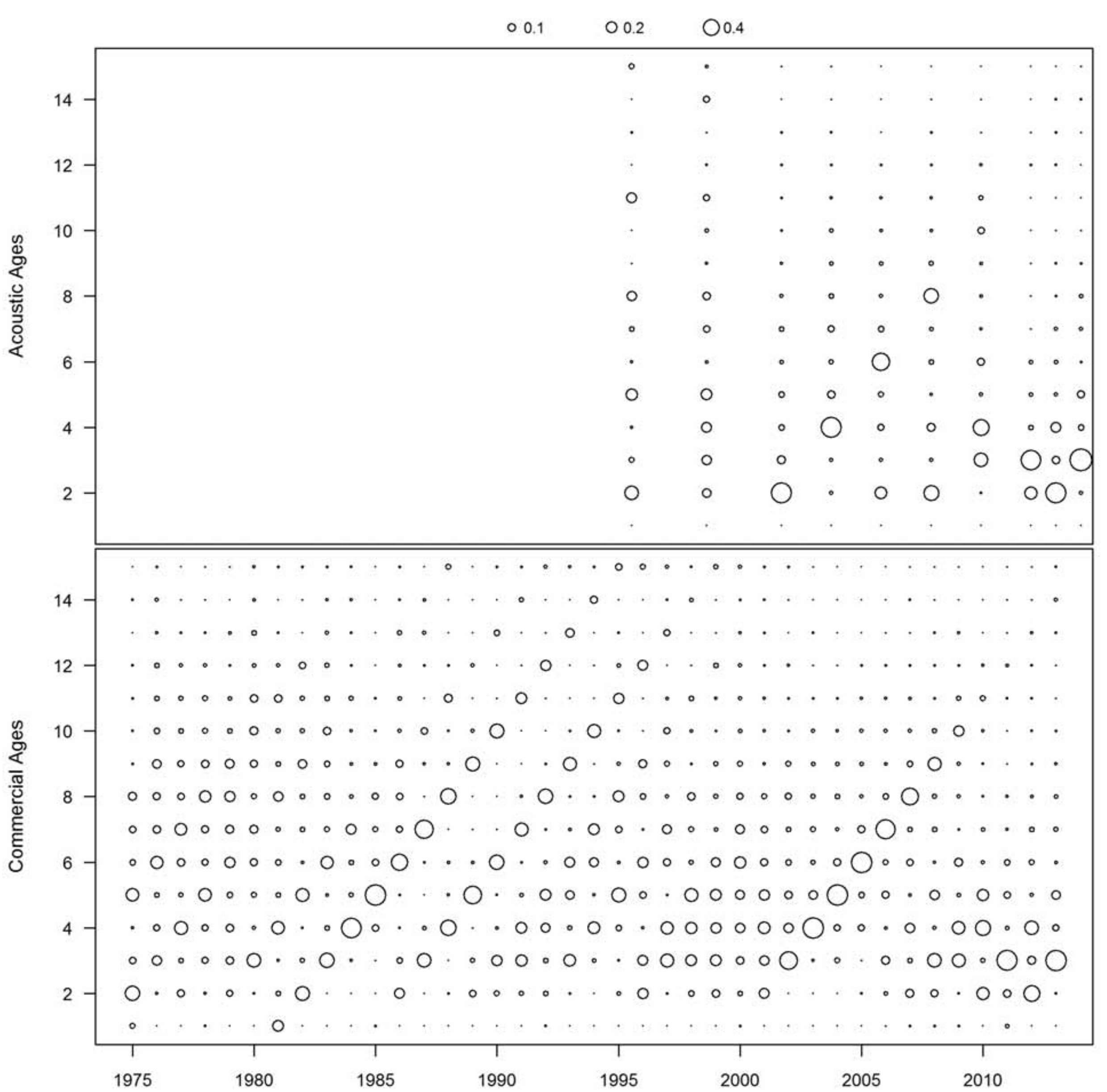


Figure 6: Age compositions for the acoustic survey (top) and the aggregate fishery (bottom, all sectors combined) for the years 1975–2013. Proportions in each year sum to 1.0 and area of the bubbles are proportional to the proportion and consistent in both panels (see key at top).

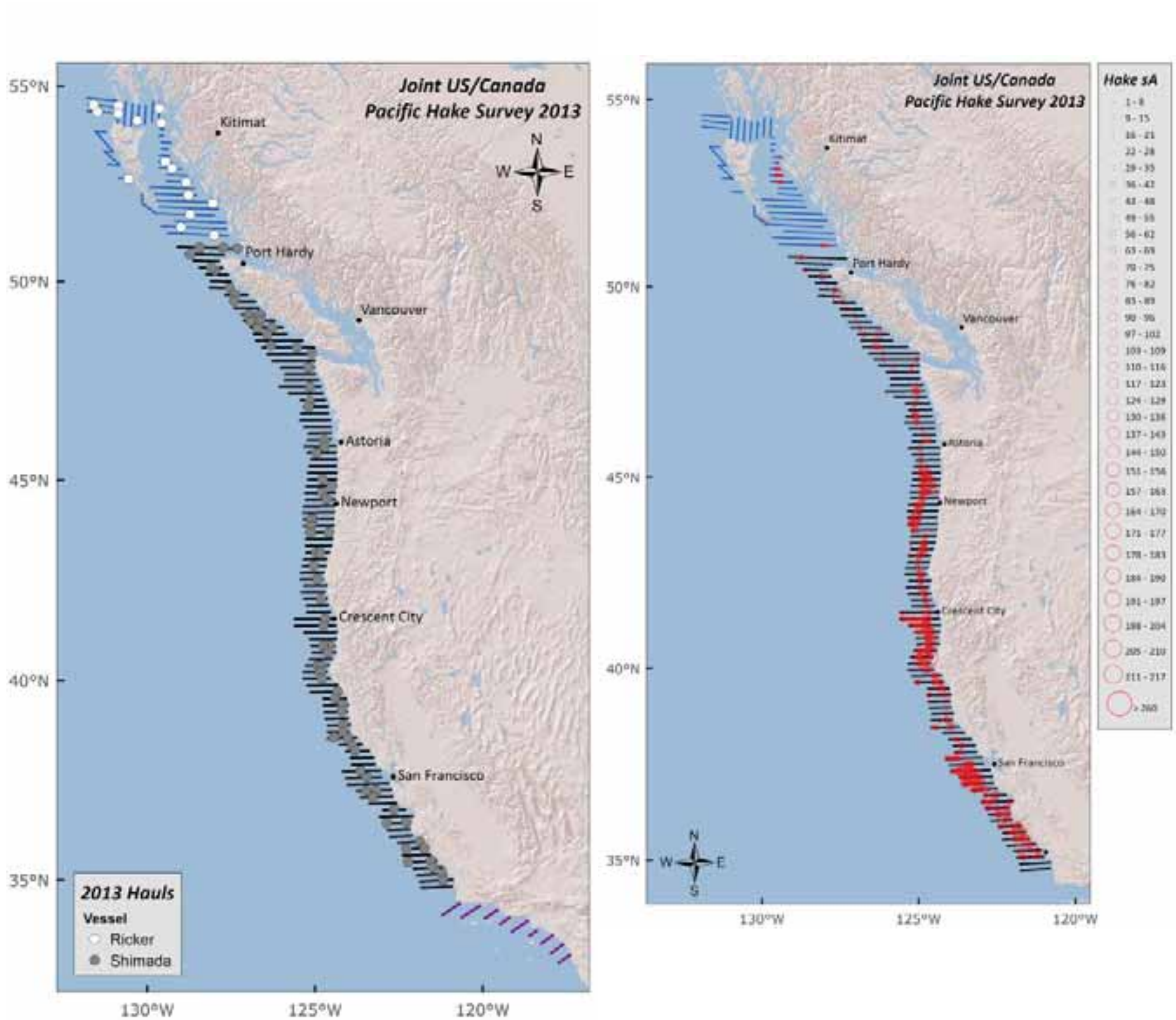


Figure 7: Acoustic survey transects surveyed in 2012 with backscatter proportional to the area of the circle (left panel) and hauls that caught or did not catch Pacific Hake (right panel).

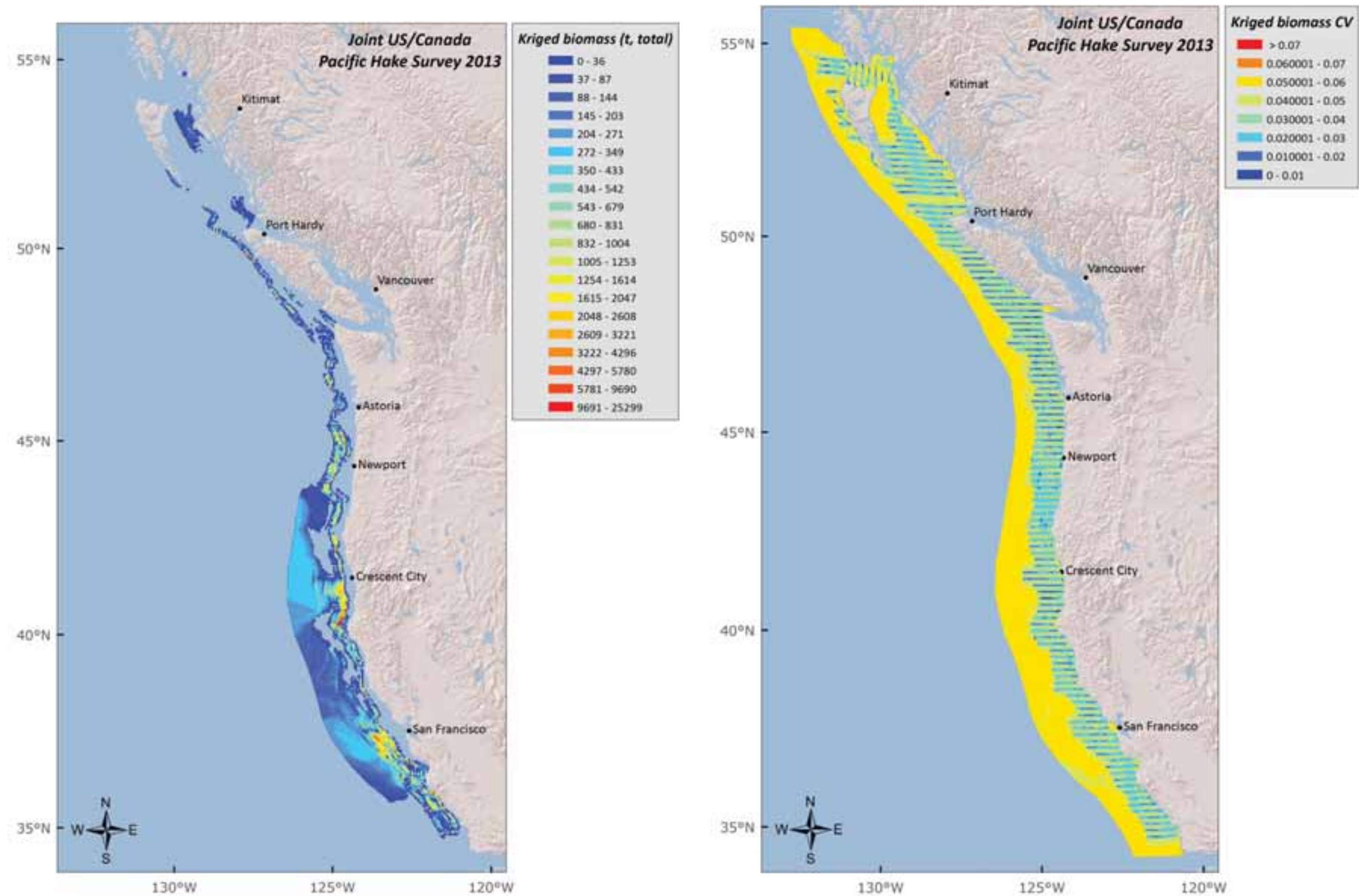


Figure 8: Estimated biomass (left) and variance (right) from the kriging analysis of the 2013 acoustic survey data.

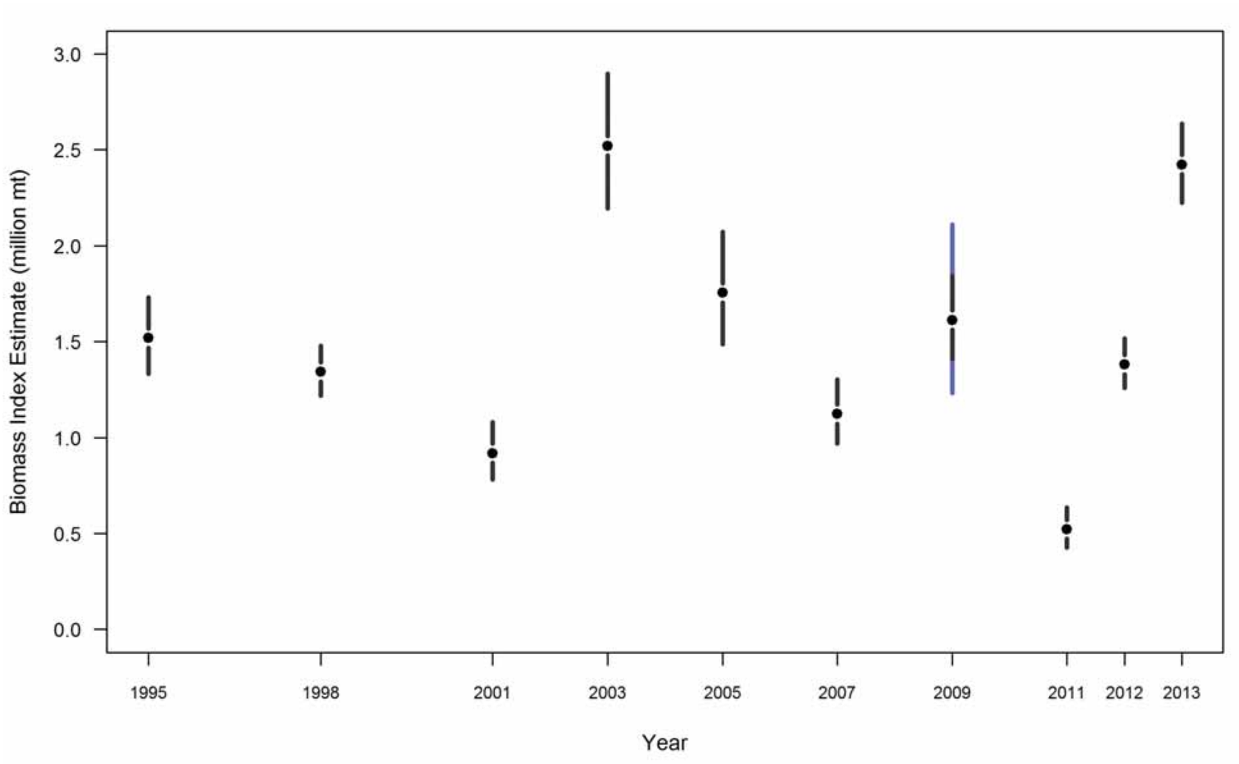


Figure 9: Acoustic survey biomass indices (millions of metric tons). Approximate 95% confidence intervals are based on only sampling variability (1995-2007, 2011–2013) and sampling variability as well as squid/hake apportionment uncertainty (blue bars, 2009).

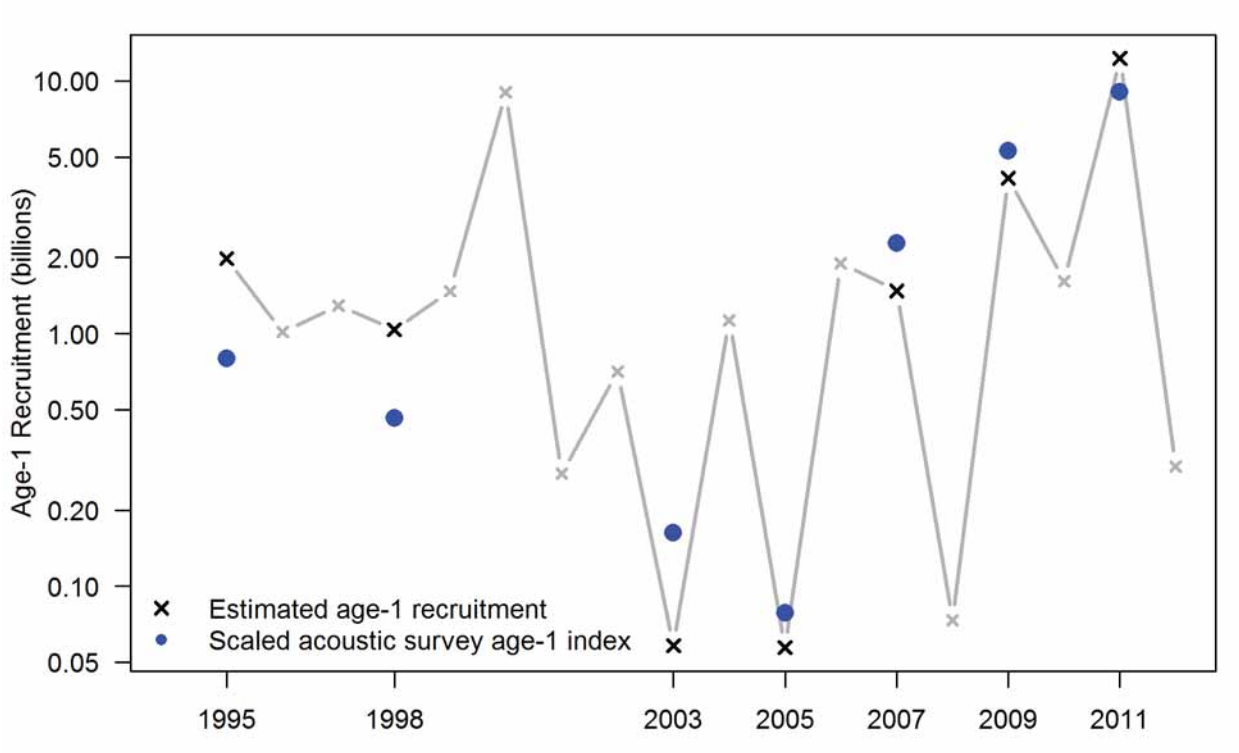


Figure 10: Preliminary acoustic survey age-1 index overlaid on the base model predicted posterior median numbers at age-1. The y-axis is on a log scale with labels in real space. This figure represents a comparison with, not a fit to, the preliminary age-1 index data.

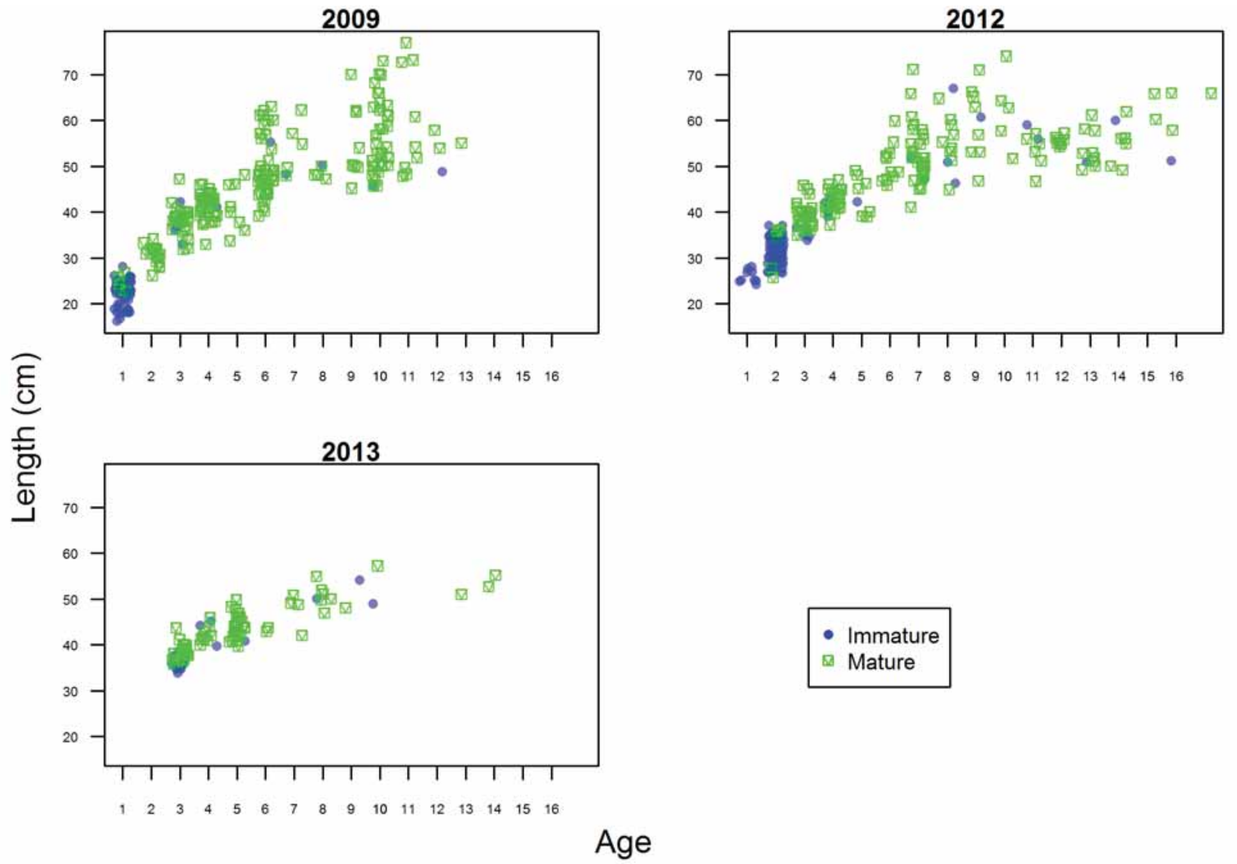


Figure 11: Observations of mature (green boxes) and immature (blue circles) Pacific Hake determined from ovary samples collected from the bottom trawl survey (2009 & 2012), the acoustic survey (2012), and the at-sea hake observer program (2013). Observations are jittered along the x- and y- axes to show individual observations.

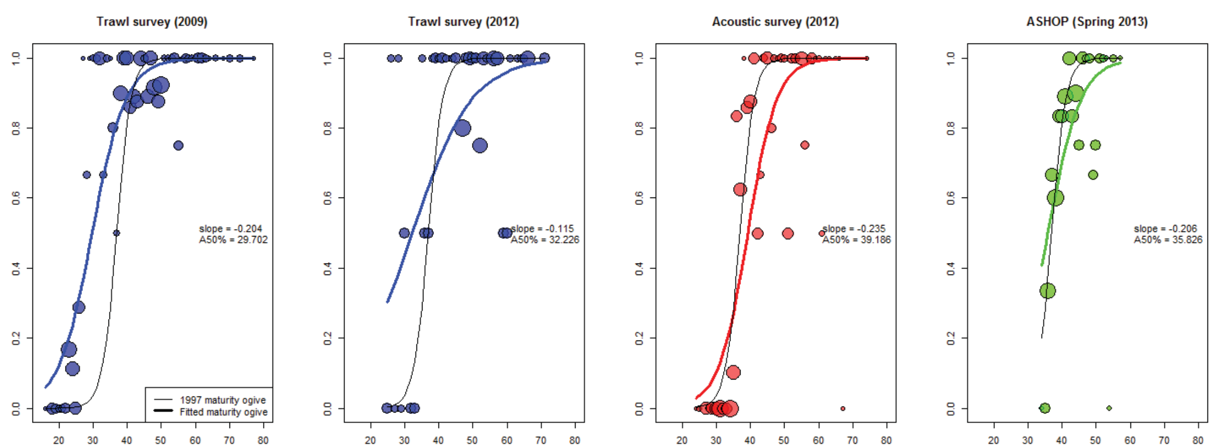


Figure 12: Proportion mature at length for each combination of year and source. A fitted logistic model is shown by the thick colored line. The maturity-at-length from Dorn & Saunders (1997) is shown by the thin black line.

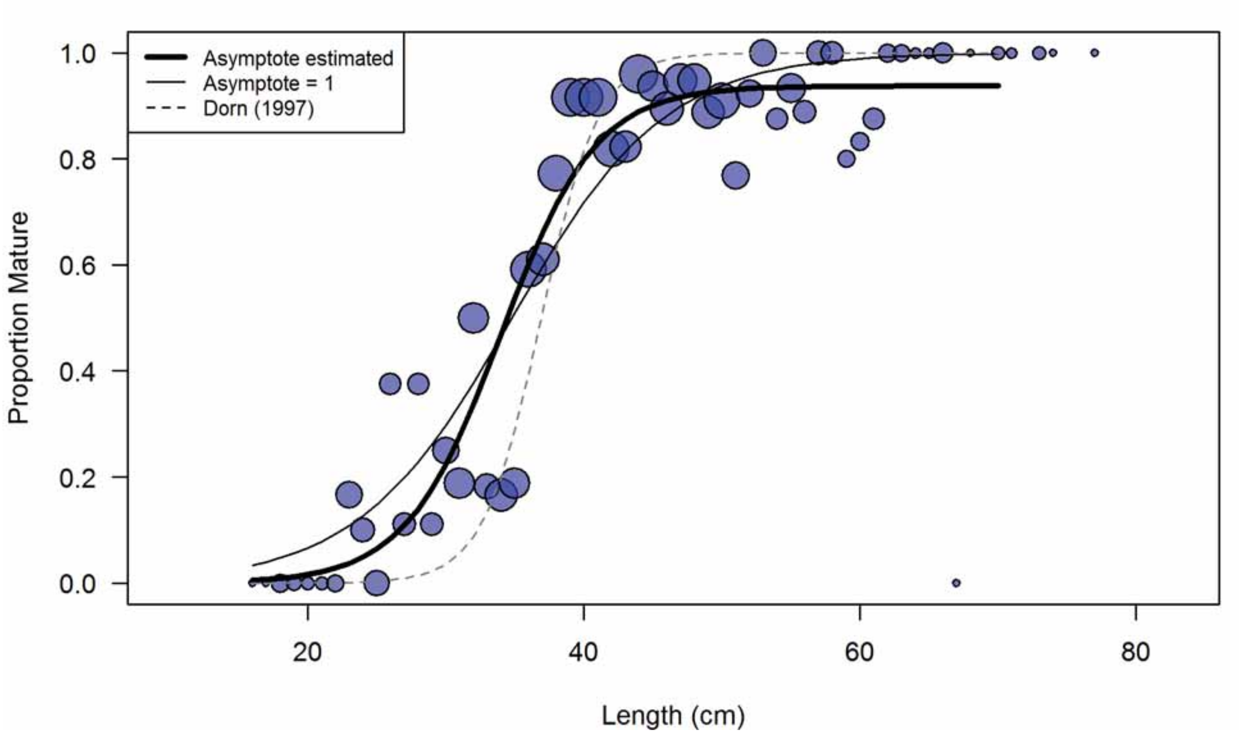


Figure 13: Proportion mature-at-length shown as blue circles with the area of the circle proportional to the number of observations. A fitted logistic curve with an asymptote at one, a fitted logistic curve with an estimated asymptote, and the maturity-at-length from Dorn & Saunders (1997) are also shown.

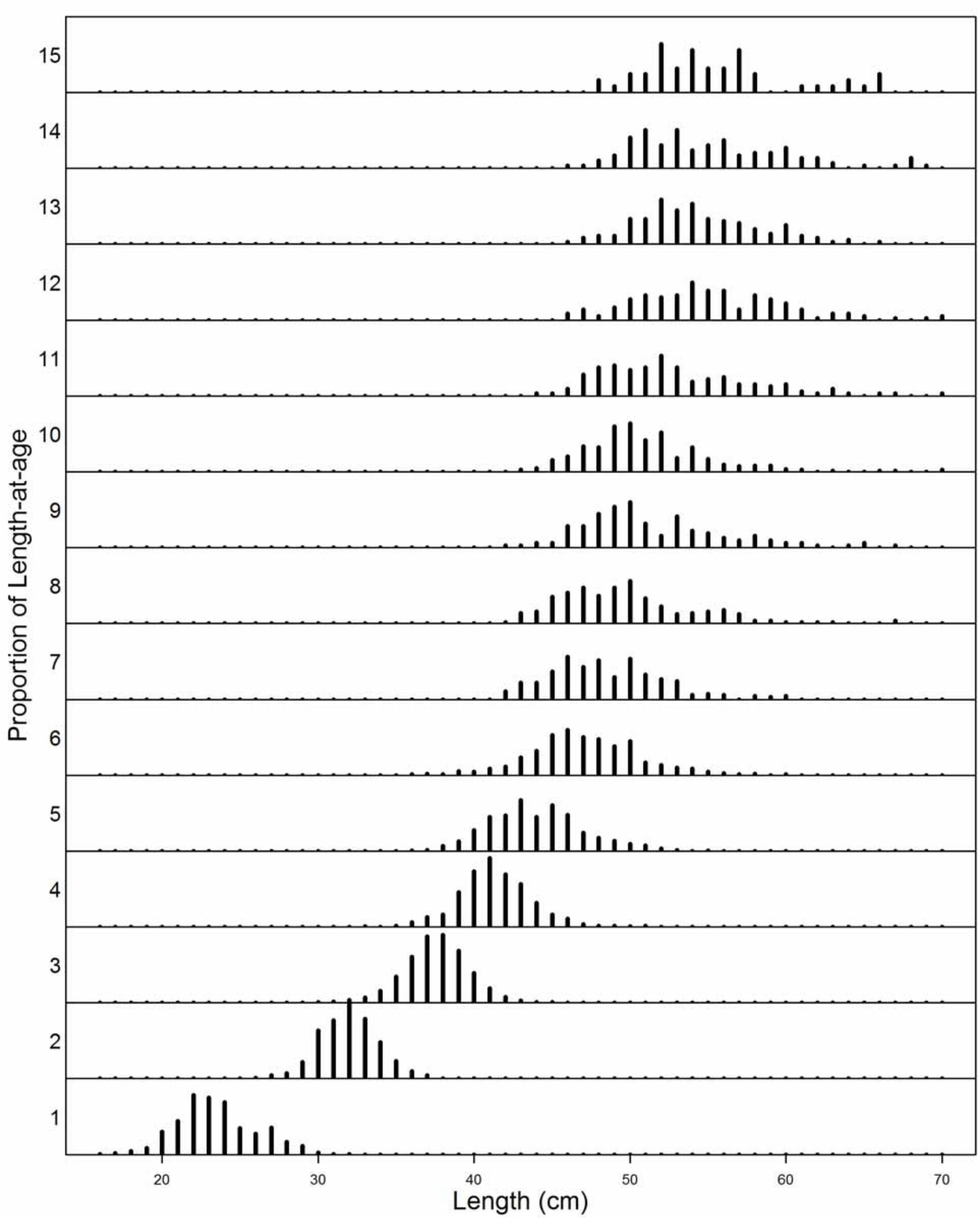


Figure 14: Proportions of length-at-age (age-length key) used to determine maturity-at-age.

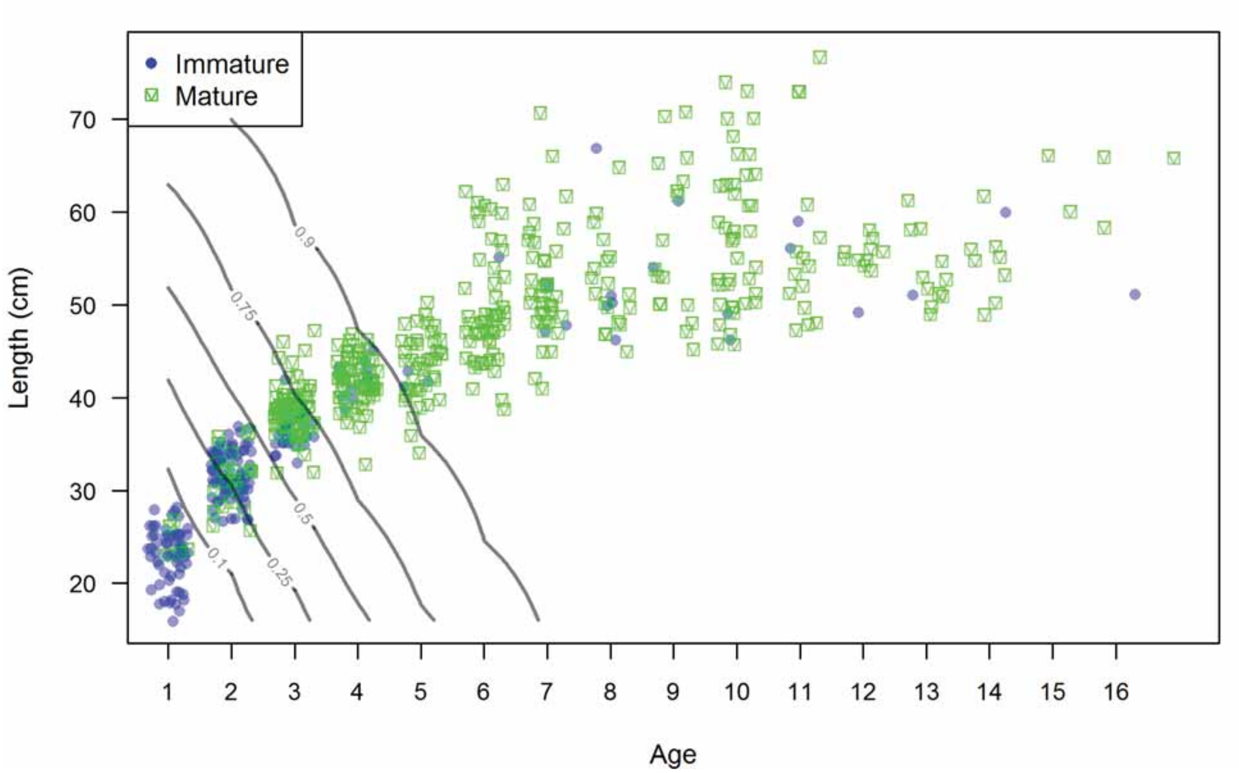


Figure 15: Mature (green boxes) and immature (blue circles) observations at length (cm) and age. Predicted proportion mature from a fitted logistic regression of maturity against length and age, with an asymptote estimated, is shown by the contour lines. Observations are jittered along the x- and y- axes to show individual observations.

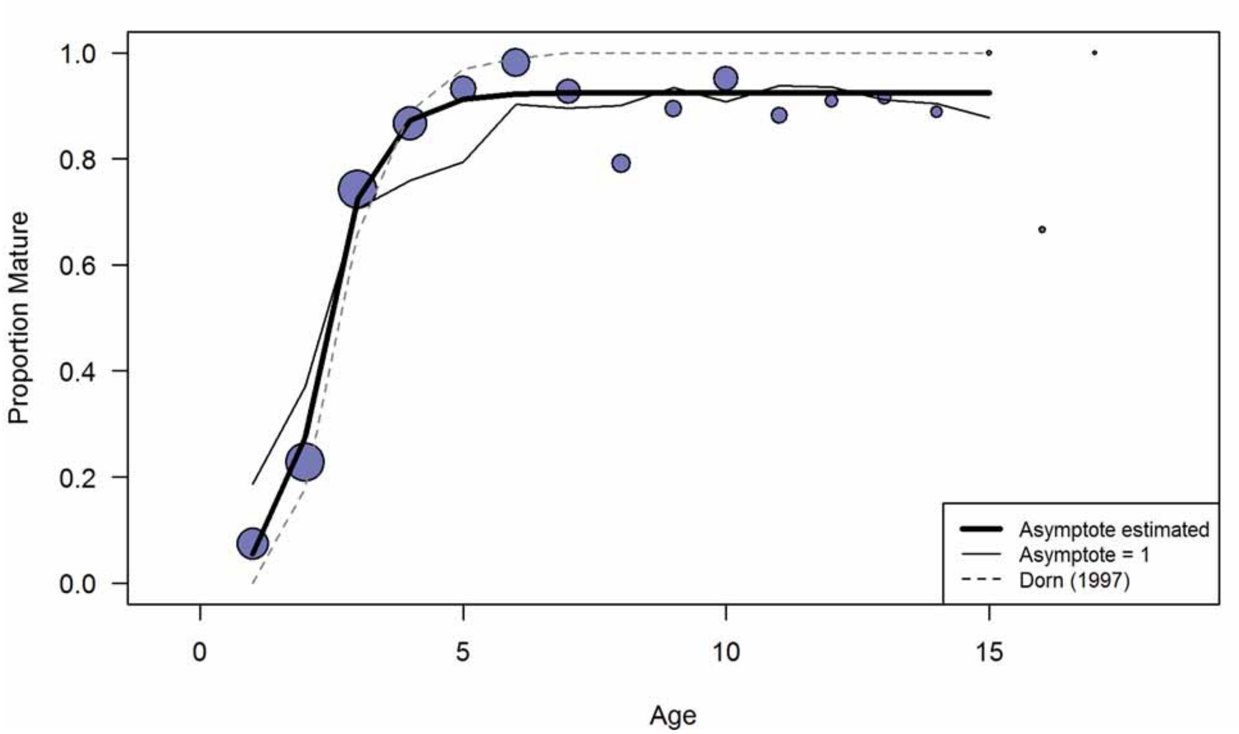


Figure 16: Proportion mature at age shown by blue circles with the area of the circle proportional to the number of observations. Maturity-at-age is shown as a dashed line from Dorn & Saunders (1997), as a thin solid line from a logistic model with an asymptote at one, and as a thick solid line from a logistic model with the asymptote estimated.

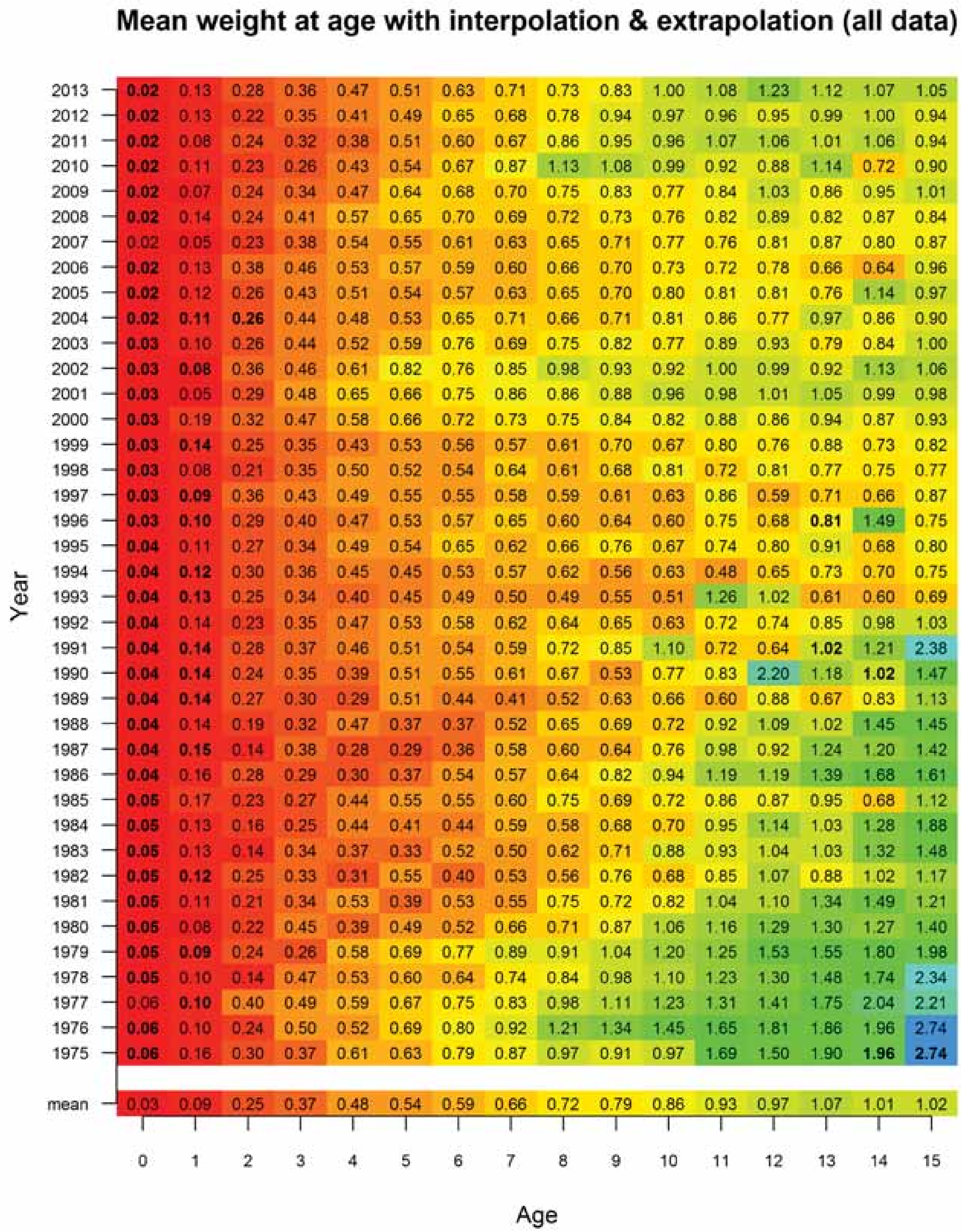


Figure 17: Empirical weight-at-age (kg) used in the assessment. Numbers shown in bold were interpolated or extrapolated from adjacent years.

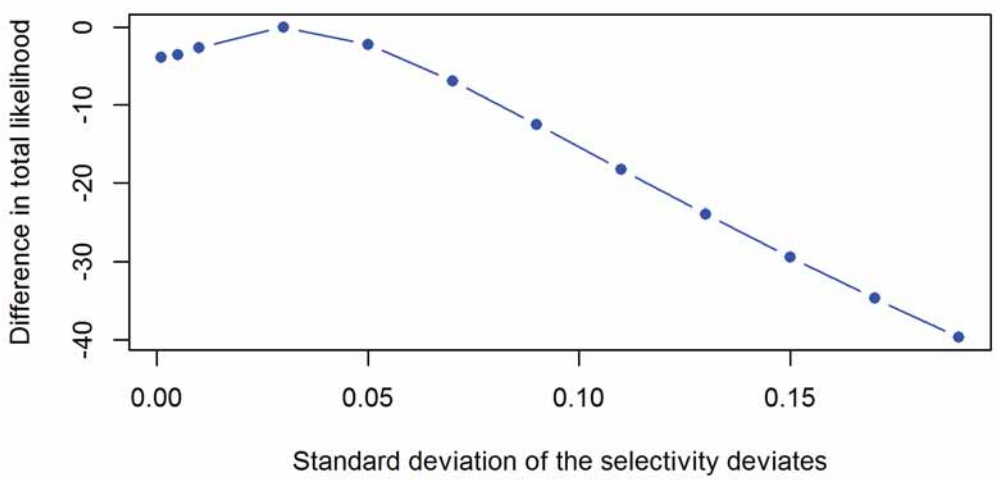


Figure 18: Difference in the log likelihood from the maximum for the standard deviation for the penalty on the selectivity deviates determined from the random effects model using the Laplace approximation as described by Thorson et al. (2014).

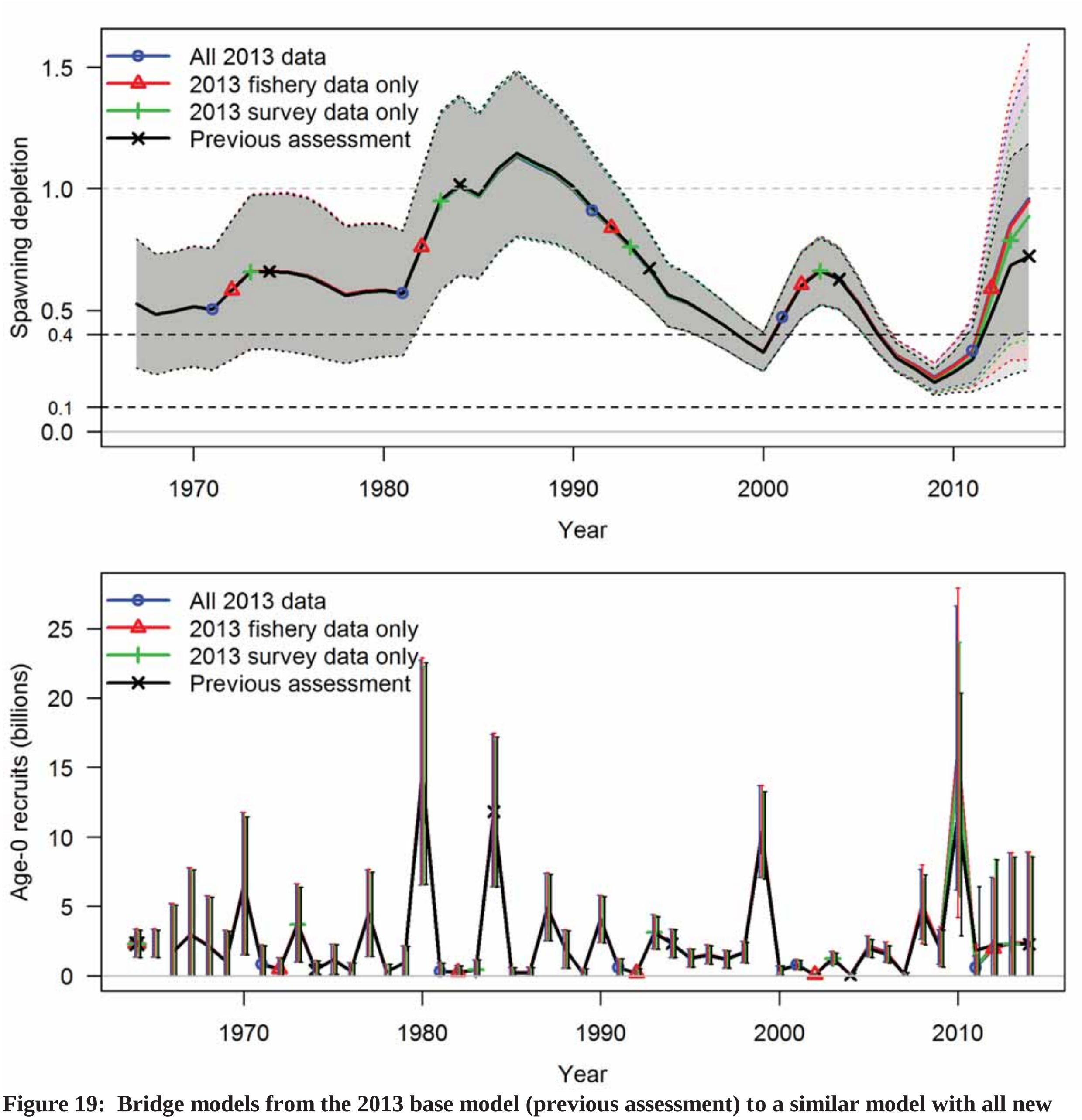


Figure 19: Bridge models from the 2013 base model (previous assessment) to a similar model with all new 2013 data (All 2013 data).

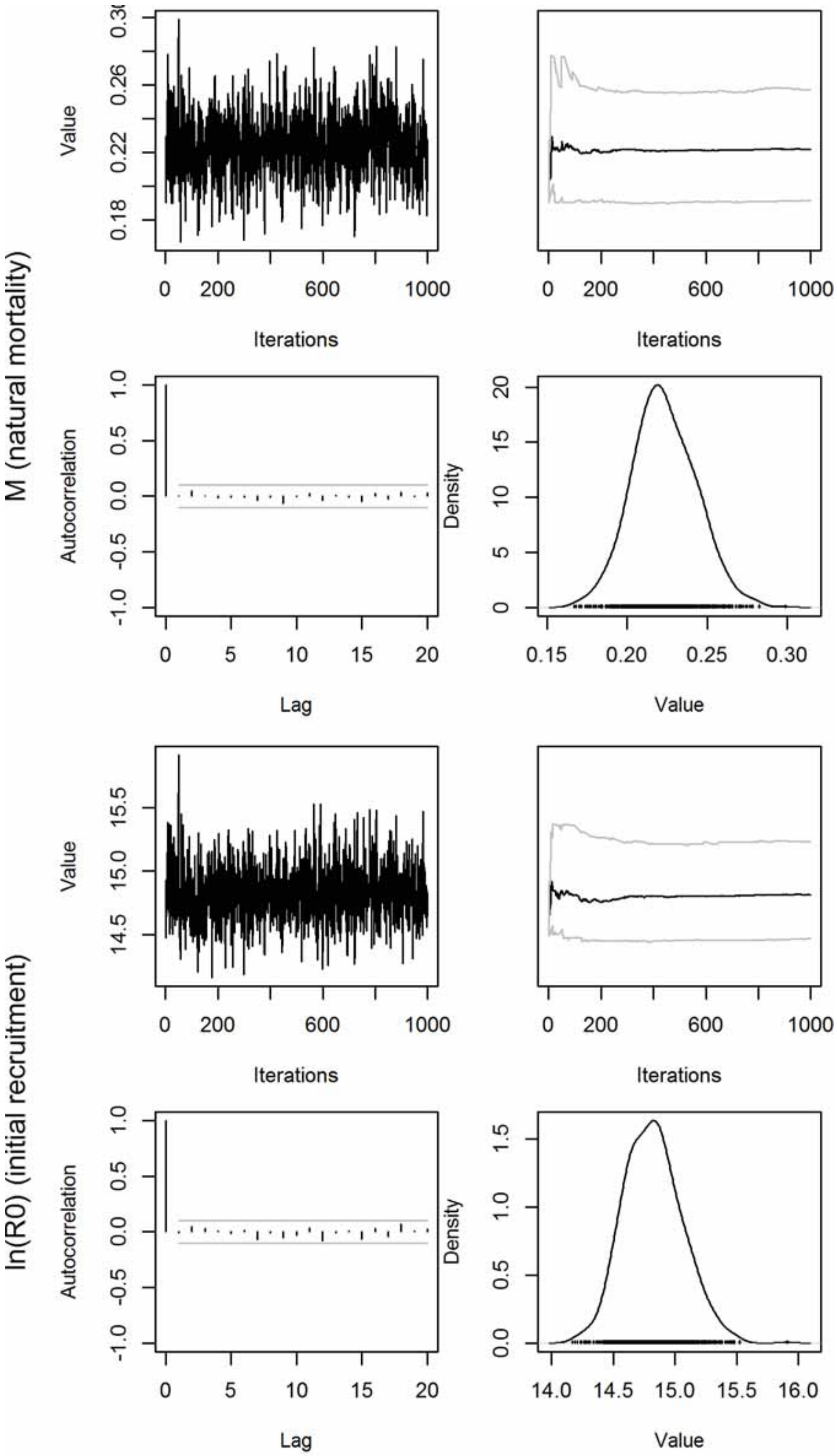


Figure 20: Summary of MCMC diagnostics for natural mortality (upper panels) and log(R_0) (lower panels) in the base model.

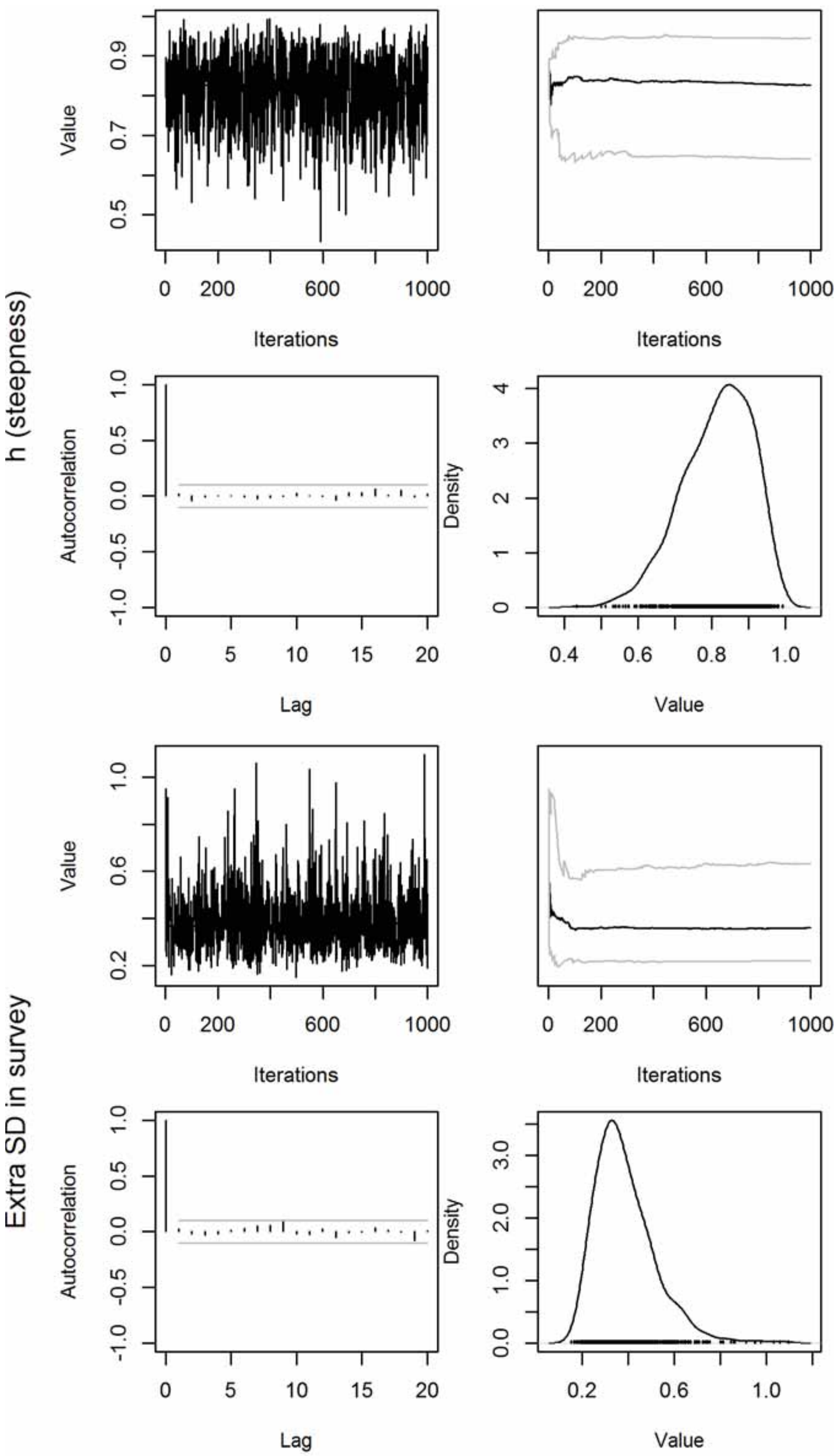


Figure 21: Summary of MCMC diagnostics for steepness (upper panels) and the additional SD for the acoustic survey index (lower panels) in the base model.

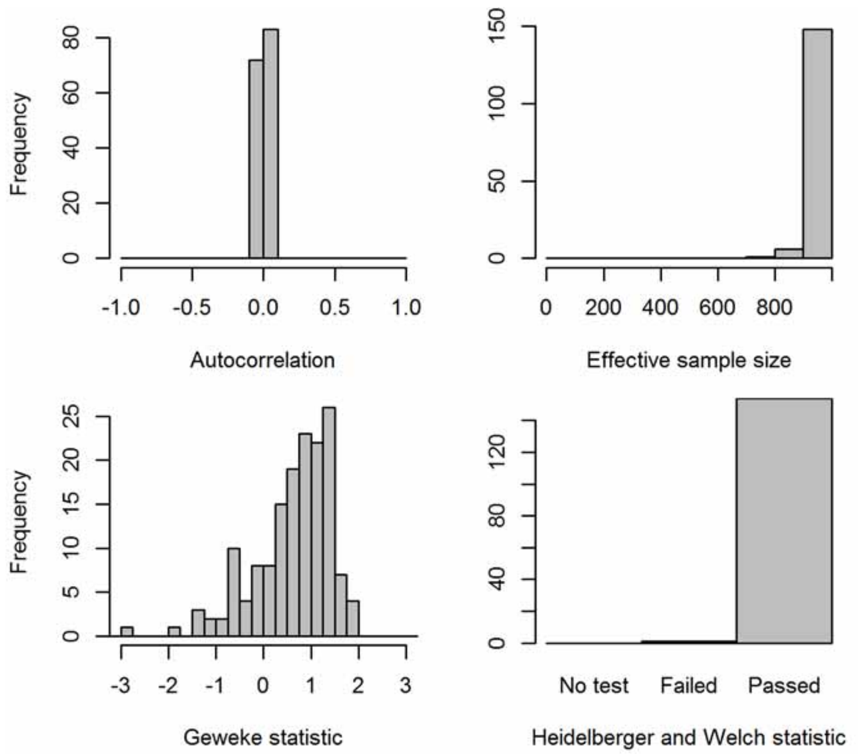


Figure 22: Summary histograms of MCMC diagnostics for all base model parameters and derived quantities including the recruitment, spawning biomass, and depletion time-series.

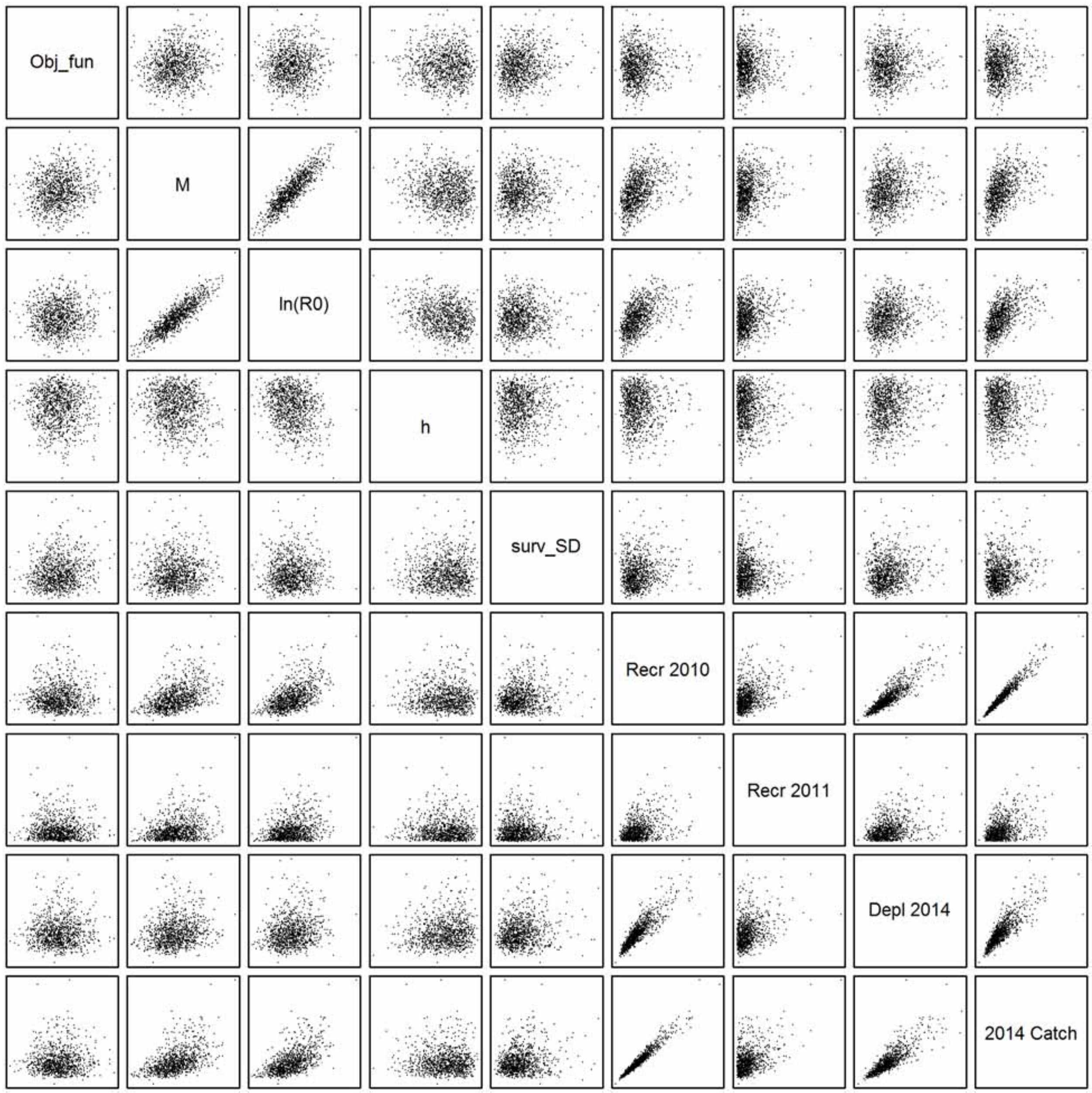


Figure 23: Posterior correlations among key base-model parameters and derived quantities. From the top left the posteriors plotted are: objective function, natural mortality, ln(R_0), steepness, the process-error SD for the acoustic survey, the 2008 recruitment deviation, the 2010 recruitment deviation, the depletion level in 2012, and the default harvest rate yield for 2013.

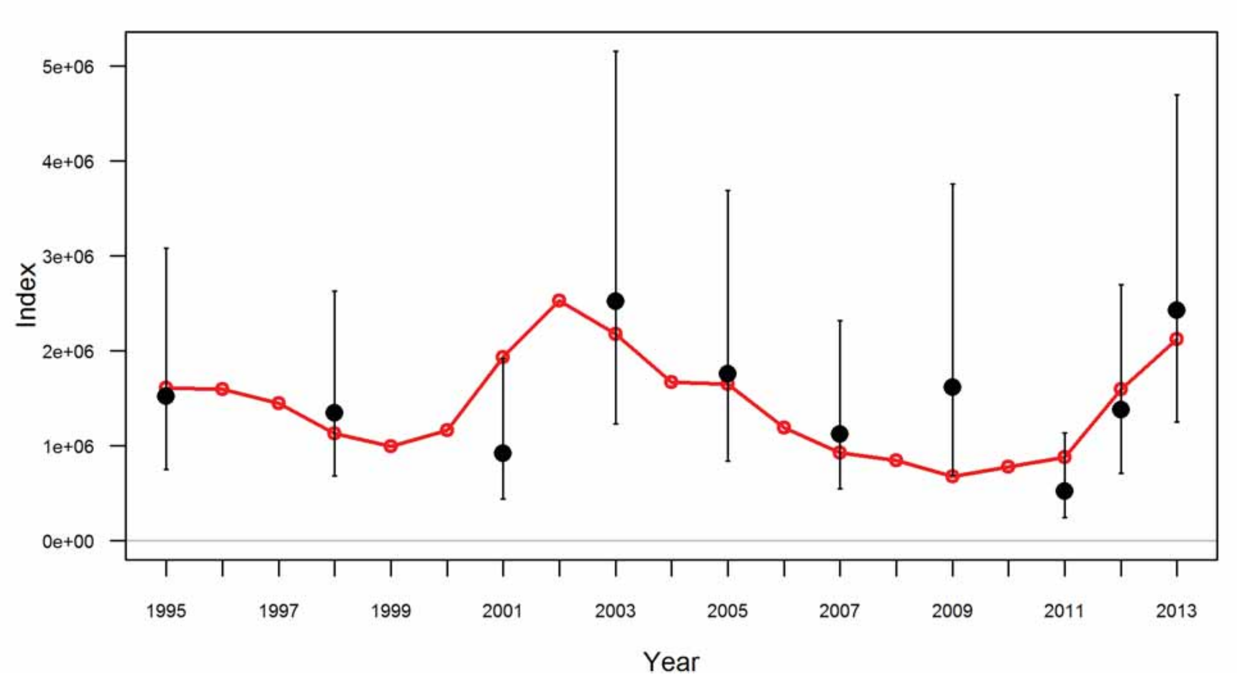


Figure 24: Predicted MLE fits to the acoustic survey with 95% confidence intervals around the index points. Red circles connected by the line are predicted survey estimates in every year, including years without a survey.

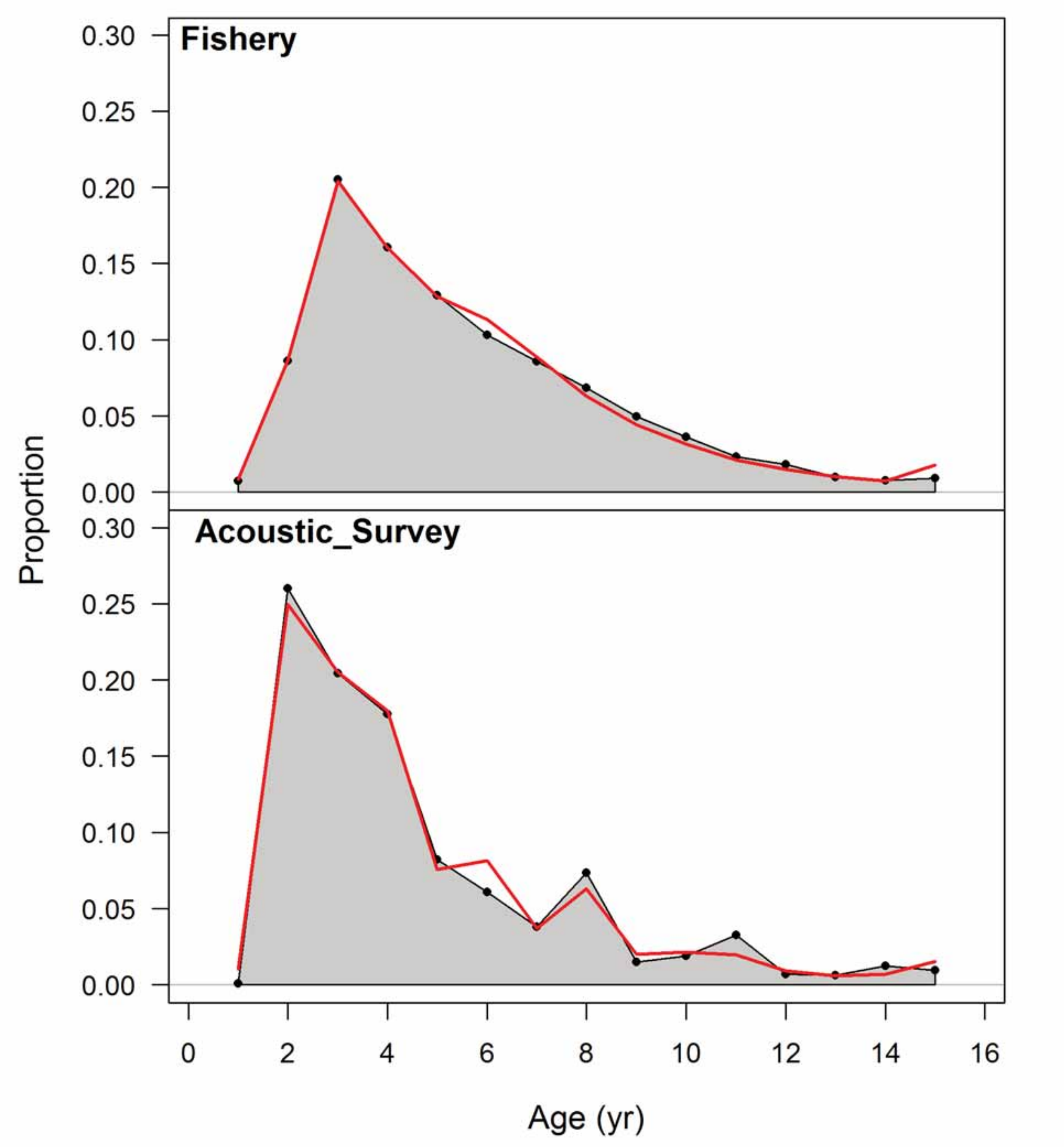


Figure 25: Aggregate fit to fishery and survey age compositions.

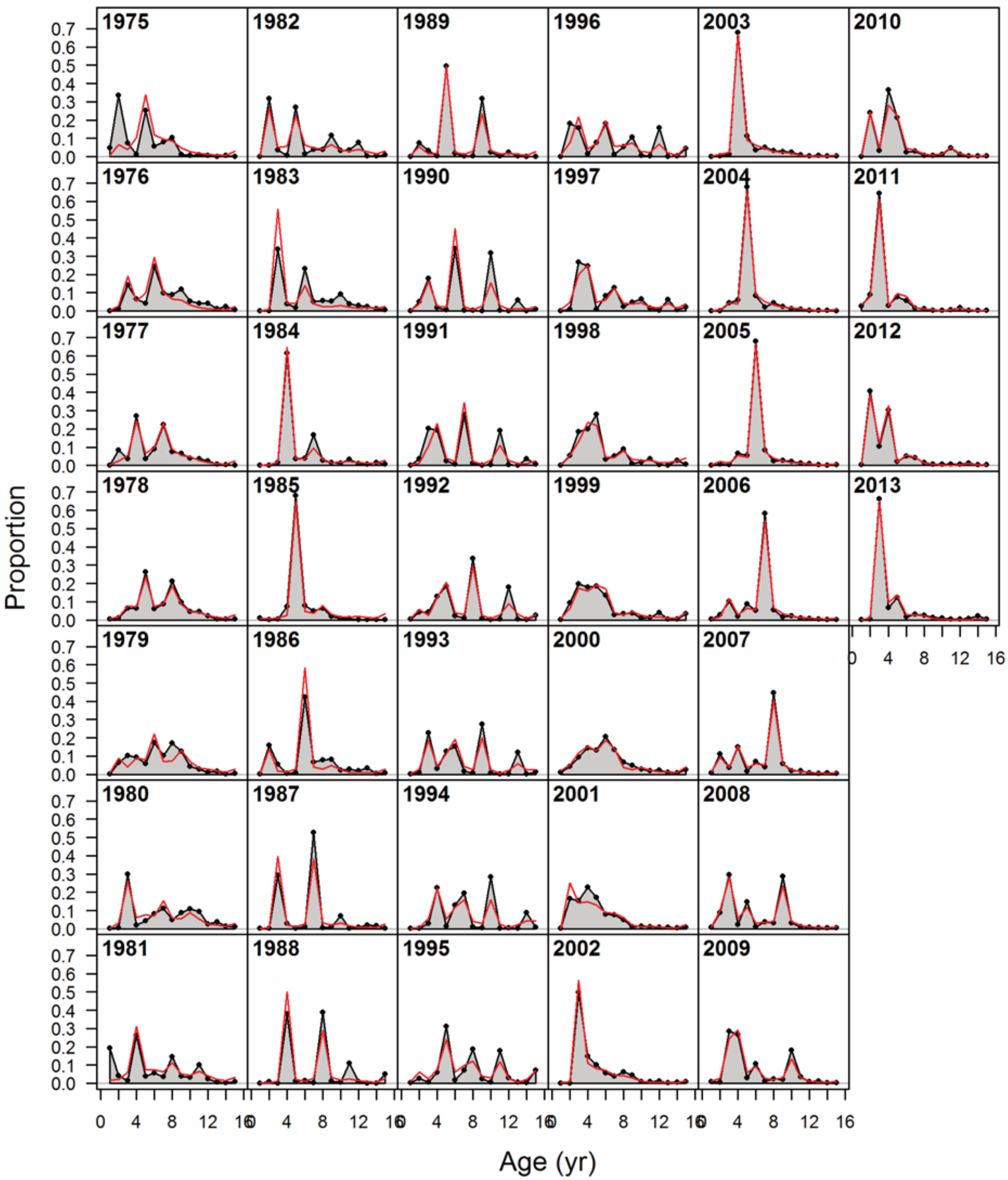


Figure 26: Base model fit to the observed fishery age compositions.

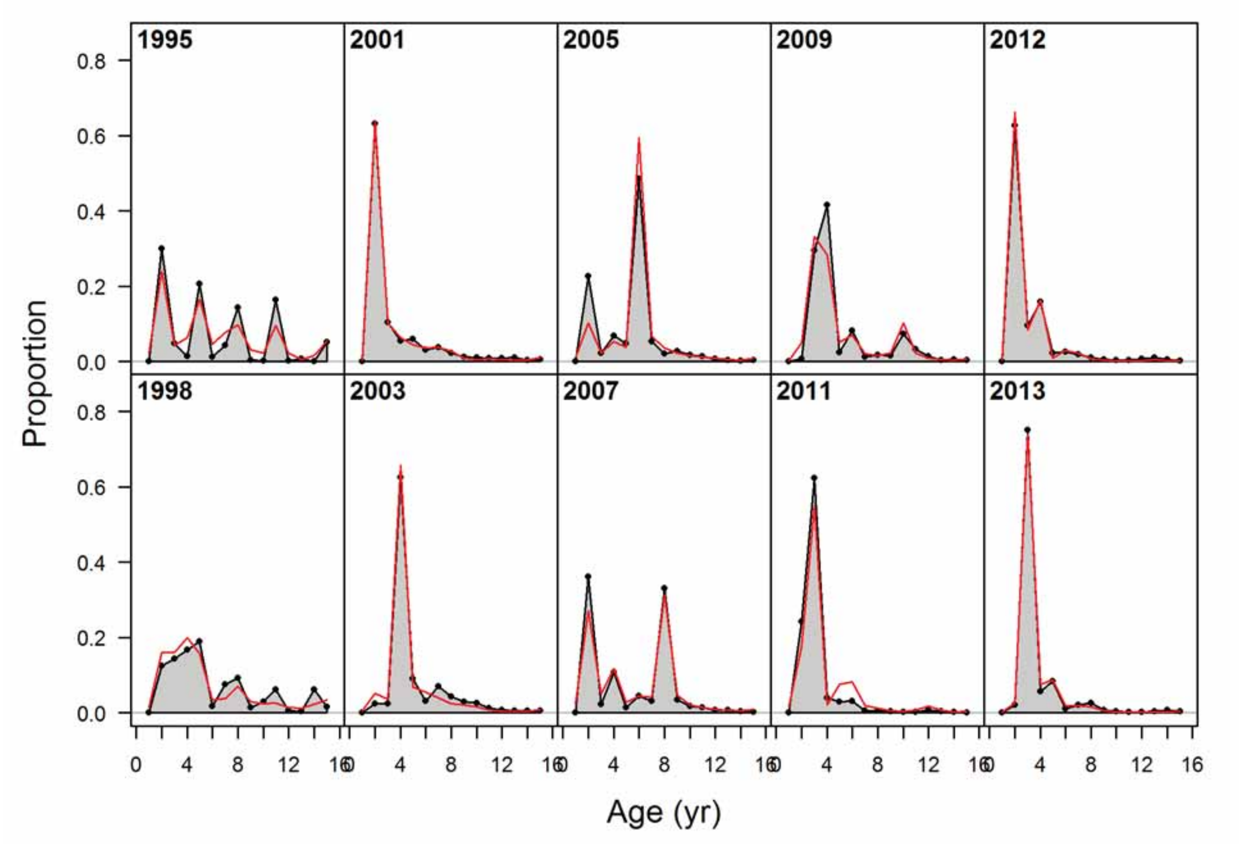


Figure 27: Base model fit to the observed acoustic survey age composition data.

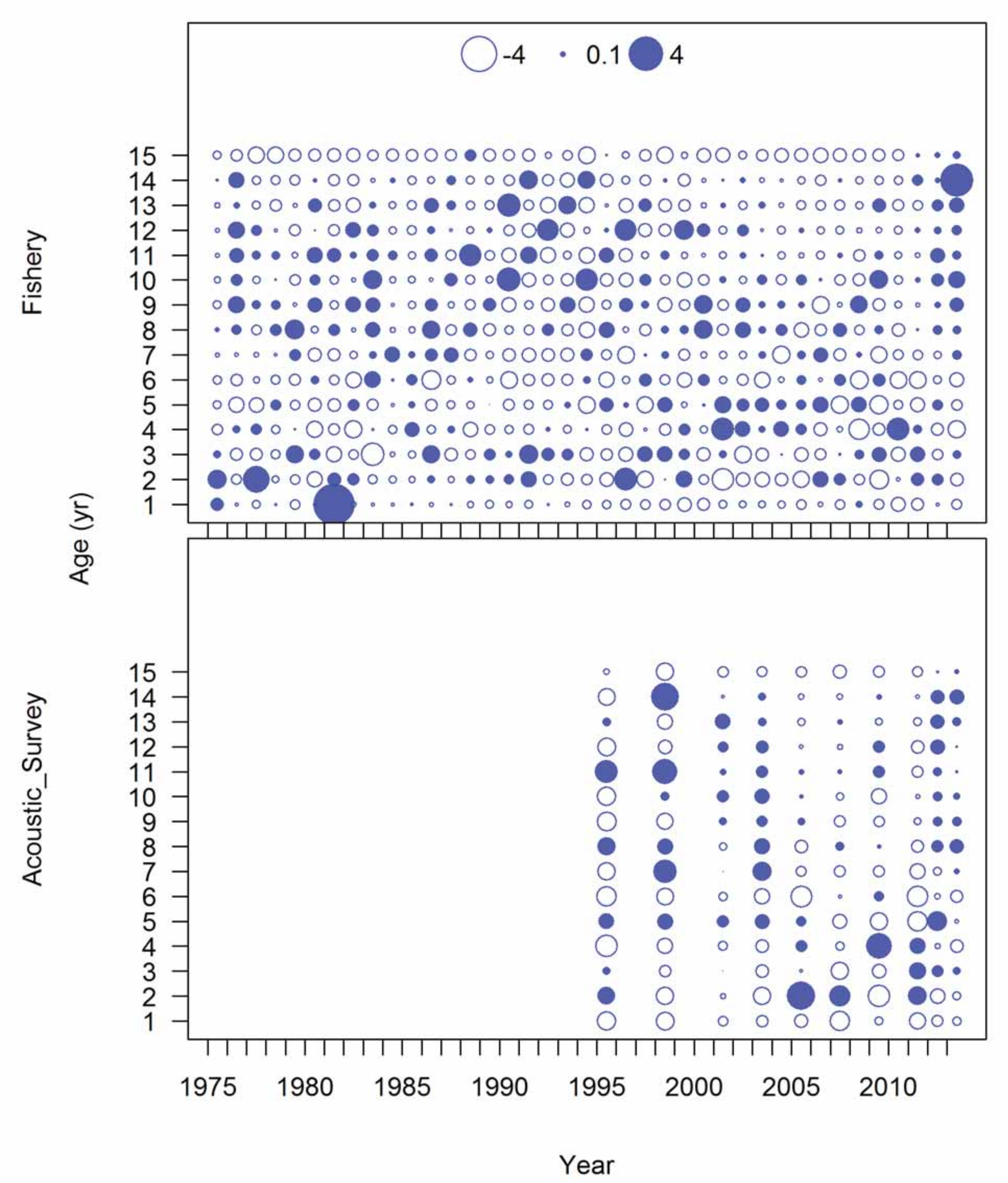


Figure 28: Pearson residuals (observed - predicted) for base model fits to the fishery age composition data. Filled circles represent positive values.

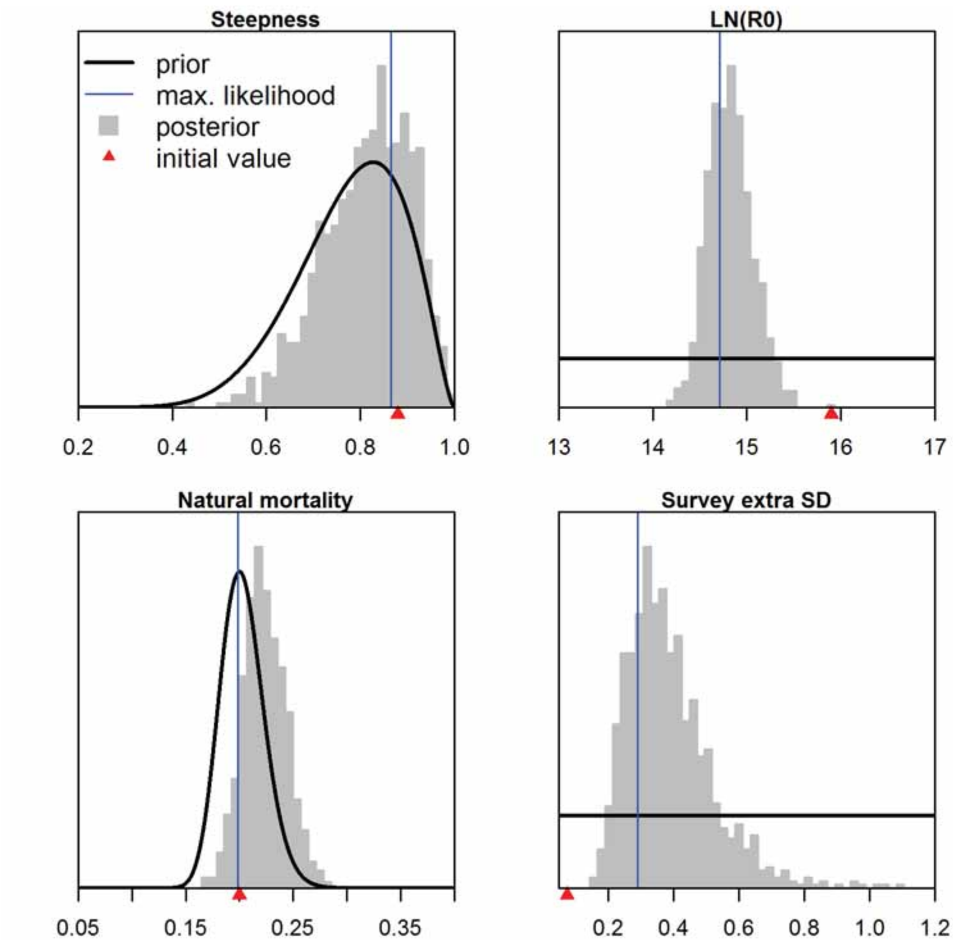


Figure 29: Prior and posterior probability distributions for key parameters in the base model. From the top left, the parameters are: steepness (*h*), Natural mortality (*M*), equilibrium log recruitment ln(R_0), and the additional process-error SD for the acoustic survey.

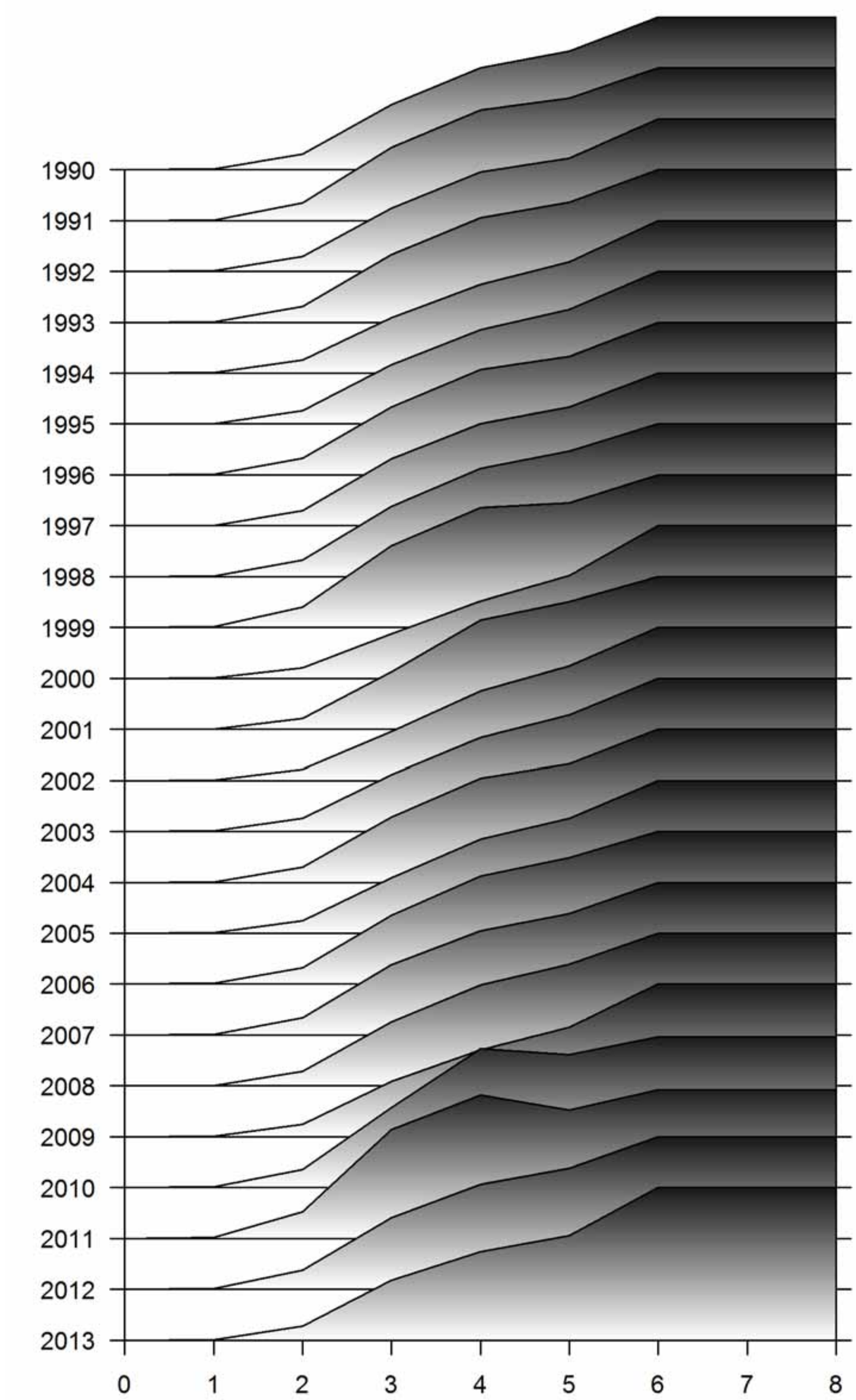


Figure 30: Mountains plot of time varying fishery selectivity for the base model

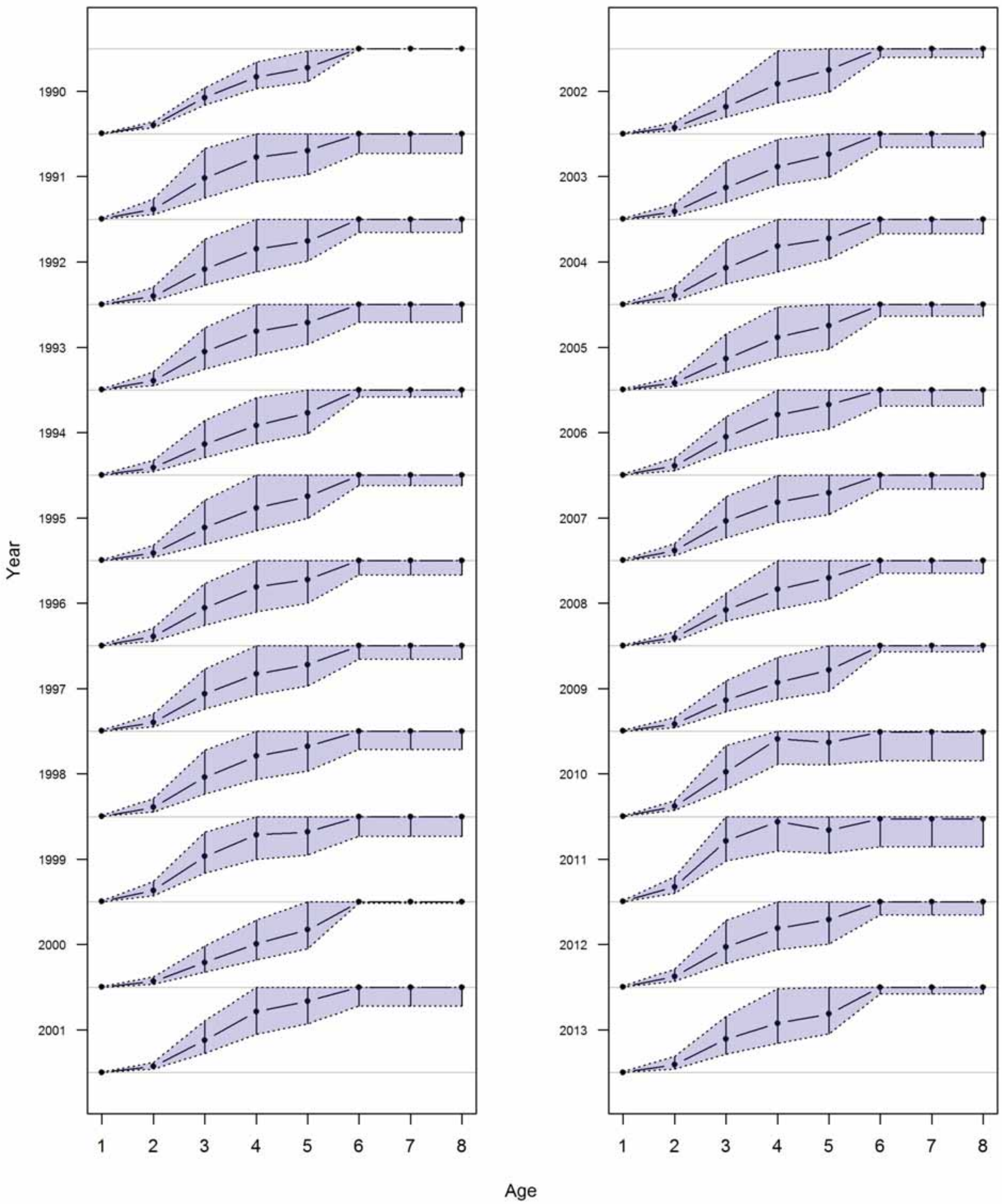


Figure 31: Fishery selectivity sampled from posterior probability distribution by year. Black dots and bars indicate the median and 95% credibility interval, respectively. The shaded polygon also shows the 95% credibility interval.

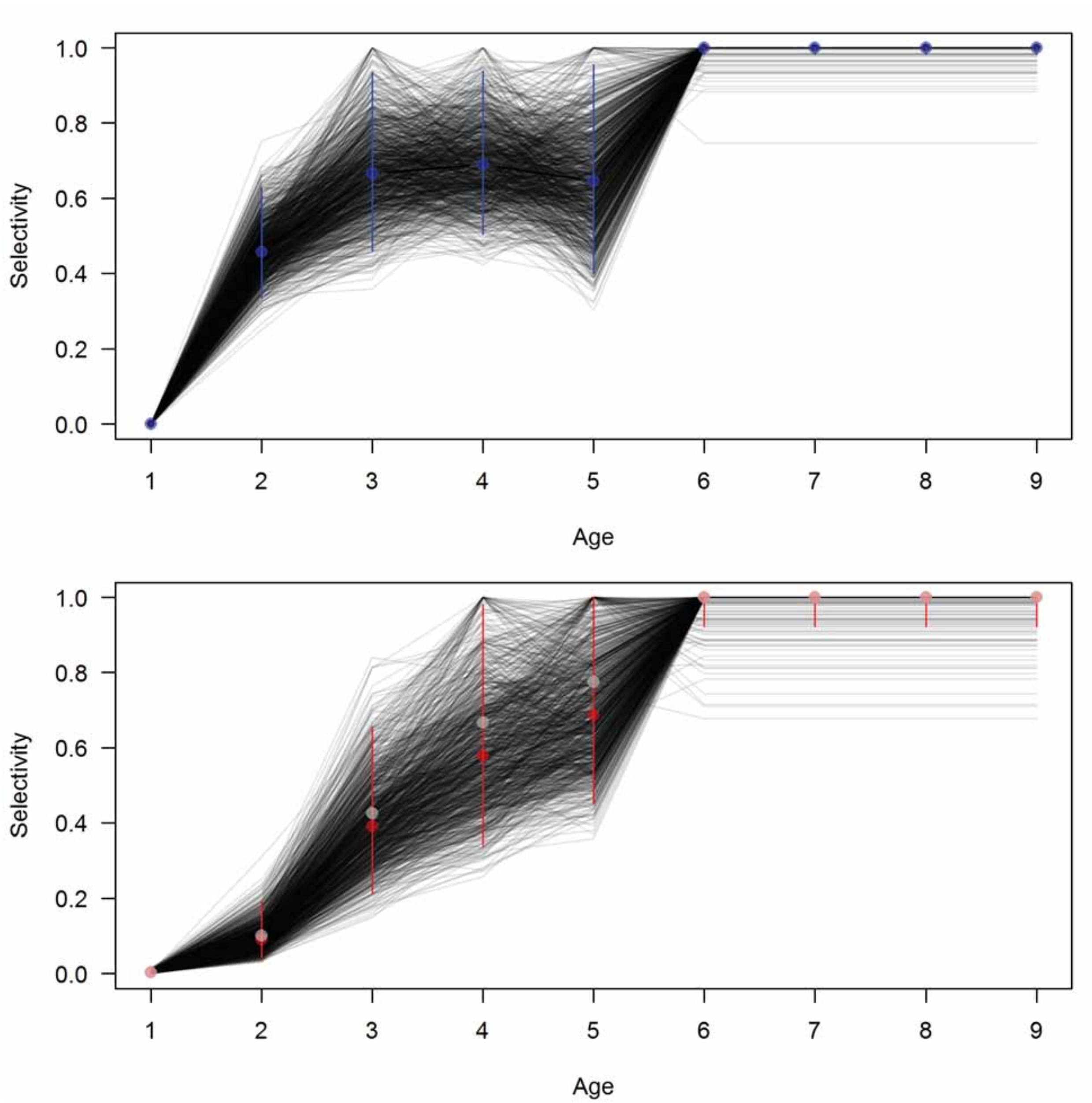


Figure 32: Estimated acoustic (top) and fishery (bottom) selectivity (2013) ogives from the posterior distribution

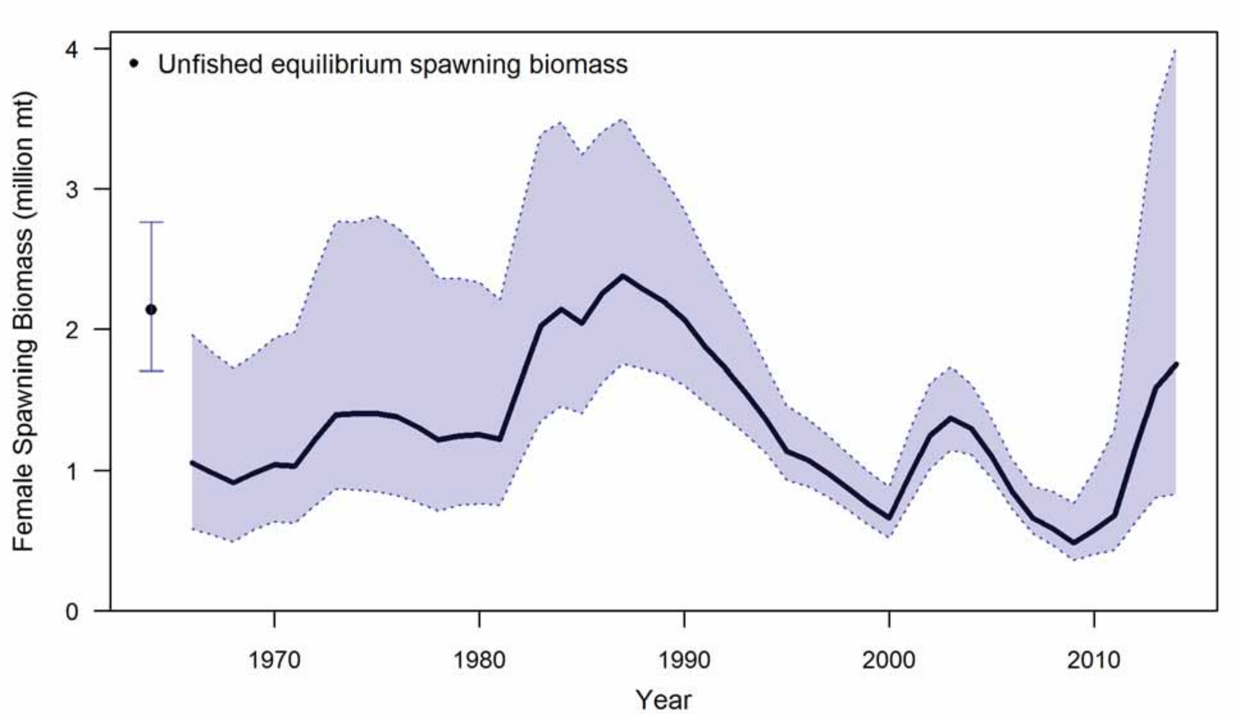


Figure 33: Median of the posterior distribution for female spawning biomass through 2013 (solid line) with 95% posterior credibility intervals (shaded area).

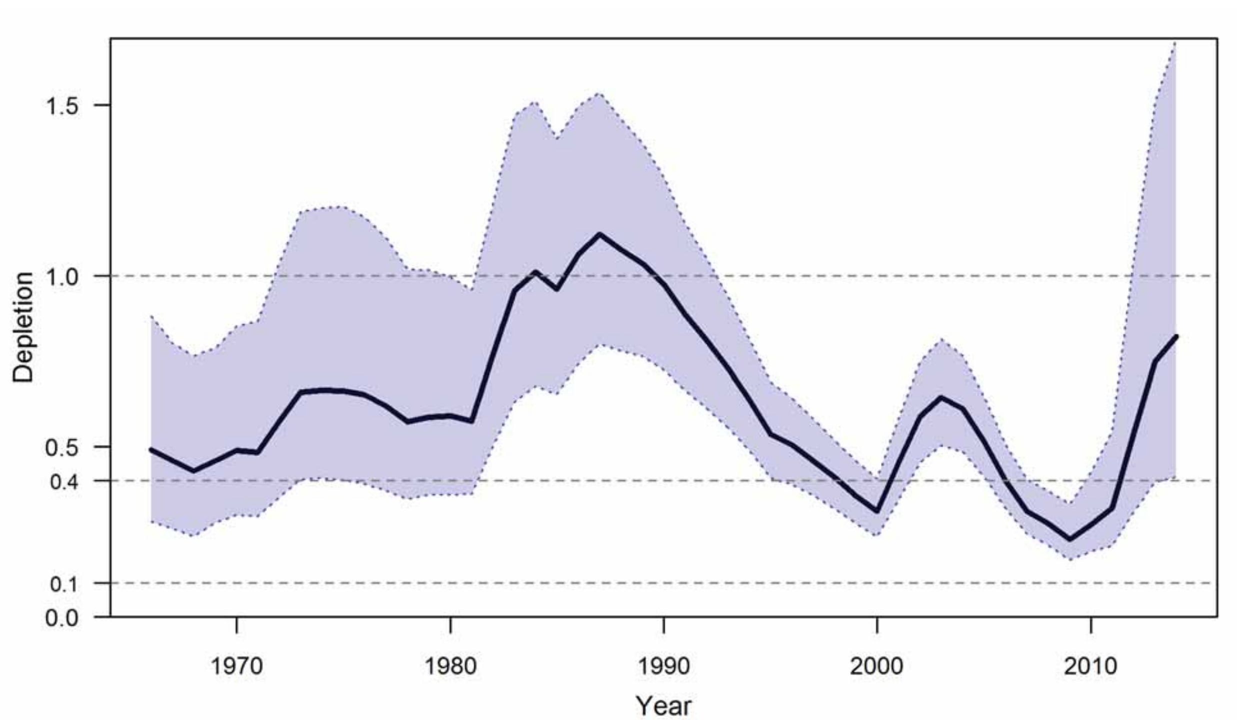


Figure 34: Median (solid line) of the posterior distribution for spawning depletion (B_t /B_0) through 2013 with 95% posterior credibility intervals (shaded area). Dashed horizontal lines show 10%, 40% and 100% depletion levels.

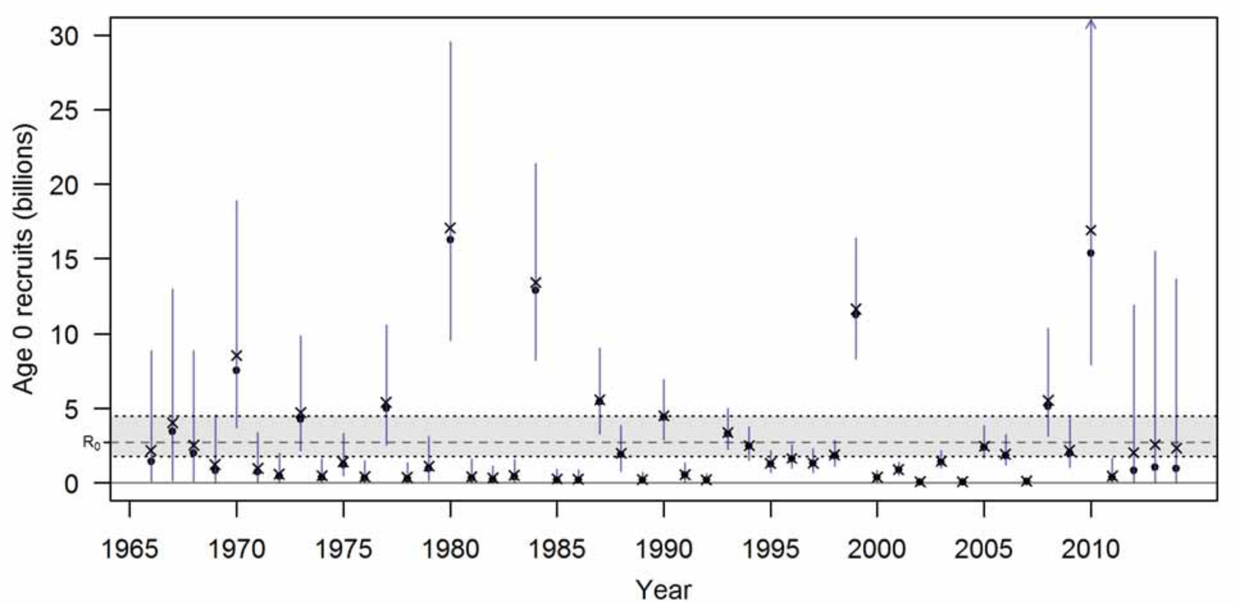


Figure 35: Medians (solid circles) and means (x) of the posterior distribution for recruitment (billions of age-0) with 95% posterior credibility intervals (blue lines). The median of the posterior distribution for mean unfished equilibrium recruitment is shown as the horizontal dashed line with a 95% posterior credibility shaded on either side of the median.

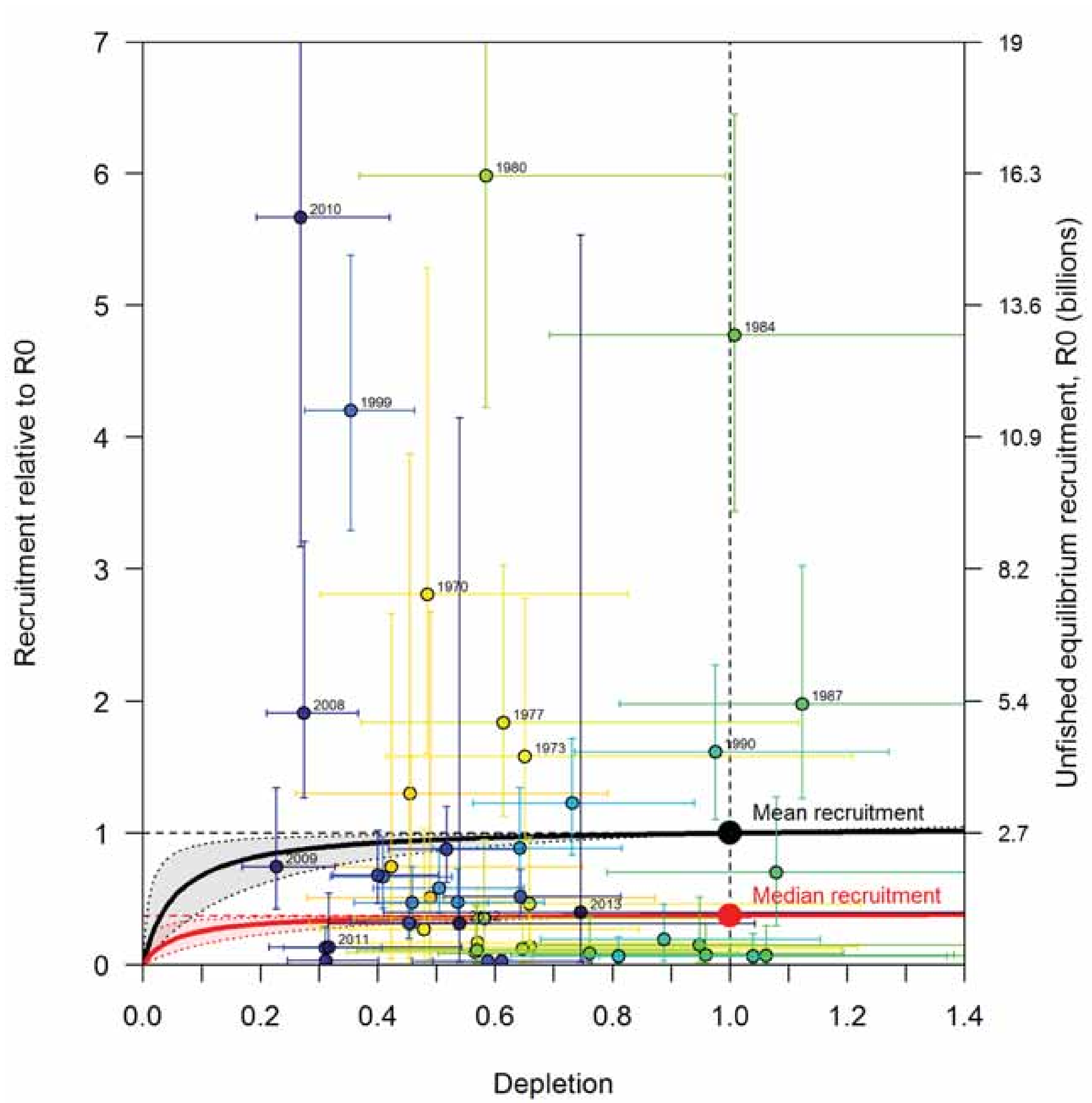


Figure 36: Estimated stock-recruit relationship for the base model with median predicted recruitments and 95% posterior credibility intervals. The thick solid black line indicates the central tendency (mean) and the red line the central tendency after bias correcting for the log-normal distribution (median).

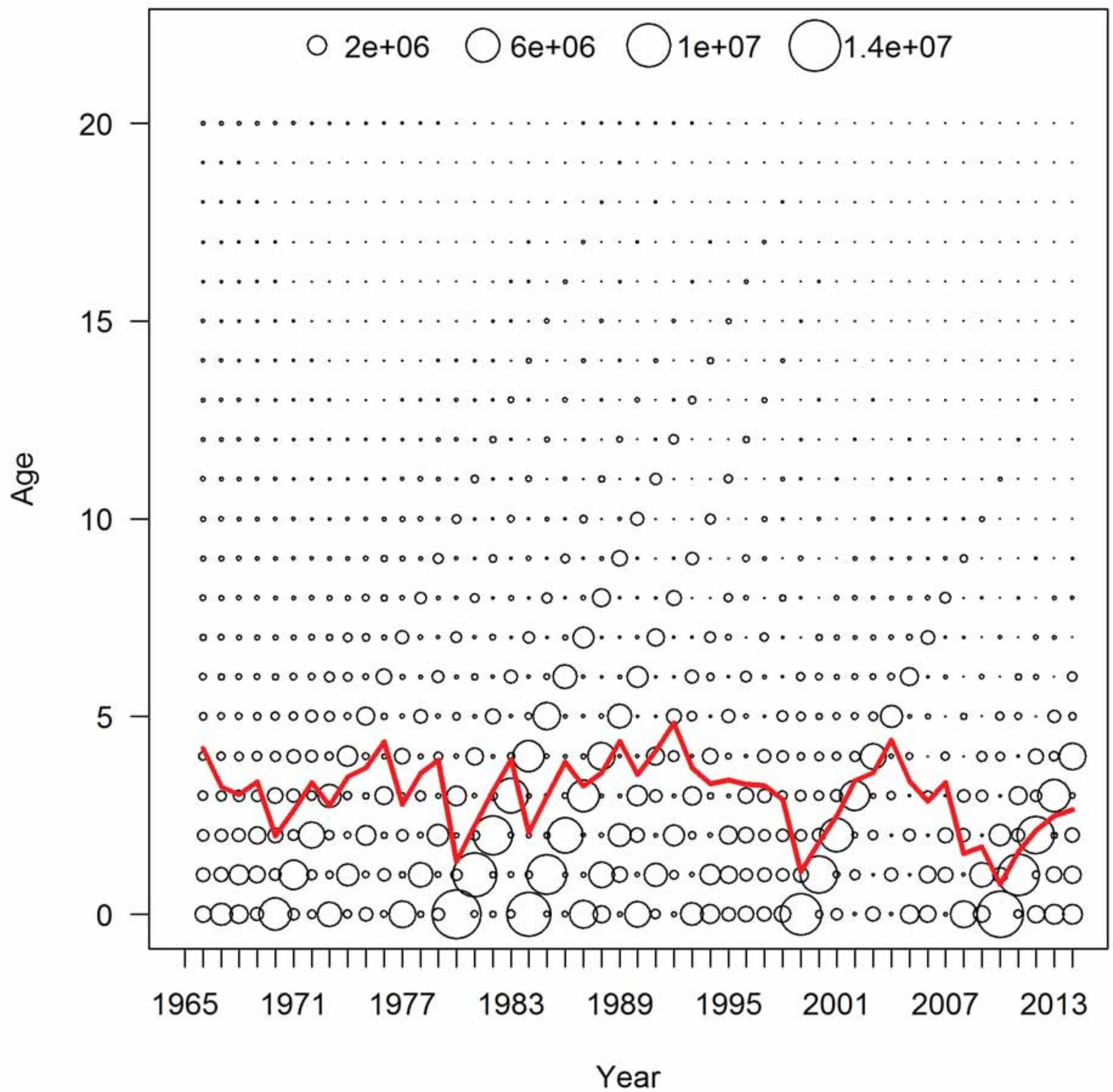


Figure 37: Bubble plot of numbers at age by year from 1966 to 2014. The red line represents the mean age.

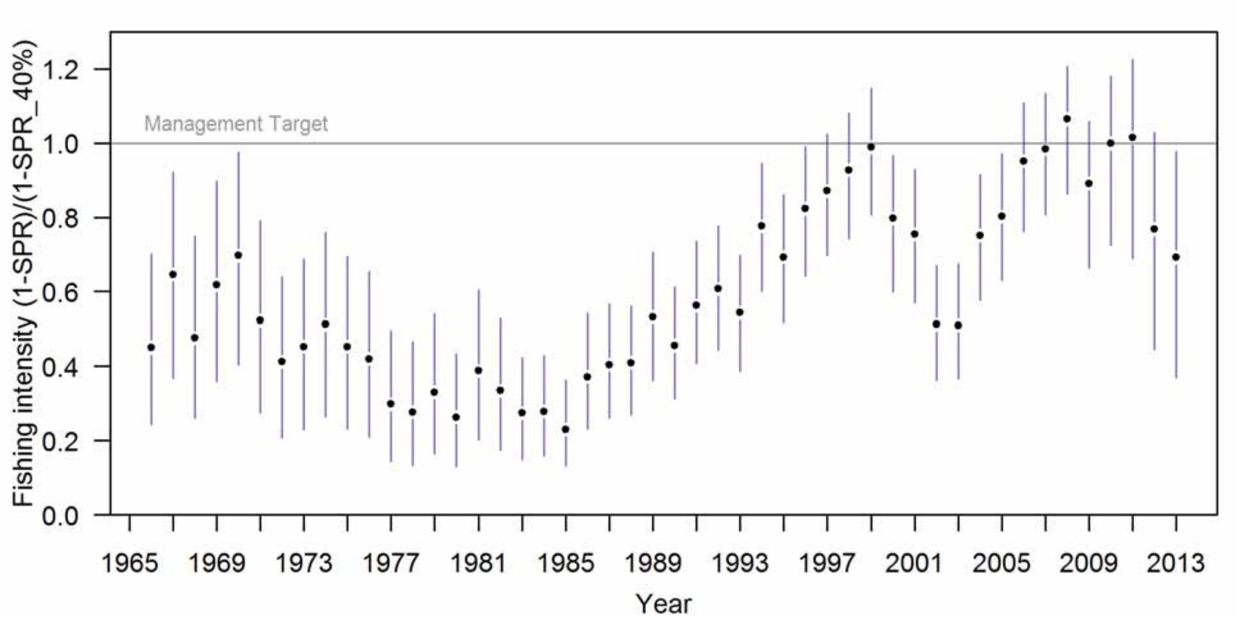


Figure 38: Trend in median fishing intensity (relative to the SPR management target) through 2013 with 95% posterior credibility intervals. The management target define in the Agreement is shown as a horizontal line at 1.0.

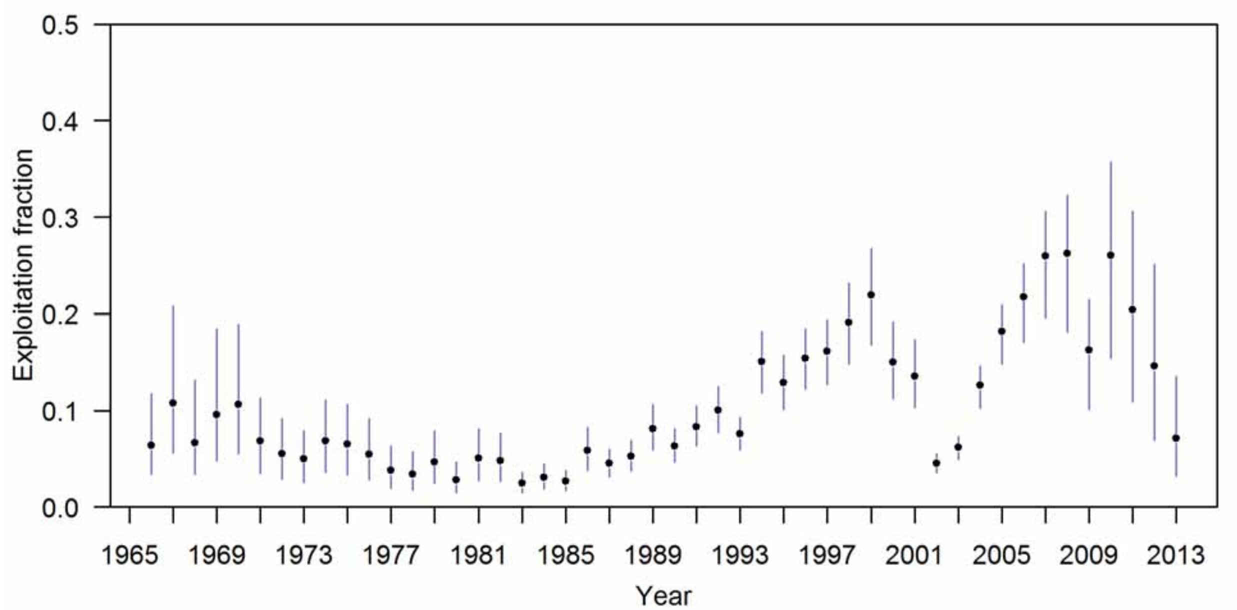


Figure 39: Trend in median exploitation fraction through 2013 with 95% posterior credibility intervals.

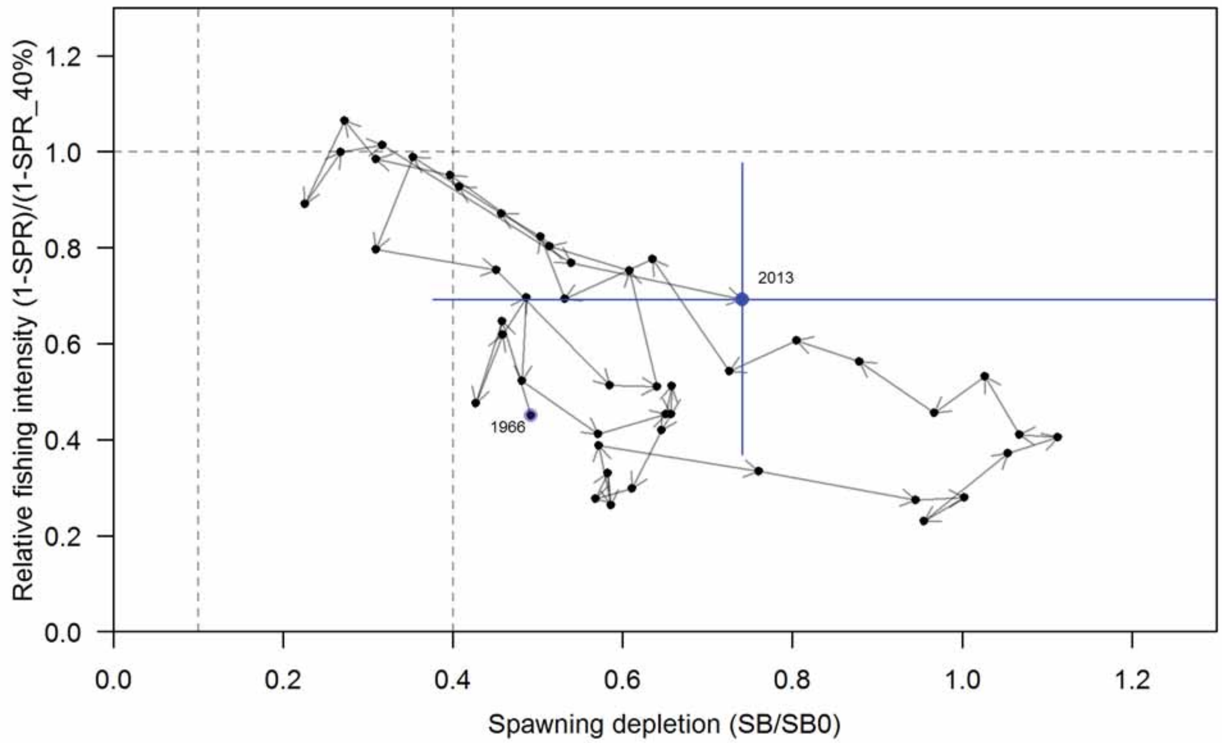


Figure 40: Estimated historical path followed by fishing intensity and spawning biomass depletion for Pacific Hake over years 1966-2013, inclusive. indicateBlue2013. Blue bars span the 95% credibility intervals for 2013 fishing intensity (vertical) and spawning biomass depletion (horizontal). The dashed lines indicate the fishing intensity target (horizontal) and the F40:10 harvest control rule (vertical) 10% and 40% depletion points.

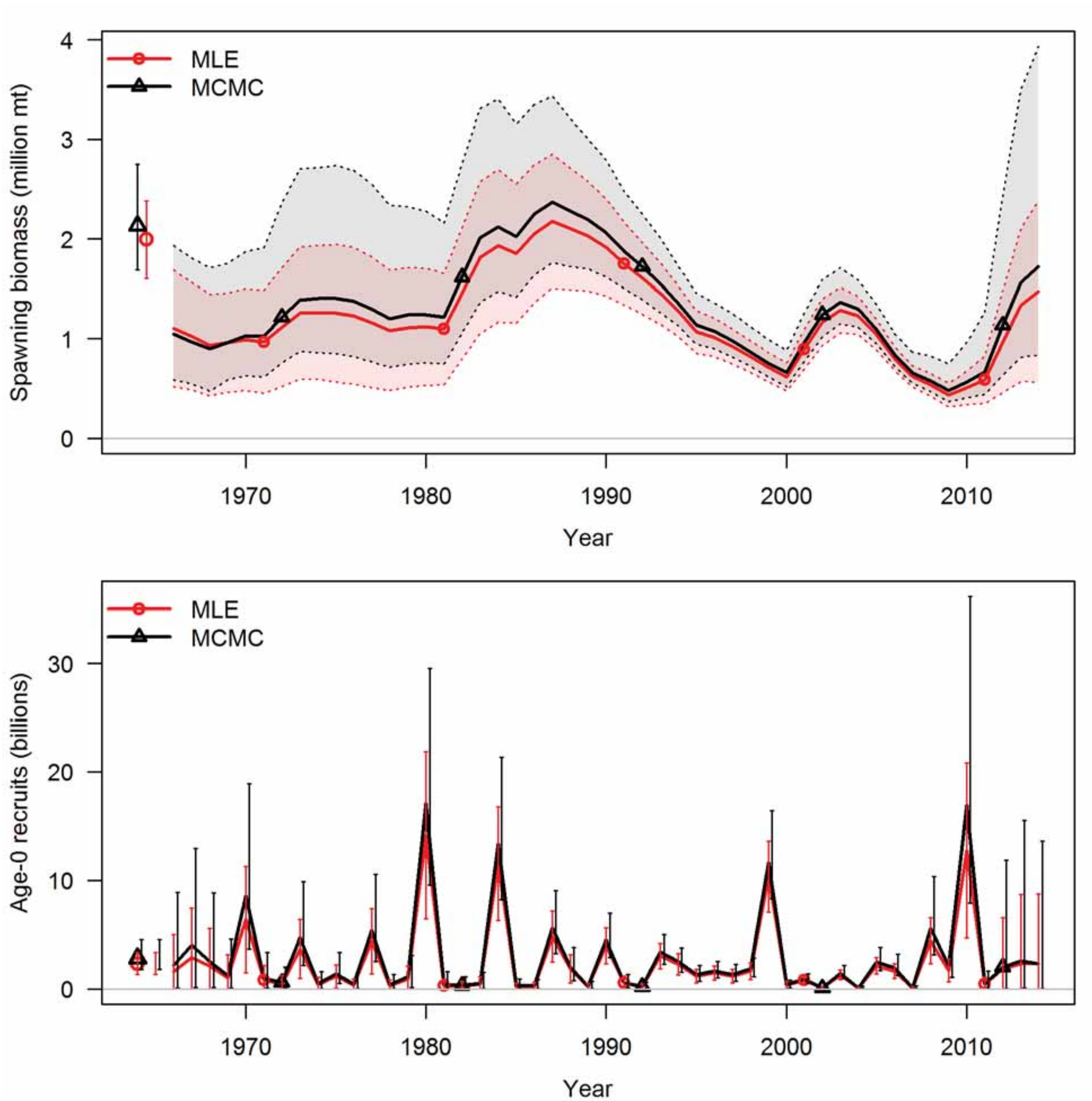


Figure 41: A comparison of MLE estimates with 95% confidence intervals determined from asymptotic variance estimates (red) to the median of the posterior distribution with 95% credibility intervals (black).

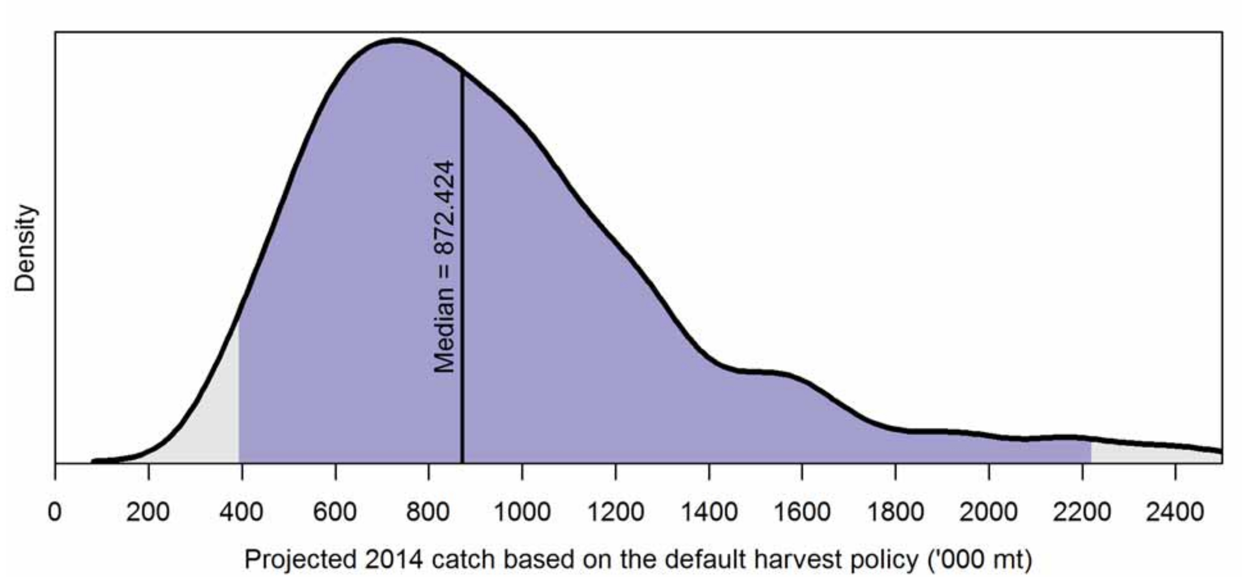


Figure 42: The posterior distribution of 2014 catch calculated using the default harvest policy (F40%-40:10). The dark shaded area ranges from the 2.5% quantile to the 97.5% quantile.

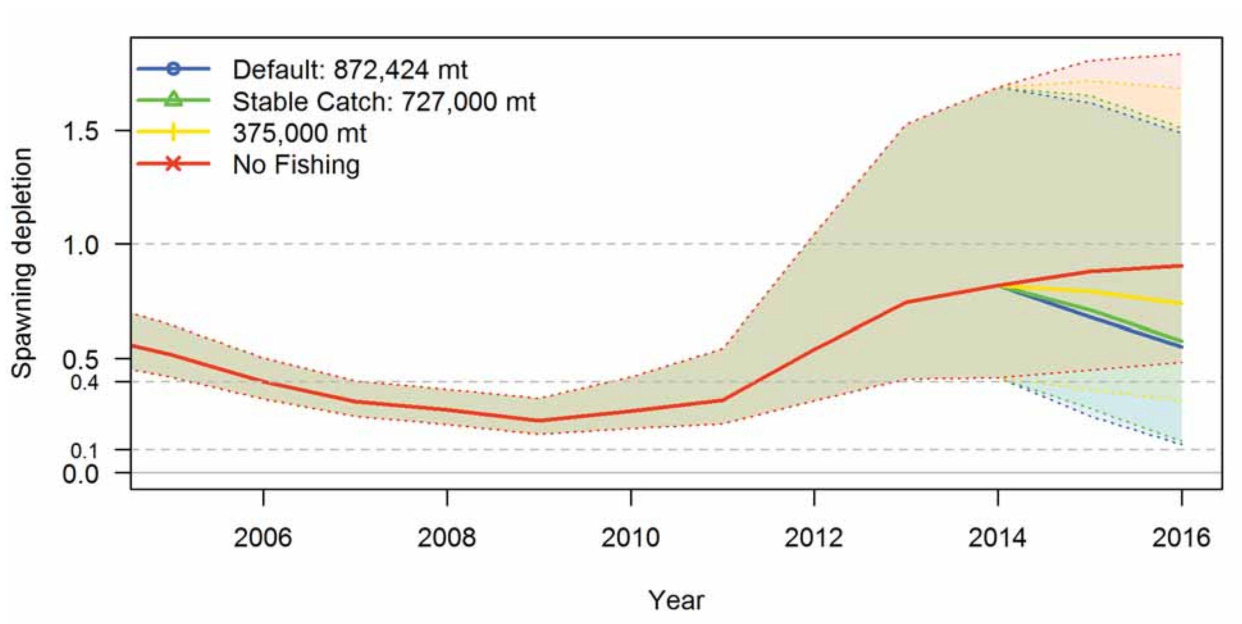


Figure 43: Time-series of estimated spawning depletion to 2014 from the base model, and forecast trajectories to 2015 for several management options from the decision table, with 95% posterior credibility intervals. The 2014 catch of 872,424 mt was calculated using the default harvest policy, as defined in the Agreement.

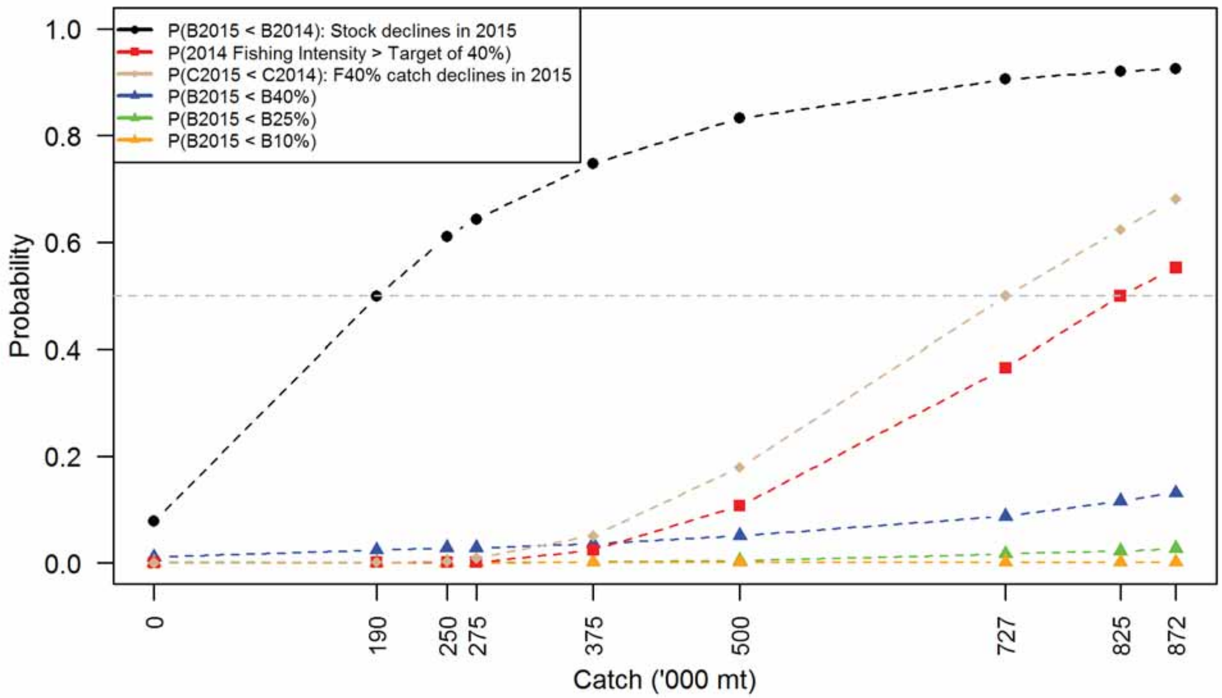


Figure 44: Probabilities of various management metrics given different catch alternatives. Catch alternatives are described in Table 16. The points show these specific catch levels and lines interpolate between the points.

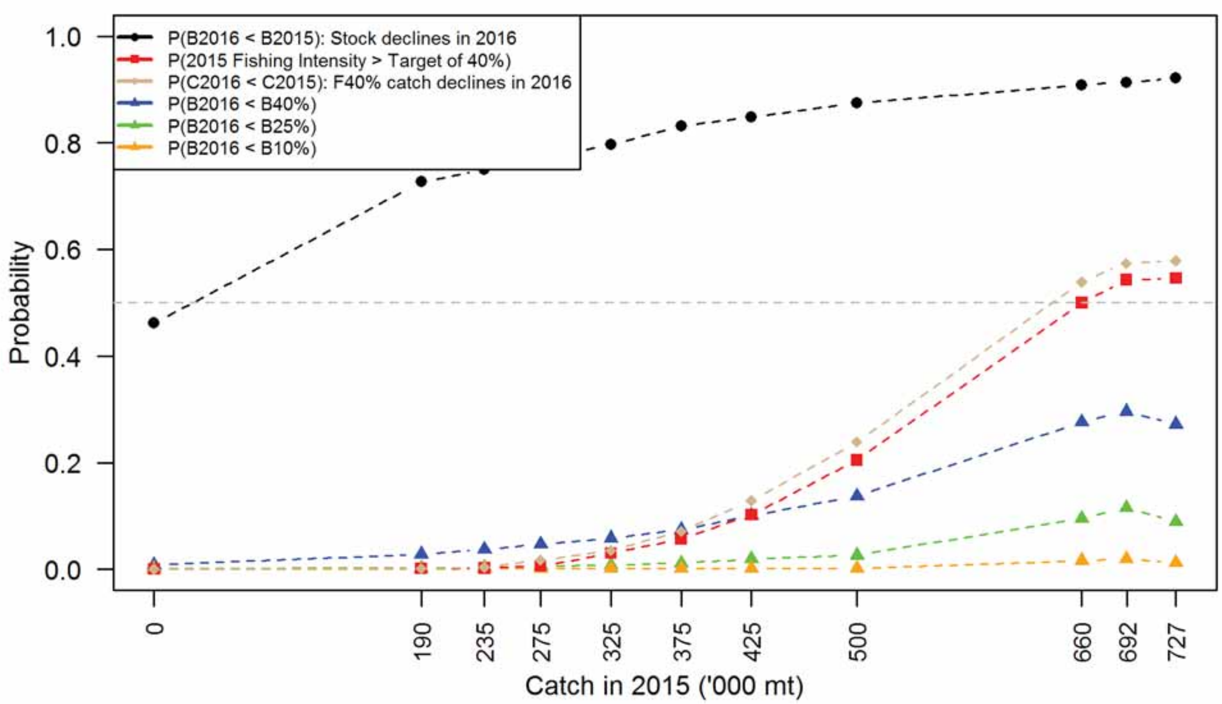


Figure 45: Graphical representation of the results presented in Table 19 for catch in 2015. The symbols indicate points that were computed directly from model output and lines interpolate between the points. These catches are conditional on the catch in 2014, and 2014 catch levels corresponding to the 2015 catches of 660 and 692 were higher (see Table 16).

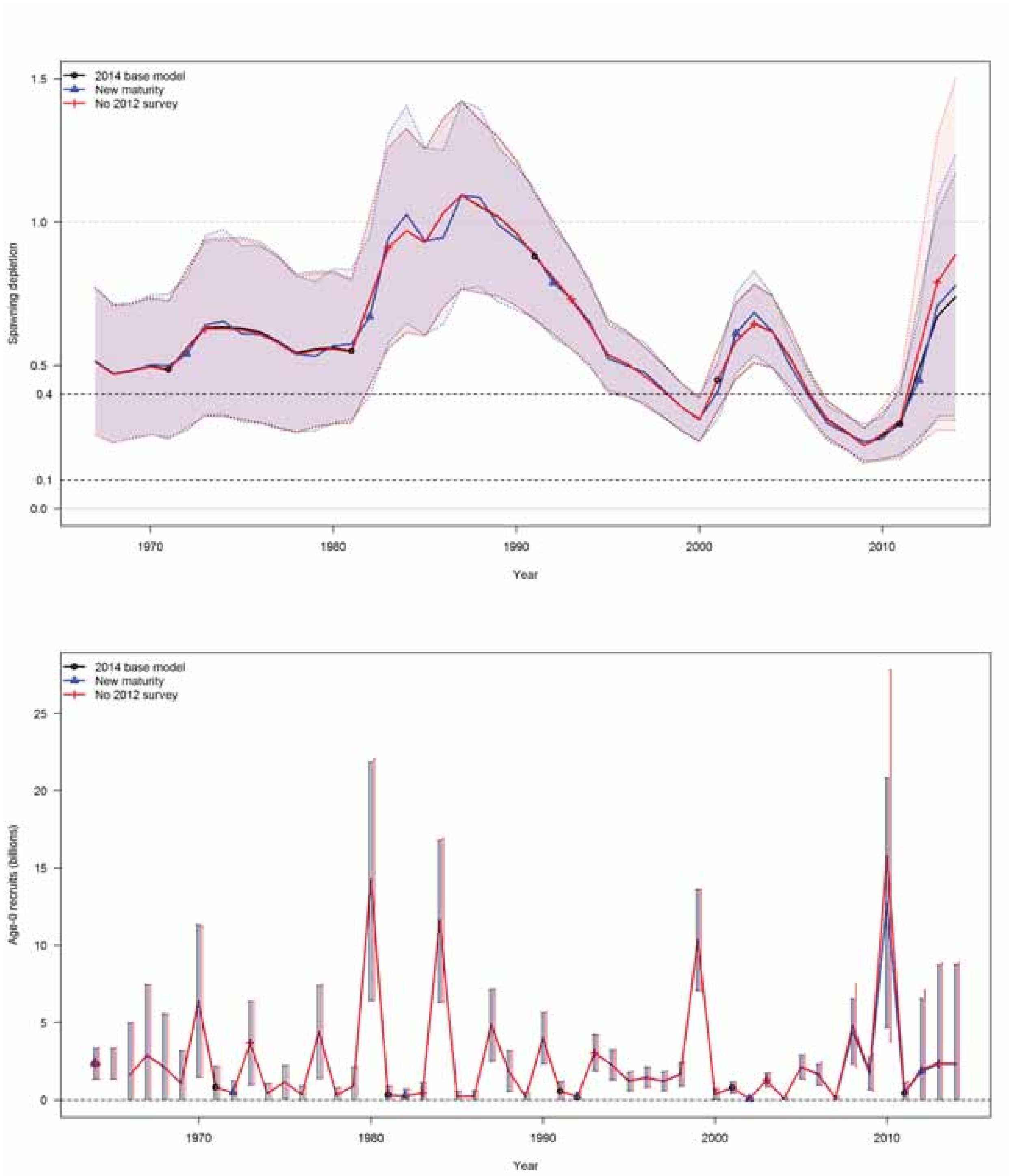
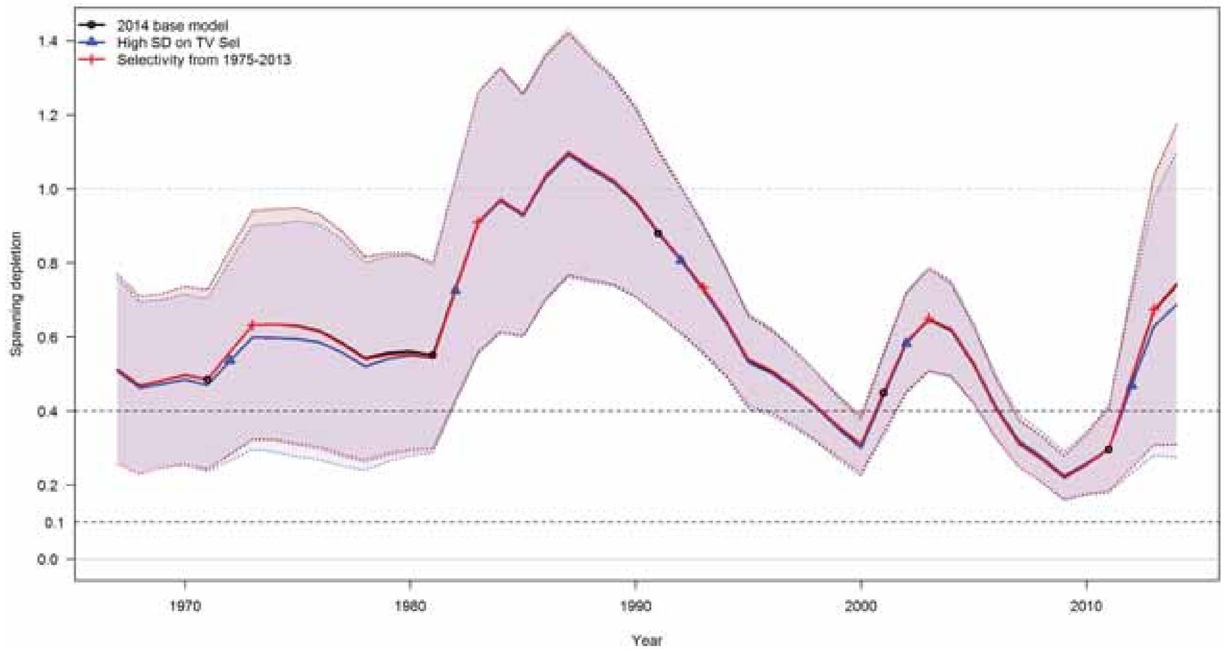


Figure 46: Maximum likelihood (MLE) predictions of depletion (top) and recruitment (bottom) for sensitivity runs with 1) newly estimated maturity-at-age (blue, "New maturity", or 2) without a 2012 survey (red, "No 2012 survey").



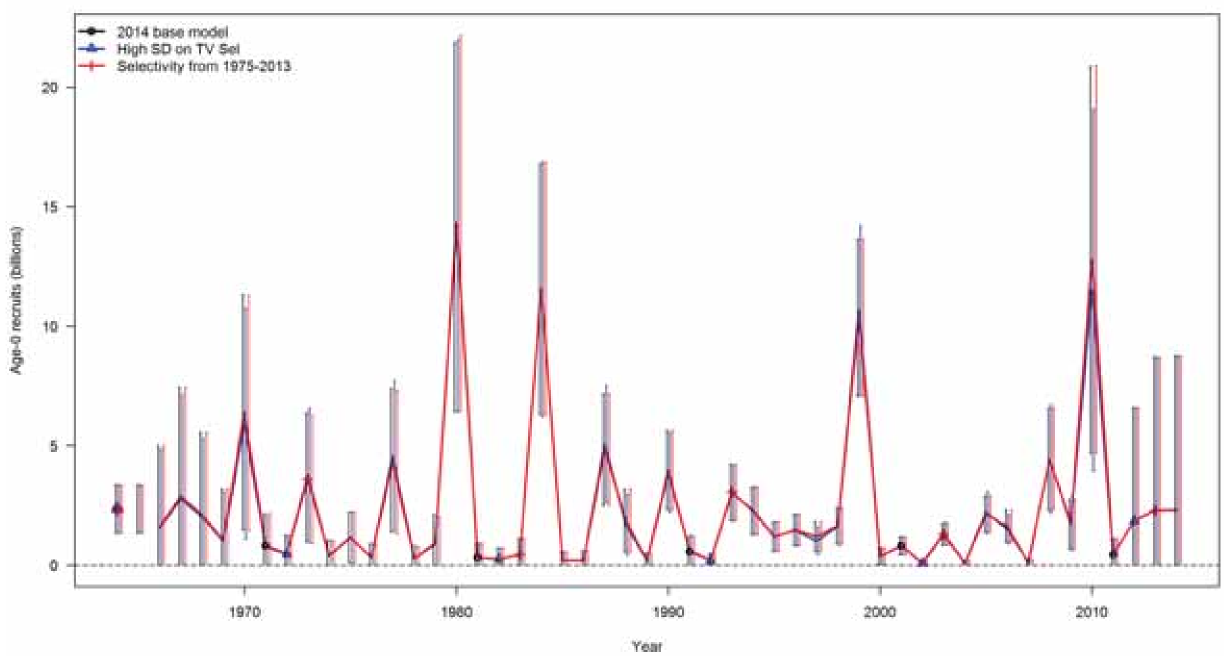


Figure 47: Maximum likelihood (MLE) predictions of depletion (top) and recruitment (bottom) for sensitivity runs with 1) a value of 0.2 for the standard deviation of the selectivity deviation penalty (blue, "High SD of TV Sel", or 2) estimating selectivity deviations from 1975 to 2013 (red, "Selectivity from 1975-2013").

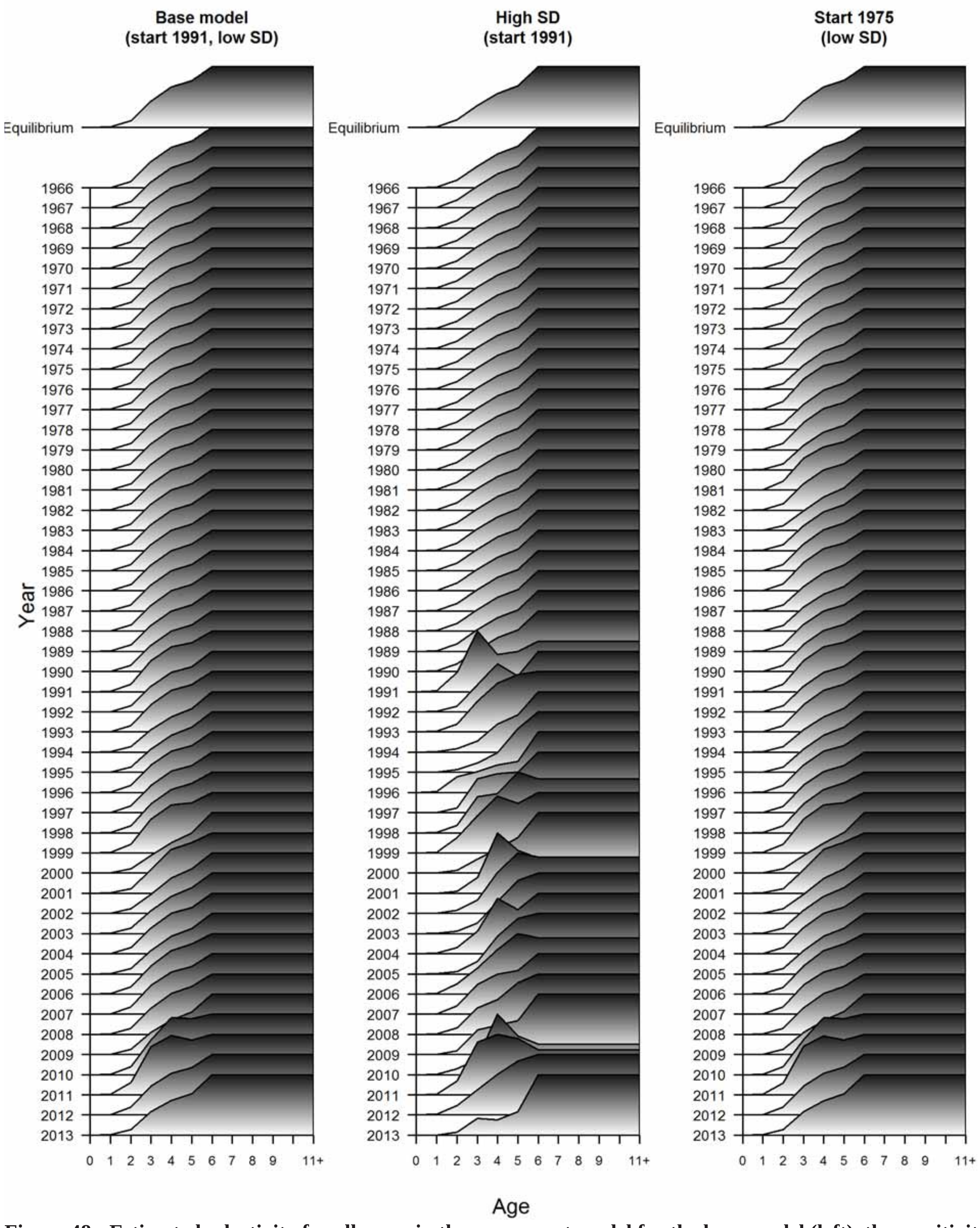


Figure 48: Estimated selectivity for all years in the assessment model for the base model (left), the sensitivity with a high standard deviation on fishery selectivity (center), and the sensitivity estimating time-varying selectivitystarting in 1975 (right).

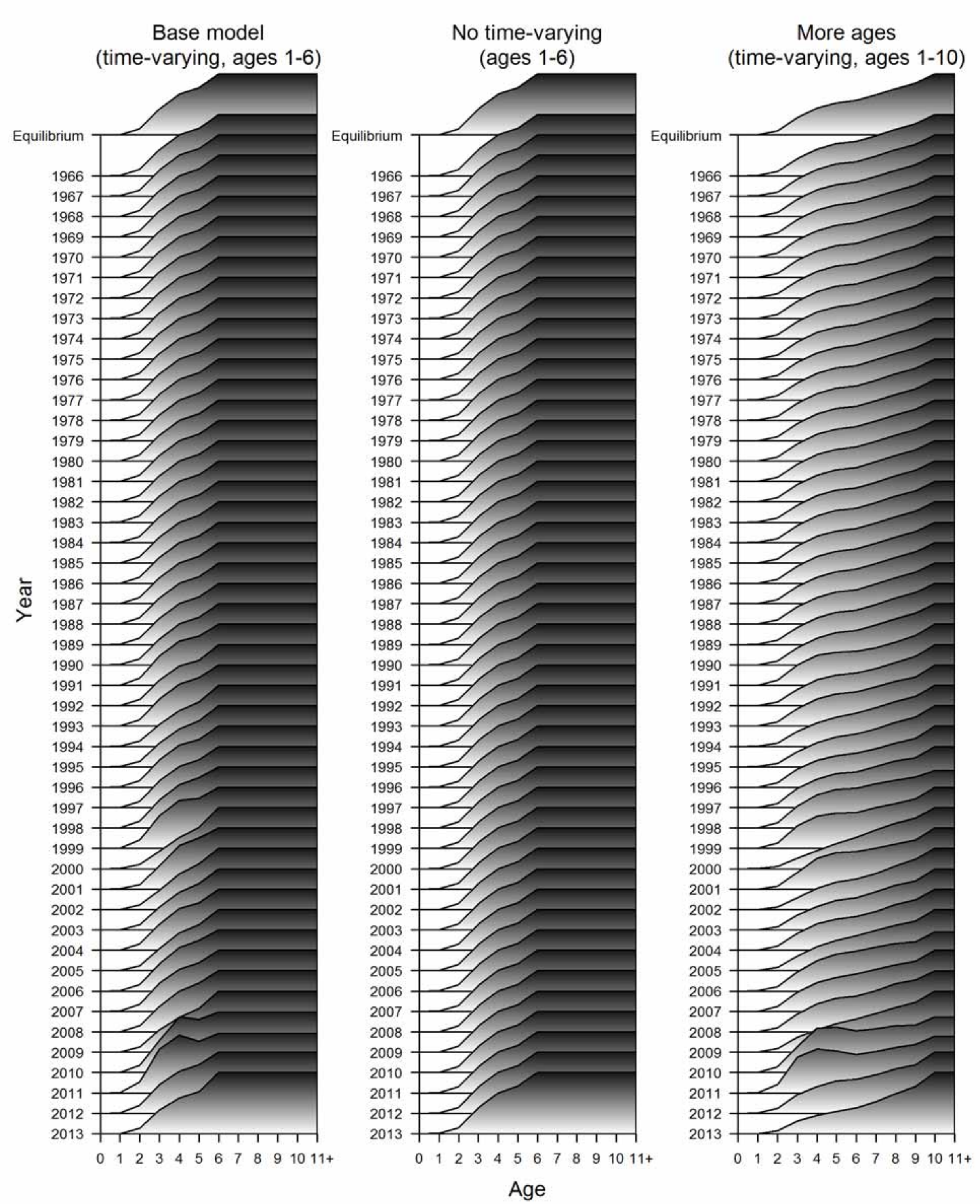


Figure 49: Estimated selectivity for all years in the assessment model for the base model (left), the sensitivity with time-invariant fishery selectivity (center), and the sensitivity estimating selectivity to age 10 (right).

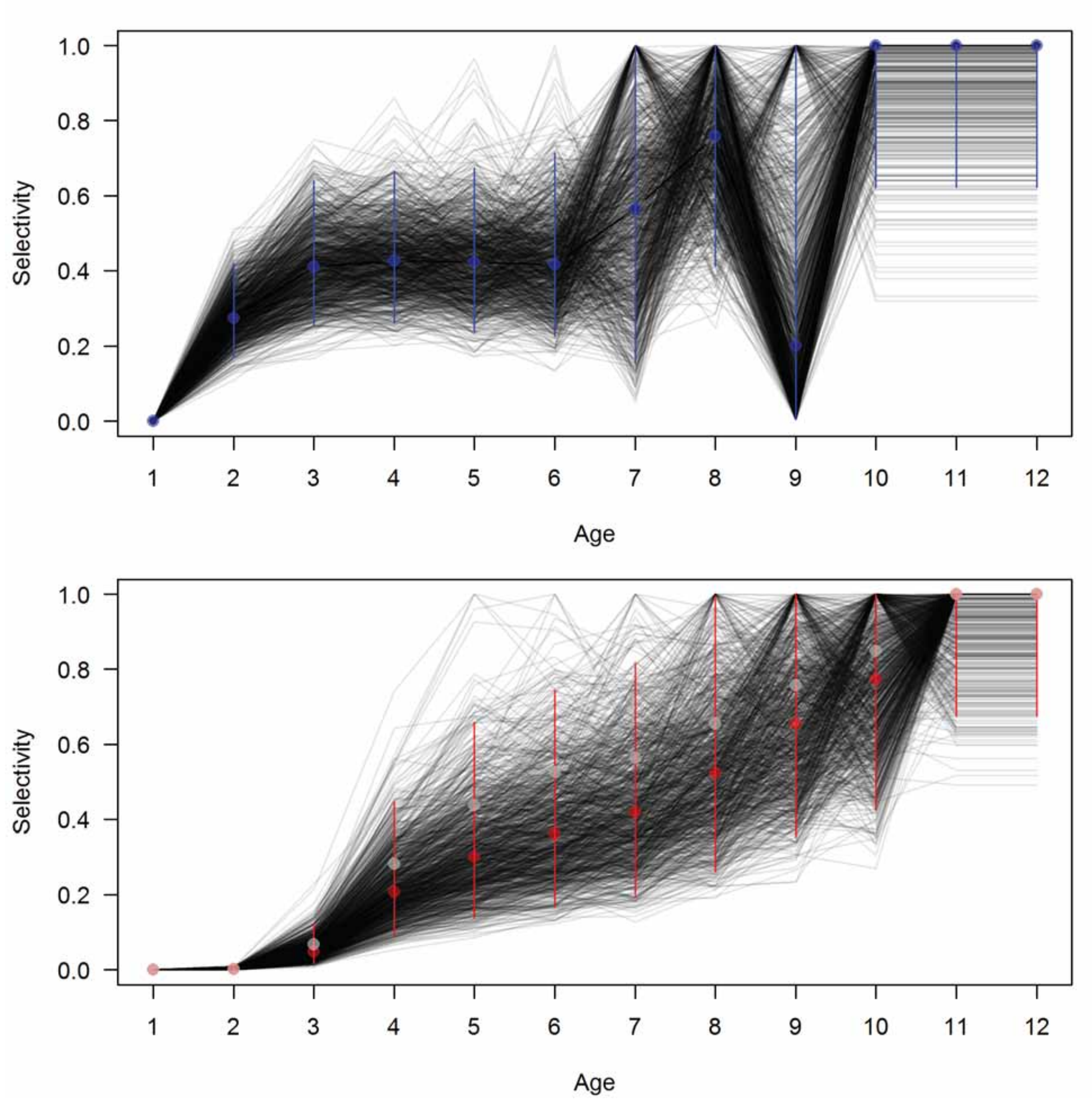
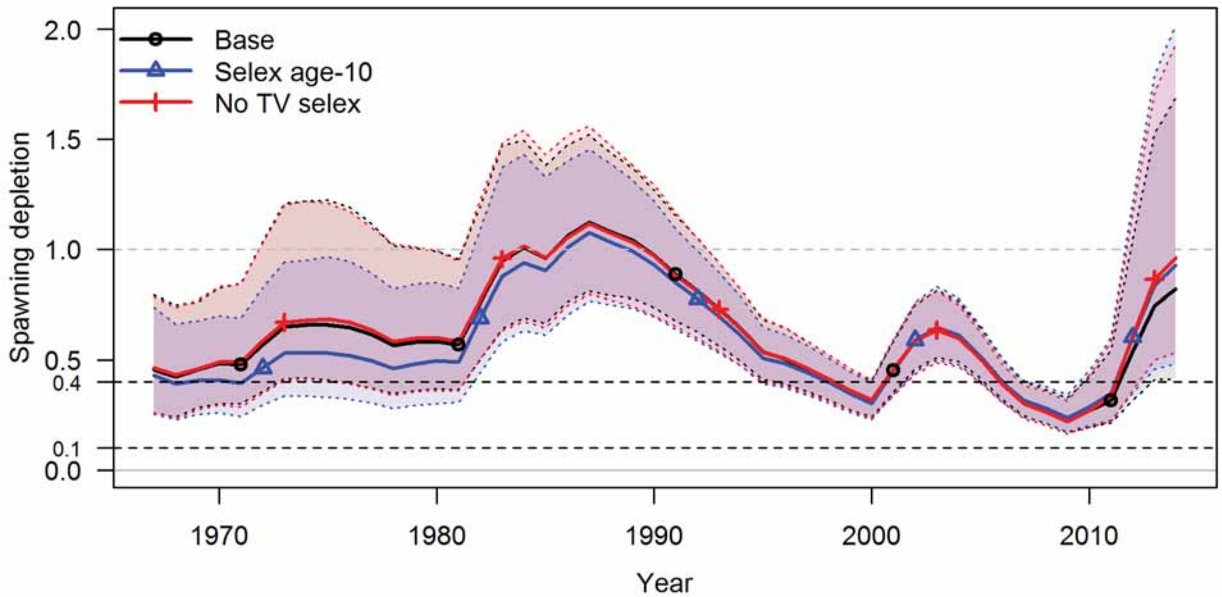


Figure 50: Bayesian posterior predictions of acoustic (top) and fishery selectivity in 2013 (bottom) for the sensitivity run estimating non-parametric selectivity to age 10. Each grey line is the estimated selectivity from one sample of the posterior distribution. The blue or red dots are the median estimated selectivity-at-age with lines showing the 20.5% and 97.5% quantiles. The light colored dots in the fishery selectivity plot (bottom) are the median base selectivity estimate prior to 1990.



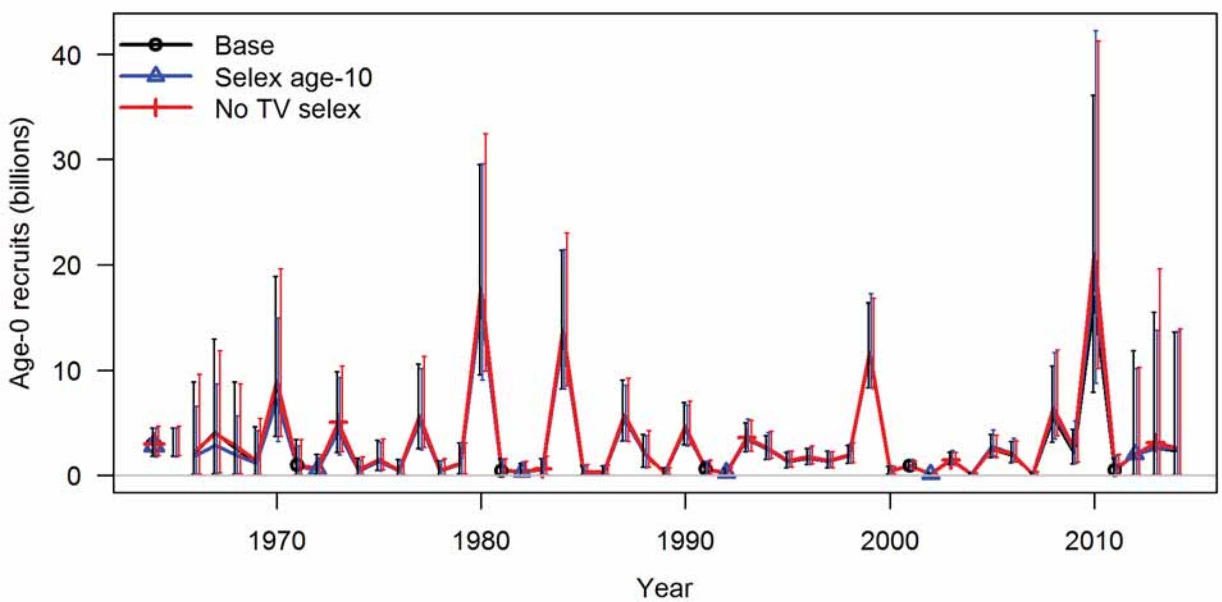


Figure 51: Bayesian posterior predictions of depletion (top) and recruitment (bottom) for sensitivity runs with 1) estimating non-parametric selectivity to age 10 (blue, "Selex age-10"), or 2) not estimating time-varying fishery selectivity (red, "No TV selex").

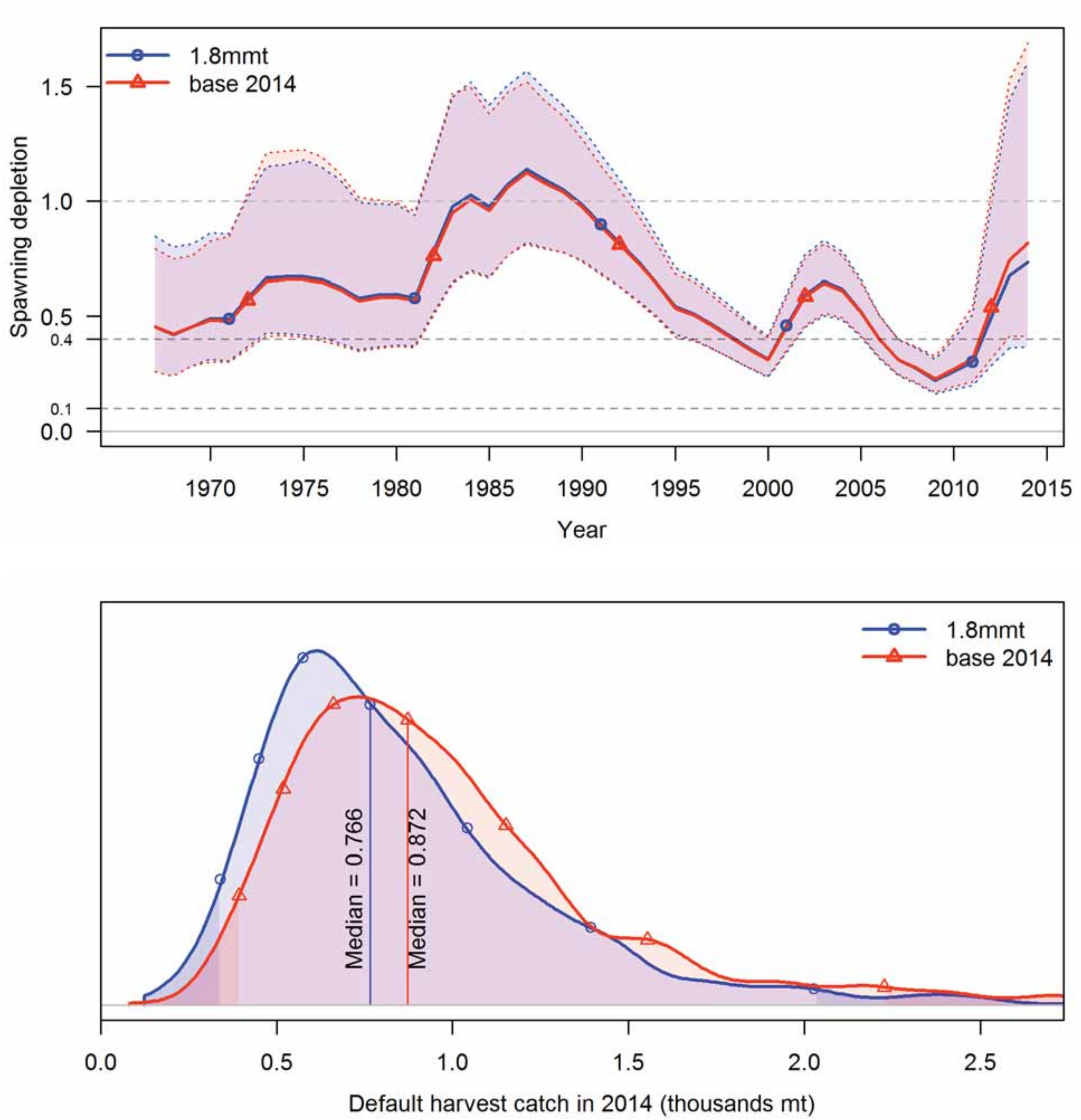


Figure 52: Bayesian posterior predictions of depletion (top) and the default harvest rate catch in 2014 (bottom) for the sensitivity run using 1.8 million mt for the 2013 acoustic survey biomass estimate.

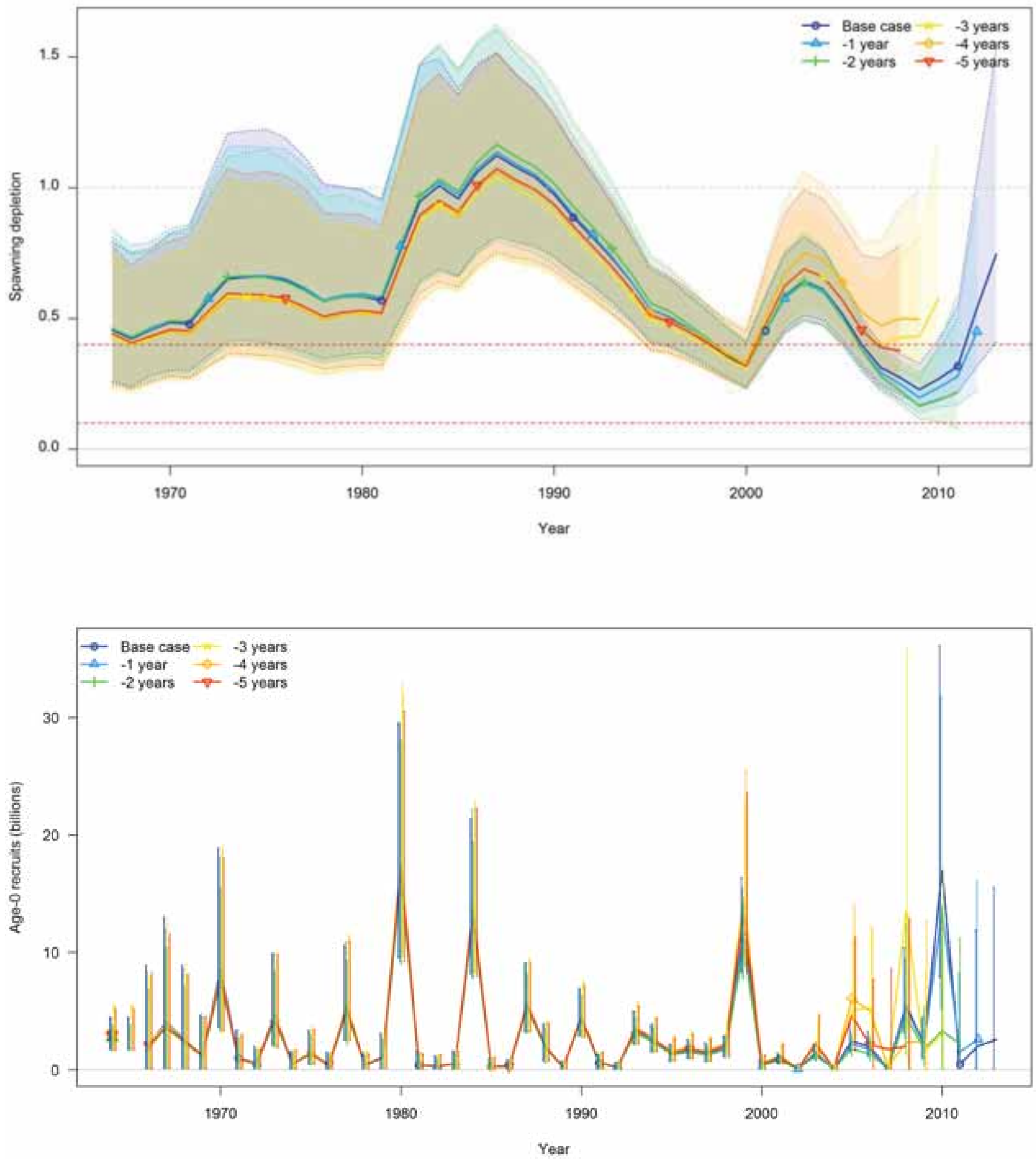


Figure 53: Depletion estimates (top) and recruitment estimates (bottom) for the base model and retrospective runs.

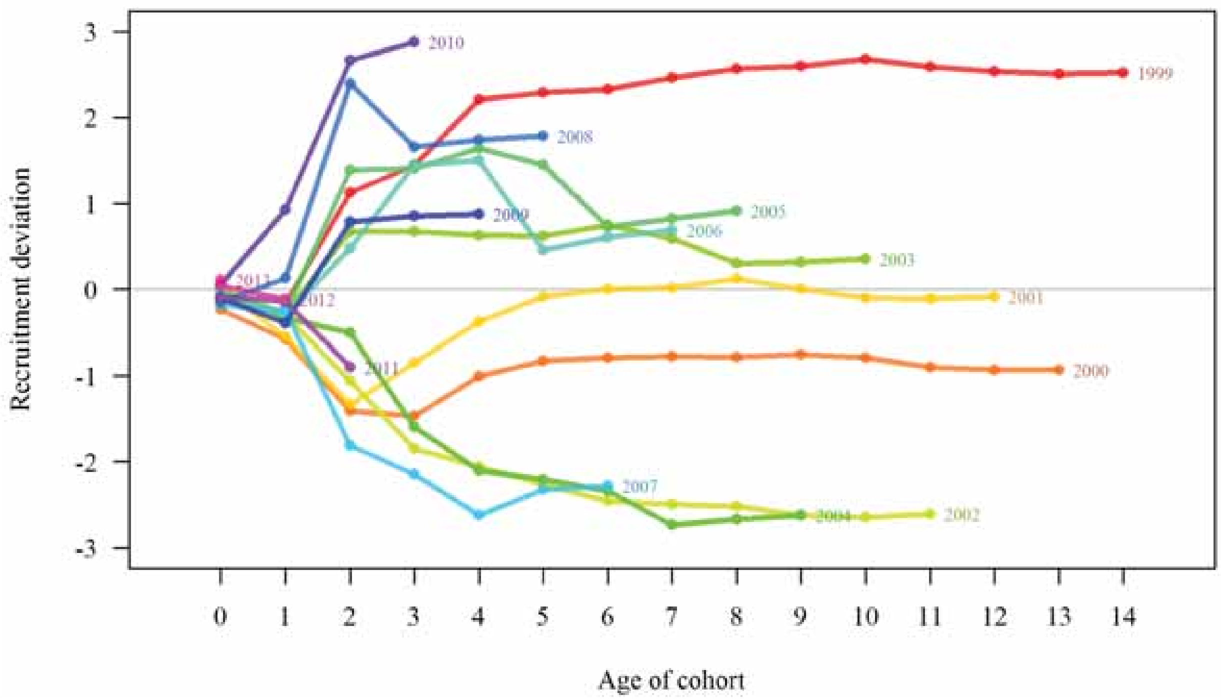


Figure 54: Base model retrospective analysis of recruitment estimates over the last thirteen years. Lines represent estimated deviations in recruitment for cohorts starting in 1999 (with cohort birth year marked at the right of each line). Values are estimated in models with data available only up to the year in which each cohort was a given age. Recruitment deviations are log-scale difference between estimated recruitment and spawner-recruit expectation.

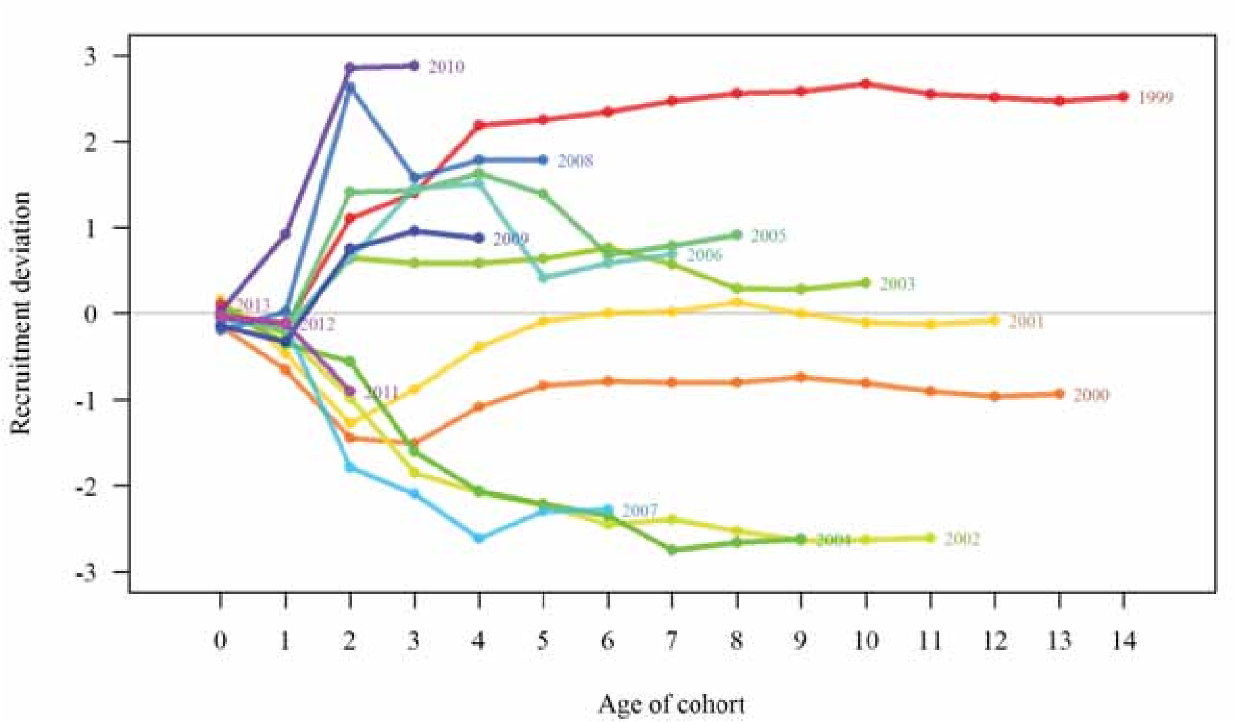


Figure 55: Retrospective analysis of recruitment estimates over the last thirteen years for a model with time-invariant selectivity. See the caption from Figure 54 for more details about the plot.

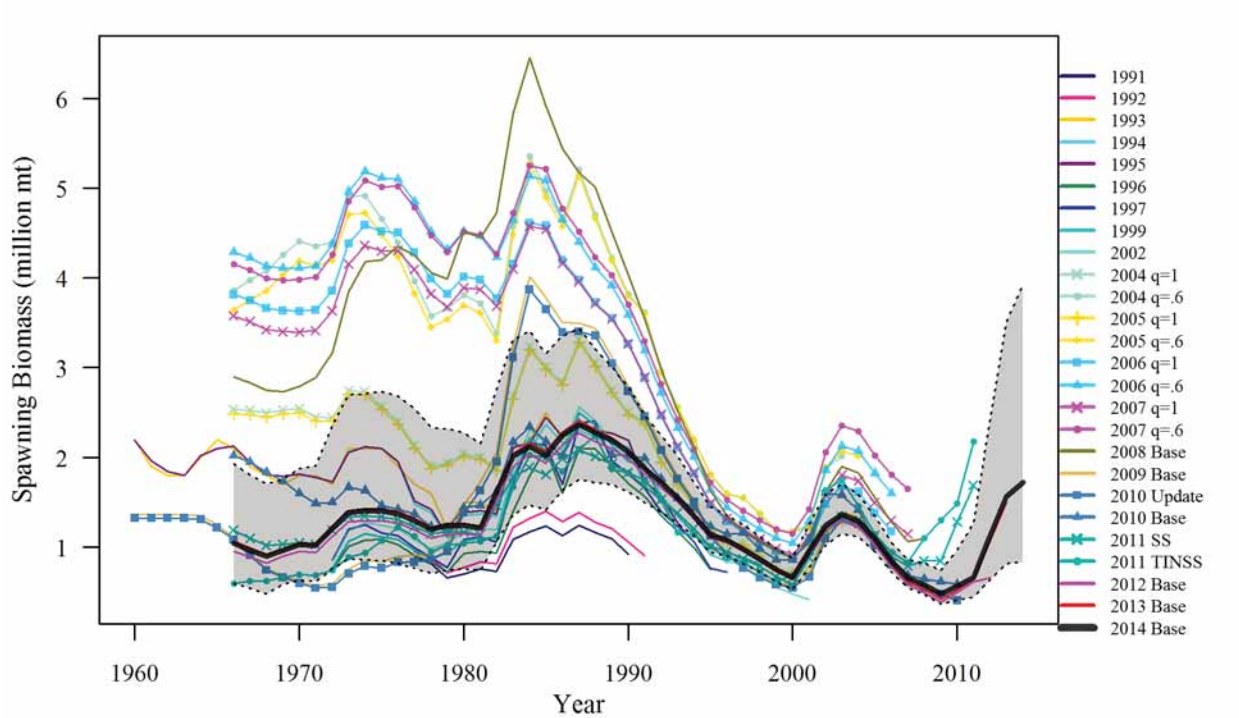


Figure 56: Summary of historical Pacific Hake assessment estimates of spawning biomass. The 2013 assessment estimated trajectory (red line) are almost completely covered by the 2014 estimated trajectory.

Appendix A. Management Strategy Evaluation (MSE)

Appendix A.1. Introduction

Fishing businesses succeed or fail based on their ability to be profitable despite unpredictable mechanical failures, changes in weather, fluctuating fish abundance, prices and costs, as well as increasingly precautionary fishing regulations. Developing a clear strategy for operating under these conditions may not be the absolute difference between success and failure, but it certainly increases the likelihood that uncontrollable events will be identified and handled in ways that are consistent with business goals and objectives.

Unpredictable fluctuations in fish stock abundances and productivity are the most significant challenges facing any fishing enterprise or management agency charged with promoting fishery sustainability. An inability to accurately forecast fish stock abundances limits fishery planning to only short time horizons (e.g., 1-2 years) during which stock assessment model predictions are reliable to an acceptable degree of certainty. On the other hand, promoting fishery sustainability requires a long-term view toward maintaining fish stocks and fisheries indefinitely. Highly precautionary and risk-averse decision-making is one way to ensure that short-term harvesting decisions do not interfere with long-term fishery sustainability. Consistently adopting conservative harvest options, which minimize the risks associated with stock assessment estimation and forecast errors, allow managers to err on the side of caution and limit risks to fish stocks. The main problem with conservative short-term decision-making is determining whether decisions are cautious enough or too cautious – without actually knowing the long-term consequences of each short-term decision, arguments can easily be made to favor any level of caution. Furthermore, the degree of caution used in short-term decisions is open to subjective interpretation both before decisions are made, and after the consequences are observed. Subjective interpretations of management performance are often based on who is either praising or criticizing the outcomes of decisions.

Like the fishing business, a fishery management system requires a strategy for decision-making that is consistent with short-term economic goals and long-term sustainability despite unpredictable changes in fish stock abundances and productivity, monitoring and stock assessment errors, and changing regulatory requirements. Consistency with sustainability goals needs to be determined objectively through a scientific process of testing the harvest strategy against the most important uncertainties about the fish stock and fishery. Such a scientific process of testing harvest strategies provides a mechanism for objectively criticizing the strategy and proposing alternatives that are consistent with a broad range of stakeholder interests and management goals.

A scientifically tested harvest strategy has several benefits for both fishing businesses and management agencies. For fishing businesses, a repeatable and predictable harvest strategy provides (*i*) assurance that short-term harvesting decisions are consistent with short- and long-term business objectives given existing fishing regulations and eco-certification constraints; (*ii*) a way to avoid using uncertainty in annual stock assessments to justify overly conservative or risky harvest decisions; and (*iii*) a mechanism to maintain or improve long-term asset (e.g., license) value. These benefits come from accurately predicting future management responses to whatever fish stock abundances might occur rather than counting on accurate stock assessment model predictions of future fish stock abundances. For management agencies, a strategic and predictable management response provides (*i*) assurance that long-term fishery sustainability is reasonably, or even highly, likely; (*ii*) reduced time and resource requirements for annual stock assessments and harvest decision-making; (*iii*) a mechanism for prioritizing requests for scientific research and advice; and (*iv*) concrete evidence that a harvest decision-making process complies with national and international fishery policies, agreements, and treaties.

Management strategy evaluation (MSE) is a structured decision-making process in which fishing businesses, management agencies, and other stakeholders collaborate to develop and test a harvest strategy (Figure A.1). A complete MSE approach involves four general harvest strategy components: (1) **Goals & Objectives** define the short- and long-term sustainability requirements of fishery stakeholders, government regulations, and eco-certifiers; (2) a **Management Procedure** represents the combination of monitoring data, stock assessment method, and harvest rule used to make short-term harvest decisions; (3) a **Simulation Test** (also called a closed-loop simulation) of the management procedure against operating models that reflect key stock assessment uncertainties (Figure A.2); and (4) **Application** of the management procedure to the real fishery. This MSE structure and process applies generally to most design-based engineering and operations problems in which uncertainty creates relatively high risks (e.g., airline travel, structural engineering, vehicle safety).

Developing the MSE components naturally flows in order from initial goals to application; however, short-term progress on individual components generates feedback and refinement of components that come earlier. For instance, the reverse arrows in Figure A.1 show that (a) clarifying the data, stock assessment, and harvest control rules that comprise a management procedure often leads to more specific goals and objectives, (b) simulation testing management procedures usually identifies unforeseen risks and the need to revise the procedures, or to find alternatives, and (c) applying a management procedure to the actual fishery provides real catch and stock abundance outcomes that can be compared to original simulated outcomes, as well as the initial goals and objectives. Completing each cycle of the MSE process provides stakeholders and managers with the experience needed to revise and improve each component of the process.

The Pacific Hake harvest strategy

At the present time, there is no formal harvest strategy containing all four elements of Figure A.1 for managing Pacific Hake fisheries, although some Management Procedure and Simulation Test elements of a strategy do exist. The Management Procedure contains Monitoring and Stock Assessment components that are both reviewed annually in collaborative processes involving stakeholders, managers, and technical experts. Although the Agreement provides a potential Harvest Rule – by defining the default harvest rate ($F_{40\%}$-40:10 adjustment) and catch limit allocation between countries – it does not specify how to consider uncertainty around the catch limit, and as a result, annual TACs often deviate substantially from the catch limits computed by applying the $F_{40\%}$-40:10 rule to stock assessment estimates of exploitable biomass (typically towards lower catch limits). Upper TAC limits seem to exist, but are not clearly quantified or rationalized based on stock assessment information. In a formal harvest strategy, TACs need to follow predictably from stock assessment information if the strategy aims to be repeatable. A harvest strategy with unpredictable annual TACs cannot be tested objectively in fishery system simulations, or any other means of establishing fishery sustainability.

The Goals & Objectives and Application components of a formal harvest strategy are missing for the Pacific Hake fishery. Although the default harvest rule in the Agreement aims to implement the $F_{SPR=40\%}$ fishing mortality rate, i.e., the fishing mortality rate that reduces spawning biomass-per-recruit to 40% of the unfished spawning biomass-per-recruit, there are no Objectives stating the acceptable risks to the hake stock or the fishery that should follow from applying this rule. It is well known that fishery stock assessment model errors (i.e., differences between estimated and true stock biomasses) can lead to higher or lower fishing mortality rates than target values such as $F_{40\%}$. Furthermore, stock assessment models are incomplete representations of actual fish populations and their interactions within marine ecosystems. These assessment realities make it highly unlikely that the future stock biomass will stabilize near $B_{40\%}$ with repeated application of the $F_{40\%}$-40:10 rule. On the contrary, it is likely that stocks will be frequently assessed below $B_{40\%}$ and, as well, below $B_{10\%}$, prompting large fluctuations in fishery catch and possible fishery closures of unknown duration.

For highly variable fish stocks such as Pacific Hake, simulation testing harvest strategies provides an indication of potential trade-offs among future stock size, catch variability, fishery closure frequency, and yield. Simulation results can also be used to help scope reasonable Goals & Objectives for the fishery harvest strategy.

Pacific Hake Management Strategy Evaluation - 2013
Since 2012, both the SRG and the JMC have recommended simulation testing Management Procedures for the Pacific Hake fishery. Two main objectives guiding this work were to determine:

(1) the expected long-term performance of applying the $F_{40\%}$-40:10 Harvest Rule as part of the Pacific Hake Management Procedure;
(2) the relative improvement in management performance of conducting Annual vs Biennial biomass surveys.

Simulation results obtained during 2012-13 suggested that Management Procedures based on the $F_{40\%}$-40:10 rule provided unrealistic ranges of biomass and catch compared to historically realized values. The wide range of outcomes also masked potential differences between Annual and Biennial surveys. Furthermore, it was noted by the 2013 SRG that the Operating Model was potentially optimistic in assuming that fishery selectivity was constant from year-to-year.

During 2013, the simulation testing objectives were revised to determine:

(1) the expected long-term performance of a revised Harvest Rule consisting of two parts:
    a. $F_{40\%}$-40:10 rule
    b. Floor (0 or 180,000 mt) and Ceiling (None, 375,000, or 500,000 mt) options that limit output TACs to pre-determined ranges
(2) the relative improvement in management performance of conducting Annual vs Biennial biomass surveys
(3) whether implementing time-varying selectivity in the Management Procedure stock assessment model improves or degrades management performance compared to fixed selectivity

The sections below describe Simulation Test outcomes against these objectives.

Appendix A.2. Methods

The early-stage MSE process for the Pacific Hake fishery includes a closed loop Simulation Test of plausible hake population responses to Management Procedure outcomes (Figure A.2). The hake population dynamics component of the Operating Model is almost identical in structure to the Management Procedure stock assessment model, but the former represents basic parameter uncertainty as well as alternative hypotheses for fishery selectivity. The closed loop simulation proceeded as follows.

1. The Operating Model (OM) was conditioned on the 2013 stock assessment, with the addition of estimating time-varying fishery selectivity for all years. Simulations began in 2013 and a catch of 365,112 was removed in 2013 for all cases
2. From the OM, data were generated that were generally comparable to the real data collection system (Monitoring in Figure A.2), except that for the Annual Survey Case, the survey index and age composition were generated every year, and for the Biennial Survey Case every even numbered year.

3. The generated data were fit by an Assessment model run in Stock Synthesis version 3.24s, and was similar to the 2013 assessment model, unless otherwise noted.
4. The Harvest Rule was applied to determine a Total Allowable Catch (TAC).
5. The TAC specified by the Harvest Rule was input back into the OM to feedback into the annual stock dynamics represented by the OM. It was assumed that the entire TAC was taken by the fishery.
6. Steps 1-5 were projected forward for 30 years.
7. Steps 1-6 were repeated 1000 times with the stock dynamics determined from a sample from the posterior distribution of the conditioned OM, taking into account correlations between parameters.

Operating model

The operating model defines a scenario and was similar to the 2013 base assessment model for Pacific Hake reported by the JTC (2013), with the addition of time-varying selectivity in the fishery for all years (1966-2012). This was a Bayesian age-structured model stock assessment model built in Stock Synthesis version 3.24s (SS) (Methot and Wetzel 2012). The model was conditioned on (i.e., fitted to) data from 1975-2012, which resulted in marginal posterior distributions for a selected set of parameters including fishery and acoustic survey selectivity-at-age, survey catchability (q), natural mortality (M), steepness (h), unfished equilibrium biomass (B_0), and annual recruitment deviations. An operating model with time-invariant selectivity was also considered, but most simulations used the operating model with time-varying fishery selectivity.

Time-varying selectivity was modelled using random deviates applied to each parameter for selectivity-at-age and year (see Appendix C for further details). These deviates were estimated for the years 1966–2012 with a standard deviation (ϕ) of 0.2 in a normal distribution to penalize the deviate as it moved away from zero. For future simulated years, deviates were randomly generated by a multivariate normal distribution with the covariance matrix estimated from the deviates in the years 1966-2012. Figure A.3 shows the median estimated selectivity-at-age by year.

Markov Chain Monte Carlo (MCMC) was used to characterize the variability of the population by sampling every 10,000th point from a chain of 30,000,000, and discarding the first thinned sample as a burn-in, as was done in the 2012 assessment (JTC 2012). This left 2999 samples from the posterior distribution, where each sample consisted of a vector of parameters that was used to simulate the population into the future. The median spawning biomass trajectory with a 95% posterior credibility interval is shown in Figure A.4, with a few actual realizations to show the potential variability of a single simulation. The posterior distribution of parameters resulted in a median 2013 beginning of the year depletion of 71% with 2.5th-% and 97.5th-% percentiles of 30% and 184%, respectively.

Management Procedures

A Management Procedure is the combination of data collected (e.g., frequency and quality), the stock assessment, and the harvest control rule which assists in determining catch. Two general methods for determining catch targets were considered: an assessment or constant catch. Time-varying selectivity in the assessment and catch ranges were also considered (Table A.2).

Within data collection, the survey frequency was annual or biennial (in even years) and a survey index was always simulated for 2013 since the survey was underway when these simulations were being done. Fishery catch-at-age was available in every year, and survey catch-at-age data were available only when the survey was done. Weight-at-age, maturity-at-age, and other externally derived quantities were unchanged in the simulations. The methods for generating data are given below.

The stock assessment differed with regard to whether or not time-varying fishery selectivity was used and when used, the size of the standard deviation in the penalty on the deviates. Without time varying fishery selectivity, the assessment model was the same as the 2013 assessment model (JTC 2013) with the addition of new data as it was simulated in future years. When time-varying fishery selectivity was used in the assessment model, two values of the standard deviation for the penalties were considered: a value of 0.05 was considered "low" and a value of 0.2 was considered "high" (which matched the OM). More information on the assessment model is given below.

The default Harvest Rule, as defined in the Agreement, was used with and without a catch range. In consultation with stakeholders, ceilings of 375,000 and 500,000 mt were chosen as values to be considered. Furthermore, a floor of 180,000 mt was also considered. These ranges were included as options to mimic the behavior of management often setting quotas lower than the harvest control rule suggests, and the fishery not catching the entire quota. This is a simple way to introduce implementation error and the results are more likely to be closer to reality than the assumption of catching the entire quota in every year.

In addition to an assessment being used to supply the quantities necessary for the Harvest Rule, various levels of constant catch were implemented as a comparison. In these cases, the operating model was run into the future with a constant catch in every year, although in some years, when the biomass was unavailable, the entire constant catch was not taken.

Perfect information from the operating model was also used in the Harvest Rule as a benchmark against which to compare the cases using an Assessment. This case illustrates the fundamental properties of Management Procedures without assessment errors, which assist in disentangling the effects of assessment errors from the intrinsic properties of the Harvest Rule. Data and an assessment model were not needed in the constant catch and perfect information cases.

Data generation

Survey abundance index and age-composition data for the years 2013–2042 were generated with random error from the operating model to reflect the data typically available for stock recent assessments of Pacific Hake. The acoustic survey index of abundance was assumed to be log-normally distributed according to

$$I_{i.y} = \mathrm{LN}\left(median = q_i e^{-0.5M} B_{i,y}^{\mathrm{survey}}\ , \sigma_{\ln(I)}\right) \qquad (1)$$

where the median is the mid-season biomass selected by the survey, adjusted by catchability.

$$B_{i.y}^{survey} = \sum\nolimits_{a=1}^{A} N_{i,y,a} s_{i,a}^{\mathrm{survey}} \overline{w}_a \qquad (2)$$

Age-based selectivity for the survey s^{survey} is taken from the posterior distribution and is different for each of the simulations. The beginning of year numbers-at-age, $N_{i,y,a}$, were from the operating model population, and , $\underline{w}_a$, , is the average of weight-at-age over the years from 1975 to 2012, as used in the 2013 stock assessment (JTC 2013). The plus-group age, A, was set to 15 years in the operating model.

The standard error in log-space was a combination of the intra- and inter-year standard errors.

$$\sigma_{\ln(I)} = \sqrt{\sigma^2_{\ln(\text{intra-year}),y} + \sigma^2_{\ln(\text{inter-year}),i}} \quad (3)$$

The intra-year standard error for the survey was fixed at a value of 0.085 and was the input into SS (see Table 4 in JTC (2013) for a history of acoustic survey estimates). This standard error represents the mean of the observed standard errors determined from an analysis of the year-specific survey data. The inter-year standard error represents the additional year-to-year observation error in the survey that is not explained by the measurable sampling variability. These values are simulation specific because the assessment model estimated a value to be added to the intra-year standard error as in the 2013 assessment (JTC 2013). A total standard error of 0.42, similar to that estimated from the 2013 assessment model, was used. With an intra-year standard error of 0.085, the inter-year standard error, from equation 3, was approximately 0.41.

Proportion-at-age data for the fishery and survey were simulated using a multinomial distribution with probabilities

$$n_{i.y,a} = N_{i,y,a} s_{i,a} \Omega \quad (4)$$

given by the product of numbers-at-age (*N*), selectivity (s) and ageing error Ω. Effective sample sizes for the fishery and survey were assumed to be the same as the recent estimates from the 2013 assessment (JTC 2013)

The ageing error matrix (Ω) contains the probabilities of assigned ages for each true age, where the probabilities are determined from a normal distribution centered on the true age with standard deviation increasing with true age as used in the 2013 stock assessment (JTC 2013), but without cohort ageing error. Ageing error was applied after the sampling process.

Assessment model

Simulated assessments were used to provide catch recommendations based on a Harvest Rule for each Management Procedure considered. These simulated assessment models estimated spawning stock and exploitable biomass by fitting each year's simulated index and age-composition data and were set up similarly to the 2013 SS base model (JTC 2013), with differences in how fishery selectivity was treated. Three assessment models were considered:

1. An assessment model with time-invariant selectivity, parameterized the same as the 2013 stock assessment model (JTC 2013).
2. An assessment model with a low amount of time-varying selectivity in the fishery. The standard deviation for the penalty on the random deviates (ϕ) was set at 0.05.
3. An assessment model with a high amount of time-varying selectivity in the fishery. The standard deviation for the penalty on the random deviates (ϕ) was set at 0.20, exactly the same as in the operating model.

Estimates were determined by maximizing the joint posterior density instead of the full posterior integration typically used in the stock assessment (i.e., JTC 2013). For each simulated assessment, model parameters were initialized at values estimated in the previous year and convergence was acceptable if the final maximum gradient was less than 0.1. If convergence was not acceptable, the starting parameters were jittered and the assessment was repeated. This was repeated 3 times, after which the final assessment was accepted, regardless of convergence. In contrast to how recent stock assessments (JTC 2012, JTC 2013) have used Bayesian methods to presents a range of probabilistic options for the TAC, the maximum posterior density (MPD) estimates of spawning stock biomass depletion and exploitable biomass were used for applying the $F_{40\%}$-40:10 rule to determine the year's catch.

Analysis and performance measures

The performance of each case is measured using performance metrics defined for short- and long-term periods. Short-term, the next 10 years (2014–2023), performance statistics, which are dependent on the starting conditions in 2014, are helpful to stakeholders to ensure that the Management Procedures meet their immediate objectives. The long-term (2033–2042) performance statistics provide an insight into the equilibrium performance of each Management Procedure under different scenarios, and are useful to determine if a given management procedure could meet conservation and sustainability objectives.

Thirteen performance metrics in three general categories are presented based on the Harvest Rule defined in the Agreement and discussions with stakeholders. These three general categories are population status, catch, and age-structure of the population. For each of these categories, two types of statistics are reported. The median average of a value is calculated by finding the average over the 10 year time period for each of the 1000 simulations, and then determining the median of these averages from all of the simulations. Probabilities are defined as the number of times the condition is met out of the 10,000 realizations in that time period (10 years times 1,000 simulations).

The four metrics related to population status are median average depletion and percentages of simulations where depletion was below 10% of B_0, between 10% and 40% of B_0, and above 40% of B_0. Median average depletion provides a central tendency over all 1000 simulations, but does not provide an indication of the variability of depletion around that central tendency. The probabilities provide an idea of the variability as well as risk. Thresholds of 10% and 40% were chosen because they are the endpoints of the 40:10 control rule defined by the Agreement.

The six metrics based on catch are the median average catch, the average annual variability (AAV), the probability that the fishery is closed (catch=0), and the probability that catch is above and/or below thresholds of 180,000 and 375,000 mt. The average annual variability is a measure of the variability from year to year (Table A.1). The probability that catch is zero reflects how often the fishery is closed based on the assessment. The catch thresholds of 180,000 and 375,000 mt were determined from discussions with stakeholders (in particular, members of the Advisory Panel, AP). Industry members preferred to maintain a catch above 180,000, and a coast-wide catch of 375,000 mt is slightly above the maximum coast-wide catch ever realized in this fishery. These thresholds are only suggestive and were not necessarily agreed upon by all industry members in the U.S. and Canada. They are simply included here for illustrative purposes.

Three statistics determined from the age composition of the population are presented to represent the age diversity of the population, provide insight into the size of fish that may be encountered by the fishery, and to give an indication of the fishing opportunities in Canadian waters since fish younger than 4 years old tend to remain in U.S. waters during the fishing year. The effect of dominant year classes on the median average mean age is greatly diminished because the statistic is a conglomeration of random recruitments over years and simulations. The mean age over time estimated from the 2013 assessment is shown in Figure 26 of JTC (2013). This is an example of how the mean age may look in one particular simulation, and you can see how the averaging over years will smooth it. The median average age 4+ biomass represents the total biomass of age 4+ fish, and the median average ratio of biomass that is age 4+ is the age4+ biomass divided by the total biomass, then averaging across years and determining the median from the simulations.

Appendix A.3. Results

General patterns

The Operating Model (OM) for this year's MSE is conditioned on the 2013 stock assessment. This means that the initial conditions include the very large 2010 year class. Accordingly, short-term (2014–2023) management procedure performance is characterized by higher average catch and lower risk of depletion than in the long term (2033–2042). The long-term period is chosen to be far enough in the future to dampen the effects of the initial conditions.

The long-term period includes numerous runs, some with large recruitments. About 2% of the simulated recruitments in this period are larger than the median estimate of 2010 recruitment. However, the distribution of recruitments for every future year includes both above- and below-average recruitments. The differences between short-term and long-term results are therefore an indication of the performance of the alternatives with or without the influence of a large recent recruitment event.

Adding time-varying selectivity to Operating Model

Including time-varying fishery selectivity in the OM changes both the initial conditions for the MSE and the interaction between the fishery and the population in the simulation years. Time-varying fishery selectivity reduces the influence of the fishery age-composition data relative to the survey data. Without time-varying selectivity, there is very little difference between the biennial and annual survey cases, but in the time-varying selectivity scenario, there is a distinct benefit to the larger quantity of data that comes from annual surveys when the Assessment has time-invariant selectivity (Table A.3). In the long term, the Average Annual Variation (AAV) in catch is reduced from 52% to 38% and the long-term probability of the fishery being closed due to the population being estimated below 10% of B_0 decreases from 13% to 5%. The probability that the OM population falls below 10% of B_0 is 6% with biennial surveys and 5% with annual surveys, indicating that the biennial survey case has a higher incidence of the assessment model falsely indicating that the population is below the threshold when in fact it remains above. This high rate of assessment error is due in part to the mismatch in assumptions about time-varying selectivity between the OM and the Assessment for these cases.

The extent of true variability in fishery selectivity is unknown, but the time-varying selectivity OM is likely to be a better representation of the true fishery than the OM with constant selectivity across all years. Therefore, all remaining MSE comparisons will focus on cases with time-varying fishery selectivity in the OM.

Adding time-varying selectivity to the Assessment

Estimating time-varying fishery selectivity in the Assessment increases the number of parameters in the model, but the better match in structure between OM and Assessment improves the performance. The addition of time-varying selectivity to the Assessment reduces the risk of the population falling below 10% of B0 from 6% and 5% with biennial or annual surveys, respectively, to 3% and 2% (Table A.4). The probability of closing the fishery due to the Assessment perceiving the biomass to be below 10% of the estimated B0 (whether or not this is true of the OM population) is reduced by a larger amount, 13% and 5% to 1% and 0%, respectively. Assessments with time-varying selectivity reduce short-term median average catch but increase the long-term catch by a greater amount. This change also reduces the variability in catch in both the short and long term (AAV declines from 52% to 31% in the biennial case for the long-term period).

When time-varying selectivity is added to the Assessment, under similar assumptions as in the OM, the benefit of the annual surveys is reduced. When the selectivity parameterization between the OM and the

Assessment do not match, the increase in data that comes from more frequent surveys reduces the risks associated with Assessment errors. With a better match in assumptions between the OM and the Assessment, these errors are less frequent and the marginal value of more frequent surveys is smaller.

The metrics related to age composition show little sensitivity to the choice of assumptions about time-varying selectivity. There are similar results for models with and without time-varying selectivity (long-term median average mean age 2.7 or 2.8, more than 1 million mt of age 4+ biomass, and 59-60% of the total biomass age 4 or greater). However, the perfect information case has a large impact on the age composition. In this case, the median average mean age is reduced to 2.4 and the fraction of biomass that is age 4 or greater falls to 54%. Under the default harvest policy (F40% with 40-10 adjustment), perfect information about spawning biomass allows the catch to increase immediately as soon as large recruitments contribute to spawning biomass, which leads to higher median average catch, lower stock status (28% instead of 37-39%), and fewer age 4+ fish remaining in the population (Table A.4). Without perfect information, the delay in estimating the strength of large recruitments leads to a lower than F40% harvest rate during periods of increasing abundance.

The effect of incorrect assessment model parameterization was larger than the relative differences in ϕ. (Table A.5). The biennial survey cases with no time-varying selectivity in the assessment had a 13% probability of fishery closure in the long term but using assessment models with time-varying selectivity greatly reduced this risk at 3% and 1% probability for ϕ=0.2 and ϕ=0.05 cases, respectively. The probability of falling below 10% of B0 was actually lower in the low flexibility assessment case (2%) than in the high flexibility case where the Assessment matched the OM (3%). This is likely the result of a slightly lower median average catch.

A range of catch values

The cases where catch ranges were imposed, generally led to lower risk of spawning biomass being less than 10% of B_0, lower variability in catch, and higher long-term catch, but had lower catch in the short term (Table A.6). Due to time limitations, these cases were not considered in combination with time-varying selectivity in the Assessment, but could be expected to have resulted in changes in the same direction in those cases as well. With a biennial survey, going from unlimited catch to catch within a range of 0 - 500,000 mt or 0 - 375,000 mt increased the long-term median average catch from 199,000 mt to 203,000 or 216,000 mt (Table A.6 and Figure A.7). This is likely a result of both the buffering against assessment errors and banking of fish for future years. With no limit on the range of catch, assessment errors have the potential to set catch higher than the population can sustain. Also, by not setting the catch as high during periods when the biomass truly is very large, more fish are available in periods with lower recruitment. The median average depletion also increases from 39% of B_0 with unlimited catch to 45% of B_0 when a 375,000 mt catch cap is used. Thus, not only do fish live longer, but the 40-10 adjustment is used less often to reduce harvest rates, leading to a higher average catch with more stability. The proportion of the biomass that is age 4 or older increases slightly from 60% to 62% when catch doesn't go above 375,000 mt.

Maintaining catch within the range 180,000 - 375,000 mt involves setting catch at 180,000 when the default harvest rate determined by the $F_{40\%}$-40:10 adjustment goes below that value. Therefore, fishing will continue even when the population is estimated to have fallen below 10% of B0 as long as the available biomass is sufficient to allow the catch to be removed. This resulted in a considerable increase in the probability of the stock falling below 10% of unfished equilibrium biomass. This reduced the variability in catch compared to the case with a 0 - 375,000 mt catch range (long-term median AAV in catch falls from 34% to 19%), but the probability of $B < B_{10\%}$ increased from 5% to 19%. With this range in place, the probability of having catch below 180,000 due to lack of available biomass to be caught was 21%. This case also had lower mean age than the other catch range cases and the median average ratio of age 4+ biomass fell from 62% to 54% with the introduction of the 180,000 mt floor on catch.

The performance of the catch range management procedure was particularly sensitive to the starting conditions of the Operating Model. The introduction of a catch range generally results in lower short-term average catch (Table A.6) because the biomass estimated with a large simulated 2010 year class was high and applying an un-capped harvest control rule to these biomass estimates often results in large catches (5% of the simulations have a short-term average catch which is more than double the highest observed historical catch) (Table A.6).

Constant catch

In general, setting a constant catch did not perform well compared to cases with either the default harvest policy or the default harvest policy adjusted by some range (Table A.7). In the short term, constant catch values of 100,000 - 300,000 mt could be achieved in the majority of the simulations, but when a constant catch of 400,000 mt was attempted, the median average short-term catch was only 394,000 mt, indicating that a majority of the scenarios drove the population to a low enough level within 10 years that the constant catch could not be removed. In the long-term, only the 100,000 and 200,000 mt constant catches could be achieved by a majority of the simulations. Attempting a constant catch of 400,000 mt resulted in a long-term median average catch of 267,000 mt, which is actually lower than the 271,000 mt median average catch achieved when attempting a 300,000 mt constant catch. For any given year within the long-term period, a majority of the simulations had 300,000 mt available for the fishery (as indicated by the green line in Figure A.8), but only a minority of the simulations had that amount available in all 10 years of the long-term period so the median average catch is below 300,000 mt. The probability of having spawning biomass below 10% of B0 was only 1% in the 100,000 mt constant catch case, but increased to 10% at 200,000 mt, and 24% at 300,000. The only metrics by which the constant catch cases performed well were the probability of catch = 0, which was 0% in the constant catch scenarios because the 40-10 rule was overridden by the constant catch values and the fishery was never shut down entirely, and catches were very stable, with median AAV at 0% in the long term at 100,000 and 200,000 mt (but increased to 35% when a constant catch of 400,000 mt was attempted do to the higher frequency of catches being limited by unavailability of biomass to be removed). The catch and depletion for each individual year is depicted in Figure A.8 and Figure A.9, and shows that a constant catch of 400,000 mt continually declines into the future as does depletion for all constant catch scenarios. The declining biomass trend at the end of the simulation period with 300,000 mt constant catch suggests that a longer projection would also show the median annual catch to be declining in this case as well.

Comparisons across management procedures

The probabilities shown in the MSE results do not reveal the extent to which two metrics could be satisfies simultaneously. Figure A.10 shows the distribution of spawning depletion and catch for the 10,000 points associated with each of the 1000 simulations over the 10-year, short-term period (2014–2023) and the fraction of this distribution associated with different combinations related to the reference points 40% of B_0 and 180,000mt catch. For the four management procedures shown in Figure A.10, the maximum probability of having catch $\geq$ 180,000 mt and spawning biomass $\geq$ 40% of B_0 is 82%, and that is associated with the lowest median average short-term catch. Comparison of values associated with different metrics against each other reveal trade-offs that appear somewhat independent of the details of the management procedures. In the long-term, the probability of being below 40% of B_0 is greater than in the short-term (Figure A.11).

A graphical comparison of pairs of metrics from the tables of MSE results (Figures A.12 and A.13) shows that some trade-offs appear to be somewhat independent of management procedure. In particular, the median average depletion appears to decline almost linearly as a function of the median average catch (Figure A.12). The relationship between these quantities differs between the short-term and long-term time periods, but appears to be similar within a time period whether catch was removed by the default harvest control rule, limited to some catch range, or taken as a constant catch. Likewise, median average mean age increases almost linearly with depletion (Figure A.13). This relationship shows not only little difference between the methods for determining catch, but also little difference between short-term and long-term periods.

Appendix A.4. Discussion

This year's MSE simulated a Pacific Hake management system that is highly volatile. Determining management procedures that produce sustainable fishing opportunities to all fishing sectors, while minimizing risk of depleting the population is a big challenge. In the MSE simulations, the default Harvest Rule leads to large year-to-year changes in catch (AAV), even in cases where perfect information about the population size is available. AAV is even higher when data are simulated with realistic errors; this leads to occasional inaccurate assessment results that can increase the risk of overfishing or foregone yield. The MSE analyses conducted this year focused on three dimensions of Management Procedures:

1. Testing the benefit of more frequent data (annual vs. biennial surveys)
2. Testing differences in assessment accuracy by modeling more underlying processes in the population dynamics (including time-varying fishery selectivity in the Assessment)
3. Investigating the management behavior that has been apparent in recent years by setting catches less than the default Harvest Rate suggests, and testing the trade-offs associated with dampening the variability in catch by attempting to maintain the catch within a given range (or at a single fixed value).

Using time-varying selectivity in both the OM and the assessment model has a large effect on management procedures performance. With time-varying selectivity in the OM, changes in the observed proportions at age in simulated catch data can be caused by recruitment and/or changes in selectivity-at-age. Without time-varying selectivity in the Assessment, these changes are more likely to be estimated as recruitment: this may bias estimates of biomass and recommended catch. Assessment models with time-varying selectivity have the flexibility to explain catch-at-age proportions as coming from a combination of recruitment and changes in selectivity. The more complex assessment model reduces the risk of overestimating high recruitment of recent cohorts and the potential for overfishing that may occur when these cohorts are smaller than expected. However, this may increase the risk of overestimating the size of a recent low recruitment event. This occurs because the penalty on recruitment deviations shrinks the estimates toward zero until enough data suggests otherwise. Time-varying selectivity allows an explanation other than low recruitment when few observations of a cohort have been made.

In the limited cases investigated in this MSE (and under the assumptions made), it is apparent that the introduction of time-varying selectivity to the assessment model has a greater benefit to stock status and catch in the long term than increased survey frequency. In the short term, an annual survey resulted in a higher average catch, but time-varying selectivity reduced the variability in the catch and lowered risk to the stock status. Combining both an annual survey and time-varying selectivity performed better than either option alone, but time-varying selectivity provided a large proportion of the improvement. These statistics are based on averages and medians over many realizations, and the benefits to specific situations were not specifically investigated. For example, from 2011 to 2013, an annual acoustic survey took place for Pacific Hake, and is believed to have resulted in a better assessment, mostly because of a reduction in uncertainty, which supported a belief that the stock was increasing. The survey predicted a high biomass in 2009 and a low biomass in 2011, causing concern for which estimate was more realistic. In this case, an annual survey in 2012 was very beneficial to increase the certainty that catch levels were being set appropriately. Future MSE analyses could evaluate the potential benefit of a system in which low biomass estimates would trigger occasional additional surveys within an otherwise biennial schedule, as occurred in 2011–2012.

Data and models are not the only tools that can be used to meet fishery and management objectives. Alternative Harvest Rules can improve performance, and also allow for consistent and understandable determination of the quota. For our simulations, we have modeled a strict $F_{40\%}$ 40:10 harvest strategy (except for the catch range scenarios), but in practice it is not clear how modifications to the TAC based on the current strategy are implemented, or how structural and parameter uncertainty is used in decision making. In the past decade, there have been multiple times when catch quotas have been set less than the median TAC predicted by the stock assessment model indicating that the decision making process is more complex than we have modeled in our simulations. The 2011 and 2013 stock assessments (JTC 2013, Stewart et al. 2011) are examples of uncertain assessments and precautionary management behavior. Both of these assessments predicted very large cohorts of age-3 fish based on high proportions at age 1 and 2 in the fishery age compositions, and age-2 fish in the 2012 survey age compositions. The uncertainty in year-class size was high and there was concern of the consequences of setting a quota at the level predicted by the median of the default Harvest Rule when actual recruitment may be lower than the predicted median recruitment. There was justification for setting the quotas lower than the assessment suggested, but our simulations have not defined or tested it, although they potentially could.

The catch ranges tested here attempted to mimic what would be precautionary behavior of managers, and/or allow for a minimum necessary catch to support the fishery. Not allowing catch to exceed a ceiling value resulted in higher long-term average catch because realized catches did not depend entirely on a potentially uncertain assessment model. There may also be a benefit associated with maintaining a higher average biomass, which could be quantified in future MSE analyses by combining catch ranges with perfect information about the stock status. And, as expected, catch variability is reduced because catches are not allowed to vary over wide ranges. However, given that the OM started with a likely increasing population size, the short-term catches are often curtailed. This is an example of the importance of defined objectives and performance metrics that can be used to balance the trade-offs between short- and long-term goals, as well as other objectives.

There is a dramatic difference between the results of the MSE and equilibrium reference points such as MSY. The median MSY estimate from the 2013 stock assessment is 357,000 mt and the equilibrium yield estimated associated with the F40% harvest rate is 337,000 mt. In contrast to this, the long-term median average catch that results from applying the harvest control rule with perfect information is only 251,000 mt when the OM has no time-varying selectivity, which is the case that best matches to the 2013 assessment. When the OM includes time-varying selectivity, the median MSY value is 337,000 mt and yet the majority of simulations with this OM can't sustain a constant catch of 300,000 mt in the long-term (the long-term median average catch is 271,000 mt in this case). The key difference in both these examples is that the equilibrium calculations are based on a stationary biomass level and the expected recruitment level associated with a particular point on the stock-recruit curve whereas the MSE simulations are characterized by highly variable recruitment. The variability in recruitment frequently causes the spawning biomass to fall below 40% of B0 at which point the catches in the perfect information case (but not the constant catch case) are reduced through the 40-10 adjustment to the default harvest rate. Perhaps more importantly, MSY is associated with a level of depletion that maximizes surplus production in equilibrium. Yet with highly variable recruitment, the spawning biomass is frequently driven to lower or higher levels associated with less productivity due to either a reduction in the spawning potential or a compensatory response to a high biomass. This result of Maximum Average Yield (MAY) often being less than MSY has been noted many times in fisheries literature (e.g., see Prager (1994)) In general, these differences suggest that for a population with recruitment as variable as Pacific Hake, the equilibrium reference points are less valuable for guiding expectations about future catch than more complex calculations such as those conducted within an MSE.

This MSE simulation tested a few Management Procedures and measured the performance against a small set of Goals & Objectives. However, this is only a small example of the utility of a MSE. Improvements can be made to the OM, such as modeling alternative recruitment dynamics (e.g., autocorrelation) or using patterns of historical recruitment, to provide a more realistic portrayal of the hake stock or alternative scenarios for simulation testing. Alternative assumptions about the sampling distribution used for simulated survey data could also be explored to model the effect of occasional extreme survey estimates. Status quo Management Procedures could be better defined by studying the past behavior of management and the fisheries at different stock sizes and including relationships between stock size and implementation error (the amount of catch relative to the TAC). New Management Procedures could be developed with the involvement of stakeholders, managers, and other interested parties, which are then Simulation Tested to determine if they meet Goals & Objectives. For example, specifically accounting for uncertainty and reducing the TAC in a repeatable manner, or limiting annual increases in catch can be easily investigated.

This is small number of potential additions and improvements to this MSE, but most importantly, consultation with stakeholders, managers, and other interested parties should occur to clearly define their Goals & Objectives. Once defined, Management Procedures can be Simulation Tested and the Application of a well performing and agreed upon strategy can be used to define future quotas.

Appendix A.5. Tables

Table A.1: Cases considered in the MSE as combinations of various procedures when using the Operating Model with time-varying selectivity.

	Catch determination	Survey Frequency	Time Vary Selex Assessment Model	Catch Ranges or Fixed Catch
Management Procedures	Assessment	Annual	None	None
			Low (0.05)	None
			High (0.20)	None
		Biennial	None	None
			Low (0.05)	None
			High (0.20)	None
	Assessment	Annual	None	375,000 (max)
		Biennial	None	375,000 (max)
	Assessment	Annual	None	500,000 (max)
		Biennial	None	500,000 (max)
	Assessment	Annual	None	180,000 (min); 375,000 (max)
		Biennial	None	180,000 (min); 375,000 (max)
	Constant Catch	NA	NA	100,000 (constant)
				200,000 (constant)
				300,000 (constant)
				400,000 (constant)
				500,000 (constant)
Benchmarks	Perfect Info			None

Table A.2: Performance metrics used to evaluate performance with regard to stock status, catch, and age-structure of the population.

Metric	Description	Formula
Stock status		
Median average depletion	The median of the average status of the stock (relative to B_0) over a defined period of time	$\text{Median}\left(\frac{1}{n+1}\sum_{i=t}^{t+n} SB_t \Big/ SB_0\right)$
$P(B < B_{10\%})$ $P(B_{10\%} \leq B \leq B_{40\%})$ $P(B > B_{40\%})$	The probability that spawning biomass is less than 10% unfished equilibrium spawning biomass ($B_{10\%}$), between $B_{10\%}$ and $B_{40\%}$, or greater than $B_{40\%}$ at any time in the period and in any simulation.	$\frac{N_{\text{within}}}{N_{\text{total}}}$ where N_{within} is the total number of observations satisfying the criteria and N_{total} is the total number of observations
Catch		
Median average catch	The median of the average catch over the time period defined.	$\text{Median}\left(\frac{1}{n+1}\sum_{i=t}^{t+n} C_t\right)$
Average annual variability (AAV)	The average absolute change in catch divided by the average total catch, and expressed as a percentage.	$\sum_{i=t+1}^{t+n} \lvert C_t - C_{t-1}\rvert \Big/ \sum_{i=t+1}^{t+n} C_t$
Probability that catch = 0, is < 180,000 mt, between 180,000 and 375,000 mt, or > 375,000 mt	The probability that catch is zero, is less than 180,000 mt, between 180,000 mt and 375,000mt, or greater than 375,000 mt at any time in the period and in any simulation.	$\frac{N_{\text{within}}}{N_{\text{total}}}$ where N_{within} is the total number of observations satisfying the criteria and N_{total} is the total number of observations
Age structure		
Median average mean age	The median of the average mean age over the time period defined.	$\text{Median}\left(\frac{1}{n+1}\sum_{i=t}^{t+n}\left(\sum_{a=0}^{20} aN_{a,t} \Big/ \sum_{a=0}^{20} N_{a,t}\right)\right)$
Median average age 4+ biomass	The median of the average age 4 and older biomass over the time period defined.	$\text{Median}\left(\frac{1}{n+1}\sum_{i=t}^{t+n}\sum_{a=4}^{a=20} B_{a,t}\right)$
Median average ratio of biomass that is age 4+	The median of the average age 4 and older biomass divided by total biomass over the time period defined.	$\text{Median}\left(\frac{1}{n+1}\sum_{i=t}^{t+n}\left(\sum_{a=4}^{20} B_{a,t} \Big/ \sum_{a=0}^{20} B_{a,t}\right)\right)$

Table A.3: Performance metrics for cases with and without time-varying selectivity in the Operating Model (OM).

	Short term (2014-2023)						Long term (2033-2042)					
Specifications												
Time-varying selectivity	None	None	None	OM	OM	OM	-	-	-	OM	OM	OM
Survey frequency	biennial	annual	perfect	biennial	annual	perfect	biennial	annual	perfect	biennial	annual	perfect
Metrics related to depletion												
Median average depletion	48%	48%	47%	51%	50%	44%	31%	32%	30%	39%	37%	28%
Probability $B < B_{10\%}$	5%	3%	0%	5%	4%	1%	5%	3%	0%	6%	5%	1%
Prob. $B \geq B_{10\%}$ & $B \leq B_{40\%}$	39%	42%	47%	39%	41%	52%	64%	66%	73%	48%	54%	73%
Probability of $B > B_{40\%}$	56%	55%	53%	57%	56%	47%	31%	31%	26%	45%	41%	25%
Metrics related to catch												
Median of average catch (1000 mt)	435	436	450	388	403	445	239	234	251	199	218	246
Median of Average Annual Variability (AAV) in catch	32%	33%	29%	53%	47%	43%	31%	30%	23%	52%	38%	33%
Probability that catch = 0	2%	1%	0%	10%	7%	1%	2%	1%	0%	13%	5%	1%
Prob. catch < 180,000 mt	20%	19%	17%	32%	29%	22%	43%	43%	41%	52%	47%	42%
Prob. catch ≥ 180,000 & catch ≤ 375,000 mt	22%	22%	29%	19%	21%	31%	32%	33%	33%	27%	30%	33%
Prob. catch > 375,000 mt	58%	58%	54%	49%	50%	47%	25%	25%	26%	21%	22%	25%
Metrics related to age composition												
Median average mean age	2.8	2.8	2.8	2.8	2.8	2.7	2.5	2.6	2.5	2.7	2.7	2.4
Median average age 4+ biomass (million mt)	1.69	1.68	1.66	1.66	1.63	1.42	1.00	1.02	0.94	1.27	1.14	0.83
Median average ratio of biomass that is age 4+	63%	63%	64%	62%	63%	61%	56%	57%	56%	60%	59%	54%

Table A.4: Performance metrics for cases with and without time-varying selectivity in the Assessment. "OM" indicates time-varying selectivity in the Operating Model only. "OM & Assess" indicates time-varying selectivity in both the operating model and the assessment.

	Short term (2014-2023)					Long term (2033-2042)				
Specifications										
Time-varying selectivity	OM	OM	OM & Assess	OM & Assess	OM	OM	OM	OM & Assess	OM & Assess	OM
Survey frequency	biennial	annual	biennial	annual	perfect	biennial	annual	biennial	annual	perfect
Metrics related to depletion										
Median average depletion	51%	50%	54%	53%	44%	39%	37%	38%	38%	28%
Probability $B < B_{10\%}$	5%	4%	2%	1%	1%	6%	5%	3%	2%	1%
Prob. $B \geq B_{10\%}$ & $B \leq B_{40\%}$	39%	41%	36%	38%	52%	48%	54%	55%	57%	73%
Probability of $B > B_{40\%}$	57%	56%	62%	61%	47%	45%	41%	42%	42%	25%
Metrics related to catch										
Median of average catch (1000 mt)	388	403	372	381	445	199	218	222	224	246
Median of Average Annual Variability (AAV) in catch	53%	47%	31%	32%	43%	52%	38%	31%	30%	33%
Probability that catch = 0	10%	7%	1%	0%	1%	13%	5%	1%	0%	1%
Prob. catch < 180,000 mt	32%	29%	21%	21%	22%	52%	47%	45%	44%	42%
Prob. catch ≥ 180,000 & catch ≤ 375,000 mt	19%	21%	31%	30%	31%	27%	30%	34%	35%	33%
Prob. catch > 375,000 mt	49%	50%	48%	49%	47%	21%	22%	21%	21%	25%
Metrics related to age composition										
Median average mean age	2.8	2.8	2.9	2.9	2.7	2.7	2.7	2.7	2.8	2.4
Median average age 4+ biomass (million mt)	1.66	1.63	1.80	1.74	1.42	1.27	1.14	1.19	1.16	0.83
Median average ratio of biomass that is age 4+	62%	63%	65%	65%	61%	60%	59%	59%	60%	54%

Table A.5: Performance metrics for cases with different levels of time-varying selectivity in the Assessment. "OM" indicates time-varying selectivity in the Operating Model only. "OM & Assess" indicates time-varying selectivity in both the operating model and the assessment. For more information on the values for time-varying selectivity flexibility (either 0, 0.05, or 0.20), see the Methods section.

	Short term (2014-2023)			Long term (2033-2042)		
Specifications						
Time-varying selectivity	OM	OM & Assess	OM & Assess	OM	OM & Assess	OM & Assess
Time-varying selectivity flexibility (OM, Assess)	(0.20, 0)	(0.20, 0.05)	(0.20, 0.20)	(0.20, 0)	(0.20, 0.05)	(0.20, 0.20)
Survey frequency	biennial	biennial	biennial	biennial	biennial	biennial
Metrics related to depletion						
Median average depletion	51%	54%	54%	39%	39%	38%
Probability $B < B_{10\%}$	5%	2%	2%	6%	2%	3%
Prob. $B \geq B_{10\%}$ & $B \leq B_{40\%}$	39%	36%	36%	48%	53%	55%
Probability of $B > B_{40\%}$	57%	62%	62%	45%	45%	42%
Metrics related to catch						
Median of average catch (1000 mt)	388	369	372	199	213	222
Median of Average Annual Variability (AAV) in catch	53%	37%	31%	52%	35%	31%
Probability that catch = 0	10%	3%	1%	13%	3%	1%
Prob. catch < 180,000 mt	32%	26%	21%	52%	47%	45%
Prob. catch ≥ 180,000 & catch ≤ 375,000 mt	19%	27%	31%	27%	32%	34%
Prob. catch > 375,000 mt	49%	48%	48%	21%	21%	21%
Metrics related to age composition						
Median average mean age	2.8	2.9	2.9	2.7	2.8	2.7
Median average age 4+ biomass (million mt)	1.66	1.77	1.80	1.27	1.24	1.19
Median average ratio of biomass that is age 4+	62%	65%	65%	60%	61%	59%

Table A.6: Performance metrics for cases with different catch ranges. These ranges are choices that the JMC could make, not a proposed alternative harvest control rule. In the case with a range of 180 - 375, the population may sometimes not have sufficient biomass for the catch to remain in that range. The frequency of these occurrences is indicated by the metric "Prob. catch ≥ 180,000 & catch ≤ 375,000 mt" having a value less than 100%.

	Short term (2014-2023)				Long term (2033-2042)			
Specifications								
Time-varying selectivity	OM	OM	OM	OM	OM	OM	OM	OM
Catch range (1000 mt)	-	< 500	< 375	180 - 375	-	< 500	< 375	180 - 375
Survey frequency	biennial	biennial	biennial	biennial	biennial	biennial	biennial	biennial
Metrics related to depletion								
Median average depletion	51%	56%	62%	61%	39%	42%	45%	35%
Probability $B < B_{10\%}$	5%	3%	2%	4%	6%	5%	5%	19%
Prob. $B \geq B_{10\%}$ & $B \leq B_{40\%}$	39%	32%	28%	27%	48%	47%	44%	41%
Probability of $B > B_{40\%}$	57%	64%	70%	69%	45%	49%	51%	41%
Metrics related to catch								
Median of average catch (1000 mt)	388	368	335	344	199	203	216	233
Median of Average Annual Variability (AAV) in catch	53%	28%	15%	9%	52%	41%	34%	19%
Probability that catch = 0	10%	8%	6%	0%	13%	12%	10%	0%
Prob. catch < 180,000 mt	32%	23%	16%	5%	52%	50%	44%	21%
Prob. catch ≥ 180,000 & catch ≤ 375,000 mt	19%	16%	84%	95%	27%	25%	56%	79%
Prob. catch > 375,000 mt	49%	61%	0%	0%	21%	26%	0%	0%
Metrics related to age composition								
Median average mean age	2.8	3.0	3.1	3.1	2.7	2.9	2.9	2.6
Median average age 4+ biomass (million mt)	1.66	1.87	2.10	2.07	1.27	1.32	1.39	1.06
Median average ratio of biomass that is age 4+	62%	66%	67%	67%	60%	61%	62%	54%

Table A.7: Performance metrics for cases with different constant catch values. In these cases, there is no assessment model or survey required to set the catch levels. In some cases, the population will fall to such a low level that the constant catch can't be removed, as indicated in the difference between the constant catch value and the median of average catch.

	Short term (2014-2023)				Long term (2033-2042)			
Specifications								
Time-varying selectivity	OM	OM	OM	OM	OM	OM	OM	OM
Constant catch (1000 mt)	100	200	300	400	100	200	300	400
Metrics related to depletion								
Median average depletion	82%	74%	66%	58%	72%	51%	32%	21%
Probability $B < B_{10\%}$	0%	1%	3%	6%	1%	10%	24%	35%
Prob. $B \geq B_{10\%}$ & $B \leq B_{40\%}$	9%	17%	23%	28%	20%	33%	36%	37%
Probability of $B > B_{40\%}$	90%	82%	74%	66%	79%	57%	40%	28%
Metrics related to catch								
Median of average catch (1000 mt)	100	200	300	394	100	200	271	267
Median of Average Annual Variability (AAV) in catch	27%	8%	2%	3%	0%	0%	14%	38%
Probability that catch = 0	0%	0%	0%	0%	0%	0%	0%	0%
Prob. catch < 180,000 mt	100%	1%	4%	8%	100%	12%	27%	39%
Prob. catch ≥ 180,000 & catch ≤ 375,000 mt	0%	99%	96%	10%	0%	88%	73%	17%
Prob. catch > 375,000 mt	0%	0%	0%	82%	0%	0%	0%	44%
Metrics related to age composition								
Median average mean age	3.6	3.4	3.2	3.0	3.8	3.1	2.4	2.1
Median average age 4+ biomass (million mt)	2.90	2.59	2.27	1.95	2.45	1.66	0.94	0.54
Median average ratio of biomass that is age 4+	75%	72%	69%	65%	72%	64%	51%	42%

Appendix A.6. Figures

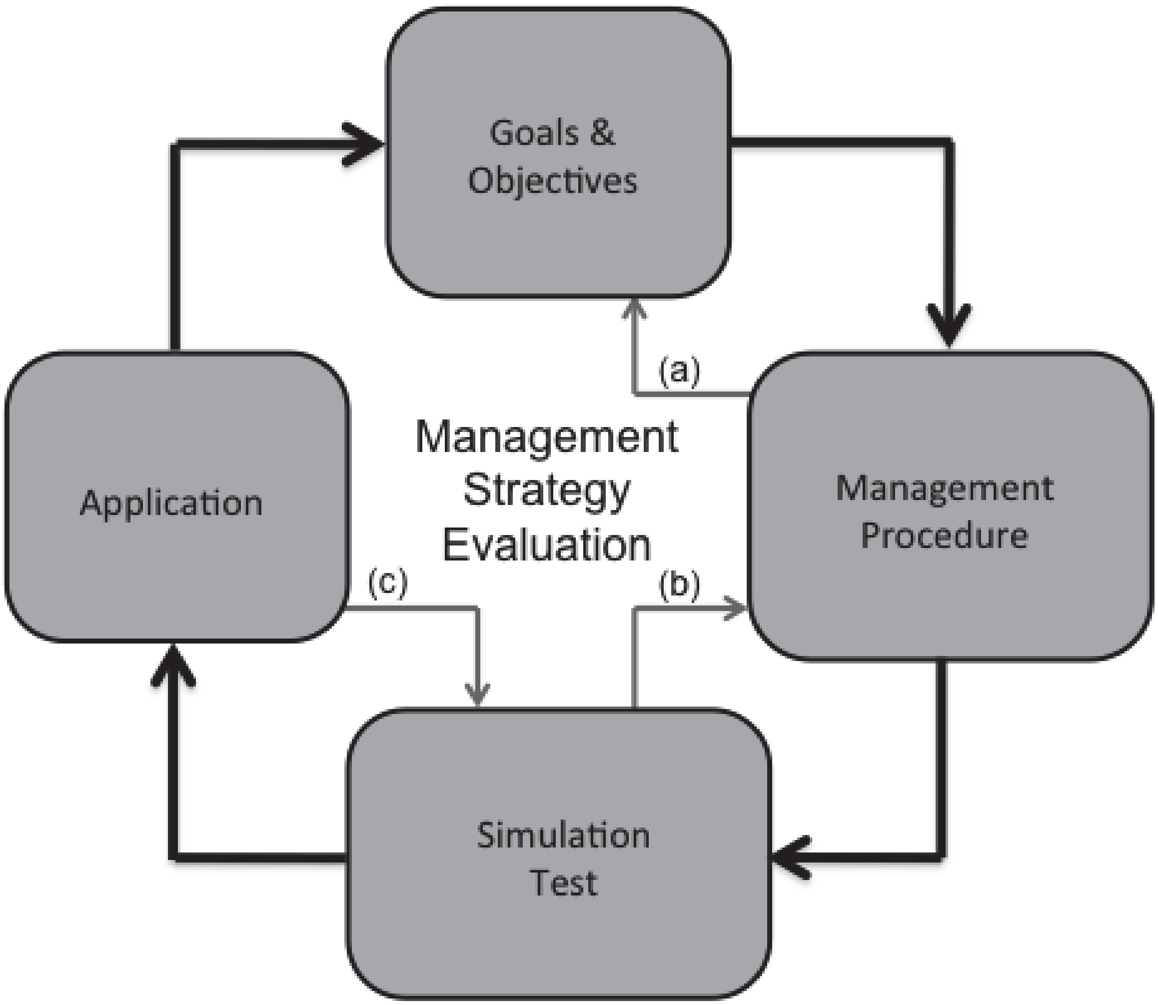


Figure A.1: Four main elements of a fishery harvest strategy are developed through a Management Strategy Evaluation (MSE) process. The flows labelled (a-c) represent short-term response feedbacks that occur as part of each MSE sub-process. The Management Procedure and Simulation Test are linked via computer simulation of the fishery system as indicated in Figure 2.

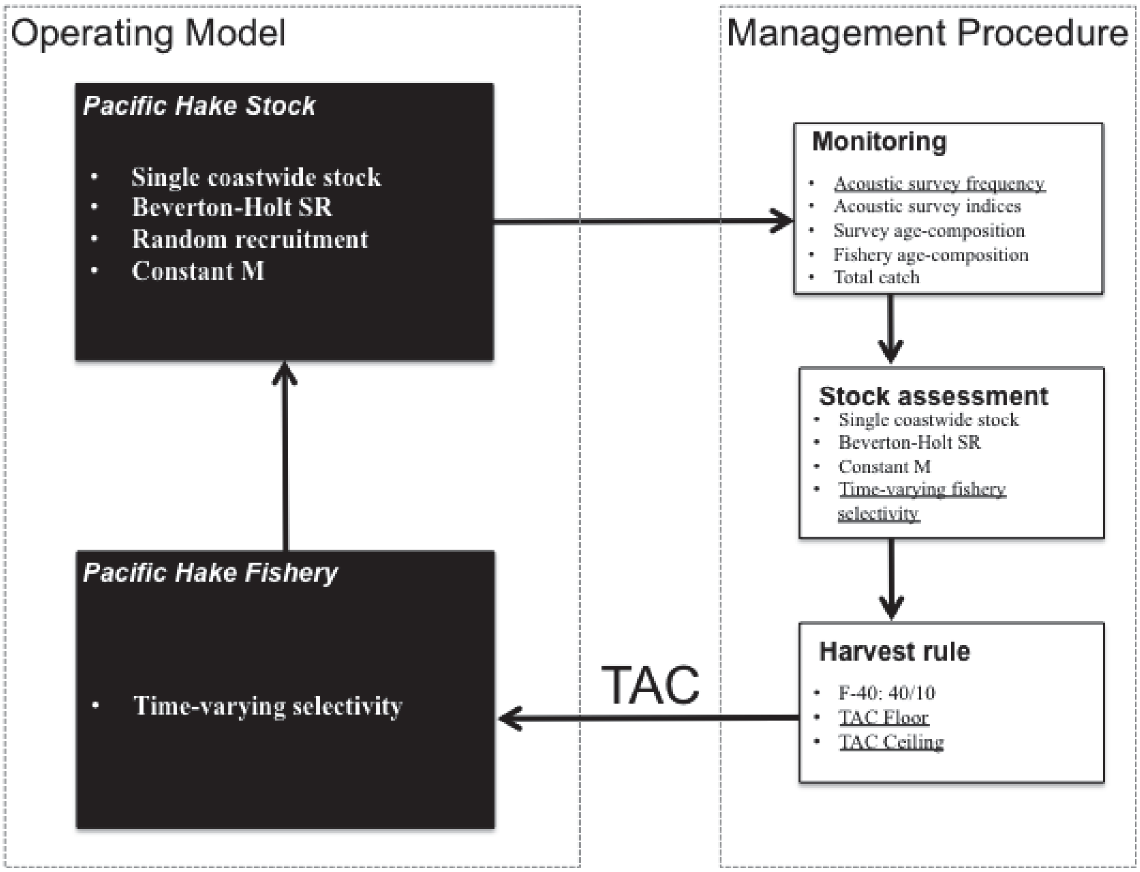


Figure A.2: Structure of the Pacific Hake fishery system simulation test. The Operating model (left) represents the biological functioning of the Pacific Hake stock and the process driving temporal changes in fishery selectivity. The Management Procedure (right) specifies the flow of information from raw data collection through the Stock Assessment and Harvest Rule to determine the total allowable catch (TAC) by the fishery. Population dynamics models of Pacific Hake occur in both the Operating Model and in the Stock Assessment. Management Procedure options tested in the 2013 MSE simulations include (underlined elements within each box): (*i*) Acoustic survey frequency – Annual or Biennial; (*ii*) Time-varying fishery selectivity – Present (high or low variation ϕ) or Absent; (*iii*) TAC Floor/Ceiling – various combinations TAC Floors (0 – 180,000 mt) and Ceilings (375,000 mt – 500,000 mt). Operating Model scenarios included high or no variability in fishery selectivity; otherwise, the Operating Model and Stock Assessment models were identical in structure.

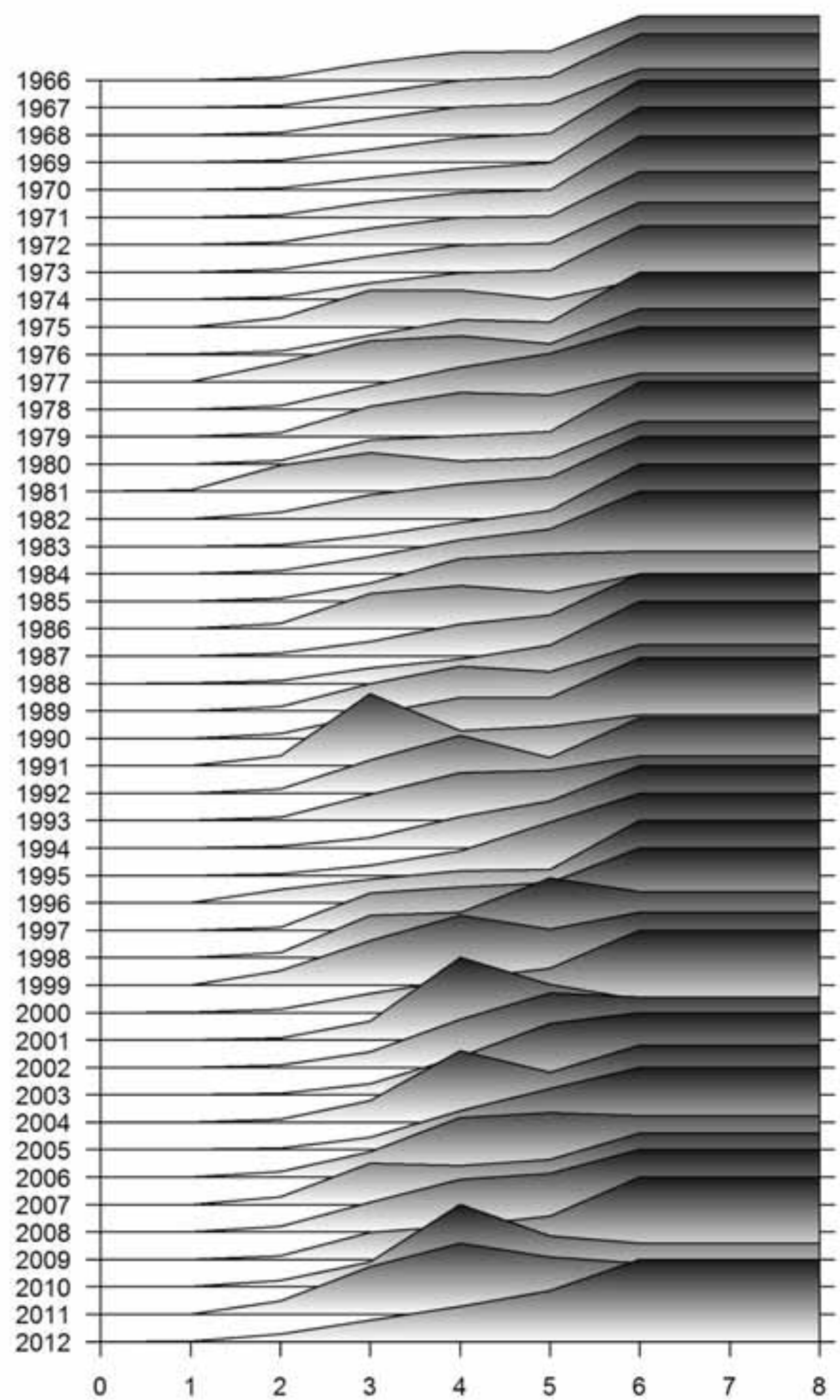


Figure A.3: Median fishery selectivity-at-age by year in the operating model.

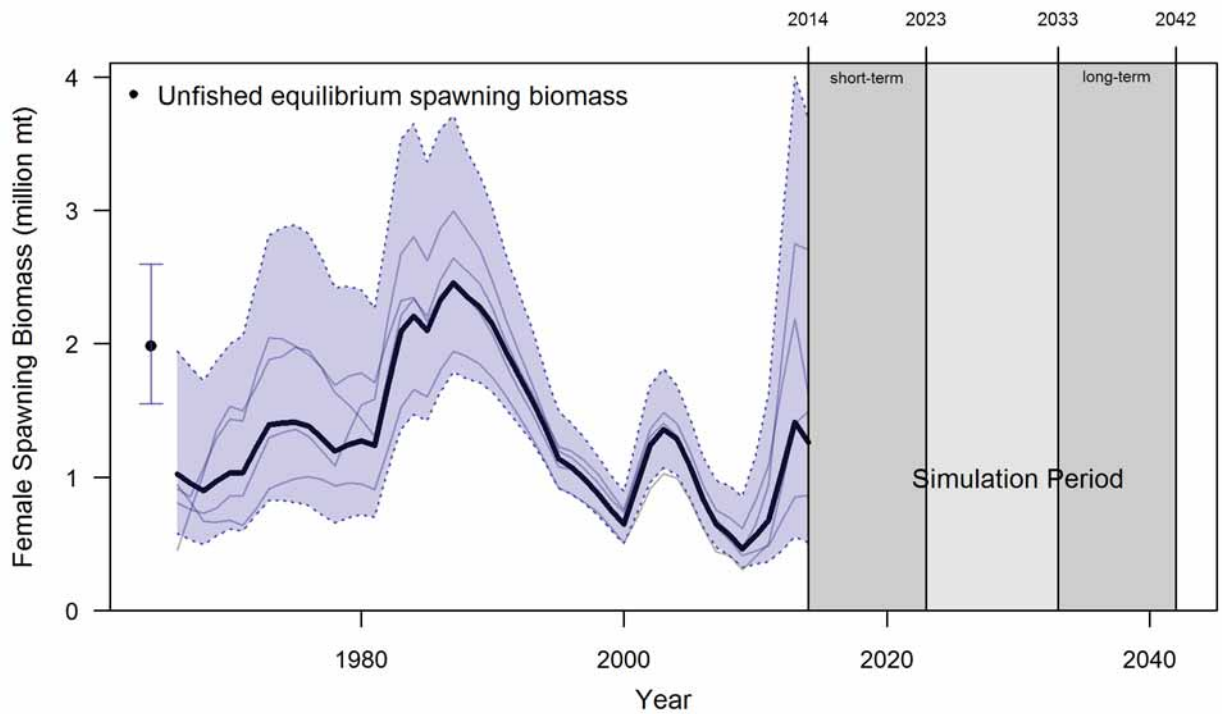


Figure A.4: Median spawning biomass trajectory for the conditioned years of the operating model (solid black line) and a 95% probability interval (blue shaded area). A small number of randomly selected individual trajectories are shown as light grey lines.

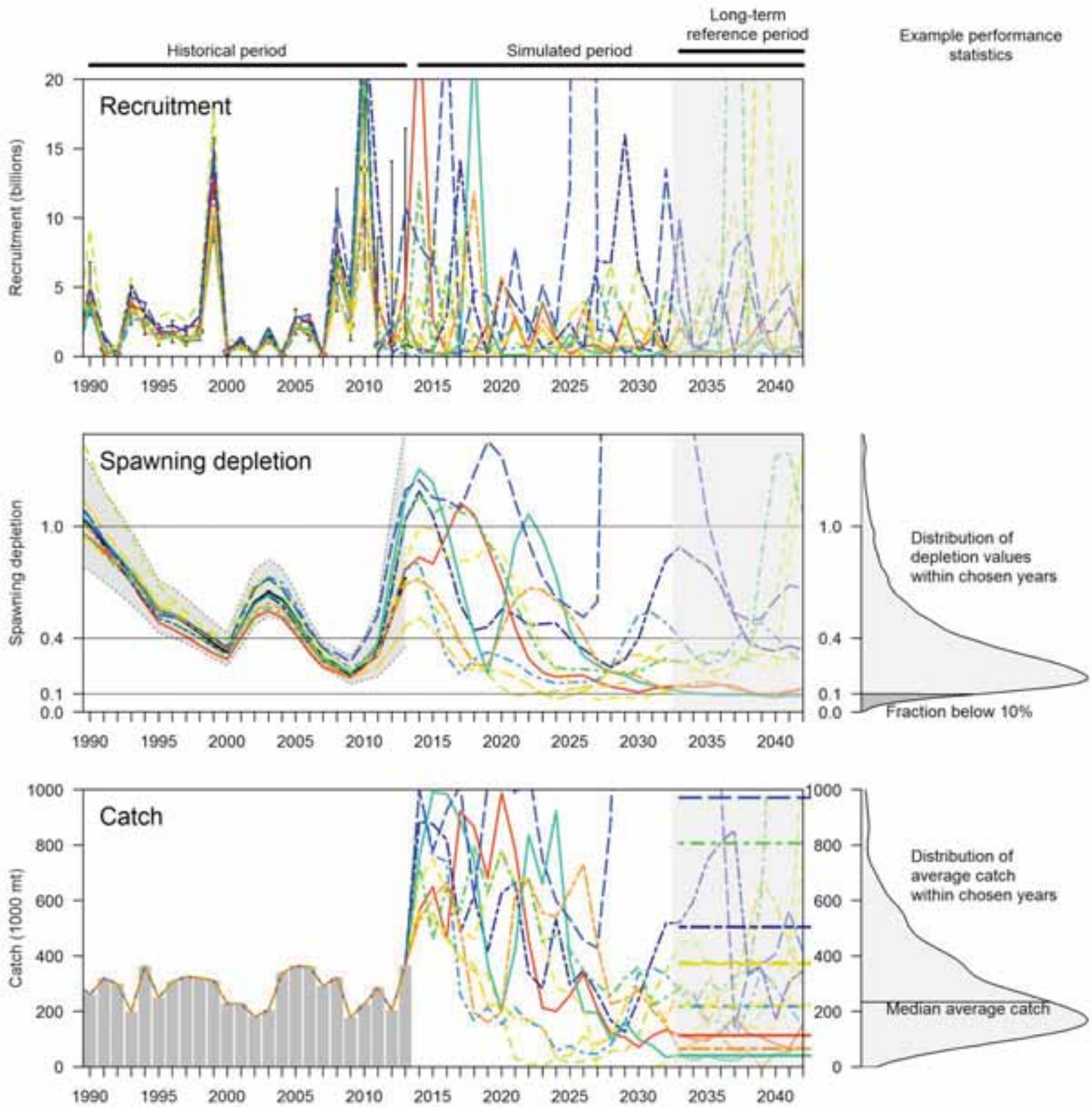


Figure A.5: Illustration of time-series showing highly variable forecasts.

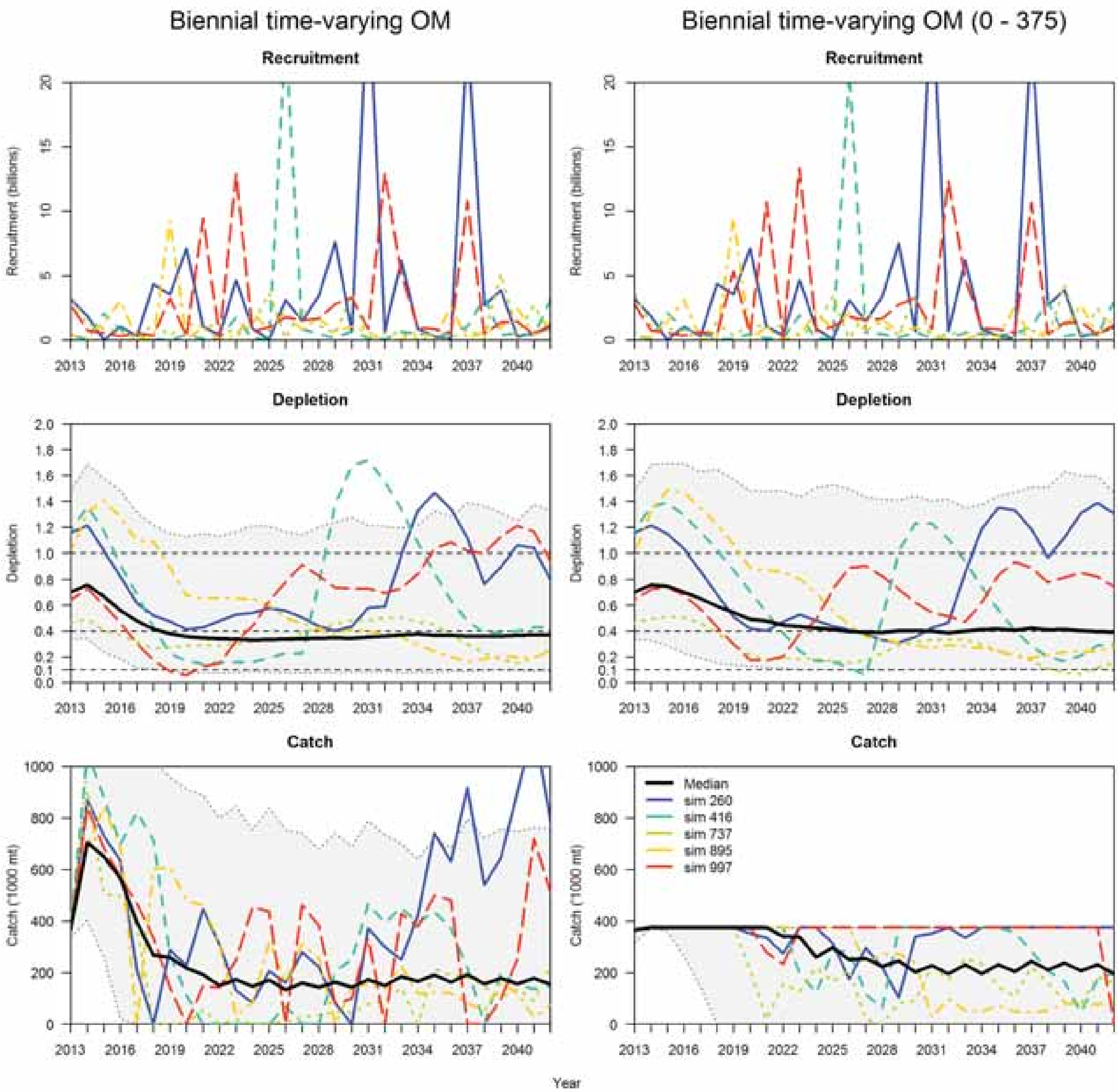


Figure A.6: Illustration of catch, depletion, and recruitment for runs with biennial time-varying selectivity in the Operating Model (but not in the assessment), with no catch range (left column) or catch limited to the range 0 - 375,000 mt (right column). The colored lines show trajectories for a random set of 5 simulations. The black lines show the median of all 1000 simulations in each case.

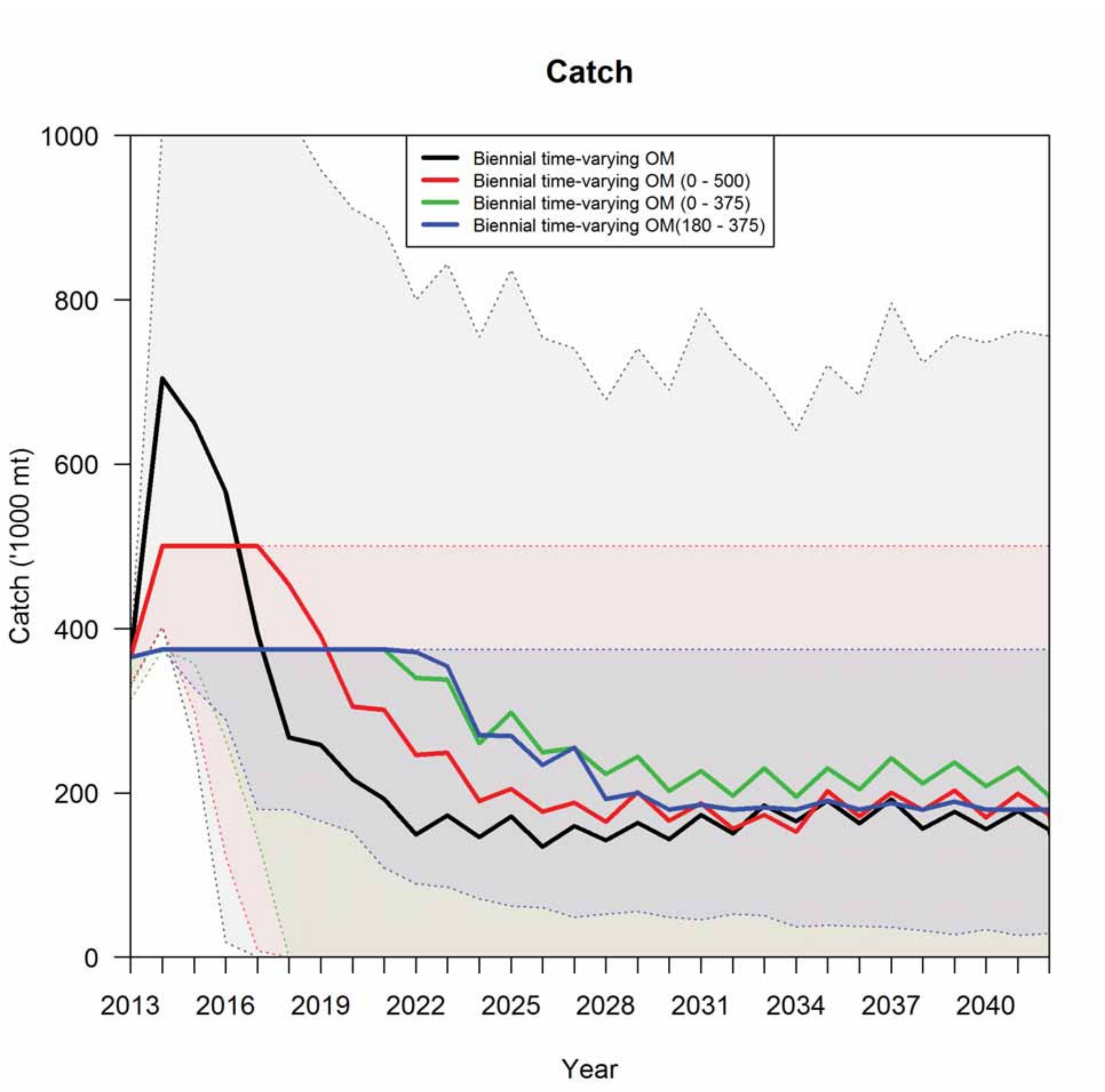


Figure A.7: Time series of median catch (thick lines) with 95% intervals (shaded regions) showing the effect of different catch ranges for the cases shown in Table 4. The black and green lines are the same as the median lines shown in the lower panels of the previous figure (both black in that figure). Surveys are modeled as biennial in all cases and the Operating Model has time-varying fishery selectivity but the Assessment does not.

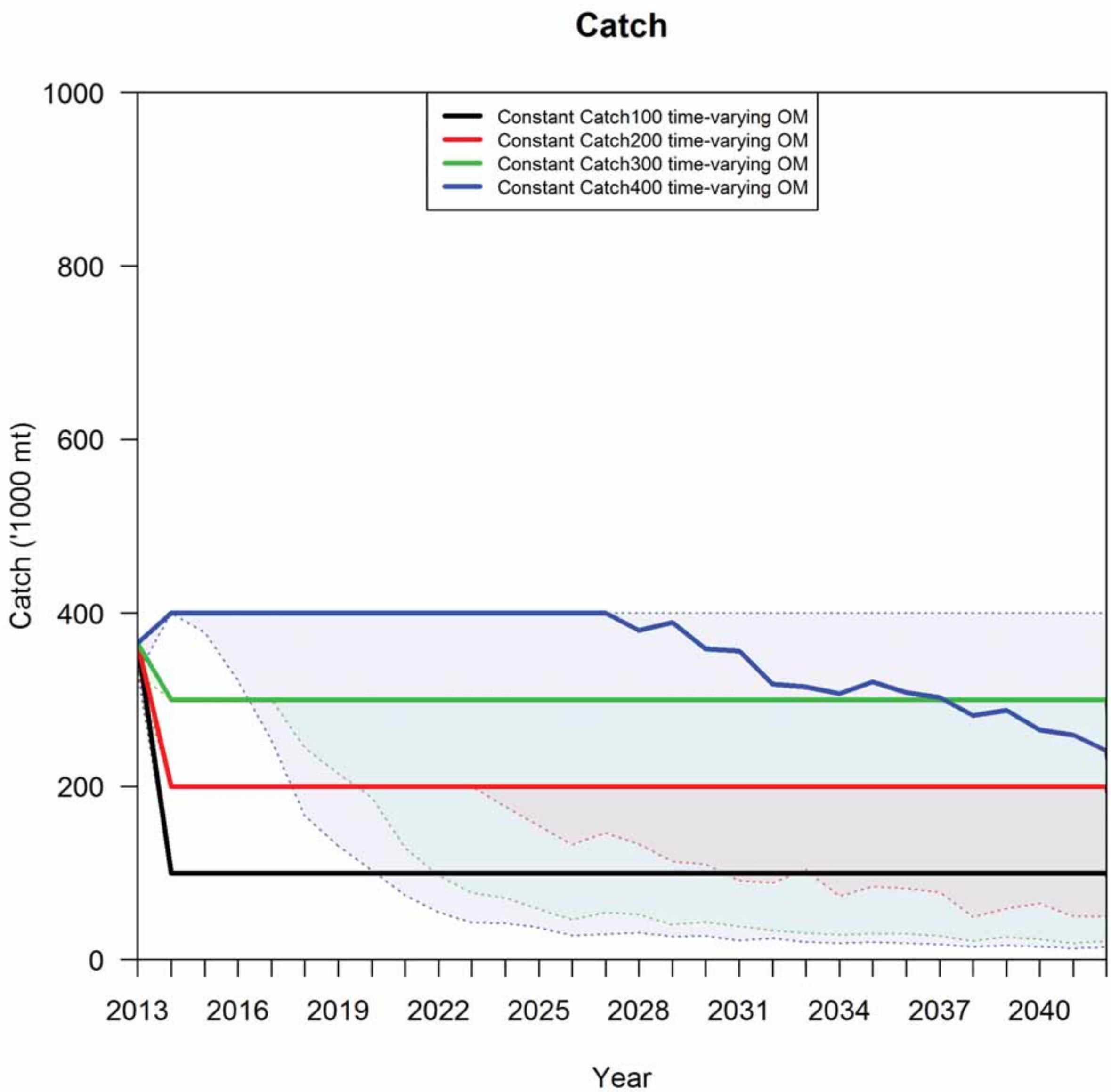


Figure A.8: Time series of median catch (thick lines) with 95% intervals (shaded regions) showing the effect of different constant catch values shown in Table 5. Surveys are modeled as biennial in all cases and the Operating Model has time-varying fishery selectivity but the Assessment does not.

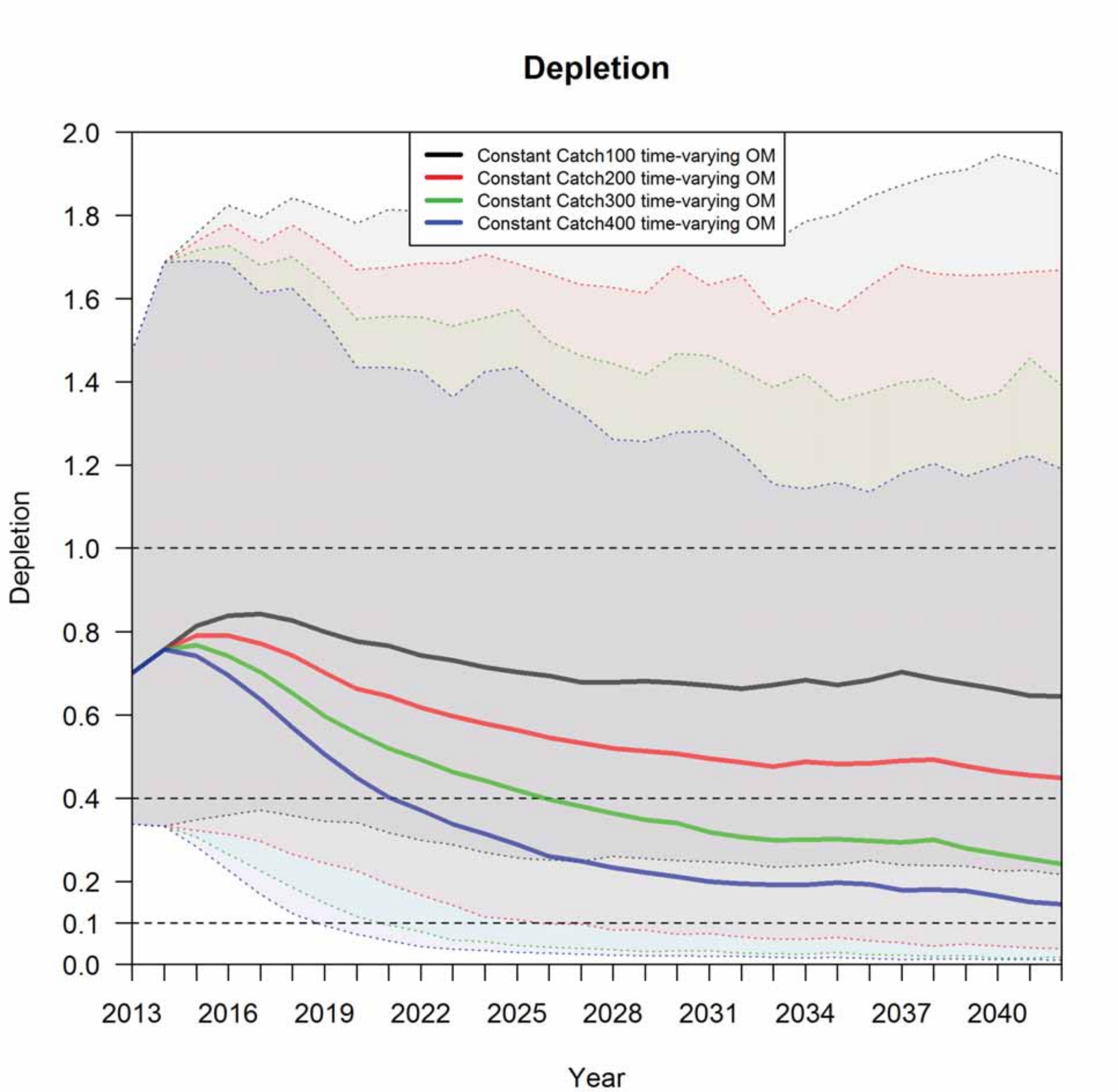


Figure A.9: Time series of depletion (thick lines) with 95% intervals (shaded regions) showing the effect of different constant catch values shown in Table 5. The Operating Model has time-varying fishery selectivity but in these cases, there is no assessment model or survey required to set the catch levels.

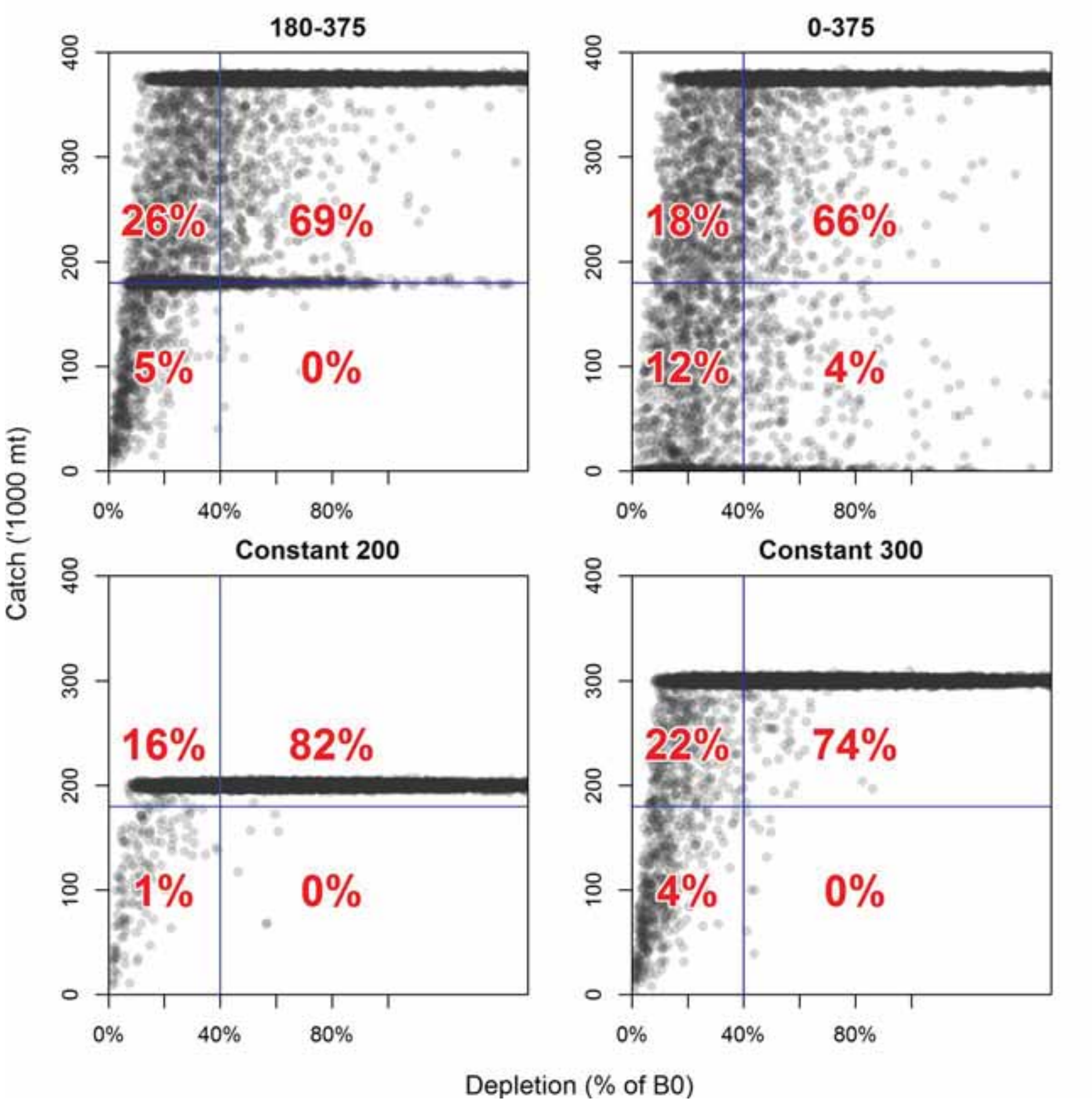


Figure A.10: Distribution of depletion and catch values (gray points) for a subset of management procedures in the short-term (2014-2023), with percentages of the distribution associated with each quadrant related the reference points 40% of B_0 and 180,000 mt catch (red values). A sampling of only 4 management procedures is shown as indicated by the labels above each panel (with catch values represented in 1000s of mt). Gray points have been jittered to better visualize overlapping points associated with constant catch or limits of catch ranges.

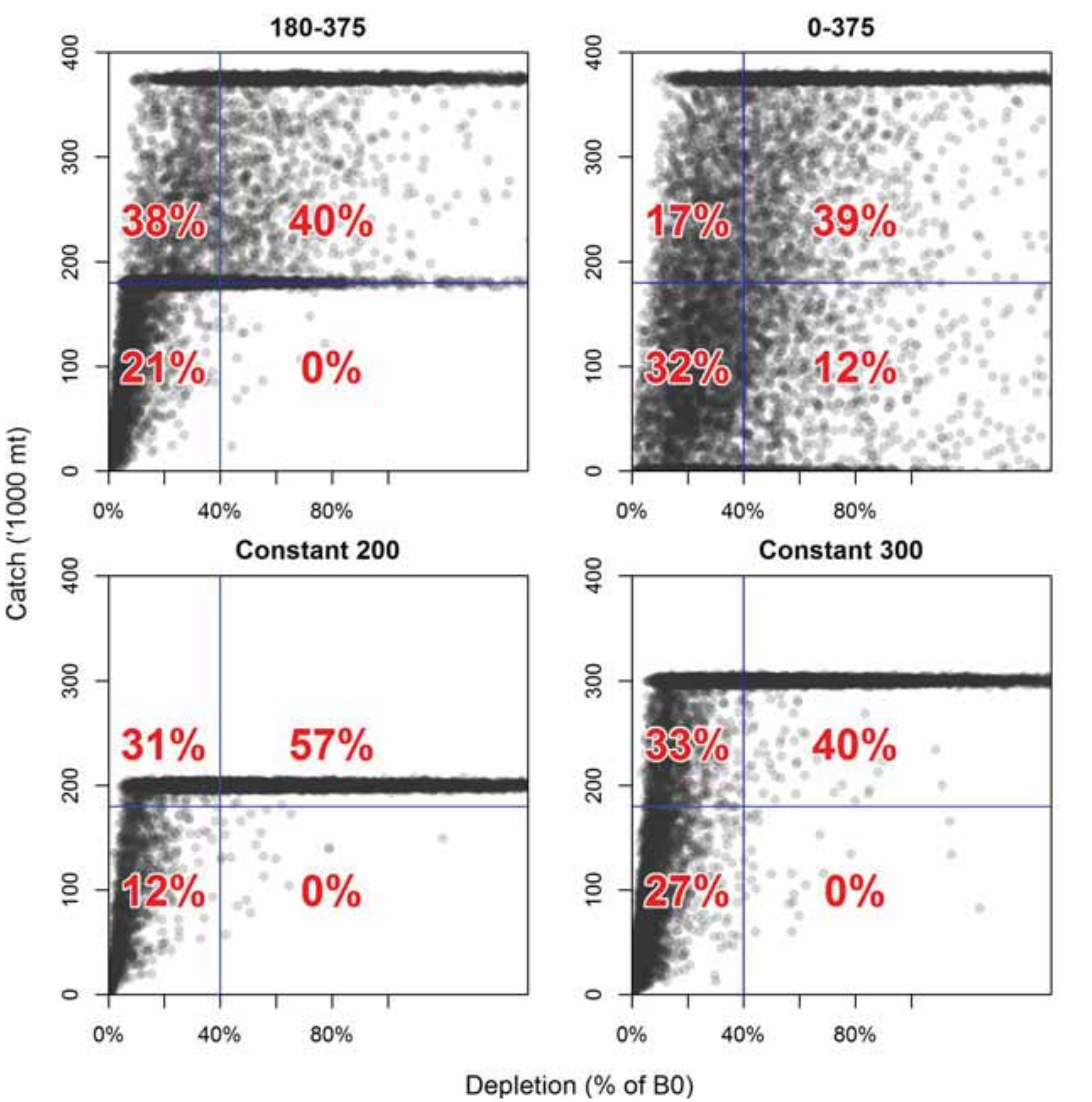


Figure A.11: Distribution of depletion and catch values (gray points) for a subset of management procedures in the long-term (2033-2042), with percentages of the distribution associated with each quadrant related the reference points 40% of B_0 and 180,000 mt catch (red values). A sampling of only 4 management procedures is shown as indicated by the labels above each panel (with catch values represented in 1000s of mt). Gray points have been jittered to better visualize overlapping points associated with constant catch or limits of catch ranges.

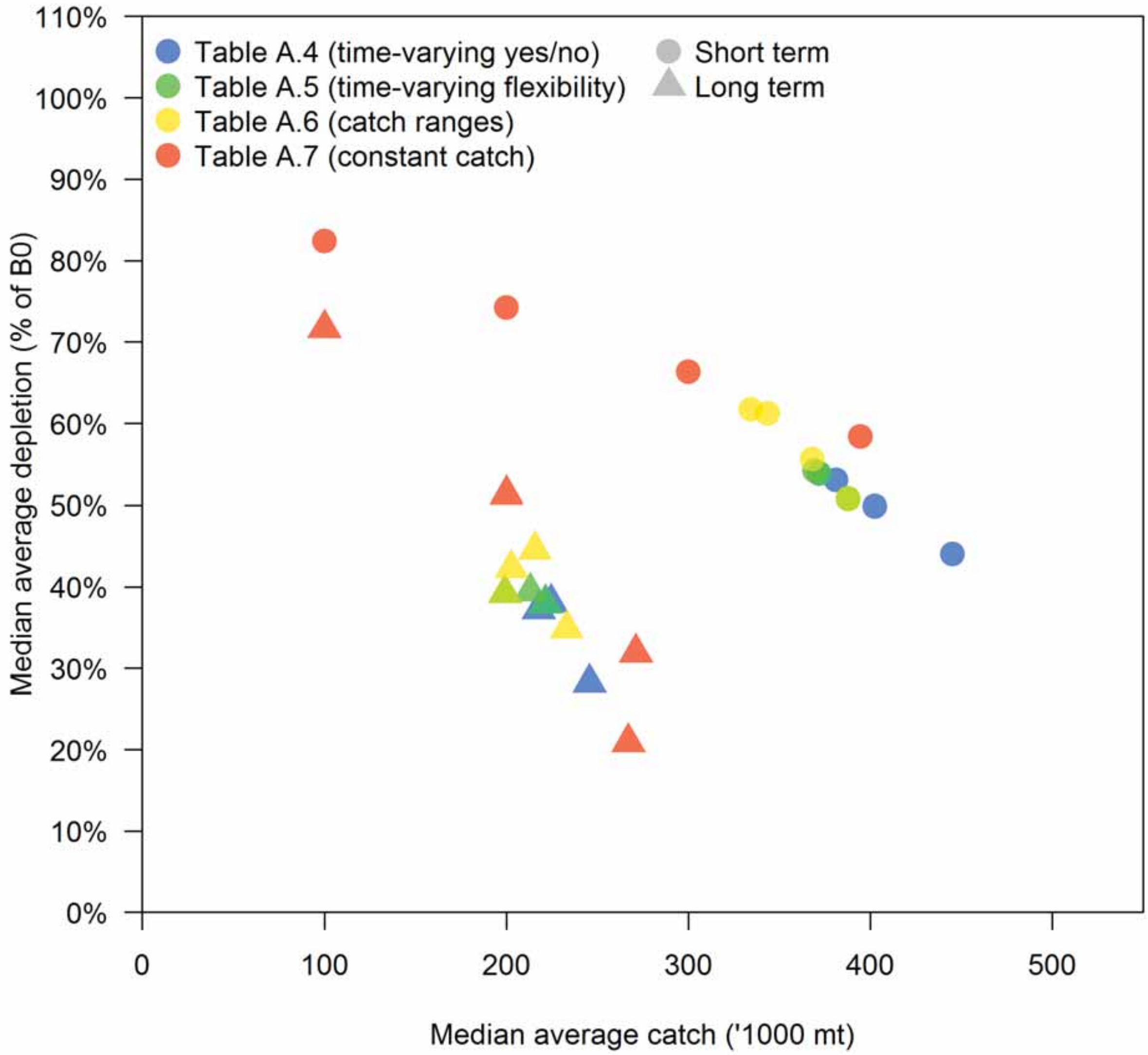


Figure A.12: Relationship between median average catch and median average depletion shown in Tables A.4 – A.7 (Table A.3 is excluded because some of values without time-varying selectivity in the OM are not comparable).

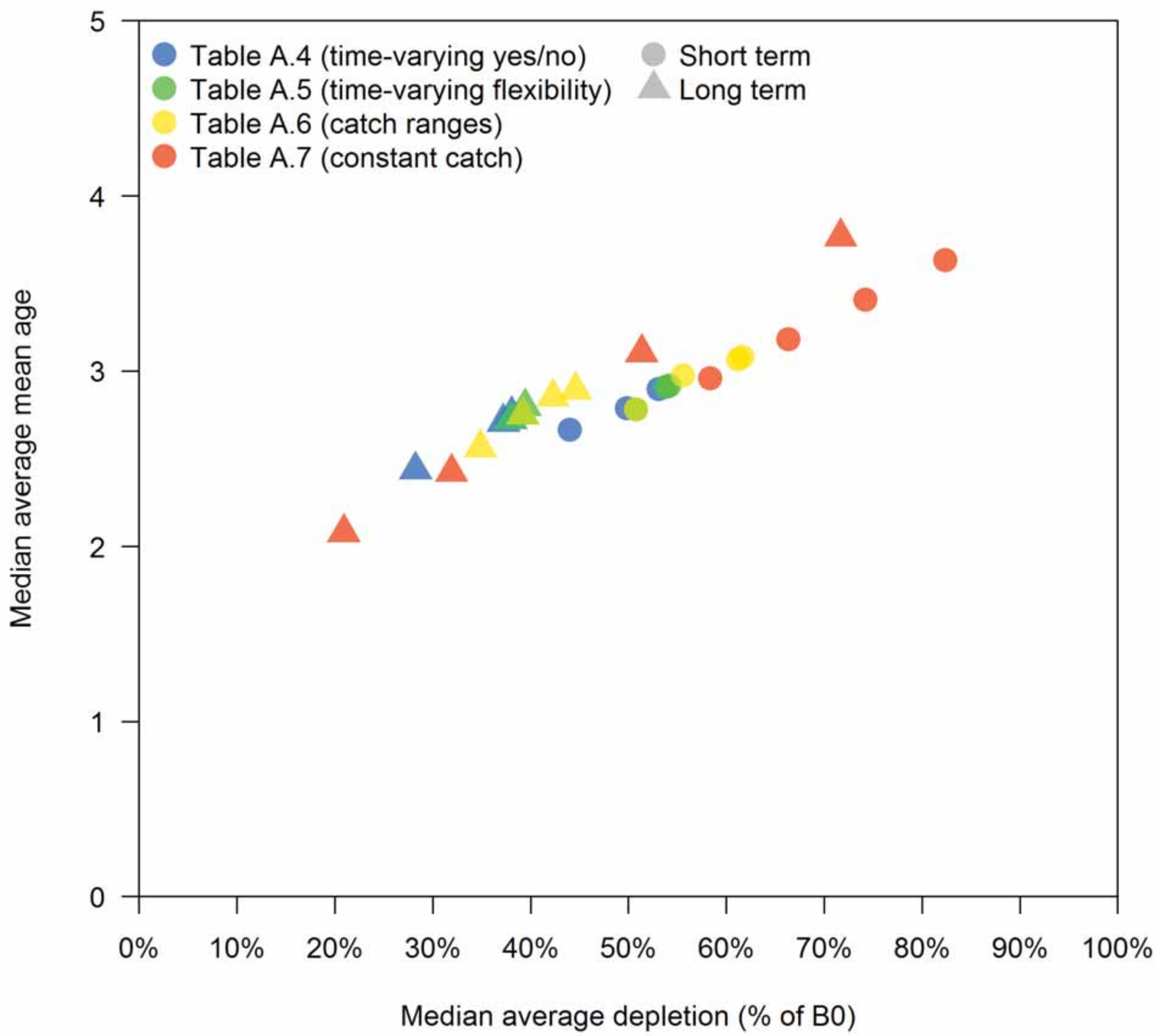


Figure A.13: Relationship between median average depletion and median average mean age values shown in Tables A.4 – A.7 (Table A.3 is excluded because some of values without time-varying selectivity in the OM are not comparable).

Appendix B. List of terms and acronyms used in this document

Note: Many of these definitions are relevant to the historical management of Pacific Hake and the U.S. Pacific Fishery Management Council process, and are included here only to improve interpretability of previous assessment and background documents.

40:10 Harvest control rule: The calculation leading to the ABC catch level (see below) for future years. This calculation decreases the catch linearly (given a constant age structure in the population) from the catch implied by the F_{MSY} (see below) harvest level when the stock declines below $B_{40\%}$ (see below) to a value of 0 at $B_{10\%}$.

40:10 adjustment: a reduction in the overall total allowable catch that is triggered when the biomass falls below 40% of its average equilibrium level in the absence of fishing. This adjustment reduces the total allowable catch on a straight-line basis from the 40% level such that the total allowable catch would equal zero when the stock is at 10% of its average equilibrium level in the absence of fishing.

ABC: Acceptable biological catch. See below.

Acceptable biological catch (ABC): The Acceptable biological catch is a scientific calculation of the sustainable harvest level of a fishery used historically to set the upper limit for fishery removals by the Pacific Fishery Management Council. It is calculated by applying the estimated (or proxy) harvest rate that produces maximum sustainable yield (MSY, see below) to the estimated exploitable stock biomass (the portion of the fish population that can be harvested). For Pacific Hake, the calculation of the acceptable biological catch and application of the 40:10 adjustment is now replaced with the default harvest rate and the Total Allowable Catch.

Advisory Panel (AP): The advisory panel on Pacific Hake/Whiting established by the Agreement.

Agreement ("Treaty"): The Agreement between the government of the United States and the Government of Canada on Pacific Hake/whiting, signed at Seattle, Washington, on November 21, 2003, and formally established in 2011.

AFSC: Alaska Fisheries Science Center (National Marine Fisheries Service)

B_0: The estimated average unfished equilibrium female spawning biomass or spawning output if not directly proportional to spawning biomass.

$B_{10\%}$: The level of female spawning biomass (output) corresponding to 10% of average unfished equilibrium female spawning biomass (B_0, size of fish stock without fishing; see above). This is the level at which the calculated catch based on the 40:10 harvest control rule (see above) is equal to 0.

$B_{40\%}$: The level of female spawning biomass (output) corresponding to 40% of average unfished equilibrium female spawning biomass (B_0, size of fish stock without fishing; see below).

B_{MSY}: The estimated female spawning biomass (output) that produces the maximum sustainable yield (*MSY*). Also see $B_{40\%}$.

Backscatter: The scattering by a target back in the direction of an acoustic source. Specifically, the Nautical Area Scattering Coefficient (a measure of scattering per area denoted by S_A) is frequently referred to as backscatter.

California Current Ecosystem: The waters of the continental shelf and slope off the west coast of North America; commonly referring to the area from central California to southern British Columbia.

Case: A combination of the harvest policy (F_{SPR} and control rule) and simulation assumptions regarding the survey. Cases considered in the MSE are “Annual”, “Biennial”, “Perfect information”, and “No Fishing”.

Catchability: The parameter defining the proportionality between a relative index of stock abundance (often a fishery independent survey) and the estimated stock abundance available to that survey (as modified by selectivity) in the assessment model.

Catch-per-unit-effort: A raw or (frequently) standardized and model-based metric of fishing success based on the catch and relative effort expended to generate that catch. Catch-per-unit-effort is often used as an index of stock abundance in the absence of fishery independent indices and/or where the two are believed to be proportional. See CPUE below.

Catch range: A term used in the MSE to describe simulations in which the JMC decision-making process is modeled very simplistically as replacing any TAC outside of a particular range with the limit of the range, even when this differs from the Default harvest policy (see below). The catch may fall outside the range if the available biomass is insufficient to support such removals.

Catch Target: A general term used to describe the catch value used for management. Depending on the context, this may be a limit rather than a target, and may be equal to a TAC, an ABC, the median result of applying the default harvest policy, or some other number. The JTC welcomes input from the JMC on the best terminology to use for these quantities.

Closed-Loop Simulation: A subset of an MSE that iteratively simulates a population using an operating model, generates data from that population and passes it to an estimation model, uses the estimation model and a management strategy to provide management advice, which then feeds back into the operating model to simulate an additional fixed set of time before repeating this process. This is illustrated in Figure A.2.

Cohort: A group of fish born in the same year. Also see recruitment and year-class.

Constant catch: One of many ways of setting catch in the MSE. In this case, the catch is set equal to a fixed value in all years unless the available biomass is insufficient to support such removals.

Catch Target: A general term used to describe the catch value used for management. Depending on the context, this may be a limit rather than a target, and may be equal to a TAC, an ABC, the median result of applying the default harvest policy, or some other number. The JTC welcomes input from the JMC on the best terminology to use for these quantities.

Cohort: A group of fish born in the same year. Also see recruitment and year-class.

CPUE: Catch-per-unit-effort. See above.

CV: Coefficient of variation. A measure of uncertainty defined as the standard deviation (SD, see below) divided by the mean.

Default harvest policy (rate): The application of $F_{40\%}$ (see below) with the 40:10 adjustment (see above). Having considered any advice provided by the Joint Technical Committee, Scientific Review Group or Advisory Panel, the Joint Management Committee may recommend a different harvest rate if the scientific evidence demonstrates that a different rate is necessary to sustain the offshore hake/whiting resource.

Depletion: Abbreviated term for relative depletion (see below).

DFO: Fisheries and Oceans Canada. Federal organization which delivers programs and services that support sustainable use and development of Canada's waterways and aquatic resources.

DOC: United States Department of Commerce. Parent organization of the National Marine Fisheries Service (NMFS).

El Niño: Abnormally warm ocean climate conditions in the California Current Ecosystem (see above) as a result of broad changes in the Eastern Pacific Ocean across the eastern coast of Latin America (centered on Peru) often around the end of the calendar year.

Estimation model: A single run of Stock Synthesis within a combination of Case, Simulation and Year. The directories containing these results are named "assess2012" through "assess2030" where the year value in this case represents the last year of real or simulated data. The amount of data available to these models is therefore consistent with the stock assessments conducted in the years 2013–2031. There are 18 Estimation Models for each of 999 Simulations within each of 4 Management strategies for a total of 71,928 model results. The estimation models use maximum likelihood estimation, not MCMC.

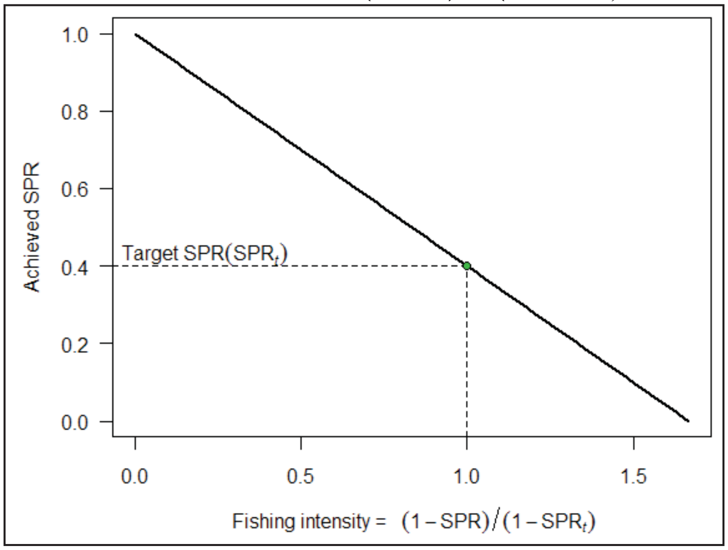
Exploitation fraction: A metric of fishing intensity that represents the total annual catch divided by the estimated population biomass over a range of ages assumed to be vulnerable to the fishery. This value is not equivalent to the instantaneous rate of fishing mortality (see below) or the Spawning Potential Ratio (*SPR*, see below).

F: Instantaneous rate of fishing mortality (or fishing mortality rate, see below).

$F_{40\%}$ (F-40 Percent): The rate of fishing mortality estimated to reduce the spawning potential ratio (SPR, see below) to 40%.

Female spawning biomass: The biomass of mature female fish at the beginning of the year. Occasionally, especially in reference points, this term is used to mean spawning output (expected egg production, see below) when this is not proportional to spawning biomass. See also spawning biomass.

Fishing intensity: A measure of the magnitude of fishing relative to a specified target. In this assessment it is defined as: relative SPR, or the ratio of (1-SPR) to (1-$SPR_{xx\%}$), where "*xx*" is the 40% proxy.



Fishing mortality rate, or instantaneous rate of fishing mortality (F): A metric of fishing intensity that is usually reported in relation to the most highly selected ages(s) or length(s), or occasionally as an average over an age range that is vulnerable to the fishery. Because it is an instantaneous rate operating simultaneously with natural mortality, it is *not* equivalent to exploitation fraction (or percent annual removal; see above) or the Spawning Potential Ratio (*SPR*, see below).

F_{MSY}: The rate of fishing mortality estimated to produce the maximum sustainable yield from the stock.

Harvest Strategy: A formal system for managing a fishery that includes the elements shown in Figure A.1.

Harvest Control Rule: A process for determining an ABC from a stock assessment. (See "40:10 Harvest control rule" above)

Joint Management Committee (JMC): The joint management committee established by the Agreement.

Joint Technical Committee (JTC): The joint technical committee established by the Agreement.

Kt: Knots (nautical miles per hour).

Magnuson-Stevens Fishery Conservation and Management Act: The MSFCMA, sometimes known as the "Magnuson-Stevens Act," established the 200-mile fishery conservation zone, the regional fishery management council system, and other provisions of U.S. marine fishery law.

MAP: maximum a posteriori probability. See below.

Maximum a posteriori probability (MAP) estimate: mode of the posterior distribution used as a point estimate which is similar to the penalized MLE. This is also referred to as the "maximum posterior density" (MPD) in this document.

Maximum posterior density (MPD) estimate: mode of the posterior distribution used as a point estimate which is similar to the penalized MLE. This is also known as the "maximum a posterior probability" (MAP).

Maximum sustainable yield (*MSY*): An estimate of the largest average annual catch that can be continuously taken over a long period of time from a stock under prevailing ecological and environmental conditions.

MCMC: Markov-Chain Monte-Carlo. A numerical method used to sample from the posterior distribution (see below) of parameters and derived quantities in a Bayesian analysis. It is more computationally intensive than the maximum likelihood estimate (MLE, see below), but provides a more accurate depiction of parameter uncertainty. See Stewart et al. (2012) for a discussion of issues related to differences between MCMC and MLE.

MLE: Maximum likelihood estimate. Sometimes used interchangeably with "maximum posterior density estimate" or MPD. A numerical method used to estimate a single value of the parameters and derived quantities. It is less computationally intensive than MCMC methods (see above), but parameter uncertainty is less well characterized.

MPD: maximum posterior density. See above.

MSE: Management Strategy Evaluation. A formal process for evaluating Harvest Strategies (see above). The elements of an MSE are illustrated in Figures A.1 and A.2.

MSY: Maximum sustainable yield. See above.

mt: Metric ton(s). A unit of mass (often referred to as weight) equal to 1000 kilograms or 2,204.62 pounds.

NA: Not available.

National Marine Fisheries Service: A division of the U.S. Department of Commerce, National Ocean and Atmospheric Administration (NOAA). NMFS is responsible for conservation and management of offshore fisheries (and inland salmon).

NMFS: National Marine Fisheries Service. See above.

NOAA: National Oceanic and Atmospheric Administration. The parent agency of the National Marine Fisheries Service.

NORPAC: North Pacific Database Program. A database storing U.S. fishery observer data collected at sea.

NWFSC : Northwest Fisheries Science Center. A division of the NMFS located primarily in Seattle, Washington, but also in Newport, Oregon and other locations.

Operating Model (OM): A model used to simulate data for use in the MSE (see above). The operating model includes components for the stock and fishery dynamics, as well as the simulation of the data sampling process, potentially including observation error. Cases in the MSE (see above) represent alternative configurations of the operating model.

Optimum yield: The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems. The OY is developed based on the acceptable biological catch from the fishery, taking into account relevant economic, social, and ecological factors. In the case of overfished fisheries, the OY provides for rebuilding to the target stock abundance.

OM: Operating Model. See above.

OY: Optimum yield. See above.

PacFIN: Pacific Coast Fisheries Information Network. A database that provides a central repository for commercial fishery information from Washington, Oregon, and California.

PBS: Pacific Biological Station of Fisheries and Oceans Canada (DFO, see above).

Pacific Fishery Management Council (PFMC): The U.S. organization under which historical stock assessments for Pacific Hake were conducted.

Pacific Hake/whiting ("Pacific Hake"): The stock of *Merluccius productus* located in the offshore waters of the United States and Canada (not including smaller stocks located in Puget Sound and the Strait of Georgia).

Posterior distribution: The probability distribution for parameters or derived quantities from a Bayesian model representing the prior probability distributions (see below) updated by the observed data via the likelihood equation. For stock assessments posterior distributions are approximated via numerical methods; one frequently employed method is MCMC (see above).

Prior distribution: Probability distribution for a parameter in a Bayesian analysis that represents the information available before evaluating the observed data via the likelihood equation. For some parameters noninformative priors can be constructed which allow the data to dominate the posterior distribution (see above). For others, informative priors can be constructed based on auxiliary information and/or expert knowledge or opinions.

Q: Catchability. See above.

R_0: Estimated average level of annual recruitment occurring at B_0 (see below).

Recruits/recruitment: A group of fish born in the same year or the estimated production of new members to a fish population of the same age. Recruitment is reported at a specific life stage, often age 0 or 1, but sometimes corresponding to the age at which the fish first become vulnerable to the fishery. See also cohort and year-class.

Recruitment deviation: The offset of the recruitment in a given year relative to the stock-recruit function; values occur on a log scale and are relative to the expected recruitment at a given spawning biomass (see below).

Relative depletion: The ratio of the estimated beginning of the year female spawning biomass to estimated average unfished equilibrium female spawning biomass (B_0, see below). Thus, lower values of relative depletion are associated with fewer mature female fish.

Relative SPR: A measure of fishing intensity transformed to have an interpretation more like *F*: as fishing increases the metric increases. Relative SPR is the ratio of (1-SPR) to (1-$SPR_{xx\%}$), where "*xx*" is the proxy or estimated SPR rate that produces MSY.

SB_0: The estimated average unfished equilibrium female spawning biomass or spawning output if not directly proportional to spawning biomass. See B_0.

$SB_{10\%}$: The level of female spawning biomass (output) corresponding to 10% of average unfished equilibrium female spawning biomass (B_0, size of fish stock without fishing; see above). This is the level at which the calculated catch based on the 40:10 harvest control rule (see above) is equal to 0. See $B_{10\%}$.

$SB_{40\%}$: The level of female spawning biomass (output) corresponding to 40% of average unfished equilibrium female spawning biomass (B_0, size of fish stock without fishing; see below). See $B_{40\%}$.

SB_{MSY}: The estimated female spawning biomass (output) that produces the maximum sustainable yield (*MSY*). Also see $B_{40\%}$.

Scientific Review Group (SRG): The scientific review group established by the Agreement.

Scientific and Statistical Committee (SSC): The scientific advisory committee to the PFMC. The Magnuson-Stevens Act requires that each council maintain an SSC to assist in gathering and analyzing statistical, biological, ecological, economic, social, and other scientific information that is relevant to the management of council fisheries.

SD: Standard deviation. A measure of variability within a sample.

Simulation: State of nature, including combination of parameters controlling stock productivity, 2012 status, and time-series of recruitment deviations. There are 999 simulations for each case, numbered 2–1000. These simulation models are samples from the MCMC calculations associated with the 2011 assessment model.

Spawning biomass: Abbreviated term for female spawning biomass (see above).

Spawning output: The total production of eggs (or possibly viable egg equivalents if egg quality is taken into account) given the number of females at age (and maturity and fecundity at age).

Spawning potential ratio (SPR): A metric of fishing intensity. The ratio of the spawning output per recruit under a given level of fishing to the estimated spawning output per recruit in the absence of fishing. It achieves a value of 1.0 in the absence of fishing and declines toward 0.0 as fishing intensity increases.

Spawning stock biomass (SSB): Alternative term for female spawning biomass (see above).

SPR: Spawning potential ratio. See above.

SPR_{MSY}: The estimated spawning potential ratio that produces the largest sustainable harvest (*MSY*).

$SPR_{40\%}$: The estimated spawning potential ratio that stabilizes the female spawning biomass at the MSY-proxy target of $B_{40\%}$. Also referred to as $SPR_{MSY\text{-}proxy}$.

SS: Stock Synthesis. See below.

SSC: Scientific and Statistical Committee (see above).

STAR Panel: Stock Assessment Review Panel. A panel set up to provide independent review of all stock assessments used by the Pacific Fishery Management Council.

Steepness (*h*): A stock-recruit relationship parameter representing the proportion of R_0 expected (on average) when the female spawning biomass is reduced to 20% of B_0 (i.e., when relative depletion is equal to 20%). This parameter can be thought of one important component to the productivity of the stock.

Stock Synthesis: The age-structured stock assessment model applied in this stock assessment. For a more detailed description of this model, see Methot and Wetzel (2013).

Target strength: The amount of backscatter from an individual acoustic target.

Total Allowable Catch (TAC): The maximum fishery removal under the terms of the Agreement.

U.S./Canadian allocation: The division of the total allowable catch of 73.88% as the United States' share and 26.12% as the Canadian share.

Vulnerable biomass: The demographic portion of the stock available for harvest by the fishery.

Year-class: A group of fish born in the same year. See also Cohort and Recruitment.

Appendix C. Details on non-parametric selectivity

For all ages in the population beginning with A_{min} = 1 for the fishery and 2 for the survey, there is a corresponding set of selectivity parameters for each fleet, p_a. The selectivity at age a is computed as,

$$S_a = \exp(S'_a - S'_{max})$$

where S'_a is the sum of parameters for ages up to a,

$$S'_a = \sum_{i=A_{min}}^{a} p_a$$

and S'_{max} is the maximum of the S'_a,

$$S'_{max} = \max(S'_a)$$

Selectivity is fixed at $S_a = 0$ for $a < A_{min}$. This formulation has the properties that the maximum selectivity is equal to 1, positive p_a values are associated with increasing selectivity between ages a-1 and a, and negative values are associated with decreasing selectivity between those ages. The parameters beyond the maximum age for which selectivity is estimated (6 in the base model) are fixed at $p_a = 0$, resulting in constant selectivity beyond the last estimated value. The condition that maximum selectivity is equal to 1 results in one fewer degree of freedom than the number of estimated selectivity values. Therefore, the parameter corresponding to the first age of estimated selectivity (1 for the fishery and 2 for the survey), is fixed at 0.

Time-varying fishery selectivity is implemented through annual deviations in each of the estimated parameters for each age, p_a. This is formulated as

$$p_{a,y} = p_a + \varepsilon_{a,y}$$

where the $\varepsilon_{a,y}$ are additional parameters estimated in the model. The values of $\varepsilon_{a,y}$ are included in an additional likelihood component with negative log likelihood proportional to

$$-\log(L) \propto \frac{1}{2}\sum_{a=2}^{6}\sum_{y=1991}^{2013}\frac{{\varepsilon_{a,y}}^2}{\varphi^2}$$

The φ value is set to 0.03 in the base model based on a selection process described in the Methods section.

Appendix D. Estimated parameters in the base assessment model

Parameter	Posterior median
NatM_p_1_Fem_GP_1	0.2218
SR_LN.R0.	14.8160
SR_BH_steep	0.8264
Early_InitAge_20	-0.2194
Early_InitAge_19	-0.0331
Early_InitAge_18	-0.0207
Early_InitAge_17	-0.0538
Early_InitAge_16	-0.0524
Early_InitAge_15	-0.1226
Early_InitAge_14	-0.0952
Early_InitAge_13	-0.1548
Early_InitAge_12	-0.2268
Early_InitAge_11	-0.2108
Early_InitAge_10	-0.2051
Early_InitAge_9	-0.2887
Early_InitAge_8	-0.4210
Early_InitAge_7	-0.3234
Early_InitAge_6	-0.3779
Early_InitAge_5	-0.4489
Early_InitAge_4	-0.3908
Early_InitAge_3	-0.3023
Early_InitAge_2	-0.2245
Early_InitAge_1	0.0085
Early_RecrDev_1966	0.3789
Early_RecrDev_1967	1.3093
Early_RecrDev_1968	0.7442
Early_RecrDev_1969	-0.1214
Main_RecrDev_1970	2.0883
Main_RecrDev_1971	-0.2657
Main_RecrDev_1972	-0.7569
Main_RecrDev_1973	1.4784
Main_RecrDev_1974	-0.9624
Main_RecrDev_1975	0.2390
Main_RecrDev_1976	-1.0903
Main_RecrDev_1977	1.6309
Main_RecrDev_1978	-1.2938
Main_RecrDev_1979	-0.0102
Main_RecrDev_1980	2.8139
Main_RecrDev_1981	-1.1733
Main_RecrDev_1982	-1.4240
Main_RecrDev_1983	-0.9030
Main_RecrDev_1984	2.5437

Parameter	Posterior median
Main_RecrDev_1985	-1.5907
Main_RecrDev_1986	-1.6652
Main_RecrDev_1987	1.6569
Main_RecrDev_1988	0.6224
Main_RecrDev_1989	-1.7088
Main_RecrDev_1990	1.4653
Main_RecrDev_1991	-0.6553
Main_RecrDev_1992	-1.7323
Main_RecrDev_1993	1.2079
Main_RecrDev_1994	0.8936
Main_RecrDev_1995	0.2905
Main_RecrDev_1996	0.5047
Main_RecrDev_1997	0.3057
Main_RecrDev_1998	0.6686
Main_RecrDev_1999	2.5193
Main_RecrDev_2000	-0.9330
Main_RecrDev_2001	-0.0902
Main_RecrDev_2002	-2.6048
Main_RecrDev_2003	0.3556
Main_RecrDev_2004	-2.6231
Main_RecrDev_2005	0.9120
Main_RecrDev_2006	0.6893
Main_RecrDev_2007	-2.2801
Main_RecrDev_2008	1.7819
Main_RecrDev_2009	0.8704
Late_RecrDev_2010	2.8826
Late_RecrDev_2011	-0.8993
Late_RecrDev_2012	-0.1142
Late_RecrDev_2013	0.1051
ForeRecr_2014	-0.0708
ForeRecr_2015	-0.0200
ForeRecr_2016	-0.0131
Q_extraSD_2_Acoustic_Survey	0.3604
AgeSel_1P_3_Fishery	3.3848
AgeSel_1P_4_Fishery	1.4404
AgeSel_1P_5_Fishery	0.4506
AgeSel_1P_6_Fishery	0.1574
AgeSel_1P_7_Fishery	0.2542
AgeSel_2P_4_Acoustic_Survey	0.3641
AgeSel_2P_5_Acoustic_Survey	0.0379
AgeSel_2P_6_Acoustic_Survey	-0.0642
AgeSel_2P_7_Acoustic_Survey	0.4381

AgeSel Parameters	Posterior median
3_Fishery_DEVadd_1991	-0.0012
3_Fishery_DEVadd_1992	-0.0004
3_Fishery_DEVadd_1993	0.0003
3_Fishery_DEVadd_1994	-0.0023
3_Fishery_DEVadd_1995	0.0009
3_Fishery_DEVadd_1996	0.0006
3_Fishery_DEVadd_1997	-0.0015
3_Fishery_DEVadd_1998	-0.0004
3_Fishery_DEVadd_1999	0.0009
3_Fishery_DEVadd_2000	0.0042
3_Fishery_DEVadd_2001	0.0003
3_Fishery_DEVadd_2002	0.0012
3_Fishery_DEVadd_2003	-0.0001
3_Fishery_DEVadd_2004	0.0006
3_Fishery_DEVadd_2005	0.0017
3_Fishery_DEVadd_2006	0.0001
3_Fishery_DEVadd_2007	0.0019
3_Fishery_DEVadd_2008	0.0015
3_Fishery_DEVadd_2009	0.0013
3_Fishery_DEVadd_2010	0.0034
3_Fishery_DEVadd_2011	0.0031
3_Fishery_DEVadd_2012	-0.0018
3_Fishery_DEVadd_2013	-0.0005
4_Fishery_DEVadd_1991	0.0000
4_Fishery_DEVadd_1992	0.0008
4_Fishery_DEVadd_1993	0.0007
4_Fishery_DEVadd_1994	0.0010
4_Fishery_DEVadd_1995	0.0043
4_Fishery_DEVadd_1996	-0.0083
4_Fishery_DEVadd_1997	0.0038
4_Fishery_DEVadd_1998	0.0021
4_Fishery_DEVadd_1999	-0.0072
4_Fishery_DEVadd_2000	0.0064
4_Fishery_DEVadd_2001	0.0330
4_Fishery_DEVadd_2002	0.0034
4_Fishery_DEVadd_2003	0.0018
4_Fishery_DEVadd_2004	0.0001
4_Fishery_DEVadd_2005	0.0079
4_Fishery_DEVadd_2006	-0.0014
4_Fishery_DEVadd_2007	-0.0047
4_Fishery_DEVadd_2008	0.0039
4_Fishery_DEVadd_2009	0.0029

AgeSel Parameters	Posterior median
4_Fishery_DEVadd_2010	0.0073
4_Fishery_DEVadd_2011	-0.0055
4_Fishery_DEVadd_2012	-0.0146
4_Fishery_DEVadd_2013	0.0025
5_Fishery_DEVadd_1991	-0.0071
5_Fishery_DEVadd_1992	-0.0003
5_Fishery_DEVadd_1993	-0.0026
5_Fishery_DEVadd_1994	0.0033
5_Fishery_DEVadd_1995	0.0040
5_Fishery_DEVadd_1996	-0.0021
5_Fishery_DEVadd_1997	-0.0035
5_Fishery_DEVadd_1998	-0.0039
5_Fishery_DEVadd_1999	-0.0106
5_Fishery_DEVadd_2000	0.0148
5_Fishery_DEVadd_2001	0.0259
5_Fishery_DEVadd_2002	0.0224
5_Fishery_DEVadd_2003	0.0077
5_Fishery_DEVadd_2004	-0.0010
5_Fishery_DEVadd_2005	0.0089
5_Fishery_DEVadd_2006	0.0008
5_Fishery_DEVadd_2007	-0.0068
5_Fishery_DEVadd_2008	0.0019
5_Fishery_DEVadd_2009	0.0008
5_Fishery_DEVadd_2010	0.0097
5_Fishery_DEVadd_2011	-0.0359
5_Fishery_DEVadd_2012	-0.0127
5_Fishery_DEVadd_2013	-0.0093
6_Fishery_DEVadd_1991	-0.0066
6_Fishery_DEVadd_1992	-0.0026
6_Fishery_DEVadd_1993	-0.0021
6_Fishery_DEVadd_1994	0.0091
6_Fishery_DEVadd_1995	0.0082
6_Fishery_DEVadd_1996	-0.0042
6_Fishery_DEVadd_1997	-0.0024
6_Fishery_DEVadd_1998	-0.0029
6_Fishery_DEVadd_1999	-0.0168
6_Fishery_DEVadd_2000	0.0205
6_Fishery_DEVadd_2001	0.0002
6_Fishery_DEVadd_2002	0.0105
6_Fishery_DEVadd_2003	0.0092
6_Fishery_DEVadd_2004	-0.0025
6_Fishery_DEVadd_2005	0.0070

AgeSel Parameters	Posterior median
6_Fishery_DEVadd_2006	0.0011
6_Fishery_DEVadd_2007	-0.0021
6_Fishery_DEVadd_2008	0.0026
6_Fishery_DEVadd_2009	0.0117
6_Fishery_DEVadd_2010	-0.0273
6_Fishery_DEVadd_2011	-0.0336
6_Fishery_DEVadd_2012	-0.0028
6_Fishery_DEVadd_2013	0.0051
7_Fishery_DEVadd_1991	-0.0081
7_Fishery_DEVadd_1992	0.0058
7_Fishery_DEVadd_1993	-0.0045
7_Fishery_DEVadd_1994	0.0103
7_Fishery_DEVadd_1995	0.0068
7_Fishery_DEVadd_1996	-0.0006
7_Fishery_DEVadd_1997	0.0005
7_Fishery_DEVadd_1998	-0.0102
7_Fishery_DEVadd_1999	-0.0110
7_Fishery_DEVadd_2000	0.0209
7_Fishery_DEVadd_2001	-0.0138
7_Fishery_DEVadd_2002	0.0062
7_Fishery_DEVadd_2003	0.0025
7_Fishery_DEVadd_2004	-0.0009
7_Fishery_DEVadd_2005	0.0051
7_Fishery_DEVadd_2006	-0.0093
7_Fishery_DEVadd_2007	-0.0039
7_Fishery_DEVadd_2008	-0.0037
7_Fishery_DEVadd_2009	0.0124
7_Fishery_DEVadd_2010	-0.0273
7_Fishery_DEVadd_2011	-0.0247
7_Fishery_DEVadd_2012	-0.0035
7_Fishery_DEVadd_2013	0.0189

Appendix E. SS data file

```
#C 2014 Hake control file - pre-SRG base model (run 21)
###################################################

### Global model specifications ###
1966    # Start year
2013    # End year
1       # Number of seasons/year
12      # Number of months/season
1       # Spawning occurs at beginning of season
1       # Number of fishing fleets
1       # Number of surveys
1       # Number of areas
Fishery%Acoustic_Survey
0.5 0.5 # fleet timing_in_season
1 1     # Area of each fleet
1       # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01    # SE of log(catch) by fleet for equilibrium and continuous options
1       # Number of genders
20      # Number of ages in population dynamics

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

48 # Number of lines of catch
# Catch  Year    Season
137700   1966    1
214370   1967    1
122180   1968    1
180130   1969    1
234590   1970    1
154620   1971    1
117540   1972    1
162640   1973    1
211260   1974    1
221350   1975    1
237520   1976    1
132690   1977    1
103637   1978    1
137110   1979    1
89930    1980    1
139120   1981    1
107741   1982    1
113931   1983    1
138492   1984    1
110399   1985    1
210616   1986    1
234148   1987    1
248840   1988    1
```

```
298079   1989    1
261286   1990    1
319705   1991    1  #updated 1/6/2014
299650   1992    1  #updated 1/6/2014
198905   1993    1  #updated 1/6/2014
362415   1994    1  #updated 1/6/2014
249495   1995    1  #updated 1/6/2014
306301   1996    1  #updated 1/6/2014
325168   1997    1  #updated 1/6/2014
320722   1998    1  #updated 1/6/2014
311922   1999    1  #updated 1/6/2014
228211   2000    1  #updated 1/6/2014
227529   2001    1  #updated 1/6/2014
180692   2002    1  #updated 1/6/2014
205175   2003    1  #updated 1/6/2014
342323   2004    1  #updated 1/6/2014
363157   2005    1
361761   2006    1  #updated 1/6/2014
291129   2007    1
322144   2008    1  #updated 1/6/2014
177209   2009    1  #updated 1/6/2014
226195   2010    1  #updated 1/6/2014
285850   2011    1
206350   2012    1
283510   2013    1  #updated 1/6/2014
# catches from 1991 to 2013 were updated because the US at-sea fleet was split
# by CP and MS and expansions were done for each instead of combined.

19 # Number of index observations
# Units: 0=numbers,1=biomass,2=F; Errortype: -1=normal,0=lognormal,>0=T
# Fleet Units Errortype
1 1 0 # Fishery
2 1 0 # Acoustic Survey

# Acoustic survey
# Year  seas    fleet   obs       se(log)
1995    1       2       1517948   0.0666
1996    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
1997    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
1998    1       2       1342740   0.0492
1999    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2000    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2001    1       2        918622   0.0823
2002    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2003    1       2       2520641   0.0709
2004    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2005    1       2       1754722   0.0847
2006    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2007    1       2       1122809   0.0752
2008    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2009    1       2       1612027   0.1375
```

```
2010    1       -2            1   1         #dummy observation to get expected value (negative fleet = no influence on results)
2011    1       2        521476   0.1015
2012    1       2       1380724   0.0475
2013    1       2       2422661   0.0433    #updated from 12/25/13 results on 1/7/2014

0  #_N_fleets_with_discard
0  #_N_discard_obs
0  #_N_meanbodywt_obs
30 #_DF_for_meanbodywt_T-distribution_like

## Population size structure
2  # Length bin method: 1=use databins; 2=generate from binwidth,min,max below;
2  # Population length bin width
10 # Minimum size bin
70 # Maximum size bin

-1      # Minimum proportion for compressing tails of observed compositional data
0.001   # Constant added to expected frequencies
0       # Combine males and females at and below this bin number

26 # Number of Data Length Bins
# Lower edge of bins
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70
0 #_N_Length_obs

15 #_N_age_bins
# Age bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

41 # N_ageerror_definitions
# No ageing error
#0.5    1.5     2.5     3.5     4.5     5.5     6.5     7.5     8.5     9.5     10.5    11.5    12.5    13.5    14.5    15.5    16.5
17.5    18.5    19.5    20.5
#0.001  0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001
0.001   0.001   0.001   0.001
# Baseline ageing error
#0.5    1.5     2.5     3.5     4.5     5.5     6.5     7.5     8.5     9.5     10.5    11.5    12.5    13.5    14.5    15.5    16.5
17.5    18.5    19.5    20.5
#0.329  0.329   0.347   0.369   0.395   0.428   0.468   0.518   0.579   0.653   0.745   0.858   0.996   1.167   1.376   1.632   1.858
2.172   2.530   2.934   3.388
# Annual keys with cohort effect
0.5      1.5       2.5       3.5       4.5       5.5       6.5       7.5       8.5       9.5       10.5       11.5       12.5
13.5      14.5       15.5      16.5    17.5    18.5    19.5    20.5
0.329242 0.329242  0.346917  0.368632  0.395312  0.42809   0.468362  0.517841  0.57863   0.653316  0.745076   0.857813   0.996322
1.1665    1.37557    1.63244   1.858   2.172   2.53    2.934   3.388
0.5      1.5       2.5       3.5       4.5       5.5       6.5       7.5       8.5       9.5       10.5       11.5       12.5
13.5      14.5       15.5      16.5    17.5    18.5    19.5    20.5
0.329242 0.329242  0.346917  0.368632  0.395312  0.42809   0.468362  0.517841  0.57863   0.653316  0.745076   0.857813   0.996322
1.1665    1.37557    1.63244   1.858   2.172   2.53    2.934   3.388
0.5      1.5       2.5       3.5       4.5       5.5       6.5       7.5       8.5       9.5       10.5       11.5       12.5
13.5      14.5       15.5      16.5    17.5    18.5    19.5    20.5
```

```
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.1810831 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.1908044 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.2027476 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.2174216 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.1810831 0.346917 0.368632 0.395312 0.2354495 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.1908044 0.368632 0.395312 0.42809 0.2575991 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.2027476 0.395312 0.42809 0.468362 0.2848125 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.2174216	0.42809	0.468362	0.517841	0.3182465	0.653316	0.745076	0.857813	0.996322
1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.2354495	0.468362	0.517841	0.57863	0.3593238	0.745076	0.857813	0.996322
1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.2575991	0.517841	0.57863	0.653316	0.4097918	0.857813	0.996322
1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.2848125	0.57863	0.653316	0.745076	0.4717971	0.996322
1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.3182465	0.653316	0.745076	0.857813	0.5479771
1.1665	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.3593238	0.745076	0.857813	0.996322
0.641575	1.37557	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.4097918	0.857813	0.996322
1.1665	0.7565635	1.63244	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.4717971	0.996322
1.1665	1.37557	0.897842	1.858	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.5479771
1.1665	1.37557	1.63244	1.0219	2.172	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
0.641575	1.37557	1.63244	1.858	1.1946	2.53	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
1.1665	0.7565635	1.63244	1.858	2.172	1.3915	2.934	3.388					
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5					
0.329242	0.329242	0.346917	0.368632	0.395312	0.42809	0.468362	0.517841	0.57863	0.653316	0.745076	0.857813	0.996322
1.1665	1.37557	0.897842	1.858	2.172	2.53	1.6137	3.388					
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					

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0.329242 0.1810831 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.0219 2.172 2.53 2.934 1.8634
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.1908044 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 1.1946 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.2027476 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 1.3915 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.2174216 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 1.6137 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.2354495 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 1.8634
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
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0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.2575991 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.2848125 0.57863 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.3182465 0.653316 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.3593238 0.745076 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.1810831 0.346917 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.4097918 0.857813 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.1908044 0.368632 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.4717971 0.996322
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.1810831 0.346917 0.202748 0.395312 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.547977
1.1665 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5
13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5
0.329242 0.329242 0.1908044 0.368632 0.2174216 0.42809 0.468362 0.517841 0.57863 0.653316 0.745076 0.857813 0.996322
0.641575 1.37557 1.63244 1.858 2.172 2.53 2.934 3.388
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0.5      1.5       2.5       3.5       4.5       5.5       6.5       7.5       8.5       9.5       10.5      11.5      12.5
13.5      14.5      15.5      16.5      17.5    18.5    19.5    20.5
0.329242 0.329242  0.346917  0.202748  0.395312  0.42809   0.468362  0.517841  0.57863   0.653316  0.745076  0.857813  0.996322
1.1665    1.37557   1.63244   1.858    2.172   2.53    2.934   3.388

#Age comps updated 1/6/2014
49   # Number of age comp observations
1    # Length bin refers to: 1=population length bin indices; 2=data length bin indices
0    #_combine males into females at or below this bin number
# Acoustic survey ages (N=10)
#year   Season  Fleet   Sex     Partition       AgeErr  LbinLo  LbinHi  nTrips  a1      a2      a3      a4      a5      a6      a7
a8      a9      a10     a11     a12     a13     a14     a15
1995    1       2       0       0       23      -1      -1      68      0.000   0.304   0.048   0.014   0.209   0.012   0.042   0.144
0.003   0.001   0.165   0.001   0.007   0.000   0.051
1998    1       2       0       0       26      -1      -1      103     0.000   0.125   0.144   0.168   0.191   0.016   0.076   0.093
0.014   0.028   0.061   0.005   0.003   0.061   0.015
2001    1       2       0       0       29      -1      -1      57      0.000   0.641   0.104   0.054   0.060   0.030   0.037   0.022
0.011   0.010   0.008   0.008   0.010   0.002   0.004
2003    1       2       0       0       31      -1      -1      71      0.000   0.024   0.023   0.635   0.092   0.031   0.070   0.042
0.028   0.026   0.011   0.007   0.005   0.004   0.004
2005    1       2       0       0       33      -1      -1      47      0.000   0.229   0.021   0.069   0.048   0.492   0.053   0.020
0.027   0.016   0.013   0.007   0.002   0.001   0.002
2007    1       2       0       0       35      -1      -1      70      0.000   0.366   0.022   0.108   0.013   0.044   0.030   0.334
0.034   0.017   0.014   0.007   0.007   0.003   0.001
2009    1       2       0       0       37      -1      -1      66      0.000   0.006   0.299   0.421   0.023   0.082   0.012   0.016
0.015   0.073   0.032   0.013   0.003   0.004   0.002
2011    1       2       0       0       39      -1      -1      59      0.000   0.244   0.631   0.039   0.029   0.030   0.004   0.004
0.003   0.002   0.001   0.007   0.003   0.001   0.000
2012    1       2       0       0       40      -1      -1      96      0.000   0.637   0.097   0.161   0.022   0.026   0.019   0.01
0.005   0.003   0.002   0.006   0.009   0.005   0.001
2013    1       2       0       0       41      -1      -1      67      0.000   0.020   0.762   0.056   0.085   0.009   0.020   0.025
0.007   0.003   0.001   0.001   0.003   0.006   0.003

#Aggregate marginal fishery age comps (n=39)
#year   Season  Fleet   Sex     Partition       AgeErr  LbinLo  LbinHi  nTrips  a1      a2      a3      a4      a5      a6      a7
a8      a9      a10     a11     a12     a13     a14     a15
1975    1       1       0       0       3       -1      -1      13      0.046   0.338   0.074   0.012   0.254   0.055   0.080   0.105
0.010   0.006   0.009   0.005   0.000   0.005   0.000
1976    1       1       0       0       4       -1      -1      142     0.001   0.013   0.145   0.067   0.041   0.246   0.098   0.089
0.121   0.054   0.043   0.041   0.011   0.024   0.007
1977    1       1       0       0       5       -1      -1      320     0.000   0.084   0.037   0.275   0.036   0.091   0.227   0.076
0.065   0.040   0.036   0.023   0.006   0.003   0.001
1978    1       1       0       0       6       -1      -1      341     0.005   0.011   0.065   0.063   0.264   0.061   0.089   0.215
0.098   0.047   0.047   0.023   0.005   0.004   0.003
1979    1       1       0       0       7       -1      -1      116     0.000   0.065   0.102   0.094   0.057   0.177   0.103   0.174
0.128   0.042   0.029   0.010   0.016   0.000   0.004
1980    1       1       0       0       8       -1      -1      221     0.001   0.005   0.301   0.019   0.045   0.082   0.112   0.050
0.089   0.111   0.095   0.026   0.038   0.015   0.011
1981    1       1       0       0       9       -1      -1      154     0.195   0.040   0.014   0.267   0.039   0.055   0.034   0.147
0.038   0.032   0.102   0.023   0.005   0.002   0.007
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1982	1	1	0	0	10	-1	-1	170	0.000	0.321	0.035	0.005	0.273	0.015	0.037	0.039
0.118	0.033	0.036	0.076	0.002	0.003	0.007										
1983	1	1	0	0	11	-1	-1	117	0.000	0.000	0.341	0.040	0.018	0.235	0.051	0.056
0.053	0.094	0.039	0.031	0.023	0.011	0.007										
1984	1	1	0	0	12	-1	-1	123	0.000	0.000	0.014	0.621	0.036	0.038	0.168	0.028
0.015	0.012	0.033	0.009	0.006	0.014	0.005										
1985	1	1	0	0	13	-1	-1	56	0.010	0.001	0.003	0.073	0.688	0.080	0.049	0.063
0.018	0.006	0.006	0.002	0.000	0.000	0.000										
1986	1	1	0	0	14	-1	-1	120	0.000	0.160	0.056	0.005	0.008	0.428	0.067	0.080
0.083	0.022	0.028	0.018	0.033	0.005	0.007										
1987	1	1	0	0	15	-1	-1	56	0.000	0.000	0.296	0.029	0.001	0.010	0.533	0.004
0.012	0.071	0.000	0.007	0.019	0.018	0.000										
1988	1	1	0	0	16	-1	-1	81	0.000	0.008	0.000	0.384	0.011	0.015	0.002	0.394
0.011	0.005	0.111	0.008	0.000	0.000	0.051										
1989	1	1	0	0	17	-1	-1	77	0.000	0.073	0.032	0.003	0.501	0.016	0.003	0.001
0.321	0.023	0.001	0.023	0.001	0.000	0.000										
1990	1	1	0	0	18	-1	-1	163	0.000	0.052	0.179	0.017	0.006	0.347	0.003	0.002
0.000	0.321	0.003	0.001	0.060	0.000	0.009										
1991	1	1	0	0	19	-1	-1	160	0.000	0.035	0.204	0.196	0.025	0.007	0.278	0.011
0.001	0.002	0.192	0.004	0.000	0.036	0.007										
1992	1	1	0	0	20	-1	-1	243	0.005	0.042	0.042	0.130	0.187	0.022	0.010	0.340
0.008	0.001	0.003	0.181	0.004	0.000	0.024										
1993	1	1	0	0	21	-1	-1	175	0.000	0.010	0.230	0.032	0.127	0.156	0.015	0.008
0.278	0.007	0.001	0.000	0.121	0.001	0.014										
1994	1	1	0	0	22	-1	-1	234	0.000	0.000	0.029	0.228	0.012	0.131	0.197	0.010
0.003	0.286	0.001	0.003	0.000	0.089	0.008										
1995	1	1	0	0	23	-1	-1	147	0.002	0.025	0.005	0.058	0.315	0.018	0.072	0.190
0.024	0.006	0.180	0.030	0.005	0.001	0.071										
1996	1	1	0	0	24	-1	-1	186	0.000	0.182	0.158	0.014	0.078	0.183	0.010	0.054
0.109	0.004	0.003	0.159	0.000	0.001	0.045										
1997	1	1	0	0	25	-1	-1	222	0.000	0.008	0.272	0.250	0.010	0.084	0.130	0.024
0.049	0.065	0.015	0.002	0.064	0.006	0.022										
1998	1	1	0	0	26	-1	-1	243	0.000	0.053	0.188	0.203	0.283	0.032	0.050	0.091
0.010	0.017	0.037	0.003	0.001	0.026	0.005										
1999	1	1	0	0	27	-1	-1	514	0.000	0.095	0.198	0.181	0.187	0.136	0.028	0.034
0.036	0.009	0.014	0.040	0.004	0.003	0.035										
2000	1	1	0	0	28	-1	-1	529	0.010	0.044	0.094	0.147	0.134	0.210	0.137	0.067
0.048	0.027	0.020	0.022	0.011	0.008	0.024										
2001	1	1	0	0	29	-1	-1	541	0.000	0.168	0.154	0.231	0.174	0.081	0.078	0.049
0.012	0.013	0.012	0.007	0.007	0.005	0.009										
2002	1	1	0	0	30	-1	-1	450	0.000	0.000	0.505	0.149	0.102	0.056	0.039	0.063
0.045	0.007	0.007	0.012	0.002	0.004	0.009										
2003	1	1	0	0	31	-1	-1	457	0.000	0.001	0.012	0.690	0.115	0.035	0.049	0.031
0.026	0.022	0.007	0.003	0.005	0.002	0.003										
2004	1	1	0	0	32	-1	-1	501	0.000	0.000	0.046	0.061	0.690	0.084	0.022	0.044
0.025	0.011	0.009	0.003	0.002	0.002	0.001										
2005	1	1	0	0	33	-1	-1	613	0.000	0.006	0.004	0.066	0.053	0.690	0.083	0.023
0.028	0.022	0.011	0.010	0.002	0.001	0.002										
2006	1	1	0	0	34	-1	-1	720	0.003	0.028	0.103	0.018	0.089	0.052	0.589	0.055
0.015	0.022	0.011	0.008	0.004	0.001	0.001										

```
2007    1       1       0       0       35      -1      -1      629     0.008   0.113   0.037   0.151   0.015   0.071   0.039   0.451
0.057   0.019   0.018   0.008   0.004   0.006   0.003
2008    1       1       0       0       36      -1      -1      794     0.008   0.089   0.299   0.023   0.149   0.011   0.037   0.033
0.290   0.031   0.010   0.009   0.005   0.003   0.004
2009    1       1       0       0       37      -1      -1      686     0.007   0.005   0.287   0.270   0.030   0.109   0.010   0.024
0.019   0.182   0.034   0.008   0.012   0.002   0.003
2010    1       1       0       0       38      -1      -1      873     0.000   0.243   0.033   0.369   0.214   0.024   0.029   0.006
0.006   0.011   0.047   0.011   0.001   0.001   0.002
2011    1       1       0       0       39      -1      -1      1081    0.028   0.091   0.653   0.030   0.077   0.058   0.014   0.011
0.004   0.003   0.005   0.017   0.003   0.003   0.003
2012    1       1       0       0       40      -1      -1      851     0.002   0.413   0.106   0.305   0.022   0.052   0.041   0.015
0.007   0.006   0.005   0.005   0.012   0.004   0.003
2013    1       1       0       0       41      -1      -1      871     0.000   0.005   0.669   0.067   0.123   0.017   0.032   0.025
0.012   0.009   0.003   0.003   0.006   0.022   0.005

0 # No Mean size-at-age data
0 # Total number of environmental variables
0 # Total number of environmental observations
0 # No Weight frequency data
0 # No tagging data
0 # No morph composition data

999 # End data file
```

Appendix F. SS control file

```
#C 2014 Hake control file - pre-SRG base model (run 21)
###################################################

1       # N growth patterns
1       # N sub morphs within patterns
0       # Number of block designs for time varying parameters

# Mortality and growth specifications
0.5     # Fraction female (birth)
0       # M setup: 0=single parameter,1=breakpoints,2=Lorenzen,3=age-specific;4=age-specific,seasonal interpolation
1       # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
1       # Age for growth Lmin
20      # Age for growth Lmax
0.0     # Constant added to SD of LAA (0.1 mimics SS2v1 for compatibility only)
0       # Variability of growth: 0=CV~f(LAA), 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
5       #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity;
5=read fec and wt from wtatage.ss
2       # First age allowed to mature
1       # Fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0       # Hermaphroditism option:  0=none; 1=age-specific fxn
1       # MG parm offset option: 1=none, 2= M,G,CV_G as offset from GP1, 3=like SS2v1
1       # MG parm env/block/dev_adjust_method: 1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/no bound check

# Lo     Hi     Init    Prior   Prior   Prior   Param   Env     Use     Dev     Dev     Dev     Block   block
# bnd    bnd    value   mean    type    SD      phase   var     dev     minyr   maxyr   SD      design  switch
### Mortality
0.05     0.4    0.2     -1.609438 3     0.1     4       0       0       0       0       0       0       0       # M
### Growth parameters ignored in empirical input approach
2       15      5       32      -1      99      -5      0       0       0       0       0       0       0       # A0
45      60      53.2    50      -1      99      -3      0       0       0       0       0       0       0       # Linf
0.2     0.4     0.30    0.3     -1      99      -3      0       0       0       0       0       0       0       # VBK
0.03    0.16    0.066   0.1     -1      99      -5      0       0       0       0       0       0       0       # CV of len@age 0
0.03    0.16    0.062   0.1     -1      99      -5      0       0       0       0       0       0       0       # CV of len@age inf
# W-L, maturity and fecundity parameters
# Female placeholders (wtatage overrides these)
-3      3       7.0E-06 7.0E-06 -1      99      -50     0       0       0       0       0       0       0       # F W-L slope
-3      3       2.9624  2.9624  -1      99      -50     0       0       0       0       0       0       0       # F W-L exponent
# Maturity ok from 2010 assessment
-3      43      36.89   36.89   -1      99      -50     0       0       0       0       0       0       0       # L at 50% maturity
-3      3       -0.48   -0.48   -1      99      -50     0       0       0       0       0       0       0       # F Logistic maturity
slope
# No fecundity relationship
-3      3       1.0     1.0     -1      99      -50     0       0       0       0       0       0       0       # F Eggs/gm intercept
-3      3       0.0     0.0     -1      99      -50     0       0       0       0       0       0       0       # F Eggs/gm slope
# Unused recruitment interactions
0       2       1       1       -1      99      -50     0       0       0       0       0       0       0       # placeholder only
0       2       1       1       -1      99      -50     0       0       0       0       0       0       0       # placeholder only
0       2       1       1       -1      99      -50     0       0       0       0       0       0       0       # placeholder only
```

```
0       2       1       1       -1      99      -50     0       0       0       0       0       0       0       # placeholder only
0 0 0 0 0 0 0 0 0 0 # Unused MGparm_seas_effects

# Spawner-recruit parameters
3 # S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no steepness or bias adjustment
# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
13      17      15.9    15      -1      99      1       # Ln(R0)
0.2     1       0.88    0.777   2       0.113   4       # Steepness with Myers' prior
1.0     1.6     1.4     1.1     -1      99      -6      # Sigma-R
-5      5       0       0       -1      99      -50     # Env link coefficient
-5      5       0       0       -1      99      -50     # Initial equilibrium recruitment offset
 0      2       0       1       -1      99      -50     # Autocorrelation in rec devs
0 # index of environmental variable to be used
0 # SR environmental target: 0=none;1=devs;_2=R0;_3=steepness
1 # Recruitment deviation type: 0=none; 1=devvector; 2=simple deviations

# Recruitment deviations
1970    # Start year standard recruitment devs
2009    # End year standard recruitment devs
1       # Rec Dev phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
1946    # Start year for early rec devs
3       # Phase for early rec devs
5       # Phase for forecast recruit deviations
1       # Lambda for forecast recr devs before endyr+1
1965    # Last recruit dev with no bias_adjustment
1971    # First year of full bias correction (linear ramp from year above)
2010    # Last year for full bias correction in_MPD
2012    # First_recent_yr_nobias_adj_in_MPD
0.87    # Maximum bias adjustment in MPD
0       # Period of cycles in recruitment (N parms read below)
-6      # Lower bound rec devs
6       # Upper bound rec devs
0       # Read init values for rec devs

# Fishing mortality setup
0.1     # F ballpark for tuning early phases
-1999   # F ballpark year
1       # F method:  1=Pope's; 2=Instan. F; 3=Hybrid
0.95    # Max F or harvest rate (depends on F_Method)

# Init F parameters by fleet
#LO     HI      INIT    PRIOR   PR_type SD      PHASE
0       1       0.0     0.01    -1      99       -50
```

```
# Catchability setup
# A=do power: 0=skip, survey is prop. to abundance, 1= add par for non-linearity
# B=env. link: 0=skip, 1= add par for env. effect on Q
# C=extra SD: 0=skip, 1= add par. for additive constant to input SE (in ln space)
# D=type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean unbiased, 2=estimate par for ln(Q)
#          3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
#A      B       C       D
0       0       0       0       # Fishery
0       0       1       0       # Survey
#LO     HI      INIT    PRIOR   PR_type SD      PHASE
0.05    1.2     0.0755  0.0755  -1      0.1     4 # additive value for acoustic survey

#_SELEX_&_RETENTION_PARAMETERS
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes
# D=Extra input (#)
# A B C D
# Size selectivity
0       0       0       0  # Fishery
0       0       0       0  # Acoustic_Survey
# Age selectivity
17      0       0       20  # Fishery
17      0       0       20  # Acoustic_Survey

# Selectivity parameters
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev     Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr   maxyr   SD      design  switch
# Fishery age-based
  -1002 3       -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 0
  -1    1        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Age 1 is Reference
  -5    9        2.8    -1      -1      0.01    2       0 2 1991 2013 0.03 0 0 # Change to age 2
  -5    9        0.1    -1      -1      0.01    2       0 2 1991 2013 0.03 0 0 # Change to age 3
  -5    9        0.1    -1      -1      0.01    2       0 2 1991 2013 0.03 0 0 # Change to age 4
  -5    9        0.1    -1      -1      0.01    2       0 2 1991 2013 0.03 0 0 # Change to age 5
  -5    9        0.0    -1      -1      0.01    2       0 2 1991 2013 0.03 0 0 # Change to age 6
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 7
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 8
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 9
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 10
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 11
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 12
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 13
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 14
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 15
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 16
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 17
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 18
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 19
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 20
```

```
# Acoustic survey - nonparametric age-based selectivity
  -1002 3       -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 0
  -1002 3       -1000   -1      -1      0.01    -2      0 0 0 0 0 0 0 # 0.0 at age 1
  -1    1        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Age 2 is reference
  -5    9        0.1    -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 3
  -5    9        0.1    -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 4
  -5    9        0.0    -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 5
  -5    9        0.0    -1      -1      0.01    2       0 0 0 0 0 0 0 # Change to age 6
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 7
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 8
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 9
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 10
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 11
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 12
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 13
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 14
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 15
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 16
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 17
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 18
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 19
  -5    9        0.0    -1      -1      0.01    -2      0 0 0 0 0 0 0 # Change to age 20

4 #selparm_dev_PH
2 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)
0 # Tagging flag: 0=no tagging parameters,1=read tagging parameters

### Likelihood related quantities ###
1 # Do variance/sample size adjustments by fleet (1)
# # Component
 0    0   # Constant added to index CV
 0    0   # Constant added to discard SD
 0    0   # Constant added to body weight SD
 1    1   # multiplicative scalar for length comps
 0.12 0.94 # multiplicative scalar for agecomps
 1    1   # multiplicative scalar for length at age obs

1  # Lambda phasing: 1=none, 2+=change beginning in phase 1
1  # Growth offset likelihood constant for Log(s): 1=include, 2=not
0  # N changes to default Lambdas = 1.0
1  # Extra SD reporting switch
2  2 -1 15 # selex type (fleet), len=1/age=2, year, N selex bins (4 values)
1  1    # Growth pattern, N growth ages (2 values)
1 -1  1 # NatAge_area(-1 for all), NatAge_yr, N Natages (3 values)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 # placeholder for vector of selex bins to be reported
-1 # growth ages
-1 # NatAges

999 # End control file
```

Appendix G. SS starter file (starter.ss)

```
#C 2014 Hake starter file - pre-SRG base model (run 21)
###################################################

2014hake_data.SS        # Data file
2014hake_control.SS # Control file

0       # Read initial values from .par file: 0=no,1=yes
1       # DOS display detail: 0,1,2
2       # Report file detail: 0,1,2
0       # Detailed checkup.sso file (0,1)
0       # Write parameter iteration trace file during minimization
0       # Write cumulative report: 0=skip,1=short,2=full
0       # Include prior likelihood for non-estimated parameters
0       # Use Soft Boundaries to aid convergence (0,1) (recommended)
1       # N bootstrap datafiles to create
25      # Last phase for estimation
1       # MCMC burn-in
1       # MCMC thinning interval
0       # Jitter initial parameter values by this fraction
-1      # Min year for spbio sd_report (neg val = styr-2, virgin state)
-2      # Max year for spbio sd_report (neg val = endyr+1)
0       # N individual SD years
0.00001 # Ending convergence criteria
0       # Retrospective year relative to end year
3       # Min age for summary biomass
1       # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1.0     # Fraction (X) for Depletion denominator (e.g. 0.4)
1       # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1       # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0       # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker
```

Appendix H. SS forecast file (forecast.ss)

```
#C 2014 Hake starter file - pre-SRG base model (run 21)
###################################################

1       # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2       # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.4     # SPR target (e.g. 0.40)
0.4     # Biomass target (e.g. 0.40)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
-999 -999 -999 -999 -999 -999 # Bmark_years: beg_bio end_bio beg_selex end_selex beg_alloc
end_alloc
2       # Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
1       # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (use first-last alloc yrs);
5=input annual F
3       # N forecast years
1.0     # F scalar (only used for Do_Forecast==5)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
-4 0 -4 0 # Fcast_years:  beg_selex end_selex beg_alloc end_alloc
1       # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4     # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1     # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1.0     # Control rule target as fraction of Flimit (e.g. 0.75)
3       # N forecast loops (1-3) (fixed at 3 for now)
3       # First forecast loop with stochastic recruitment (fixed at 3 for now)
-1      # Forecast loop control #3 (reserved)
0       #_Forecast loop control #4 (reserved for future bells&whistles)
0       #_Forecast loop control #5 (reserved for future bells&whistles)
2017    # FirstYear for caps and allocations (should be after any fixed inputs)
0.0     # stddev of log(realized catch/target catch) in forecast
0       # Do West Coast gfish rebuilder output (0/1)
1999    # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2002    # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
1       # fleet relative F:  1=use first-last alloc year; 2=read seas(row) x fleet(col) below
2       # basis for fcast catch tuning and for fcast catch caps and allocation  (2=deadbio;
3=retainbio; 5=deadnum; 6=retainnum)
-1      # max totalcatch by fleet (-1 to have no max)
-1      # max totalcatch by area (-1 to have no max)
1       # fleet assignment to allocation group (enter group ID# for each fleet, 0 for not
included in an alloc group)
# assign fleets to groups
1.0
# allocation fraction for each of: 2 allocation groups
0 # Number of forecast catch levels to input (else calc catch from forecast F)
2 # basis for input Fcast catch:  2=dead catch; 3=retained catch; 99=input Hrate(F) (units are
from fleetunits; note new codes in SSV3.20)

999 # verify end of input
```

Appendix I. SS weight-at-age file (wtatge.ss)

```
# empirical weight-at-age Stock Synthesis input file for hake
# created by code in the R script: wtatage_calculations.R
# creation date: 2014-01-06 21:21:44
###################################################
161 # Number of lines of weight-at-age input to be read
20 # Maximum age

#Maturity x Fecundity: Fleet = -2 (Values unchanged from 2012 Stock Assessment)
 #_#Yr seas gender GP bseas fleet a0 a1     a2     a3     a4    a5     a6     a7     a8     a9    a10    a11    a12    a13    a14
a15    a16    a17    a18    a19   a20
 -1940    1      1  1     1    -2  0  0 0.1003 0.2535 0.3992 0.518 0.6131 0.6895 0.7511 0.8007 0.8406 0.8724 0.8979 0.9181 0.9342
0.9469 0.9569 0.9649 0.9711 0.9761 0.983
#All matrices below use the same values, pooled across all data sources

#Weight at age for population in middle of the year: Fleet = -1
 #_#Yr seas gender GP bseas fleet     a0     a1     a2     a3     a4     a5     a6     a7     a8     a9    a10    a11    a12    a13
a14    a15    a16    a17    a18    a19    a20
 -1940    1      1  1     1    -1 0.0300 0.0935 0.2474 0.3730 0.4823 0.5437 0.5933 0.6640 0.7226 0.7923 0.8634 0.9339 0.9735 1.0703
1.0069 1.0190 1.0190 1.0190 1.0190 1.0190 1.0190
  1975    1      1  1     1    -1 0.0550 0.1575 0.2987 0.3658 0.6143 0.6306 0.7873 0.8738 0.9678 0.9075 0.9700 1.6933 1.5000 1.9000
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1976    1      1  1     1    -1 0.0550 0.0986 0.2359 0.4973 0.5188 0.6936 0.8041 0.9166 1.2097 1.3375 1.4498 1.6532 1.8066 1.8588
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1977    1      1  1     1    -1 0.0550 0.1006 0.4021 0.4870 0.5902 0.6650 0.7493 0.8267 0.9781 1.1052 1.2349 1.3148 1.4058 1.7511
2.0367 2.2094 2.2094 2.2094 2.2094 2.2094 2.2094
  1978    1      1  1     1    -1 0.0539 0.1026 0.1360 0.4699 0.5300 0.6027 0.6392 0.7395 0.8391 0.9775 1.0971 1.2349 1.3028 1.4814
1.7419 2.3379 2.3379 2.3379 2.3379 2.3379 2.3379
  1979    1      1  1     1    -1 0.0528 0.0913 0.2410 0.2587 0.5821 0.6868 0.7677 0.8909 0.9128 1.0369 1.1987 1.2482 1.5326 1.5520
1.7950 1.9817 1.9817 1.9817 1.9817 1.9817 1.9817
  1980    1      1  1     1    -1 0.0517 0.0800 0.2236 0.4529 0.3922 0.4904 0.5166 0.6554 0.7125 0.8740 1.0616 1.1623 1.2898 1.3001
1.2699 1.3961 1.3961 1.3961 1.3961 1.3961 1.3961
  1981    1      1  1     1    -1 0.0506 0.1079 0.2137 0.3422 0.5264 0.3933 0.5254 0.5462 0.7464 0.7204 0.8231 1.0413 1.0989 1.3449
1.4926 1.2128 1.2128 1.2128 1.2128 1.2128 1.2128
  1982    1      1  1     1    -1 0.0494 0.1183 0.2465 0.3336 0.3097 0.5496 0.3956 0.5275 0.5629 0.7606 0.6837 0.8539 1.0670 0.8793
1.0186 1.1693 1.1693 1.1693 1.1693 1.1693 1.1693
  1983    1      1  1     1    -1 0.0483 0.1287 0.1357 0.3410 0.3694 0.3277 0.5200 0.5028 0.6179 0.7060 0.8800 0.9299 1.0356 1.0310
1.3217 1.4823 1.4823 1.4823 1.4823 1.4823 1.4823
  1984    1      1  1     1    -1 0.0472 0.1315 0.1642 0.2493 0.4385 0.4113 0.4352 0.5872 0.5802 0.6758 0.7010 0.9513 1.1364 1.0258
1.2807 1.8800 1.8800 1.8800 1.8800 1.8800 1.8800
  1985    1      1  1     1    -1 0.0461 0.1740 0.2297 0.2679 0.4414 0.5497 0.5474 0.6014 0.7452 0.6933 0.7231 0.8584 0.8698 0.9458
0.6759 1.1217 1.1217 1.1217 1.1217 1.1217 1.1217
  1986    1      1  1     1    -1 0.0450 0.1555 0.2771 0.2909 0.3024 0.3735 0.5425 0.5717 0.6421 0.8209 0.9403 1.1860 1.1900 1.3864
1.6800 1.6142 1.6142 1.6142 1.6142 1.6142 1.6142
  1987    1      1  1     1    -1 0.0439 0.1478 0.1388 0.3790 0.2786 0.2870 0.3621 0.5775 0.5975 0.6369 0.7638 0.9820 0.9250 1.2407
1.2031 1.4157 1.4157 1.4157 1.4157 1.4157 1.4157
  1988    1      1  1     1    -1 0.0428 0.1400 0.1870 0.3189 0.4711 0.3689 0.3731 0.5163 0.6474 0.6851 0.7183 0.9167 1.0924 1.0225
1.4500 1.4537 1.4537 1.4537 1.4537 1.4537 1.4537
```

```
  1989    1      1  1     1    -1 0.0417 0.1389 0.2737 0.3047 0.2931 0.5134 0.4386 0.4064 0.5167 0.6263 0.6611 0.6027 0.8758 0.6686
0.8282 1.1264 1.1264 1.1264 1.1264 1.1264 1.1264
  1990    1      1  1     1    -1 0.0406 0.1378 0.2435 0.3506 0.3906 0.5111 0.5462 0.6076 0.6678 0.5300 0.7691 0.8312 2.2000 1.1847
1.0166 1.4668 1.4668 1.4668 1.4668 1.4668 1.4668
  1991    1      1  1     1    -1 0.0394 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437 0.5907 0.7210 0.8497 1.0997 0.7185 0.6403 1.0174
1.2051 2.3828 2.3828 2.3828 2.3828 2.3828 2.3828
  1992    1      1  1     1    -1 0.0383 0.1356 0.2316 0.3473 0.4743 0.5334 0.5817 0.6210 0.6406 0.6530 0.6330 0.7217 0.7354 0.8501
0.9750 1.0272 1.0272 1.0272 1.0272 1.0272 1.0272
  1993    1      1  1     1    -1 0.0372 0.1274 0.2486 0.3384 0.3960 0.4539 0.4935 0.5017 0.4880 0.5491 0.5100 1.2630 1.0250 0.6135
0.5995 0.6850 0.6850 0.6850 0.6850 0.6850 0.6850
  1994    1      1  1     1    -1 0.0361 0.1191 0.3000 0.3626 0.4469 0.4473 0.5262 0.5700 0.6218 0.5598 0.6341 0.4850 0.6491 0.7300
0.7013 0.7455 0.7455 0.7455 0.7455 0.7455 0.7455
  1995    1      1  1     1    -1 0.0350 0.1108 0.2682 0.3418 0.4876 0.5367 0.6506 0.6249 0.6597 0.7560 0.6670 0.7442 0.7998 0.9101
0.6804 0.8008 0.8008 0.8008 0.8008 0.8008 0.8008
  1996    1      1  1     1    -1 0.0339 0.1007 0.2876 0.3982 0.4674 0.5317 0.5651 0.6509 0.5957 0.6362 0.6049 0.7500 0.6756 0.8109
1.4853 0.7509 0.7509 0.7509 0.7509 0.7509 0.7509
  1997    1      1  1     1    -1 0.0328 0.0906 0.3555 0.4322 0.4931 0.5476 0.5453 0.5833 0.5855 0.6071 0.6315 0.8633 0.5946 0.7118
0.6618 0.8693 0.8693 0.8693 0.8693 0.8693 0.8693
  1998    1      1  1     1    -1 0.0317 0.0805 0.2091 0.3539 0.5041 0.5172 0.5420 0.6412 0.6099 0.6769 0.8078 0.7174 0.8100 0.7733
0.7510 0.7714 0.7714 0.7714 0.7714 0.7714 0.7714
  1999    1      1  1     1    -1 0.0306 0.1352 0.2502 0.3455 0.4251 0.5265 0.5569 0.5727 0.6117 0.7030 0.6650 0.7989 0.7554 0.8787
0.7348 0.8187 0.8187 0.8187 0.8187 0.8187 0.8187
  2000    1      1  1     1    -1 0.0294 0.1899 0.3216 0.4729 0.5766 0.6598 0.7176 0.7279 0.7539 0.8378 0.8159 0.8814 0.8554 0.9391
0.8744 0.9336 0.9336 0.9336 0.9336 0.9336 0.9336
  2001    1      1  1     1    -1 0.0283 0.0512 0.2867 0.4843 0.6527 0.6645 0.7469 0.8629 0.8555 0.8802 0.9630 0.9790 1.0054 1.0494
0.9927 0.9768 0.9768 0.9768 0.9768 0.9768 0.9768
  2002    1      1  1     1    -1 0.0272 0.0756 0.3583 0.4575 0.6058 0.8160 0.7581 0.8488 0.9771 0.9322 0.9176 0.9974 0.9890 0.9236
1.1250 1.0573 1.0573 1.0573 1.0573 1.0573 1.0573
  2003    1      1  1     1    -1 0.0261 0.1000 0.2551 0.4355 0.5225 0.5879 0.7569 0.6915 0.7469 0.8246 0.7692 0.8887 0.9266 0.7894
0.8414 0.9965 0.9965 0.9965 0.9965 0.9965 0.9965
  2004    1      1  1     1    -1 0.0250 0.1081 0.2577 0.4360 0.4807 0.5319 0.6478 0.7068 0.6579 0.7094 0.8050 0.8581 0.7715 0.9704
0.8631 0.8959 0.8959 0.8959 0.8959 0.8959 0.8959
  2005    1      1  1     1    -1 0.0239 0.1162 0.2603 0.4311 0.5086 0.5393 0.5682 0.6336 0.6550 0.7027 0.7962 0.8104 0.8109 0.7602
1.1449 0.9678 0.9678 0.9678 0.9678 0.9678 0.9678
  2006    1      1  1     1    -1 0.0228 0.1324 0.3831 0.4575 0.5341 0.5740 0.5910 0.5979 0.6560 0.6997 0.7259 0.7220 0.7753 0.6580
0.6399 0.9550 0.9550 0.9550 0.9550 0.9550 0.9550
  2007    1      1  1     1    -1 0.0217 0.0461 0.2272 0.3776 0.5352 0.5530 0.6073 0.6328 0.6475 0.7055 0.7723 0.7627 0.8137 0.8702
0.8008 0.8698 0.8698 0.8698 0.8698 0.8698 0.8698
  2008    1      1  1     1    -1 0.0217 0.1380 0.2435 0.4123 0.5732 0.6488 0.6985 0.6914 0.7151 0.7280 0.7593 0.8241 0.8934 0.8227
0.8696 0.8425 0.8425 0.8425 0.8425 0.8425 0.8425
  2009    1      1  1     1    -1 0.0217 0.0667 0.2428 0.3430 0.4735 0.6410 0.6831 0.7047 0.7529 0.8263 0.7687 0.8363 1.0329 0.8561
0.9492 1.0124 1.0124 1.0124 1.0124 1.0124 1.0124
  2010    1      1  1     1    -1 0.0217 0.1089 0.2305 0.2621 0.4343 0.5361 0.6707 0.8666 1.1295 1.0818 0.9925 0.9214 0.8842 1.1424
0.7200 0.9031 0.9031 0.9031 0.9031 0.9031 0.9031
  2011    1      1  1     1    -1 0.0217 0.0845 0.2428 0.3194 0.3833 0.5103 0.5989 0.6727 0.8608 0.9476 0.9606 1.0749 1.0633 1.0148
1.0557 0.9368 0.9368 0.9368 0.9368 0.9368 0.9368
  2012    1      1  1     1    -1 0.0217 0.1290 0.2175 0.3531 0.4065 0.4884 0.6476 0.6841 0.7795 0.9363 0.9736 0.9639 0.9473 0.9949
1.0030 0.9373 0.9373 0.9373 0.9373 0.9373 0.9373
  2013    1      1  1     1    -1 0.0217 0.1297 0.2813 0.3552 0.4710 0.5090 0.6265 0.7149 0.7310 0.8338 0.9989 1.0752 1.2303 1.1187
1.0682 1.0545 1.0545 1.0545 1.0545 1.0545 1.0545
```

```
#Weight at age for population at beginning of the year: Fleet = 0
 #_#Yr seas gender GP bseas fleet     a0     a1     a2     a3     a4     a5     a6     a7     a8     a9    a10    a11    a12    a13
a14    a15    a16    a17    a18    a19    a20
 -1940    1      1  1    1     0 0.0300 0.0935 0.2474 0.3730 0.4823 0.5437 0.5933 0.6640 0.7226 0.7923 0.8634 0.9339 0.9735 1.0703
1.0069 1.0190 1.0190 1.0190 1.0190 1.0190 1.0190
  1975    1      1  1    1     0 0.0550 0.1575 0.2987 0.3658 0.6143 0.6306 0.7873 0.8738 0.9678 0.9075 0.9700 1.6933 1.5000 1.9000
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1976    1      1  1    1     0 0.0550 0.0986 0.2359 0.4973 0.5188 0.6936 0.8041 0.9166 1.2097 1.3375 1.4498 1.6532 1.8066 1.8588
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1977    1      1  1    1     0 0.0550 0.1006 0.4021 0.4870 0.5902 0.6650 0.7493 0.8267 0.9781 1.1052 1.2349 1.3148 1.4058 1.7511
2.0367 2.2094 2.2094 2.2094 2.2094 2.2094 2.2094
  1978    1      1  1    1     0 0.0539 0.1026 0.1360 0.4699 0.5300 0.6027 0.6392 0.7395 0.8391 0.9775 1.0971 1.2349 1.3028 1.4814
1.7419 2.3379 2.3379 2.3379 2.3379 2.3379 2.3379
  1979    1      1  1    1     0 0.0528 0.0913 0.2410 0.2587 0.5821 0.6868 0.7677 0.8909 0.9128 1.0369 1.1987 1.2482 1.5326 1.5520
1.7950 1.9817 1.9817 1.9817 1.9817 1.9817 1.9817
  1980    1      1  1    1     0 0.0517 0.0800 0.2236 0.4529 0.3922 0.4904 0.5166 0.6554 0.7125 0.8740 1.0616 1.1623 1.2898 1.3001
1.2699 1.3961 1.3961 1.3961 1.3961 1.3961 1.3961
  1981    1      1  1    1     0 0.0506 0.1079 0.2137 0.3422 0.5264 0.3933 0.5254 0.5462 0.7464 0.7204 0.8231 1.0413 1.0989 1.3449
1.4926 1.2128 1.2128 1.2128 1.2128 1.2128 1.2128
  1982    1      1  1    1     0 0.0494 0.1183 0.2465 0.3336 0.3097 0.5496 0.3956 0.5275 0.5629 0.7606 0.6837 0.8539 1.0670 0.8793
1.0186 1.1693 1.1693 1.1693 1.1693 1.1693 1.1693
  1983    1      1  1    1     0 0.0483 0.1287 0.1357 0.3410 0.3694 0.3277 0.5200 0.5028 0.6179 0.7060 0.8800 0.9299 1.0356 1.0310
1.3217 1.4823 1.4823 1.4823 1.4823 1.4823 1.4823
  1984    1      1  1    1     0 0.0472 0.1315 0.1642 0.2493 0.4385 0.4113 0.4352 0.5872 0.5802 0.6758 0.7010 0.9513 1.1364 1.0258
1.2807 1.8800 1.8800 1.8800 1.8800 1.8800 1.8800
  1985    1      1  1    1     0 0.0461 0.1740 0.2297 0.2679 0.4414 0.5497 0.5474 0.6014 0.7452 0.6933 0.7231 0.8584 0.8698 0.9458
0.6759 1.1217 1.1217 1.1217 1.1217 1.1217 1.1217
  1986    1      1  1    1     0 0.0450 0.1555 0.2771 0.2909 0.3024 0.3735 0.5425 0.5717 0.6421 0.8209 0.9403 1.1860 1.1900 1.3864
1.6800 1.6142 1.6142 1.6142 1.6142 1.6142 1.6142
  1987    1      1  1    1     0 0.0439 0.1478 0.1388 0.3790 0.2786 0.2870 0.3621 0.5775 0.5975 0.6369 0.7638 0.9820 0.9250 1.2407
1.2031 1.4157 1.4157 1.4157 1.4157 1.4157 1.4157
  1988    1      1  1    1     0 0.0428 0.1400 0.1870 0.3189 0.4711 0.3689 0.3731 0.5163 0.6474 0.6851 0.7183 0.9167 1.0924 1.0225
1.4500 1.4537 1.4537 1.4537 1.4537 1.4537 1.4537
  1989    1      1  1    1     0 0.0417 0.1389 0.2737 0.3047 0.2931 0.5134 0.4386 0.4064 0.5167 0.6263 0.6611 0.6027 0.8758 0.6686
0.8282 1.1264 1.1264 1.1264 1.1264 1.1264 1.1264
  1990    1      1  1    1     0 0.0406 0.1378 0.2435 0.3506 0.3906 0.5111 0.5462 0.6076 0.6678 0.5300 0.7691 0.8312 2.2000 1.1847
1.0166 1.4668 1.4668 1.4668 1.4668 1.4668 1.4668
  1991    1      1  1    1     0 0.0394 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437 0.5907 0.7210 0.8497 1.0997 0.7185 0.6403 1.0174
1.2051 2.3828 2.3828 2.3828 2.3828 2.3828 2.3828
  1992    1      1  1    1     0 0.0383 0.1356 0.2316 0.3473 0.4743 0.5334 0.5817 0.6210 0.6406 0.6530 0.6330 0.7217 0.7354 0.8501
0.9750 1.0272 1.0272 1.0272 1.0272 1.0272 1.0272
  1993    1      1  1    1     0 0.0372 0.1274 0.2486 0.3384 0.3960 0.4539 0.4935 0.5017 0.4880 0.5491 0.5100 1.2630 1.0250 0.6135
0.5995 0.6850 0.6850 0.6850 0.6850 0.6850 0.6850
  1994    1      1  1    1     0 0.0361 0.1191 0.3000 0.3626 0.4469 0.4473 0.5262 0.5700 0.6218 0.5598 0.6341 0.4850 0.6491 0.7300
0.7013 0.7455 0.7455 0.7455 0.7455 0.7455 0.7455
  1995    1      1  1    1     0 0.0350 0.1108 0.2682 0.3418 0.4876 0.5367 0.6506 0.6249 0.6597 0.7560 0.6670 0.7442 0.7998 0.9101
0.6804 0.8008 0.8008 0.8008 0.8008 0.8008 0.8008
  1996    1      1  1    1     0 0.0339 0.1007 0.2876 0.3982 0.4674 0.5317 0.5651 0.6509 0.5957 0.6362 0.6049 0.7500 0.6756 0.8109
1.4853 0.7509 0.7509 0.7509 0.7509 0.7509 0.7509
  1997    1      1  1    1     0 0.0328 0.0906 0.3555 0.4322 0.4931 0.5476 0.5453 0.5833 0.5855 0.6071 0.6315 0.8633 0.5946 0.7118
0.6618 0.8693 0.8693 0.8693 0.8693 0.8693 0.8693
```

```
  1998    1      1  1     1     0 0.0317 0.0805 0.2091 0.3539 0.5041 0.5172 0.5420 0.6412 0.6099 0.6769 0.8078 0.7174 0.8100 0.7733
0.7510 0.7714 0.7714 0.7714 0.7714 0.7714 0.7714
  1999    1      1  1     1     0 0.0306 0.1352 0.2502 0.3455 0.4251 0.5265 0.5569 0.5727 0.6117 0.7030 0.6650 0.7989 0.7554 0.8787
0.7348 0.8187 0.8187 0.8187 0.8187 0.8187 0.8187
  2000    1      1  1     1     0 0.0294 0.1899 0.3216 0.4729 0.5766 0.6598 0.7176 0.7279 0.7539 0.8378 0.8159 0.8814 0.8554 0.9391
0.8744 0.9336 0.9336 0.9336 0.9336 0.9336 0.9336
  2001    1      1  1     1     0 0.0283 0.0512 0.2867 0.4843 0.6527 0.6645 0.7469 0.8629 0.8555 0.8802 0.9630 0.9790 1.0054 1.0494
0.9927 0.9768 0.9768 0.9768 0.9768 0.9768 0.9768
  2002    1      1  1     1     0 0.0272 0.0756 0.3583 0.4575 0.6058 0.8160 0.7581 0.8488 0.9771 0.9322 0.9176 0.9974 0.9890 0.9236
1.1250 1.0573 1.0573 1.0573 1.0573 1.0573 1.0573
  2003    1      1  1     1     0 0.0261 0.1000 0.2551 0.4355 0.5225 0.5879 0.7569 0.6915 0.7469 0.8246 0.7692 0.8887 0.9266 0.7894
0.8414 0.9965 0.9965 0.9965 0.9965 0.9965 0.9965
  2004    1      1  1     1     0 0.0250 0.1081 0.2577 0.4360 0.4807 0.5319 0.6478 0.7068 0.6579 0.7094 0.8050 0.8581 0.7715 0.9704
0.8631 0.8959 0.8959 0.8959 0.8959 0.8959 0.8959
  2005    1      1  1     1     0 0.0239 0.1162 0.2603 0.4311 0.5086 0.5393 0.5682 0.6336 0.6550 0.7027 0.7962 0.8104 0.8109 0.7602
1.1449 0.9678 0.9678 0.9678 0.9678 0.9678 0.9678
  2006    1      1  1     1     0 0.0228 0.1324 0.3831 0.4575 0.5341 0.5740 0.5910 0.5979 0.6560 0.6997 0.7259 0.7220 0.7753 0.6580
0.6399 0.9550 0.9550 0.9550 0.9550 0.9550 0.9550
  2007    1      1  1     1     0 0.0217 0.0461 0.2272 0.3776 0.5352 0.5530 0.6073 0.6328 0.6475 0.7055 0.7723 0.7627 0.8137 0.8702
0.8008 0.8698 0.8698 0.8698 0.8698 0.8698 0.8698
  2008    1      1  1     1     0 0.0217 0.1380 0.2435 0.4123 0.5732 0.6488 0.6985 0.6914 0.7151 0.7280 0.7593 0.8241 0.8934 0.8227
0.8696 0.8425 0.8425 0.8425 0.8425 0.8425 0.8425
  2009    1      1  1     1     0 0.0217 0.0667 0.2428 0.3430 0.4735 0.6410 0.6831 0.7047 0.7529 0.8263 0.7687 0.8363 1.0329 0.8561
0.9492 1.0124 1.0124 1.0124 1.0124 1.0124 1.0124
  2010    1      1  1     1     0 0.0217 0.1089 0.2305 0.2621 0.4343 0.5361 0.6707 0.8666 1.1295 1.0818 0.9925 0.9214 0.8842 1.1424
0.7200 0.9031 0.9031 0.9031 0.9031 0.9031 0.9031
  2011    1      1  1     1     0 0.0217 0.0845 0.2428 0.3194 0.3833 0.5103 0.5989 0.6727 0.8608 0.9476 0.9606 1.0749 1.0633 1.0148
1.0557 0.9368 0.9368 0.9368 0.9368 0.9368 0.9368
  2012    1      1  1     1     0 0.0217 0.1290 0.2175 0.3531 0.4065 0.4884 0.6476 0.6841 0.7795 0.9363 0.9736 0.9639 0.9473 0.9949
1.0030 0.9373 0.9373 0.9373 0.9373 0.9373 0.9373
  2013    1      1  1     1     0 0.0217 0.1297 0.2813 0.3552 0.4710 0.5090 0.6265 0.7149 0.7310 0.8338 0.9989 1.0752 1.2303 1.1187
1.0682 1.0545 1.0545 1.0545 1.0545 1.0545 1.0545

#Weight at age for Fishery: Fleet = 1
 #_#Yr seas gender GP bseas fleet     a0     a1     a2     a3     a4     a5     a6     a7     a8     a9    a10    a11    a12    a13
a14    a15    a16    a17    a18    a19    a20
 -1940    1      1  1     1     1 0.0300 0.0935 0.2474 0.3730 0.4823 0.5437 0.5933 0.6640 0.7226 0.7923 0.8634 0.9339 0.9735 1.0703
1.0069 1.0190 1.0190 1.0190 1.0190 1.0190 1.0190
  1975    1      1  1     1     1 0.0550 0.1575 0.2987 0.3658 0.6143 0.6306 0.7873 0.8738 0.9678 0.9075 0.9700 1.6933 1.5000 1.9000
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1976    1      1  1     1     1 0.0550 0.0986 0.2359 0.4973 0.5188 0.6936 0.8041 0.9166 1.2097 1.3375 1.4498 1.6532 1.8066 1.8588
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1977    1      1  1     1     1 0.0550 0.1006 0.4021 0.4870 0.5902 0.6650 0.7493 0.8267 0.9781 1.1052 1.2349 1.3148 1.4058 1.7511
2.0367 2.2094 2.2094 2.2094 2.2094 2.2094 2.2094
  1978    1      1  1     1     1 0.0539 0.1026 0.1360 0.4699 0.5300 0.6027 0.6392 0.7395 0.8391 0.9775 1.0971 1.2349 1.3028 1.4814
1.7419 2.3379 2.3379 2.3379 2.3379 2.3379 2.3379
  1979    1      1  1     1     1 0.0528 0.0913 0.2410 0.2587 0.5821 0.6868 0.7677 0.8909 0.9128 1.0369 1.1987 1.2482 1.5326 1.5520
1.7950 1.9817 1.9817 1.9817 1.9817 1.9817 1.9817
  1980    1      1  1     1     1 0.0517 0.0800 0.2236 0.4529 0.3922 0.4904 0.5166 0.6554 0.7125 0.8740 1.0616 1.1623 1.2898 1.3001
1.2699 1.3961 1.3961 1.3961 1.3961 1.3961 1.3961
```

```
  1981    1      1  1     1     1 0.0506 0.1079 0.2137 0.3422 0.5264 0.3933 0.5254 0.5462 0.7464 0.7204 0.8231 1.0413 1.0989 1.3449
1.4926 1.2128 1.2128 1.2128 1.2128 1.2128 1.2128
  1982    1      1  1     1     1 0.0494 0.1183 0.2465 0.3336 0.3097 0.5496 0.3956 0.5275 0.5629 0.7606 0.6837 0.8539 1.0670 0.8793
1.0186 1.1693 1.1693 1.1693 1.1693 1.1693 1.1693
  1983    1      1  1     1     1 0.0483 0.1287 0.1357 0.3410 0.3694 0.3277 0.5200 0.5028 0.6179 0.7060 0.8800 0.9299 1.0356 1.0310
1.3217 1.4823 1.4823 1.4823 1.4823 1.4823 1.4823
  1984    1      1  1     1     1 0.0472 0.1315 0.1642 0.2493 0.4385 0.4113 0.4352 0.5872 0.5802 0.6758 0.7010 0.9513 1.1364 1.0258
1.2807 1.8800 1.8800 1.8800 1.8800 1.8800 1.8800
  1985    1      1  1     1     1 0.0461 0.1740 0.2297 0.2679 0.4414 0.5497 0.5474 0.6014 0.7452 0.6933 0.7231 0.8584 0.8698 0.9458
0.6759 1.1217 1.1217 1.1217 1.1217 1.1217 1.1217
  1986    1      1  1     1     1 0.0450 0.1555 0.2771 0.2909 0.3024 0.3735 0.5425 0.5717 0.6421 0.8209 0.9403 1.1860 1.1900 1.3864
1.6800 1.6142 1.6142 1.6142 1.6142 1.6142 1.6142
  1987    1      1  1     1     1 0.0439 0.1478 0.1388 0.3790 0.2786 0.2870 0.3621 0.5775 0.5975 0.6369 0.7638 0.9820 0.9250 1.2407
1.2031 1.4157 1.4157 1.4157 1.4157 1.4157 1.4157
  1988    1      1  1     1     1 0.0428 0.1400 0.1870 0.3189 0.4711 0.3689 0.3731 0.5163 0.6474 0.6851 0.7183 0.9167 1.0924 1.0225
1.4500 1.4537 1.4537 1.4537 1.4537 1.4537 1.4537
  1989    1      1  1     1     1 0.0417 0.1389 0.2737 0.3047 0.2931 0.5134 0.4386 0.4064 0.5167 0.6263 0.6611 0.6027 0.8758 0.6686
0.8282 1.1264 1.1264 1.1264 1.1264 1.1264 1.1264
  1990    1      1  1     1     1 0.0406 0.1378 0.2435 0.3506 0.3906 0.5111 0.5462 0.6076 0.6678 0.5300 0.7691 0.8312 2.2000 1.1847
1.0166 1.4668 1.4668 1.4668 1.4668 1.4668 1.4668
  1991    1      1  1     1     1 0.0394 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437 0.5907 0.7210 0.8497 1.0997 0.7185 0.6403 1.0174
1.2051 2.3828 2.3828 2.3828 2.3828 2.3828 2.3828
  1992    1      1  1     1     1 0.0383 0.1356 0.2316 0.3473 0.4743 0.5334 0.5817 0.6210 0.6406 0.6530 0.6330 0.7217 0.7354 0.8501
0.9750 1.0272 1.0272 1.0272 1.0272 1.0272 1.0272
  1993    1      1  1     1     1 0.0372 0.1274 0.2486 0.3384 0.3960 0.4539 0.4935 0.5017 0.4880 0.5491 0.5100 1.2630 1.0250 0.6135
0.5995 0.6850 0.6850 0.6850 0.6850 0.6850 0.6850
  1994    1      1  1     1     1 0.0361 0.1191 0.3000 0.3626 0.4469 0.4473 0.5262 0.5700 0.6218 0.5598 0.6341 0.4850 0.6491 0.7300
0.7013 0.7455 0.7455 0.7455 0.7455 0.7455 0.7455
  1995    1      1  1     1     1 0.0350 0.1108 0.2682 0.3418 0.4876 0.5367 0.6506 0.6249 0.6597 0.7560 0.6670 0.7442 0.7998 0.9101
0.6804 0.8008 0.8008 0.8008 0.8008 0.8008 0.8008
  1996    1      1  1     1     1 0.0339 0.1007 0.2876 0.3982 0.4674 0.5317 0.5651 0.6509 0.5957 0.6362 0.6049 0.7500 0.6756 0.8109
1.4853 0.7509 0.7509 0.7509 0.7509 0.7509 0.7509
  1997    1      1  1     1     1 0.0328 0.0906 0.3555 0.4322 0.4931 0.5476 0.5453 0.5833 0.5855 0.6071 0.6315 0.8633 0.5946 0.7118
0.6618 0.8693 0.8693 0.8693 0.8693 0.8693 0.8693
  1998    1      1  1     1     1 0.0317 0.0805 0.2091 0.3539 0.5041 0.5172 0.5420 0.6412 0.6099 0.6769 0.8078 0.7174 0.8100 0.7733
0.7510 0.7714 0.7714 0.7714 0.7714 0.7714 0.7714
  1999    1      1  1     1     1 0.0306 0.1352 0.2502 0.3455 0.4251 0.5265 0.5569 0.5727 0.6117 0.7030 0.6650 0.7989 0.7554 0.8787
0.7348 0.8187 0.8187 0.8187 0.8187 0.8187 0.8187
  2000    1      1  1     1     1 0.0294 0.1899 0.3216 0.4729 0.5766 0.6598 0.7176 0.7279 0.7539 0.8378 0.8159 0.8814 0.8554 0.9391
0.8744 0.9336 0.9336 0.9336 0.9336 0.9336 0.9336
  2001    1      1  1     1     1 0.0283 0.0512 0.2867 0.4843 0.6527 0.6645 0.7469 0.8629 0.8555 0.8802 0.9630 0.9790 1.0054 1.0494
0.9927 0.9768 0.9768 0.9768 0.9768 0.9768 0.9768
  2002    1      1  1     1     1 0.0272 0.0756 0.3583 0.4575 0.6058 0.8160 0.7581 0.8488 0.9771 0.9322 0.9176 0.9974 0.9890 0.9236
1.1250 1.0573 1.0573 1.0573 1.0573 1.0573 1.0573
  2003    1      1  1     1     1 0.0261 0.1000 0.2551 0.4355 0.5225 0.5879 0.7569 0.6915 0.7469 0.8246 0.7692 0.8887 0.9266 0.7894
0.8414 0.9965 0.9965 0.9965 0.9965 0.9965 0.9965
  2004    1      1  1     1     1 0.0250 0.1081 0.2577 0.4360 0.4807 0.5319 0.6478 0.7068 0.6579 0.7094 0.8050 0.8581 0.7715 0.9704
0.8631 0.8959 0.8959 0.8959 0.8959 0.8959 0.8959
  2005    1      1  1     1     1 0.0239 0.1162 0.2603 0.4311 0.5086 0.5393 0.5682 0.6336 0.6550 0.7027 0.7962 0.8104 0.8109 0.7602
1.1449 0.9678 0.9678 0.9678 0.9678 0.9678 0.9678
```

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  2006    1      1  1     1     1 0.0228 0.1324 0.3831 0.4575 0.5341 0.5740 0.5910 0.5979 0.6560 0.6997 0.7259 0.7220 0.7753 0.6580
0.6399 0.9550 0.9550 0.9550 0.9550 0.9550 0.9550
  2007    1      1  1     1     1 0.0217 0.0461 0.2272 0.3776 0.5352 0.5530 0.6073 0.6328 0.6475 0.7055 0.7723 0.7627 0.8137 0.8702
0.8008 0.8698 0.8698 0.8698 0.8698 0.8698 0.8698
  2008    1      1  1     1     1 0.0217 0.1380 0.2435 0.4123 0.5732 0.6488 0.6985 0.6914 0.7151 0.7280 0.7593 0.8241 0.8934 0.8227
0.8696 0.8425 0.8425 0.8425 0.8425 0.8425 0.8425
  2009    1      1  1     1     1 0.0217 0.0667 0.2428 0.3430 0.4735 0.6410 0.6831 0.7047 0.7529 0.8263 0.7687 0.8363 1.0329 0.8561
0.9492 1.0124 1.0124 1.0124 1.0124 1.0124 1.0124
  2010    1      1  1     1     1 0.0217 0.1089 0.2305 0.2621 0.4343 0.5361 0.6707 0.8666 1.1295 1.0818 0.9925 0.9214 0.8842 1.1424
0.7200 0.9031 0.9031 0.9031 0.9031 0.9031 0.9031
  2011    1      1  1     1     1 0.0217 0.0845 0.2428 0.3194 0.3833 0.5103 0.5989 0.6727 0.8608 0.9476 0.9606 1.0749 1.0633 1.0148
1.0557 0.9368 0.9368 0.9368 0.9368 0.9368 0.9368
  2012    1      1  1     1     1 0.0217 0.1290 0.2175 0.3531 0.4065 0.4884 0.6476 0.6841 0.7795 0.9363 0.9736 0.9639 0.9473 0.9949
1.0030 0.9373 0.9373 0.9373 0.9373 0.9373 0.9373
  2013    1      1  1     1     1 0.0217 0.1297 0.2813 0.3552 0.4710 0.5090 0.6265 0.7149 0.7310 0.8338 0.9989 1.0752 1.2303 1.1187
1.0682 1.0545 1.0545 1.0545 1.0545 1.0545 1.0545

#Weight at age for Survey: Fleet = 2
 #_#Yr seas gender GP bseas fleet     a0     a1     a2     a3     a4     a5     a6     a7     a8     a9    a10    a11    a12    a13
a14    a15    a16    a17    a18    a19    a20
 -1940    1      1  1     1     2 0.0300 0.0935 0.2474 0.3730 0.4823 0.5437 0.5933 0.6640 0.7226 0.7923 0.8634 0.9339 0.9735 1.0703
1.0069 1.0190 1.0190 1.0190 1.0190 1.0190 1.0190
  1975    1      1  1     1     2 0.0550 0.1575 0.2987 0.3658 0.6143 0.6306 0.7873 0.8738 0.9678 0.9075 0.9700 1.6933 1.5000 1.9000
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1976    1      1  1     1     2 0.0550 0.0986 0.2359 0.4973 0.5188 0.6936 0.8041 0.9166 1.2097 1.3375 1.4498 1.6532 1.8066 1.8588
1.9555 2.7445 2.7445 2.7445 2.7445 2.7445 2.7445
  1977    1      1  1     1     2 0.0550 0.1006 0.4021 0.4870 0.5902 0.6650 0.7493 0.8267 0.9781 1.1052 1.2349 1.3148 1.4058 1.7511
2.0367 2.2094 2.2094 2.2094 2.2094 2.2094 2.2094
  1978    1      1  1     1     2 0.0539 0.1026 0.1360 0.4699 0.5300 0.6027 0.6392 0.7395 0.8391 0.9775 1.0971 1.2349 1.3028 1.4814
1.7419 2.3379 2.3379 2.3379 2.3379 2.3379 2.3379
  1979    1      1  1     1     2 0.0528 0.0913 0.2410 0.2587 0.5821 0.6868 0.7677 0.8909 0.9128 1.0369 1.1987 1.2482 1.5326 1.5520
1.7950 1.9817 1.9817 1.9817 1.9817 1.9817 1.9817
  1980    1      1  1     1     2 0.0517 0.0800 0.2236 0.4529 0.3922 0.4904 0.5166 0.6554 0.7125 0.8740 1.0616 1.1623 1.2898 1.3001
1.2699 1.3961 1.3961 1.3961 1.3961 1.3961 1.3961
  1981    1      1  1     1     2 0.0506 0.1079 0.2137 0.3422 0.5264 0.3933 0.5254 0.5462 0.7464 0.7204 0.8231 1.0413 1.0989 1.3449
1.4926 1.2128 1.2128 1.2128 1.2128 1.2128 1.2128
  1982    1      1  1     1     2 0.0494 0.1183 0.2465 0.3336 0.3097 0.5496 0.3956 0.5275 0.5629 0.7606 0.6837 0.8539 1.0670 0.8793
1.0186 1.1693 1.1693 1.1693 1.1693 1.1693 1.1693
  1983    1      1  1     1     2 0.0483 0.1287 0.1357 0.3410 0.3694 0.3277 0.5200 0.5028 0.6179 0.7060 0.8800 0.9299 1.0356 1.0310
1.3217 1.4823 1.4823 1.4823 1.4823 1.4823 1.4823
  1984    1      1  1     1     2 0.0472 0.1315 0.1642 0.2493 0.4385 0.4113 0.4352 0.5872 0.5802 0.6758 0.7010 0.9513 1.1364 1.0258
1.2807 1.8800 1.8800 1.8800 1.8800 1.8800 1.8800
  1985    1      1  1     1     2 0.0461 0.1740 0.2297 0.2679 0.4414 0.5497 0.5474 0.6014 0.7452 0.6933 0.7231 0.8584 0.8698 0.9458
0.6759 1.1217 1.1217 1.1217 1.1217 1.1217 1.1217
  1986    1      1  1     1     2 0.0450 0.1555 0.2771 0.2909 0.3024 0.3735 0.5425 0.5717 0.6421 0.8209 0.9403 1.1860 1.1900 1.3864
1.6800 1.6142 1.6142 1.6142 1.6142 1.6142 1.6142
  1987    1      1  1     1     2 0.0439 0.1478 0.1388 0.3790 0.2786 0.2870 0.3621 0.5775 0.5975 0.6369 0.7638 0.9820 0.9250 1.2407
1.2031 1.4157 1.4157 1.4157 1.4157 1.4157 1.4157
  1988    1      1  1     1     2 0.0428 0.1400 0.1870 0.3189 0.4711 0.3689 0.3731 0.5163 0.6474 0.6851 0.7183 0.9167 1.0924 1.0225
1.4500 1.4537 1.4537 1.4537 1.4537 1.4537 1.4537
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  1989    1      1  1     1     2 0.0417 0.1389 0.2737 0.3047 0.2931 0.5134 0.4386 0.4064 0.5167 0.6263 0.6611 0.6027 0.8758 0.6686
0.8282 1.1264 1.1264 1.1264 1.1264 1.1264 1.1264
  1990    1      1  1     1     2 0.0406 0.1378 0.2435 0.3506 0.3906 0.5111 0.5462 0.6076 0.6678 0.5300 0.7691 0.8312 2.2000 1.1847
1.0166 1.4668 1.4668 1.4668 1.4668 1.4668 1.4668
  1991    1      1  1     1     2 0.0394 0.1367 0.2754 0.3697 0.4598 0.5138 0.5437 0.5907 0.7210 0.8497 1.0997 0.7185 0.6403 1.0174
1.2051 2.3828 2.3828 2.3828 2.3828 2.3828 2.3828
  1992    1      1  1     1     2 0.0383 0.1356 0.2316 0.3473 0.4743 0.5334 0.5817 0.6210 0.6406 0.6530 0.6330 0.7217 0.7354 0.8501
0.9750 1.0272 1.0272 1.0272 1.0272 1.0272 1.0272
  1993    1      1  1     1     2 0.0372 0.1274 0.2486 0.3384 0.3960 0.4539 0.4935 0.5017 0.4880 0.5491 0.5100 1.2630 1.0250 0.6135
0.5995 0.6850 0.6850 0.6850 0.6850 0.6850 0.6850
  1994    1      1  1     1     2 0.0361 0.1191 0.3000 0.3626 0.4469 0.4473 0.5262 0.5700 0.6218 0.5598 0.6341 0.4850 0.6491 0.7300
0.7013 0.7455 0.7455 0.7455 0.7455 0.7455 0.7455
  1995    1      1  1     1     2 0.0350 0.1108 0.2682 0.3418 0.4876 0.5367 0.6506 0.6249 0.6597 0.7560 0.6670 0.7442 0.7998 0.9101
0.6804 0.8008 0.8008 0.8008 0.8008 0.8008 0.8008
  1996    1      1  1     1     2 0.0339 0.1007 0.2876 0.3982 0.4674 0.5317 0.5651 0.6509 0.5957 0.6362 0.6049 0.7500 0.6756 0.8109
1.4853 0.7509 0.7509 0.7509 0.7509 0.7509 0.7509
  1997    1      1  1     1     2 0.0328 0.0906 0.3555 0.4322 0.4931 0.5476 0.5453 0.5833 0.5855 0.6071 0.6315 0.8633 0.5946 0.7118
0.6618 0.8693 0.8693 0.8693 0.8693 0.8693 0.8693
  1998    1      1  1     1     2 0.0317 0.0805 0.2091 0.3539 0.5041 0.5172 0.5420 0.6412 0.6099 0.6769 0.8078 0.7174 0.8100 0.7733
0.7510 0.7714 0.7714 0.7714 0.7714 0.7714 0.7714
  1999    1      1  1     1     2 0.0306 0.1352 0.2502 0.3455 0.4251 0.5265 0.5569 0.5727 0.6117 0.7030 0.6650 0.7989 0.7554 0.8787
0.7348 0.8187 0.8187 0.8187 0.8187 0.8187 0.8187
  2000    1      1  1     1     2 0.0294 0.1899 0.3216 0.4729 0.5766 0.6598 0.7176 0.7279 0.7539 0.8378 0.8159 0.8814 0.8554 0.9391
0.8744 0.9336 0.9336 0.9336 0.9336 0.9336 0.9336
  2001    1      1  1     1     2 0.0283 0.0512 0.2867 0.4843 0.6527 0.6645 0.7469 0.8629 0.8555 0.8802 0.9630 0.9790 1.0054 1.0494
0.9927 0.9768 0.9768 0.9768 0.9768 0.9768 0.9768
  2002    1      1  1     1     2 0.0272 0.0756 0.3583 0.4575 0.6058 0.8160 0.7581 0.8488 0.9771 0.9322 0.9176 0.9974 0.9890 0.9236
1.1250 1.0573 1.0573 1.0573 1.0573 1.0573 1.0573
  2003    1      1  1     1     2 0.0261 0.1000 0.2551 0.4355 0.5225 0.5879 0.7569 0.6915 0.7469 0.8246 0.7692 0.8887 0.9266 0.7894
0.8414 0.9965 0.9965 0.9965 0.9965 0.9965 0.9965
  2004    1      1  1     1     2 0.0250 0.1081 0.2577 0.4360 0.4807 0.5319 0.6478 0.7068 0.6579 0.7094 0.8050 0.8581 0.7715 0.9704
0.8631 0.8959 0.8959 0.8959 0.8959 0.8959 0.8959
  2005    1      1  1     1     2 0.0239 0.1162 0.2603 0.4311 0.5086 0.5393 0.5682 0.6336 0.6550 0.7027 0.7962 0.8104 0.8109 0.7602
1.1449 0.9678 0.9678 0.9678 0.9678 0.9678 0.9678
  2006    1      1  1     1     2 0.0228 0.1324 0.3831 0.4575 0.5341 0.5740 0.5910 0.5979 0.6560 0.6997 0.7259 0.7220 0.7753 0.6580
0.6399 0.9550 0.9550 0.9550 0.9550 0.9550 0.9550
  2007    1      1  1     1     2 0.0217 0.0461 0.2272 0.3776 0.5352 0.5530 0.6073 0.6328 0.6475 0.7055 0.7723 0.7627 0.8137 0.8702
0.8008 0.8698 0.8698 0.8698 0.8698 0.8698 0.8698
  2008    1      1  1     1     2 0.0217 0.1380 0.2435 0.4123 0.5732 0.6488 0.6985 0.6914 0.7151 0.7280 0.7593 0.8241 0.8934 0.8227
0.8696 0.8425 0.8425 0.8425 0.8425 0.8425 0.8425
  2009    1      1  1     1     2 0.0217 0.0667 0.2428 0.3430 0.4735 0.6410 0.6831 0.7047 0.7529 0.8263 0.7687 0.8363 1.0329 0.8561
0.9492 1.0124 1.0124 1.0124 1.0124 1.0124 1.0124
  2010    1      1  1     1     2 0.0217 0.1089 0.2305 0.2621 0.4343 0.5361 0.6707 0.8666 1.1295 1.0818 0.9925 0.9214 0.8842 1.1424
0.7200 0.9031 0.9031 0.9031 0.9031 0.9031 0.9031
  2011    1      1  1     1     2 0.0217 0.0845 0.2428 0.3194 0.3833 0.5103 0.5989 0.6727 0.8608 0.9476 0.9606 1.0749 1.0633 1.0148
1.0557 0.9368 0.9368 0.9368 0.9368 0.9368 0.9368
  2012    1      1  1     1     2 0.0217 0.1290 0.2175 0.3531 0.4065 0.4884 0.6476 0.6841 0.7795 0.9363 0.9736 0.9639 0.9473 0.9949
1.0030 0.9373 0.9373 0.9373 0.9373 0.9373 0.9373
  2013    1      1  1     1     2 0.0217 0.1297 0.2813 0.3552 0.4710 0.5090 0.6265 0.7149 0.7310 0.8338 0.9989 1.0752 1.2303 1.1187
1.0682 1.0545 1.0545 1.0545 1.0545 1.0545 1.0545
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Table 1 includes the final estimates of Pacific whiting mortality from 2007 to 2012 for research and the pink shrimp fishery from the West Coast Groundfish Mortality Reports.

Table 1. Estimates of Pacific whiting mortality from 2007-2012 for Research and the Pink Shrimp Fishery.

	2012	2011	2010	2009	2008	2007
Research	473	1,062	133	35	12	49
Pink shrimp	19	282	399	1,937	684	2,808
Total	492	1,344	532	1,972	696	2,857

Agenda Item C.5.c
Supplemental GMT Report
April 2014

GROUNDFISH MANAGEMENT TEAM REPORT ON IMPLEMENT 2014 PACIFIC WHITING FISHERY UNDER THE U.S.-CANADA PACIFIC WHITING AGREEMENT

The Groundfish Management Team (GMT) had a brief discussion about the off-the-top deduction for Pacific whiting for 2014. The GMT had heard from industry on concerns that the off-the-top deduction for research of 2,500 mt in previous years might be too high for 2014, given that the National Marine Fisheries Service (NMFS) acoustic survey may not occur. The GMT conferred with NMFS West Coast Region (WCR) staff who track research catch.

In 2013, there was approximately 1,100 mt of Pacific whiting taken in scientific research activities, less than 14 mt of which came from midwater trawls that occurred during the NMFS acoustic survey. For 2014, anticipated research take is anticipated to be approximately 1,100 mt, even without the acoustic survey. In recent years, the majority of Pacific whiting take in scientific research is from gear testing projects that are anticipated to continue in 2014.

The GMT is not aware of the details of what research programs are proposed for 2014. However, the GMT expects that the estimated increased biomass of Pacific whiting may lead to higher catch rates of Pacific whiting relative to rockfish. Therefore, any research on excluder devices may result in larger Pacific whiting catches than previous years.

PFMC
04/07/14

Agenda Item C.5.c
Supplemental GAP Report
April 2014

GROUNDFISH ADVISORY SUBPANEL REPORT ON IMPLEMENT 2014 PACIFIC WHITING FISHERY UNDER THE U.S.-CANADA PACIFIC WHITING AGREEMENT

The Groundfish Advisory Subpanel (GAP) was briefed about the 2014 Total Allowable Catch (TAC) determination by the Whiting Agreement Joint Management Committee (JMC). The JMC process addressed issues relevant to setting the 2014 TAC and reached a consensus recommendation, which was forwarded to the Parties for implementation. Given that the JMC provided a consensus recommendation, the GAP has identified one issue ripe for Council action.

Council action is required to establish a set-aside amount for incidental catches of whiting in non-whiting fisheries and catches in research surveys. The GAP recommends 1,000 metric tons be established as the 2014 set-aside to accommodate research and incidental catch. From data provided to the GAP (Agenda Item C.5.a, Supplemental REVISED Attachment 2: Table 1. Estimates of Pacific whiting mortality from 2007-2012 for Research and the Pink Shrimp Fishery) this amount is sufficient to cover research and incidental catches. Moreover, relative to potential catches of hake in research and incidental to the pink shrimp fishery, it is the GAP's understanding that there will not be a hake acoustic survey in 2014 and, as the pink shrimp fishery continues to refine excluder devices, incidental catch of hake will decline. Therefore, the GAP concluded that it is reasonable to expect that 1,000 metric tons will be adequate for the 2014 set aside.

PFMC
04/05/14

Agenda Item C.6
Situation Summary
April 2014

SABLEFISH CATCH SHARE PROGRAM REVIEW PHASE I

The Council began a review of its sablefish permit stacking program at its September 2013 meeting. Phase I of the program review includes:

1) an assessment of the program as it has performed against its original objectives;
2) consideration of two issues for action—
    a) rules for assessing permit control, and
    b) electronic fish tickets; and
3) identification of additional issues for potential action.

The Council is scheduled to approve the final program assessment document and final preferred alternatives for the two action items at its June 2014 meeting. If during the review additional issues for action are identified, a second phase of the review will be conducted for the purpose of considering these issues—process to commence in September 2014.

The first phase of this review process will produce two separate documents: a program assessment and a document that presents and analyzes impacts for the two action issues.

The first of these two documents, the program assessment document (Agenda Item C.6.a, Attachment 1), will be completed and finalized for public review after this Council meeting. The current draft contains an initial assessment of the achievement status for the ten adopted program objectives. Council members may wish to comment on the draft or provide additional guidance on the content to be included in the document.

The latter of these two documents (Agenda Item C.6.a, Attachment 2) will eventually become the environmental analysis (EA) required under the National Environmental Policy Act, as well as fulfill the analytical requirements of the Magnuson-Stevens Act and other applicable law. The current draft describes the purpose-and-need and alternatives related to both issues, and provides an analysis of the impacts of changing the rules for assessing permit control. Analysis of the impacts of requiring electronic fish tickets will be provided as Agenda Item C.6.a, Supplemental Attachment 3. The Council was scheduled to select a preliminary preferred alternative for both of these issues, however, because the analysis of the electronic fish ticket issue was not available in the advance briefing materials the Council may wish to defer selection of a preliminary preferred alternative and instead move straight to selection of a final preferred alternative for electronic fish tickets at the June meeting. At this meeting the Council may wish to refine the electronic fish ticket alternatives which will be analyzed.

In April of 2012, under its trawl trailing actions, the Council made a recommendation to re-establish regulations which allow joint registration of trawl and fixed gear (longline and fishpot) permits to the same vessel at the same time. National Marine Fisheries Service (NMFS) is developing an implementation package on this issue, which will be combined with the two action items being considered as part of this review. In June, after the Council takes final action on the fixed gear catch sharing program review and issues for action, a draft EA will be published and proposed regulations promulgated on all three issues. If NMFS identifies any questions regarding Council intent with respect to the joint registration issue (none have been identified as of the time of the advance briefing book), it may bring those questions to the Council under this agenda item and a noticed Council response may be scheduled for the June Council meeting.

Council Action:

1. Provide guidance on refinement of the draft review document, as appropriate.
2. Select a preliminary preferred alternative for the rules for assessing permit control.
3. Refine electronic fish ticket alternatives, as appropriate.

Reference Materials:

1. Agenda Item C.6.a, Attachment 1: Preliminary Draft and Outline, Pacific Coast Groundfish Limited Entry Fixed Gear Sablefish Permit Stacking Program Review.
2. Agenda Item C.6.a, Attachment 2: Sablefish Permit Stacking Program – Action Issues: Draft Council Decision Analysis Document.
3. Agenda Item C.6.a, Supplemental Attachment 3: Sablefish Permit Stacking Program – Action Issues, Electronic Fish Ticket Analysis.

Agenda Order:

a. Agenda Item Overview Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Adopt Preliminary Preferred Alternatives for Electronic Fish Tickets and Permit Control Rule; Provide Guidance for Program Review and Related Actions, as Appropriate

PFMC
03/21/14

Agenda Item C.6.a.
Attachment 1
April 2014

PRELIMINARY
DRAFT & OUTLINE

PACIFIC COAST GROUNDFISH LIMITED ENTRY FIXED GEAR SABLEFISH PERMIT STACKING PROGRAM REVIEW

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MARCH 2014

DOCUMENT PREPARATION AND ACKNOWLEDGEMENTS

Preparation of this draft review of the limited entry fixed gear sablefish permit stacking program was performed by a work group composed of the following members:

Mr. Jim Seger and Dr. John Coon	Pacific Fishery Management Council
Dr. Ed Waters	Economic Consultant
Ms. Ariel Jacobs, Mr. Steve Freese, and Mr. Kevin Ford	National Marine Fisheries Service, West Coast Region

Additional assistance and consultation was provided by personnel of the National Marine Fisheries Service, Northwest Fisheries Science Center, especially Ms. Lisa Pfeiffer.

A draft report of the Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Number FNA10NMF4410014. This preliminary draft is not citable.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACL	Annual catch limit
AKFIN	Alaska Fisheries Information Network. Provides commercial fishery data for Alaska fisheries.
Council	Pacific Fishery Management Council
DTL	Daily trip limit
FMP	Fishery management plan
IFQ	Individual fishing quota
IQ	Individual quota
LAP	Limited access privilege
LAPP	Limited access privilege program
LEFG	Limited entry fixed gear
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NS	National Standard
PacFIN	Pacific Coast Fisheries Information Network. Provides commercial fishery data for Washington, Oregon, and California (maintained by the Pacific States Marine Fisheries Commission)

1.0 INTRODUCTION

This review document concerns implementation of Amendment 14 to the Pacific Coast Groundfish Fishery Management Plan (FMP). Amendment 14 (PFMC, 2001) was approved by the Pacific Fishery Management Council (Council) at its November 2000 meeting and partially implemented by National Marine Fisheries Service (NMFS) on August 2, 2001(Federal Register, 2001) (66 FR 41152, August 7, 2001), in time to provide for a limited entry fixed gear (LEFG) sablefish season from August 15 through October 31. The amendment was fully implemented for the 2002 fishery. This amendment created a permit stacking program for limited entry permit holders with sablefish endorsements (i.e., the sablefish permit stacking program or simply the sablefish program). The program was expected to lengthen the duration of the limited entry, fixed gear primary sablefish fishery, increase safety and flexibility for fishery participants, and reduce capacity in the limited entry, fixed gear fleet.

1.1 Purpose and Need for a Program Review

The purpose of this document is to provide an overall review of the sablefish program to determine how well it has met its FMP goals and objectives, and to help identify any potential modifications or improvements to the program which would then be considered through the Council's standard notice and review process. The goals and objectives of the program are based on, and are consistent with the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) which is the ultimate authority for regional council fishery management.

While the sablefish program seems to have been generally successful at achieving its main objectives, a few limited requests for program modifications have emerged in the more than twelve years that have elapsed since its implementation (see Section 1.2). During that time there have been several changes in the fishery and groundfish management. In consideration of the changes and time elapsed, the Council and NMFS have agreed upon the need to review the program with a more in-depth look to determine how well it has met its original objectives and how well it continues to serve Pacific Coast groundfish management and its stakeholders. In addition, the sablefish permit stacking program is of a type of fishery management program that was categorized in the 2006 reauthorization of the MSA as a limited access privilege (LAP) program. After 2006, any programs initiated as LAP programs had to meet certain requirements listed in Section 303A(c) of the MSA, including the need to be reviewed on a periodic basis. While it was initiated as a LAP program prior to the MSA requirements for new LAP programs, a periodic review of any program to determine how well it is working and achieving its original objectives is a prudent management process and is consistent with the requirements in §303A of the MSA.

1.2 Concurrent Considerations of the Sablefish Program

Separate from this review, the Council is currently considering three potential modifications to the regulations implementing the sablefish program (Sablefish Program Phase I Review). The modifications under consideration are: 1) liberalizing the own-and-hold threshold which currently specifies that partial ownership of any permit, no matter how small, counts toward the limit of no more than three per vessel, 2) requiring the use of electronic fish tickets to aid in the tracking of landings, and 3) allowing a limited entry fixed gear endorsed permit and a trawl endorsed permit to be registered to the same vessel at the same time.[1] A final Council decision on these three potential changes to the sablefish program is scheduled for the June 2014 Council meeting.

2.0 BACKGROUND

2.1 Pre-Permit Stacking Management History

Sablefish (*Anoplopoma fimbria*), also known as "black cod," is one of the most valuable species in the groundfish fishery off Washington, Oregon, and California. Because of its high ex-vessel value per pound, sablefish is a desirable target species for many West Coast fisheries and gear groups. The Council made several sablefish allocation decisions over the 15 years prior to implementation of Amendment 14 in an attempt to divide this desirable resource among different sectors of the fishery in an equitable and beneficial way.

In 1987, an allocation of sablefish was established that provided 52 percent to the trawl fishery and 48 percent to the non-trawl gear groups. This allocation was later adjusted to 58 percent and 42 percent. Industry representatives of vessels participating in the non-trawl sablefish fisheries expressed their desire that the fishery be managed on a seasonal basis (as opposed to the year-round policy the Council pursued for most sectors of the groundfish fishery). The pursuit of seasonal management for the non-trawl segment of the sablefish fishery was a key decision that, when combined with a decline in sablefish abundance, ultimately impacted safety, efficiency, and allocation issues that the permit stacking program was meant to address.

The vast majority of the trawl and non-trawl sablefish harvest was placed under a license limitation program in 1994 under Amendment 6 (PFMC, 1992). Of the non-tribal commercial optimum yield of sablefish, 90.6 percent was allocated to the limited entry fishery and 9.4 percent was allocated to the open access fishery. The limited entry sablefish allocation was then

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[1] In trailing actions for the trawl individual fishing quotas (IFQ) program (trawl rationalization) the Council has previously approved the allowance for a fixed gear and trawl permit to be registered to the same vessel. NMFS is in the process of considering implementation of that action.]

allocated 58 percent to the limited entry trawl sector and 42 percent to the limited entry non-trawl (fixed gear) sector.

Management for the fixed gear fleet was, and continues to be divided at 36º N. latitude (approximately 20 miles south of Point Sur, California) with separate annual catch limits (ACLs) for the northern and southern fisheries divided by this line. While the coastwide trawl fishery took sablefish as part of its year-round cumulative trip limit fisheries, the northern fixed gear fleet landed 85 percent of its allocation in a directed sablefish season, and 15 percent of its allocation in daily trip limit (DTL) fisheries. The southern fixed gear fleet landed all of its allowed harvest in DTL fisheries. The directed season north of 36º N. latitude had become increasingly tense over the years as vessel capacity and competition for landings increased and amounts of fish available for harvest decreased. Through 1996, the directed (or “primary”) season was managed as an open competition derby. Derby duration shortened each year, until the fishery was just five days long in 1996.

Concern for the safety of participants in the sablefish derby led the Council to develop Amendment 9 to the FMP. In 1997, NMFS implemented Amendment 9, the sablefish endorsement program (PFMC, 1996). Under this program, the limited entry permit holders were eligible for sablefish endorsements based on their permit history. Permits without sufficient sablefish landings history were not endorsed for future participation in the primary season, but could still be used in the DTL fisheries.

Even with the sablefish endorsement, the fishery season remained short (nine days in 1997). In order to lengthen the season, equal limits were imposed on all qualified participants (sablefish endorsement holders). However, the season still had to be limited to keep the fishery from being classified as an individual quota (IQ) program. A fishery with a limited class of participants each with an amount of fish they are allowed to harvest is an IQ. In its 1996 re-authorization of the MSA, Congress had included a moratorium on implementing new IQ programs through October 1, 2000. The moratorium was interpreted to cover any program that would allow a vessel ample time and opportunity to catch a limit allocated specifically to that vessel. The moratorium forced the Council to manage the primary season for a short duration that prevented many participants from fully taking their vessel-specific limits (a “modified derby”). To further assure that the cumulative limits would not be categorized as an IQ program, regulations were established to set a maximum season length of 10 days. Equal cumulative limits were viewed by the Council as being extraordinarily reallocative in nature, but for 1997, equal limits were the only option available to lengthen the season and to begin to address safety issues.

The inequitable allocation system created by the equal cumulative limits was partially resolved with a “three-tier” system, which was established by regulatory amendment for 1998 and beyond. Under this “three-tier” system, sablefish endorsement holders were ranked into three different tiers based on their permit histories, with the lowest tier (Tier 3) having the lowest qualification requirements. Annual management of the three-tier cumulative limit system required that the allocation for this fishery be divided such that there were three different cumulative limits for the different tiers. While somewhat more equitable than the cumulative limit program, the three-tier system still required some fishermen to make large cutbacks in their harvest levels while allowing others to expand. The system provided little flexibility to operators to determine the manner in which their sablefish catch is harvested or to scale their harvest upward to match their pre-existing levels of capital investment. This lack of flexibility undoubtedly reduced efficiency, resulting in a lower net value for harvest.

Even under the three-tier system, the fishery still had to be managed as a modified derby, and the seasons were still too short (between 6-9 days) to allow fishermen to operate with care and safety. Short derby seasons are believed to result in accidents due to fatigue and financial pressure to fish and transit under unsafe conditions.

The MSA moratorium on new IQ programs expired on October 1, 2000. On December 21, 2000, Public Law 106-553, an appropriations bill for the National Oceanic and Atmospheric Administration (NOAA), contained a continuation of the IQ moratorium through October 1, 2002 and an exception to that moratorium for a permit stacking program in the West Coast fixed gear sablefish fishery. On August 2, 2001, Amendment 14 implemented a permit stacking program, in which up to three sablefish-endorsed permits could be registered for use with a single vessel and that vessel could then have access to the primary season sablefish cumulative limits associated with each of those permits. Most importantly, the exception to the IQ moratorium for the fixed gear sablefish fishery as implemented through Amendment 14 allowed longer seasons (April through October), so that each vessel could fish against its limits at its own speed.

Portions of Amendment 14 were implemented for the 2001 primary sablefish season. The extended sablefish season (April 1 through October 21) was fully implemented in 2002. In 2006, NMFS implemented additional regulations for Amendment 14. In the future, NMFS will consider implementing a permit stacking program fee system as required by the MSA (see Section 3.11). Table 2-1 recounts the implementation history.

Table 2-1. Implementation of Amendment 14.

Date	Action	Reference
08/02/2001	NMFS final rule implementing initial permit stacking provisions as follows: 1) up to 3 sablefish-endorsed permits per vessel; 2) limited entry, primary sablefish season of August 15 - October 31; 3) a vessel may fish for sablefish in the primary season with any of the gears specified on at least one of the limited entry sablefish-endorsed permits registered for use with that vessel; 4) no person may own or hold more than 3 sablefish-	66 FR 41152, August 7, 2001

Date	Action	Reference
	endorsed limited entry permits unless that person owned more than 3 permits as of November 1, 2000; 5) no partnership or corporation may own a sablefish-endorsed limited entry permit unless that partnership or corporation owned a permit as of November 1, 2000; 6) cumulative limits for species other than sablefish and for the sablefish daily trip limit (DTL) fishery remain per vessel limits and are not affected by permit stacking; and 7) the limited entry DTL fishery for sablefish is open during the primary season for vessels not participating in the primary season.	
03/01/2002	As part of the final rule implementing the 2002 groundfish regulations, the primary limited entry sablefish season was extended to April 1 – October 31.	67 FR 10490, March 7, 2002
04/03/2006	Final rule including additional permit stacking regulations as follows: 1) permit owners and permit holders required to document their permit ownership interests to ensure that no person holds or has ownership interest in more than 3 permits; 2) owner-on-board requirement for permit owners who did not own sablefish-endorsed permits as of November 1, 2000; 3) an opportunity for permit owners to add a spouse as co-owner; 4) vessels not meeting minimum frozen sablefish historic landing requirements are not allowed to process sablefish at sea; 5) permit transferors required to certify sablefish landings during mid-season transfers; and 6) a definition of the term "base permit."	71 FR 10614, March 2, 2006

2.2 Permit Stacking Program Goals and Objectives

The legal basis for Amendment 14 is the Groundfish FMP approved by the Secretary of Commerce under the authority provided by the MSA.

Permit stacking and its accompanying regulatory provisions were expected to help the Council address objectives related to National Standards 4 (fair and equitable allocation), 5 (consider efficiency), 6 (take into account variations and contingencies), 8 (take communities into account), 9 (minimize bycatch and bycatch mortality), and 10 (promote safety). Specifically, it was expected to affect achievement of Groundfish FMP Goals 2 (maximize the value of the resource as a whole) and 3 (achieve maximum biological yield) through impacts related to Objectives 6 (achieve greatest net benefit), 9 (reduce wastage), 11 (minimize bycatch), 12 (equitable sharing of the conservation burden), 13 (minimize gear conflicts), and 14 (accomplish changes with minimum disruption).

Key objectives of Amendment 14 and the permit stacking program were further defined as provided in Table 2-2.

The stacking program was intended to modify the economic and social impacts of the fishery management system in order to attain a more favorable result with respect to the entire suite of standards, goals, and objectives for management of the groundfish fishery.

Table 2-2. Key objectives of the permit stacking program and consistency with management objectives.

Key Objective	Consistency with Management Objectives of the FMP and MSA
1. Rationalize the fleet and promote efficiency	Capacity reduction is one of the key elements of the Council's strategic plan. The strategic plan generally approaches capacity reduction by reducing the number of fishing vessels. This reduction does not of itself imply the rationalization of the fleet or increased efficiency. It is possible that the most efficient fixed gear sablefish harvest could involve a greater number of vessels taking sablefish as bycatch in other fisheries. However, given the high degree of overcapitalization in the fishery, it is believed that a reduction in capacity will generally move the fishery toward greater efficiency, addressing National Standard (NS) 5 and FMP Objective 6 on net national benefits.
2. Maintain or direct benefits toward fishing communities	This objective relates to NS 8 on fishing communities and FMP Objective 16 on fishing communities.
3. Prevent excessive concentration of harvest privileges	This objective relates to NS 4 on allocation, NS 8 on fishing communities, and FMP Objective 15 on avoiding adverse impacts to small entities.
4. Mitigate the reallocational effects of recent policies (3-tier system and equal limits)	This objective relates to NS 4 on allocation and FMP Objectives 12 on equitable allocation and 14 on minimizing disruption.
5. Promote equity	This objective relates to NS 4 on allocation and FMP Objective 12 on equitable sharing.
6. Resolve or prevent new allocation issues from arising	This objective relates to NS 4 on allocation and FMP Objectives 12 on equitable sharing and 14 on minimizing disruption.
7. Promote safety	This objective relates to NS 10 and FMP Objective 17 on safety.
8. Improve product quality and value	This objective relates to NS 5 on efficiency and FMP Objective 6 on net national benefits.
9. Take action without creating substantial new disruptive	This objective relates to FMP Objective 14 on minimizing disruption.

Key Objective	Consistency with Management Objectives of the FMP and MSA
effects.	
10. Create a program that will readily transition to a multi-month IQ program.	This objective relates to capacity reduction recommendations in the strategic plan. Where individual quotas are transferable and divisible they address NS 6 by providing the fleet with substantial flexibility to respond to changing conditions in the fishery and NS 5 by taking efficiency into account. FMP Objective 6 is also addressed.

2.3 Description of the Current Permit Stacking Program

The current permit stacking program, or sablefish primary fishery, occurs north of 36º N. latitude where vessels registered to at least one limited entry permit, with either a gear endorsement for longline or trap (or pot) gear, and an endorsement for sablefish, fish a specified tier limit. Such vessels are eligible to fish in the DTL fishery before the primary season (i.e., January through March) and after their aggregate tier limit on the vessel has been harvested, or the season has ended, whichever comes first. This transition between fisheries often occurs during the sablefish primary season. Under the permit stacking program, each fixed gear sablefish endorsed limited entry permit is assigned to one of three tiers. The permit's tier level determines the poundage of sablefish which can be landed by that permit each season while participating in the primary sablefish fishery. For sablefish endorsed, limited entry permits, the Regional Administrator will biennially or annually announce the size of the cumulative trip limit for each of the three tiers associated with the sablefish endorsement such that the ratio of limits between the tiers is approximately 1:1.75:3.85 for Tier 3:Tier 2:Tier 1, respectively. Up to three permits can be stacked onto a single vessel, allowing that vessel to land up to the sum of the three tier limits in aggregate.

The program also includes other provisions, including a prohibition on the ownership of permits by corporations or other business entities, a permit owner-on-board requirement, a limit on the number of permits any individual or entity (individually and collectively) can own or hold, and a prohibition on at-sea processing. A grandfather clause was provided for each of these provisions, allowing the continuation of situations in place prior to Council action. For non-grandfathered permits, the owner of the permit must be on board the vessel during the primary season when that permit's tier amount is being fished. If landings from a trip will be attributed to multiple tiers, then all permit owners of those tiered permits being fished must be onboard. However, there are medical and death exemptions from this requirement.

Currently there are 164 sablefish endorsed permits of which 131 are endorsed for longline only; 27 are trap/pot endorsed only, and 6 have two gear endorsements. The number of permits by tier levels is as follows: Tier 1 – 28 permits; Tier 2 – 42 permits, and Tier 3 – 94 permits. As of August 2013, approximately 40 vessels have stacked permits.

2.4 Relevant Groundfish Policy and Regulatory Changes Since Program Implementation

Since the implementation of the fixed gear sablefish permit stacking program, numerous regulatory changes have taken place within the Pacific Coast groundfish fishery. Chief among these changes was implementation of groundfish conservation areas (i.e., ecologically important habitat closed areas and rockfish conservation areas) and the rationalization of the trawl fishery. The large number of transfers occurring between the limited entry fixed gear (LEFG) sablefish fishery and the rationalized trawl fishery make the development of the rationalized trawl fishery especially important in reviewing the sablefish program.

Trawl rationalization involved two closely related and interlinked decisions. The first was the specification of the management system used to rationalize the trawl fishery in Amendment 20 to the groundfish FMP (PFMC and NMFS, 2010). Amendment 20 involved the consideration of harvest control tools such as individual fishing quotas (IFQs) and harvester co-ops. The second decision involved determining the proportion of the available catch that would be allocated to the trawl versus the non-trawl fishery. This decision was addressed as Amendment 21 to the Groundfish FMP (PFMC, 2010).

3.0 PROGRAM PERFORMANCE AND REVIEW

This review of the fixed gear LAPP will concentrate on assessing achievement of the 10 key objectives of the sablefish program (Sections 3.1 through 3.10) as provided in Groundfish Amendment 14 and summarized in Table 2-2 of this document. These objectives are all socio-economic objectives. While the biological impacts of the sablefish permit stacking program have not been quantified, they are believed to be insignificant. The impacts, if any, would result from a potential increase in unreported discards of smaller sablefish and changes in retention of other groundfish species. An increase in discard of small sized sablefish (high grading) might be expected because the permit tier limits are landing limits rather than catch limits which would limit both catch and discards. The degree of high grading will be a function of the price differential between large and small fish, catch composition by size class, and fishing costs. There is no reliable data on size composition of landings because different buyers use different size categories. The ending of the derby fishery constraint may have allowed vessels to increase their retention of other groundfish or may have had no effect. Under current management, the conservation of sablefish and other groundfish is protected by annual catch limits (ACLs) which are independent of the permit stacking program.

This is the first official review of the impacts and outcome of this program by the Council. In 2013, NOAA published a technical memorandum on the performance of U.S. catch share programs (Brinson, Ayeisha A. and Thunberg, Eric A., 2013) which included a review of the Pacific Coast sablefish fishery. The authors of that report found evidence for capacity reduction in the fishery as well as better achievement of the catch quota. Total revenue (adjusted for inflation) also increased, however they were not able to determine what part of the change might be due to the program versus other market forces.

This review will utilize primarily available PacFIN landings data and AKFIN vessel participation indicators (“yes/no” flags), and U.S. Coast Guard records on safety incidents to look at how the program has met its objectives.

The assessment of each objective of the program, as identified above, follows in sections 3.1 through 3.10 below.

3.1 Rationalize the Fleet and Promote Efficiency

3.1.1 Background

Rationalizing the fleet and promoting efficiency, primarily through reducing the number of participating vessels (capacity reduction) and lengthening the season, was a key objective of Amendment 14. In considering how to reduce the fleet, the Council also had to balance that reduction with its other objective of preventing excessive concentration of harvest privileges (see also Section 3.3). At the time Amendment 14 was adopted, the Council had just completed the Groundfish Strategic Plan (PFMC, 2000) for which capacity reduction is one of the goals. In support of the Council’s Strategic Plan development process, the Scientific and Statistical Committee (SSC) assessed the capital utilization rates in year 2000 groundfish fisheries. The SSC characterized the capital utilization rate for a fishery as “the percentage of boats in the [year 2000] fleet needed to harvest the groundfish available in 2000.” For the limited entry fixed gear sablefish fishery, the SSC calculated that just 9 percent of the vessels in that fleet in 2000 were capable of harvesting that fleet’s sablefish allocation for that year. While the Council was not interested in reducing the number of vessels participating in the limited entry fixed gear sablefish fleet to 9 percent of the year 2000 levels, capacity reduction was a significant objective for Amendment 14 and the permit stacking program.

Amendment 14 was designed to allow the fleet to achieve some balance between too little and too much capacity reduction, without specific criteria for what constituted “too little” or “too much.” Too little capacity reduction could mean that commercial fishermen intending to make a career of fishing would have to rely on sablefish landings providing a smaller proportion of their incomes and have to rely more on other fisheries. Too much capacity reduction could mean that the fleet could be reduced and concentrated to such a small number of vessels that harvest benefits from the fishery would be channeled to relatively few individuals, coastal communities, and processors.

Amendment 14 was explicitly *not* designed to reduce the fleet numbers to as few vessels as possible. The Council’s judgment on whether the fleet’s capacity has been reduced by too much or by too little, and whether excessive concentration of harvest privileges has occurred, will be necessarily qualitative, since the Council did not set an explicit capacity reduction goal with Amendment 14.

Information and data for considering whether the fleet has been rationalized and made more efficient include assessing the following:

- Changes in season length and average fishing days by year;
- Changes in the concentration of harvest, including combinations of stacked permits, landings, and revenue by vessels in the fishery, both before and after program implementation; and
- Changes in permit prices for available years.

3.1.2 Assessment

The sablefish program provided an immediate and significant lengthening of the primary sablefish fishery and average duration of the time over which a vessel might fish. Table 3-1 provides a succinct display of the season length and management history. In 1996 the primary fishery lasted only 5 days (September 1-6) in the derby mode. Beginning with 2002, the annual primary sablefish season was increased to 7 months in length (April 1 through October 31), giving fishermen and processors far more flexibility in how and when they fished and made landings. Figure 3-1 displays the average duration in days over which a vessel was fished per year in the primary sablefish fishery (calendar days from a vessel's first until its last landing made as part of the primary sablefish fishery). Looked upon in that way, within the 7 months of fishing opportunity, individual vessels tailored seasons for themselves that ranged on average from 60 to 75 days.

With regard to reducing the capacity of the fishery, Figure 3-2 displays the number of vessels participating in the sablefish fishery prior to and following implementation of the sablefish tier program. Primary season participation from 1998 through 2000 (prior to the program) averaged 135 vessels compared to an average of 90 vessels after program implementation (2002 through 2013), a 33 percent decrease. The number of vessels and landings in the primary season fishery prior to 1998 were not separated from the total fishery and are not directly comparable to the post program numbers. ***Primary–season-only values for 1996 and 1998 will be provided in the next draft of this document.***

With regard to any changes in the ability of the fishery to achieve its allocation, Figure 3-3 displays the primary LEFG sablefish fishery allocation and landings from 1998 through 2012. Comparing preprogram (1998 and 2000) with post program (2002 through 2012) landings indicates a significantly closer achievement of the allocation post program. The average percent of the sablefish primary season allocation that was harvested after implementation of the program (2002 through 2012), on either an unweighted or weighted basis, indicates a 90 percent utilization rate of the allocation during this time with a relatively small variation and no obvious upward or downward trend (Figure 3-4). This compares to an unweighted average utilization for the years 1998 and 2000 of 65 percent and a much larger variation between the two years than between any of the post program years. Some of the shortfall in the two preprogram years was made up in a mop-up fishery. ***Information on the mop-up fishery will be included in the next draft of this document.***

Table 3-1. Season length and management summary for the primary LEFG sablefish season north of 36° N. latitude, 1992 through the present.

Year	Season Length	Management
1992-1994	2 to 3 weeks	Derby
1995	7 days	Derby
1996	5 days	Derby
1997	9 days	Equal Limits/Modified Derby
1998	6 days	Tiered Limits/Modified Derby
1999	9 days	Tiered Limits/Modified Derby
2000	9 days	Tiered Limits/Modified Derby
2001	Aug. 15 - Oct. 31	Aug. 2 implementation of Permit Stacking
2002-present	Apr. 1 - Oct. 31	Permit Stacking

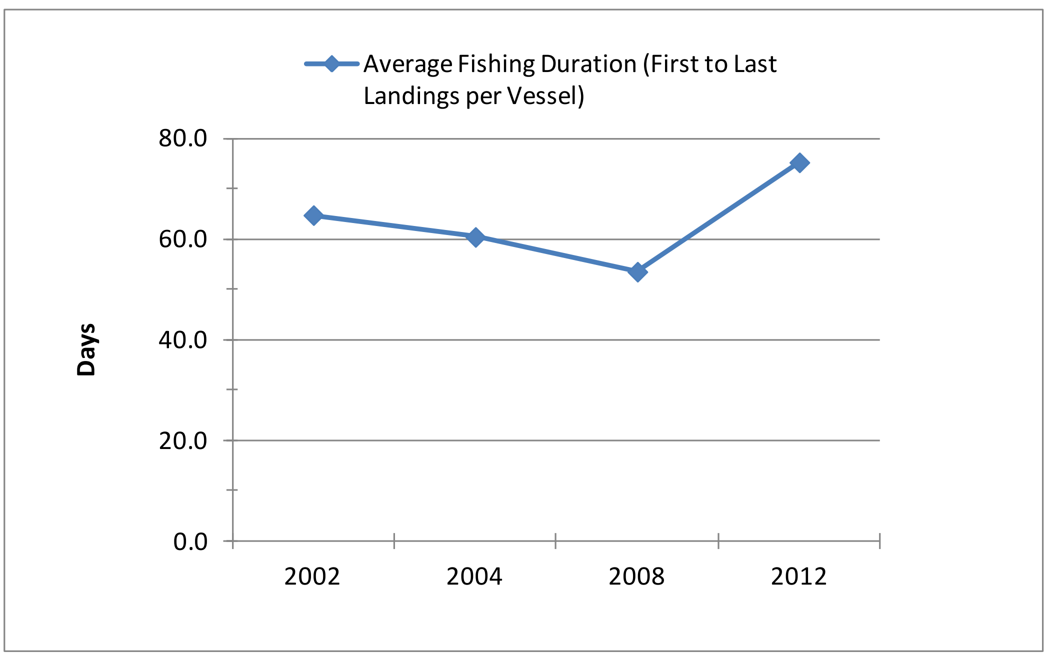

Figure 3-1. Average duration in days from first to last day of landings for vessels participating in the primary sablefish fishery (2002, 2004, 2008, and 2012).

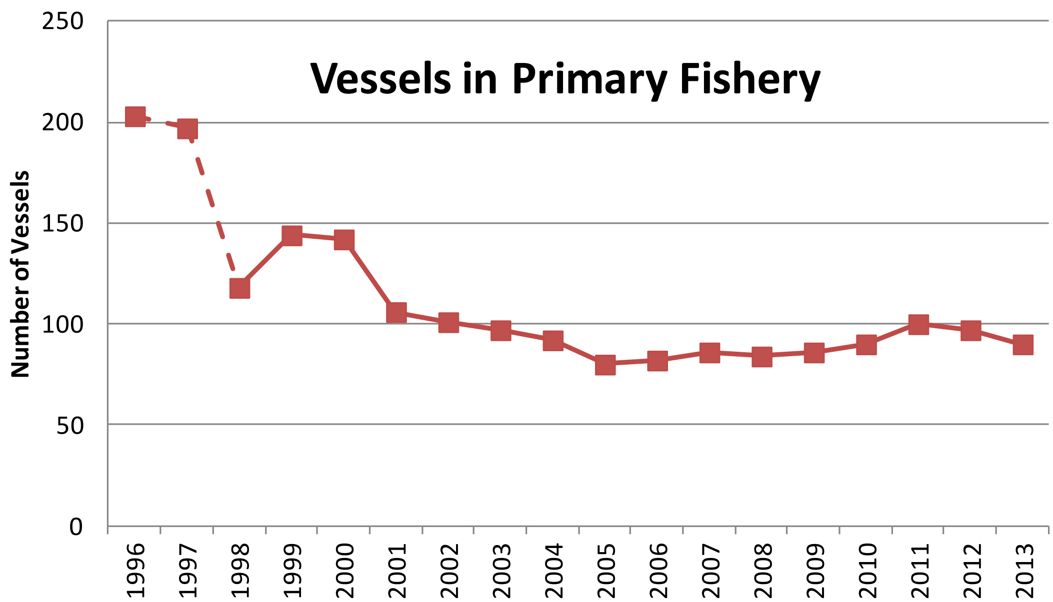

Figure 3-2. Number of vessels participating in the LEFG primary sablefish fishery from 1998 to 2013. Prior to 1998 the numbers represent total vessels as no breakdown between the primary season and other landings was available.

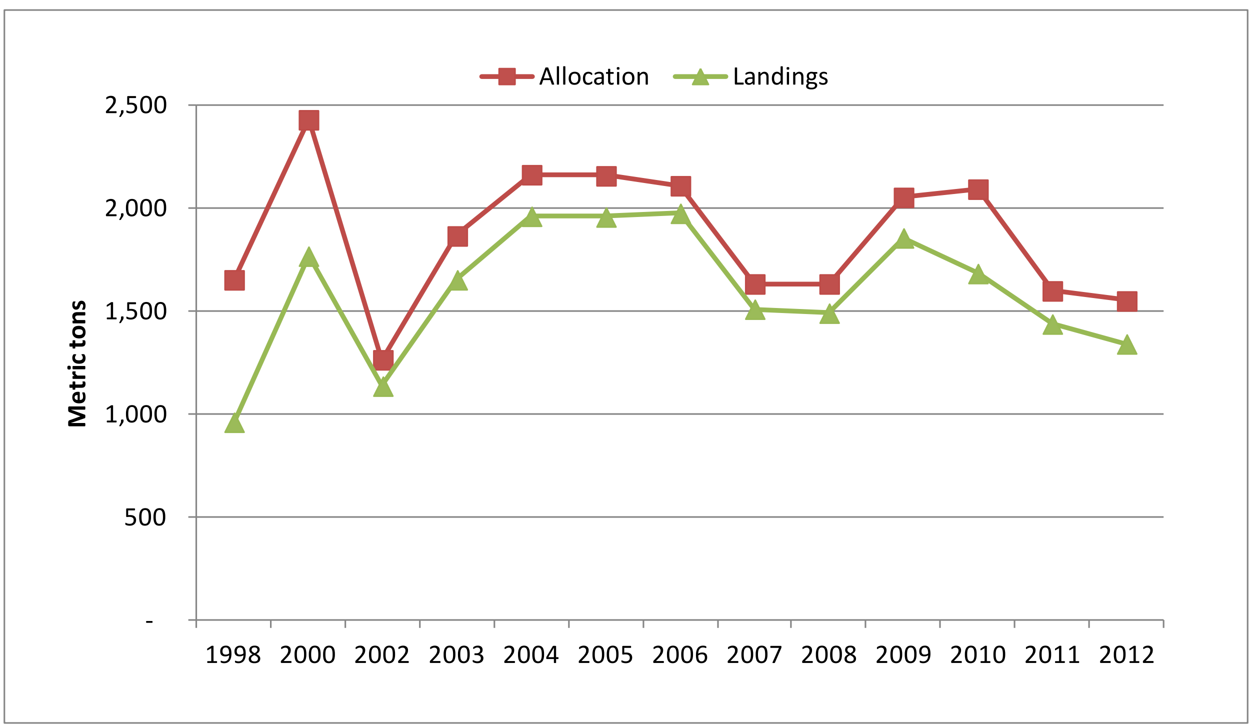

Figure 3-3. The LEFG sablefish primary season allocation and landings (1998 through 2012). The landings in 1998 and 2000 do not include the "mop-up" fishery.

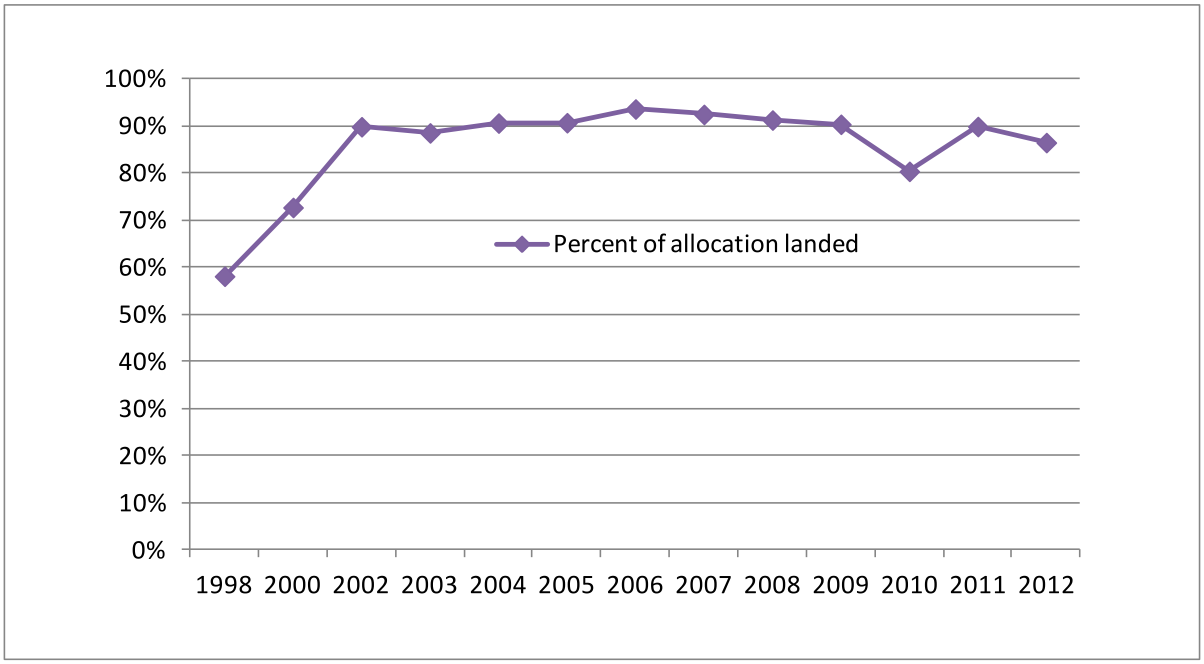

Figure 3-4. The LEFG sablefish primary season landings as a percent of the allocation (1998 through 2012). Landings in 1998 and 2000 do not include the "mop-up" fishery.

For the period of the program, Tables 3-2 and 3-3 compare the number of vessels and their landings with the various possible permit combinations in 2002, 2004, 2008, and 2012. From the snapshots within the first 12 years of the program provided by the tables, there does not appear to be any consistent direction of change that would indicate significant consolidation or disaggregation of permits and landings on a per vessel or fleet level. The number of vessels with combinations other than a single Tier 3 permit varied only slightly between 58 and 62 vessels. The main difference between years is due to the number of vessels with only a single Tier 3 permit (second row from the bottom in Table 3-2). Table 3-2 also displays the percent of the sablefish trawl individual fishing quota (IFQ) harvested by vessels with tier permits during the years 2011 through 2013 (17.2 percent).

Figure 3-5 displays how the participating vessels and concentration of landings in the primary sablefish fishery changed during selected years between 1996 and 2012. The participating vessels decreased fairly consistently from a high of around 200 in 1996 to a low of 82 in 2006. After 2006, the number of vessels participating in the primary fishery increased to 84 in 2008, 90 in 2010 and 97 in 2012. The number of vessels participating in 2012 was the highest since 92 participated in 2004.

Figure 3-6 graphs the concentration of landings and the cumulative share of vessels making landings in the LEFG sablefish fishery during selected years from 1996-2012. An equal distribution line has been added to indicate the shape of the curve if each vessel landed exactly the same amount in a given year. Greater deviations from the equal distribution line indicate relatively greater concentration of landings among fewer vessels. The graph shows the distribution changing over the years after program implementation. The dark 1996 line shows the distribution during the last year of the derby fishery. The 1997 line shows the degree to which equal cumulative limit management equalized distribution of harvest among vessels. The 1998 and 2000 lines show a move toward the 1996 distribution. After the permit stacking provisions went to effect in 2001, the lines move even closer to the 1996 line. The similarity of the curves for the earliest year, 1996, to the most recent year, 2012, is striking (see Section 3.4 for additional discussion of this graph). Although many fewer vessels participated in the fishery in 2012 than in 1996, they delivered a similar cumulative distribution of landings in both years. This is reinforced by comparing the Gini coefficient values for 1996 and 2012 from Figure 3-7. Gini coefficients are an indicator of the deviation from the equal distribution line shown in Figure 3-6. A Gini coefficient of 1.0 indicates an equal distribution of landings, while values below 1.0 indicate increasingly concentrated landings distributions.

Information on sablefish permit prices proved to be too limited for use in determining any trends in the permit values over time. Table 3-4 shows recent offerings of tier permits from Dock Street Brokers website. This snapshot shows a preponderance of trading for Tier 3 permits (the lowest quota share level).

3.2 Maintain or Direct Benefits toward Fishing Communities

3.2.1 Background

This objective relates most directly to NS 8 and FMP Objective 16 (take socio-economic needs of fishing communities into account) [2]. Did the program provide for the sustained participation of fishing communities and to the extent practicable, minimize adverse economic impacts on such communities?

To consider how well the sablefish program maintained or directed benefits toward fishing communities requires data on changes in the sablefish landings by West Coast port over the life of the program. Additionally, an owner-on-board requirement, intended, in part, to direct benefits toward local fishing communities, can be assessed by evaluating changes in the number of entities subject to the provision. The following information was considered or analyzed for this objective:

- Identification of the primary ports where sablefish landings (both primary season landings and landings made in the DTL fishery) are occurring;
- Calculation of a port involvement and dependence ratio; and
- Percent of landings by owner on board versus non-owner on board vessels.

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[2] Objective 17 at the time Amendment 14 was adopted.

Table 3-2. Comparison of the number of vessels and allocations for various combinations of stacked permits in 2002, 2004, 2008, and 2012. This is just a snapshot in time so that it may not capture changes in permit combinations during the season.

Possible Combinations of Stacked Permits by Tier				Relative Total Allocation for the Permit Combination	Number of Vessels															
					Total by Permit Combination				Stacking Only Longline Permits				Stacking Only Pot Permits				Stacking Both Longline and Pot Permits			
Tier 1 (3.85)	Tier 2 (1.75)	Tier 3 (1.0)	Total Number		2002	2004	2008	2012	2002	2004	2008	2012	2002	2004	2008	2012	2002	2004	2008	2012
3			3	11.55	1	1	1	2	0	0	0	0	1	1	1	2	0	0	0	0
2	1		3	9.45	1	1	2	3	0	0	1	1	0	0	0	0	1	1	1	2
2		1	3	8.7	2	1	1	1	0	1	1	1	1	0	0	0	1	0	0	0
1	2		3	7.35	-	1	1	3	-	1	1	1	-	0	0	0	-	0	0	2
1	1	1	3	6.6	4	7	5	2	1	1	1	0	0	0	0	0	3	6	4	2
1		2	3	5.85	-	2	-	-	-	1	-	-	-	0	-	-	-	1	-	-
	3		3	5.25	1	1	-	-	1	1	-	-	0	0	-	-	0	0	-	-
	2	1	3	4.5	2	2	4	3	2	2	2	2	0	0	0	0	0	0	2	1
	1	2	3	3.75	3	2	3	5	2	2	3	3	0	0	0	0	1	0	0	2
		3	3	3	2	6	9	2	1	4	7	1	0	0	0	0	1	2	2	1
2			2	7.7	1	1	-	1	1	0	-	1	0	1	-	0	0	0	-	0
1	1		2	5.6	2	3	3	-	2	2	1	-	0	0	0	-	0	1	2	-
1		1	2	4.85	3	1	2	2	1	0	0	0	0	0	0	0	2	1	2	2
	2		2	3.5	1	2	1	3	0	1	1	2	0	0	0	0	1	1	0	1
	1	1	2	2.75	7	8	6	3	6	7	4	2	0	0	0	0	1	1	2	1
		2	2	2	7	9	10	13	6	7	8	12	0	1	1	0	1	1	1	1
1			1	3.85	7	4	4	3	4	2	3	2	3	2	1	1	0	0	0	0
	1		1	1.75	17	9	10	12	14	6	9	11	3	3	1	1	0	0	0	0
		1	1	1	49	29	22	39	43	26	20	35	5	2	1	3	1[a/]	1	1	1
				TOTAL	**110**	**90**	**84**	**97**	**84**	**64**	**62**	**74**	**13**	**10**	**5**	**7**	**13**	**16**	**17**	**16**

a/ This permit is endorsed for both longline and pot gear, and therefore, is recorded in the last four columns of the table.

Table 3-3. Comparison of sablefish landings by vessels under various allocations and combinations of stacked permits in 2002, 2004, 2008, and 2012; and share of sablefish trawl IFQ landed by these vessels in 2011-2013.

Combinations of Stacked Permits by Tier				Relative Total Allocation for the Permit Combination	Total Vessels with this Combination of Sablefish Permits				Sablefish Landings (1,000's of Pounds) within a Combination of Tiers																Share of Sablefish IFQ landed 2011-2012
									Total				Average per Vessel				Average Percent of Total Fleet Landings per Vessel				Percent of Total Fleet Represented by all Vessels with this Combination				
Tier 1 (3.85)	Tier 2 (1.75)	Tier 3 (1.0)	Total Number of Permits		2002	2004	2008	2012	2002	2004	2008	2012	2002	2004	2008	2012	2002	2004	2008	2012	2002	2004	2008	2012	
3			3	11.55	1	1	1	2																	
2	1		3	9.45	1	1	2	3																	
2		1	3	8.7	2	1	1	1																	
				Subtotal	4	3	4	6	363	543	520	653	91	181	130	109	3.6%	4.2%	4.0%	3.7%	15%	13%	16%	22%	5.7%
1	2		3	7.35	-	1	1	3																	
1	1	1	3	6.6	4	7	5	2																	
				Subtotal	4	8	6	5	245	894	489	418	61	112	82	84	2.4%	2.6%	2.5%	2.8%	10%	21%	15%	14%	1.8%
1		2	3	5.85	-	2	-	-																	
	3		3	5.25	1	1	-	-																	
	2	1	3	4.5	2	2	4	3																	
				Subtotal	3	5	4	3	132	396	206	117	44	79	52	39	1.8%	1.8%	1.6%	1.3%	5%	9%	6%	4%	-
	1	2	3	3.75	3	2	3	5																	
		3	3	3	2	6	9	2																	
				Subtotal	5	8	12	7	156	407	477	252	31	51	40	36	1.2%	1.2%	1.2%	1.2%	6%	9%	15%	9%	-
2			2	7.7	1	1	-	1																	
1	1		2	5.6	2	3	3	-																	
1		1	2	4.85	3	1	2	2																	
				Subtotal	6	5	5	3	323	574	351	209	54	115	70	70	2.2%	2.7%	2.1%	2.4%	13%	13%	11%	7%	1.3%
	2		2	3.5	1	2	1	3																	
	1	1	2	2.75	7	8	6	3																	
				Subtotal	8	10	7	6	212	449	242	223	26	45	35	37	0.6%	1.0%	1.1%	1.3%	5%	10%	7%	8%	1.4%
		2	2	2	7	9	10	13	130	208	178	238	19	23	18	18	0.4%	0.5%	0.5%	0.6%	3%	5%	5%	8%	-
1			1	3.85	7	4	4	3	267	186	335	152	38	46	84	51	0.9%	1.1%	2.5%	1.7%	6%	4%	10%	5%	5.9%
	1		1	1.75	17	9	10	12	261	240	229	236	15	27	23	20	0.4%	0.6%	0.7%	0.7%	6%	6%	7%	8%	1.0%
		1	1	1	49	29	22	39	414	428	258	457	8	15	12	12	0.2%	0.3%	0.4%	0.4%	10%	10%	8%	15%	-
				TOTAL	**110**	**90**	**84**	**97**	**2,503**	**4,323**	**3,285**	**2,955**									**100%**	**100%**	**100%**	**100%**	**17.2%**

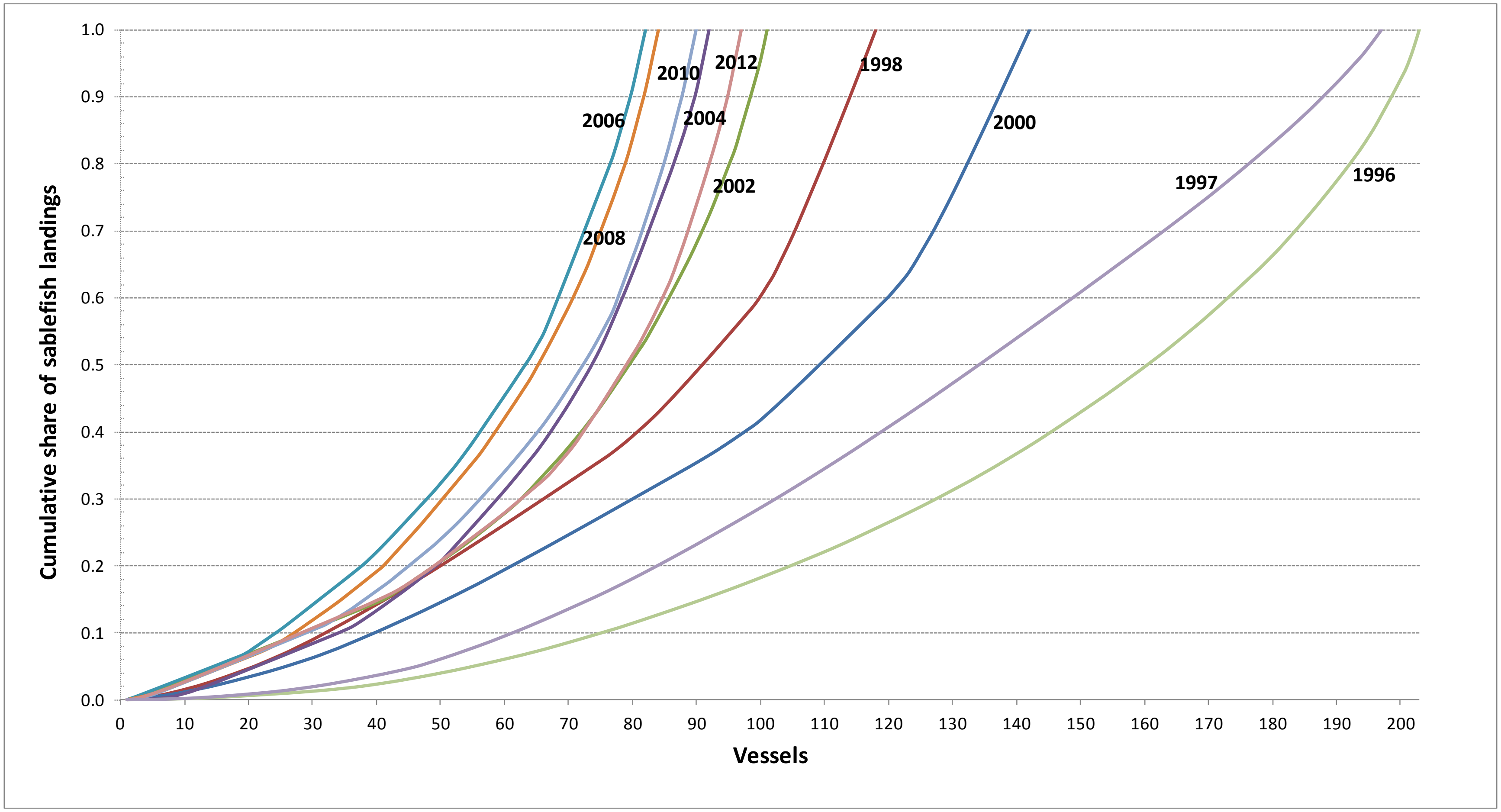

Figure 3-5. Cumulative share of landings by the number of vessels participating in the LEFG sablefish fishery during selected years from 1996-2012.

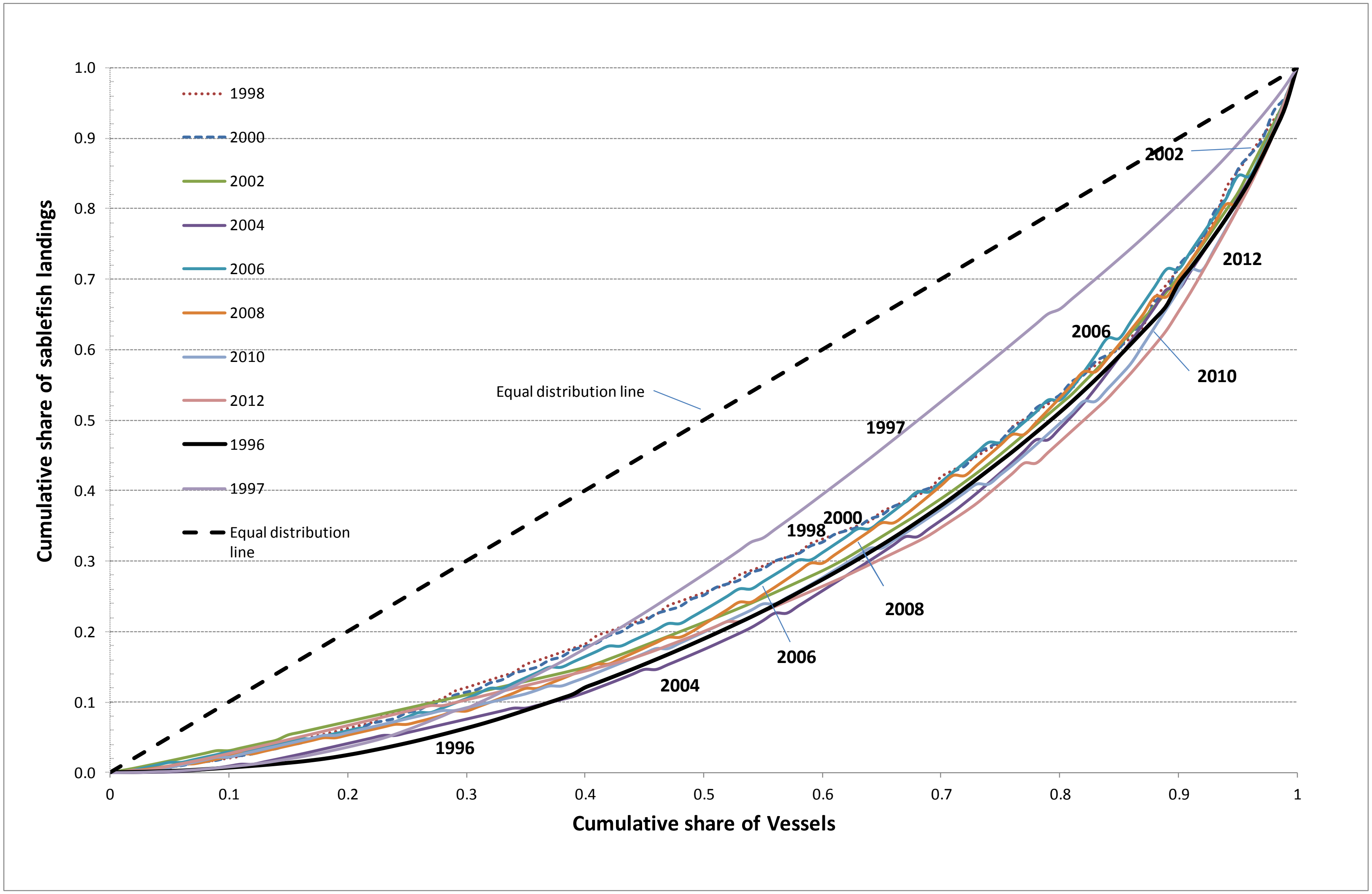

Figure 3-6. Concentration of landings by the cumulative share of vessels participating in the LEFG sablefish fishery for selected years from 1996-2012.

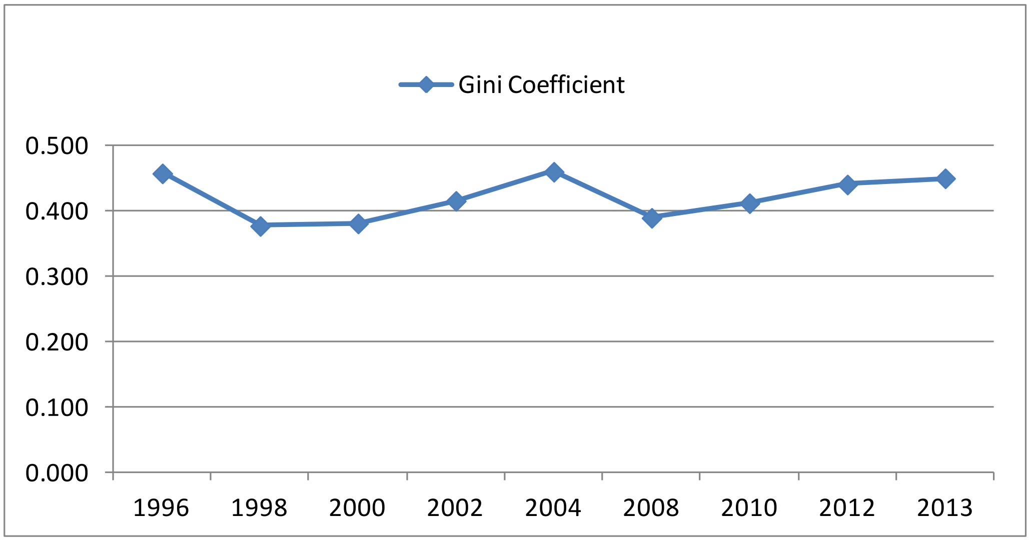

Figure 3-7. Gini coefficients for the concentration of landings by vessels in the LEFG sablefish fishery for selected years before and after the permit stacking program.

Table 3-4. Recent listings of West Coast longline sablefish endorsed permits offered for sale on Dock Street Brokers (info@dockstreetbrokers.com).

Type of Permit	Asking Price	Updated	Notes
Tier 1	$825,000	11/26/2012	- pot endorsed
Tier 2		05/17/2013	- Call for Pricing
Tier 2		03/05/2014	- Will trade for northern sablefish trawl
Tier 3	$165,000	08/23/2013	- make offer
Tier 3	$197,000	10/15/2013	- Good to ~70' LOA
Tier 3	$155,000	03/10/2014	- SOLD
Tier 3	$140,000	02/21/2014	- Price Reduced** good to 51 feet
Tier 3	$208,000	01/25/2013	
Tier 3	$145,000	02/25/2014	- Sale Pending
Tier 3	$170,000	04/02/2013	
Tier 3		05/17/2013	- Pot Endorsed Call for pricing

3.2.1 Assessment

Figure 3-8 displays port involvement and Figures 3-9 and 10 display revenue dependence by port groups in the LEFG sablefish fishery (LEFG landings or revenue in one port group divided by total sablefish landings or revenue in all ports).

[Additional comments to be developed on figures 3-8 through 3-10]

Table 3-5 shows the distribution of landings in selected years by vessels controlled by entities that were exempt from the owner-on-board permit requirement. The table shows the number of vessels that participated in the primary fishery with owner-on-board exemptions declined from 2004 to 2008 and remained relatively unchanged from 2008 to 2012. As a share of total vessels, the number of vessels with owners exempt from the provision has declined across all years. The share of total primary fishery landings accounted for by these vessels also declined during that time, although not as precipitously.

Table 3-5. Summary of landings in selected years by vessels participating in the primary sablefish fishery and operating under permits that were exempt from the owner-on-board requirements.

Year	Vessel Count	Share of Total Vessels	Landings (mt)	Share of Total Landings
2004	72	78.3%	1,223	62.4%
2008	43	51.2%	687	46.1%
2012	44	45.4%	579	43.2%

3.3 Prevent Excessive Concentration of Harvest Privileges

3.3.1 Background

This objective relates to NS 4 on allocation and NS 8 and FMP Objective 16 on fishing communities. In the Council's effort to reduce capacity in the fishery, did they provide an environment for excessive concentration of the remaining harvest privileges among a few individuals or entities? Such concentration could lead to significant changes in which and how much various communities receive the benefits of the fishery.

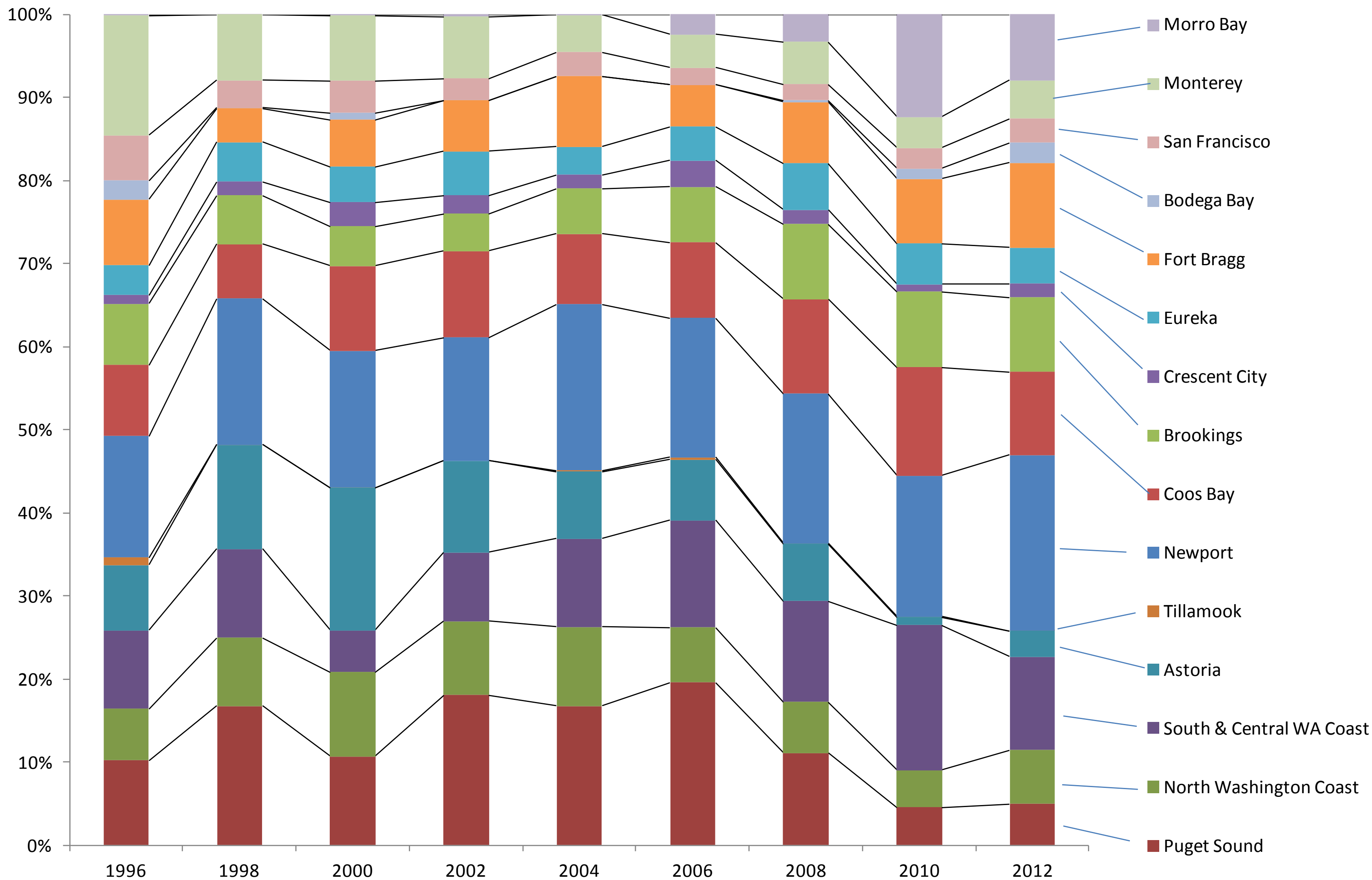

Figure 3-8. Percent involvement in the LEFG sablefish landings by port group.

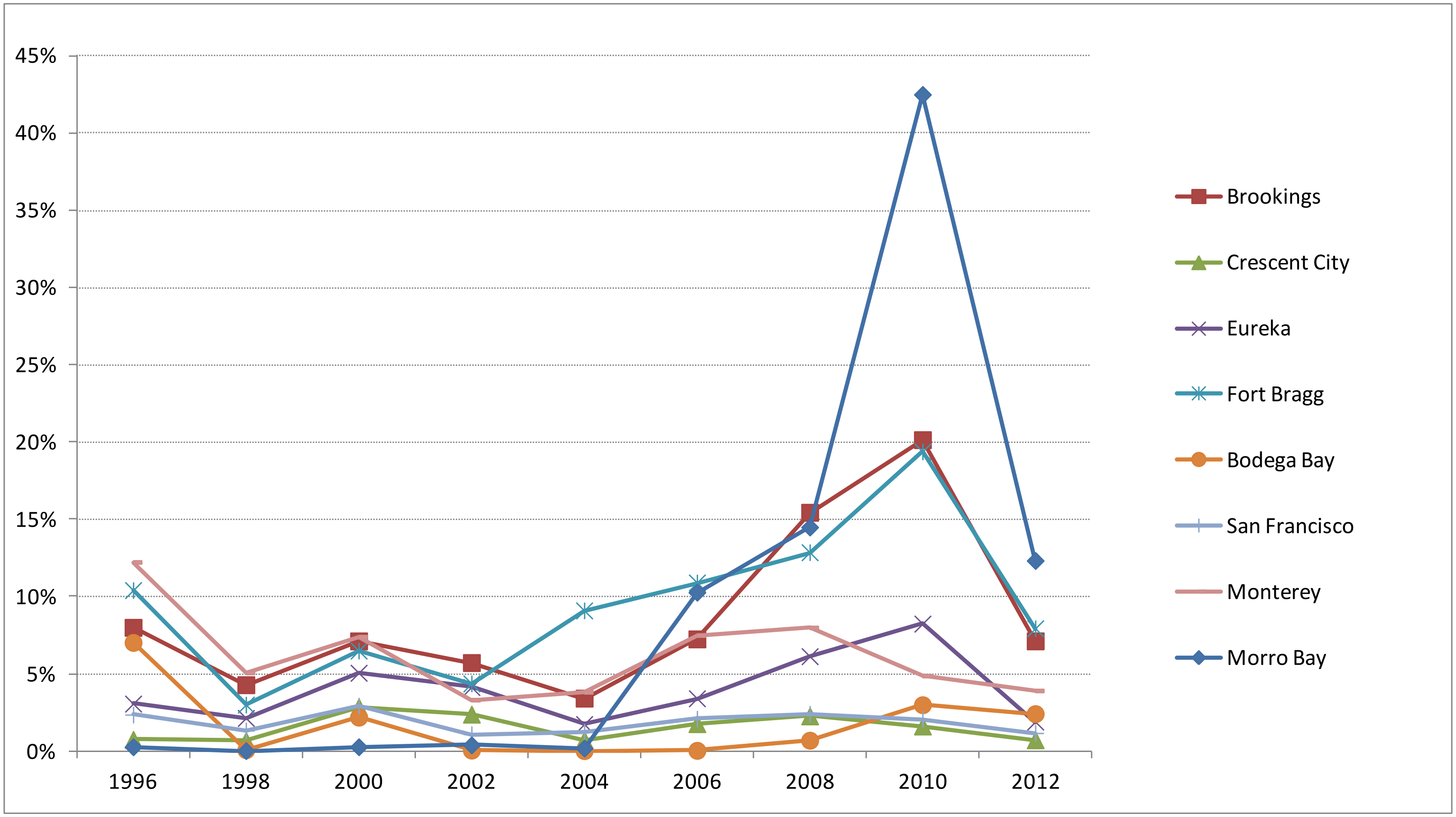

Figure 3-9. Percent revenue dependence on LEFG sablefish landings by port group from Brookings, Oregon to Morrow Bay, California.

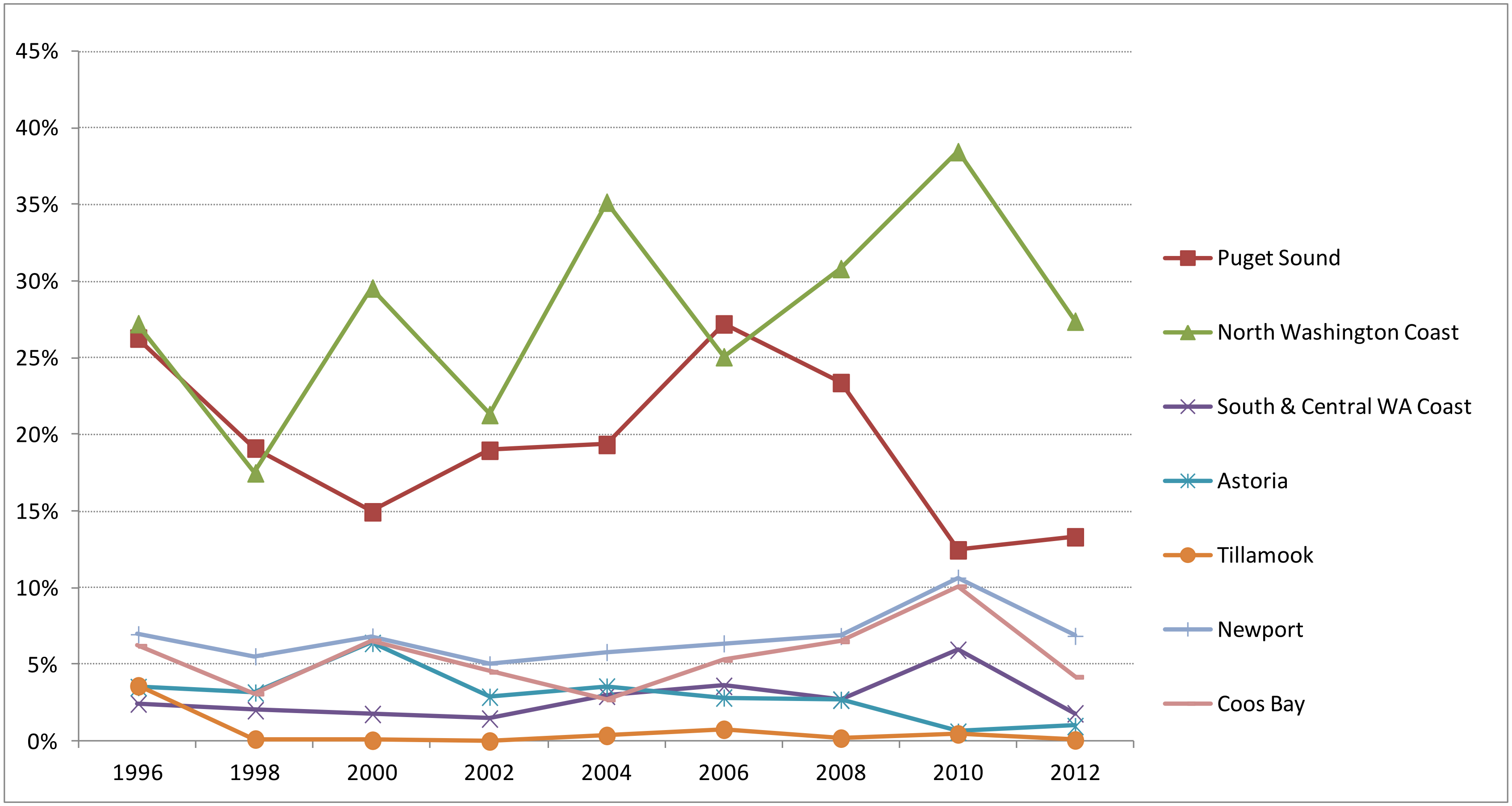

Figure 3-10. Percent revenue dependence on LEFG sablefish landings by port group from the north Washington coast to Coos Bay, Oregon.

3.3.2 Assessment

To be completed:

- **Graph of ownership concentration**
- **Gini Coefficients of ownership concentration**
- **Graph of control concentration**
- **Gini coefficients for control concentration**

3.4 Mitigate the Reallocational Effects of Policies Just Prior to This Program (e.g., the Three Tier System and Equal Limits)

3.4.1 Background

This very specific objective can really be categorized as a subset of the broader objective of promoting overall equity which is covered in Section 3.5. Both objectives relate to National Standard 4 on allocation, FMP Objective 12 on equitable allocation, and FMP Objective 14 on minimizing disruption.

The regulatory regime prior to Amendment 14 had included a series of partial and short-term policies and actions in an attempt to end the derby fishery (Table 3-1). In 1997 the regulations substantially flattened the distribution of harvest among vessels in the fleet by giving equal cumulative limits to fishery participants who qualified for LEFG sable fish endorsements. These limits were substantially higher than the maximum landings ever taken by many of the lower level participants and substantially lower than historic landings of the high liners. The flattening effect of the equal limits can be seen by comparing the annual lines in Figure 3-6.

3.4.2 Assessment

To assess how well the sablefish program mitigated the effects of the temporary policies used to modify the derby fishery requires comparing the harvest of vessels prior to the 1997 equal cumulative limit management regime with that following full implementation of the stacking program. The first step toward restoring the prior distribution was the implementation of tiered cumulative limits in 1998. Each sablefish endorsed permit was assigned to one of three tiers based on its landing history. Tier 1 permits received cumulative limits 3.85 times that of Tier 3 permits and Tier 2 permits received cumulative limits 1.75 times that of Tier 3 permits. The 1998 and 2000 lines in Figure 3-6 are close to one another and illustrate movement toward the distributions of harvest that were present during the 1996 derby. The derby year reflects a typical distribution which occurs when all vessels are on an equal footing in competition with one another with respect to speed of harvest. The final step in mitigating the reallocation effects was implementation of the permit stacking program in August 2001with its allowance for up to three tier endorsed permits and their associated tier limits to be stacked on a single vessel. The effectiveness of this policy is indicated by the fact that the annual lines in Figure 3-6 for the years after implementation become ever closer to the 1996 line. In general for the derby system, vessels competed on the basis of how quickly and effectively they could fish. The tier system replaced speed with other economic factors in determining the competitive outcome and results in a somewhat similar distribution in terms of concentration of harvest.

3.5 Promote Equity

3.5.1 Background

The objective of promoting equity is an overarching objective that includes the objective of the previous section (3.4). Both objectives relate to NS 4 on allocation, FMP Objective 12 on equitable allocation, and FMP Objective 14 on minimizing disruption. The issue of compliance (with the regulations) also bears heavily on this objective. If some fishermen are not complying with the program they are often viewed as gaining an unfair advantage over other fishermen.

3.5.2 Assessment

Much of this objective was addressed through the re-establishment of the opportunity for a distribution of harvest among vessels similar to distributions present prior to imposition of equal cumulative limits in 1997 and similar to what is seen in many other fisheries.

With regard to compliance with regulations, the number of vessels landing amounts of sablefish in excess of the limits associated with their stacked permits is provided in Table 3-6 (T**o be developed]**

3.6 Resolve or Prevent New Allocation Issues from Arising

3.6.1 Background

This objective relates to National Standard 4 on allocation and FMP Objectives 12 on equitable sharing and 14 on minimizing disruption.

3.6.2 Assessment

Since implementation of the permit stacking program in 2002, there have been few calls for any changes to the allocations within the fixed gear sector. Most discussion and concern has been with intersector allocations. However, even during the Council's formal consideration of its groundfish allocations for Amendment 21, it was decided that there was not a sufficient need to examine reallocations of sablefish among sectors, relative to other workload concerns.

Within the limited entry fixed gear sector, 15 percent of the sablefish is set aside for a daily trip limit fishery. There has been some suggestion that this allocation and its management might be revisited, but up until the time this program review was initiated, the interest in modifications has not been sufficient to bring the topic onto the Council agenda.

3.7 Promote Safety

3.7.1 Background

This objective relates to National Standard 10 and FMP Objective 17 on safety. Before Amendment 14 was implemented, the LEFG sablefish fishery had become a classic derby fishery, lasting only 5 days in 1996. Such classic derby fisheries are well known for creating safety hazards. The short seasons provide a strong incentive to fish regardless of the weather in order to get an adequate share of the catch and also encourage taking risks with overloading the capacity of the vessel or to skip importance maintenance at inopportune times (National Resarch Council, Marine Board, Committee on Fishing Vessel Safety, 1991).

3.7.2 Assessment

At this time, it is not apparent that there is any direct information that might be useful in evaluating the safety record of the fleet before and after implementation of the fixed gear stacking program. However, the Northwest Fisheries Science Center is in the process of developing a more detailed report on the safety effects of the limited entry sablefish program. Following implementation of Amendment 14 there has been an absence of anecdotal reports on safety problems associated with the primary fishery, particularly in comparison to concerns expressed during the derby fisheries of the mid-1990s. While the United States Coast Guard (USCG) keeps safety statistics, it is only possible to isolate those statistics by date and area. There is no direct information on the fishery in which the vessel was participating (particularly when events prevented a vessel from making a landing). Page A-17 of the Council's Fishery Ecosystem Initiatives Appendix to the Pacific Coast Ecosystem Fishery Plan (PFMC, 2013) provides a table of recorded vessel incidents by FMP. However, it is not possible to determine which groundfish fishery incidents were in the primary sablefish fishery. The elimination of the derby fishery through extension of the season to seven months could be expected to have a positive effect on reducing the pressure to fish under unsafe conditions.

3.8 Improve Product Quality and Value

3.8.1 Background

This objective relates to National Standard 5 on efficiency and FMP Objective 6 on net national benefits. Determining achievement of this objective could be reflected by changes in the sales price and volume of sablefish after implementation of Amendment 14. However, changes in exvessel price (the most readily available data) are strongly driven by markets which might overshadow any price change resulting from a change in product quality. For example, sales volume and prices may have been more influenced by worldwide shifts in fuel prices and, because sablefish is essentially a luxury good, by the worldwide recession. A price comparison of the difference between fixed-gear caught and trawl-caught sablefish during the derby, relative to the difference in prices between these gears after the implementation of the permit stacking program, could provide some limited insight. A widening gap might indicate an improvement in the quality of fixed gear caught sablefish. Larger fish generally bring higher prices and might be considered a higher quality. Size of fish landed may also be increased by gear selectivity or highgrading which the longer season may make more possible. However, there is no consistent and reliable fish ticket information on size of fish landed.

3.8.2 Assessment

[To be completed--Possible indicators: Compare prices of trawl caught, longline caught, and pot caught sablefish holding time of year constant), by year for 1994-2012.]

3.9 Avoid Creating Substantial New Disruptive Effects

3.9.1 Background

This objective relates to FMP Objective 15 on minimizing disruption. The derby fishery and equal cumulative limit management system that this permit stacking program replaced were extremely disruptive. When the new program was proposed for implementation, only seven entities provided formal comments on the proposed rule (two state agencies, one commercial organization, and 4 individuals). Public comment generally included overall positive comments about the program. Dissent generally concerned specific issues relating to a few individuals (e.g., permit allocation, ownership or control, and owner-on-board requirements). The comments were generally split between support or opposition to the owner-on-board requirement, the limit on the number of permits that could be stacked, and the restrictions on processing at sea.

3.9.2 Assessment

This objective was achieved with program implementation that allowed for a longer, more reasonable fishing season and by allowing fishermen to acquire and stack permits rather than directly changing the allocation among permits. Given that permit caps (tier limits) were already in place, the mere creation of a longer season allowed participants to have more flexibility in when they went fishing. They were more able to avoid dangerous weather events and move their permits around as needed. In the 12 years over which the program has operated, the Council has received little, if any, complaint about disruption caused by the program.

3.10 Create a Program that Will Readily Transition to a Multi-month IQ Program

3.10.1 Background

The type of program created for the sablefish fishery assists in attaining capacity reduction recommendations in the Groundfish Strategic Plan and responds to NS 6 (take into account variations and contingencies). Individual harvest quotas that are transferable provide the fleet with substantial flexibility to respond to changing conditions in the fishery or for the changing conditions faced by an individual fisherman. The properties of transferability and divisibility also address NS 5 (efficiency) and FMP Objective 6 (achieving the best possible net economic benefit).

3.10.2 Assessment

At the time it was implemented, the permit stacking program transitioned to a multi-month catch share program with a season that is seven months long. To date, there have been no moves to consider allowing the sablefish tiers to be separated from permits and divided into smaller units, such that the permit stacking program would resemble a more typical IFQ program. While such divisibility could be added to the program, this might diminish achievement of other standards and objectives. Net effects would have to be assessed as part of the deliberations on such a change.

While there has been no Council action or discussion toward a transition to a more typical IFQ program, the objective of Amendment 14 was to create a program that could readily make such a transition, not necessarily to make the transition. The existence of an already implemented allocation among permits addresses one of the major challenges for new catch share programs (the initial allocation). On that basis, this objective might be considered to have been met.

3.11 Management Costs and Cost Recovery

The MSA requires LAPPs to develop a methodology and means to identify and assess management, data collection and analysis, and enforcement programs that are directly related to and in support of the LAPP. Further, the Secretary of Commerce is authorized to establish and collect fees paid by holders of limited access privileges that will cover the costs of management, data collection and analysis, and enforcement activities; not to exceed 3 percent of the ex-vessel value of the fish harvested under the program. The LEFG sablefish program was established prior to the addition of these requirements in the MSA and, to this point, a means to identify costs or to establish a cost recovery program have not been developed.

Prior to the program review, incremental costs associated with this LAPP were likely minimal, although at this time no quantitative assessment of incremental costs has been done. However, the actions being considered during this review process would implement an electronic fish ticket and modify the control rules. Also, the Council has taken action to allow trawl and LEFG endorsed permits to be registered to the same vessel at the same time. These actions may introduce additional incremental costs. For example, implementation of modified control rules could require an additional vessel ownership interest form, as well as new database programming requirements that would take time and would require additional funding to implement. These are examples of additional incremental costs that could be tracked and partially recovered through implementation of a cost recovery program for the LAPP.

4.0 RESEARCH NEEDS

[Consult with the SSC, GMT, GAP and Council Research and Data Needs 2013, to develop recommendations]

4.1 Biological

4.2 Socioeconomic

4.3 Community

5.0 SUMMARY AND PRELIMINARY CONCLUSIONS

[To be completed for Public Review Draft after considering input at April Council meeting]

6.0 COUNCIL RECOMMENDATIONS

[To be developed by Council in June]

7.0 REFERENCES

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Agenda Item C.6.a
Attachment 2
April 2014

Sablefish Permit Stacking Program—
Action Issues

Draft Council Decision Analysis Document

March 2014

Table of Contents

Chapter 1 Background, Proposed Actions, Purpose and Need for the Actions

1.1 Background

The current permit stacking program applies to the sablefish primary fishery which occurs north of 36º N. lat. Under this program vessels registered to at least one limited entry permit, with either a gear endorsement for longline or trap (or pot) gear, and an endorsement for sablefish, fish a specified tier limit during a seven month primary fishery season (April through October).

Under the permit stacking program, each fixed gear sablefish endorsed limited entry permit is assigned to one of three tiers. The permit's tier level determines the poundage of sablefish which can be landed by that permit each season while participating in the primary sablefish fishery. For sablefish endorsed, limited entry permits, the Regional Administrator will biennially or annually announce the size of the cumulative trip limit for each of the three tiers associated with the sablefish endorsement such that the ratio of limits between the tiers is approximately 1:1.75:3.85 for Tier 3:Tier 2:Tier 1, respectively. Up to three permits can be stacked onto a single vessel, allowing that vessel to land up to the sum of the three tier limits in aggregate. Because each vessel is assigned a proportion of catch based on its tier limit, the stacking program is considered a limited access privilege program (LAPP), or catch share program.

Vessels with sablefish endorsed permits are also eligible to fish in the daily trip limit (DT)L fishery before the primary season (i.e., January through March) and after their aggregate tier limit on the vessel has been harvested, or the primary season has ended, whichever comes first. Because each vessel has its own limit, vessels often transition from the primary to DTL fisheries sometime during the sablefish primary season.

The program also includes other provisions, including a prohibition on the ownership of permits by corporations or other business entities, a permit owner-on-board requirement, a limit on the number of permits any individual or entity (individually and collectively) can own or hold, and a prohibition on at-sea processing. A grandfather clause was provided for each of these provisions, allowing the continuation of situations in place prior to Council action. For non-grandfathered permits, the owner must be on board the vessel during the primary season when that permit's tier amount is being fished. If landings from a trip will be attributed to multiple tiers, then all permit owners of those tiered permits being fished must be onboard. However, there are limited[1] medical and death exemptions from this requirement.

Currently there are 164 sablefish endorsed permits of which 131 are endorsed for longline only; 27 are trap/pot endorsed only, and 6 have two gear endorsements. The number of permits by tier levels is as follows: Tier 1 -28 permits; Tier 2 – 42 permits, and Tier 3 – 94 permits. As of August 2013, approximately 40 vessels have stacked (multiple) permits (either tier 2 or 3). When a sablefish fixed gear tier delivery is made, the delivery is recorded on a state fish ticket. One to three tiers may be delivered and recorded on this one trip ticket. If the vessel operator does not specify which tier the catch should be counted against, the delivery is apportioned to the individual tiers (up to 3) by an even split until the tiers are reduced to a point where they are

[1] These exemptions can only be given for three years maximum to a permit owner or to the surviving spouse of a permit owner.

equal to or less than the daily-trip limits (DTL). All of this tabulation is done by the state agency(s) and then sent to Pacific States Marine Fisheries Commission (PSMFC) for entry into Pacific Fishery Information Network (PacFIN).

At the September 2013 meeting of the Pacific Fisheries Management Council (Council), the Enforcement Consultants (EC) report outlined several concerns with the existing reporting requirements. Their primary concern was that the opportunity for underreporting is extremely high under the current regulations, which defer to the states to report catch data and permit numbers on paper fish tickets, and enforcement agents often have little access to data that is often times severely outdated. This creates a situation where at sea boarding or dockside inspection can do little besides checking the permit status, because no real time information on the actual status of the tier(s) being fished is available.

Since inception of the tier program, there has been a voluntary request made to the state agencies to list the federal permit number on the state ticket. Washington requires the tier permit number be listed on the state fish ticket and Washington enforcement and management personnel have ready access to the Washington State landing data. Unlike Washington, in Oregon and California there are no state regulatory requirements for the tier permit number to be listed on the state fish ticket.

Although federal or state enforcement personnel may request information from their individual states or from PACFIN, the information is dated the process does not lend itself to making information available to an agent or officer working in the field performing patrol related activities. This action seeks to address these catch accounting issues.

The current own/hold regulations limit participants (permit owners and/ or vessel owners) in this program to owning or holding three permits, whereby ownership or holdership of any percentage of a permit counts as 1 permit. Regulations at 660.25(b)(3)(iv)(C)(2) specify ownership restrictions and also state that ownership interest from “holding” permits is counted towards the 3 permit limit in addition to owning permits. A permit holder is the owner of the vessel registered to a limited entry permit. A vessel owner is credited with holding a sablefish permit when their vessel is registered to a permit not owned by the vessel owner (the permit is in some sense “leased”).

The 3 permit own and hold limit has created an issue for some permit owners who participate in both the Pacific coast sablefish permit stacking program and the North Pacific Fishery Management Council (NPFMC) managed Individual Fishing Quota (IFQ) Program for fixed-gear Pacific halibut and sablefish fisheries in and off of Alaska. Regulations for the Alaska sablefish IFQ program require that individual owners of catcher vessel quota shares (Alaska QS, vessel categories B, C, or D) be onboard the vessel during all IFQ fishing. An exemption to the owner on board requirement allows an initial recipient of catcher vessel Alaska QS to employ a hired master to fish his or her IFQ, but only if the initial recipient owns a minimum of 20 percent interest of the vessel on which they hire a master to fish their IFQ. The regulations were structured in this way to maintain a predominantly owner-operator fishery. In order to harvest their Alaska IFQ under this exemption, some Alaska IFQ owners have invested in partial ownership of Alaskan vessel(s). If there is also a West Coast limited entry fixed gear sablefish permit(s) (LEFG permit) registered to the vessel participating in the Alaska fishery, then the LEFG permit (permits) counts toward the 3 permit own and hold limit for the West Coast program for each owner of that Alaska participating vessel, even if the individual has an ownership interest only in the vessel and not the permit. With respect to the harvest of Alaska IFQ, the West Coast three permit limit combined with the Alaskan 20 percent ownership requirement constrains cooperation between owners of West Coast limited entry fixed gear permits (or owners of permitted vessels) and vessels that participate on both the West Coast and Alaska. Alaska regulations have recently been modified to further encourage movement toward an owner-operated fishery in Alaska. This situation is described in more detail in the impact mechanism section of Chapter 4. This action seeks to address this issue by modifying the West Coast own and hold limits.

1.2 Proposed Action

The proposed action is to: (a) implement an electronic fish ticket requirement for the sablefish fishery, and (b) modify the control rules for the Limited Entry Fixed Gear Sablefish Permit Stacking Program (program).

1.3 Purpose and Need

The purpose of the electronic fish ticket measure is to consider a Federal landing and monitoring requirement, the implementation of an electronic fish ticket. The need for this measure is to improve catch accounting and enforcement capabilities in the fishery, particularly among the sablefish-endorsed tiers in the primary fishery. There is a need to improve the data system so that management and enforcement can take more timely action when individual vessel overages occur.

The purpose of the own/control limit measure is to modify the vessel ownership threshold used to evaluate the control limit on the number of limited entry fixed gear permits owned or held by a single entity. The need for this measure is to accommodate fishing enterprises that participate in, or partner with enterprises that participate in, both the Alaskan fixed gear sablefish and halibut IFQ program (Alaska program) and the West Coast primary sablefish fishery, as well as West Coast enterprises in which a person’s minor security interests in a vessel may unnecessarily disrupt its business.

Chapter 2 Description of Alternatives

2.1 Electronic Fish Ticket Alternatives

For the electronic fish ticket issue, there are four alternatives (status quo and three action alternatives) which are summarized here and described in more detail in the following sections.

Alternative 1: (Status Quo) There are currently no federal regulations requiring fish ticket documentation for sablefish landings in the primary (tier) sablefish fishery or within the larger limited entry fixed gear (LEFG) fishery.

Alternative 2: A Federal requirement that **all tier** deliveries be recorded on an electronic fish ticket that documents the associated federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 2, to allow the use of paper tickets.

Alternative 3: A Federal requirement that **all limited entry permit sablefish deliveries (primary/tier and DTL)** be recorded on an electronic fish ticket that documents the associated federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 3, to allow the use of paper tickets.

Alternative 4: A Federal requirement that **all sablefish deliveries (primary/tier, DTL, and open access)** be recorded on an E Fish Ticket. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 4, to allow the use of paper tickets.

2.1.1 No Action Alternative

Alternative 1: (Status Quo) There are currently no federal regulations requiring fish ticket documentation for sablefish landings in the primary (tier) sablefish fishery or within the larger limited entry fixed gear (LEFG) fishery.

Recordkeeping and reporting requirements for the fixed gear fishery (at §660.213) refer to the general groundfish recordkeeping and reporting requirements at §660.13 which recognizes that the states of California, Oregon, and Washington are responsible for collecting catch and effort data necessary to implement the FMP and that any person landing groundfish is responsible for complying with all applicable state reporting requirements.

When the sablefish permit stacking program was implemented, documentation of catch against tier limits and documentation of permit numbers was left to the states to implement. Since inception of the tier program, there has been a request made to the state agencies that they voluntarily list the federal permit number on the state paper fish ticket. Washington requires the tier permit number be listed on the state fish ticket and Washington enforcement and management personnel have ready access to the Washington State landing data. Unlike Washington, in Oregon and California there are no state regulatory requirements for the tier permit number to be listed on the state fish ticket.

Under the current system, when a sablefish fixed gear tier delivery is made the delivery is recorded on a state paper fish ticket in accordance with state law. One to three tiers may be delivered and recorded on this one trip ticket. If not specified by the operator, the delivery is apportioned to the individual tiers (up to three) by an even split until the tiers are reduced to a point where they are equal to or less than the daily-trip limits (DTL). All of this tabulation is done by the state agency(s) and then sent to Pacific States Marine Fisheries Commission (PSMFC) for entry into Pacific Fishery Information Network (PacFIN).

2.1.2 Action Alternatives

The action alternatives being considered would create a federal requirement for an electronic fish ticket to be filled out by the processor or buyer at the time of a sablefish landing in the Pacific coast groundfish fishery. The action alternatives differ from each other in terms of the sectors of the fishery that would be held to this requirement.

> Alternative 2: A Federal requirement that **all tier** deliveries be recorded on an electronic fish ticket that documents the associated federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.
>
> > Suboption: Delete the word "electronic" and the second sentence from Alternative 2, to allow the use of paper tickets.

When deliveries are made, the vessel operator would be required to designate which tier the landing (pounds of sablefish) should be applied to. The existing PSMFC E Fish Ticket already has the appropriate fields and drop down boxes necessary to accommodate this fishery. Washington, Oregon, and California allow "split deliveries" ergo, a trip being landed on multiple electronic tickets. This feature will readily accommodate the owner on board requirement where the portion of the trip that is attributed to one or more tier permits would be recorded on separate tickets, with the owner of the permit signing the electronic ticket as validation that he/she was truly on board during the trip. After a landing was made to a shoreside first receiver, buyer, or processor, all necessary landing and catch information would be recorded on the electronic ticket using software provided by PSMFC. This electronic ticket would then be uploaded to PSMFC within 24 hours of the landing. The data would then be processed and entered into PacFIN and made available online to all interested parties (ie the state agencies, enforcement, NMFS, and permit owners).

Alternative 3: A Federal requirement that **all limited entry permit sablefish deliveries (primary/tier and DTL)** be recorded on an electronic fish ticket that documents the associated federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 3, to allow the use of paper tickets.

When deliveries are made, the vessel operator would be required to designate which tier the landing (pounds of sablefish) should be applied to. The existing PSMFC E Fish Ticket already has the appropriate fields and drop down boxes necessary to accommodate this fishery. Washington, Oregon, and California allow "split deliveries" ergo, a trip being landed on multiple electronic tickets. This feature will readily accommodate the owner on board requirement where the portion of the trip that is attributed to one or more tier permits would be recorded on separate tickets, with the owner of the permit signing the electronic ticket as validation that he/she was truly on board during the trip. Landings made while fishing in the DTL fishery would be recorded in a similar way and would be debited against the DTLs; vessels would still be prohibited from landing catch against the primary season cumulative limits and the DTL limits within the same 24 hour period. After a landing was made to a shoreside first receiver, buyer, or processor, all necessary landing and catch information would be recorded on the electronic ticket using software provided by PSMFC. This electronic ticket would then be uploaded to PSMFC within 24 hours of the landing. The data would then be processed and entered into PacFIN and made available online to all interested parties (ie the state agencies, enforcement, NMFS, and permit owners).

Alternative 4: A Federal requirement that **all sablefish deliveries (primary/tier, DTL, and open access)** be recorded on an E Fish Ticket. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 4, to allow the use of paper tickets.

Note: This alternative may go beyond the scope of the stated purpose for this action. For example, there are no vessel accounts for open access vessels.

2.2 Own/ Control Limit Alternatives

For the own/control issue, there are three alternatives (status quo and two action alternatives) which are summarized here and described in more detail in the following sections.

Alternative 1: (Status Quo) The control limit to own and hold is 3 permits. Any level of permit ownership would count as 1 permit towards limit of 3. Additionally, any permits registered to a vessel, wholly or partially owned by the entity, would count toward the three permit limit. Select permit owners are grandfathered in with more than 3 permits based on what they owned as of 11/1/00. Any group ownership interest in the permit results in a permit count of 1 being attributed to each group member.

Alternative 2a: Status Quo for permit ownership (any percentage ownership in a permit is a count of 1), however holding a permit is counted only if the vessel owner has a greater than 20% share. Partial vessel ownership is capped at two vessels, i.e. the 20% or less ownership in a vessel exemption could only be used twice.

Alternative 2b: Status Quo for permit ownership (any percentage ownership in a permit is a count of 1), however holding a permit is only counted if the vessel owner has a greater than 30% share. Partial vessel ownership is capped at two vessels, i.e. the 20% or less ownership in a vessel exemption could only be used twice.

2.2.1 No Action Alternative

Alternative 1: (Status Quo) The control limit to own and hold is 3 permits. Any level of permit ownership would count as 1 permit towards limit of 3. Additionally, any permits registered to a vessel, wholly or partially owned by the entity, would count toward the three permit limit. Select permit owners are grandfathered in with more than 3 permits based on what they owned as of 11/1/00. Any group ownership interest in the permit results in a permit count of 1 being attributed to each group member.

For example, the partnership of Mary and Mike Smith own a tier permit. As a result, each have 1 permit towards the 3 permit limit, and the partnership also has a count of 1 towards the limit. Similarly, Group Z (owned by John Doe and his partners) has X% ownership of a vessel registered to the permit owned by Mary and Mike Smith. Group Z accrues a count of 1 permit held towards the 3 permit limit AND John Doe and each of his partners accrue a count of 1 permit held towards the 3 permit limit.

2.2.2 Action Alternatives

Alternative 2a: Status Quo for permit ownership (any percentage ownership in a permit is a count of 1), however holding a permit is counted only if the vessel owner has a greater than 20% share. Partial vessel ownership is capped at two vessels, i.e. the 20% or less ownership in a vessel exemption could only be used twice.

For example, John Doe owns permit GF0001 and 20% of the vessel Fairweather. Fairweather is registered to GF0001 and GF0002. GF0002 is not owned by John Doe. John Doe has a count of 1 permit because he owns GF0001 but is not credited with a hold count for GF0002 because he only has a 20% interest in the vessel. If John Doe owned 21% of Fairweather, then his own and hold count would be 2 because he owns GF0001 and owns more than 20% of the vessel registered to the second permit.

Alternative 2b: Status Quo for permit ownership (any percentage ownership in a permit is a count of 1), however holding a permit is only counted if the vessel owner has a greater than 30% share. Partial vessel ownership is capped at two vessels, i.e. the 20% or less ownership in a vessel exemption could only be used twice.

For example, John Doe owns permit GF0001 and 30% of the vessel Fairweather. Fairweather is registered to GF0001 and GF0002. John Doe has a count of 1. If John Doe owned 31% of Fairweather, then his own and hold count would be 2 because he owns GF0001 and owns more than 30% of the vessel registered to the second permit.

2.2.3 Alternatives Considered But Rejected From Further Analysis

The following alternatives were considered but have been rejected from further analysis because they are administratively burdensome to implement and track (Alternative 3) or because they weaken the control limits beyond what is needed to increase flexibility in the fishery for those that are disadvantaged by the existing control limit rules (Alternatives 4, 5, and 6). If the control limits were revised to the extent that Alternatives 4 through 6 would allow, this could undermine the purpose of having control limits in place, namely to maintain the owner-operator nature of the fleet.

> Alternative 3: Maintain a three permit limit but calculate control based on percentage ownership of permits and vessels. Total ownership (permit ownership and holdership) is capped at 300%. 1st and 2nd generation owners would be limited to a total of 300 percent. (The intent being to limit total ownership to 3 permits which is status quo.)

For example, John Doe wholly owns GF0001 and 20% of the vessel Fairweather. Fairweather is registered to GF0001 and GF0002. John Doe has a count of 120%.
Another possible example: The partnership of Mike and Mary Smith own 3 permits. As such, Mike and Mary Smith, as a partnership, have 300% of total ownership, which is the limit. However, Mike as an individual has 150%, as does Mary.

> Alternative 4: Increase the own and hold limit to 6 permits. Partial or any percent ownership or holdership is a count of 1 towards the limit of 6. (Permit counts are determined as under status quo.)

For example, John Doe owns GF0001, GF0003, and 20% of the vessel Fairweather. Fairweather is registered to GF0001, GF0002, and GF0004. John Doe owns 2 permits and holds 2 additional permits due to partial ownership of Fairweather for a total count of 4.

> Alternative 5: Status Quo on permit owner (no one may own more than 3 permits unless grandfathered in). Cap the number of tier permits an entity may register to a vessel at 3. Cap the number of limited entry fixed gear tier vessels an entity can own at three. The maximum own and hold limit is effectively increased to 12 permits (an entity could own 3 permits and have partial or total ownership of three vessels each of which are registered to three different permits owned by others).

For example, John Doe owns GF0001, GF0002, and GF0003. Mr. Doe also owns 20% of the vessel Alpha, 10% of the vessel Beta, and 30% of the vessel Gamma. Alpha is registered to GF0004, GF0005, and GF0006; Beta is registered to GF0007, GF0008, and GF0009; and Gamma is registered to GF00010, GF00011, and GF00012. John Doe owns 3 permits and has partial ownership of 3 vessels that each hold 3 permits; his total count is 12. In this example, Doe could not register his own permits to any other vessels he owns beyond Alpha, Beta, and Gamma, but he could lease the additional permits out to other vessels. He has maxed out on the number of vessels he has an ownership interest in and they are in the primary fishery. Also, Alpha, Beta, and Gamma are at the limit of 3 permits registered to them during the primary season; they cannot remove a permit mid-season and add a 4th permit.

> Alternative 6: Status Quo on 3 permit limit, but the calculation is based only on ownership of permits; holding or leasing a permit/ ownership in the vessel would not count towards the 3 permit limit. A person could own 3 permits and hold any number of additional permits by registering the vessel(s) they own to permits owned or leased by other persons.

For example, John Doe owns GF0001, GF0002, and GF0003, and 20% of the vessel Fairweather. Fairweather is registered to GF0004, GF0005, and GF0006. John Doe owns 3 permits and his partial ownership of a vessel registered to other permits does not affect his own and hold limit; his total count is 3.

CHAPTER 3 IMPACTS

3.1 Impact Mechanisms

Own/Control Limits

The action alternative would change the criteria by which it is determined whether an entity controls a limited entry fixed gear (LEFG) permit. Currently, entities are considered to control any permit over which they have some share in the direct ownership plus any permit attached to a vessel in which they have at least a partial ownership interest. For example, if a fisherman owns one vessel and owns two LEFG permits (Fisherman 2 in Figure 3-1), but also holds a partial ownership interest in another vessel (perhaps as security for a loan), then all the permits of the other vessel also count toward that fisherman's total (in Figure 3-1, for Fisherman 2 a total of four permits, i.e. one in excess of the three-permit limit). Such a situation might also arise for a lender or any other person who takes part ownership in a vessel to secure a loan or other debt, rather than establishing a maritime lien (Figure 3-1). The current accounting rule might be conceptualized as an "all-or-nothing" rule: if an entity has any ownership interest in a vessel then all LEFG permits associated with the vessel count as being under that entities control.[2] An action alternative would allow entities to have a small percent ownership interest in a vessel without being considered to also be in control of the permits attached to the vessel.

[2] Direct ownership of a permit is counted in a similar fashion, i.e. any fraction of ownership counts as ownership of the entire permit.

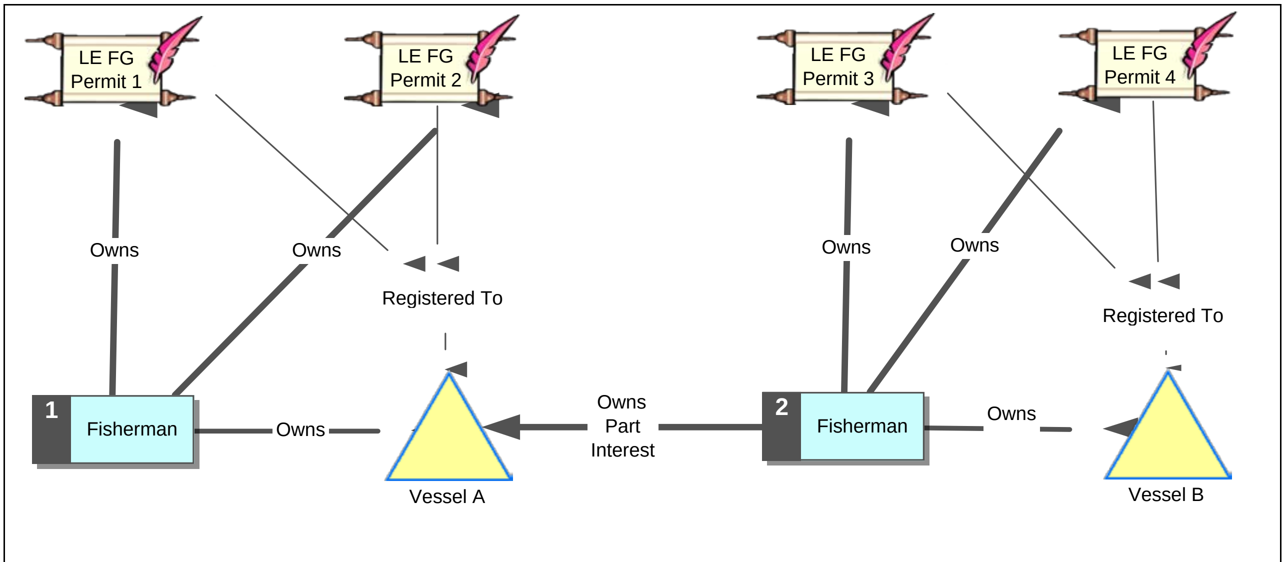

Figure 3-1. Fisherman example--full or partial ownership of a vessel implies control over the limited entry fixed gear (LEFG) permits associated with that vessel, potentially resulting in violation of the three-permit control limit (in this example, four permits for Fisherman 2).

Figure 3-2. Lender example--full or partial ownership of a vessel implies control over the limited entry fixed gear (LEFG) permits associated with that vessel, potentially resulting in violation of the three-permit control limit (in this example, four permits for a lender that secures interest through vessel ownership rather than through a maritime lien).

While there are a number of imaginable situations constrained by the current “all-or-nothing” rule, there are primarily two types of situations that have been brought to managers’ attention. Because these are the situations which are currently bumping up against the all-or-nothing rule, they are the most likely indicators of how human activity would change with a change in the constraint. The first situation had to do with a family wanting to bring other members into the fishery by helping them purchase a vessel, essentially by acquiring the vessel and selling it to them. Whether within a family or among fishermen, a frequent practice is that a seller financing a vessel allows the buyer to operate the vessel (to virtually act as owner) but the seller retains an ownership interest until the vessel is fully paid for (at which time the transaction is completed and full vessel ownership transferred to the buyer). However, by maintaining that ownership interest in the vessel for security (regardless of how small) any LEFG permits the vessel buyer attaches to the vessel will also count against the control total for the seller, and potentially put the seller over the cap, if the seller owns another vessel with LEFG permit(s).

In the second situation, rather than to secure financing, the incentive for maintaining ownership in a vessel relates to IFQ owner participation requirements of the Alaskan fixed gear sablefish and halibut IFQ program (Alaska program). In the Alaska program, there is an IFQ owner-on-board requirement with a grandfather clause exception. Most partnerships, corporations, and other non-individual Alaska IFQ owners are required to hire skippers to fish their IFQ and individuals grandfathered in are allowed to hire skippers to fish in their stead. However, in order to hire a skipper an IFQ owner must have at least a 20% ownership interest in the vessel on which the IFQ will be fished (CITE REGS). This creates a situation in which vessel ownership established to take advantage of the exception to the owner-on-board requirements of the Alaska program may push an entity over the West Coast LEFG permit control limits. For example, if an individual that owns a vessel that participates only in the West Coast fixed gear sablefish fishery also has ownership of Alaskan IFQ, then that person may desire to acquire part ownership in a vessel participating in the Alaskan IFQ fishery in order to take advantage of the Alaskan owner-on-board exception provision. Under such circumstances, any West Coast permits which are attached to the Alaskan IFQ vessel would also count against the individual's control limit for West Coast LEFG permits, as illustrated in Figure 3-3. A similar situation would pertain to corporations, partnerships, etc. that are required to hire a skipper to fish their initial allocations of Alaska IFQ.[3]

[3] The Alaska program grandfathered in corporations, partnerships, and other non-individual entities. Their grandfather status will expire with the addition of new owners of the sale of their IFQ.

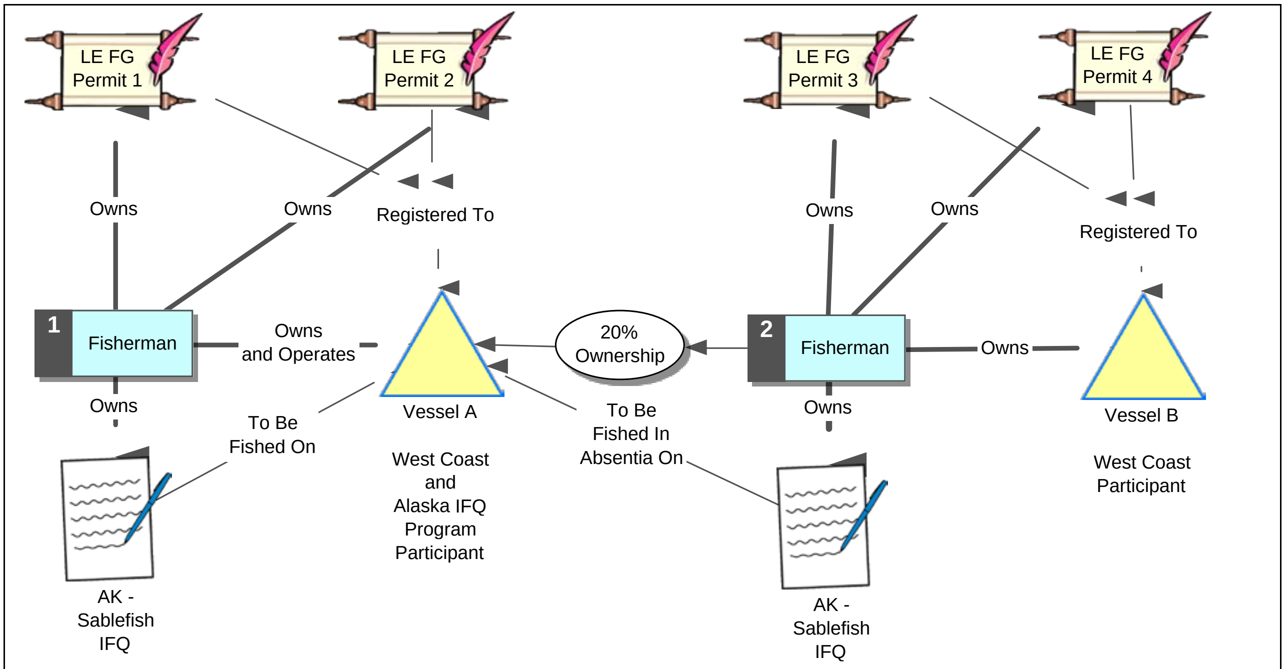

Figure 3-3. Alaska cross participation example--full or partial ownership of a vessel implies control over the limited entry fixed gear (LEFG) permits associated with that vessel, potentially resulting in violation of the three-permit control limit (in this example, four permits for Fisherman 2).

Thus, there appear to be two potential direct effects of the Council's all-or-nothing rule for counting permits toward the control limit:

1. an effect on arrangements that involve financial interests secured through vessel ownership, and
2. an effect on the distribution of limited entry privileges (both Alaska IFQ and LEFG permits) among fishing operations.

The latter of these two situations appears to be of most concern at this time, based on the content of public testimony to the Council and communications with the NMFS Limited Entry Permit Office.

In addition to these two direct effects on participant behavior, a third direct effect of one of the action alternatives would be:

3. a change in effort required to administer the program (collection and tracking of additional information).

Impact on Lending

To date, institutional lenders have not expressed any concerns about the all-or-nothing rule for assessing the three-permit control limit. An action alternative would only affect assessing the three-permit limit with respect to vessel ownership (i.e., it does not change how control limit would be assessed with respect to direct permit ownership). Institutional lenders likely secure loans against vessels through a *preferred mortgage* and associated maritime lien.

> A preferred mortgage is a mortgage which is given status as a maritime lien. As such it enjoys a certain priority in the event of default. In addition, the Coast Guard is prohibited from making certain changes in documentation including, but not limited to, change of vessel ownership, name, and hailing port without consent of the mortgagee. For this reason many financial institutions require vessels which are eligible for documentation to be documented and to have preferred mortgages recorded against them.
>
> USCG National Documentation Center (http://www.uscg.mil/nvdc/nvdcfaq.asp#18)

As discussed above, the main lending practice likely to be affected by an action alternative would be that which is reported to occur among industry members (as fishing operations and families secure loans they make to other fishermen by maintaining possession of the vessel being sold until such time as all payments have been made, as described above).

If such within industry arrangements are advantageous over working with an institutional lender, it is likely because it generates some economic advantages that would not be available through an institutional lender. For a vessel seller, providing a buyer direct financing may allow the seller to negotiate a better price. The buyer may gain either through access to financing that would otherwise not be available or through access at a lower cost. A seller's personal knowledge and social connections with the buyer may mean that the transaction is a lower risk than would be perceived by an institutional lender or the seller may have a social interest in the buyer's entry into the fleet. At the same time, the fleet has been operating for over 12 years under the current all-or-nothing control rule and in the interim may have found other ways to achieve similar private financing outcomes.

Thus, with respect to lending, the impact mechanism of an action alternative might be

- **a redistribution of risks, financing transaction costs, and related profits from institutional lenders toward the private parties involved in a transaction, and**
- **more social connections between buyers and sellers than might be the case if borrowers were qualified by institutional lenders**

Impact on Distribution of Fishing Privileges

To consider the impact mechanisms with respect to the second direct effect, we will look at three groups of participants:

1. West Coast and Alaska (WC&AK) participants,
2. Alaska only participants (AKO), and
3. West Coast only participants (WCO).

For purposes here, West Coast participation is participation involving control of a West Coast LEFG permit. Alaska participation involves owning or fishing Alaska IFQ. An AKO participant is one that participates in the Alaska IFQ program and may own a vessel that is partially owned by a West Coast participant but the AKO participant does not have an ownership interest in a West Coast operation (example analogy: if stock in a corporation (AKO business) is owned by a mom and pop business (WC&AK business), the corporation issuing the stock is not a participant in the mom-and-pop business (not a WC participant)).

The WC&AK group can be further divided into

1. those who directly participate only on the West Coast, fishing their Alaska sablefish IFQ on an AKO vessel without traveling to Alaska (i.e. hiring a skipper to fish their Alaska IFQ for them), and
2. those who individually or with their vessel travel to Alaska to participate in the fishery.

For the second subgroup to participate in the Alaska IFQ program, there is no requirement that they have ownership in the vessel that fishes (e.g. if they personally travel to Alaska to be present during fishing operations). Therefore, with respect to the WC&AK group, the impact mechanism operates mainly through the first subgroup of WC&AK participants, those fishing under a grandfather exception to the Alaska owner-on-board provision, which allows them to participate without being present during fishing operations. The owners of approximately 87 percent of the West Coast limited entry fixed gear sablefish vessels might fall in the first category (their vessels do not go to Alaska) but would fall in the second category if they travel there individually or would not be affected if they do not own Alaska IFQ. The owners of the remaining 13 percent of vessels fall in the second category (their vessels fish in Alaska) (Table 3-1) and are impacted by their inability to fish Alaska IFQ for members of the first group if doing so would put the vessels fishing in Alaska over the three-permit control limit, as explained further below.

Table 3-1. Number of vessels with LEFG permits that participate in Alaska fisheries.

	Number of Permits Stacked on a Vessel			
	3 Permits	2 Permits	1 Permit	Total
Number of Vessels Without Alaska Participation (owners might have Alaska IFQ) [a/]	18	16	50	84
Number of Vessels With Known Alaska Participation	3	6	4	13
Total	21	22	54	97

a/ These data provide only a general indication of the magnitude of the number of entities potentially affected by the all-or-none accounting method and Alaska participation requirement. On the one hand, the number of entities affected may be greater than these numbers indicate because there may be more than one owner per vessel affected (if for a single vessel there are multiple owners that each individually own Alaska IFQ). On the other hand, the number may be smaller because: some of these owners may still travel to Alaska on their own, and therefore not need to take advantage of the grandfather clause; some may not qualify under the grandfather clause; and some (many) may not have Alaska IFQ.

In the following discussion it is shown that the direct impacts on the distribution of harvest privileges is likely to be some degree of increase in

- **consolidation of Alaskan IFQ on vessels that also participate in the West Coast LEFG fishery (WC&AK participants),**
- **consolidation of West Coast LEFG permits on vessels that fish in both fisheries (WK&AK participants), and**
- **acquisition of West Coast LEFG permits by vessels that previously fished only in the Alaskan IFQ fishery (AKO participants).**

To simplify the discussion, we will first examine the effects with respect to WC&AK operations, starting with operations that have three permits. Then we will examine effects with respect to AKO participants.

For a WC&AK operation to participate in the Alaska IFQ fisheries, while taking advantage of the grandfather exception for the owner-on-board provision, it must acquire ownership in a vessel participating in the Alaska fishery (as indicated in Figure 3-3). If the WC&AK operation has three LEFG permits, it cannot fish its AK IFQ as an absent owner on another WC&AK vessel because acquiring an ownership interest in that vessel would put it over the three permit limit. Therefore, the Alaska IFQ owner with ownership in a WC&AK operation that has three permits would either have to fish its Alaska IFQ from an AKO vessel or participate in the fishery in person (forego use of the grandfather clause). This situation can be characterized as a constraint on the opportunity to hire a vessel and is illustrated on the left hand side of Figure 3-4.

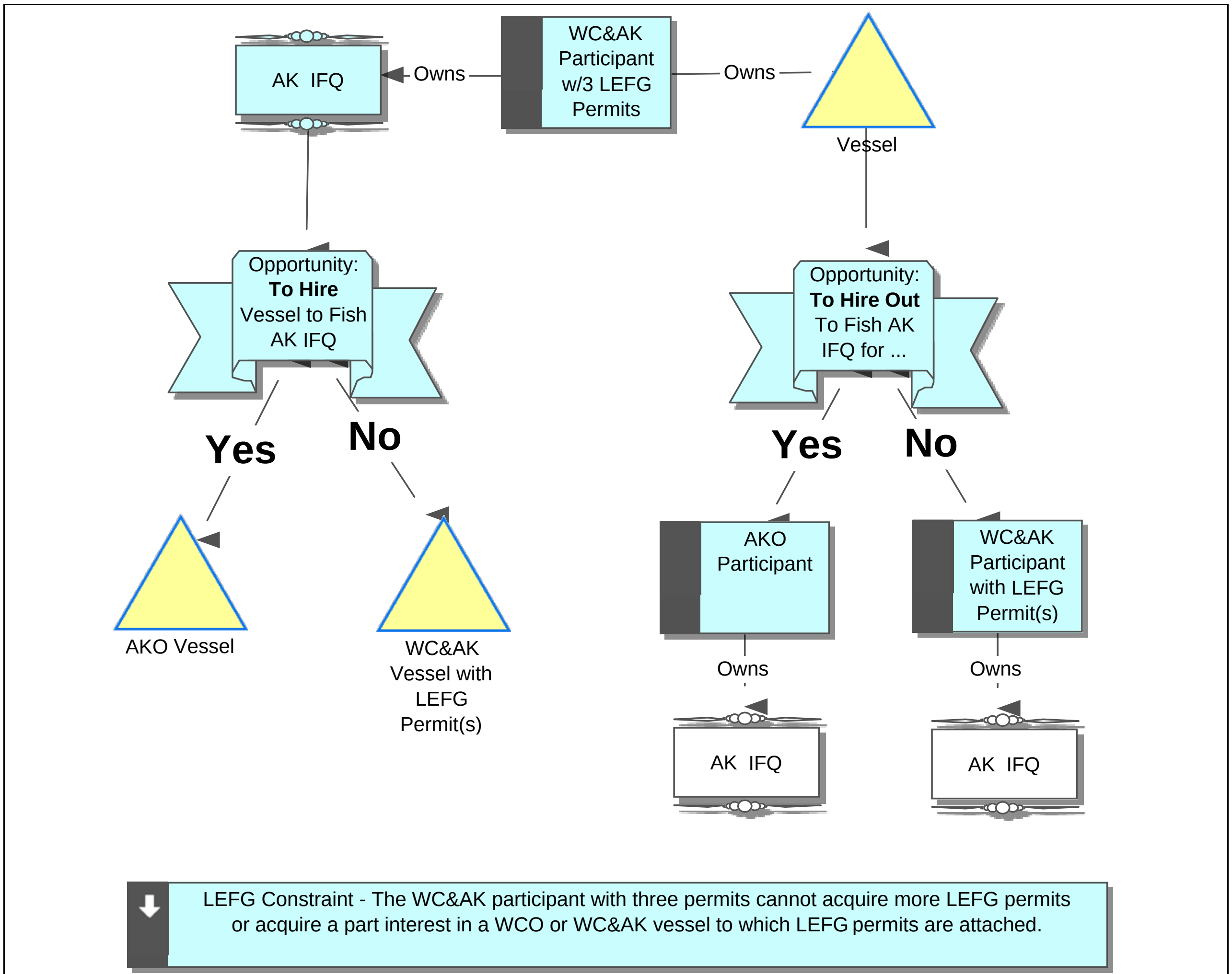

Figure 3-4. Ability of a West Coast and Alaska vessel to hire out to fish Alaska IFQ or to hire others to fish Alaska IFQ for it.

WC&AK vessels also have the opportunity to operate as a hired skipper in the Alaska IFQ fisheries, fishing the Alaska IFQ for other absent IFQ owners taking advantage of the grandfather exception to the owner-on-board provisions. A WC&AK vessel with three LEFG permits would not be able to hire out to fish Alaska IFQ for another WC&AK operation because that other operation would have to acquire an ownership in the WC&AK vessel with three permits, which would put it over the three permit limit. This is illustrated on the right hand side of Figure 3-4.

WC&AK participants with fewer than three LEFG permits would have more flexibility to hire, or hire out to, other WC&AK vessels to fish Alaska IFQ, with the number of other vessels with which they could work depending on the number of permits owned. Table 3-2 illustrates the combinations of WC&AK participants and AKO participants that would be allowed to operate and not operate together under status quo. Table 3-3 shows the change in combinations allowed under an action alternative.

Table 3-2. Status quo: ability of WC&AK and AKO vessels to fish Alaska sablefish IFQ for the potential participant listed in the first column (to "hire out" to the participant listed in the first column) and number of additional LEFG permits that the owners of each entity listed in the columns might acquire.

	WC&AK Vessels			
	Number of Permits Owned			
	3 Permits	2 Permits	1 Permit	AKO Vessels
Participants Seeking to Hire Out Their AK IFQ (Hire a Skipper)	Able to Fish IFQ For Entity Listed to Left – Yes or No (Maximum Number of Additional Permits That Could Be Acquired, If Vessel is Able to Fish for Entity Listed to Left)			
WK&AK w/3 LEFG Permits	N (-)	N (-)	N (-)	Y (0)
WK&AK w/2 LEFG Permits	N (-)	N (-)	Y (0)	Y (1)
WK&AK w/1 LEFG Permits	N (-)	Y (0)	Y (1)	Y (2)
AKO	Y (0)	Y (1)	Y (2)	Y (3)

"N" means vessel in the column could not hire out to the participant listed in the row.
Numbers in parenthesis show the number of additional LEFG permits the vessel in the column could acquire without violating the three permit limit (a "-" is displayed where the combination is impermissible).

Table 3-3. Action alternative: ability of WC&AK and AKO vessels to fish Alaska sablefish IFQ for the potential participant listed in the first column (to "hire out" to the participant listed in the first column) and number of additional LEFG permits that the owners of each entity listed in the columns might acquire.

	WC&AK Vessels			
	Number of Permits Owned			
	3 Permits	2 Permits	1 Permit	AKO Vessels
Participants Seeking to Hire Out Their AK IFQ (Hire a Skipper)	Able to Fish IFQ For Entity Listed to Left – Y/N (Maximum Number of Additional Permits That Could Be Acquired, If Vessel is Able to Fish for Entity Listed to Left)			
WK&AK w/3 LEFG Permits	Y (0)	Y (1)	Y (2)	Y (3)
WK&AK w/2 LEFG Permits	Y (0)	Y (1)	Y (2)	Y (3)
WK&AK w/1 LEFG Permits	Y (0)	Y (1)	Y (2)	Y (3)
AKO	Y (0)	Y (1)	Y (2)	Y (3)

Numbers in parenthesis show the number of additional LEFG permits the vessel in the column could acquire without violating the three permit limit.

Under an action alternative, WC&AK operations would have more flexibility to both hire out to other WC&AK operations or to hire other WC&AK vessels to fish their IFQ, because the 20 percent ownership in a hired vessel needed to meet the requirements of the Alaska IFQ program would not be enough to cause associated LEFG permits to count against the three-permit cap. **Thus this change would provide more opportunities for consolidation of AK IFQ on WC&AK vessels.**

If an AKO participant is fishing Alaska IFQ for an absent WC&AK participant (i.e. the WC&AK participant has part ownership in the AKO vessel), each WC&AK participant must have some ownership interest in the AKO vessel but the AKO operation does not have to have an ownership interest in the WC&AK operations. Moreover, an AKO vessel might fish for several separately owned WC&AK operations, each with three LEFG permits, without violating the three permit control limit. This situation is illustrated in Figure 3-5. The main inhibition to the AKO operation is on its ability to acquire a West Coast LEFG permit (i.e. to become a WC&AK vessel).

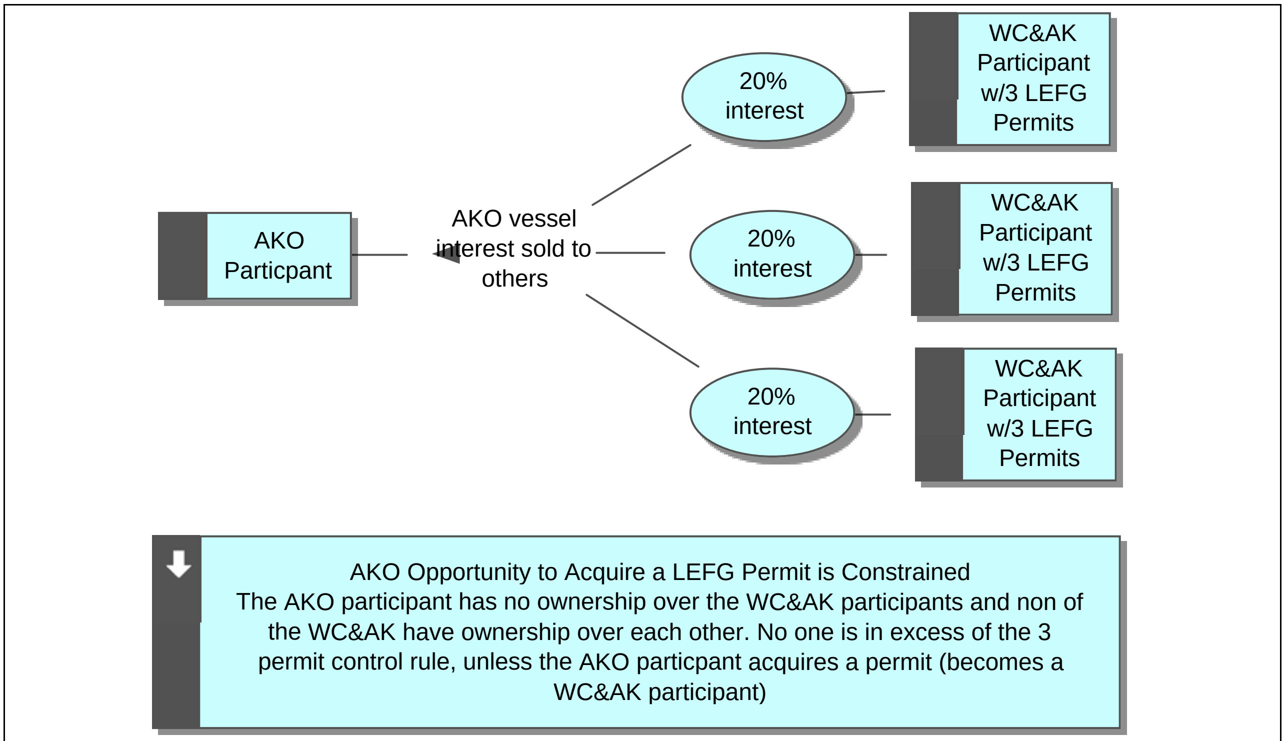

Figure 3-5. Opportunity for AKO participant to hire out to multiple WC&AK participants, each of which might be at the three-permit limit for control of FG GF permts.

The LEFG permits held by the WC&AK operations that an AKO vessel fishes IFQ for do not prevent an AKO vessel from acquiring its own LEFG permit but may provide a disincentive for such acquisitions. The WC&AK vessels that the AKO vessel fish for have an ownership interest in the AKO vessel. If the AKO participant's acquisition of a West Coast LEFG permit puts one of its WC&AK owners over the three permit limit, then that WC&AK participant would have to withdraw its partial ownership and Alaska IFQ from the AKO participant's vessel. (Note: it would be the WC&AK participant that is over the there-permit limit and in violation, not the AKO participant that acquires the WC LEFG permit). Thus, the current West Coast three-permit limit does not limit the AKO vessel's opportunity to hire or hire out to AKO or WC&AK vessels but in some circumstances may provide a disincentive for the AKO operations acquisition of an LEFG permit (Figure 3-6). Table 3-2 shows in parenthesis the number of permits the vessels shown in each column could acquire without either violating the three permit limit or risking loss of the IFQ held by the hiring participant. Table 3-3 shows (by comparison to Table 3-2) that under an action alternative there are more situations in which a vessel hiring out to a WC&AK participant could acquire permits and that in some situations the number of permits that could be acquired by both WC&AK and AKO participants would increase.

Thus, under an action alternative there may both be fewer situations in which there is a disincentive for AKO vessels to acquire a permit and more opportunities to consolidate LEFG permits on existing WC&AK vessels.

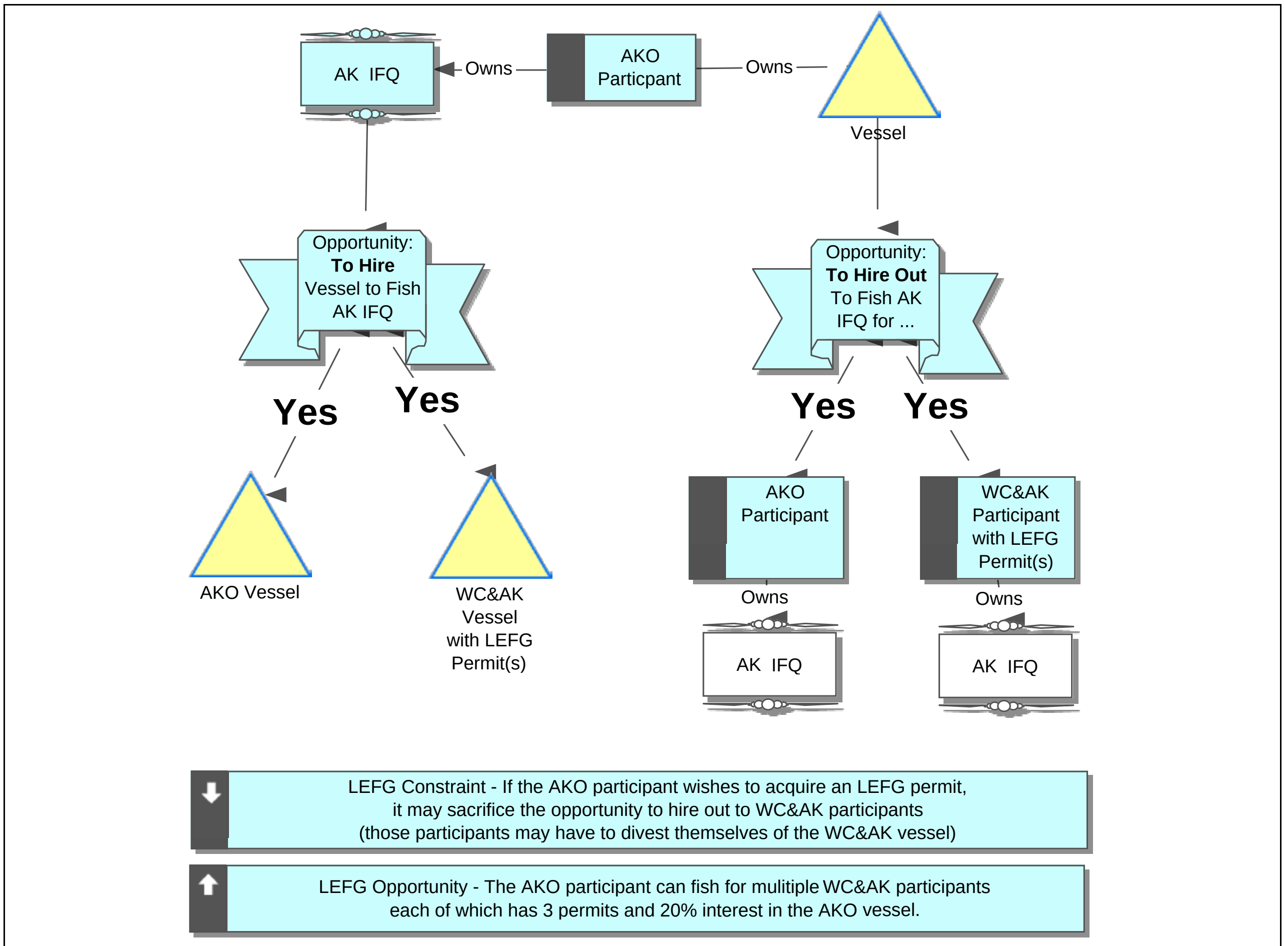

Figure 3-6. Ability of an Alaska only vessel to hire out to fish Alaska IFQ or to hire others to fish Alaska IFQ for it and constraints on acquiring a West Coast LEFG permit.

With respect to the new opportunities for consolidation, the situations affected are somewhat limited. First, the impact mechanisms pertain only to those situations in which a WC&AK participant both qualifies for a grandfather exception to the Alaska owner-on-board provision and chooses to exercise that exception by hiring a vessel and skipper rather than travelling to Alaska to participate in the fishing activities. Second, the most binding constraint relates to the owners of about 18 West Coast LEFG vessels which have three stacked permits and vessels that do not participate in Alaska fisheries, if those owners have IFQ and fall under the grandfather clause. Other operations may experience a lesser constraint, e.g. a vessel with two LEFG permits can fish Alaska IFQ for the owner of an LEFG operation with one permit but not for owners of one of the 18[4] with three permits or one of the 15[4, 5] other vessels with two permits. Vessels that fish only in Alaska and might fish Alaska IFQ for an owner of one of the 18 three permitted vessels would have an immediate disincentive for acquiring a West Coast LE groundfish permit, as described above. Alaska vessels that have already acquired an LEFG permit are included in this discussion as a WC&AK vessel that might acquire additional permits under the action alternative.

[4] Vessels with no Alaska participation, the owners of which may or may not have Alaska IFQ.
[5] Sixteen vessels have two permits and no Alaska participation, but one of those is the vessel in this example, leaving fifteen other two permit vessels that it cannot work with.

The number of all individuals[6] with Alaska sablefish IFQ started at 528 in 1995 and had declined to 445 in 2011 (Table 3-4). Over that same period, the number eligible to hire a skipper (those grandfathered in) has declined from 496 to 239. Of those eligible to hire skippers the number doing so has increased from 20 to 96 over that period. In 2011, the 96 IFQ eligible holders hired 122 different skippers (vessels) to fish their IFQ. Because the number of Alaska participants and potentially hired vessels (362 in 2011) is high relative to the number of West Coast operations, it seems unlikely that the change under an action alternative would create substantial new opportunity for Alaskan only vessels that does not already exist (i.e. only a small percent of the Alaska fleet is potentially affected by the change in constraint). Therefore the action alternative is more likely to affect consolidation among WC&AK operations and mainly among the owners of those west coast vessels that do not participate in Alaska but who have Alaska IFQ. While the degree of consolidation which would occur under the action alternative is uncertain, on these bases, it is expected that the actual degree of additional consolidation, relative to what already exists, would be expected to be modest at most.

Table 3-4. Participation in Alaska sablefish IFQ fishery.

	1995	**2011**
Total number of vessels fishing.	616	362
Individuals with sablefish quota	528	445
Individuals eligible to hire a skipper	496	239
Number that do hire a skipper	30	96
Number of skippers hired	30	122
Non-individuals (corporations, partnerships etc.) - must hire a skipper[a/]	160	78
Number that do hire a skipper	52	55
Number of skippers hired	51	105

a/ The requirement that non-individuals must hire skippers did not go into place until 1998.

Impact on Administrative Effort

Currently, NMFS collects only a listing of the individuals with an ownership interest in LEFG permits and the vessels to which they are registered. Under the action alternatives, NMFS would have to collect information on percent of ownership interest in vessels and those ownership interests would have to be updated with any change in the portions of ownership.[7] Additionally, depending on the policy guidance, ownership interests may have to be tracked through several levels of ownership – for example if one partnership is part owner of a second partnership that owns a vessel.

[6] These numbers for Alaska do not include those required to hire skippers.

[7] This entails ownership interests of shareholders in a corporation and the relative ownership in partnerships.
Example

Acme Inc and Fish Inc own a vessel
Acme Inc and Fish Inc each 50% ownership in the vessel
Acme Inc is made up of John Doe and Mary Doe and each owns 50% of Acme
Fish Inc is made up of Mark and Sarah Smith and each have a 50% interest in Fish.

To be determined: Will vessels owned by two or more individuals need to file ownership interest forms?

Summary of Impact Mechanisms and Differences Between Alternatives 1 and 2

In summary, the primary direct impact mechanisms are as follows.

1. A potential effect on arrangements that involve financial interests secured through vessel ownership in vessels:
    a. a redistribution of risks, financing transaction costs, and related profits from institutional lenders toward the private parties involved in a transaction, and
    b. more social connections between buyers and sellers than would be the case if borrowers were qualified by institutional lenders
2. An uncertain but at most modest effect the distribution of limited entry privileges among fishing operations:
    a. Some degree of increased opportunity for consolidation of Alaskan IFQ on vessels that also participate in the West Coast LEFG fishery,
    b. Some degree of increased opportunity for consolidation of LEFG permits on vessels that fish in both fisheries, and
    c. Some degree of increased opportunity for acquisition of LEFG permits by vessels that previously fished only in the Alaskan IFQ fishery.
3. An increase in the administrative effort required to track and enforce the control limits.

On the basis of the situations that regulations currently constrain, it is expected that the direct impact mechanisms of the action alternatives would be some increased flexibility in financing within the fishery (including an increase in personal connections between lenders and borrowers) and at most some modest consolidation of both LEFG permits and Alaska sablefish and halibut IFQ on fewer vessels. Additionally, there may be some impact on program administrative costs. The effects of these changes on each of the resources is discussed in the following sections.

Action Alternatives 1 and 2 vary from one another in terms of the threshold amount of vessel ownership which counts as ownership of the associated LEFG permits. Under Alternative 1 the amount (20 percent) is the minimum ownership required to take advantage of the grandfather exception provision to the owner-on-board clause for the Alaska IFQ program. The Alternative 2 threshold (30 percent) provides some additional leeway for agreements that may have been established to take advantage of the exception that, for one reason or another, provided somewhat more than the minimum ownership required. Both action alternatives represent a compromise compared to the status quo, under which any one holding even a fraction of a percent ownership of a vessel would meet the control threshold and be credited with complete control over all of the permits associated with the LEFG vessel. While Alternative 2 may cover some individual ownership situations not covered in Alternative 1, Alternative 2 would not be expected to lead to any appreciable overall differences in the intensity of the impact mechanisms described here. If Alternative 1 is selected instead of Alternative 2, individuals in those situations might have to divest themselves of up to 10% of their ownership in order to not exceed the threshold for the LEFG program while meeting the 20% threshold for the Alaska program.

Under both alternatives, two is the maximum number of vessels in which ownership less than 20 percent (or 30 percent) would not count for the purpose of determining permits controlled. This means that the maximum control over LEFG permits that an individual could have would be

100% ownership over three permits (as under status quo) plus up to 20 percent (or 30 percent) ownership in two vessels each of which were registered to three LEFG permits, none of which are owned in any part by the individual.

Recent final and proposed rules for the Alaska halibut and sablefish IFQ fisheries are expected to expedite the shift toward an all owner-on-board fishery in Alaska. NMFS, North Pacific region, recently published a final rule (79 FR 9995, February 24, 2014) that imposes a 12-month vessel ownership requirement on initial individual recipients of QS who wish to use an exemption from the owner on board requirement and use a hired master to harvest their IFQ. NMFS has also proposed a regulation that would prevent an initial recipient from using a hired master to harvest QS that an initial recipient acquired by transfer after February 12, 2010, with a limited exception for small amounts of QS (78 FR 24707, April 26, 2013).

Physical and Biological Environment

Own/Control Limits

Summary: Under an action alternative no substantial impact to the physical or biological environment would be expected. The primary potential effect would result from a possible geographic shift in the area of harvest. Any such shift is expected to be modest (as described in Section 3.1.1.2). If that shift were to occur the data collection and reporting system would alert managers to any significant impacts and tools are available for an appropriate management response.

Section 3.1 and 3.2 describe the potentially affected physical and biological environment including:

- Groundfish stocks
- Nongroundfish Species
- Protected Species
- Essential Fish Habitat
- California Current Marine Ecosystem

Impacts on the physical and biological environment would depend on whether the changes in the control rule changed fishing behavior. Impacts to the physical and biological environment might change if there were

- changes in total harvest,
- changes in the types of gear used,
- changes in the way gear is fished,
- changes in the amount of fishing effort required to take a given amount of harvest (CPUE), or
- changes in the distribution of harvest

The limited entry fixed gear allocations are generally fully harvested under the limited entry fixed gear permit stacking program (a type of LAPP program) by vessels using longline and/or fishpot gear (Table 3-x harvest in relation to allocations TO BE PRODUCED). There is no opportunity to increase total removals and no reason to expect that changing the control rule provision would result in a decrease of harvest.

The impacts of a control rule change under an action alternative would occur through the mechanism of changes in financing or consolidation (see Section 3.1.1). There is no reason to expect that these mechanisms would cause a change in the type of gear used, the way the gear is fished, or the catch per unit effort in either the West Coast LE FG sablefish or Alaska fixed gear sablefish and halibut IFQ fisheries.

If the changes result in some modest degree of consolidation on vessels that fish in both the West Coast and Alaska (see discussion in Section 3.1.1.1) and those vessels tend to fish in a different geographic distribution along the West Coast than the vessels from which the permits are acquired, then there could be a spatial shift in the distribution of effort and catch. The current program does not restrain redistribution of sablefish harvest and landings within the management area for the stock. Such redistributions may occur in response to local area CPUE, local fish marketing opportunities, and shifts of the permits between ports (through transfer or changing locations of fishing operations). To a certain extent, a natural rebalancing of effort would be expected from any significant shifts. For example, if effort shifted enough to cause a CPUE decline in a particular area then, as a result of the increased fishing cost, effort would be expected to reshift to some other area. Biologists and managers have determined that the northern sablefish stock to which this program applies (roughly north of 36 degrees north latitude) is a unit that can be effectively managed as such, i.e. there are not issues of localized depletion that would require further subdivisions to ensure the productivity of the target species. All catch in the fishery (including sablefish and nontarget species) is assessed through an observer program and landings are recorded on state fish tickets. Thus, if there is a geographic shift and if that shift leads to changes that are of management concern, a data collection and reporting system is in place to alert managers to the situation and coordinated federal, state, and tribal regulatory authority is available to mitigate such impacts.

Habitat impacts are limited to the possibility that there may be a redistribution of effort, redistributing gear impacts along the coast. The amount of any such redistribution would be expected to be small (see section on impacts on communities in Section 4.3.1). Amendment 19 to the groundfish FMP set aside essential fish habitat conservation areas and provided a process for five year reviews which includes assessment of changes in the intensity and distribution of fishing effort (see NMFS, 2013 for an example of the type of information produced). This review process provides an opportunity for adaptive management in response to any significant shifts in fishing effort that adversely impacts habitat.

Socio-economic Environment

Own/Control Limits

Summary: The following is a summary of the potential socio-economic impacts of an action alternative.

West Coast LEFG Harvesters.

- Some potential increase in net revenue and efficiency of vessel operations through consolidation and increased scale of operation and decreased financing costs.
- Some potential increase in fees related to increased NMFS administrative costs.
- Some increase in social cohesion within the fleet.
- An increase in paper work for all vessels related to need to submit ownership interest information.

Harvesters in Other Fisheries.

- Some redistribution of Alaska IFQ away from vessels that participate in Alaska but not in the West Coast LEFG fishery.
- A possible increase in acquisition of LEFG permits by Alaska vessels that hire out to catch Alaska IFQ owned by West Coast LEFG participants and the attendant increase in profits and possibly efficiency based on scale of operation.
- Vessels displaced as a result of consolidation may have some impact on other fisheries.

Crew.

- Consolidation may lead to fewer jobs but increased wages for remaining jobs.

Processors.

- Processing companies tied to a particular port may be affected if there is some geographic redistribution (see section on communities).

Communities.

- Potential for some harvest redistribution among ports (appears likely to be minor)
- An increase in social connections within the fleet
- A possible small decrease in the lending business of financial institutions.

Agencies.

- An increase in administrative workload related to the need to collect, store, and track vessel ownership information.

Section 3.3 describes the potentially affected socioeconomic environment including:

- Fixed gear sablefish harvesting operations
- Harvesting operations in other fisheries
- Crew
- Processors
- Communities
- Management Agencies

As discussed in Section 3.1.1, the primary direct impact mechanisms are as follows.

1. An potential effect on arrangements that involve financial interests secured through vessel ownership in vessels:
    a. a redistribution of risks, financing transaction costs, and related profits from institutional lenders toward the private parties involved in a transaction, and
    b. more social connections between buyers and sellers than would be the case if borrowers were qualified by institutional lenders
2. An uncertain but at most modest effect the distribution of limited entry privileges among fishing operations:
    a. Some degree of increased opportunity for consolidation of Alaskan IFQ on vessels that also participate in the West Coast LEFG fishery,
    b. Some degree of increased opportunity for consolidation of LEFG permits on vessels that fish in both fisheries, and
    c. Some degree of increased opportunity for acquisition of LEFG permits by vessels that previously fished only in the Alaskan IFQ fishery.
3. An increase in the administrative effort required to track and enforce the control limits.

Fixed Gear Harvesting Operations

For the fixed gear sablefish harvesters, the proposed alternatives may affect profits and efficiency. There may also be some social effects.

The action alternatives may facilitate within sector financing whereby the seller retains possession of a vessel as security for a loan (see discussion in Section 3.1.1). To the degree that additional seller financing of buyers is facilitated by an action alternative, the potential economic and social impacts for such sellers include:

- Generating profits from financing the sale (either through charging an interest rate or a higher sale price)
- Increasing the number of potential buyers by lowering transaction costs and financing barriers for potential buyers (which contributes to the profits in the first bullet and may speed the process of finding a buyer, reducing transaction costs for the seller)
- A strengthened social network by facilitating entry of a community member or other known individual into the fishery.

The potential economic and social impacts for the vessel buyer in these situations include:

- Access to financing and or lower financing costs than if financial institutions are the only option.
- Competition from more potential buyers
- Entry into a fleet with more social cohesion

At present seller financing is believed to occur, and only those seller financed transactions inhibited by the three permit limit might be facilitated by one of the action alternatives. Additionally, even where the three-permit limit has presented an obstacle, members of industry may have found alternative ways to secure their loans, further reducing the potential effect through this impact mechanism.

The opportunity for larger operations (i.e. those constrained by the three permit limit) to consolidate more harvest privileges (either by acquiring West Coast LEFG permits or by hiring out to WC&AK participants to harvest Alaska IFQ) may increase economic profits and fleet efficiency through economies of scale. The degree of the current constraint and consequently the opportunity provided by the action alternative (as described in Section 3.1.1.1) is modest for the fleet as a whole but may be significantly important to some individuals.

LEFG permits and their associated tier limits are the main components of an LEFG LAPP program. Because the program is classified as a LAPP, a requirement of the MSA is that costs of administering the program be recovered through fees, up to a maximum of 3% of exvessel revenue. The action alternatives may increase administrative workload and hence cost of administering and enforcing the program. These additional costs may be passed on to participants through fees, increasing vessel costs and resulting in a minor adverse impact on vessel profits.

The current control rule and all-or-none accounting method is intended to err on the side of precaution in trying to ensure that the three permit control rule is not undermined by private business arrangements which might convey control without conveying majority ownership interest. It also makes it more likely that there will be a greater number of harvesters that are totally independent of one another. One mechanism by which control might be asserted over a greater number of permits is through lending to finance the purchase of a vessel. Such lending might be turned into leverage over a permit and the activities of a particular vessel. The current all-or-none rule reduces the opportunity to use that type of mechanism where its use is dependent on securing at least part ownership in a vessel. As discussed in Section 3.1.1, the action alternatives would provide opportunity to secure vessel financing thought part ownership without tripping the control rule, potentially opening an avenue for circumventing the permit control rule. However, the action alternatives still stop well short of providing the opportunity for an entity to have controlling interest in a vessel without also being considered to control the permits registered to the vessel.

As a result of the additional vessel ownership information required to track and enforce compliance with this provision, under the action alternatives most owners of vessels registered with LEFG permits would likely be subject to the requirement to submit vessel ownership interest forms specifying each individual's share of ownership.[8]

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[8] Currently all vessel owners that are businesses (corporations) have to file an ownership interest form at renewal but they do not provide percent ownership for individual shareholders. Vessel owners who are individual partners (husband/wife) would now have to file ownership interest forms and report relative ownership in the vessel. Also vessels with multiple owners (corporations and individuals) would need to report relative ownership in the vessels. Businesses would continue to file ownership interest listing shareholders but would now need to provide percent of ownership for each shareholder.

Impacts on financial institutions are discussed in the section on communities.

Harvesters in Other Fisheries

As indicated in Section 3.1.1, an action alternative could result in shifts in fishing privileges among participants. On the one hand, there would be some decreased opportunity for Alaskan only vessels (AKO participants) to fish Alaska IFQ for WC&AK participants, as there would be a reduction in a constraint that currently limits WC&AK participants' ability to fish for one another. On the other hand, a few AKO participants that fish for WC&AK vessels might have a new opportunity to buy LEFG permits (become WC&AK vessels) without sacrificing income they earn by hiring out to fish Alaska IFQ for WC&AK vessels. However, there are already a large number of AKO vessels that have the opportunity to acquire LEFG permits and do not exercise such opportunity. The addition of a few more AKO vessels to the pool of potential participants is not expected to have a notable effect in new entry to the LEFG fishery by what are currently AKO participants.

The main impact mechanism by which other fisheries might be affected is consolidation. Section 3.1.1 indicates that under the action alternative there is some limited possibility that LEFG permits and Alaska IFQ may be consolidated onto fewer vessels. This might then generate some surplus capital (vessels) that would be sold into other fisheries. Most US fisheries are under some form of rationalization program that would limit the effects of this surplus capital.

Crew

If there is some consolidation of LEFG permits and/or Alaska IFQ on to fewer vessels, then the income of crew members on vessels from which the permits/IFQ are moved may decrease while there may be a gain on the vessels to which the permits/IFQ are moved. If the loss of permits or IFQ result in a vessel going out of business then, rather than a decrease in income, there may be a net job loss. As described in Section 3.1.1., the degree of consolidation is expected to be, at most, modest.

Processors

Section 3.1.1 identifies some possibility of a geographic redistribution of harvest and landings, to the degree that LEFG permits are consolidated onto WC&AK vessels and that WC&AK vessel tend to have a different geographic distribution than West Coast only participants. Such a redistribution may affect processors (and processing dependent jobs) that are dependent on the landings in a particular port. Processing companies that purchase through a number of ports would be less affected.

Any redistribution of permits is expected to be modest and that there would a geographic difference in the distribution of the harvesters receiving such permits is uncertain. The issue of geographic redistribution is discussed further in the section on communities.

Communities

Geographic distribution. Some increased consolidation of LEFG permits on vessels that participate on the West Coast and in Alaska is expected. The current fleet of WC&AK vessels tends to be distributed somewhat differently than those that participate only on the West Coast, with vessels from Washington and northern Oregon ports being more likely to participate in Alaskan fisheries than vessels from other ports (Table 3-5). Whether geographic distribution is affected depends on the degree to which WC&AK acquire additional LEFG permits and the geographic area from which those additional LEFG permits come. With respect to consolidation, one of the primary motivations for the action is to allow the harvest of more Alaska IFQ to be consolidated on WC&AK operations, rather than allowing WC&AK operations to consolidate more LEFG permits. Nevertheless, some additional consolidation of LEFG permits may occur. If WC&AK operations acquire LEFG permits from West Coast only vessels that operate in the same geographic region of the West Coast as the WC&AK operations, then there may be no net geographic impact would be expected. If they acquire permits from other regions on the West Coast, then some geographic redistribution may occur.

Table 3-5. Counts of vessels by principle port and whether the vessels participated only on the West Coast LEFG fishery or also in Alaskan Fisheries.

	West Coast Only	West Coast and Alaska Participation	Total
Puget Sound	-	3	3
North Washington Coast	8	2	10
South & Central WA Coast	8	4	12
Astoria	4	1	5
Newport	13	1	14
Brookings	9	-	9
Coos Bay	11	-	11
Crescent City	3	-	3
Eureka	4	-	4
Fort Bragg	6	1	7
Bodega Bay	2	-	2
San Francisco (excl. Bodega Bay)	4	-	4
Monterey	5	1	6
Morro Bay	6	-	6
Santa Barbara	1	-	1
	84	13	97

With respect to the Alaska IFQ program, there could be some additional consolidation of harvest of Alaska IFQ on WC&AK vessels. Most of the Alaska IFQ consolidation is expected to occur among existing WC&AK (i.e. those constrained by the West Coast LEFG control rule) thus a substantial change in geographic distribution of benefits from the Alaska IFQ program would not be expected.

Social Connections. As discussed in Section 3.1.1, facilitation of seller financing may increase the degree to which buyers known to the seller are sold vessels, increasing social connections and cohesion within the fleet and community under the action alternatives.

Financial Institutions. Financial institutions are often part of local fishing communities. To the degree that permit transactions would have occurred under status quo but under status quo would have been financed through financial institutions rather than through seller financing then under an action alternative the increased in seller financing represents some loss in business to the financial institutions.

Agency Costs

Currently, to monitor the three permit limit, the agency need only keep track of a list of the individuals with some ownership interest in the permits and in the vessels. Under the action alternatives the agency would have the additional cost of tracking whether an individual had more or less than a given percent. Additionally, records would have to be updated each time an individual's share of ownership changes. These factors may add to agency costs which could be charged as fees to permit owners.

Prior to the program review, incremental costs associated with this LAPP were likely minimal, although at this time no quantitative assessment of incremental costs has been done. However, the actions being considered during this review process would implement an electronic fish ticket and modify the control rules. Also, the Council has taken action to allow trawl and LEFG endorsed permits to be registered to the same vessel at the same time. These actions may introduce additional incremental costs. For example, implementation of modified control rules could require an additional vessel ownership interest forms from some, as well as new database programming requirements that would take time and would require additional funding to implement. These are examples of additional incremental costs that could be tracked and partially recovered through implementation of a cost recovery program for the LAPP.

As part of the alternatives, a determination will need to be made about the layers through which ownership is tracked. For example, if the ABC Partnership owns 80% of a vessel and Mr. A owns 20% of a vessel but also owns a share of the ABC Partnership, would Mr. A then be considered to own in excess of 20% of the vessel? Such tracking will also add to program administrative costs.

National Marine Fisheries Service. 2013. Groundfish Essential Fish Habitat Synthesis: A report to the Pacific Fishery Management Council. NOAA, NMFS, Northwest Fisheries Science Center, Seattle WA, April, 2013. 107 p.

SABLEFISH PERMIT STACKING PROGRAM- ACTION ISSUES, ELECTRONIC FISH TICKET ANALYSIS

In the *Draft Council Decision Analysis Document* for the sablefish permit stacking program action issues, Attachment 2 to Agenda Item C.6.a, pages 6-11 describe alternatives for developing a Federal electronic fish ticket program for some or all of the sectors of the commercial nontrawl groundfish fleet. Similar to the electronic fish tickets used in the Trawl Rationalization (IFQ) fishery, the National Marine Fisheries Service (NMFS) is proposing that the Council consider Federal electronic fish tickets for some or all sectors of the commercial nontrawl groundfish fleet. The electronic fish ticket alternatives presented in that document and re-stated below were developed from the Council's recommendations at the November 2013 meeting. The Council's recommendations were based on alternatives identified in the Groundfish Advisory Subpanel (GAP) report, Agenda Item H.3.b, Supplemental GAP Report and the bolded items in the Groundfish Management Team (GMT) report, Agenda Item H.3.b, Supplemental GMT Report.

Electronic fish ticket means a software program or data files meeting data export specifications approved by NMFS that are used to send landing data to the Pacific States Marine Fisheries Commission (PSMFC). Electronic fish tickets are used to collect information similar to the information required in state fish receiving tickets or landing receipts, but do not replace or change any state requirements. The electronic fish ticket system was designed and is managed by the PSMFC, with funding from NMFS. The electronic fish ticket system has been used for the Pacific whiting shoreside fishery since 2007 (see 72 FR 50906, September 5, 2007).

In 2011, the electronic fish ticket system was expanded to include not only the Pacific whiting shoreside fishery, but all groundfish delivered shoreside by vessels participating in the shoreside IFQ program under Amendment 20 (the Trawl Rationalization Program). The current electronic fish ticket system is software based, however PSMFC is in the process of moving to a web-based electronic fish ticket system. This change would affect the requirements associated with using the electronic ticket. Electronic fish ticket regulations at 50 CFR 660.15 explain the current software and hardware requirements associated with using the electronic ticket. These regulations currently apply only to first receivers[1] in the Shorebased Trawl IFQ program and not to the limited entry fixed gear (LEFG) and open access (OA) fisheries. The existing electronic fish ticket varies slightly by state such that each form records the information necessary for compliance with state landings regulations. Although the form is currently used for the Trawl Rationalization Program, it could easily accommodate landings in the commercial nontrawl groundfish fleet, and also provides unique reporting functions, such as preparation of tax information, that may be beneficial to first receivers.

[1] First Receiver means a person who receives, purchases, or takes custody, control, or possession of catch onshore directly from a vessel.

Electronic Fish Ticket Alternatives (see also Section 2.1 of Attachment 2)

Alternative 1: (No Action) There are currently no Federal regulations requiring fish ticket documentation for sablefish landings in the primary (tier) sablefish fishery or within the larger limited entry fixed gear (LEFG) fishery.

Alternative 2: A Federal requirement that **all primary/tier** deliveries be recorded on an electronic fish (E fish) ticket that documents the associated Federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions completed as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 2, to allow the use of paper tickets.

Alternative 3: A Federal requirement that **all limited entry permit sablefish deliveries (primary/tier and daily trip limit (DTL))** be recorded on an electronic fish ticket that documents the associated Federal groundfish permit number. Tier Permits must be loaded into the IFQ Vessel Account System with deductions completed as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 3, to allow the use of paper tickets.

Alternative 4: A Federal requirement that **all sablefish deliveries (primary/tier, DTL, and open access)** be recorded on an E Fish Ticket. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word "electronic" and the second sentence from Alternative 4, to allow the use of paper tickets.

Alternative 1: (No Action)

Catch accounting in the limited entry fixed gear and open access fisheries is based on landed catch derived from state landing receipts. Total catch is derived by combining landed catch values from state landing receipts with discard ratios derived from observer sample data. Current regulations at 50 CFR 660.3 require vessels to adhere to applicable state laws for recordkeeping and reporting. State landing receipts do not consistently include the federal groundfish permit number associated with the landing, which can be problematic, particularly when multiple permits are registered to a single vessel. Electronic fish ticket regulations at 50 CFR 660.15 apply only to first receivers in the Shorebased Trawl IFQ program and not to the limited entry and open access fisheries first receivers. Landings data

> **§ 660.3 Reporting and recordkeeping.**
> Any person who is required to do so by applicable state law or regulation must make and/or file all reports of management unit species landings containing all data and in the exact manner required by applicable state law or regulation.

are available in the Pacific Fisheries Information Network (PacFIN) database for management and enforcement purposes several months after the date of landing.

Suboption

Alternatives 2 through 4 each include a suboption to require sablefish deliveries be recorded on state paper fish tickets, rather than on Federal electronic fish tickets. Under these suboptions, NMFS would implement a Federal requirement that sablefish landings and the Federal groundfish permit number associated with the landing(s) be recorded on the state paper fish tickets. At the time of implementation of Amendment 14, no Federal regulations requiring fish ticket documentation of the groundfish permit number associated with sablefish landings in the primary (tier) sablefish fishery were enacted. Documentation of catch against tier limits and documentation of permit numbers was left to the states to implement. In the Amendment 14b final rule (71 FR 10614, March 2, 2006), comment and response section, Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife (ODFW) committed to requiring Federal permit numbers to be recorded on state fish tickets by 2007. At that time California Department of Fish and Game, now California Department of Fish and Wildlife (CDFW), had already added a line for Federal permit number on their state ticket and entered that information into PacFIN. As of 2014, Federal permit numbers are not being recorded consistently on state landing receipts associated with sablefish landings.

Although the paper fish ticket suboptions would cause the least disruption to the existing landings process, adding new requirements to the state paper fish ticket system would fail to address the Purpose and Need Statement, as stated in Attachment 2 to Agenda Item C.6.a, for this action because doing so would not improve catch accounting and enforcement capabilities in the fishery. Adding new requirements to the state paper fish ticket system would also cause several logistical challenges in managing the sablefish fishery: sablefish landings data would not get into the PacFIN database at a faster than current rate; there would continue to be a lag time of several months between when the landings occur and when the data is available; the accuracy of landings data would not be improved; and further augmenting paper fish ticket recording requirements would be disruptive to state data collection and management practices. **NMFS recommends that this suboption be removed from each of the action alternatives.**

Action Alternatives

Each of the Action Alternatives 2 through 4 would implement a Federal electronic fish ticket reporting program for nontrawl commercial sablefish landings to U.S. West Coast ports. The action alternatives differ from each other in the fleets that they address: Alternative 2 would affect participants in the primary (tier) limited entry fixed gear (LEFG) sablefish fishery; Alternative 3 would expand upon Alternative 2 to add participants in the LEFG daily trip limit fishery (DTL); Alternative 4 would expand upon Alternative 3 to add participants in the open access sablefish DTL fishery. Under each of the action alternatives, the Federal electronic fish ticket would use the electronic tickets already in use by the IFQ program. The Federal electronic ticket could easily accommodate nontrawl sablefish landings with little to no revision to the existing electronic ticket. PSMFC is currently in the process of converting its software based electronic tickets to a web-based system, meaning that any dealer required to fill out an electronic ticket need only request a free PSMFC dealer account, then fill out an electronic ticket online, and submit that electronic ticket to PSMFC within 24 hours of landing. The catch data recorded on the electronic ticket is then added to the PacFIN data system by PSMFC staff. Table 1 of this document, below, summarizes some of the potential logistical differences between the No Action Alternative and Action Alternatives 2 through 4.

Table 1 Comparison of the No Action and Electronic Fish Ticket Alternatives

Issues	No Action (Status Quo)	Electronic Ticket Alternatives
Timely reporting of catch	• Federal reporting requirements not specified • Paper landing receipts required by state of landing • May take 2-4 months for NMFS to have access to landings by permit, if the permit is even recorded on the ticket	• Federal electronic fish tickets required • Submission of electronic fish tickets within 24 hours of the date of landing • Paper landing receipts still required by state of landing
Accurate reporting of catch	• In-season data available for monitoring is a combination of landing receipt data and estimates • NMFS unable to obtain real-time, accurate landings data • Landing receipts are subject to compromise and error	• Data electronically entered into the system can be verified and validated at the time of entry by buyer personnel • Provides a tool for first receivers to capture and track fish tickets, generate tax reports and summary data
Enforce landing overage violations	• In-season estimates are not sufficient for enforcement purposes • Data delays prevent real-time, in-season enforcement of tier overages	• Accurate, real-time tracking of landings against tier limits will allow enforcement to monitor and enforce tier limits and DTLs

The action alternatives include language that speaks to how the catch data recorded on the electronic tickets would be used on the back end ("That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket"). This language is potentially misleading and overly restrictive; how the data is processed and made available to end users is largely an implementation issue and it may be premature to discuss such implementation issues this early in the Council process. **NMFS recommends that the sentence, "That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket", be removed from each of the action alternatives (Alternatives 2 through 4).**

Potential Impacts of the Alternatives

For the Council's June 2013 meeting in Garden Grove, California, NMFS intends to supplement the Council staff analysis provided in Attachment 2 to this agenda item to provide a draft Environmental Assessment in support of the action. This supplemental attachment is not intended to address the full suite of National Environmental Policy Act (NEPA) requirements for analysis of the action. Issues NMFS intends to address in its June analysis include the potential impacts of the alternatives on the physical, biological, and socio-economic environments, as summarized here.

Potential Impacts of the Alternatives on the Physical Environment

Alternatives 2 through 4 consider implementing a Federal electronic fish ticket program for some or all of the sectors of the commercial nontrawl groundfish fleet landing sablefish into U.S. West Coast ports. None of the action alternatives are expected to change where fishing vessels operate at sea or where they land their catch. None of the action alternatives would constrain how much or how little gear fishery participants use, where they use the gear, or whether and how they interact with the ocean floor or essential fish habitat. Therefore, NMFS does not anticipate that any of the alternatives would have any effect on the physical environment, nor would the action alternatives result in the monitored fisheries having different effects on the physical environment from those experienced under the No Action alternative.

Potential Impacts of the Alternatives on the Biological Environment

Effects on the biological environment resulting from fishery management actions primarily include changes in fishing mortality levels resulting from implementation of the alternatives. This particular action considers changes to a catch accounting system and record keeping and reporting requirements for fishery participants. No direct biological effects are expected to result from any of the action alternatives because none of the alternatives would change the allowable directed harvest or incidental catch levels allowed in the fishery. The Council considers allowable groundfish harvest levels under its specifications and management measures process and this action would not alter that process, nor would it alter the fishing practices of vessels pursuing the allowable harvest. Indirect impacts from fishery management actions include changes in fishing practices that affect the biological environment, but are further away in time or location than those occurring as a direct impact. Indirect biological impacts could result if catch data were inaccurate or delayed such that fishery specifications could not be adequately monitored or the fishing actually stopped before a specification was exceeded. Exceeding a specification increases the risk of overfishing, may affect rebuilding times for overfished species, or result in a stock becoming overfished.

Accurate and timely data are needed to monitor total catch of all groundfish, including sablefish (a precautionary zone stock), to prevent overfishing, and to maintain rebuilding schedules for overfished stocks. Since implementation of the permit stacking program in 2002, inseason management of the primary and DTL sablefish fixed gear fisheries has been based on two types of information: (1) paper landing receipts that typically have a two to four month time lag between the date of landing and when the landing data is available in PacFIN, and (2) the QSM Best Estimate Report, which fills in the three month time lag based on estimates from the previous years' landings. Both of these data sources estimate which landings are attributed to the primary (tier) fishery and which are attributed to the DTL fishery. Thus, under the No Action Alternative, the current catch accounting system is subject to inaccuracy and time delays, and is incapable of distinguishing between landings in the primary (tier) and DTL fisheries.

Under the No Action Alternative, the requirements for sending in paper landing receipts vary between states with Washington requiring the paper landing receipts to be received within six working days, Oregon requiring the landing receipts to be received within five working days, and California requiring the landing receipts to be received by the first and sixteenth of each month. It is a considerable time after the tickets are prepared and submitted that the data is entered into a state database, edited, and forwarded to the PacFIN database. Depending on the state, it may take several months. Extending the electronic fish ticket requirements to the non-trawl fisheries would result in fish tickets being submitted within 24 hours of landing. The requirement for daily submissions of electronic fish tickets, under Alternatives 2 through 4, provides for timely and efficient reporting of landing data such that species allocations and annual catch limit (ACL) can be effectively monitored and inseason adjustments for conservation purposes can be made as necessary within the DTL fishery. Electronic fish tickets would allow managers to use timely, accurate data to manage the fisheries inseason rather than having to rely on estimates and data from the previous year to supplement data from paper landing receipts. The electronic fish tickets would also provide daily landings estimates for all species landed, not just sablefish, providing improved inseason data for other species, including overfished species. Electronic fish ticket reporting is expected to expedite the receipt of catch data that is combined with observer data for total catch estimates. Thus, timely reporting reduces the risk of indirect impacts on the biological resource.

The quality and accuracy of data could also be expected to improve with the use of electronic fish tickets. Paper landing receipts introduce two areas where data entry errors could occur, when the first receiver enters the data on the paper form and when the data is entered into the database weeks to months later by the state. The electronic fish ticket allows users to pre-load landings data into their account. For example, a first receiver that generally receives sablefish landings from five different vessels could enter each of the vessels identifying information into their user account. Then, at the time of landing, the first receiver would simply select information such as vessel I.D. and permit number from drop down menus in each field. The first receiver also has the ability to fill out an electronic fish ticket and save it and submit it at a future date, should any corrections need to be made. There are also numerous, built-in data checks that prevent entry errors and improve the quality of landings data for all species. Also, a federal electronic ticket would allow NMFS to specify the reporting groups consistent with federal regulation. This could improve the quality of species-specific reporting (for example, when a stock is left in a complex, but NMFS requires species-specific reporting for conservation concerns). By reducing data entry errors, issues can be resolved in a timely manner by the first receivers and fishers, such that the resolution is likely to be more accurate and timely than errors found weeks to months after the landing occurred.

If catch accounting difficulties continue, delays in catch reporting may or may not have an effect on the biological condition of groundfish stocks. The severity of the impact caused by inaccurate or untimely landings data depends on how sensitive the groundfish stock is to changes in catch levels. For precautionary zone and healthy groundfish species or species groups, the risk to the stock is lower than it is for overfished species. If catch allocations of the most constraining overfished species are greatly exceeded due to delayed or inaccurate catch reporting, the risk of exceeding rebuilding based OYs is increased. Although there are many variables that affect the time it takes a stock to rebuild, exceeding the rebuilding based OY could result in an extended rebuilding period for an overfished species. Additionally, since sablefish is a precautionary zone species that is usually fished to a high level of attainment, inseason monitoring and management is especially important when managers are trying to make decisions that may be impacted by exceeding or attaining sector ACLs, such as the annual issuance of carry over quota in the shorebased IFQ fishery.

In terms of improved catch accounting, Alternative 4 has the broadest scope in that it would require all sablefish and DTL landings in the LEFG, and OA fisheries to be reported via electronic fish tickets. The scope of Alternative 3 is narrower than Alternative 4 in that it would not require DTL OA landings to be recorded on electronic tickets. Alternative 2 has the narrowest scope in that it would require only sablefish landings in the primary (tier) fishery to be recorded on electronic fish tickets.

Potential Impacts of the Alternatives on the Socio-Economic Environment

The action alternatives primarily affect fishermen, first receivers where non-trawl sablefish are landed (limited entry fixed gear and open access), and state and federal management and enforcement agencies.

Impacts to Sablefish Fishermen

It is likely that under the action alternatives regulations will require that sablefish landings be made to first receivers that have electronic fish ticket capabilities. To the extent that this limits the number of first receivers that may receive sablefish landings, fishermen may find a reduced number of first receivers capable of recording sablefish landings on electronic fish tickets. The catch accounting issues previously discussed in this document (i.e. the time lag associated with landing data from state landing receipts and subsequent use of estimates for inseason management) affect the ability of state and federal enforcement to accurately track sablefish landings on an individual permit basis. Overages in the primary fishery may impact sector specific allocations and introduce potential issues of intersector inequity. By implementing an electronic fish ticket, NMFS will be able to better track instances of tier overages and ensure that neither the tier limits nor the DTL limits are exceeded inseason.

Impacts to Sablefish First Receivers

The main burden of implementation of an electronic fish ticket would fall on sablefish first receivers that receive: (1) primary (tier) sablefish landings, (2) primary and LEFG DTL sablefish landings, or (3) primary (tier) and DTL (LEFG and OA) sablefish landings. There are 100 unique sablefish first receivers that receive fish from fishermen fishing under sablefish tiers (primary), under limited entry fixed gear daily trip limits, and/or under open access fisheries (direct and indirect). Of these 100 first receivers, 23 are already operating as licensed IFQ first receivers and required to use electronic fish tickets. The 77 non-IFQ first receivers account for about one-third of the sablefish landings in these fisheries. There are 20 first receivers in California that do not receive fish from tier endorsed permits; they only received DTL landings of sablefish. Under Alternative 2 these 20 first receivers in California would not be required to use electronic tickets, but they would be required to use electronic tickets under Alternatives 3 and 4. All first receivers in Washington and Oregon received both tier and LEFG DTL sablefish landings. Therefore, in terms of number of affected first receivers, there is no difference between Alternative 2 (All primary/tier processors) and Alternative 3 (All limited entry sablefish processors-primary/tier and DTL) for Oregon and Washington based first receivers.

The action alternatives would increase the amount of time first receivers spend recording sablefish landings. Action Alternatives 2 through 4 do not require that additional data be gathered, but do require additional time in the states of Washington and California, because the data would need to be recorded on both the paper forms provided by the state and entered into the electronic fish ticket forms. Action Alternatives 2 through 4 do not require additional time in the state of Oregon since state law already requires that the information be gathered and allows the submission of a printed and signed electronic ticket in lieu of a paper landing receipt. Entering the fish ticket information is expected to take eight minutes per ticket, including the time necessary to check for transcription errors. For first receivers in all three states, two minutes per response would be required to access the internet and send the data files.

This analysis assumes that all first receivers have access to a personal computer and internet access adequate to access the electronic fish ticket website developed by PSMFC. The electronic fish ticket system would require that the first receiver's personal computer be properly operating when accepting a landing requiring electronic fish ticket reporting. Therefore, some first receivers may choose to have an additional personal computer or laptop computer as a back-up. To reduce the potential impacts on first receivers should there be a system failure, a waiver could be granted by NMFS that would temporarily exempt a processor from the reporting requirements and allow reasonable time to resolve the electronic fish ticket system problem, similar to what is provided for in the Shorebased IFQ Program at §660.113(b)(4). The duration of the waiver would be determined on a case-by-case basis. Under these circumstance, first receivers would be required to submit, in paper form, the same data as is required on electronic fish tickets within 24 hours of the date received during the period that the waiver is in effect.

Impacts to State Agencies

As mentioned previously, implementation of a Federal electronic fish ticket would be separate from, and in addition to, existing state reporting requirements. Under Alternatives 2 through 4, each sablefish buyer would be responsible for recording sablefish landings on an electronic fish ticket in addition to state (landing receipt) landing requirements. States may decide the extent to which they would like their landing receipt system to overlap with the Federal electronic ticket. In the state of Oregon, a printed copy of the electronic ticket may be submitted in lieu of a paper landing receipt, however in Washington and California, a hand-written landing receipt would likely be required in addition to the federally required electronic ticket. Each state would have access to their state's electronic fish ticket landings data through the PacFIN database. Currently Oregon and Washington receive their state's PacFIN landings data every night, enabling them to check their state landing receipts for quality assurance and quality control. Because the federal electronic ticket is separate from, and in addition to, the state required landing receipts, it is unlikely that any burden due to implementation of a federal electronic ticket would be placed on state management and enforcement agencies, and the state agencies may benefit from access to more timely and accurate data.

Impacts to Federal Agencies

Section 6.10.1 of the Pacific Coast Groundfish Fishery Management Plan identifies some of the issues involved in managing enforcement risks. The primary goals of enforcement are to ensure a cost-effective way that all fishing is conducted in accordance with fishery regulations, while reducing management complexity, and ensuring that the monitoring methods used are sufficient to enforce existing regulations. As mentioned previously, there are several problems with the current system. The paper-based landing receipts are subject to compromise and typographical error, inconsistently record the federal permit number, and are subject to a time lag of several months. Additionally, the use of inseason estimates for catch accounting purposes does not provide NMFS with sufficient evidence to enforce tier landing overage violations, either inseason or post-season. Implementation of an electronic fish ticket would improve the accuracy and timeliness of landings data, and would provide managers with the real time data necessary to do inseason management of the primary and DTL fisheries. It would also provide enforcement with the permit specific landings data necessary to monitor landings overages in the primary (tier) and DTL sablefish fisheries, and could also help aid enforcement of the owner on board requirement.

NOAA FISHERIES
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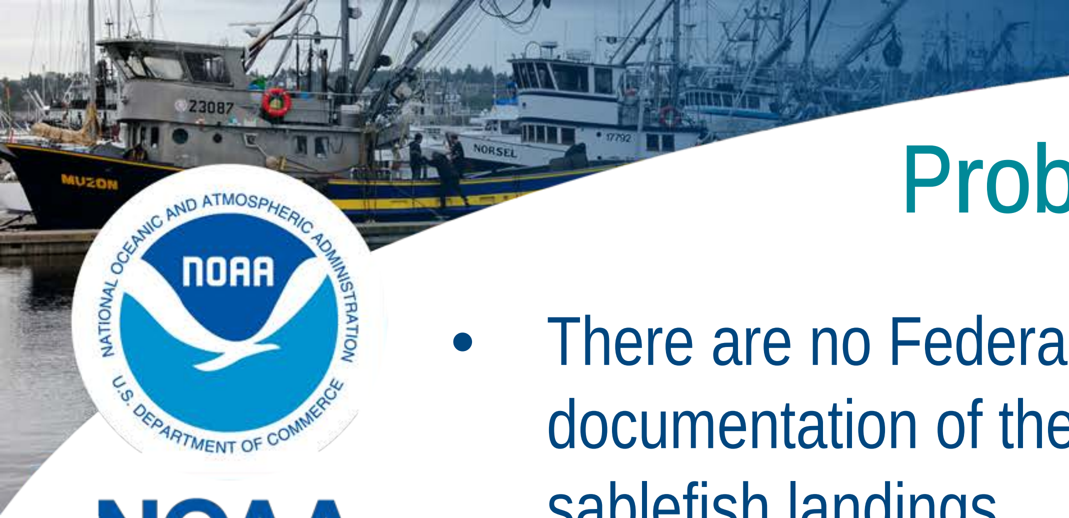
Sablefish Permit Stacking Program- Action Issues, Electronic Fish Ticket Analysis

Agenda Item C.6.a

Supplemental Attachment 3



NOAA FISHERIES
West Coast Region

Problem Summary

- There are no Federal regulations requiring documentation of the groundfish permit number for sablefish landings.
- As of 2014, Federal permit numbers are not being recorded consistently on state landing receipts.
- The current catch accounting system is subject to inaccuracy and time delays, and is incapable of distinguishing between landings in the primary (tier) and daily trip limit (DTL) fisheries.

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Purpose and Need

The purpose of the electronic fish ticket measure is to consider a Federal landing and monitoring requirement, the implementation of an electronic fish ticket. The need for this measure is to improve catch accounting and enforcement capabilities in the fishery, particularly among the sablefish-endorsed tiers in the primary fishery. There is a need to improve the data system so that management and enforcement can take more timely action when individual vessel overages occur.

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Electronic Fish Tickets

- **Electronic fish ticket** means a software program or data files meeting data export specifications approved by NMFS that are used to send landing data to the Pacific States Marine Fisheries Commission (PSMFC).
- The current electronic fish ticket system is software based, however PSMFC is in the process of moving to a web-based electronic fish ticket system.
- The existing electronic fish ticket varies slightly by state such that each form records the information necessary for compliance with state landings regulations.

State of Washington - Marine Fish Receiving Ticket

Fish Ticket Number: X1000001

Print Ticket | Preview Ticket | Close

IFQ Landing? Y | Fed. LE Permit #: GF 1234 | Trawl Endorsed? Y | IFQ Vessel Account #: VAXY1234 | IFQ Area: 300 36 to 34'27

Fisher (Last, First) [Add New]: White, Snow
Me & Seven Ugly Guys, Inc
111 Mockingbird Lane

Date of Landing: 01/11/11

Days Fished: 3

Primary Data Source: COMM COMMERCIAL

Enter Overage Ticket | Void Ticket | Enter as Overage Ticket | Delete Ticket

Dealer: 1234
WA Fish Buyer

Fish Caught: Outside 3 Miles

Hold Inspection #

Vessel/Gear/License [Add New]: 11111 - Bad Apple
Gear Code: 34
License ID: 12345678

Buyer: 101 [Add New]
Dave Colpo
On Reservation?

Transport Ticket#

Previous Ticket | Next Ticket | View All

Catch Area: 061 | Area Subunit:
Oregon Coast 42D N to 46D 16M N

Physical Gear Actually Used: 34 MIDWATER TRAWL
Specify Other Gear:

Ticket Category [Add New]

Port of First Landing: 295 WESTPORT

Enter Fish Ticket Costs | Search for Tickets

Fish (Species Code/Description)		Pounds	Price	Condition	Grade	Gear	Data Source	Area	Area Subunit	Amount	# of Fish	Take Home/Weighback	
244	Whiting, Pacific	99,400.00	$0.11	0	22	34		07B		$10,934.00		NET LB	T/H - WB
244	Whiting, Pacific	100.00	$0.00	0	22	34	TKHM	07B		$0.00		T/H	T/H - WB
244	Whiting, Pacific	200.00	$0.00	0	20	34		061		$0.00			T/H - WB
253	Rockfish, Canary or Red	1,234.56	$0.1234	0	0	34		063		$152.34			T/H - WB
244	Whiting, Pacific	500.00	$0.00	0	22	34		07B		$0.00		WB	T/H - WB
221	Sablefish	100.00	$1.00	1	0	34	COMM	061		$100.00			T/H - WB
*				1	0	34	COMM	061		$0.00			T/H - WB

Total Pounds/Value: **101,534.56 $11,186.34** Total # of Fish:

Notes:

Entered: 1/11/2011 By: dcolpo | Updated: 6/30/2011 By: dcolpo | Exported:

Enter New Fish Ticket

Oregon - Groundfish and Shrimp

Fish Ticket Number: 3947373

Print Ticket | Preview Ticket | Save & Close

IFQ Landing? N — Fed. LE Permit #: GF — IFQ Vessel Account #: — IFQ Mgmt Area:

Trawl Endorsed?

View Overage Ticket | Void Ticket

Enter as Overage Ticket | Delete Ticket

Commercial License No. (Add New): 123456

Date of Landing: 01/24/11

Port Code: 01 COLUMBIA RIVER PORTS - OREGON

Boat Number (Add New): OR123456

F/V Nadine

Dealer No.: 2345

OR Fish Buyer

Primary Catch Area:

# of Days Fished — Unloading Station — Hold Inspection #

Previous Ticket | Next Ticket | View All

Fisher's Name - Last, First (Add New): Crow, John

IEatCrow, Inc

Gear Used:

Ticket Category: (Add New)

Search for Tickets

Fish (Code/Description)	Condition	Grade	# of Fish	Gross Lbs	Price Per Lb	Amount	Take Home/Weighback		
624 Dover sole	0	0		990.00	$2.00	$1,980.00	NET LB	T/H - WB	X
624 Dover sole	0	0		10.00	$2.00	$20.00	T/H	T/H - WB	X
	0	0				$0.00		T/H - WB	X

Total # of Fish/Pounds: 1,000.00 $2,000.00

Enter New Fish Ticket

Enter Fish Ticket Costs

Costs: $20.00

Notes:

Entered: 1/24/2011 By: dcolpo — Updated: 7/20/2011 By: dcolpo — Exported:

California: X - Northern Trawl Quota

Fish Ticket Number: X100001

Print Ticket | Preview Ticket | Close

Landing Date: 01/18/11 | Fed. LE Permit #: GF 1234 | IFQ Vessel Account # VABC1234 | IFQ Mgmt Area 100 N of 40'10

IFQ Landing? Y | Trawl Endorsed? Y

Enter Overage Ticket | Void Ticket | Enter as Overage Ticket | Delete Ticket

Fisher I.D. Number: L 12345 (Add New) White, S

Port of First Landing: 223 FORT BRAGG

Location Where Fish Caught: 0000 UNKNOWN ORIGIN

Vessel I.D.: CA1234 (Add New) F/V Seven Dwarfs

Fish Business I.D.: 3456 CA Fish Buyer

Primary Gear Used: 49 TRAWL, FOOTROPE GREATER THAN 8 INCHES IN DIAMETER

Previous Ticket | Next Ticket | View All

Transportation#

Ticket Category (Add New)

Fish (Species Code/Description)		Gross Lbs	Price Per Lb	Amount	Grade	Condition	Use	Gear	# of Fish	Take Home/ Weighback
190	Sablefish	1,000.00	$2.0000	$2,000.00	M	0		49		T/H - WB
678	Thornyhead, Longspine	500.00	$0.2500	$125.00	M	0		49		T/H - WB
679	Thornyhead, Shortspine	500.00	$3.2500	$1,625.00		0		49		T/H - WB
				$0.00		0	3	49		T/H - WB

Search for Tickets

Enter New Fish Ticket

Total Pounds/Value: **2,000.00** **$3,750.00** Total # of Fish:

Enter Fish Ticket Costs

Notes:

Entered: 1/18/2011 By: dcolpo | Updated: 2/7/2011 By: dcolpo | Exported:

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West Coast Region

Current Range of Alternatives
Alternative 1

(No Action) There are currently no Federal regulations requiring fish ticket documentation for sablefish landings in the primary (tier) sablefish fishery or within the larger limited entry fixed gear (LEFG) fishery.

Current Range of Alternatives
Alternative 2

A Federal requirement that **all tier** deliveries be recorded on an electronic fish ticket that documents the associated Federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

Suboption: Delete the word “electronic” and the second sentence from Alternative 2, to allow the use of paper tickets.

Current Range of Alternatives
Alternative 3

A Federal requirement that **all limited entry permit sablefish deliveries (primary/tier and DTL)** be recorded on an electronic fish ticket that documents the associated Federal groundfish permit number. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

<u>Suboption</u>: Delete the word “electronic” and the second sentence from Alternative 3, to allow the use of paper tickets.

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Current Range of Alternatives
Alternative 4

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West Coast Region

A Federal requirement that **all sablefish deliveries (primary/tier, DTL, and open access)** be recorded on an E Fish Ticket. That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket.

<u>Suboption</u>: Delete the word "electronic" and the second sentence from Alternative 4, to allow the use of paper tickets.

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Biological Considerations

- Accurate and timely data are needed to monitor total catch of all groundfish, including sablefish (a precautionary zone stock), to prevent overfishing and to maintain rebuilding schedules for overfished stocks.
- Accurate catch data: paper landing receipts introduce two areas where data entry errors could occur
- Timely catch data: it may take 2-4 months for data to be entered into PacFIN

Socio-Economic Considerations Industry

- The burden of implementation will primarily fall on sablefish first receivers.

- **First Receiver** means a person who receives, purchases, or takes custody, control, or possession of catch onshore directly from a vessel.

- Each first receiver will need to have a computer with internet access.

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West Coast Region

Socio-Economic Considerations State and Federal Agencies

- Implementation of a Federal electronic fish ticket would be separate from, and in addition to, existing state reporting requirements.
- Section 6.10.1 of the FMP: primary goals of enforcement are to ensure a cost-effective way that all fishing is conducted in accordance with fishery regulations, while reducing management complexity, and ensuring that the monitoring methods used are sufficient to enforce existing regulations


Questions?

Agenda Item C.6.a
Supplemental Staff Overview Powerpoint (Seger)
April 2014

Sablefish Catch Share Program Review – Phase I

Agenda ItemC.6

Supplemental Documents

C.6.a Att 3

GAP

SSC

EC

Program Review - Overview

- Phase I (Elements and ***Council tasks***) -
  - Program Review – Draft Assessment Document – ***Guidance on Content***
  - Action Items – Council Decision Analysis Document (EA)
    - Rules for assessing permit control (for own/control limit) - ***PPA***
    - Electronic Fish Tickets – ***Refine Alternatives***
  - Both to be finalized in June
- Phase II
  - Consideration of Other Program Changes

Council Action

1. **Provide guidance on refinement of the draft review document, as appropriate.**

2. **Select a preliminary preferred alternative for the rules for assessing permit control.**

3. **Refine electronic fish ticket alternatives, as appropriate.**

Questions?

Program Review Document
Agenda Items C.6.a, Attachment 1

Program Review Document

- Section 3.0 – Evaluates the 10 Original Objectives
  - Listed on pages 6-7
- Mostly Complete
  - Areas for development during review
    - Identification of Research Needs (Section 4.0)
    - Summary and Preliminary Conclusions (Section 5.0)
    - Council Recommendations (Section 6.0)

Program Review Document
Some Results

- Derby Seasons – 5 days
  - Now 50 to 80 day average harvest period (1st to last landing)
- Vessels Participation
  - Prior to permit stacking – about 160 (1996 derby)
  - Permit stacking about 80-100 (2004-2012)

More Results

- Average percent of permits in triple stack situation
  - Tier 1 – about two thirds
  - Tier 2 – about half
  - Tier 3 – just over a third
- Trend – increasing stacking – some recent reversal
  - Tier 1 – **increasing triple stacking**
  - Tier 2 – **increasing triple stacking** with a slight drop in 2012
  - Tier 3 – **increasing triple stacking** with a major drop between 2008 and 2012

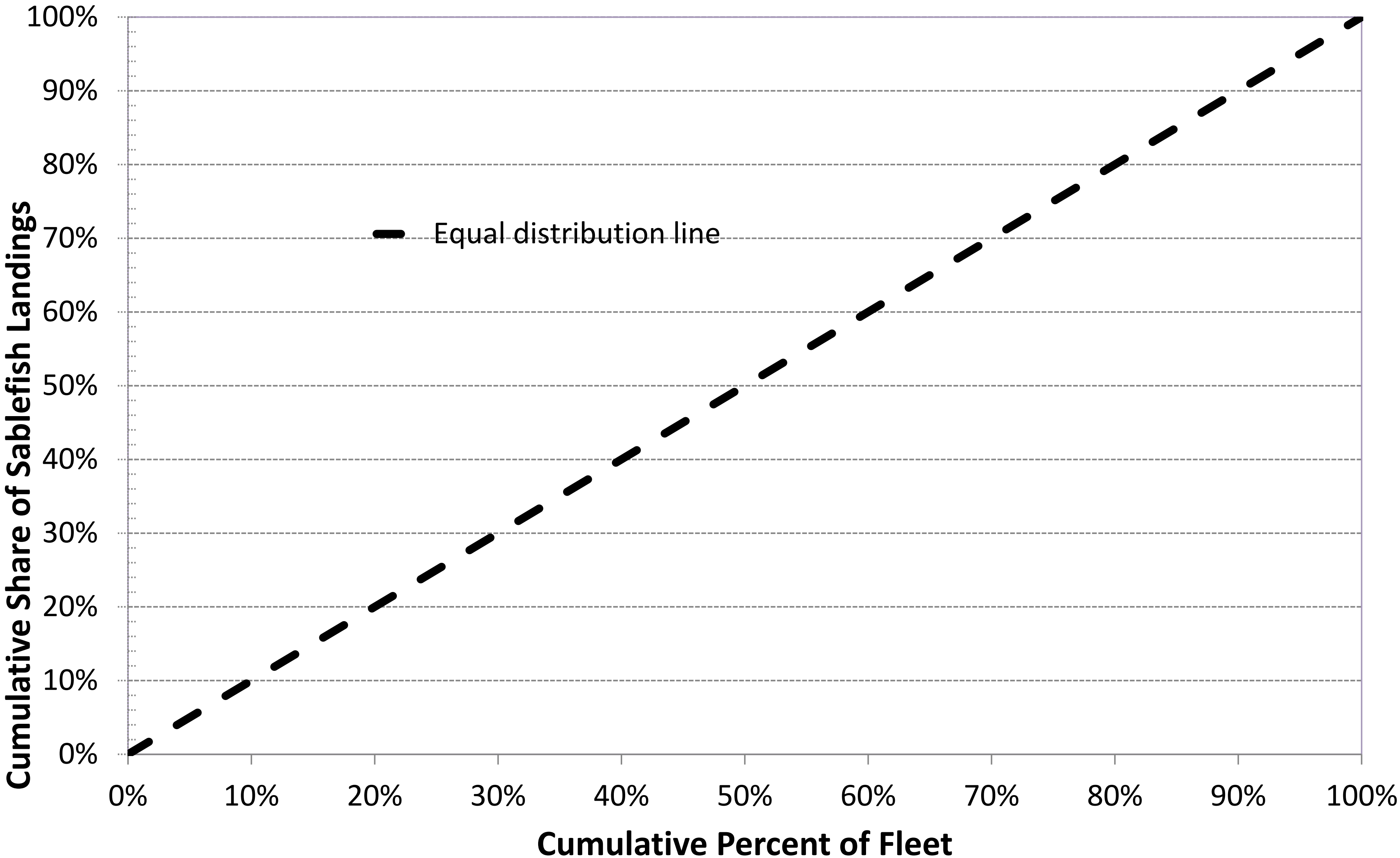
"More Results" Background Table

	2002		2004		2008		2012
Stacked with			Tier 1 Permits				
Two Other Permits	13	↗	17	↗	18	↗	19
One Other Permit	7	↘	6	↘	5	↘	4
No Other Permits	7	↘	4	→	4	→	4
Total Permits for the Tier	27		27		27		27
Stacked with			Tier 2 Permits				
Two Other Permits	15	↗	19	↗	23	↘	22
One Other Permit	11	↗	15	↘	10	↘	9
No Other Permits	17	↘	9	↗	10	↗	12
Total Permits for the Tier	43		43		43		43
Stacked with			Tier 3 Permits				
Two Other Permits	20	↑	36	↗	43	↓	22
One Other Permit	24	↗	29	→	29	↗	33
No Other Permits	50	↓	29	↘	22	↑	39
Total Permits for the Tier	94		94		94		94
Total Permits	164		164		164		164
Total Vessels	110	↓	90	↘	84	↑	97

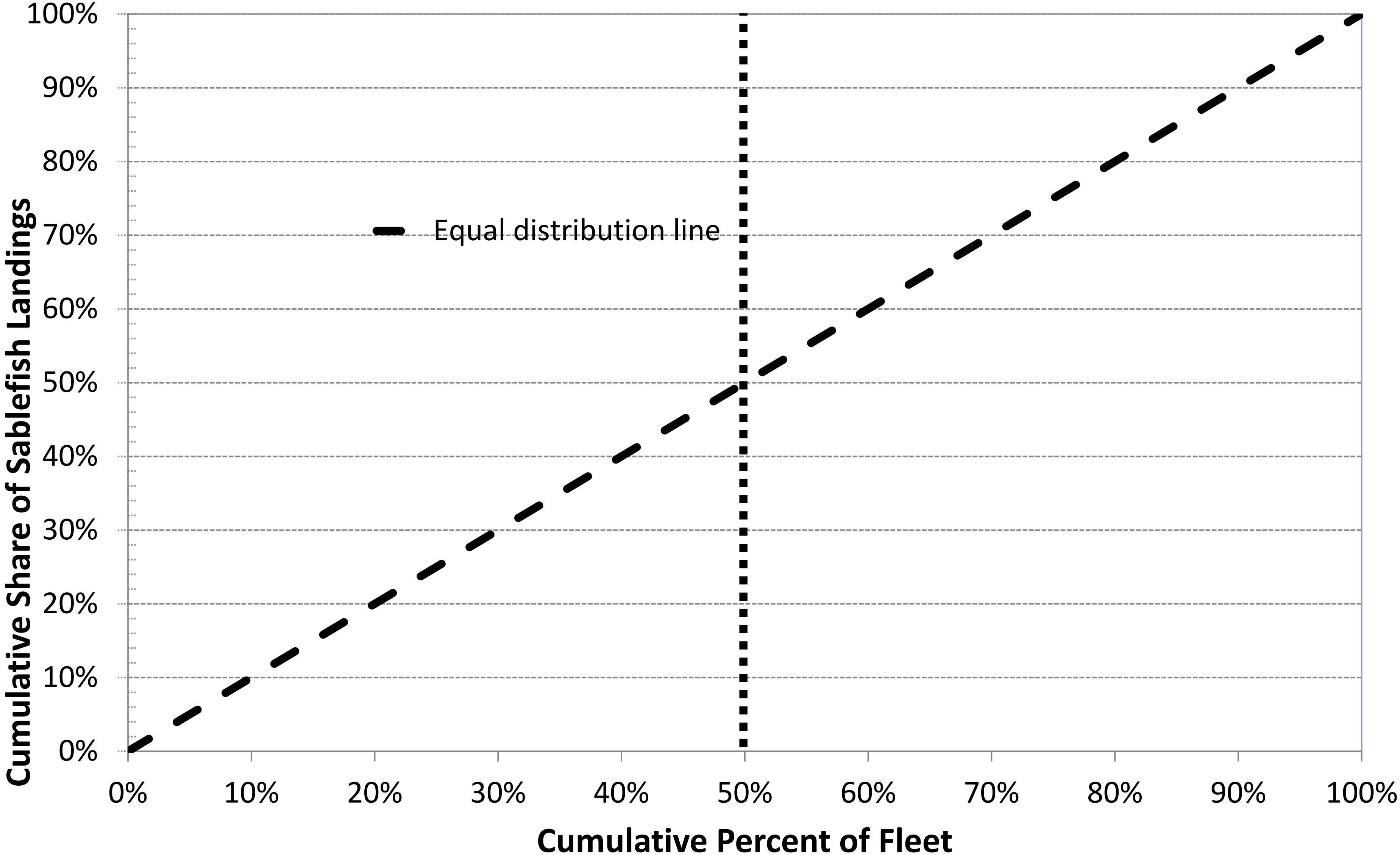
Distribution of Harvest

- Post-derby cumulative limit management
  - redistributed harvest
- The stacking program
  - intended to allow operations to move back to a more “natural” distribution.

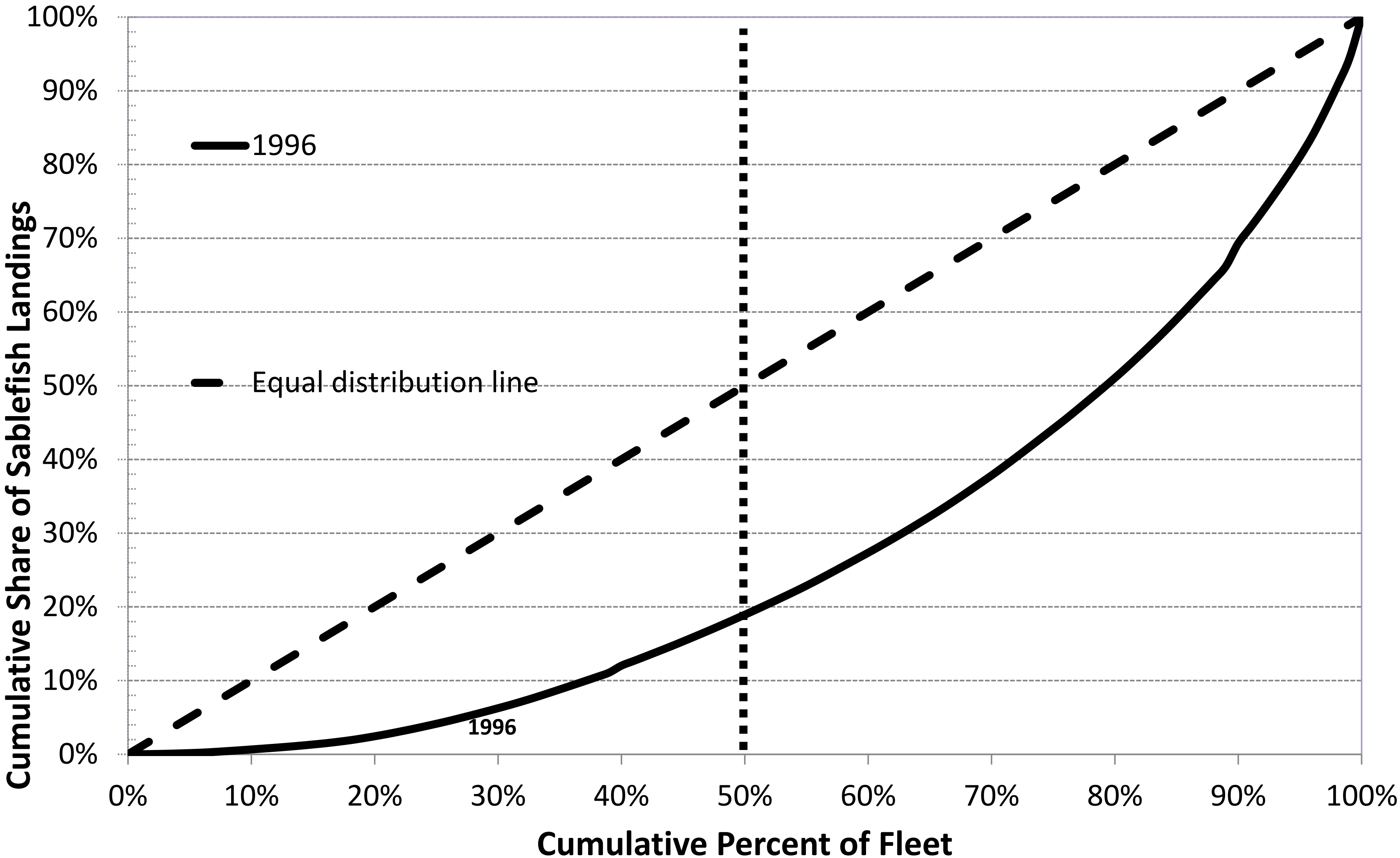
Distribution of Harvest



Distribution of Harvest



Distribution of Harvest



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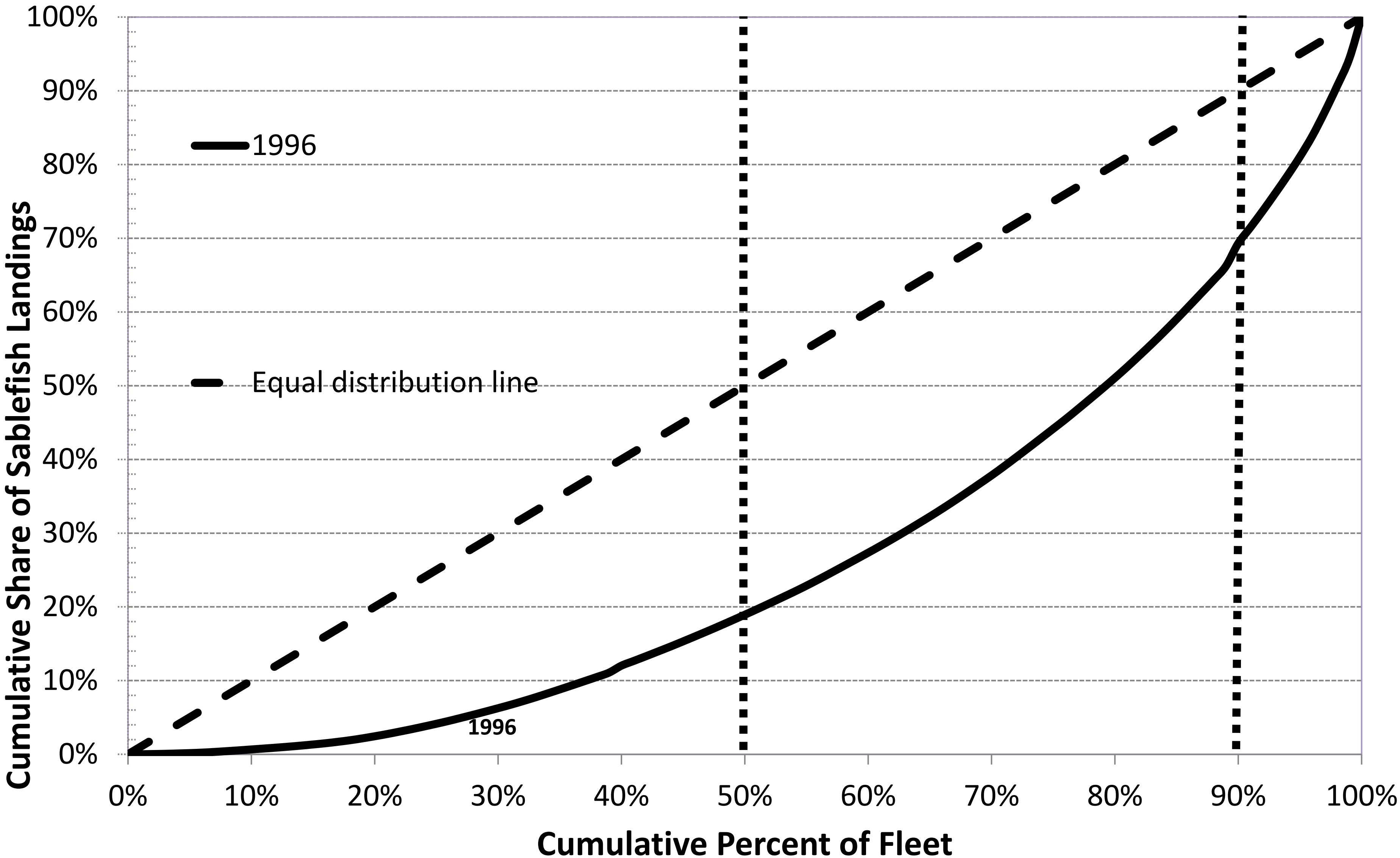

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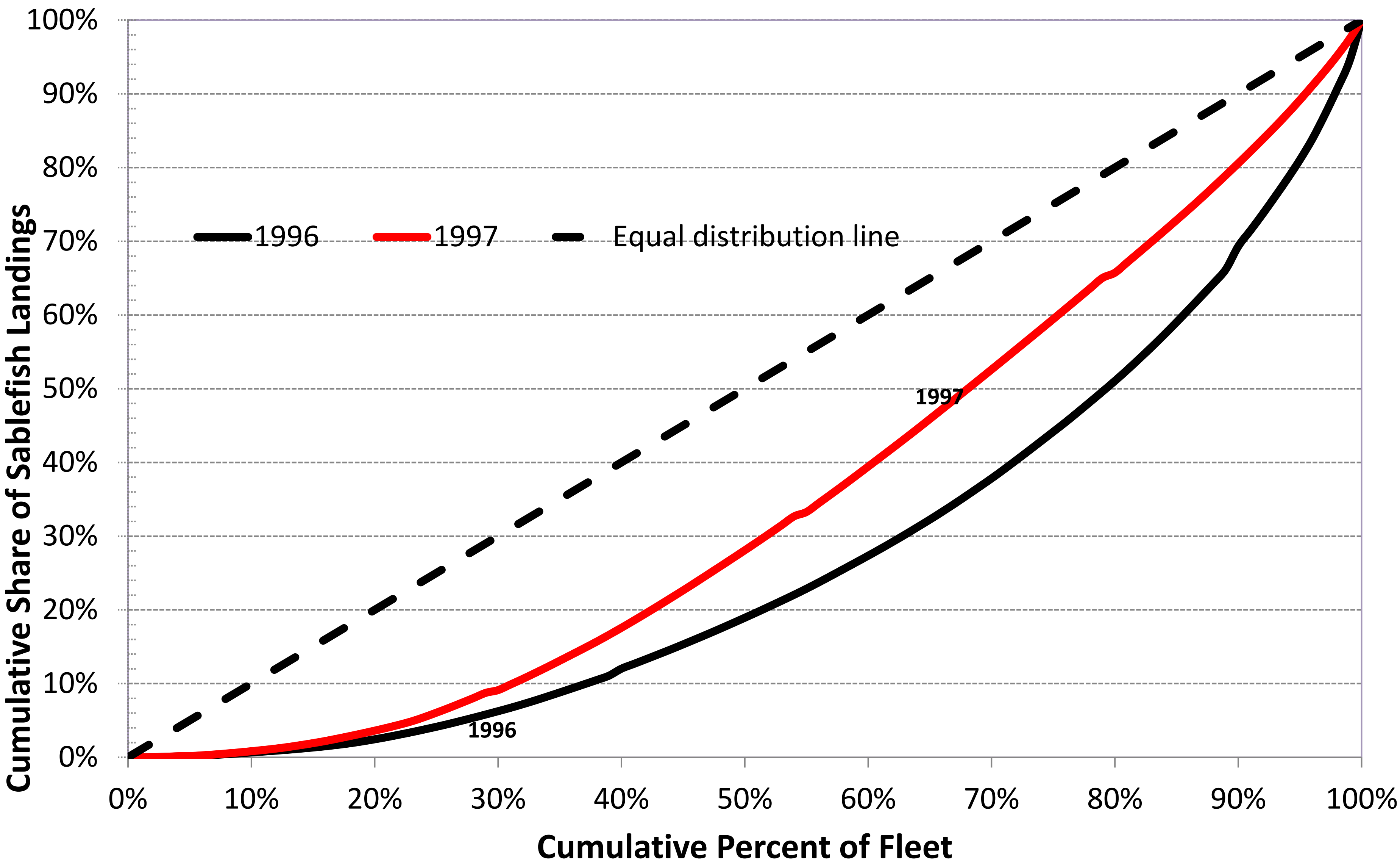
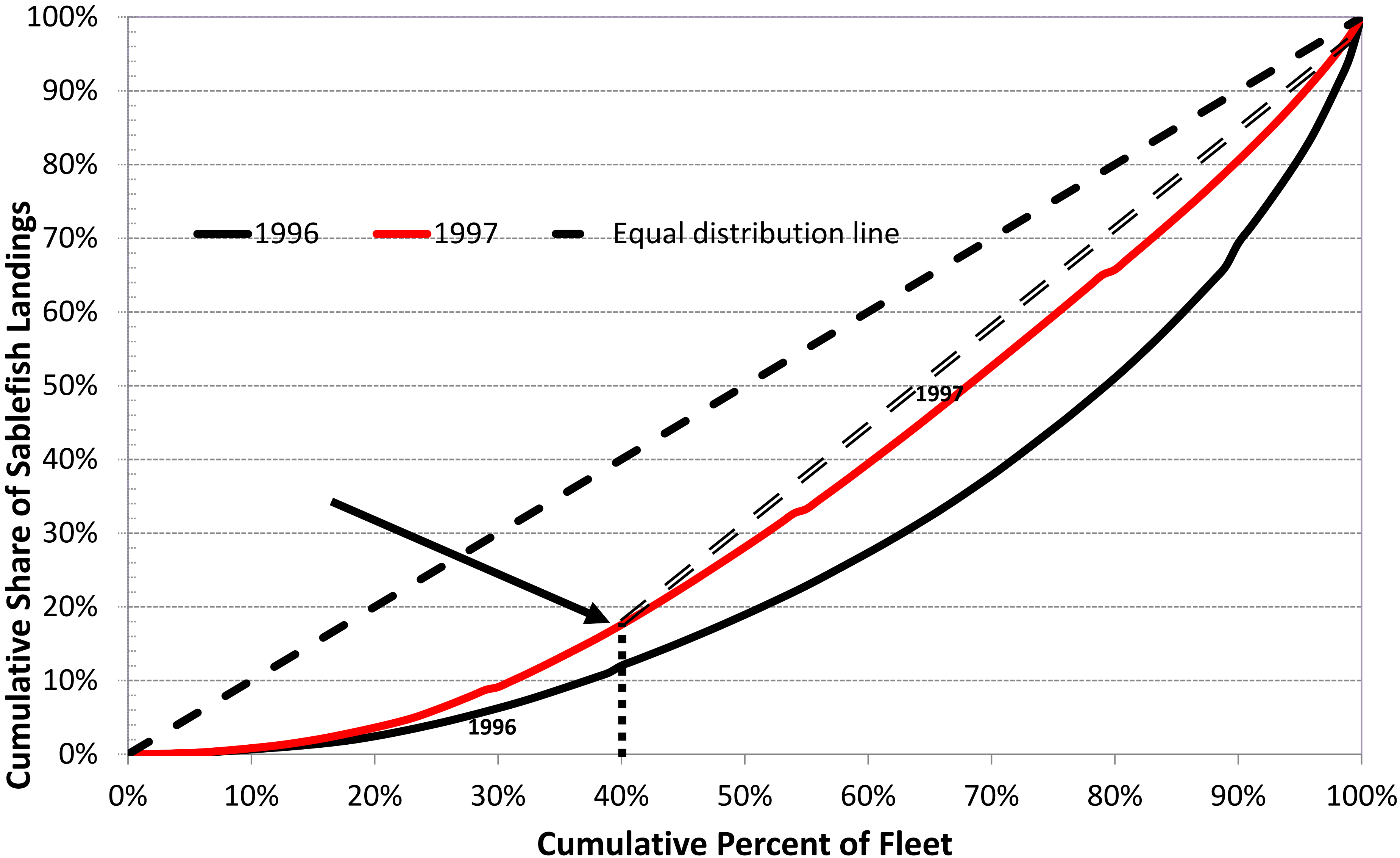


Distribution of Harvest



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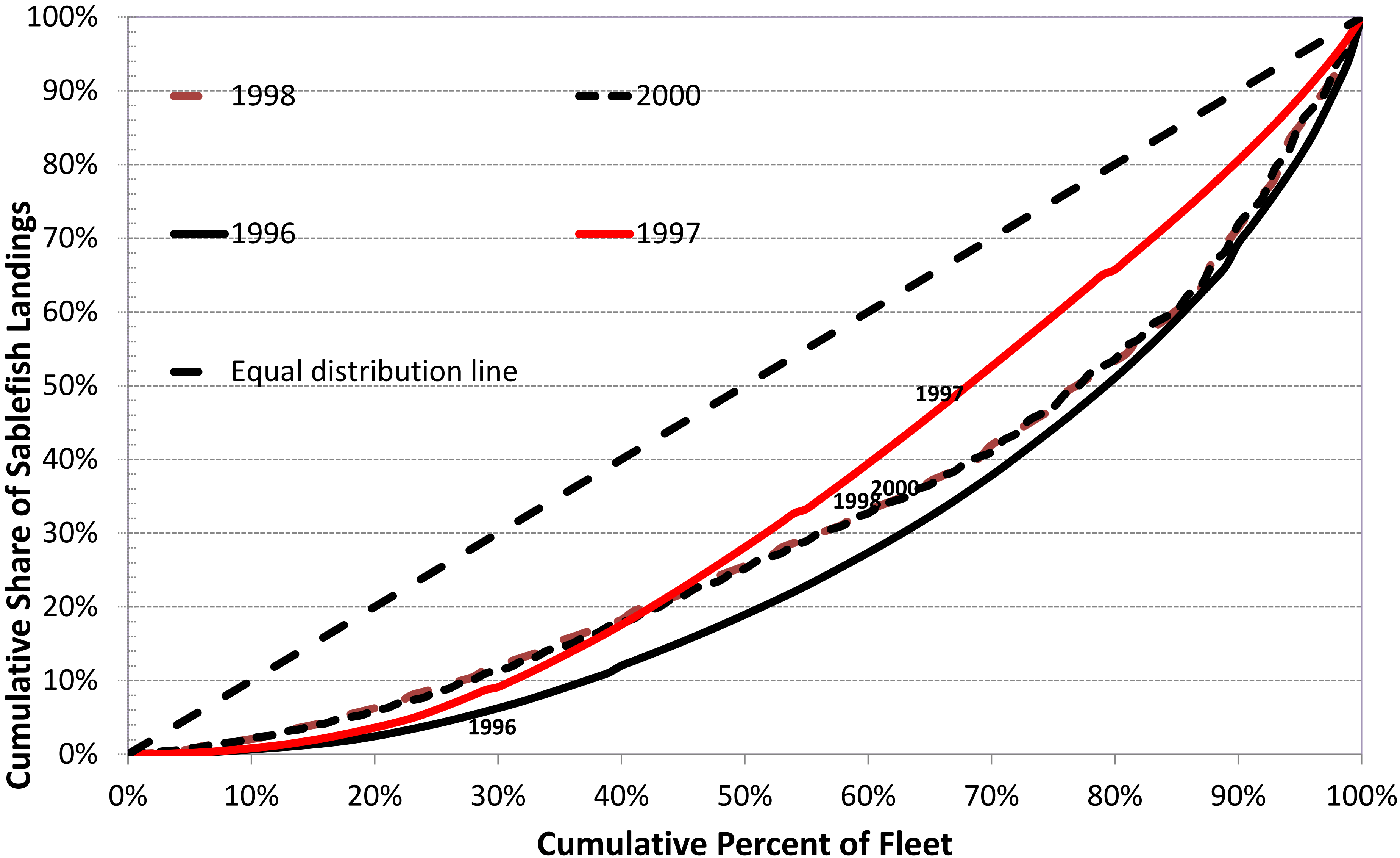
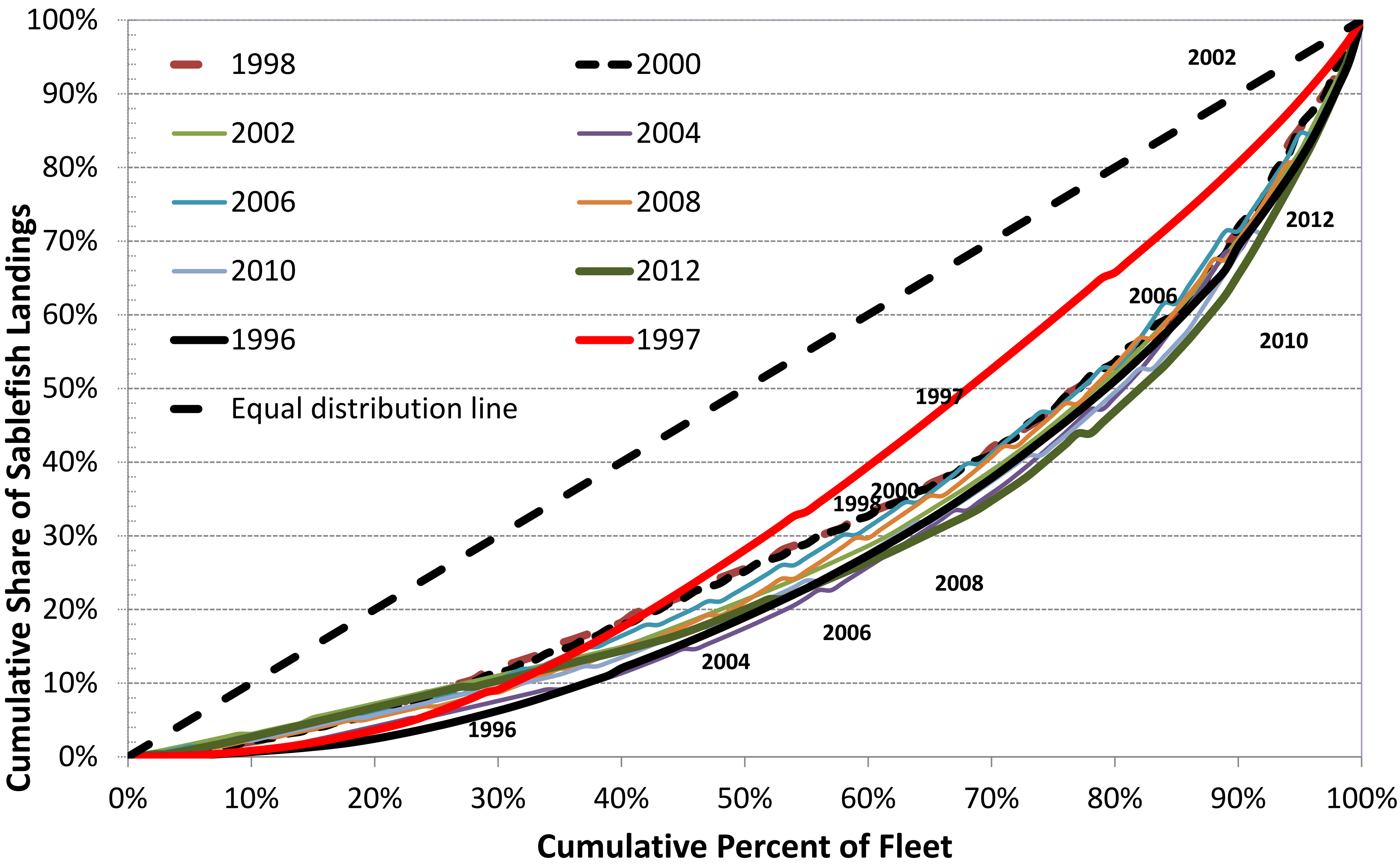
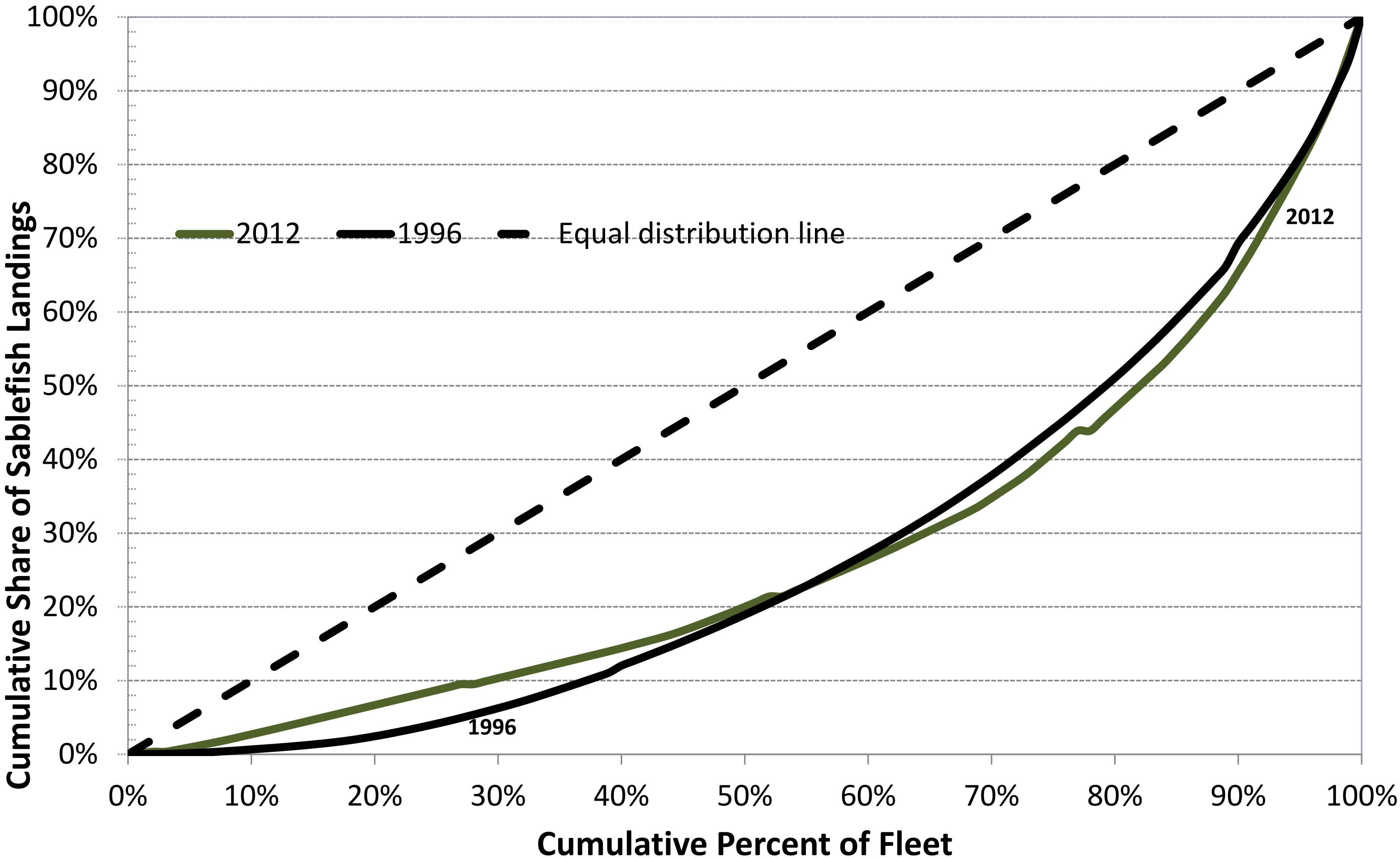


Distribution of Harvest



Distribution of Harvest



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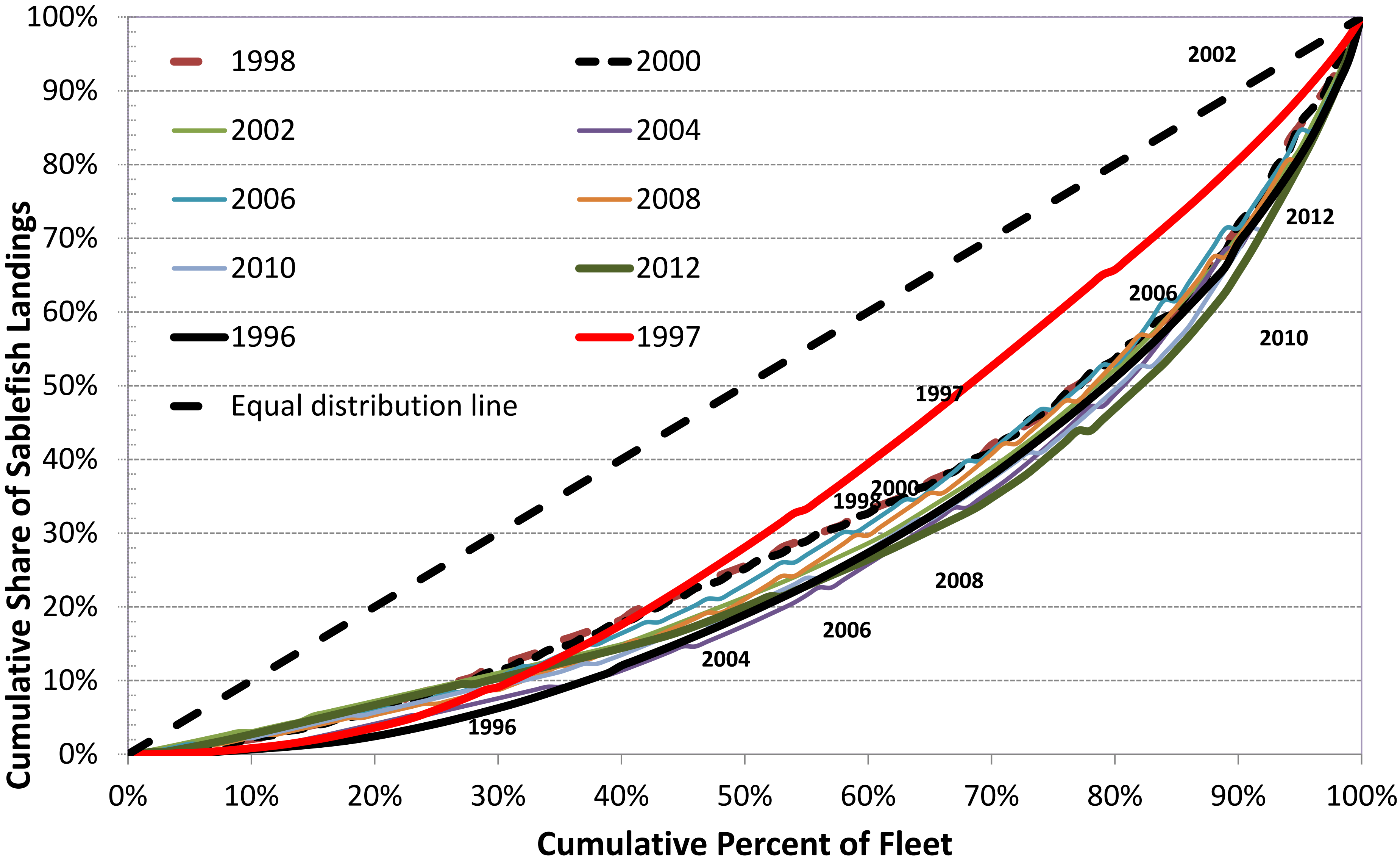
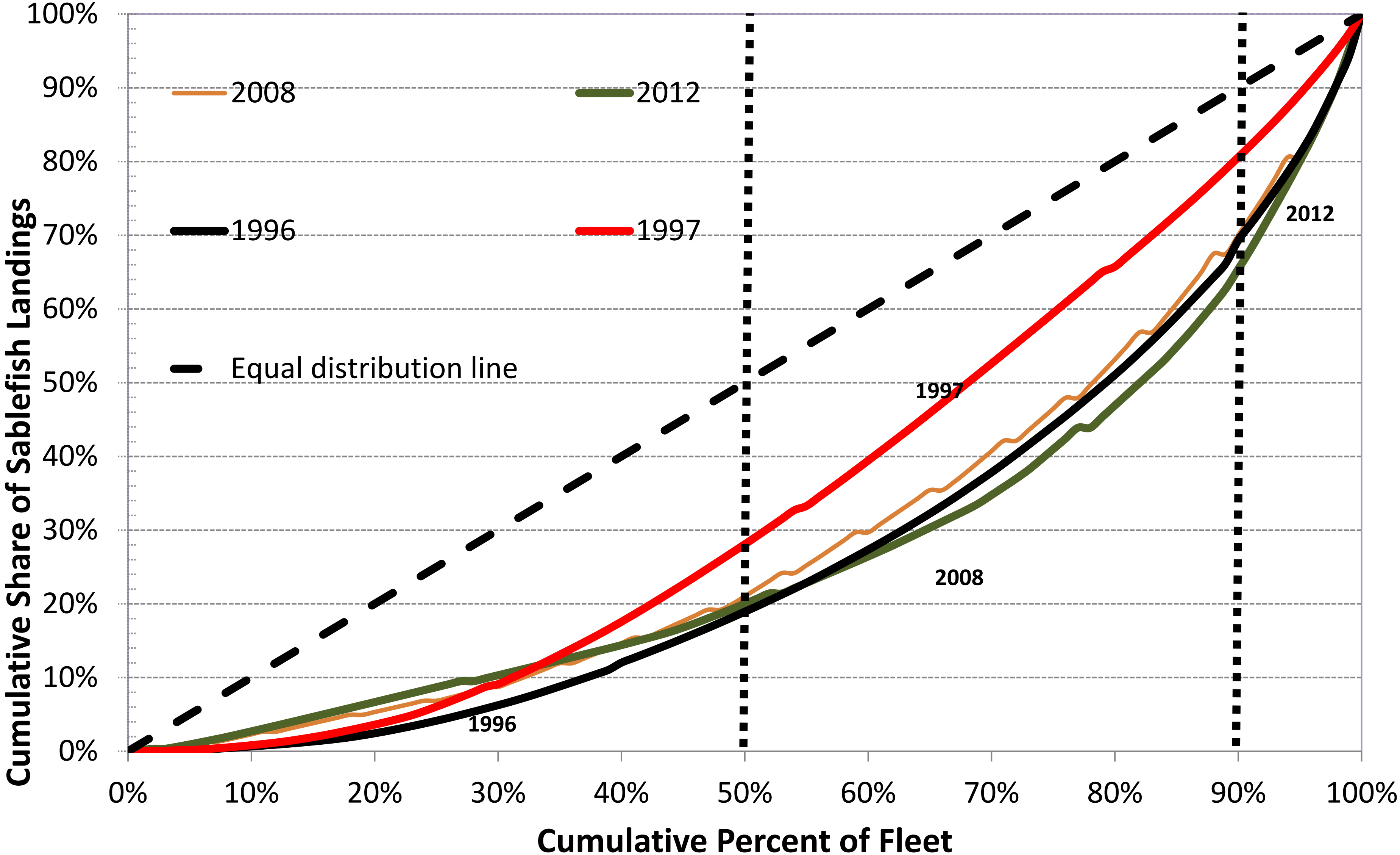
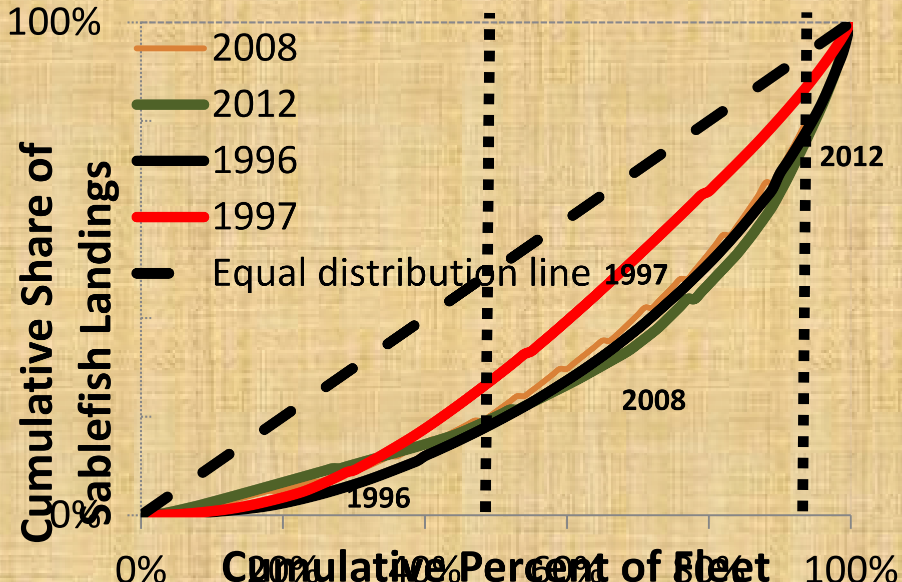


Distribution of Harvest



Program Review Document
Agenda Items C.6.a, Attachment 1

Questions?



Council Decision Analysis Document
Agenda Items C.6.a, Attachment 2

Council Decision Analysis Document

- Rules for assessing permit control (for own/control limit) – ***PPA***
- Electronic Fish Tickets – ***Refine Alternatives***

Own and Control Limit

- 3 Permit Own/Control Limit
- Counting toward the limit
  - Partial ownership of any permit
  - Partial ownership of a vessel – permits registered to that vessel
  - E.g. A person gets to the three permit limit by
    - Owner-operator of a vessel and its LEFG permit, and
    - Being part owner of another vessel with a two LEFG permits

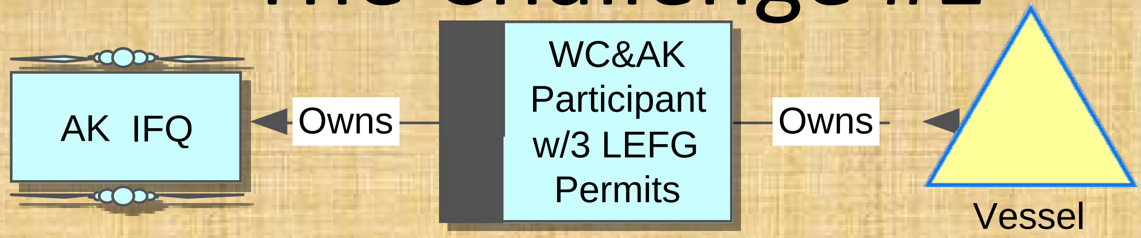
Assessing Permit Control Challenge #1

- Limitation on West Coast fishing operations' abilities to work with each other
- Cross participation in Alaska halibut and sablefish IFQ fisheries
  - In general, Alaska sablefish and halibut IFQ owners must either
    - be present during fishing, or
    - with a grandfather exception
      - hire a vessel to fish IFQ for them
      - 20% vessel ownership required
  - 20% vessel ownership counts for LEFG permit control

Assessing Permit Control
The Challenge #1

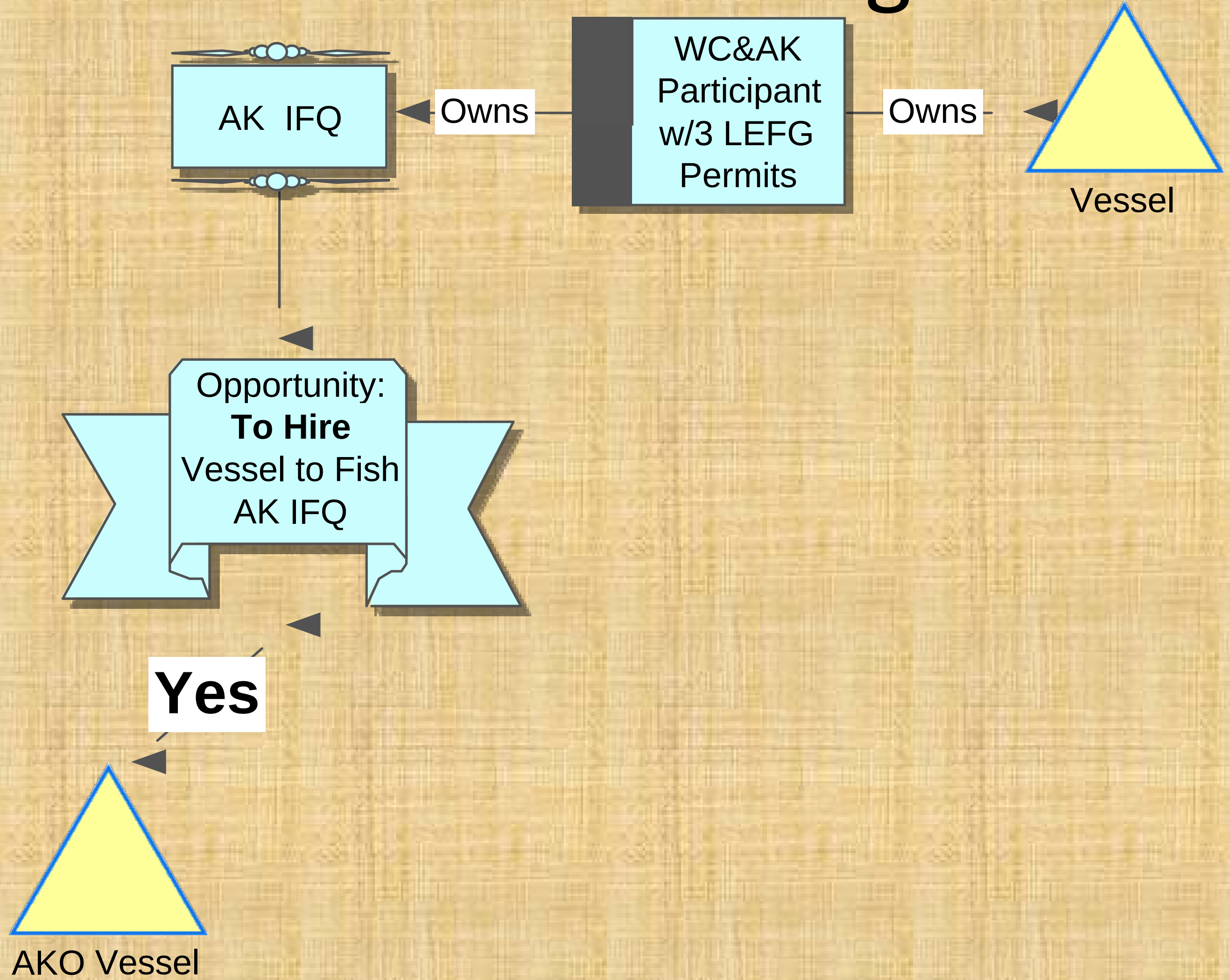
WC&AK Participant w/3 LEFG Permits

Assessing Permit Control
The Challenge #1

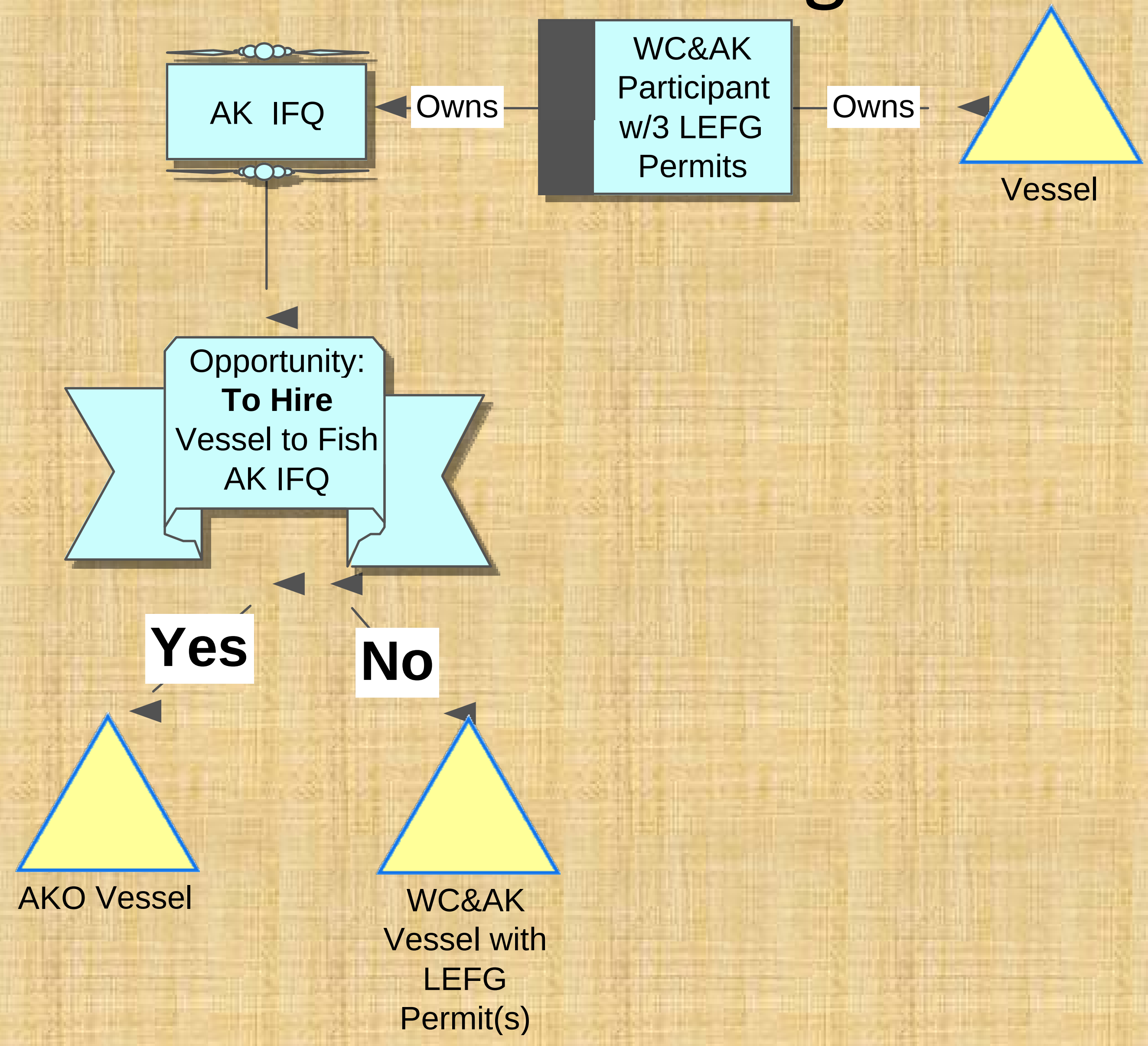


Assessing Permit Control
The Challenge #1

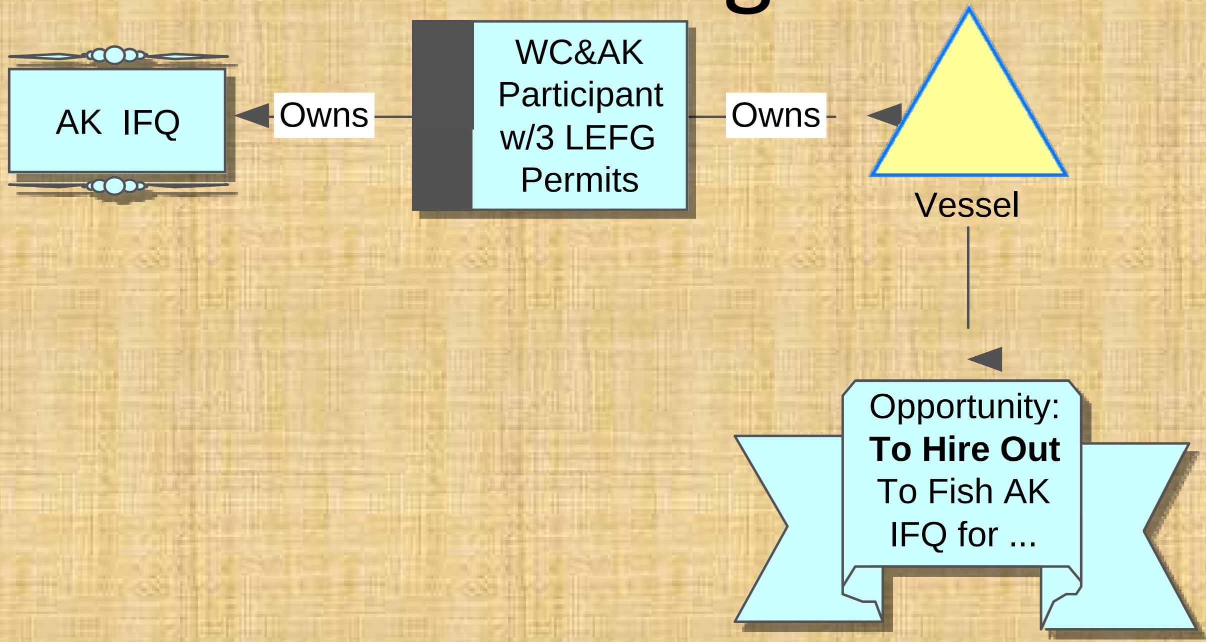
Assessing Permit Control
The Challenge #1



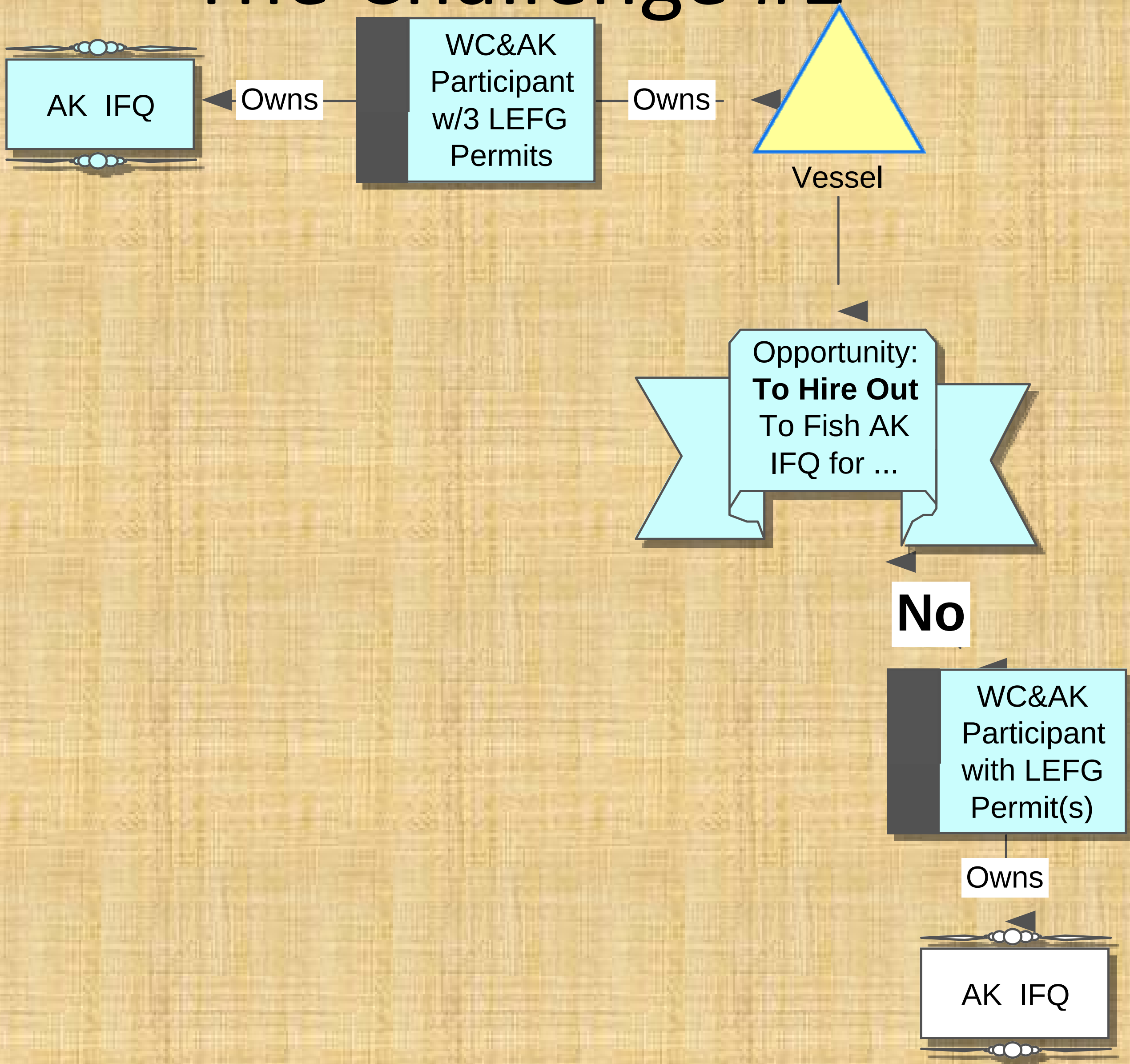
Assessing Permit Control
The Challenge #1



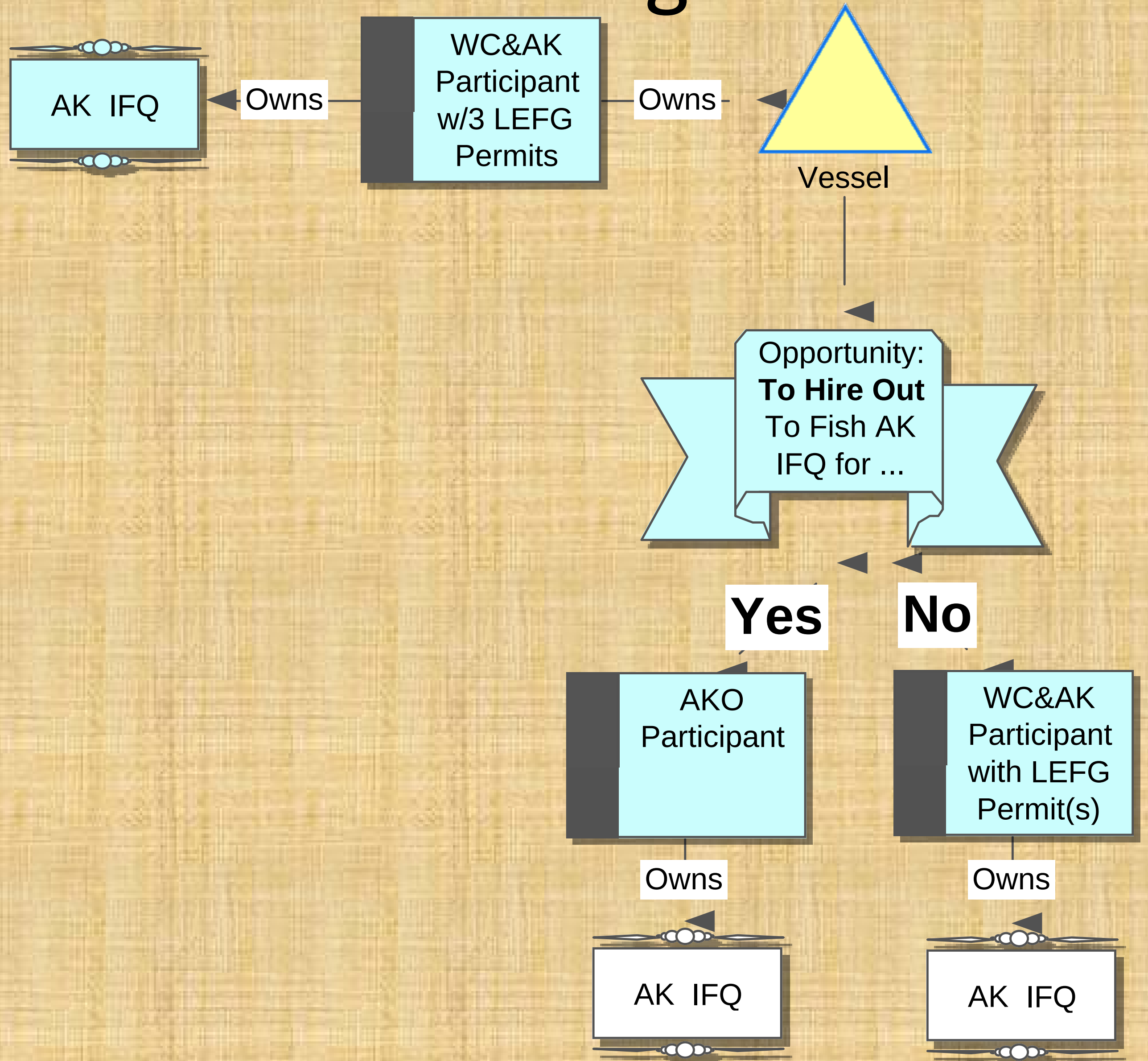
Assessing Permit Control
The Challenge #1



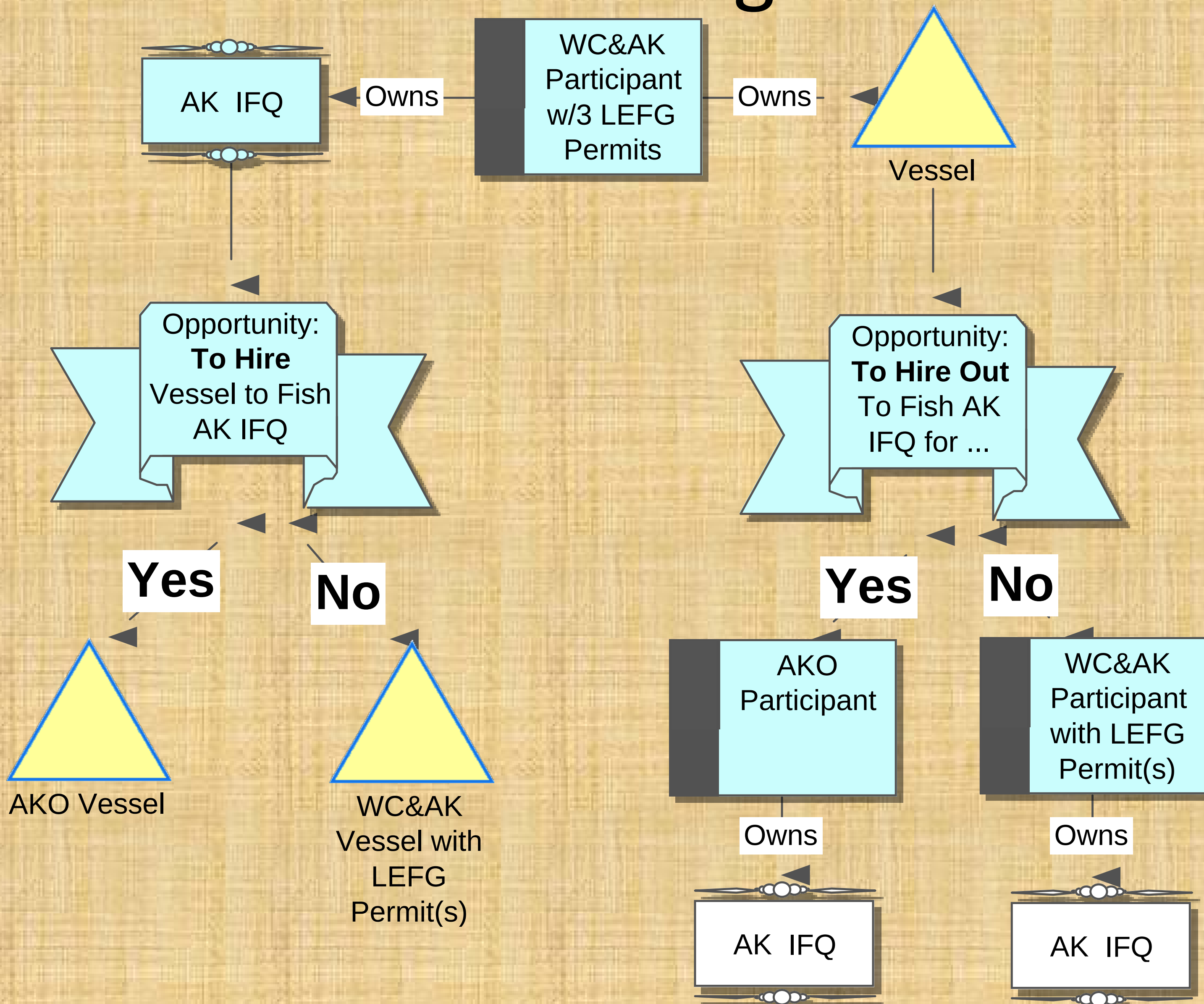
Assessing Permit Control
The Challenge #1



Assessing Permit Control
The Challenge #1



Assessing Permit Control
The Challenge #1



Assessing Permit Control Action Alternatives

- Action alternatives

  exempt the permits

  associated with up to two vessels,

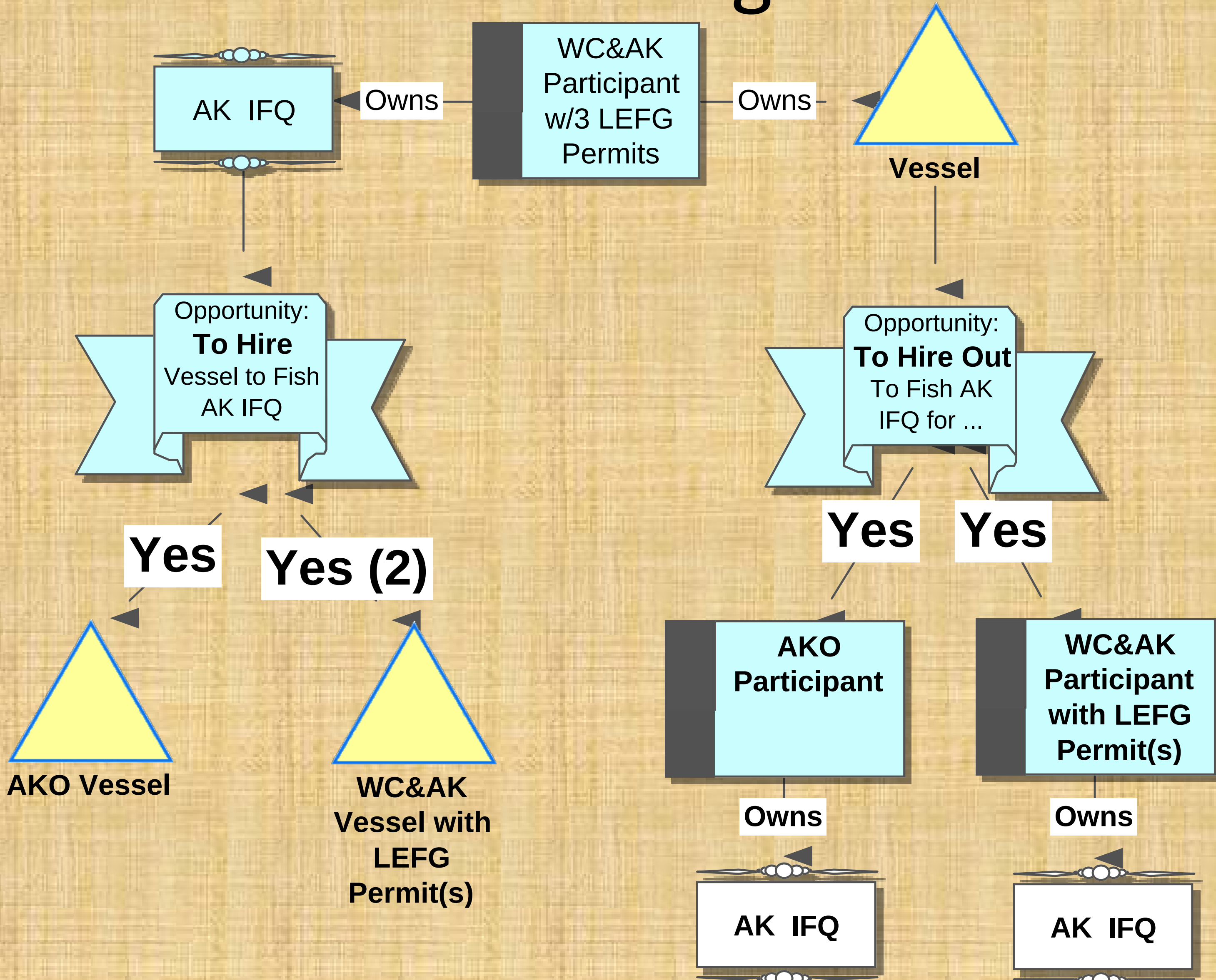
  so long as

  – no direct permit ownership, and

  – vessel ownership not more than

    - Action Alternative 2a – 20%
    - Action Alternative 2b – 30%

Assessing Permit Control
The Challenge #1



Assessing Permit Control Challenge #2

- Loan Collateral
  - Maritime Lien – No Problem
  - Maintaining Vessel Ownership – Potential Problem

- Alternatives offer only a partial solution

Council Decision Analysis Document
Agenda Items C.6.a, Attachment 2

QUESTIONS?

ENFORCEMENT CONSULTANTS REPORT ON SABLEFISH CATCH SHARE PROGRAM REVIEW PHASE 1

The Enforcement Consultants Committee (EC) has reviewed the documents pertaining to agenda item C.6 Sablefish Permit Stacking Program Review Phase 1 April 2014 and has the following comments:

As reported at the 2013 September and November Pacific Fishery Management Council meetings, the EC's primary concern for all sectors of the West Coast sablefish fishery is catch accounting. Under the current system, the recording of Federal limited entry permits (LEP) numbers is voluntary, except in Washington where it is required by state regulation. When a sablefish fixed gear LEP tier delivery is made, the delivery, by Federal and state regulation, is recorded on a state fish ticket. Up to three tiers may be delivered and recorded on this one trip ticket, except in Washington where they require separate tickets when multiple tiers are involved in a single delivery. If not specified by the operator, the delivery is apportioned to the individual tiers (up to 3) by an even split until the tiers are reduced to a point where they are equal to or less than the daily-trip-limits (DTLs). All of this tabulation is done by the state agency(s) making managerial assumptions about sablefish deliveries after reviewing paper fish tickets submitted days to weeks after the fact. This data is then sent to Pacific States Marine Fisheries Commission (PSMFC) for entry into the PACFIN data base. The entire process can take weeks to months. As a consequence, for enforcement personnel who are responsible for monitoring a west coast wide fishery, the PACFIN data is not only dated, but lack evidentiary integrity.

The current reporting system is inadequate on a number of fronts. Federal and state enforcement personnel have limited access to the landing data. The current system does not allow for the tracking of landings for vessels that fish in multiple states, and for Federal permit managers, complicates their ability to provide accurate landing data regarding the status of a tier for permit transfers. Enforcement personnel conducting at-sea boarding or dockside inspection can do little besides checking the permit status and compliance with the owner on board requirement, but have no real time information on the actual status of the tier(s) being fished. Federal Agents have virtually no ability to do after the fact investigations of tier overages because the evidence (the delivery data) is based upon multiple layers of management assumptions and presumptions.

Contrast this reality with the timely submission of data and corresponding access to the data through a Federal regulation requiring all sablefish deliveries be recorded on a PSMFC Electronic Fish Ticket. The E Fish Ticket Program is now in its fifth year of implementation (2 years as an exempted fishing permit (EFP), 3 years under trawl rationalization). Since inception of the Trawl Rationalization Program, approximately 8000 IFQ trawl deliveries have been made with 96 percent of the E tickets reconciled and in the data base within 48 hours. And as we heard earlier this week, in 2013 the 48 hour reconciliation rate was greater than 99 percent.

Moving to an electronic format will provide multiple benefits to industry, science, management, and enforcement. Consider: data electronically entered into the system can be verified and validated at the time of entry by the buyer/first receiver and provides a tool for those buyers to capture and track fish tickets, generate tax reports, and summarize data for their own internal purposes.

Enforcement of landing overage violations, both tier/DTL and open access (OA) deliveries could be greatly enhanced through access to accurate, near real time tracking of landings against tier limits, conversion to DTL landing limits when tiers are exhausted, and daily/weekly OA deliveries. Each of these delivery scenarios creates unique enforcement challenges for Federal and state enforcement personnel. For example: What is the status of a vessel's tier(s)? Which tiers are/were credited to a particular landing? Is/was the owner on board? Is the DTL delivery within limits? Is the OA delivery within daily, weekly or cumulative limits? What is the potential for an illegal split delivery, i.e. underreporting? How many daily deliveries were made by a given vessel during a reporting week, month, or two month period? What was the cumulative total of those deliveries? And in which state(s) were the deliveries made?

Open Access deliveries are exceedingly challenging for state dockside enforcement. E Ticket reporting would improve cumulative trip monitoring immensely. The current OA regulations allow for 300 lb/day, or 1 landing per week of up to 800 lb, not to exceed 1,600 lb/2months. Potentially, for the daily limit, we are talking about tracking 5 plus deliveries over a two month period and for weekly landing a minimum of 2 deliveries over that same two month period.

E Ticket is the tool that will create the data base that can be accessed by the Agent, Officer, Trooper or Warden to answer these questions in near real time either while inspecting an off load or investigating that off load after the fact. E Ticket is the tool that will eliminate the management uncertainty created when assumptions regarding delivery status are made weeks and months after the fact. E Ticket is the tool that will create the data base of near real time information that can be queried and validated with management certainty.

The EC's overarching concern regarding compliance with **ALL** West Coast sablefish landing requirements, coupled with our desire to improve our enforcement capabilities, thereby achieving far greater compliance, moves the EC to endorse Alternative 4: a Federal requirement that all sablefish deliveries (primary/tier, DTL and open access) be recorded on an E Fish Ticket. Conversely, we find Alternative 1 and all sub options (use of paper tickets) to be not satisfactory for effective enforcement purposes, due to the time lag created by paper submission and the opportunity for error data entry errors.

The EC encourages the Council to take advantage of the investments made in your PSMFC E Ticket Program. We believe Alternative 4 will vastly improve sablefish catch accounting, and is in fact, necessary for achieving the compliance goals of this highly valued, highly regarded fishery.

EC recommendations:

1. Adopt Alternative 4: a Federal requirement that all sablefish deliveries (primary/tier, DTL and open access) be recorded on an E Fish Ticket.
2. Eliminate all sub options (use of paper tickets) and do not forward for further consideration.

PFMC
04/06/14

Agenda Item C.6.b
Supplemental GAP Report
April 2014

GROUNDFISH ADVISORY SUBPANEL REPORT ON
SABLEFISH CATCH SHARE PROGRAM REVIEW PHASE 1

The Groundfish Advisory Subpanel (GAP) reviewed Agenda Item C.6 a., pertaining to the Fixed Gear Sablefish fishery and heard presentations from Ms. Ariel Jacobs, National Marine Fisheries Service (NMFS); Mr. Jim Seger, Pacific Fishery Manage Council (PFMC); and comments from Mr. Dayna Matthews, NMFS Office of Law Enforcement (OLE).

ELECTRONIC FISH TICKETS:

The GAP recognizes there is a need for timely documentation of sablefish catch against limited entry (LE) tier limits, LE daily trip limit (DTL) and open access (OA) DTL. The GAP agrees the current accounting system for the landings of all three groups is inadequate. To highlight just a few of the problems: 1) federal fishery permit numbers are not currently required in all three states; 2) paper receipts have a 2-4 month lag time between landings and when data is available in the Pacific Fisheries Information Network (PacFIN); 3) The time lag in data is filled in with estimates based on previous year's landings; and 4) the current system is incapable of distinguishing which are DTL landings and which are tier landings.

For the purpose of analysis, the GAP feels there is a sufficient range of alternatives presented. The GAP agrees with the NMFS recommendation to remove from further analysis the suboptions that allow for a federal system that utilizes paper tickets.

The GAP recommends the Council adopt as a preferred preliminary alternative (PPA) Action Alternative #4 from Agenda Item C.6.a, Attachment 2, that would implement a federal electronic fish ticket reporting program for fixed gear commercial sablefish limited entry tier limit landings, limited entry DTL landings, and open Access DTL landings.

OWNERSHIP/CONTROL:

Currently, limited entry tier permit ownership is limited to three permits. The GAP reviewed the options presented and reviewed the analysis. The GAP recommends that the Council adopt as a preliminary preferred alternative Option 2a (Page 9 of Agenda Item C.6.a, Attachment 2).

This action would allow a current owner of three permits (Owner A) to acquire up to 20 percent ownership in another vessel, on which limited entry tier permits are being fished. The permit(s) that are owned by another person (Owner B) and being fished on the vessel in which Owner A has up to 20 percent interest, would not count against Owner A’s limit.

This option does not allow a person or a business to acquire title to more than three permits, which is status quo. It would allow an owner of three permits to own 20 percent of another boat – which has permits assigned to it – other than the three permits he already owns.

The option would allow a person or a business currently holding three permits to acquire up to a 20 percent interest in two different boats.

FIXED GEAR SABLEFISH PERMIT STACKING PROGRAM REVIEW:

There was discussion in the GAP as to whether there were any modifications to the fixed gear stacking program to be brought before the Council for consideration in their review of the program. There were none.

PFMC
04/06/14

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON SABLEFISH CATCH SHARE PROGRAM REVIEW PHASE I

Mr. Jim Seger briefed the Scientific and Statistical Committee (SSC) regarding the draft review document for the limited entry fixed gear (LEFG) sablefish permit stacking program (Agenda Item C.6, Attachment 1). The SSC recommends the following be included in the document, if time allows:

1. Include vessel length distribution by Tier and number of permits to show the composition of the LEFG sablefish fleets.
2. Include results from a safety study conducted by the Northwest Fisheries Science Center (NWFSC) to address to what extent the LEFG sablefish program promoted safety.
3. As a contrast to Figure 3-4 of the draft review document, include an additional figure showing the percent utilization by individual vessels. This new figure would indicate the number of vessels that exceeded their individual allocations, while Figure 3-4 shows the percent utilization of the overall allocation to the vessels in the LEFG sector.
4. Figures 3-9 and 3-10 show the percent revenue dependence on LEFG sablefish landings by port group. This reflects the percent of the landed value of fish that is LEFG sablefish but ports differ in the extent to which their local economies depend on fish landings. It would be informative to include additional figures that show LEFG sablefish revenue dependence relative to a broader measure of economic activities.
5. Information on regional economic impacts and net-revenue associated with the fishery would provide important information about economic contributions and returns from the fishery. These analyses would enhance the economic content of the report, and are available through work at the NWFSC.

For future research, the SSC makes the following recommendations:

1. Routine collection of permit sale prices to indicate the market value of the fishery.
2. Collect information about crew, captains and owners of vessels. Information about the county of residence, and participation in the fishery is necessary to understand the regional economic impacts of the fishery (for models such as IO-PAC), and to estimate the number of people who directly work in the fishery. This information will also assist in an evaluation of the community effect of the owner-on-board requirement.

PFMC
04/07/14

The Paper Suboption

NOAA FISHERIES
West Coast Region

- Fails to adequately address the purpose and need for this action; would not improve catch accounting and enforcement capabilities in the fishery.

- NMFS recommends that this suboption be removed from each of the action alternatives.

NOAA FISHERIES
West Coast Region

The Vessel Account System

"That Tier Permits be loaded into the IFQ Vessel Account System with deductions made as appropriate when a tier delivery is made and recorded on the E Fish Ticket."

- This language is premature and overly restrictive.
- NMFS recommends that this sentence be removed from each of the action alternatives.

Agenda Item C.7
Situation Summary
April 2014

ELECTRONIC MONITORING PROGRAM DEVELOPMENT INCLUDING PRELIMINARY APPROVAL OF EXEMPTED FISHING PERMITS

At the November, 2013 Council meeting, the Council adopted for further analysis a range of alternatives contained in the November Groundfish Electronic Monitoring Policy Advisory Committee report with the modifications recommended in the Enforcement Consultants report. The alternatives are summarized in Tables 1 through 3; each table increases in detail (Agenda Item C.7.a, Attachments 1-3). Additionally, the Council scheduled consideration of special, out-of-cycle exempted fishing permit (EFP) proposals for electronic monitoring (EM), with maximized retention requirements, with a preliminary approval stage to occur at the April 2014 Council meeting. A letter regarding this special EFP process was provided to the fishing industry participants (Agenda Item C.7.a, Attachment 4) as well as the Council Operating Procedures (COPs) that describe the EFP application process (Agenda Item C.7.a, Attachment 5).

On January 22-23, 2014, the Groundfish Electronic Monitoring Technical Advisory Committee (GEMTAC) met to discuss the environmental impacts of the range of alternatives adopted by the Council. A GEMTAC report is provided that contains a primary question, whether the industry or National Marine Fisheries Service (NMFS) should pay for observers that sample for biological data (Agenda Item C.7.b, GEMTAC Report). At the meeting, EFP applicants presented draft applications to the GEMTAC. The GEMTAC and additional NMFS staff provided feedback for refinement of the applications based on the Council's COP 19, the Council's direction to develop EFPs with maximized retention requirements, and the Council's adopted range of alternatives.

At this meeting, the Council will receive reports from the West Coast Observer Program (WCOP) and Pacific States Marine Fisheries Commission (PSMFC). At the June 2013 Council meeting, the Council requested that the Northwest Fisheries Science Center provide a report on how the WCOP may move forward with an EM program in place for midwater trawl, fixed gear, and potentially bottom trawl. An initial report was provided on January 22 to the GEMTAC. A more detailed report by NMFS is included in the advance Briefing Book (Agenda Item C.7.b, NMFS Report) and a presentation will be provided by NMFS at the meeting.

The PSMFC will provide an informational briefing to the Council under Agenda Item C.1 to present preliminary results of the NMFS/PSMFC 2013 field study and provide the Council with insights from the 2012 and 2013 field studies that may inform the development of an EM program and implications regarding potential EFPs (Agenda Item C.1.b, Attachment 1). A final 2013 report will be available in June. Also included in the briefing items is a 2014 PSMFC supplemental study design to estimate species density and discard weights (Agenda Item C.1.b, Attachment 2).

Under this agenda item, the Council is scheduled to hear an update from Council staff regarding EM program development and provide any guidance on refinement of alternatives as appropriate. The Council is scheduled to receive a draft initial decision document and select preliminary preferred alternatives for an EM Program at the June Council meeting. The Council is currently scheduled to make a final decision at the September Council meeting (Agenda Item C.7.a, Attachment 10).

Regarding EFPs, under this agenda item, the Council is to consider preliminary approval of EFPs provided by the fishing industry. If any are moved forward, a final decision is scheduled for June. At the time of the Briefing Book deadline the Council received four EFP applications (Agenda Item C.7.a, Attachments 6 through 9). The Council needs to consider the ramifications of workload on Council and NMFS staff that is necessary to accomplish EFPs by January 2015. The Council may need to consider that both EFPs and the regulatory process cannot be pursued on the same timeline; therefore, the Council may need to prioritize their decision-making. (Agenda Item C.7.a, Supplemental Attachment 11). The Council may need to also consider other ramifications about approval of EFPs, such as pricing effects on observers available to non-EFP participants and effects on the WCOP.

The Groundfish Electronic Monitoring Policy Advisory Committee and the GEMTAC will meet in Seattle on May 7 and 8, 2014.

Council Action:

1. **Provide guidance on further development of EM program.**
    a. **Confirm or add to the range of alternatives in Attachment 3.**
    b. **Alter or add options to the action alternatives in Attachment 3.**
    c. **Consider options for responsible party payments for biological observers.**
    d. **Guidance on specific analysis of the alternatives and options.**
2. **Recommendations for further consideration of EFPs.**
3. **Provide guidance on schedule and process calendar.**
4. **Provide other guidance as necessary.**

Reference Materials:

1. Agenda Item C.7.a, Attachment 1: Table 1, General Introductory Display of Electronic Monitoring Alternatives.
2. Agenda Item C.7.a, Attachment 2: Table 2, Medium Level Descriptive Display of EM Alternatives.
3. Agenda Item C.7.a, Attachment 3: Table 3: Detailed Descriptive Display of EM Alternatives.
4. Agenda Item C.7.a, Attachment 4: Notice Letter Regarding EM EFP Process.
5. Agenda Item C.7.a, Attachment 5: Council Operating Procedure 19.
6. Agenda Item C.7.a, Attachment 6: Silva EFP Application.
7. Agenda Item C.7.a, Attachment 7: Leipzig EFP Application.
8. Agenda Item C.7.a, Attachment 8: California Risk Pool EFP Application.
9. Agenda Item C.7.a, Attachment 9: Mann/Paine EFP Application.
10. Agenda Item C.7.a, Attachment 10: Adopted Process and Schedule to Consider EM Regulations.
11. Agenda Item C.7.a, Supplemental Attachment 11: Timeline-EFPs vs. EM Regulatory Package.
12. Agenda Item C.7.b, GEMTAC Report: GEMTAC Report to Council.
13. Agenda Item C.7.b, NMFS Report: WCOP Impact Analysis.

Agenda Order:

a. Agenda Item Overview — Brett Wiedoff
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Guidance on Electronic Monitoring Program Development and Consideration of Preliminary Approval of Exempted Fishing Permits for Electronic Monitoring in the Limited Entry Trawl Groundfish Fishery

PFMC
03/24/14

Table 1. General Introductory Display of Electronic Monitoring Alternatives in the Pacific Council Regulatory Process

	ALTERNATIVES		
	1	2	3
Monitoring Characteristic	**Status Quo: Human Observers Estimate Discard**	**Camera Recordings Used to Estimate Discard**	**Logbooks Use to Estimate Discard, with Camera Audits**
Compliance[1/] Monitoring (Counting of Total Catch)			
Discarded Catch	Human observers at sea required for 100% of trips; all discards counted by species.	Cameras replace human observers at sea and camera recordings are transferred onshore and read to count total discards by species. Options exist to require retention of species that may be difficult for cameras to speciate.	Boat Skippers are required to record in logbooks total catch at sea for each trip, including retained catch and discards by species. Cameras are required just as in Alternative 2 but video is read sporadically to audit accuracy of skipper logbook information.
Retained Catch	Human catch monitors are required for 100% of landings to count retained catch.	Same as Status Quo	Same as Status Quo
Total Catch	The count at sea and the count onshore are reconciled with fish tickets by NMFS to produce a total count by species.	Discard estimates are combined with retained catch estimates and fish tickets by an entity to produce a total count by species.	Discard estimates are combined with retained catch estimates and fish tickets by an entity to produce a total count by species.
Science[2/] Monitoring (Biological Data Collection on Total Catch) NOTE: THIS IS NOT PART OF EM REGULATORY ALTERNATIVES			
Discarded Catch	Collected by at sea observers based on random samples from 100% of the trips.	Collected by at sea observers based on random samples from the 20%-30% (or an appropriate level) of trips assigned observers	Collected by at sea observers based on random samples from the 20%-30% (or an appropriate level) of trips assigned observers
Retained Catch	Collected by the onshore observers based on random samples of 100% of the trips.	Collected by the onshore observers based on random samples of 100% of the trips.	Collected by the onshore observers based on random samples of 100% of the trips.

1/ Compliance in this context refers to a total count of all species so that compliance with the IFQ program and annual quota pound allocations can be determined and

2/ Science in this context means the collection of biological data such as age/length/weight data from fish landed, size and condition data for fish released, estimates for protected species, etc. .

Table 2. Medium Level Descriptive Display of EM Alternatives.

Component	ALTERNATIVES 1 **Status Quo: Human Observers Estimate Discard**	2 **Camera Recordings Used to Estimate Discard**	3 **Logbooks Use to Estimate Discard, with Camera Audits**
Compliance Monitoring Basic Provisions			
Discard Documentation Technology	Observers	Observers with Vessel Option to Use Cameras	Observers with Vessel Option to Use Cameras
Documentation Coverage	100%	100%	100%
Video Reading Protocols	None	**Option A**: 100% (census). **Option B**: Subsample Video (% to review must be developed)	Audit logbook (intensity varies based on vessel's compliance history)
Eligibility For Camera Use	N/A	Vessel in good standing and has approved equipment and operational plan certifications.	
Discard Requirements	Discard at will unless required to retain.	**Option A**: Maximized Retention **Option B**: Optimize Retention of Catch Share Species - Limited Discards. Different sub options may be selected for different sectors/gears. (discard sub options are not mutually exclusive; all species approved for discard would need to be verifiable with cameras) Subopt 1: flatfish Subopt 2: lingcod & sablefish Subopt 3: non-rockfish groundfish Subopt 4: spp verifiable with cameras Subopt 5: all nongroundfish spp **Option C:** Discard at will (status quo) Some discards allowed under all options Different options may be selected for different sectors/gears.	
Vessel Operation Provisions			
Observer Exemption Process	None	NMFS Application and Approval Process	
EM Vessel Operational Plan	No plan required	**EM Operational Plan Required** **Option A**: Plan expires when certain vessel modifications occur. **Option B**: Plan expires annually or when certain vessel modifications occur.	
Declaration of EM Use	No declaration	**Option A**: Declare EM use annually for entire year[1/] **Option B**: Declare annual schedule for EM use (by month)[1/] **Option C**: Declare EM use by trip	

Table 2. Medium Level Descriptive Display of EM Alternatives.

	ALTERNATIVES		
	1	2	3
Component	**Status Quo: Human Observers Estimate Discard**	**Camera Recordings Used to Estimate Discard**	**Logbooks Use to Estimate Discard, with Camera Audits**
Equipment and Protocol Provisions			
EM Equipment Requirements	None	Options for specification of technology hardware, data formats, etc. including consideration for changes through time.	
Data Transfer Process	Completed by observers	Options to accomplish enforcement chain of custody standards, including combinations of shoreside observers, PSMFC personnel, enforcement officers, EM providers, skippers, etc.	
Video and Data Processing and Analysis	None	Options as to who is responsible for video reading, validation, and reporting.	
Spatial Variation for High Bycatch Areas		**Option A**. No special provisions **Option B**. EM option not available in high bycatch area (would need to define those areas) **Option C**. Higher levels of video review required in high bycatch areas (would need to define those areas)	
Adaptive or Phased Implementation		**Option A**. None **Option B**. Use EFPs to test final Council policy, prior to full regulatory implementation. Option C. Phase in by sector/gear. **Option D**. Phase in retention options over time. **Options B-D** are not mutually exclusive.	

Footnote: 1/ Options A and B include emergency provisions to use cameras in lieu of observers or vice versa.

Table 3. Detailed Descriptive Display of EM Alternatives

Component	ALTERNATIVES 1 Status Quo: Human Observers Estimate Discard	2 Camera Recordings Used to Estimate Discard	3 Logbooks Use to Estimate Discard, with Camera Audits
Compliance Monitoring Basic Provisions			
Discard Documentation Technology	Observers	Observers with Vessel Option to Use Cameras	
Documentation Coverage	100%	100% of all IFQ trips must either have observer or cameras	
Video Reading Protocols	None	**Option A**: 100% (census). **Option B**: Subsample Video (% to review must be developed)	Audit logbook (intensity varies based on vessel's compliance history)
Eligibility For Camera Use	N/A	Vessel in good standing and has approved equipment and operational plan certifications. Initial eligibility criteria: 1. Limited entry groundfish trawl permit 2. Quota share permit 3. No IFQ deficits 4. No civil penalties related to fishing activity exceeding a certain amount 5. Schematic and Description of NMFS approved Individual Vessel Monitoring Plan (IVMP) a. IVMP unique for each vessel b. Multiple IVMPs included if submitted by group of vessels 6. Self-Governing Plan (if applicable, not required) a. Data Delivery and Analysis (DDA) specifications b. submitted by either a group of vessels or an individual vessel Continued eligibility: 1. Participants must be in compliance with their IVMP 2. Demonstrate proper documentation of the discards in logbooks or on video 3. No civil penalties related to fishing activity exceeding a certain amount within the time period of EM use	

Component	ALTERNATIVES 1 Status Quo: Human Observers Estimate Discard	2 Camera Recordings Used to Estimate Discard	3 Logbooks Use to Estimate Discard, with Camera Audits
Eligibility For Camera Use (continued)	N/A	Requires application to NMFS to use EM, could include: 1. Operational Informational information. a. Installation by certified EMS Provider b. EMS service provider responsibilities c. Data Confidentiality Standards d. Data Storage and Delivery Standards e. EMS Coverage Requirements f. Monitoring Requirements g. Vessel Responsibilities 2. Data Sources a. Digital Camera(s) b. Winch Sensors c. Hydraulic Sensors d. Log Book e. VMS f. GPS 3. EM Data Standards a. Secure Watertight Control Box Data Storage b. Encrypted Data c. Storage Standards d. Date and Time Stamp and Counter e. Digital File Format f. Minimum Frame Rate g. Minimum Resolution h. Accepted Delivery Methods i. Time Frames j. Color Optics k. Lighting Standards l. Power Supply Standards	

	ALTERNATIVES		
Component	1 **Status Quo: Human Observers Estimate Discard**	2 **Camera Recordings Used to Estimate Discard**	3 **Logbooks Use to Estimate Discard, with Camera Audits**
Discard Requirements	Discard at will unless required to retain • May discard any species unless regulations require you to retain them • May discard catch share species, non-catch share species • May discard non-groundfish • Allow selective discard of trash, mud coral, etc. • Require selective discards of prohibited species; • Require discards of ESA and MMPA species (protected species).	**Option A**: Maximized Retention • No selective discard for catch share species, non-catch share groundfish species • No selective discard for non-groundfish species • Allow selective discard of trash, mud coral, etc. • Require selective discards of prohibited species (except whiting trips); • Require selective discards of ESA and MMPA species (i.e., protected species). • Non-selective discard for e.g., safety, "bleeding net", zipper accidentally opened, fish came off hook, gilled in net **Option B**: Optimize Retention of Catch Share Species with Limited discards. Different options may be selected for different sectors/gears (discard sub options are not mutually exclusive; all species approved for discard would need to be verifiable with cameras) Subopt 1: flatfish Subopt 2: lingcod & sablefish Subopt 3: non-rockfish groundfish Subopt 4: spp verifiable with cameras Subopt 5: all nongroundfish spp • Allow selective discard of trash, mud coral, etc. • Require selective discards of prohibited species (except whiting trips); • Require selective discards of ESA and MMPA species (i.e., protected species). • Non-selective discard for e.g., safety, "bleeding net", zipper accidentally opened, fish came off hook, gilled in net **Option C** - Discard At Will (Status Quo) • May discard any species unless regulations require you to retain them • May discard catch share species, non-catch share species • May discard non-groundfish • Allow selective discard of trash, mud coral, etc. • Require selective discards of prohibited species (except	
Vessel Operation Provisions			
Observer Exemption Process	None	NMFS Application and Approval Process	

	ALTERNATIVES		
Component	1 Status Quo: Human Observers Estimate Discard	2 Camera Recordings Used to Estimate Discard	3 Logbooks Use to Estimate Discard, with Camera Audits
EM Vessel Operational Plan - Individual Vessel Monitoring Plans (IVMP)	No plan required	**EM Operational Plan Required** Potential categories of information in an IVMP: a) Type of system b) Hardware c) Software d) Emergency protocols e) Back-up equipment use protocols f) Catch handling protocols g) Layout of vessel h) Screen shots of all camera views i) Number of cameras needed with placement specifications j) Care and maintenance of the EM system k) Types of sensors and data for sensors to capture l) Download/maintenance schedule m) Logbook format (electronic or paper) n) Tamper Resistant/Taper Evident o) Number and Location of Digital Cameras p) Lighting Locations (Stern, Deck, Discard Shoot, etc.) q) Bridge Mounted Computer Interface/Monitors r) GPS Receiver s) Winch Sensors t) Hydraulic Pressure Transducers u) Power Supply / Backup v) Wire Runs w) Geo Fencing (NMFS supplied) x) System's Check Certification y) Data logger	
EM Vessel Operational Plan - IVMP Expiration	No plan required	**Option A – No Expiration** unless modifications are made • Approval of plans by NMFS • Plan modification provisions: (NMFS to decide how this is done) 1. EM Provider and vessel operator provisions – changes that do not need re-approval by NMFS (e.g. camera position changes) 2. NMFS provisions - changes that trigger the need for re-approval by NMFS (e.g. operator will use a different vessel) **Option B – Annual Expiration** or if modifications are made Same as Option A but with annual expiration	

	ALTERNATIVES		
	1	2	3
Component	Status Quo: Human Observers Estimate Discard	Camera Recordings Used to Estimate Discard	Logbooks Use to Estimate Discard, with Camera Audits
Declaration of EM Use	No declaration	**Option A -** Annual Declaration Use EM all year **Option B -** Declaration for Intermittent Use For the coming year, participants must indicate in which months, if any, it will use EM and in which months, if any, it will use an observer. (e.g. quarterly) **Option C -**Trip by Trip Basis Vessel and the observer provider would need to work out when observers may be available on a per trip basis. **Exception for Emergency Situation for Option A and B** For example, camera broke so need an observer tomorrow, vice versa	
Equipment and Protocol Provisions			
EM Equipment Requirements	None	Options for specification of technology hardware, data formats, etc. including consideration for changes through time.	
Data Transfer Process	Completed by observers	Video data transfer, electronic/paper logbook, and data logger information will be developed during implementation of the program. Some of this information would be disclosed in an IVMP. Includes secure transfer for data and chain of custody requirements. Options (not mutually exclusive) • Crew • Catch monitor • PSMFC • EM Provider • Enforcement	
Video and Data Processing and Analysis	None	Video reviewers (not mutually exclusive): **Option A** -NMFS **Option B** -PSMFC **Option C** - EM Provider	
Spatial Variation for High Bycatch Areas		**Option A** - No special provisions **Option B** - fishing activity in areas that are likely to have lower bycatch could be monitored with EM rather than using observers; no EM in high bycatch areas **Option C** - Under this option, if you chose to fish in a high bycatch area, a higher level of EM review may be required	

	ALTERNATIVES		
Component	1 **Status Quo: Human Observers Estimate Discard**	2 **Camera Recordings Used to Estimate Discard**	3 **Logbooks Use to Estimate Discard, with Camera Audits**
Adaptive or Phased Implementation		**Option A**. None **Option B**. Use EFPs to test final Council policy, prior to full regulatory implementation. **Option C**. Phase in by sector/gear. **Option D**. Phase in retention options over time. **Options B-D are not mutually exclusive.**	

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Dorothy M. Lowman, Chair| Donald O. McIsaac, Executive Director

December 12, 2013

RE: Special Exempted Fishing Permit for Electronic Monitoring

Dear Interested Participant in the Groundfish Trawl Catch Share Program:

The purpose of this letter is to provide notice and guidance regarding the development of Exempted Fishing Permit (EFP) proposals for electronic monitoring and provide a deadline for EFP submission to the Pacific Fishery Management Council (Council).

At the November 2013 Council meeting, the Council announced that at its April 2014 meeting it will consider EFP proposals submitted for the purpose of allowing the use of electronic monitoring (EM) in place of observers for vessels participating in the trawl rationalization program. In April, the Council and its advisory bodies are currently scheduled to review and consider making recommendations on applications that include EM for fishing vessels that are willing to fish under maximized retention requirements. The Council is scheduled to take up preliminary approval of applications at the April meeting. If the Council moves the EFPs forward, final approval for EFP applications advanced for further consideration is scheduled for the Council's June 2014 meeting.

The Council is considering a regulatory change for all vessels required to take human observers in accordance with the groundfish trawl catch share program. However, full fleet regulatory changes, if any, adopted by the Council are not expected to be implemented prior to January 1, 2016. Thus, the Council is considering EFPs for possible use in 2015 and beyond, depending on final implementation of new regulations providing for EM, should the Council approve any EM regulations.

The Council Operating Procedures (COP) provide guidance in the qualification, submission, purpose and content, review, and approval of EFP proposals (Go to COP 19 at: http://www.pcouncil.org/wp-content/uploads/cop19.pdf). Normally, applications are required by the November 2013 meeting; however, an exception was made for EFPs submitted for the purpose stated above. The Council encourages applicants to consider consolidating interested vessels or parties using the same gear type and proposed protocols into a single application. This will increase the efficiency for Council review. Rather than just providing an exemption from using human observers and relief from the future economic burden on the industry to pay for human observers, the use of EFPs should allow testing and refinement of the overall fishery management approach for EM that has been drafted to date for the Council. For example, EFPs could assist evaluation of discard monitoring methods, individual vessel monitoring plans, and the data capturing and processing techniques, as well as providing an opportunity to test the fishery monitoring, assessment, and management system.

For an example of information to be included in an EFP, please visit the website at: http://www.pcouncil.org/groundfish/trawl-catch-share-program-em/.

In considering formal recommendations for issuance of EFPs, the Council will evaluate the impact of EFP applications on the existing workload of the National Marine Fisheries Service (NMFS). Several priority matters are currently scheduled for NMFS in 2014, such as the full fleet EM regulatory process, the groundfish 2015-2016 biennial regulatory process, the sablefish permit stacking review process, and other trawl trailing actions. A significant amount work may be necessary to implement EFPs by January 2015. At the November meeting, NMFS indicated the need for additional time to assess how processing EFP applications would affect existing timelines for completion of other matters the Council has identified as high priorities. At this time, NMFS has provided the following statement on this matter.

> *Exempted Fishing Permits require analysis and review that is similar to a regulatory process. Any new EFP recommended by the Council in June will have a substantial impact on NMFS' workload, depending on the complexity of the requested regulatory exemptions, the need for any new NEPA analyses, and the need to divert staff time from other duties. Because of this, NMFS will work with the Council and Council staff to balance the workload among the numerous important competing tasks.*

The Council encourages applicants to provide draft EFP proposals to the Council's Groundfish Electronic Monitoring Technical Advisory Committee (GEMTAC) before submission of a complete EFP application to the Council. The GEMTAC may provide feedback to the applicants regarding completeness of the study design, feasibility of implementation, or other elements of the application that might be considered for adjustment. The GEMTAC is scheduled to meet on January 23, 2014 in Portland, Oregon; therefore, the deadline to submit draft EFPs to the GEMTAC for review is January 17, 2014. The Council encourages applicants to attend the GEMTAC meeting in person to hear any feedback that may be forthcoming. Applicants are not required to provide a draft EFP application to the GEMTAC (See COP 19).

If you would like the GEMTAC to review your *draft* EFPs, **send your completed draft application by January 17, and include your intent to attend the GEMTAC meeting in person to:**

Dr. Donald McIsaac, Attn: GEMTAC Review
Pacific Fishery Management Council
7700 NE Ambassador Pl. Suite, 101
Portland, OR 97220
Or to Brett.L.Wiedoff@noaa.gov

By this letter, the Council announces an EFP submission deadline of 11:59 p.m. March 12, 2014. Applications will be included in the Council's Briefing Book material for the April 2014 meeting. Applications submitted after March 12 may not be considered by the Council.
Submit completed *proposed* EFP applications to:

Pacific Fishery Management Council
7700 NE Ambassador Pl. Suite, 101
Portland, OR 97220
Or via e-mail to pfmc.comments@noaa.gov Or to Brett.L.Wiedoff@noaa.gov

In the event your proposed EFP is advanced for further consideration at the June 2014 Council meeting, a final EFP application must be submitted in early June, on a specific date to be determined.

Should you have any questions on this matter, please contact Brett.L.Wiedoff@noaa.gov or 503-820-2424.

Sincerely,

D. O. McIsaac, Ph.D.
Executive Director

BLW:kam

C: Council Members
Groundfish Management Team
Groundfish Advisory Subpanel
Scientific and Statistical Committee

19

COUNCIL OPERATING PROCEDURE

Protocol for Consideration of Exempted Fishing Permits for Groundfish Fisheries

Approved by Council: 09/10/03
Revised: 03/11/05; 09/14/07; **06/10/11**

DEFINITION

An exempted fishing permit (EFP) is a federal permit, issued by the National Marine Fisheries Service, which authorizes a vessel to engage in an activity that is otherwise prohibited by the Magnuson-Stevens Fishery Conservation and Management Act or other fishery regulations for the purpose of collecting limited experimental data. EFPs can be issued to federal or state agencies, marine fish commissions, or other entities, including individuals. An EFP applicant need not be the owner or operator of the vessel(s) for which the EFP is requested.

PURPOSE

The specific objectives of a proposed exempted fishery may vary. The Pacific Fishery Management Council's (Council) fishery management plan (FMP) for West Coast groundfish stocks provides for EFPs to promote increased utilization of underutilized species, realize the expansion potential of the domestic groundfish fishery, and increase the harvest efficiency of the fishery consistent with the Magnuson-Stevens Act and the management goals of the FMP. However, EFPs are commonly used to explore ways to reduce effort on depressed stocks, encourage innovation and efficiency in the fisheries, provide access to constrained stocks while directly measuring the bycatch associated with those fishing strategies, and to evaluate current and proposed management measures.

GENERAL PROCESS

The Council process for considering and recommending groundfish EFP proposals is a biennial one that is synchronized with the decision-making process for considering new biennial groundfish harvest specifications and management measures. Approved EFP activities may continue for one or both years of the biennial management cycle. The Council's EFP process begins at the November meeting in odd-numbered years when alternatives for biennial harvest specifications and management measures are decided for detailed analysis. The Council also decides preliminary preferred yield set-asides for overfished and non-overfished species at this November meeting, including the yields necessary to conduct EFPs. Therefore, EFP applications for the following two-year management cycle are first considered at this November meeting. Any EFP proposals recommended for further consideration are given final consideration at the June meeting in even-numbered years, when final harvest specifications and management measures are decided. The Council may task the Scientific and Statistical Committee (SSC) or other advisors to do a more thorough review of refined EFP proposals that are recommended in November, prior to the June Council meeting, when EFPs are given final consideration. Those EFPs recommended at the June Council meeting are forwarded to NMFS for implementation in the next biennial management cycle.

PROTOCOL

A, Submission

1. The Pacific Fishery Management Council and its advisory bodies [Groundfish Management Team (GMT), Groundfish Advisory Subpanel (GAP), and SSC] should review EFP proposals prior to issuance; the advisory bodies may provide comments on methodology and relevance to management data needs, and make recommendations to the Council accordingly. The public may also comment on EFP proposals.

2. Completed applications for EFPs from individuals or non-government agencies, for Council consideration, must be received by the Council for review the earlier of the briefing book deadline or two weeks prior to the November Council meeting in odd-numbered years.

3. Applications for EFPs from federal or state agencies must meet the briefing book deadline for the November Council meeting in odd-numbered years.

B. Proposal Contents

1. EFP proposals must contain sufficient information for the Council to determine:

    a. There is adequate justification for an exemption to the regulations.

    b. The potential impacts of the exempted activity have been adequately identified.

    c. The exempted activity would be expected to provide information useful to management and use of groundfish fishery resources.

2. Applicants must submit a completed application in writing that includes, but is not limited to, the following information:

    a. Date of application.

    b. Applicant's names, mailing addresses, and telephone numbers.

    c. A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP.

    d. Valid justification explaining why issuance of an EFP is warranted.

    e. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

f. An expected total duration of the EFP (i.e., number of years proposed to conduct exempted fishing activities). Note that EFPs are considered every other year for the following two-year management cycle. However, the EFP can be developed to cover only one year of the two-year cycle.

g. Number of vessels covered under the EFP.

h. A description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment; this description should include harvest estimates of overfished species.

i. A description of a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted.

j. A description of the proposed data collection and analysis methodology.

k. A description of how vessels will be chosen to participate in the EFP.

l. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used.

m. The signature of the applicant.

n. The GMT, GAP, SSC, and/or Council may request additional information necessary for their consideration.

C. Review and Approval

1. The GMT, GAP, and SSC will review EFP proposals in November of odd-numbered years and make recommendations to the Council for action; the Council will consider those proposals for preliminary action. Final action on EFPs will occur at the June Council meeting in even-numbered years. Only those EFP applications that were considered in November may be considered the following June; EFP applications received after the November Council meeting for the following two-year management cycle will not be considered.

2. EFP proposals must contain a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted. Also, EFP proposals must include a description of the proposed data collection and analysis methodology used to measure whether the EFP objectives will be met.

3. The Council will give priority consideration to those EFP applications that:

a. Emphasize resource conservation and management with a focus on bycatch reduction (highest priority).

b. Encourage full retention of fishery mortalities.

c. Involve data collection on fisheries stocks and/or habitat.

d. Encourage innovative gear modifications and fishing strategies to reduce bycatch.

e. Encourage the development of new market opportunities.

f. Explore the use of higher trip limits or other incentives to increase utilization of underutilized species while reducing bycatch of non-target species.

4. The GMT review will consider the following questions:

   a. Is the application complete?

   b. Is the EFP proposal consistent with the goals and objectives of the West Coast Groundfish FMP?

   c. Does the EFP account for fishery mortalities, by species?

   d. Are the harvest estimates of overfished species within the amounts set aside for EFP activities?

   e. Does the EFP meet one or more of the Council's priorities listed above?

   f. Is the EFP proposal compatible with the federal observer program effort?

   g. What infrastructure is in place to monitor, process data, and administer the EFP?

   h. How will achievement of the EFP objectives be measured?

   i. Is the data ready to be applied? If so, should it be used, or rejected? If not, when will sufficient data be collected to determine whether the data can be applied?

   j. What are the benefits to the fisheries management process to continue an EFP that began during the previous management cycle?

   k. If the EFP proposes to integrate the data into management, what is the appropriate process?

   l. What is the funding source for at-sea monitoring?

m. Has there been coordination with appropriate state and federal enforcement, management, and science staff?

5. SSC Review:

a. All EFP applications should first be evaluated by the GMT for consistency with the goals and objectives of the groundfish FMP and the Council's strategic plan for groundfish.

b. When a proposal is submitted to the GMT that includes a significant scientific component that would benefit from SSC review, the GMT can refer the application to the SSC groundfish subcommittee for comment. Those EFPs recommended at the November meeting that are also recommended for an SSC review, can be reviewed at the March, April, and/or June SSC meetings during even-numbered years prior to a final Council decision on the EFP in June of even-numbered years.

c. In such instances, the groundfish subcommittee will evaluate the scientific merits of the application and will specifically evaluate the application's: a) problem statement, b) data collection methodology, c) proposed analytical and statistical treatment of the data, and d) the generality of the inferences that could be drawn from the study. The SSC groundfish subcommittee's evaluation shall be presented to the full SSC for review and comment.

d. EFP proposals can be deferred to allow adequate time for SSC review.

D. Other considerations:

1. EFP candidates or participants may be denied future EFP permits under the following circumstances:

a. If the applicant/participant (fisher/processor) has violated past EFP provisions; or has been convicted of a crime related to commercial fishing regulations punishable by a maximum penalty range exceeding $1,000 within the last three years; or within the last three years assessed a civil penalty related to violations of commercial fishing regulations in an amount greater than $5,000; or, has been convicted of any violation involving the falsification of fish receiving tickets including, but not limited to, mis-reporting or under-reporting of groundfish. Documented fish receiving tickets indicating mis-reporting or under-reporting of groundfish will not qualify for consideration when fish reporting documents are used as part of the qualifying criteria for EFPs.

E. Report Contents

1. The EFP applicant must present a preliminary report on the results of the EFP and the data collected (including catch data) to the GMT and GAP at the November Council meeting of the odd-numbered year during the management cycle in which the EFP

activity was conducted. The report should provide the EFP catch of species made to date and announce the sponsor's intent to continue the EFP activity in the second year of the management cycle (assuming the approved EFP activity was scheduled for a two-year duration). If the EFP was scheduled for two years and the EFP sponsors announce their intent to terminate the EFP early, the Council can recommend a release of EFP yield set-asides for other uses.

2. A final written report on the results of the EFP and the data collected must be presented to the GMT, GAP, SSC, and the Council at the September Council meeting of the year following the management cycle in which the EFP activity was conducted.

3. The final report should include:

    a. A summary of the work completed.

    b. An analysis of the data collected.

    c. Conclusions and/or recommendations.

4. Timely presentation of results is required to determine whether future EFPs will be recommended.

F/V Patty AJ
PO Box 3129
Coos Bay, OR 97420

Pacific Fishery Management Council,

The potential impacts of the exempted activity have been adequately identified by using the data from the cameras and discard chutes. The camera and the discard logbook data provide information useful to management and groundfish fishery resources.

The following information is a completed application in writing:

Date of application:	March 10, 2014
Applicants name:	Earl Silva and Ronald Silva (F/V Patty AJ)
Mailing Address:	PO Box 3129 Coos Bay, OR 97420
Phone number:	541-888-6691

We feel that we could do without an observer because our camera coverage shows the entire deck. The data collected will be all we need to show maximum retention with little discard. We really don't need an observer now because of the camera coverage and the discard chute.

We can move forward by eliminating the observers and using the cameras and discard logbooks to show the data. We think that the cameras will work out better for our usage. The observer is an added cost factor and we have had discrepancies with discard wastes and unloading weights. Most of the observers feel that this isn't what they expected to be doing in their career.

Observations that I have noticed are that some of them won't get up at night, and then they write you up for not waking them, even though I have given every effort to do so. Most of the time they estimate the poundage of the discard instead of actually weighing the discards. It's hard to get discard weights from them. They tend to take their information home and do it instead of leaving the information with me before they leave. When they do give me information, it has been wrong. There isn't any consistency.

In closing, the Observers are safety issues which add food expenses and other duties for myself and crew. They don't clean up after themselves, do their own dishes, nor do they take off their gloves in the galley so scales and such don't get in food. They also wash their "paper" in the galley sink instead of washing it outside or in the restroom as asked of them. This leads to added work that myself and crew can do without.

Thank you for your time and consideration.

Earl Silva
Ronald Silva

Maximized Retention And Monitoring For Vessels Participating
In The Pacific Groundfish IFQ Trawl Fishery

March 11, 2014

Peter Leipzig, Executive Director
Fishermen's Marketing Association
1585 Heartwood Dr.
Suite E
McKinleyville, CA 95519
707-840-0182
pete@trawl.org

Purpose and Need for Exempted Fishing Permit

Purpose

Issuance of the EFPs would allow fishery participants to fish in the Pacific Groundfish IFQ fishery using Electronic Monitoring Equipment in lieu of an observer and to allow the National Marine Fisheries Service (NMFS) to evaluate components of an overall monitoring program before implementation of a comprehensive regulatory program.

Need

On January 1, 2011, west coast groundfish trawl fishermen began fishing under an individual fishing quota program. Under the new program, all vessels are required to have 100% at-sea observer coverage in addition to 100% shoreside monitoring of all offloads. While full accountability is critical to the success of the program, the fleet is concerned that monitoring costs will be untenable, and may cause individual fishermen or even whole ports to stop fishing.

Observer contracts vary somewhat, but most observer providers are charging between $450-500 per day. This expense disproportionately impacts smaller trawl vessels. Based on these projected costs, the observer issue has become one of the fundamental hurdles to the success of the IFQ program. It is essential to find a way for fishermen to meet NMFS' and PFMC's accountability requirements without imposing such prohibitive costs on the fleet.

At the implementation of the program, NMFS announced that they had funding to subsidies the cost of observers, but would need to reduce this subsidy over several years, until 100% of the cost was being paid by the industry. During 2014 this subsidy will be $216, so fishermen are currently paying a little more than one half of the cost of observers. It is anticipated that in the future this cost to fishermen will increase as the subsidy declines and the cost of placing observers increases.

It is important to remember that the cost of observers although significant it is not the only cost which trawl fishermen are paying to participate in this fishery. Trawlers are now paying 5% of gross revenue for the buy-back loan repayment, 3% of gross revenue for cost recovery in the IFQ program, State landing taxes, and industry organization dues. The cost of observers is a fixed cost per day, rather than a percentage of gross revenue, so the calculation of percentage of gross is dependent upon the gross revenue. For higher grossing boats the percent is lower, for lower grossing boats the percentage is higher. A fair estimate of the cost of observers is between 10% and 15% of gross revenue, with a combined total cost to participate in the fishery of 18% to 23% of gross revenue.

Lastly, a compelling argument can be made for the use of cameras when examining the availability of observers. Not all ports have a large fleet of boats which are making back to back fishing trips. Most ports have a few vessels, which out of need will also participate in the Pink shrimp fishery and the Dungeness crab fishery during those seasons. The work as an observer is not steady in those ports and therefore the ability to provide observer coverage in a number of locations has proved to be difficult. The use of cameras is a logical alternative in these situations.

Species to be harvested and their disposition:

This EFP is not requesting any additional allocation of groundfish species for participants. The participant will cover all species harvested under this EFP with Quota Pounds in the same manner that all participants in the groundfish IFQ fishery cover their landings. All species caught will be retained and unloaded at the completion of each fishing trip at a first receiver site and monitored by a shoreside monitor.

Broader Significance:

It is hoped that this EFP will allow participants to lower their cost of observation. But additionally, the issuance of this EFP will provide experience to better develop procedures involving the installation of cameras, the retrieval of video data, and the analysis of that data. Overall this EFP will provide the NMFS greater insights into how best to structure and write regulations which will allow the use of cameras on a broader basis.

Looking more into the future, this EFP will provide researchers a great deal of additional data which can then be used to improve the development of image recognition software. This type of software has enormous potential to greatly reduce the cost of video review.

Lastly, the lessons learned from this EFP will benefit other sectors of the groundfish fishery, as well as other fisheries both regionally as well as nationally that are wrestling with the cost of observers.

Duration:

It is requested that this be an annual permit and to be continually renewed until comprehensive permanent regulations can be implemented.

Number of Vessels Covered:
It is unknown the exact number of vessels which will choose to participate under this permit. In recent years there have been roughly 120 vessels that have participated in the Groundfish IFQ Trawl fishery. It is anticipated due to the start-up hardware cost (yet to be determined) coupled with a full retention requirement, participation will be initially unattractive to many fishermen in the fishery. A fair guess of the number of participants would be several dozen.

This EFP would be available to any groundfish trawl permit vessel while operating with trawl gear. Interested individuals will be asked to contact the applicant to be included.

Scope:
This EFP would apply to all fishing activities by the permitted vessel while fishing with trawl gear in the Pacific Groundfish IFQ program.

This EFP authorizes, for limited purposes as described in this permit, the following activities which would otherwise be prohibited by federal regulation:

1. Under 50 CFR § 660.12 (a)(1) it is unlawful for any person to retain any prohibited species, which must be returned to the sea as soon as practicable with a minimum of injury when caught and brought on board. This EFP allows the permitted vessel to retain prohibited species until offloading and requires the vessel to deliver all catch.

2. Under 50 CFR 660.140 (h)(1)(i)(A) any vessel participating in the Pacific Groundfish IFQ fishery is required to carry an observer. This EFP allows participants to utilize EM in lieu of the requirement to carry observers.

All other provisions of 50 CFR Part 660 would apply to fishing conducted under this EFP.

Reporting Requirements

Trawl logbooks must be maintained as required by the applicable state law.

Fishing Restrictions

A vessel fishing under this EFP must bring all catch on board the vessel and retain that catch (including prohibited species) until offloading, with the following exceptions:

1. Operational discards. For the purposes of this permit, any fish that pass through the webbing of the net while the net is being retrieved or any fish that cannot be completely removed from the net prior to the net being reset or at the termination of fishing, shall be considered operational discards and need not be estimated or recorded.

2. Large marine organisms. Large individual marine organisms, such as marine mammals or fish species longer than 6 ft (1.8 m) in length, may be discarded. If a large marine organism is discarded, the species and the reason for discarding must be recorded and labeled as "discard" in the required logbook.

3. Debris. It is perfectly acceptable for the crew of a permitted vessel to discard any and all debris items which may be encountered while fishing.

Monitoring Requirements

Each vessel must have properly installed and functioning Electronic Monitoring System (EMS) equipment. Owners of vessels must arrange for EMS services from a (NMFS approved) EMS service provider.

The EMS must be installed, tested, the system initialized and the EMS computer box sealed with tamper evident seals before the vessel leaves port on the first EFP fishing trip. Fishing without installing and testing the EMS equipment is a violation of this EFP.

As specified by the EMS provider, the vessel operator must schedule maintenance of EMS equipment and data removal by the NMFS-specified EMS provider by scheduling periodic appointments during the term of this EFP.

On each trip prior to leaving port, the vessel operator must conduct an EMS system status check as specified by the EMS provider to confirm that all components of the EMS are functioning properly. The EMS will record the results of this check. If the EMS check identifies a malfunction, the vessel must contact the NMFS-specified EMS provider immediately. When requested by the EMS service provider, the vessel would be required to carry EMS units that transmit system performance data while a vessel is at sea. Any such requirement would be in addition to the operator initiated system check which is to occur on each trip.

Each vessel operating under this EFP must provide lighting to the following vessel areas such that the manipulation of trawl nets and fish handling can be clearly recorded by the EMS cameras: fish hold openings, deck spaces, and the trawl ramp.

The vessel is obligated to monitor the EMS performance. When aware that the EMS is not functioning properly or that the power has been interrupted, the vessel must contact the EMS service provider immediately. The EMS provider is required to provide technical service within 24 hours of notification at the vessels expense.

Other Restrictions

It is unlawful and in violation of this EFP for any person to tamper with, disconnect, damage, destroy, alter, or in any way distort, render useless, inoperative, ineffective, or inaccurate any component of the EMS unit required by this EFP.

EXEMPTED FISHING PERMIT APPLICATION

OPTIMIZED RETENTION AND ELECTRONIC MONITORING FOR CALIFORNIA RISK POOL GROUNDFISH IFQ VESSELS IN 2015 AND 2016

1. Date of Application: 3/14/14

2. Applicant

California Risk Pool

Fort Bragg Groundfish Association - Michelle Norvell
Half Moon Bay Groundfish Marketing Association - Lisa Damrosch
Central California Seafood Marketing Association - John Griesser

3. Project Partners

Environmental Defense Fund
Shems Jud, Sarah McTee, Alexa Fredston-Hermann, Huff McGonigal

The Nature Conservancy
Melissa Stevens, Michael Bell, Kate Labrum

4. Summary

This EFP application seeks exemption from the requirements at 50 CFR 660.140 (h)(1)(i)(A), requiring observers on board trawl and fixed gear IFQ fishing trips during the 2015 and 2016 fishing seasons. In place of observers, we propose to use the electronic accountability and reporting mechanisms described below as well as any additional measures the Council may require. The EFP includes approaches for both trawl and fixed gear vessels under one application. However, if for any reason the provisions applying to one of these sectors are not approved, it is our hope that the Council may view the trawl and fixed gear components as severable.

5. Statement of Purpose and Goals

Purpose:

The purpose of this EFP is create a pathway towards a viable and more cost effective means of ensuring accountability in the Pacific groundfish catch share grogram.

Goals:

1. Demonstrate the functionality of electronic monitoring (EM) according to the approach described
2. Identify improvements to EM systems and protocols that can be made to inform a broader regulatory approach that encompasses all segments of the groundfish fleet
3. Build comfort with EM within the industry, law enforcement, and management communities
4. "Operationalize" the lessons learned through national EM pilot studies
5. Determine how to implement electronic monitoring and accountability in a way that will provide economic relief and operational flexibility to the groundfish IFQ program

6. Justification and Broader Significance

Successful fishery management is dependent upon the collection of data from fishing activities. A robust fishery monitoring program provides data on catch, effort and bycatch to fishery stakeholders, which in turn, supports and improves stock assessments and ensures catch limits are both optimized and sustainable in the long-term. While monitoring is a necessary component of accurate catch accounting, the costs associated with fisheries monitoring can be a barrier to implementing more comprehensive monitoring programs.

The transition of the Pacific groundfish fishery to catch share management has brought considerable conservation and management benefits including significantly reduced discards and bycatch of overfished species. Fleetwide revenues under the program have also increased. A critical component of the catch share's success is 100% accountability through at-sea observers; however, the costs associated with these monitoring requirements also pose the greatest existential risk to the program. As the fleet begins to bear more of the financial burden of monitoring, smaller operations that are already on the margins of profitability may no longer be viable, resulting in socioeconomic impacts to the fishermen and their port communities. Beyond direct costs, human observers also pose logistical and operational challenges to the fleet that prevent the program from reaching its full potential. These types of impacts will have serious negative consequences for the durability and scalability of this catch share program. This is therefore not only an economic issue, but a significant conservation and management issue as well.

Finding electronic means of ensuring the accountability that human observers provide is a challenge, particularly for the trawl segment of the fleet. Adoption of EM creates genuine accountability and enforcement risks and roadblocks can be easily constructed. However, there are ways to mitigate these risks. Additionally, risks need to be compared to the broader programmatic and policy risks associated with failing to address the issue of observer costs, particularly for the non-whiting fleet. Any risk also needs to be compared to those inherent in the management of other sectors of the groundfish fleet including the recreational and open access sectors.

In an effort to mitigate accountability risks, the vessels participating in this EFP will be required to be members of the California Risk Pool. (Fishermen who are currently non-members of the Risk Pool can apply to join.) This will mean that any overfished species (OFS) caught will be covered through the terms of their membership. There will therefore be less incentive for participants to try to underreport catches. In fact, the remaining incentive will be to do whatever is needed to ensure that the EFP is carried out in a way that creates a pathway towards reduced observer costs. Additionally, in recognition of the concerns of underreporting we waive any process requirements associated with permit revocation if problems or concerns arise with the EFP. On balance, we believe that given the measures proposed in this application the benefits of moving forward with this EFP far outweigh the risks.

While the EFP would be limited in scope and number of participating vessels (approx. 6), it has much broader significance through its potential to inform an eventual regulatory package that applies across the fleet. Beyond West Coast groundfish, national EM programs are struggling to operationalize and this EFP represents an important opportunity to move EM forward in a vital fishery and in a manner that's well controlled.

This EFP will also contribute valuable data and insights, which could inform the regulatory process for implementing EM in the West Coast groundfish fishery. For the first time, a detailed cost breakdown will be available for monitoring vessels in this fishery using EM, and the contribution of individual EM components to the overall cost will be identified. This project will provide detail on the optimal design of discard areas and demonstrate the ability of EM trained analysts to accurately speciate and estimate weights for certain flatfish (see Section 9). The authors of this EFP plan to work closely with the SSC and the GMT to ensure data collection and analysis is done in a thoughtful and predetermined fashion so that it contributes the most value to EM research in general.

7. Duration

Given the amount of resources required to approve and issue an EFP, we request the permit be issued for 2 years (2015, and 2016). However, if the Council wishes to limit the EFP to a single year we request that it be for 2015.

8. Number of Vessels

We anticipate that approximately 6 vessels will participate in this EFP - 3 from the fixed gear fleet and 3 trawlers.

9. Description and Amount of Harvested Species

Target Species:

Sablefish, Dover Sole, Chilipepper rockfish, Lingcod, minor shelf rockfish, minor slope rockfish, Splitnose rockfish, Yellowtail rockfish, English sole, Petrale sole, other flatfish

Rebuilding species:

Cowcod, Canary rockfish, Yelloweye rockfish, Widow rockfish, Darkblotched rockfish, Bocaccio

The amount of these species that will be taken is difficult to estimate, however, the project partners will be providing all quota required and no request for quota pounds is being made.

10. Accountability Mechanism

Harvest limits will be complied with under a gear-specific retention plan developed for this EFP. The insurance of accountability in this EFP using EM is described in Section 11. Options considered for retention plans were drawn from the range of Alternatives for Groundfish Electronic Monitoring Policy adopted by the Council in November 2013. We chose to eliminate Alternative 1 since it would put vessels in violation of existing regulations that require release at-sea of ESA, MMPA, and other species.

This EFP will use a definition of "catch" – i.e. will describe what fish are to be counted against the vessel's quota – based on the pending NMFS policy on this topic.

<u>Fixed Gear Retention Plan</u>

Fixed-gear vessels will retain all groundfish species, both IFQ species and non-IFQ species. This retention plan reflects Alternative 2: Maximize Retention of the discard alternatives with provisions intended for other gear types (i.e. midwater trawl) removed:

i. Discards **required** for:
    a. ESA species, MMPA species, and other protected species.
    b. Prohibited species.
    c. Halibut; a quota deduction will be generated by obtaining a length measurement visible to the camera using a measuring board, which will then be used to calculate weight. For pot gear, a mortality estimate will be applied based on the vessel's 2011-2013 average halibut mortality rate, as determined by the Observer Program. For hook and line gear, the mortality rate established by the Groundfish Observer Program will be applied.

ii. Discards **prohibited** for:
    a. IFQ groundfish species.
    b. Non-IFQ groundfish species.
    c. Non-groundfish finfish species.
    d. Prohibited species.

iii. Discards **permitted** for:
    a. Trash, mud, coral, wood, and other debris.
    b. Crabs, starfish, sponges and other invertebrates
    c. Situations where human life or safety is threatened.

<u>Shoreside Bottom Trawl Retention Plan</u>

After consulting with fishery participants, we concluded that it would not be economically profitable for shoreside bottom trawl vessels to operate under a maximized retention plan (Alternative 2).

There are two major concerns with maximized retention for shoreside bottom trawl vessels. First, shoreside bottom trawl vessels often discard low-value, high-volume fish at-sea (often flatfish). Retaining these species could significantly impact the profitability of a vessel's fishing trip by filling the hold with low-value species. Second, even if vessels were to land these fish (which are typically undersized, unmarketable, or both), processors and/or buyers would not accept them. Ultimately, these undesirable fish would be discarded on land, resulting in additional disposal costs to the fishing vessel. We consulted with fishery participants and identified low-risk species that represent much of the low-value discards in this fishery, which are incorporated into the retention plan below. Consequently, we proposed to explore under this EFP, a limited discard or "optimized retention" option that better reflects fishing operations and needs, thereby providing a realistic model for how EM could operate in this fishery in the future. This proposal is a modified version of Alternative 3, Retention of Catch Share Species with Options:

i. Discards **required** for:
    a. ESA species, MMPA species, and other protected species.
    b. Prohibited species.

ii. Halibut; a quota deduction will be generated by obtaining a length measurement visible to the camera using a measuring board, which will then be used to calculate weight. A mortality estimate will be applied based on the vessel's 2011-2013 average halibut mortality rate, as determined by the Observer Program.

iii. Discards **permitted** for:
    a. Non-IFQ groundfish species that can be clearly identified
    b. Dover sole, provided they can be adequately identified and assigned weight estimates using EM.
    c. English sole, provided they can be adequately identified and assigned weight estimates using EM.
    d. Arrowtooth flounder, provided they can be adequately identified and assigned weight estimates using EM.

e. Trash, mud, coral, wood, and other debris.
f. Crabs, starfish, sponges and other invertebrates
g. Situations where human life or safety is threatened.

iv. Discards **prohibited** for:

a. IFQ groundfish not mentioned above, and IFQ groundfish that cannot be adequately identified by the skipper or crew and/or assigned weight estimates using EM.

It is worth noting here that many, if not all, of the trawl vessels that will participate in this EFP are also experimenting with modified trawl gear that significantly reduces their bycatch of small flatfish, often from thousands of pounds down to hundreds of pounds. Consequently, we anticipate that the catch accounting system proposed for bottom trawl discards will be used for no more than several hundred pounds of discarded fish per trip.

11. Proposed Data Collection

EM Services

An EM service provider will be selected by the California Risk Pool or its designated representatives through a Request for Proposals and a subsequent bidding process. The installation of the EMS and data analysis will be performed by the service provider or subcontracted entities.

The EMS will include the following:

i. Secure, watertight control box for data storage.
ii. Digital cameras that include or are connected to a date and time stamp and counter.
iii. A minimum camera resolution and frame capture rate (to be determined).
iv. A minimum amount of on-board data storage (to be determined).
v. Tamper-evident hardware.
vi. A monitor showing a live feed from all EMS cameras, so that the skipper can ensure the EMS is functioning correctly.
vii. An electronic reporting system consisting of a device (smartphone, tablet, or computer) and software that, at a minimum, contains data entry fields and units that conform to the existing California state logbooks.

The installation and operation of the EMS will be governed by the Individual Vessel Monitoring Plan (IVMP) drafted by the service provider with collaboration from the vessel skipper. The IVMP will address the following:

i. Hardware, including but not limited to the control box, removable hard drive, camera specifications, GPS receiver, pressure and motion sensors, and power supply.
ii. Software for data collection.
iii. Protocols for EMS malfunction.
iv. Back-up equipment use protocols.
v. Catch handling protocols.
vi. Vessel layout and camera coverage.
vii. Number and placement of cameras.
viii. Lighting requirements.
ix. Instructions for care and maintenance of the EMS.
x. Schedule for EMS maintenance and data transfer.
xi. Instructions for filling out and submitting electronic logbooks.

EM data capture and analysis

EM data analysis for the purpose of assessing compliance will draw on a variety of data sources, including pressure and motion sensors in fishing gear and/or on the back deck, electronic logbooks, VMS, and GPS devices, as well as the camera footage itself.

The EMS service provider selected by the California Risk Pool will:

i. Describe and adhere to a clear chain of custody for hard drives with EM data.
ii. Ensure the timely retrieval of hard drives from EFP vessels after every fishing trip.
iii. Maintain confidentiality of EM data at all times.

In this EFP, quota accounting will be accomplished by cross-checking the electronic logbook against two main data sources: EM, which provides data on discards, and fish tickets, which provide data on landings. In other words, the total catch and discards of a vessel will be determined using the fish ticket plus any discard events witnessed using EM to verify the electronic logbook.

A designated discard area will be established and 100% of the discard events will be reviewed using the video footage from a camera focused on the discard location. For each of the discard events, the EM reviewer will identify the IFQ species, note its length, and calculate a corresponding weight estimate. This discard data will be compared to the vessel e-logbook.

As an additional layer of accountability, 10% of the fishing events identified in the vessel's EM video data (at least one per trip) will be reviewed. This review will ensure that no discards occurred outside of the discard area. Sensor data will be used to confirm all fishing events and trips were recorded in the electronic logbook.

Discrepancies identified during video review may include, but are not limited to, the following:

i. Unauthorized discards: discarding species required to be retained (e.g. discarded rockfish).
ii. Discard events occurring outside of the predetermined discard area.
iii. Crew behavior or fish handling preventing accurate fish identification or weight estimation.
iv. Discard event was not recorded in e-logbook.
v. Fishing trip or event not recorded in e-logbook
vi. The e-logbook underestimates discards by more than 10% for any species.

Concurrent observer coverage

This EFP is requesting an exemption from regulations mandating 100% observer coverage. However, some observer deployment may be instructive, to compare catch profiles with and without the observer present and to consider whether the EMS and observer have distinct effects on crew and skipper behavior. On a select number of trips, the EMS protocols will be maintained but supplemented with human observer coverage. The design of this experimental component will be developed with input from the GMT and SSC to ensure that the resulting data is informative.

Quota accounting

As long as a fishing vessel does not have a quota deficit, it may begin a fishing trip while data from a past trip is being reviewed; however, the fishing vessel may not embark on more than one subsequent EFP fishing trip until their quota account has been balanced.

Catch accounting will use three sources of data: e-logbooks, dockside monitor landing data, and data from the EM video review.

This accounting system relies on the assumption that all discards are adequately captured by the EMS (and any behavior violating this assumption would be treated as a violation, as described above).

For discarded fish, the vessel's quota account will be debited whichever is greater: the estimated weight by species from the EM video reviewer, or the recorded weight by species from the e-logbook.

For retained fish, the vessel's quota account will be debited the weight by species from the dockside monitor.

If the discrepancy between data sources – either the e-logbooks and the dockside monitor, or e-logbooks and the EM video reviewer – is greater than 10%, then a human video reviewer will watch 100% of the video from all fishing events in the trip. The vessel will be responsible for the cost of additional video review.

Compliance and penalty structure

We define an EMS failure as one or more cameras malfunctioning, and/or any loss of sufficient quality video footage during a fishing event. In every case of EM malfunction, the service provider will examine the EMS for signs of tampering. In the event of EMS malfunction, vessels may return to traditional monitoring using on-board observers in order to begin another fishing trip if desired.

The consequences of an EMS failure hinge on the tamper-evident nature of the EM equipment, the crew adhering to the care and maintenance protocols as well as the availability of video feeds available to the skipper and crew:

i. If the EMS fails and the skipper's EM video feed shows some malfunction, the skipper must alert the service provider and immediately suspend fishing activities and return to port. The skipper may not begin another fishing trip without carrying an observer or ensuring the EMS is repaired.
ii. If an EMS failure is noted during data retrieval and analysis, but the EM video feed had not been affected (i.e. the skipper was unaware), the vessel's quota account will be settled using the e-logbook as confirmed with fish ticket data. The quota account will also be debited an additional 5% of the fishing trip's landed pounds (of each species) to compensate for the EMS failure. The skipper may not begin another fishing trip without carrying an observer or ensuring the EMS is repaired.
iii. *In any EMS failure*, if the service provider determines the system has been tampered with, the vessel will be penalized according to NMFS and OLE determination.

These measures and others will be codified in a contract between the EFP applicant and participating fishermen. The contract will describe possible violations and the associated monetary, quota, and participation penalties. This penalty schedule will be developed in partnership with, and to the satisfaction of, NOAA OLE. The applicant will hold all fishermen accountable to the terms of the contract. This structure will help ensure that compliance incentives are in place and that minor issues are dealt with by the EFP applicant. However, all deviations from protocol will be reported to NOAA OLE for full transparency and possible EFP revocation.

12. Vessel Selection Process

Up to 6 vessels will be selected to participate in the EFP that meet the following criteria:

The *vessel* must:

i. Have sufficient space and ventilation for EMS hard drive.
ii. Have sufficient power to run EMS uninterrupted.
iii. Have or establish a designated discard area that can be monitored adequately.
iv. Create an IVMP.
v. If possible, have participated in a previous EM pilot project or EFP.

The *skipper/owner* must:

i. Be engaged in and responsible for EMS deployment, troubleshooting, and implementation on their vessel.
ii. Be willing to retrofit the vessel and catch handling operations necessary for EM deployment.
iii. Participate in or designate a representative to participate in PFMC meetings and related workshops, representing this EFP.
iv. Be able to re-train crew in appropriate behavior for EM.
v. Sign a contract indicating acceptance of appropriate protocols in the case of EM malfunctions and penalties in the case of violations
vi. Fill out and submit electronic logbooks, in addition to the currently required California state logbooks.
vii. Must be a member of the California Risk Pool; or submit an application and be approved for membership to the Risk Pool.
viii. Must be in "good standing" with NMFS and Risk Pool (i.e. no outstanding violations).

The following list includes all 10 vessels currently participating in the California Risk Pool, up to 6 of which may participate in this EFP. Inclusion in this list does not imply any commitment at this stage on the part of these fishermen to participate in the EFP.

- Geoff Bettencourt - F/V Moriah Lee - traps
- Steve Fitz - F/V Mr Morgan - Scottish Seine
- Bernie Norvell - F/V Donna J - trawl
- Brian Jourdain - F/V Blue Pacific - traps
- Tom Estes - F/V Tara Dawn - trawl
- Vince Doyle - F/V Verna Jean - trawl
- Bill Blue and Jon Blue - F/V Brita Michele - traps
- David Rose - F/V Nikki J - longline
- Rob Seitz - F/V South Bay - trawl
- Keith Marshall - F/V Captain John - trawl

13. Times and Places of Fishing, Type of Gear

Exact fishing locations and times will depend on the vessels that are selected, their home ports and fishing plans. The gears used will be groundfish bottom trawl gear and groundfish fixed gear. For trawl vessels, it is anticipated that fishing will occur both seaward and shoreward of the trawl Rockfish Conservation Area and with both large and small footropes. All fishing will be conducted south of Cape Mendocino.

14. Signatures

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Lisa Damrosch
Executive Director
Half Moon Bay Groundfish Marketing Association

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John Griesser
Executive Director
Central California Seafood Marketing Association

____

Michelle Norvell
Executive Director
Fort Bragg Groundfish Association

Project Title: Exempted Fishing Permit Proposal for Utilizing Electronic Monitoring Systems in Lieu of Human Observers in the At-sea and Shoreside West Coast Whiting Fishery.

Date: January 17, 2014

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Purpose and Need for Exempted Fishing Permit:

Purpose
Ballooning monitoring costs and logistical considerations form a well-defined need and justification to move forward with issuing an EFP for these fisheries. The purpose of the EFP is to determine whether utilizing cameras in lieu of human observers proves both cost effective and logistically effective while still providing 100% monitoring of catch and discards that adequately comply with the personal accountability requirements of Amendment 20.

Need
Amendment 20 was implemented in January 2011. The Trawl rationalization program includes individual transferable quotas for the shoreside whiting fleet and a cooperative system for the at-sea whiting fleet. A majority of west coast whiting fishermen participates in both sectors. Both programs require 100% monitoring of catch and discards as a fundamental component of the catch accounting system. Currently the monitoring mandate is accomplished using human observers provided by two National Marine Fisheries Service-approved providers with the majority of the cost borne by the industry and a subset of the cost covered by a government subsidy.

For 2014 the government subsidy is $216 of the total $450-$500 per day cost of a human observer. The cost of monitoring is only one piece of a larger financial burden that fishermen participating in this fishery are facing. In addition to the normal operating costs associated with running a fishing vessel, there are several other government-imposed fees including state landings taxes, a 5% annual Buyback Loan payment and a 3% annual Cost Recovery fee. All of these costs are based on ex-vessel value – so they come out of a business's gross earnings, which can equate to upwards of 15-18% of a vessel's gross BEFORE paying out all the other costs associated with running the business. Human observer costs are expected to continue to increase in the coming years. Cost relief is the primary reason we are seeking to experiment with using electronic monitoring versus human observers in the whiting fishery. It is expected that monitoring costs will decrease with the use of cameras versus human observers.

Another primary reason we are seeking to utilize electronic monitoring in lieu of human observers is related to logistical and operational considerations. Human observers are just that – human. There are times when observers are sick and do not leave their bunk. There are other times when observers delay fishing trips due to tardiness or when there are no observers available at all and a vessel is prohibited from leaving the dock. Human observers take up additional space on a vessel and the feeding and care of an observer is an additional burden on the captain and crew. Comparatively, cameras are always on, they do not eat, sleep or get sea sick and once installed they are always ready to head out on a fishing trip, regardless of time or location.

Species Disposition:
All species harvested under this EFP must be covered by quota share or cooperative species allocation as currently detailed in the existing Amendment 20 regulations. This EFP does not request a special allowance to harvest any additional species (species of concern or otherwise) and the disposition of all species should mirror current fishing operations and strategies. There is no set aside of any species – target or otherwise – with this EFP and impacts on rebuilding species are already considered and included in annual scorecard accounting and monitoring based on Amendment 21 allocations.

Broader Significance:
The proposed activity under this EFP will have broader significance than simply achieving certain goals for the applicants. There are other sectors and fisheries on the west coast that are interested in utilizing EM – the bottom trawl and fixed gear sectors of the trawl ITQ fishery as well as other Pacific fisheries in need of monitoring but unable to carry observers due to small vessel size or even safety concerns. In addition, there is a national push to explore and implement electronic monitoring in a variety of fisheries utilizing an assortment of gears. The information garnered through this EFP will be very informative in helping to design and implement EM systems both on the west coast but around the country in other regions as well.

Duration:
The EFP would be issued for the entire whiting season, which begins in May and continues through the remainder of the year.

Number of Vessels Covered:

Any vessel which participates in the primary whiting fishery would be eligible to participate under this EFP as long as they meet all criteria and requirements as outlined in this application – this could be as many as 37 vessels. Realistically there will be between a dozen and twenty vessels that likely take advantage of this EFP opportunity during the first year.

Whiting Fishery Description:
The West Coast whiting fishery is divided up into three distinct sectors: the shoreside fishery where vessels deliver to seafood processors onshore; the mothership sector where vessels catch and deliver the fish to at-sea seafood processors; and the catcher processor sector where vessels catch and process whiting on the same vessel. This EFP applies to the shoreside and mothership sector. Currently the at-sea season begins in May and the full shoreside sector begins in June (there is a small shoreside fishery in California which begins in May). In 2015 both sectors are expected to begin in May following the implementation of an amendment to the program that changes the shoreside date to effectively the match the start date of the at-sea fishery.

Fishermen target Pacific whiting (also known as hake) with midwater trawl gear. There is no sorting of the catch at-sea for the shoreside fishery and the crew works to get the catch into the fish holds and refrigerated seawater systems (RSW) as quickly as possible to ensure high quality fish. Pacific whiting contain an enzyme that causes the flesh to deteriorate and break down rapidly unless the fish is chilled immediately. All sorting of pacific Whiting catch is done shoreside at the seafood processor. The at-sea fishery requires that the vessel deliver their catch directly to the floating processor – the bag never reaches the deck of the catcher vessel. Bycatch species typically associated with whiting fishing includes rockfish and sometimes salmon.

Fishing activity is not expected to change substantially under this EFP. There may be more flexibility for fishermen who are not bound by the scheduling restraints of human observers – but once on the water the strategies and fishing behavior should be consistent with recent years since implementation of the rationalization program.

Scope:
This EFP application is to use an EM system in the whiting fishery for compliance with monitoring requirements only. Biological information collection is not part of this EFP.

The participants will fish under a maximized retention scenario like the one that is used now. Participants would be required to dump unsorted catch directly below deck and would be allowed to land unsorted catch providing an EMS is sued on all fishing trips to verify retention of catch at-sea. The fishermen will self-report their catch and any operational discards in their logbook. The video from the cameras will be used as an "audit" to ensure correct reporting. The reviewer will first review video for reported discards and follow-up with a 10% random review of the remaining video seeking any unreported discard events.

Unreported discard events that are discovered during the review will be cause for disciplinary action and loss of EFP privileges for the remainder of the season.

Fishermen will be required to complete a logbook (ideally an electronic logbook) that includes the following information:

- Date
- Set time
- Depth
- Time of net retrieval
- Latitude & Longitude
- Depth of head rope
- Estimated amount of catch
- Estimated amount of any operational discard

Applicants will work with a 3rd party provider to develop an electronic logbook – if an electronic logbook cannot be developed in time for when the EFP is implemented, than a paper logbook that captures the same information will be utilized (as is currently done in the fishery).

The vessel will develop a Vessel Monitoring Plan (VMP) that will be approved by National Marine Fisheries Service. The VMP will layout the placement of all cameras on the vessel and detail the criteria that the camera system must meet.

It is the responsibility of the Vessel Captain to ensure that all systems are operational before leaving port. The camera will be turned on once the first set is made and remain on until the vessel returns to port. The camera will not be required to be on while the vessel is initially transiting to the fishing grounds.

Video and logbook information will be transmitted once the vessel returns to shore via the already existing shoreside catch monitor.

A 3rd party organization (approved by NMFS) will be responsible for review of the logbook and associated video.

Specific Regulations from Which an Exemption is Being Requested:

a. Under 50 CFR § 660.12 (a)(1) it is unlawful for any person to retain any prohibited species, which must be returned to the sea as soon as practicable with a minimum of injury when caught and brought on board. This EFP allows the permitted vessel to retain prohibited species until offloading and requires the vessel to deliver all catch.

b. Under 50 CFR 660.140 (h)(1)(i)(A) any vessel participating in the Pacific Groundfish IFQ fishery is required to carry an observer. This EFP allows participants to utilize EM in lieu of the requirement to carry observers

Reporting Requirements

- Trawl logbooks must be maintained as required by the applicable state law and include the information detailed above

Maximized Retention Requirements

- All catch must be brought on board the vessel and retained until offloading, with some exceptions:
    - Pacific whiting removed from the deck and fishing gear during cleaning may be discarded, provided that the total does not exceed one based from any single haul, with the maximum dimensions of the basket being 24 inches by 16 inches by 16 inches. All catch in excess of the one basket would need to be placed into the fish hold. Discarding species other than pacific whiting would be prohibited.
    - Large individual marine organisms, such as marine mammals or fish species longer than 6 feet in length, could be discarded provided the species and the reason for discarding were properly recorded in the required logbook
    - All incidentally caught marine mammals would need to be documented in the vessel logbook and reported to the NMFS Office of Protected Resources by submitting a completed Marine Mammal Authorization Program mortality/injury report form.
    - Unavoidable discard of catch would be the result of an event that is beyond the control of the vessel operator or crew. The quantity and all species discarded as a result of an unavoidable discard event would need to be estimated, and the location of the tow, and reason for discarding recorded in the logbook.
    - Discard that results when more catch is taken than is necessary to fill the hold is within the control of the vessel operator and would continue to be prohibited.
- All prohibited species incidentally caught in a midwater trawl, and required to be retained under this section, would be abandoned to the State of landing immediately upon offloading.

EMS Requirements

- Owners of participating vessel would be required to arrange from EMS services from a NMFS-approved provider and pay all associated costs
- Vessels required to procure EMS services may also be required to carry an NMFS West Coast Groundfish Observer Program observer (for the purposes of capturing biological information)
- The vessel operator would be required to schedule maintenance of EMS equipment
- Before each haul is retrieved, the vessel operator would be required to check status of EMS control box to confirm that the EMS is functioning properly

- From 30 minutes before official sunset until 30 minutes after official dawn, each vessel covered under this EFP would be required to provide adequate lighting to areas where the trawl nets and fish are handled and fish hold openings, deck spaces, and the trawl ramp so the activities could be clearly recorded by the EMS cameras.

Table 1. Pacific Fishery Management Council Schedule for Considering Electronic Monitoring of the Pacific Coast Groundfish Limited Entry Trawl Fishery.

Dates	**Process Considerations**
April 2013 through November 2013	• Initial Scoping and Preliminary Development of Alternatives
April 2014	• EM Program Development Update • Consider EFPs for Preliminary Approval
June 2014	• Consider full analysis of alternative. • Select preliminary preferred alternative. • EFP Final Council Approval Forward to NMFS
September 2014	• Select final preferred alternative.
September 2014 through 2015	• Secretarial approval process and implementation, including ➢ regulation drafting and paperwork reduction act submissions, ➢ securing contracts for video review, ➢ commercial installation and testing, and ➢ observer program adjustments.
January 1, 2016	Final Rule is Effective with Implementation of EM program

Table 2. DRAFT Timeline for electronic monitoring (EM) rulemaking and exempted fishing permit (EFP) process, absent a workload feasibility assessment.

	2014				2015				
Task	April-May	June-August	Sept	Oct - Dec	Jan-Feb	March-May	June-Aug	Sept	Oct-Dec
EM Rulemaking	Provide update at April Council meeting; Determine NEPA document, (EA or EIS decision)[1]; continue drafting NEPA document.	Council selects preliminary preferred alternatives at June Council meeting; further develop NEPA document.	Council selects preferred alternatives at Sept Council meeting.	Complete NEPA document; start implementation/approval process; draft regulations; regulation deeming process; submit Paperwork Reduction Act collection of information request (6 months lead time).				Publish Proposed Rule.	Address public comment Final Rule effective Jan 1, 2016.
EFP	At April Council meeting, EFP application review by SSC, GMT, GAP, and Council and Council decision on preliminary approval; determine NEPA document; identification of responsible party for NEPA document. Begin drafting EFP NEPA document.	At June Council meeting, Council final decision on recommending EFPs to NMFS for implementation.	Submit Paperwork Reduction Act collection of information request (6 months lead time); draft EFP regulations and EFP permits.	Finalize NEPA document for EFPs; *Federal Register* notice of intent to issue permits (15-day comment period).	First implementation of EFPs possible by March 2015, dependent on competing NMFS workload.			Prelim-inary report/ feedback to Council regarding EFP findings.	Report to Council on EFP progress and findings; Council discussion regarding continuation of EFPs.

[1] The balance of this schedule presumes the NEPA document is an Environmental Assessment and not an Environmental Impact Statement.

Application for Experimental Fisheries Permit

Use of Electronic Monitoring in West Coast Trawl Fishery on Vessels Utilizing Fixed Gear.

Date: March 11, 2014

Applicants:

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Background:

In 2011, NMFS implemented a Council-developed catch share program for the West Coast limited entry groundfish trawl fishery. The program requires that each vessel acquire quota pounds (QP) to cover its catch (including discards) of nearly all groundfish species. Proper functioning of the program requires some form of at-sea monitoring to ensure that discards are enumerated for each vessel. The catch share program specified that this monitoring function be achieved through 100% at-sea observer coverage. Electronic monitoring (EM) is being explored as a potential technically and economically viable substitute for the use of human observers in the function of compliance monitoring for the catch share program.

In 2012 and 2013, Pacific States Marine Fisheries Commission (PSMFC) expanded its initial pilot project to test the feasibility of using electronic monitoring for catch accounting in the trawl catch share program in the west coast groundfish fishery. Included in expansion of the project were trawl-permitted vessels utilizing both pot and longline gear. Vessels were outfitted by NMFS certified EM service providers. In addition to the installation of EM systems, permitted vessel owners were also required to continue to contract for and carry a federal fisheries observer.

On May 3, 2013, National Marine Fisheries Services issued policy directive 30-133, setting forth the following objective:

It is the policy of the National Oceanic & Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NOAA Fisheries) to encourage the consideration of electronic technologies to complement and/or improve existing fishery-dependent data collection programs to achieve the most cost-effective and sustainable approach that ensures alignment of management goals, data needs, funding sources and regulations

Purpose and Goals:

For this experimental fishery permit, applicants propose to monitor catch and discard aboard a trawl-permitted vessel, utilizing fixed gear, via an electronic monitoring system, without the on board presence of a human observer. Compliance monitoring, rather than the collection of biological data, is the primary focus of this application. While industry is interested in finding less costly and more flexible methods to monitor catch and discards at sea, this application is meant to address a key management issue:

Can video monitoring be used on board a fixed gear vessel to accurately track and correctly identify an individual's fish catch, including discards, to be debited from a quota account? And can this be done without the presence of a trained federal fisheries observer?

From previous experience in 2012 and 2013 with the PSMFC pilot projects, preliminary data has indicated a very high confidence level in the correlation of logbook data entered by vessel captains of the weight and the species of fish caught and discarded, when compared to observer data and the review of onboard video. Applicants seek the issuance of an EFP to show whether such a high confidence level in the reporting of catch and discard can be demonstrated solely through the use of EM and without the presence of the human observer.

Broader Significance of EFP: In the event that there continues to be a very high correlation of EM data, video review and logbook data of the catch and discard of IQ species aboard the vessel, it is anticipated that the requirement for 100% human observer coverage on trawl-permitted vessels using fixed gear may be significantly reduced, if not entirely eliminated.

Duration of EFP and Number of Vessels Participating: Applicants request that this EFP be for a duration of two years, beginning January 1, 2015 and ending December 31, 2016.

While vessel owners from three states are submitting this application for an EFP, it is anticipated that an estimated 20 other trawl vessel operators utilizing fixed gear and experienced in the deployment and operation of EM could qualify under this EFP to participate in the second year.

Applicants envision the successful outcome of this EFP will be demonstrated within the first year, and anticipate Council action and NMFS future approval of a regulatory amendment to allow the use of EM without the presence of a human observer. However, applicants' past experience with the regulatory process leads them to believe that the amendment process may be quite lengthy, possibly exceeding two years. With the implementation of a two year EFP on January 1, 2015: 1) additional vessels will be able to join for the second year, providing additional data, and 2) the EFP can continue without interruption, pending a regulatory amendment.

Qualifications of Applicants:

John Corbin has longlined for sablefish off the West Coast and Alaska for more than 30 years. The F/V Buck and Ann is 56 ft long and the F/V Southeast is 66 ft long. Both vessels have trawl permits with sablefish and other groundfish quota in their respective vessel accounts, and have fished the trawl permits with pot gear for the last 3 years. During 2013, the F/V Buck and Ann participated in the PSFMC project, deploying an EM system while also carrying a federal fishery observer.

For purposes of this application, the F/V Buck and Ann will be using pot gear as will the F/V Southeast. The F/V Buck and Ann may also utilize longline gear while fishing off Morro Bay, CA.

Bob Eder has fished for sablefish with pots off the coasts of Oregon and Washington for 35 years. The F/V Timmy Boy is a 60 ft vessel, and has a trawl permit, sablefish and other groundfish quota in its vessel account, and fished its trawl permit with pot gear in 2011 and 2013. During 2013, the F/V Timmy Boy also participated in the PSFMC project, deploying an EM system while also carrying a federal fisheries observer.

Bill Blue has fished commercially for 40 years off the California coast in multiple state and federally managed fisheries with various gear types. Most recently, he began pot fishing for sablefish in 2006. In 2008 he was part of the first EFP to use fixed gear to harvest trawl allocation and has continued to be involved with catching trawl quota with fixed gear. In 2009 he added EM to the project, and while participating in that fishery, has not left the dock from that time until now without a human observer and EM on his boat. He currently owns and operates the F/V Brita Michelle.

Burton Parker has fished numerous pot and trawl fisheries and owned commercial vessels off the West Coast and Alaska for 40 years. He has previous experience with the installation and operation of EM in the whiting fishery. Alyssa Ann LLC is the owner of the F/V Alyssa Ann, a 44 ft vessel that fishes for sablefish out of Newport and Astoria OR. Burton Parker is the sole member of the LLC. The vessel has a trawl permit, quota in the account, and uses pots to fish for sablefish. The vessel's skipper is Jake Erickson, who has commercially fished for 10 years, and has 3 years' experience operating the F/V Alyssa Ann, fishing for sablefish with pots.

Methods:

All of the applicants have successfully participated in at least one, if not multiple years, in an EM program aboard vessels they own. All have experience working with EM contractors, having vessels outfitted with gear and cameras, making system modifications suited to the individual vessel to ensure operational success, using customized logbooks, and facilitating data storage, retrieval, and delivery to EM contractors.. It is anticipated that the protocol for EM for this EFP will be entirely consistent with the protocols as established in previous years under PSMFC guidelines.

A. MONITORING REQUIREMENTS:

1. Procurement of electronic monitoring system services. Each vessel must have properly installed and functioning EMS equipment, unless the vessel has been granted a written EMS coverage waiver by NMFS. Owners of vessels must arrange for EMS services from a NMFS EMS service provider. Currently, the following are NMFS-specified EM system providers:

    - Archipelago Marine Research, Ltd.
    - Saltwater, Inc.

2. Installation. A vessel owner intending to fish under this EFP must schedule a time with the specified EMS provider for installation of the system. The EMS must be installed, tested, the system initialized and the EMS computer box sealed with tamper evident seals before the vessel leaves port on the first EFP fishing trip. Fishing without installing and testing the EMS equipment is a violation of this EFP.

3. EMS maintenance and data retrieval. As specified by the EMS provider, the vessel operator must schedule maintenance of EMS equipment and data removal by the NMFS-specified EMS provider by scheduling periodic appointments during the term of this EFP.

4. System checks. On each trip prior to leaving port, the vessel operator must conduct an EMS system status check as specified by the EMS provider to confirm that all components of the EMS are functioning properly. The EMS will record the results of this check. If the EMS check identifies a malfunction, the vessel must contact the NMFS-specified EMS provider immediately. When requested by the EMS service provider, the vessel would be required to carry EMS units that transmit system performance data while a vessel is at sea. Any such requirement would be in addition to the operator initiated system check which is to occur on each trip.

5. System malfunctions. The vessel is obligated to monitor the EMS performance. When aware that the EMS is not functioning properly or that the power has been interrupted, the vessel must contact the EMS service provider immediately. The EMS provider is required to provide technical service within 24 hours of notification.

6. Logbooks: For purposes of this EFP, vessel captains shall utilize what is known as an "Oregon Fixed Gear Logbook," as modified per instructions from PSMFC and utilized in 2013 in the EM protocols. Vessels shall also maintain any other logbooks as required by state and federal agencies.

B. FISHING RESTRICTIONS

1. Gear restrictions. Only legal pot or longline gear may be used for fishing under this EFP.

2. Permits. Each participating vessel must have a limited entry trawl permit registered to the vessel, and have a vessel account with quota pounds registered to the account before beginning fishing. A copy of this EFP must be carried on board the vessel while EFP fishing and when fish caught while fishing under the EFP are on board the vessel.

3. Retention requirements. A vessel fishing trawl quota share with fixed gear under this EFP must account for 100% of all IFQ species caught on board the vessel. Procedures regarding full retention of fish shall be consistent with those approved and operational during the PSFMC EM practices in 2013. All IFQ species must be retained until offloading, with the following exceptions:

   i. Fish in unmarketable condition ; or
   ii. Halibut, which will be measured, evaluated for condition, and returned to the ocean.

   Non IFQ species such as deepwater crab, giant grenadier, pink urchins, and brittle stars, may be discarded at sea.

   If a large marine organism is discarded, the species and the reason for discarding must be recorded and labeled as "discard" in the required logbook. Any incidentally caught marine mammals must be documented in the vessel logbook and reported to the NMFS Office of Protected Resources by submitting a completed Marine Mammal Authorization Program mortality/injury report form as required by regulations at § 50 CFR 229.4.

4. Landing restrictions. All fish must be offloaded at only one designated processing plant (i.e. the offloading of catch from one trip cannot be split between two or more processing plants). Once offloading has begun at a designated processing plant, all fish on board the vessel must be continuously offloaded at that plant. The processing plant must be one qualified to receive trawl quota fish under the limited entry trawl IFQ program.

C. DATA RETRIEVAL AND ANALYSIS:

Applicants will work in partnership with PSMFC and EM service providers to insure the integrity of and timely delivery of data from the vessel to the service provider for analysis. Once the data is obtained from the vessel, the following is a general description of the analysis undertaken by the service provider

1. Evaluate data set completeness and identify fishing events

2. Confirm fishing events, and examine catch stowage operations to examine compliance with full retention of IQ species

3. Document discard events

4. Examine vessel logs to verify trips and fishing events align with sensor data

5. Compare vessel operator records of landed catch and discard as compared with EM data.

D. REPORTING REQUIREMENTS:

1. Preliminary: Pursuant to Council Operating Procedures, applicants, in conjunction with the EM service provider, will present a preliminary report on the results of the EFP at the November Council meeting in 2015. The report will indicate the applicants' intent to continue the EFP activity for the second year of the management cycle.

2. Final: A final written report of the results of the EFP will be presented by the applicants to the GMT, GAP, SSC and the Council at the September Council meeting of the year following the management cycle for which the EFP activity is conducted. The final report will include a summary of the work completed, an analysis of the data collected, a conclusion and recommendations.

Submitted by Applicants:

s/ John Corbin

s/ Bob Eder

s/ Bill Blue

s/ Burton Parker

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On Behalf of Applicants

Agenda Item C.7.a
Supplemental Staff Overview PowerPoint
April 2014

Agenda Item C.7

Electronic Monitoring Program Development and Preliminary Approval of Exempted Fishing Permits

Agenda Item C7 Attachments

- Agenda Item C.7.a, Attachment 1: Table 1, General Introductory Display of Electronic Monitoring Alternatives.
- Agenda Item C.7.a, Attachment 2: Table 2, Medium Level Descriptive Display of EM Alternatives.
- Agenda Item C.7.a, Attachment 3: Table 3: Detailed Descriptive Display of EM Alternatives.
- Agenda Item C.7.a, Attachment 4: Notice Letter Regarding EM EFP Process.
- Agenda Item C.7.a, Attachment 5: Council Operating Procedure 19.
- Agenda Item C.7.a, Attachment 6: Silva EFP Application.
- Agenda Item C.7.a, Attachment 7: Leipzig EFP Application.
- Agenda Item C.7.a, Attachment 8: California Risk Pool EFP Application.
- Agenda Item C.7.a, Attachment 9: Mann/Paine EFP Application.
- Agenda Item C.7.a, Attachment 10: Adopted Process and Schedule to Consider EM Regulations.
- Agenda Item C.7.a, Supplemental Attachment 11: Timeline-EFPs vs. EM Regulatory Package.
- Agenda Item C.7.b, GEMTAC Report: GEMTAC Report to Council.
- Agenda Item C.7.b, NMFS Report: WCOP Impact Analysis.

Overview

- **WCGOP Report**
- **Other management entity reports**
- **Advisory body statements**
- **Public Comment**
- **Council Action**

Council Action

- Provide guidance on further development of EM program.
  - Confirm or add to the range of alternatives in Attachment 3.
  - Alter or add options to the action alternatives in Attachment 3.
  - Consider options for responsible party payments for biological observers.
  - Guidance on specific analysis of the alternatives and options.

Council Action

- **Recommendations for further consideration of EFPs.**
- **Provide guidance on schedule and process calendar.**
- **Provide other guidance as necessary.**

Agenda Item C7b

Groundfish EM Technical Advisory Committee (GEMTAC) Report

Questions?

GROUNDFISH ELECTRONIC MONITORING TECHNICAL ADVISORY COMMITTEE REPORT
April 2014

Report to the Council

The Groundfish Electronic Monitoring Committee (GEMTAC) met January 22-23, 2014 in Portland, Oregon to discuss development of an impact analysis for the range of alternatives and options adopted by the Council for an electronic monitoring (EM) program. The GEMTAC also reviewed preliminary Exempted Fishing Permits (EFP) documents submitted to the GEMTAC by potential applicants. The GEMTAC had productive discussions and provided verbal comments to the applicants for consideration. With respect to the impact analysis, the committee reviewed plans for the analysis including issues and identified questions; numerous data requests were identified to support the analysis.

The GEMTAC received a presentation from the NMFS West Coast Observer Program (WCOP) on potential impacts an electronic monitoring program might have on the scientific collection program and consequences for industry and the agency. A more detailed report is available in Agenda Item C.7.b NMFS Report, April 2014 Council meeting.

The GEMTAC discussed the presentation by the WCOP and the observer duties. There are two types of duties for observers in the IFQ fishery, compliance observations and scientific observations. Compliance observations are needed to support catch and discard monitoring in the IFQ fishery to estimate total catch by a fishermen. Scientific observations are conducted to collect data to support stock assessments and estimate protected species interactions, amongst other things. If EM is used on IFQ trips and the observer is removed from the vessel without making other program adjustments, significant scientific information would be lost. A continuous need exists for at least some level of scientific observer coverage to collect biological samples and other scientific data on EM trips.

During the GEMTAC discussion, a possible need for an additional provision for the EM alternatives was identified. If scientific observations are needed on EM trips, who will be responsible for the costs of collecting this information? How the scientific observers are funded may substantially affect the impacts of a transition to EM. Prior to the trawl rationalization program NMFS paid for observers to collect biological data. If the management policy requires that the industry continue to pay for fulfillment of the biological observer function, the impacts (both financially and operationally and for both industry and NMFS) may be substantially different than would be the case if NMFS pays for observers. As an example with respect to operations, if NMFS is paying for observers, vessels may encounter longer wait times for observer availability. These and other potential impacts can be developed in greater detail in the forthcoming impact analysis of the alternatives; however, before proceeding with the analysis it may be most efficient for the Council to provide guidance on a reasonable range of options for the issue of payment for scientific observers.

Agenda Item C.7.b
NMFS Report
April 2014

NORTHWEST FISHERIES SCIENCE CENTER OBSERVER PROGRAM CONSIDERATIONS AND IMPACTS REGARDING ELECTRONIC MONITORING IMPLEMENTATION

The West Coast Groundfish Observer Program (WCGOP) is responsible for providing fishery-dependent data for management of west coast groundfish fisheries. Observer data supports stock assessments, bycatch estimates, protected species management and fisheries research. The latter includes important information for management decisions including EFH delineation, stock complex designation and more. Under the Individual Fishing Quota (IFQ) program, vessels are required to have 100% observer coverage. The observer program provides in-season discard estimates to the Vessel Account System (VAS) for quota management and collects scientific data.

Implementing Electronic Monitoring (EM) for compliance monitoring will affect the observer program, observer providers, and logistics of the program. Scientific data collection will continue to be a need for fisheries management. There may be options for obtaining this information under different EM scenarios, such as:

- Observer coverage under a scientifically-based sampling plan
- Electronic logbooks
- Increased shoreside monitoring/sampling
- Combination(s) of the above
- In all cases, sampling plans and reporting requirements will need to be developed

Implementation of EM via an EFP for January 1, 2015, will likely create workload issues and a very short timeline for the WCGOP to develop and implement plans for scientific observer coverage. A regulatory approach will allow for more strategic planning of what an EM program will look like and more time to develop efficient observer coverage plan. Typically EFPs require an observer to be present on the vessel to help monitor the effectiveness of the EFP. The proposed EM EFPs request exemption from observer coverage; therefore, the proposals should contain contingency plans for how discard will be reported when equipment failures occur. There will not be an observer on board to validate or provide discard or catch estimates.

A main driver of EM implementation seems to be to reduce the costs to vessels for at sea observers and a cost analysis will be vital in the overall discussion of EM. It is unclear the monetary benefit that will be realized by implementing EM compared to the current status quo. Overall costs, including training, equipment, and data management and processing should be included. Data management in particular needs to be considered in regards to cost. There will likely be significant costs associated with integrating existing data systems and creating new EM data infrastructures. There is likely to be a need to use EM data directly for quota management as well as for scientific uses and there should be standardization of the data so those that need it are able to use and integrate it efficiently.

Relevant Observer Program Needs to Support Robust Science

- Unbiased, random sampling of fleets/fisheries with spatial distribution

- Ability to quantify and randomly sample;
  - IFQ species
  - Non-IFQ groundfish species
  - Other non-groundfish species
  - Protected resources
    - In the future PR monitoring mandates could affect observer coverage levels needed in any fishing sector including those with EM

- Vessel and trip level information (spatial and effort data, landings information, etc.)
  - Electronic logbooks for reporting spatial, trip and vessel information along with electronic reporting methods should be considered with any EM program and will aid in fishery dependent data needs
    - Not all sectors currently require vessel logbooks
  - Relevant EM data should be in a format useable for the observer program and fishery managers to provide needed fishery dependent data products in lieu of observers

- 20%-30% coverage need for scientific observer data
  - These are pre-IFQ observer coverage levels
  - Assumption that vessels not carrying EM will continue to have 100% observer coverage
  - Likely need for a new trip by trip call-in type notification system as used by other regional observer programs
  - Research is currently underway to help inform future appropriate coverage levels and coverage level effects on bycatch estimation

- Adequate declaration timelines that allow for the planning and preparation of an observer workforce
  - Training and placement of observers requires time and money
  - Liberal switching from EM and observer coverage will create problems and likely result in observer shortage and retention issues as well as increase training and briefing needs
  - The level of participation in EM will affect how the observer program and providers are able to operate

- Knowledge of the funding mechanism for scientific observer coverage in the fishery sectors implementing EM

General Sector-specific considerations

At-Sea Mothership Sector

General

The Mothership Catcher Vessels (MSCV) seems like a good candidate for EM due to the nature of the fishing operations (high volume, low bycatch with single codends tied off and delivered to motherships (MS)) along with the general lack of sorting or discarding from the deck.

Sampling design/coverage

This fishery currently has observer coverage on the MSCVs and motherships. With maximized retention, an EM system with an electronic logbook and continued mothership observer coverage, it is feasible that EM could collect the discard or compliance information needed to monitor catch allocations and scientific observers would not be needed on the MSCVs. Data collected on the motherships is of much higher value than that on the MSCVs: therefore, the collection of scientific data from the motherships coupled with adequate logbook data should supply the necessary scientific data needed for the fishery.

Maximized Retention vs. Discarding at-sea

This fishery already operates in a maximized retention manner which supports a simpler compliance EM system and could facilitate observers on the motherships only. If discarding practices or catch compositions change, scientific observer coverage may be needed at the 20-30% level for vessels with EM.

Cost

Under the scenario described above no increased costs to the observer program are anticipated at this time. If at-sea scientific observers were needed and were agency funded, then increased costs would be realized. Observer costs for vessels without EM could increase since there may be less business available for observer providers.

Shoreside Whiting Sector

General

The Shoreside Whiting sector seems a likely candidate for a successful EM program due to the nature of the fishery (high volume, low bycatch, little to no sorting at sea). There is also extensive data on EM pilots to help inform an EM strategy for this fishery.

Sampling design/coverage

Unlike the at-sea whiting fishery there is no observer sampling at the delivery site, only on the vessels. Some type of at-sea or shoreside observer program for biological data collection is likely to be important.

Maximize Retention vs. Discarding at-sea

This fishery already operates in a maximized retention manner which supports a simpler compliance EM system and could facilitate the need for shoreside observer sampling only, particularly when coupled with electronic reporting. If discarding practices or catch compositions changed, scientific observer coverage may be needed at-sea at the 20-30% level.

Cost

Implementation of a shoreside observer program or expansion of the shoreside catch monitoring program would likely increase observer program training and operational costs. If at-sea or shoreside observers are needed and were to be agency funded, that would increase agency costs as well. Observer costs for vessels without EM could increase since there may be less business available for observer providers.

Shoreside Fixed Gear Sector (longline and pot)

General

While this is a multi-species, potentially high-volume fishery, fishing operations seem to be captured fairly well with EM. There are issues with species identification and discarding at sea that could be problematic under EM for some species. There is also data from previous pilot projects to help inform EM decision making.

Sampling design/coverage

This is a multi-species, multi-target fishery that lands multiple sets at a time at each delivery. Even under a maximized retention EM system the mixing of catch that occurs with this type of fishing doesn’t allow for collection of spatially specific biological data and species complex data at the landing site, as in the whiting fishery. For vessels electing to carry an EM system, random observer coverage would likely be needed at sea at a 20-30% rate to collect this data.

Maximized Retention vs. Discarding at-sea

Due to the large number of species caught and the current limitations of EM to identify species, it seems that a maximized retention fishery would be a better candidate for EM.

Cost

If observer coverage is to be agency funded, this will be an increased cost for the observer program. If shoreside sampling needs to be increased this could increase cost and workload as well, depending on funding sources and implementation. Observer costs for vessels without EM could increase since there may be less business available for observer providers.

Shoreside Bottom Trawl Sector

General

This is a multi-species, high-volume fishery, with fishing operations that generally involve discarding a number of species at sea. This fishery encounters a high number of groundfish species and has seen habitat and protected species interactions as well. Research and testing are currently underway to help develop EM options in this fishery. Unfortunately there isn't a history of applicable EM pilot studies on the west coast in this fishery sector.

Sampling design/coverage

This is a multi-species, multi-target fishery that lands multiple sets at a time at each delivery. Targets often vary significantly from tow to tow on a given trip and by depth. Even under a maximized retention EM system, the mixing of catch that occurs with this type of fishing activity doesn't allow for collection of spatially specific biological data and species complex data at the landing site, as in the whiting fishery. For vessels electing to carry an EM system, random observer coverage would most likely be needed at sea at a 20-30% rate to collect this data.

Maximized Retention vs. discarding at-sea

Due to the large number of species caught and the current limitations of EM to identify species, it seems that a maximized retention fishery would be a better candidate for EM. The decision on the ability to discard species like corals should be addressed in the larger EM discussions in the light of EFH.

Cost

If observer coverage is to be agency funded, this will be an increased cost for the observer program. If shoreside sampling needs to be increased this could increase cost and workload as well, depending on funding sources and implementation. Observer costs for vessels without EM could increase since there may be less business available for observer providers.

ENFORCEMENT CONSULTANT REPORT ON ELECTRONIC MONITORING PROGRAM DEVELOPMENT INCLUDING PRELIMINARY APPROVAL OF EXEMPTED FISHING PERMITS

The Enforcement Consultants (EC) has reviewed the documents associated with agenda item C.7, and in particular Agenda Item C.7.a, Attachment 3, April 2014 and has the following comments.

The EC is highly interested in the development and implementation of Electronic Monitoring (EM) strategies. Primary issues for the EC are the proper use of cameras as a component to achieving compliance monitoring objectives, development of an electronic logbook, and expanded use of the Pacific States Marine Fisheries Commission (PSMFC) E-Fish Ticket program.

We appreciate the work done by PSMFC as they further develop and understand these tools and their capabilities and restrictions.

Working from *Table 3: Detailed Descriptive Display of EM Alternatives,* the EC endorses the three alternatives as presented. These alternatives are consistent with the recommendations we made at the November 2013 Council meeting under Agenda Item H.8. Electronic Monitoring Alternatives. We have no recommended modifications, deletions, or additions at this time.

Speaking to the specific component of Adaptive or Phased Implementation, the EC is a strong supporter of *Option B: Use EFPs to test final Council policy, prior to full regulatory implementation*. We also recognize the merits of *Option C: Phase in by sector/gear*. Both alternatives allow for a phased-in approach that will provide opportunity to test "proof of concept" of the many nuances of this proposed compliance monitoring program.

Some will suggest that certain sectors such as the at-sea Pacific whiting fishery could move forward under a regulatory development schedule and that no further exempted fishing permit (EFP) testing is necessary. Other sectors, such as fixed gear and bottom trawl could certainly benefit from an EFP phased-in approach. The dilemma in moving forward with both a regulatory and EFP approach is the impact on workload, putting proposed timelines for both processes at risk, which for the EC is the heart of the issue, risk!

The EFP proposals the Council will be evaluating under this agenda item encompass all trawl rationalization sectors. With some further guidance and development, the EC believes the Leipzig, Fisherman's Marketing Association (FMA) EFP Application, the California Risk Pool EFP Application, the Mann/Paine EFP Application, and the Eder Fixed Gear EFP Application have merit and represent a unique opportunity for the Council. That is not to say that these applications are complete and "ready for prime time."

To that end, the EC offers these specific comments:

Leipzig FMA EFP Application: This application will provide the opportunity to analyze the capabilities of EM on a bottom trawl vessel under a full/maximized retention protocol.

The application presents a clear justification for testing EM on bottom trawl vessels, but lacks rationale for the large scope of the EM work. The applicant appears capable of reporting results of the EFP, but vessel specific oversight is unclear, particularly if the permit were an umbrella EFP. The EFP proposes near full retention which could address a barrier in EM implementation for bottom trawl and non-whiting midwater trawl, and will be using existing EM systems and providers.

But, there will be discards, so there needs to be a plan for handling discards. More importantly, a crew handling plan for protected species needs to be included. As presented, halibut would be retained, a specific violation of International Pacific Halibut Commission regulations. Overall, the applicant needs to add catch accounting rules adequate for individual fishing quota (IFQ) catch accounting if IFQ and individual bycatch quota catch are discarded.

The large number of participants (upwards to 120) is problematic. In discussions, the applicant has indicated that the retention requirements and potential halibut interactions will virtually eliminate vessels fishing near shore of the Rockfish Conservation Area. The primary target species will be Dover sole. The applicant suggests that perhaps as many as 20 vessels may participate.

More specifics on system components such as lighting requirements and chain of custody would be helpful. What is the protocol if the EM system fails at sea? The applicants' actions to address non-compliance needs to be a stronger component of the EFP. For example: how would the applicant facilitate removal of the EFP for non-compliance in lieu of due process?

California Risk Pool EFP Application: This application is by far the most comprehensive application received and offers the Council the opportunity to analyze a maximized retention protocol for fixed gear and a modified retention protocol for bottom trawl in a nearshore application.

The applicant presents a clear justification with clear goals and objectives and appears capable of providing adequate oversight of EFP activities and reporting. The scope of the work is reasonable and is applicable to fixed gear and trawl, which could be later applied to non-IFQ fisheries, particularly fixed gear.

Specific to enforcement, there are well-defined maximized retention protocols per gear type. The applicant proposes to only use existing EM systems and providers. Catch accounting from video sources is addressed to include catch accounting rules for IFQ catch accounting. This is the only EFP proposed that recognizes the need for observer validation. Chain of custody is considered, but more explanation is needed as to what constitutes discarding for safety.

Mann/Paine EFP Applications: This is a maximized retention EM application for the At-Sea Whiting and Shoreside Midwater Trawl sectors.

The applicant presents a clear justification for testing EM on midwater trawl vessels in two sectors, but could benefit by bolstering the rationale for the large scope of the EM work. The applicant appears capable of reporting EFP outcomes, but vessel-specific oversight is unclear, particularly if approved as an umbrella EFP. The applicant states that the work is broadly significant, but does not identify what aspects are broadly significant. Existing EM systems and providers will be used in this EFP.

There is no discussion regarding target species, i.e. whiting and/or yellowtail. This is significant because regulations regarding salmon disposition are different for these species. Absent specifics, we assume this application to be for EM use on a midwater trawl vessel, targeting more than just Pacific whiting. As such, the applicant needs to add catch accounting rules adequate for IFQ catch accounting for IFQ discards and prohibited species handling protocols. The application is unclear how the EFP would facilitate removal of the EFP for non-compliance, as such; a non-compliance criteria needs to be a stronger component of the EFP.

Eder Fixed Gear EFP Application: This application is for use of EM under a fixed gear maximum retention protocol.

The applicant presents a clear justification for testing EM on fixed gear vessels and appears capable of reporting results of the EFP, but vessel specific oversight is unclear, particularly if the permit was issued as an umbrella EFP. This proposal is applicable to fixed gear which could inform EM usage in fixed gear non-IFQ fisheries. The maximized retention protocols need refinement. The applicant proposes only using existing EM systems and providers but fails to address the percentage of video that would be analyzed. Are we to assume 100 percent video analysis? What is the protocol if the EM system fails at sea?

The applicant needs to add catch accounting rules adequate for IFQ catch accounting for IFQ discards. The application is unclear how the EFP would facilitate removal of the EFP for non-compliance, as such, non-compliance criteria need to be a stronger component of EFP.

Other than the California Risk Pool EFP application, no other EFP application includes any of the concepts delineated in the document "*Electronic Monitoring Compliance Program: Electronic Monitoring System (EMS) Criteria*" as presented at the November 2013 Council meeting. The EC believes the applications could be improved with consideration and inclusion of these program incentive/accountability components.

We believe applicants would be well-served to evaluate and consider elements contained throughout the California Risk Pool EFP application to include: Section 6, Justifications and Broader Significance where mitigating accountability risks are addressed, and Section 11, Proposed Data Collection in its entirety where Individual Vessel Monitoring Plans, data capture and analysis, concurrent observer coverage, quota accounting, and compliance with related penalty structure are discussed in detail.

In Summary

As presented, these EFP applications provide an opportunity for each sector to further explore their interest in using EM monitoring technology in lieu of the 100 percent human observer coverage. Yes, some EFPs have components which are redundant from previous experiments, but they still offer opportunity for furthering technology development, analytical capabilities, and development of incentivized self-governing schemes. And then there are other EFPs, which will explore new ground providing information for future regulatory development that simply does not exist today.

Is there risk in moving forward with these EFPs as presented? Certainly, but with modifications prior to implementation, as well as subsequent improvements as more is learned, we feel the risk is mitigated to make it more equitable on the risk/reward scale. Is there also risk in moving forward with EM regulations? Absolutely! For example: the EC, as an advisory body, is not yet comfortable with making recommendations on EM application in the bottom trawl sector. Nor is there a thorough understanding of the implications on observer coverage, observer availability, or observer costs if the Council moves forward with regulations to provide EM in the whiting sectors, but not in other sectors.

Therefore, we return to the original dilemma: Can we continue with EM regulation development and EFP implementation concurrently? It appears, due to workload implications, the answer is no. So which option, regulations or EFPs, offers the best option for timely EM implementation with the least amount of risk? The EC contends the answer is to pursue EFPs, while using a deliberate, informed, controlled, and adaptive, "learn as you go" approach.

To the extent workload will constrict the number of EFPs which can be finalized and implemented within the Council's desired timeframe; the EC offers this qualitative ranking.

1. California Risk Pool
2. Eder Fixed Gear EFP
3. Mann/Paine EFP
4. Leipzig FMA EFP

EC Recommendations:

1. Forward for further consideration and development the following EFP applications (Provide guidance to the applicants to include elements of *Electronic Monitoring Compliance Program: Electronic Monitoring System (EMS) Criteria* as appropriate):

    Leipzig, Fisherman's Marketing Association (FMA) EFP Application
    California Risk Pool EFP Application
    Mann/Paine EFP Application
    Eder Fixed Gear EFP Application

2. Prioritize EFP EM development, analysis, and processing over EM regulation development.

PFMC
04/06/14

Agenda Item C.7.b
Supplemental GAP Report
April 2014

GROUNDFISH ADVISORY SUBPANEL REPORT ON ELECTRONIC MONITORING PROGRAM DEVELOPMENT INCLUDING PRELIMINARY APPROVAL OF EXEMPTED FISHING PERMITS

The Groundfish Advisory Subpanel (GAP) heard a report from Mr. Brett Wiedoff on electronic monitoring (EM) alternatives and EM exempted fishing permits (EFPs), and from Mr. Jon McVeigh on the ongoing need for scientific observers. The GAP offers the following comments.

The GAP would benefit from clarification of workload and timeline issues for the regulatory and EFP processes. As we mention in more detail below, our primary goal is to see effective and cost effective EM systems implemented as quickly as possible. Without additional clarification, the best pathway forward is not clear. For example, when would regulations likely be implemented if we proceed with the regulatory pathway? Would it be possible to proceed with the regulatory process for the whiting sector and EFPs for the other sectors? If we did so, when could we expect EM to be on the water? If we proceed with EFPs for all sectors and delay the regulatory process, when could it be resumed?

Regulatory Process

The GAP believes that the EM alternatives are comprehensive and adequately capture the universe of potential options that should be analyzed prior to EM implementation.

Biological sampling

The GAP understands that if the Council approves EM for compliance monitoring there will still need to be human observers for biological sampling where appropriate. While the GAP strongly supports the ongoing need for robust science, the GAP believes those costs should be borne by National Marine Fisheries Service (NMFS). NMFS covers those costs for other sectors and fisheries on the west coast as they do in other regions. Likewise, prior to the implementation of the individual fishing quota (IFQ) program, the cost of scientific observers was covered by NMFS. The data collected supports not only the trawl fishery but also other groundfish sectors. For those reasons, the GAP believes NMFS should pay for scientific observers in the fishery at an appropriate rate of coverage for biological sampling (likely around 20 percent). EM for compliance monitoring should in no way interfere with NMFS' prerogative to continue biological sampling.

EFP Process

Council Operating Procedure 19 states "An exempted fishing permit (EFP) is a Federal permit, issued by the National Marine Fisheries Service, which authorizes a vessel to engage in activity that is otherwise prohibited by the Magnuson-Stevens Act or other fishery regulations for the purpose of collecting limited experimental data." The purposes include encouraging innovation and efficiency in fisheries and evaluating current and proposed management measures.

At the outset, the GAP notes four of the five EFP applications were excellent, reflecting significant work and careful thinking on the topic by the applicants. They meet the requirements of COP 19 and the Federal regulations for EFPs.

To reiterate our previous statements, costs of participating in the IFQ program are high, access to target stocks remains low, and many trailing amendments that could reduce cost or increase profitability are stuck in the trailing amendment pipeline. Replacing 100 percent observer coverage with EM can reduce direct costs of participation and reduce the number of missed trips thereby enhancing the IFQ program. To enhance economic benefits to the industry, fishing communities and the nation, the GAP would like to see EM implemented in the fleet as quickly as possible.

The GAP believes that EM coverage in the whiting fishery can be established via either a regulatory process or an EFP process. This belief was supported by Mr. Colpo's presentation and particularly his statement that there is really nothing left to test. However, the GAP heard that the regulatory timeline would not allow implementation prior to 2016, so the GAP believes the EFP route is likely the best opportunity to place EM on whiting vessels before the start of 2015 whiting season (Presently June 15, 2015). To reiterate, the GAP supports whichever option will place EM on whiting vessels most quickly.

Regarding the fixed gear fishery some vessels have already carried EM for multiple years under the PSFMC program. The Council saw in the Mr. Colpo's presentation a very high correlation of EM with catch monitor data. This fishery is far enough advanced in its experience with EM for implementation of an EM EFP in 2015.

For the trawl sector, the GAP believes that Mr. Leipzig and California Risk Pool EFPs will help inform the regulatory process. While the GAP firmly believes that maximized retention will work for the bottom-trawl sector, the GAP understands that unlike whiting where an EM EFP operated for many years, an EFP is necessary to demonstrate that ability. Under the incentives inherent in the IFQ program, we have already seen the discard rate drop dramatically. This will make maximized retention much easier for fishermen to handle. Likewise, the amount of discard in the "optimized retention" EFP will be relatively small for that same reason. The GAP notes that for bottom trawl, there could be additional benefit by proceeding with both EFPs rather than either one alone. A comparison could be made between the two, providing information about costs, commercial viability, and other important considerations under two separate EM program designs. This would be of great help in developing eventual regulations.

For the reasons stated above, the GAP believes that four of the five EFPs should move forward for further consideration. The Silva EFP was simply not complete enough to move forward. The GAP believes the Silvas would be eligible to participate in another bottom trawl EFP should one be approved. If there is a workload issue which creates a situation in which regulations cannot move forward simultaneously with EFPs, then we support delaying the regulatory process in order to prioritize the EFPs. We would then propose resuming the regulatory process when workload permits. The GAP believes that two-year EFPs would be most appropriate for testing EM.

Discard definition – One EFP applicant noted that NMFS' definition of discard would drive costs unnecessarily high and could impair the viability of the EFPs. That applicant proposed an alternate definition that would not count as discard those fish which do not touch the deck. The GAP notes that the definition of discard will be a major factor in overall cost and having a final definition is critical before discussing with EM providers what their systems will need to do. Mr.

Colpo's presentation and discussions with Mr. McVeigh revealed that the volume of fish that is caught but doesn't touch the deck is insignificant. The Groundfish Electronic Monitoring Policy and Technical Advisory Committees are planning to discuss discard definitions at their upcoming meeting on May 7th and 8th.

PFMC
04/07/14

GROUNDFISH MANAGEMENT TEAM REPORT ON ELECTRONIC MONITORING DEVELOPMENT INCLUDING PRELIMINARY EXEMPTED FISHING PERMITS APPROVAL

Some of the Groundfish Management Team (GMT) reviewed the Pacific States Marine Fisheries Commission (PSMFC) Draft Report Electronic Monitoring (EM) Program (Agenda Item C.1.b, Attachment 1, April 2014) and PSMFC 2014 EM Research (Agenda Item C.1.b, Attachment 2, April 2014). Some on the GMT were also able to attend the presentation by Mr. Dave Colpo and Dr. Alia Al-Humaidhi (Agenda Item C.1.b, Supplemental PSMFC PowerPoint, April 2014). Many GMT members did not have time to thoroughly review and comment because of the GMT's 2015-16 biennial harvest specifications and management measures workload.

At the March Council meeting, under the workload planning discussion, this agenda item was identified as a lower priority relative to the biennial specifications agenda items. Therefore, the GMT did not have time for a thorough review or have in-depth discussions on the associated briefing book materials. We were unable to meet with exempted fishing permit (EFP) authors and participants or with Mr. Colpo and Dr. Al-Humaidhi to discuss their projects and ask questions. Additionally, we were unable to meet with Mr. Brett Wiedoff (Council staff) for an overview and questions. The GMT points out that our inability to meet with these individuals to thoroughly discuss the EM program and the EFPs is not a reflection of our lack of interest or how important we feel this issue is, but reflects our inability to accomplish everything that we would like. Even during "in-cycle" years for EFPs, we find it difficult to provide the full attention of the GMT to EFPs due to the number of other agenda items that receive higher priority. Although many members of the GMT are keenly interested in the EFPs and the development of EM, we will not likely have time to consider these EM EFPs in depth (or EFPs in general) in the near future without prioritization guidance from the Council to do so.

Exempted Fishing Permits Relative to Council Operating Procedure 19

In an attempt to provide input on the Council Operating Procedure (COP) 19, a GMT sub-group created Table 1 that compares the EFP applications to the requirements under COP 19. The GMT did not have the opportunity to consider the technical merits of the applications. If the Council wishes the GMT to spend time between now and June reviewing and commenting on the EFP proposals, the Council needs to indicate this to the GMT, weighing the trade-offs with work on the biennial specifications analysis and documentation.

Table 1. Electronic monitoring-related exempted fishing permit applications and requirements under Council Operating Procedure 19. Cells containing "x" indicate completion. (FMA = Fishermen's Marketing Association, MTC = Midwater Trawlers Cooperative, UCB = United Catcher Boats)

COP 19 REQUIREMENTS ("x" if completed)	**Silva**	**FMA**	**CA Risk Pool**	**MTC UCB**	**Eder et. al**
Date of application	**x**	**x**	**x**	**x**	**x**
Applicant's name, mailing addresses, and telephone numbers	**x**	**x**		**x**	**x**
Statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP		**x**	**x**	**x**	**x**
Valid justification explaining why issuance of an EFP is warranted		**x**	**x**	**x**	**x**
Statement of whether the proposed experimental fishing has broader significance than applicant's individual goals		**x**	**x**	**x**	**x**
Expected total duration of the EFP		**x**	**x**	**x**	**x**
Number of vessels covered under the EFP	**x**		**x**		
Description of species (target and incidental) to be harvested under the EFP and the amounts of such harvest necessary to conduct the experiment; include harvest estimates of overfished species		**x**	**x**	**x**	
Description of a mechanisms, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted.		**x**	**x**	**x**	**x**
Description of the proposed data collection and analysis methodology			**x**	**x**	**x**
Description of how vessels will be chosen to participate in the EFP		**x**	**x**	**x**	**x**
For each vessel in EFP, the approximate times and places fishing will take place, and the type, size, and amount of gear to be used			**x**	**x**	
Signature of applicant	**x**	**x**	**x**	**x**	**x**

Agenda Item C.7.b
Supplemental NMFS PowerPoint (McVeigh)
April 2014

NOAA FISHERIES

NW Fisheries Science Center

NWFSC Observer Program Considerations for EM/ER implementation

Jon McVeigh

Fisheries Observation Science (FOS)

PFMC April 2014

Observer Data Supports

- Stock Assessments
- Bycatch and total mortality estimates
- Protected species management
- Fisheries research
- In-season quota management for IFQ/IBQ

Core Observer Program sampling requirements to support robust science

- Unbiased, random sampling of fleets/fisheries with spatial distribution
- Ability to quantify and sample
    - IFQ species
    - Non-IFQ Groundfish
    - Certain non-groundfish species
    - Protected Resources
- Continued access to catch while sampling aboard vessels with EM systems

Scientific Observer Coverage

- Observers provide needed protected resource and biological data
- Observer sampling at sea provides tow by tow species level data and biological samples
    - Species complex data lost by mixing of tows
- Different sectors will have different needs for scientific observer coverage

Observer Program Considerations

- For now, assumption is a 20-30% coverage level for scientific observer coverage on EM vessels
  - Continued research is needed for development of new sampling plans for scientific data collection with EM
- Observer and EM programs will need to continue to evolve together to address the needs of managers and fishers
  - Both need to continue to be adaptable, flexible and responsive

Observer Coverage and Sampling Design

- Fishing sectors are currently sampled at the fleet level, not at the individual vessel level
    - Likely require new trip notification requirements for vessels
- Advanced declarations for use of EM or observers will allow for the observer program and providers to ensure adequate observer availability (ALTs 2 & 3 Options A and B)

EM implementation process

- Process is not as big of a concern as is the timeline
- Implementing a new sampling program will be a challenge for a Jan, 1 2015 start
- Observer workforce needs will be unclear until the number of participants is known

EM Alternative considerations

- Discard Requirements– Alternatives 2 & 3
  - Alternative A – Maximized Retention
    - Could reduce observer coverage levels/need
    - More sampling may be needed shoreside

EM Alternative considerations

- EM has the ability to easily collect certain data pieces that will be very useful for management
  - As EM moves forward opportunities to capture and report new and useful data should be seized

- Data Transfer Process – Alternatives 2&3
  - Logbooks or electronic logbooks
  - Electronic logbooks move ER along on the west coast

Observer providers

- Existing west coast observer providers should be considered and consulted regarding EM
  - Observer provider participation may change with reduced demand for observers

Data Format, Infrastructure and Availability

- Data and data formats for EM will likely be used by fishery managers and other stakeholders
- Data will also need to be shared through systems
- IT and Data management should be involved with building EM programs

QUESTIONS?

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
ELECTRONIC MONITORING PROGRAM DEVELOPMENT INCLUDING
PRELIMINARY APPROVAL OF EXEMPTED FISHING PERMITS

Mr. Brett Wiedoff briefed the Scientific and Statistical Committee (SSC) on the Electronic Monitoring (EM) Program Development process (Agenda Item C.1.a) and the alternatives being explored by the Council (Agenda Item C.7.a, Attachments 1-3). The briefing was informative, and the SSC had minor questions for clarification. Data from fish tickets and logbooks could be compared for the bottom-trawl fishery to explore the precision and accuracy of visual estimates of landings. This level of precision and accuracy would reflect a best-case scenario in terms of what could be expected for visual estimates.

Mr. Dave Colpo gave a presentation to the SSC on the EM Field Program run by the Pacific States Marine Fisheries Commission (Agenda Item C.1.b). The SSC concluded that this is a very informative initial study and gives a general summary of some of the issues an EM program might encounter. There was greater agreement between compliance monitors and the video for fish counts than for fish weights. There was also better agreement for retained catch than discards. When catch is not sorted, identifying catch to the species level was difficult. Even when landings were sorted, such identification could still be challenging, especially for small fish, rockfish, and flatfish.

Many of the discrepancies between the compliance monitors and the video were when the video observed a discard event but the compliance monitor did not, and vice-versa. This indicates that some discard events may be unobserved by compliance monitors and that the video will also miss some events. There were also questions as to whether the agreement between compliance monitors and video might be different for different vessels, but any of these discrepancies will likely be negligible once one takes into account the all-volunteer nature of the data. The all-volunteer nature of the participation in the study makes the extrapolation of the results to the rest of the fleet difficult. This raises the question if sampling is representative of the entire fleet.

While the project provided useful estimates of the cost of reviewing the video, these estimates do not account fully for the costs to industry and the public. Also, these costs were only for a single reading, and these costs will increase if double-reading is necessary due to inter-reader variability.

The SSC was tasked with evaluating the scientific merits of the exempted fishing permit (EFP) applications and reviewing the applicants' approaches to addressing their respective questions. While EFPs can be useful for informing EM program design and may answer some of the questions previously proposed by the SSC (Agenda Item 1.4.c Supplemental SSC Report from April 2012), the EFPs provided to the SSC were not specifically designed to answer such questions. If an EFP were to be designed to answer specific questions in a scientific manner, the applicant would likely need either full retention or have observers onboard who would collect both the amount of discards as well as their biological characteristics. In addition to this, a research design should have explicit contingency plans for equipment failure and situations when catch cannot be identified to the species level in the video. Standards of research design should be established if the Council wishes EFPs to be designed to answer specific questions in a scientific manner.

PFMC
04/07/14

Optimized Retention and Electronic Monitoring for California Risk Pool Groundfish IFQ Vessels in 2015 and 2016

Agenda Item C.7.c
Supplemental Public Comment
April 2014

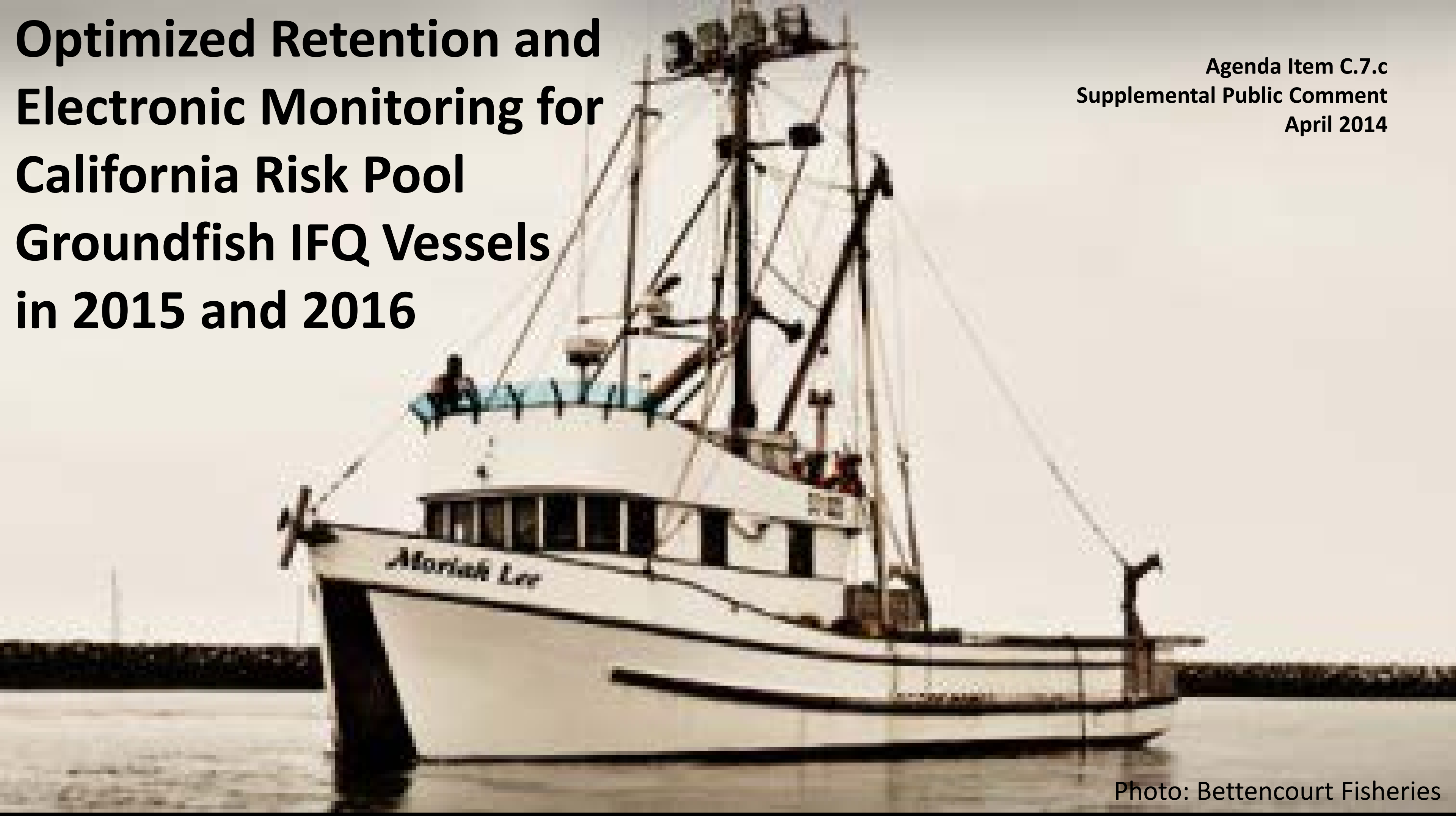


Photo: Bettencourt Fisheries

Fort Bragg Groundfish Association
Half Moon Bay Groundfish Marketing Association
Central California Seafood Marketing Association

EDF ENVIRONMENTAL DEFENSE FUND Finding the ways that work

The Nature Conservancy Protecting nature. Preserving life.™

Why do bottom trawl and fixed-gear vessels need EM?

Photo: John Rae

Why is this EFP valuable?

Flexibility for vessels

Cost effectiveness and cost transparency

Comparison of catch with and without observer

Extra accountability from collective contract

Different model of using EM data

Data Flow: PSMFC

EM Video

100% video census for species and weight

Catch Accounting

Discard Accounting

Data Flow: Our EFP

Dockside Landings

Cross-checked with 10% audit for retention compliance

Catch Accounting

EM Video

Cross-checked with 100% review of discard area

Discard Accounting

E-Logbook

Fixed Gear: Maximized Retention

All non-prohibited species retained

EM cameras will record all fishing activities

10% review of fishing events for <u>retention compliance</u>

Halibut will be placed on a measuring board and then discarded (2011-2013 vessel-specific average mortality or fleet-wide, gear-specific average)

Trawl Gear: Optimized Retention

Optimized retention: maximized retention except discards allowed of three low-attainment species

1. Dover sole
2. English sole
3. Arrowtooth flounder

10% review of fishing events for retention compliance

100% review of video from discard chute camera for species ID and length/weight estimates

Compliance Measures

Types of violations

Equipment malfunction procedures and live camera feeds

10% discrepancy rule

Contract with participants accepting possible penalties

Built-in accountability from risk pool vessels


Photo: John Rae

Questions?

FISHERIES IN 2015-2016 AND BEYOND: STOCK COMPLEX RESTRUCTURING

After consideration at the June and September 2013 Council meetings, the Council adopted alternatives for analysis in consideration for restructuring the slope rockfish complexes north and south of 40º10' N lat. at the November 2013 Council meeting (Agenda Item C.8.a, Attachment 1). During the briefing at the March 2014 Council meeting updating progress on the 2015 and 2016 groundfish regulatory process, it was noted that delays in getting the harvest specifications adopted had greatly inhibited analyses of these slope rockfish complex alternatives. At that meeting, in recognition of workload realities, National Marine Fisheries Service (NMFS) recommended analysis of only one alternative for restructuring slope rockfish complexes: removing rougheye and shortraker rockfish from the existing complexes and managing these species in a new coastwide complex. NMFS further committed to having an analysis in the advance briefing book, which is provided in Agenda Item C.8.a, Attachment 2.

At this meeting, the Council is tasked with adopting a preliminary preferred alternative for slope rockfish complexes. The Council should also consider which alternatives can be fully analyzed in the 2015-2016 specifications Environmental Impact Statement, recognizing workload limitations needed to achieve the objectives under the adopted process and schedule (Agenda Item C.4.a, Attachment 8). The Council should also consider advisory body reports and public comment under this agenda item before deciding the preliminary preferred alternative.

Council Action:

Adopt a preliminary preferred alternative for slope rockfish complexes.

Reference Materials:

1. Agenda Item C.8.a, Attachment 1: Slope Rockfish Stock Complex Reorganization Alternatives.
2. Agenda Item C.8.a, Attachment 2: Creating a Coastwide Rougheye/Shortraker Complex: An Alternative to Continued Management Within the Slope Rockfish Stock Complexes.
3. Agenda Item C.8.a, Attachment 3: Excerpted Portions of Appendix B of the Preliminary Draft 2015-2016 Groundfish Harvest Specifications and Management Measures Environmental Impact Statement Relevant to Slope Rockfish Complex Management.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt a Preliminary Preferred Alternative for Slope Rockfish Stock Complexes

PFMC
03/21/14

1.1 Slope Rockfish Stock Complex Reorganization Alternatives

This section describes alternative structures for the two existing slope rockfish complexes north and south of 40º10' N. lat. Reorganization of the existing slope rockfish complexes is one way to manage the risk of potential overfishing of individual component stocks within these complexes; the other alternative being implementation of management measures designed to reduce fishing mortality of stocks of concern. These alternatives contemplate a mix of individual management of slope rockfish stocks, as well as new complexes that are either managed coastwide or north and south of 40º10' N lat.

The tables describing the alternatives in this section assume the preferred harvest control rules decided by the Council, which would specify component stock ACLs = ABCs assuming P* is equal to 0.45. The exception to this is blackgill rockfish south of 40º10' N lat., where the ACLs are less than the ABCs due to application of the 40-10 ACL harvest control rule for this stock since it is in the precautionary zone.

1.1.1 No Action for Slope Rockfish Complexes

The No Action alternative maintains the stock complexes as they are currently structured north and south of 40º10' N lat. Table 1 shows the No Action slope rockfish complexes and associated harvest specifications.

Table 1. The No Action slope rockfish complexes north and south of 40º10' N lat. with associated preferred 2015 and 2016 ACLs (stocks with new assessments in bold).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Slope Rockfish Complex North of 40º10' N lat.	1,804	1,669	1,669	1,818	1,683	1,683
Aurora	***17.4***	***16.6***	***16.6***	***17.5***	***16.7***	***16.7***
Bank	*17.2*	*14.4*	*14.4*	*17.2*	*14.4*	*14.4*
Blackgill	*4.7*	*3.9*	*3.9*	*4.7*	*3.9*	*3.9*
Redbanded	*45.3*	*37.7*	*37.7*	*45.3*	*37.7*	*37.7*
Rougheye/Blackspotted	***201.9***	***184.3***	***184.3***	***206.8***	***188.8***	***188.8***
Sharpchin	***305.6***	***279.0***	***279.0***	***297.6***	***271.7***	***271.7***
Shortraker	*18.7*	*15.6*	*15.6*	*18.7*	*15.6*	*15.6*
Splitnose	*1,000.6*	*956.6*	*956.6*	*1,018.2*	*973.4*	*973.4*
Yellowmouth	*192.4*	*160.5*	*160.5*	*192.4*	*160.5*	*160.5*
Slope Rockfish Complex South of 40º10' N lat.	806	698	687	807	699	689
Aurora	***74.3***	***70.7***	***70.7***	***74.3***	***70.7***	***70.7***
Bank	*503.2*	*419.7*	*419.7*	*503.2*	*419.7*	*419.7*
Blackgill	*137.0*	*125.1*	*113.8*	*140.0*	*127.8*	*117.2*
Pacific ocean perch	-	-	-	-	-	-
Redbanded	*10.4*	*8.7*	*8.7*	*10.4*	*8.7*	*8.7*
Rougheye/Blackspotted	***4.1***	***3.8***	***3.8***	***4.2***	***3.9***	***3.9***
Sharpchin	***76.4***	***69.8***	***69.8***	***74.4***	***67.9***	***67.9***
Shortraker	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Yellowmouth	*0.8*	*0.7*	*0.7*	*0.8*	*0.7*	*0.7*

1.1.2 *Alternative 1 for Slope Rockfish Complexes*

Alternative 1 for slope rockfish complexes contemplates individual management of aurora rockfish, Pacific ocean perch, rougheye/blackspotted rockfish, shortraker rockfish, and splitnose rockfish with coastwide stock-specific harvest specifications. Two coastwide complexes would be specified: 1) Slope Rockfish Complex comprised of redbanded rockfish, sharpchin rockfish, and yellowmouth rockfish; and 2) Slope Rockfish Complex B comprised of bank and blackgill rockfish. Table 2 depicts this alternative with associated preferred 2015 and 2016 harvest specifications.

Table 2. Alternative 1 slope rockfish complexes with associated preferred 2015 and 2016 harvest specifications (stocks with new assessments in bold).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Individually Managed Stocks						
Aurora	**92**	**87**	**87**	**92**	**87**	**87**
Pacific ocean perch	842	805	158	850	813	164
Rougheye/Blackspotted	**206**	**188**	**188**	**211**	**193**	**193**
Shortraker	19	16	16	19	16	16
Splitnose	2,795	2,672	2,672	2,844	2,719	2719
Slope Rockfish Coastwide Complex A	631	556	556	621	547	547
Redbanded	*55.7*	*46.4*	*46.4*	*55.7*	*46.4*	*46.4*
Sharpchin	***382.0***	***348.8***	***348.8***	***372.0***	***339.6***	***339.6***
Yellowmouth	*193.3*	*161.2*	*161.2*	*193.3*	*161.2*	*161.2*
Slope Rockfish Coastwide Complex B	662	563	552	665	566	555
Bank	*520.5*	*434.1*	*434.1*	*520.5*	*434.1*	*434.1*
Blackgill	*141.7*	*129.0*	*117.8*	*144.7*	*131.7*	*121.1*

1.1.3 Alternative 2 for Slope Rockfish Complexes

Alternative 2 for slope rockfish complexes contemplates individual management of bank rockfish, Pacific ocean perch, and splitnose rockfish with coastwide stock-specific harvest specifications. The remaining stocks managed in the status quo slope rockfish complexes north and south of 40º10' N lat. would continue to be managed together. Table 3 depicts this alternative with associated preferred 2015 and 2016 harvest specifications.

Table 3. Alternative 2 slope rockfish complexes with associated preferred 2015 and 2016 harvest specifications (stocks with new assessments in bold).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Individually Managed Stocks						
Bank	520	434	434	520	434	434
Pacific ocean perch	842	805	158	850	813	164
Splitnose	2,795	2,672	2,672	2,844	2,719	2,719
Slope Rockfish Complex North of 40º10' N lat.	786	698	698	783	695	695
Aurora	***17.4***	***16.6***	***16.6***	***17.5***	***16.7***	***16.7***
Blackgill	*4.7*	*3.9*	*3.9*	*4.7*	*3.9*	*3.9*
Redbanded	*45.3*	*37.7*	*37.7*	*45.3*	*37.7*	*37.7*
Rougheye/Blackspotted	***201.9***	***184.3***	***184.3***	***206.8***	***188.8***	***188.8***
Sharpchin	***305.6***	***279.0***	***279.0***	***297.6***	***271.7***	***271.7***
Shortraker	*18.7*	*15.6*	*15.6*	*18.7*	*15.6*	*15.6*
Yellowmouth	*192.4*	*160.5*	*160.5*	*192.4*	*160.5*	*160.5*
Slope Rockfish Complex South of 40º10' N lat.	303	279	268	304	280	269
Aurora	***74.3***	***70.7***	***70.7***	***74.3***	***70.7***	***70.7***
Blackgill	*137.0*	*125.1*	*113.8*	*140.0*	*127.8*	*117.2*
Redbanded	*10.4*	*8.7*	*8.7*	*10.4*	*8.7*	8.7
Rougheye/Blackspotted	***4.1***	***3.8***	***3.8***	***4.2***	***3.9***	***3.9***
Sharpchin	***76.4***	***69.8***	***69.8***	***74.4***	***67.9***	***67.9***
Shortraker	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	0.1
Yellowmouth	*0.8*	*0.7*	*0.7*	*0.8*	*0.7*	0.7

1.1.4 Alternative 3 for Slope Rockfish Complexes

Alternative 3 for slope rockfish complexes contemplates individual management of blackgill rockfish, rougheye/blackspotted rockfish, and shortraker rockfish with coastwide stock-specific harvest specifications with an option to manage these three stocks in their own coastwide complex. The remaining stocks managed in the status quo slope rockfish complexes north and south of 40º10' N lat. would continue to be managed together. Table 4 depicts this alternative with associated preferred 2015 and 2016 harvest specifications.

Table 4. Alternative 3 slope rockfish complexes with associated preferred 2015 and 2016 harvest specifications (stocks with new assessments in bold).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Individually Managed Stocks a/						
Blackgill	142	129	118	145	132	121
Rougheye/Blackspotted	**206**	**188**	**188**	**211**	**193**	**193**
Shortraker	19	16	16	19	16	16
Slope Rockfish Complex North of 40º10' N lat.	1,579	1,465	1,465	1,588	1,474	1,474
Aurora	***17.4***	***16.6***	***16.6***	***17.5***	***16.7***	***16.7***
Bank	*17.2*	*14.4*	*14.4*	*17.2*	*14.4*	*14.4*
Redbanded	*45.3*	*37.7*	*37.7*	*45.3*	*37.7*	*37.7*
Sharpchin	***305.6***	***279.0***	***279.0***	***297.6***	***271.7***	***271.7***
Splitnose	*1,000.6*	*956.6*	*956.6*	*1,018.2*	*973.4*	*973.4*
Yellowmouth	*192.4*	*160.5*	*160.5*	*192.4*	*160.5*	*160.5*
Slope Rockfish Complex South of 40º10' N lat.	665	653	653	663	651	651
Aurora	***74.3***	***70.7***	***70.7***	***74.3***	***70.7***	***70.7***
Bank	*503.2*	*503.2*	*503.2*	*503.2*	*503.2*	503.2
Pacific ocean perch	-	-	-	-	-	-
Redbanded	*10.4*	*8.7*	*8.7*	*10.4*	*8.7*	8.7
Sharpchin	***76.4***	***69.8***	***69.8***	***74.4***	***67.9***	***67.9***
Yellowmouth	*0.8*	*0.7*	*0.7*	*0.8*	*0.7*	0.7

a/ Option to manage these three species in their own coastwide complex.

CREATING A COASTWIDE ROUGHEYE/SHORTRAKER COMPLEX: AN ALTERNATIVE TO CONTINUED MANAGEMENT WITHIN THE SLOPE ROCKFISH STOCK COMPLEXES

NMFS requests consideration of the action alternative with options as described below. At this meeting, NMFS requests the Council to consider the NMFS action alternative options. NMFS further requests that the Action Alternative is analyzed and included for Council consideration of a Final Preferred Alternative (FPA) at the June 2014 Council meeting.

No-Action Alternative: For reference, the No Action alternative maintains the slope rockfish stock complexes as they are currently structured north and south of 40°10' N. lat. A description of the No-action Alternative and the management measures being analyzed that could control mortality of rougheye rockfish while it remains within the current slope rockfish complexes is available in the excerpts from the Draft Environmental Impact Statement (DEIS) and in 2014 April Council meeting Agenda Item C.4 overview documents.

Action Alternative: Remove Rougheye (including Blackspotted rockfish) and Shortraker rockfish from the North and South (of 40° 10' N. lat.) slope rockfish complexes and manage as a new coastwide rougheye/shortraker (R/S) complex. Under this alternative, an overfishing limit (OFL), acceptable biological catch (ABC), and annual catch limit (ACL) would be established for the R/S complex.

Creating a new R/S complex and establishing the associated harvest specifications would allow management to occur at the R/S complex level. Managing R/S as a new complex may provide increased management options as opposed to the No Action Alternative, where a species-specific harvest guideline for rougheye rockfish is being considered. For example, the Council could implement new trawl/non-trawl harvest guidelines at the R/S complex level or consider managing catch to the R/S complex ACL without establishing sector harvest guidelines.

Under the Action Alternative, several decision points are presented, and associated options are raised. These decision points and options are described further below. Following the description of the options is a section on what happens to the remaining minor slope complex.

Depending on the level of detail to which the Council is interested in tracking catch of the R/S complex, there are several potential management responses depending on the specific circumstances. Potential management responses include inseason changes to trip limits and closed areas or post season changes to management measures. Appendix B provides some potential management responses that are available to the groundfish fishery, also called accountability measures (AMs).

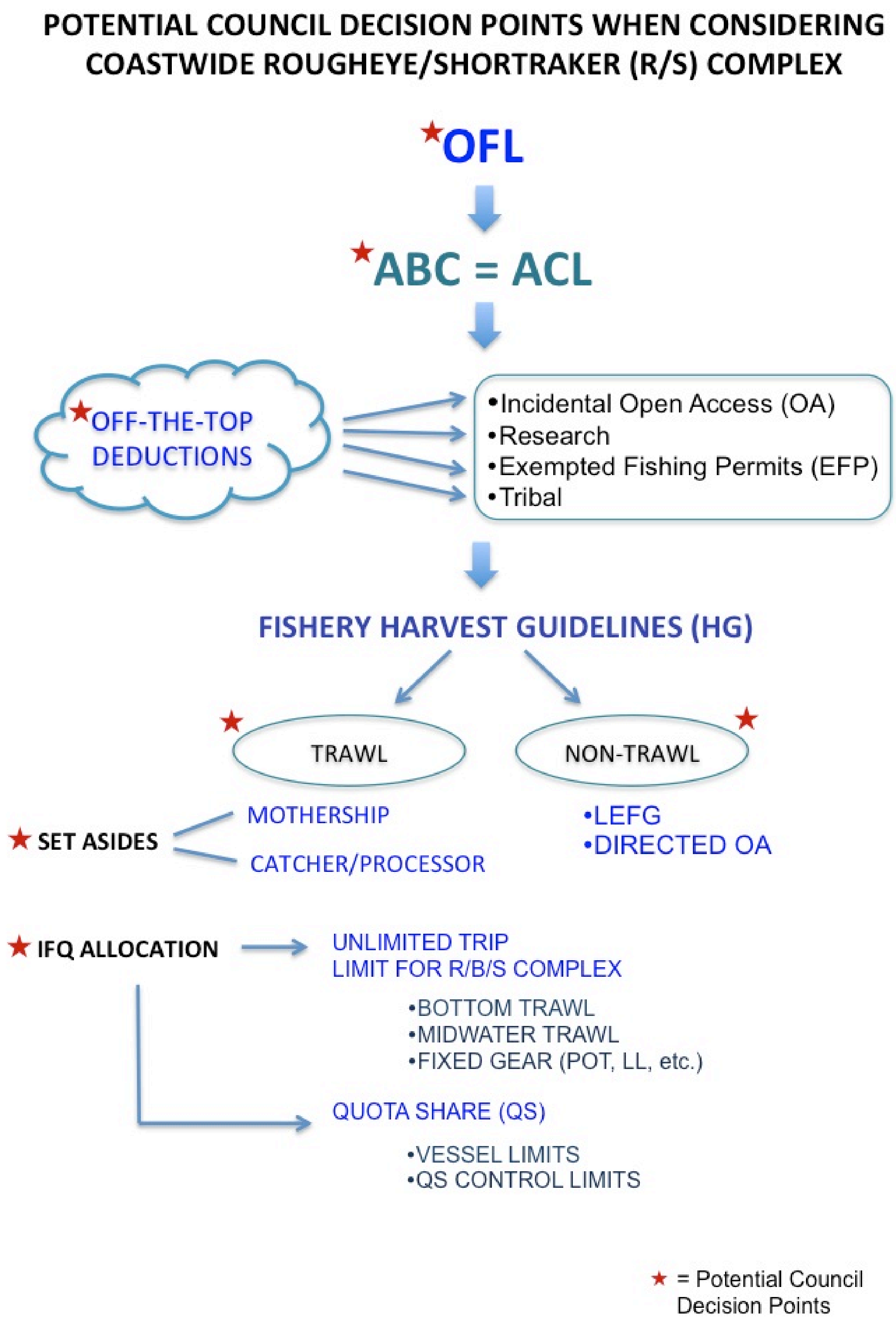


Figure 1: Potential Decision Points (□) for the Council to consider amongst various action alternative options.

Establishing an ACL: In creating a new coastwide R/S slope complex, the Council would need to select an OFL, ABC, and ACL.

For purposes of analysis, it is assumed that the Council would adopt the OFL contribution for rougheye and shortraker as recommended by the SSC, which would be summed to determine the R/S complex OFL. It is also assumed that the Council would select a P* of 0.45 and a sigma of 0.72 would be used to determine the ABC for Rougheye, and that a P* of 0.45 and sigma of 1.44 would apply for Shortraker to determine the component ABC and the summed ACLs would be set equal to the ABC in 2015 and 2016 for the R/S complex. Table 2 (below) demonstrates the resulting 2015 and 2016 OFL and ABC, and ACL contribution estimates for Rougheye/Blackspotted and Shortraker species combined, with a coastwide R/S complex OFL/ABC of 224.8 mt. for 2015 and 203.8 mt. for 2016. Of course, the Council could consider different values if desired.

Table 1: 2015 and 2016 OFL and ABC (=ACL) contribution estimates for Rougheye rockfish, Shortraker rockfish, Minor Slope North and Minor Slope South Complexes (North and South of 40° 10' N. lat.).

North Stock	2015 OFL	2015 ABC/ACL	Coastwide OFL (N & S combined)	2015 ABC/ACL	2015 OFL	South Stock
Minor Slope North Complex	1,804	1,669	2,610	698	806	Minor Slope South Complex
Rougheye/Blackspotted	201.9	184.3	206.0	3.8	4.1	Rougheye/Blackspotted
Shortraker	18.7	15.6	18.8	0.1	0.1	Shortraker

Table 2: 2015 and 2016 OFL and ABC (=ACL) contribution estimates for Rougheye and Shortraker species combined (coastwide).

		2015 OFL	2015 ABC/ACL	2016 OFL	2016 ABC/ACL
Coastwide	Rougheye/Blackspotted	206	188.1	211	192.6
	Shortraker	18.8	15.7	18.8	15.7
	Rougheye/ Blackspotted/Shortraker	**224.8**	**203.8**	**229.8**	**208.3**

Figure 2 (below) provides 2002 to 2012 historical Rougheye and Shortraker catch (all sectors) compared to 2015 OFL/ABC estimates. All R/S estimates in this analysis include all Rougheye and Shortraker associated data fields contained within the Northwest Fisheries Science Center (NWFSC) Groundfish Mortality Report (GMR) excel file, including the: (1) Rougheye; (2) Blackspotted; (3) Shortraker; and (4) Rougheye-Shortraker data fields.

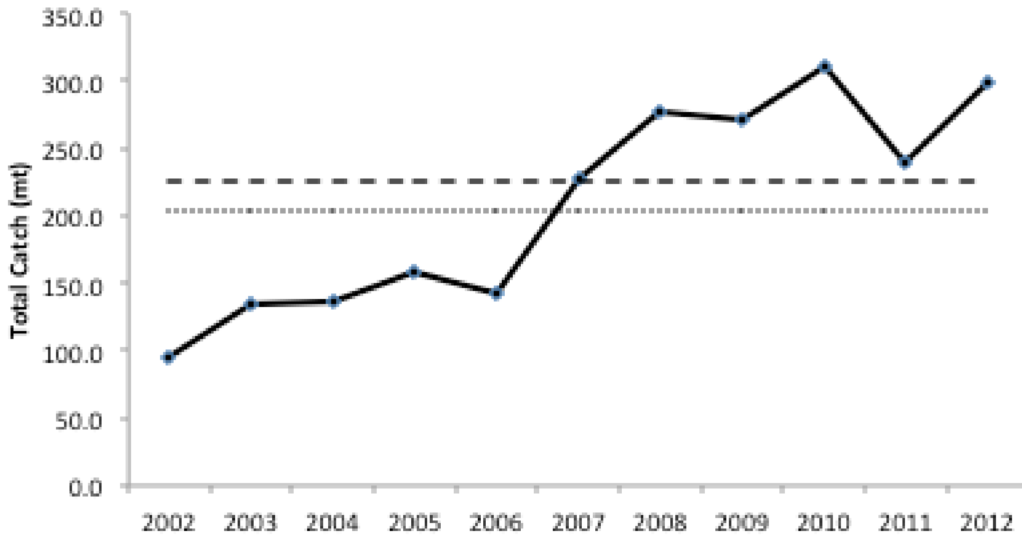


Figure 2: Estimated coastwide total catch of Rougheye/Blackspotted/Shortraker (R/S) rockfish combined coastwide, 2002-2012 historical catch (all sectors) in reference to 2015 OFL/ABC estimates (upper line=OFL, lower line= ACL). Source: NWFSC groundfish mortality report (GMR) data file developed for GMT analysis. Note: Includes Rougheye, Blackspotted, Shortraker, and Rougheye-Shortraker data GMR data fields.

During public comment, industry representatives (and the supplemental GAP statement Agenda Item D.5.b, 2014 March Council meeting) requested consideration of future Rougheye biomass projections from the 2013 stock assessment (see Table 3). Note that Shortraker biomass projections are not available, given that the Shortraker stock has not been fully assessed. Regardless, depletion projection estimates between 47% (2013) and 53% (2024) for Rougheye Rockfish (utilizing a 188 mt catch and discard model estimate) provide some information with respect to status of the new R/S complex being considered.

Table 3: Rougheye biomass depletion projections from the Northwest Fisheries Science Center (NWFSC) compared with average catch data from 2002 to 2012 from the final 2013 PFMC Rougheye stock assessment (1-6-2014): Projection of potential OFL, landings, and catch, summary biomass (age-10 older), spawning biomass, and depletion for the base case model projected with total catch equal to the recent 5-year catch average in 2013 and 2014 (landings *without* discards, discard estimates provided within the model), and equal to the predicted ABC (adjusted by the 40:10 control rule and 0.956 to reflect the P* buffer afterwards). The predicted OFL is the calculated total catch determined by $F_{SPR=50\%}$.

Year	Predicted OFL (mt)	ABC Catch (mt)	Landings (mt)	Age 10+ biomass (mt)	Spawning Biomass (mt)	Depletion (%)
2013			184	8,176	2,552	47.3%
2014			184	8,220	2,600	48.2%
2015	206	188	183	8,227	2,653	49.2%
2016	210	192	187	8,219	2,706	50.2%
2017	215	197	191	8,225	2,755	51.1%
2018	219	201	195	8,217	2,797	51.8%
2019	222	204	198	8,188	2,829	52.4%
2020	224	206	201	8,136	2,851	52.9%
2021	226	208	202	8,113	2,864	53.1%
2022	227	209	203	8,084	2,868	53.2%
2023	226	209	203	8,052	2,865	53.1%
2024	226	208	203	8,019	2,856	53.0%

In Table 3 above, the Rougheye assessment author (Hicks et al, 2013) focused on landings and discard rates generated by the July 2013 assessment model (which estimated an annual removal of 188 mt). The updated 2013 groundfish total mortality report data file (GMR file) provided to the Groundfish Management Team (GMT) by the NWFSC may reflect greater total removals than previously estimated (actual GMR expansions may be different than how the assessment model calculates discards). Yet, the 188 mt catch estimate stabilizes equilibrium depletion at 40% in this base model (Table 3), has an average catch of 266 mt, and results in a median estimated depletion of 49%. Although these higher total removal estimates and data summaries had not been conducted in time to inform the STAR panel and 2013 Rougheye assessment, recent projection estimates calculating the recent average five-year total mortality GMR generated catch (2008 to 2012) are described below in Table 4. The years 2008 through 2012 were chosen to estimate a total mortality average, because this is the range of years when component OFLs of Rougheye and Shortraker began to consistently exceed their contributions to the Minor Slope complexes.[1] Therefore, additional Rougheye depletion model runs were calculated to account for

[1] The recent five-year estimate (2008-2012) represents the first year that Rougheye and Shortraker exceeded their independent contribution OFLs to the Minor Slope Complex. Other recent catch ranges could be presented to the Council.

average total mortality (catch and discards) in these years to better reflect actual total mortality, and its effect on depletion estimates of the Rougheye stock.

Table 4: Rougheye biomass depletion projections from the NWFSC compared with recent average total mortality catch data from 2008 to 2012 (average coastwide catch of 247.7 mt): Projection of potential OFL, landings, and catch, summary biomass (age-10 older), spawning biomass, and depletion for the base case model projected with total catch equal to the recent 5-year total mortality catch average in 2008 to 2012 (landings *with* total mortality discards), and equal to the predicted ABC (adjusted by the 40:10 control rule and 0.956 to reflect the P* buffer afterwards). The predicted OFL is the calculated total catch determined by $F_{SPR=50\%}$. Note: 247.7 mt average Rougheye catch estimate (2008 -2012) includes Rougheye, Blackspotted, Shortraker, and Rougheye-Shortraker data GMR data fields.

209.9 (Lowest Recent Year) Total Mortality Removal					247.7 (Recent 5-Year Average) Total Mortality Removal					275.9 (Highest Recent Year) Total Mortality Removal				
Year	Total Removals	Age 10+ biomass (mt)	Spawning Biomass (mt)	Depletion (%)	Year	Total Removals	Age 10+ biomass (mt)	Spawning Biomass (mt)	Depletion (%)	Year	Total Removals	Age 10+ biomass (mt)	Spawning Biomass (mt)	Depletion (%)
2013	209.9	8,194	2,560	47.44%	2013	247.7	8,194	2,560	47.44%	2013	275.9	8,194	2,560	47.44%
2014	209.9	8,217	2,600	48.18%	2014	247.7	8,182	2,586	47.91%	2014	275.9	8,156	2,575	47.72%
2015	209.9	8,204	2,644	49.00%	2015	247.7	8,135	2,616	48.48%	2015	275.9	8,083	2,595	48.09%
2016	209.9	8,176	2,690	49.85%	2016	247.7	8,073	2,648	49.06%	2016	275.9	7,996	2,616	48.48%
2017	209.9	8,167	2,732	50.63%	2017	247.7	8,031	2,676	49.59%	2017	275.9	7,929	2,635	48.82%
2018	209.9	8,147	2,769	51.31%	2018	247.7	7,979	2,699	50.02%	2018	275.9	7,854	2,647	49.05%
2019	209.9	8,110	2,797	51.84%	2019	247.7	7,910	2,714	50.29%	2019	275.9	7,761	2,652	49.14%
2020	209.9	8,054	2,817	52.20%	2020	247.7	7,823	2,720	50.41%	2020	275.9	7,650	2,648	49.07%
2021	209.9	8,028	2,828	52.41%	2021	247.7	7,767	2,718	50.37%	2021	275.9	7,571	2,636	48.85%
2022	209.9	7,998	2,832	52.47%	2022	247.7	7,707	2,708	50.18%	2022	275.9	7,489	2,616	48.48%
2023	209.9	7,966	2,828	52.41%	2023	247.7	7,645	2,692	49.88%	2023	275.9	7,406	2,590	47.99%
2024	209.9	7,932	2,820	52.25%	2024	247.7	7,583	2,670	49.48%	2024	275.9	7,323	2,558	47.41%

Under the action alternative, actual management performance of landed catch and known discards could be evaluated by the GMT as additional information becomes available (i.e., inseason selected species scorecards and end of the year NWFSC groundfish mortality reports). Fishery performance could be tracked inseason to the ACL level. Monitoring the harvests of these stocks at the R/S complex level could potentially inform future formal allocation considerations.

Option A Decision Point – (Fishery HG): For the new coastwide R/S slope complex, the Council could set a fishery HG below the ACL. To do so, deductions from the ACL as specified at 660.55(b) (also called "off-the-top" set-asides), would need to be determined. Off-the-top set asides would need to be considered for the Incidental Open Access (OA), Research, EFP, and Tribal (At-sea and Shoreside) fisheries for 2015-2016.

As described at 660.55(b), the fishery harvest guideline is the remaining amount after the off-the-top set-asides are deducted from the ACL. To inform what appropriate amounts might be for the off-the-top set-asides, NMFS estimated total coastwide catches of R/S over the years 2008 through 2012 (see Tables 5 and 6).

Table 5: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide catches (mt) by sector, 2008-2012.

Total estimated Rougheye/Blackspotted/Shortraker Rockfish coastwide catches by sector, 2008-2012.					
Set-Aside	**2008**	**2009**	**2010**	**2011**	**2012**
Incidental	1.0	2.3	0.5	0.3	0.9
Pink Shrimp	1.0	2.3	0.5	0.3	0.9
Tribal At-Sea Hake	2.9	0.7	0.0	2.4	0.0
Tribal Shoreside	17.3	34.6	19.5	17.3	16.5

Table 5 (above) and Table 6 (below) indicate some negligible inseason variability between Non-Tribal Incidental Open Access and Pink Shrimp Fisheries. Inter-annual variability is also observable between reported Tribal At-Sea catch ranges between 0 and 2.9 mt, with even greater amounts of catches (and interannual-variability) in the Tribal Shoreside fisheries, ranging between 16.5 mt to 34.6 mt of landed Rougheye and Shortraker catch. Given inter-annual variability in harvest, adding the highest known total mortality for both Treaty sectors in recent 5-year reports would total approximately 37.5 mt per year.

Table 6: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide catches (mt) by sector, 2008-2012 average, lowest to highest amount caught by sector.

Set-Aside	Average ('08-'12)	Range ('08-'12)
Incidental	1.0	0.3 to 2.3
Pink Shrimp	1.0	0.3 to 2.3
Tribal At-Sea Hake	1.2	0 to 2.9
Tribal Shoreside	21.0	16.5 to 34.6

For comparison, the Minor Slope Complex off-the-top Set-Asides from 2013 were as follows:

Minor slope rockfish north. The 2012 ACL of 1,160 mt had 62 mt deducted from the ACL for the Tribal fishery (36 mt), the incidental open access fishery (19 mt), EFP catch (1 mt) and research catch (6 mt), resulting in a fishery HG of 1,036 mt.

In cases where the set-aside amount is unknown or uncertain (EFPs and research), these 2013 minor slope complex values could be used as a proxy until more specific estimates could help inform a Council Final Preferred Action in June.

Option B Decision Point – (Trawl/Non-Trawl HGs): For the new coastwide R/S slope complex the Council could also establish Trawl/Non-Trawl HGs. To do so, the following amounts would also need to be set: OFL, ABC, ACL, and off-the-top set-asides. The off-the-top set-asides and resulting fishery HG could then be apportioned through trawl/non trawl HGs. Attainment of a HG would not require that the sector be closed, which provides some flexibility when responding inseason to potentially variable catch between and within sectors.

The non-treaty, trawl amount would be for all three sectors of the trawl fishery combined (IFQ, MS, C/P). The non-treaty, non-trawl amount would be for the limited entry fixed gear fishery, the directed open access fishery, and the recreational fishery. To inform what appropriate amounts might be for the Trawl/Non-Trawl HGs, NMFS estimated total coastwide catches of R/S over the years 2008 through 2012 (see Table 7, 8, and 9, below).

Table 7: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide catches (mt) by Trawl/Non-Trawl sectors, 2008-2012.

Sector	2008	2009	2010	2011	2012
Non-Trawl	81.0	74.5	91.7	44.3	104.7
Trawl	189.2	158.2	199.6	174.6	190.8

Table 8: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide catches (mt) by Trawl/Non-Trawl sectors, 2008-2012 & 2011-2012 (Post Trawl Rationalization), average, lowest to highest amount caught by Trawl/Non-Trawl sectors.

Sector	Average ('08-'12)	Range ('08-'12)	Average ('11-'12)	Range ('11-'12)
Non-Trawl	79.2	74.5 to 104.7	74.5	44.3 to 104.7
Trawl	182.5	158.2 to 199.6	182.7	174.6 to 190.8

Table 9: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide catches (%) by Trawl/Non-Trawl sectors, 2008-2012, average & 2011-2012 (Post Trawl Rationalization), lowest to highest percentage caught by Trawl/Non-Trawl sectors.

Sector	Average ('08-'12)	Range ('08-'12)	Average ('11-'12)	Range ('11-'12)
Non-Trawl	30.3%	20.2% to 35.4%	27.8%	20.2% to 35.4%
Trawl	69.7%	64.6% to 79.8%	72.2%	64.6% to 79.8%

The resulting Trawl/Non-Trawl HGs equal the fishery HG from Option B split by either a percent or set weights (in mt). The fishery HG equals the ACL reduced by the off-the-top set-aside amounts decided under Option A.

Option C Decision Point (Within-Trawl HG): For the new coastwide R/S slope complex, the Council could set within Trawl HGs. If within trawl HGs are desired, a trip limit for the R/S complex could be defined in Tables 1, 2, and 3 (north and south) to Part 660, Subpart D of groundfish regulations, and could be set as "unlimited" initially.

To determine within-trawl HGs, the trawl HG from Option B would be further divided between the IFQ fishery and the at-sea whiting fisheries (Mothership (MS) and Catcher-

Processor (C/P)). Regulations at 660.55(j) on fishery set-asides specify that set-asides for the at-sea whiting fisheries will be deducted from the limited entry trawl allocation. For 2012/2013, the resulting at-sea whiting set-asides were in regulation at Table 1d and 2d to Part 660, Subpart C. To inform what appropriate amounts might be for the within Trawl HGs, NMFS estimated the percentage of coastwide catches of R/S among trawl fisheries over the years 2008 through 2012 (see Table 10 and 11, below).

Table 10: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide total mortality catches (%) by within-Trawl IFQ sectors, 2008-2012 & 2011-2012 (Post Trawl Rationalization) average, lowest to highest percentage caught (range) by Trawl/Non-Trawl sectors.

IFQ	Average ('08-'12)	Average ('11-'12)	Range ('08-'12)	Range ('11-'12)
LE Trawl- Fixed Gear	4%	10%	0% to 12%	9% to 12%
LE Trawl- Trawl	62%	37%	32% to 93%	32% to 42%
Shoreside Hake	8%	16%	0 to 28%	4% to 28%
IFQ Total % of Trawl	**74%**	**63%**	55% to 94%	55% to 71%

Table 11: Total estimated Rougheye/Shortraker (R/S) Rockfish coastwide total mortality catches (%) by within-Trawl IFQ sectors, 2008-2012 & 2011-2012 (Post Trawl Rationalization) average, lowest to highest percentage caught (range) by Trawl/Non-Trawl sectors.

At-Sea	Average ('08-'12)	Average ('11-'12)	Range ('08-'12)	Range ('11-'12)
Catcher-Processor	23%	33%	5% to 43%	22% - 43%
Mothership	3%	4%	0 to 6%	2% - 6%
At-Sea Total % of Trawl	**26%**	**37%**	6 to 45%	29% - 45%

Compared to all other sectors, harvest removals between these two sectors has the highest degree of inter-annual variability (see table 10 and table 11, above).

The resulting within Trawl HGs equal the Trawl HG from Option C split by either a percent or set weights (in mt). This would result in an HG for IFQ and an HG for the at-sea sectors. Appropriate At-Sea set aside recommendations, as well as recommendations for other HG options described above, could be provided by the Council's advisory bodies (e.g, average catch 2008-2012, high, or low catch averages, etc).

Option D Decision Point (R/S complex as an IFQ species group): The Council could create a new coastwide R/S slope complex IFQ species group. To do so, the following amounts would also need to be set: OFL, ABC, ACL, off-the-top set-asides, Trawl/Non-Trawl HGs, and at-sea whiting set-asides. In addition, QS would be issued consistent with regulation at 660.140(c)(3)(vii). The Council would also need to recommend QS control limits and vessel limits, including reconsidering aggregate non-whiting groundfish amounts.

Under current default rules, when removing a component species in an IFQ species complex (in which the complex itself is treated as a species for accounting purposes) removed species (i.e., Rougheye/Shortraker) continue to be managed as IFQ species. In this case, R/S would not only be removed from the north and south minor slope complex IFQ species groups, but also recombined from north south to coastwide. Regulations at 660.140(c)(3)(vii) describe how to issue QS based on these circumstances. In addition to issuing QS for the new R/S complex, QS control limits and vessel limits would need to be established, including aggregate non-whiting groundfish limits.

Under current regulations, when two areas are combined for an IFQ species, the QS or IBQ held by individuals in each area will be adjusted proportionally such that: (1) the total QS or IBQ for the area sums to 100 percent, and; (2) a person holding QS or IBQ in the newly created area will receive the same amount of total QP or IBQ pounds as they would if the areas had not been combined (§ 660.140 (c)(3)(vii)(A)(2)).

Current regulations also require that when a management area boundary line is moved for an IFQ species, the QS or IBQ held by individuals in each area will be adjusted proportionally such that they each maintain their same share of the trawl allocation on a coastwide basis. Those holding QS or IBQ in the area being expanded will have their QS or IBQ reduced such that the total QP or IBQ pounds they receive in the year of the line movement will not increase or be reduced as a result of the expansion (§ 660.140 (c)(3)(vii)(A)(3)).

However, the Council could elect to treat a R/S coastwide complex as a non-IFQ management unit and change the default procedures. This would allow management of the new complex to occur at different levels of detail (e.g., managing to an ACL without issuing R/S quota share and resulting quota pounds).

Issuing R/S complex IFQ for the shorebased trawl fleet in 2015-2016 could be difficult to accomplish in a timely fashion and is currently not being considered in detail in the DEIS.

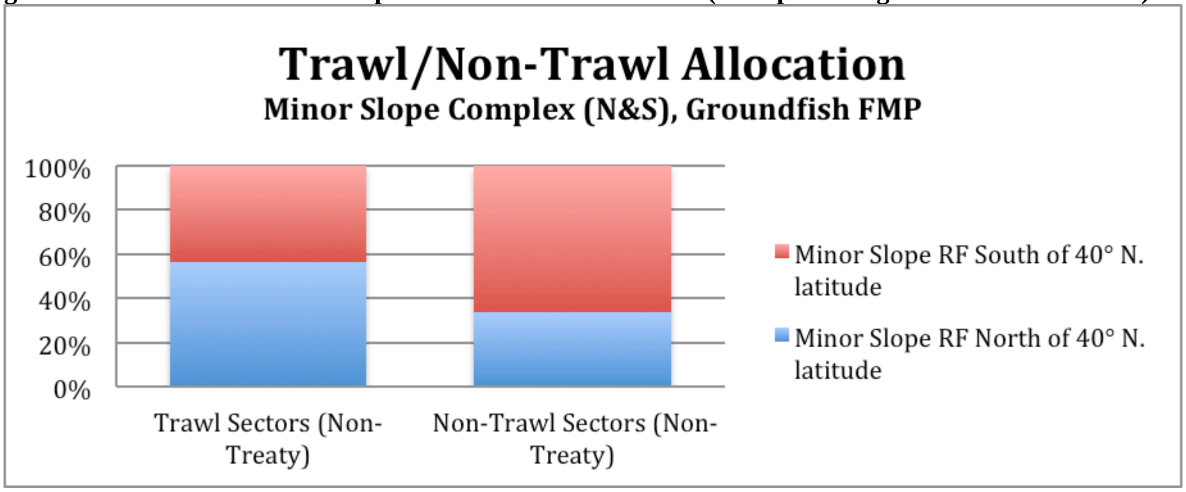
Remaining minor slope complex discussion

The remaining ACL for the Minor Slope complexes (North and South) would be reduced by removing Rougheye and Shortraker. In addition, the appropriate amounts for the off-the-top set asides for the remaining Minor Slope complexes would likely be reduced and would need to be decided by the Council. Removing Rougheye and Shortraker from the current Minor Slope complex, and looking at preliminary 2015 and 2016 Minor Slope ACLs (North and South), it seems to leave ample room in the Trawl/Non-Trawl allocations. Therefore, there may be no need to revisit the Minor Slope Amendment 21 allocations (see table 12, figure 3, below). Approximately 90% of the collective 2015 and 2016 Minor Slope ACLs remain in the complex, even when removing S/R total mortalities (catch and known discard) in the most recent five-years.

Table 12 (below): Allocation percentages for limited entry trawl and non-trawl sectors specified for FMP groundfish stocks and stock complexes under Amendment 21 (most percentages based on 2003-2005).

Stock or Complex	Trawl Sectors (Non-Treaty)	Non-Trawl Sectors (Non-Treaty)
Minor Slope RF North of 40° N. latitude	81%	19%
Minor Slope RF South of 40° N. latitude	63%	37%

Figure 3 (below): Allocation percentages for limited entry trawl and non-trawl sectors specified for FMP groundfish stocks and stock complexes under Amendment 21 (most percentages based on 2003-2005).



Interestingly, R/S-specific coastwide percentages (Table 10 and 11, above, Option C) are identical to Amendment 21 Trawl/Non-Trawl allocation percentages (Table 12, Figure 3, above) for the Minor Slope South complex post-TRAT (2011-2012), as percentages of S/R do indeed directly apply to the Trawl/Non-Trawl percentages for the Southern Minor Slope South Complex which is 63% Trawl/37% Non-Trawl (as opposed to the 81%/19% Trawl/Non-Trawl percentages of the Minor Slope North Complex).

Appendix A: Coastwide Total Mortality Catch Summaries Among Sectors for Rougheye-Shortraker (R/S) combined; and Rougheye, Shortraker separately

The Source for this Appendix is the 2002- 2013 NWFSC Groundfish Mortality Report (GMR) excel data file.

Table A1a: 2002-2012 Coastwide Catch Summary Among Sectors,
Estimated coastwide total mortality catch of Rougheye/Blackspotted(R/B) rockfish, 2002-2012 (including proportional Rougheye/Blackspotted(R/B) total mortality catch by sector of Rougheye-Shortraker GMR data field by annum)

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total estimated Rougheye/Blackspotted Rockfish coastwide catches by sector, 2002-2012.											
Set-Aside	**9.3**	**16.7**	**18.5**	**21.5**	**21.4**	**24.0**	**19.5**	**36.4**	**18.9**	**18.8**	**15.9**
Incidental	2.4	5.0	2.6	1.5	0.5	2.0	1.0	2.2	0.5	0.3	0.7
Pink Shrimp	0.0	0.0	1.7	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Tribal At-Sea Hake	0.0	0.0	0.0	0.0	0.0	0.1	2.9	0.6	0.0	2.4	0.0
Tribal Shoreside	6.9	11.6	14.3	19.8	20.9	21.8	15.7	33.6	18.4	16.1	15.2
Non-Trawl	**21.5**	**13.3**	**24.2**	**37.3**	**42.2**	**47.0**	**62.1**	**71.6**	**86.2**	**41.3**	**84.7**
Nearshore Fixed Gear	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonnearshore Fixed Gear	21.5	13.1	24.2	36.6	42.1	47.0	62.1	71.6	86.2	41.3	84.6
Trawl	**44.8**	**77.6**	**73.1**	**84.6**	**67.7**	**123.7**	**160.0**	**130.9**	**170.7**	**150.9**	**170.5**
Limited Entry Trawl Permit - Fixed Gear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	21.7
Limited Entry Trawl Permit - Trawl Gear	44.1	75.4	58.5	45.6	61.1	92.9	86.9	120.7	144.0	53.1	47.9
Shoreside Hake	0.0	0.0	0.8	0.2	0.0	1.9	0.6	1.6	5.1	4.2	47.1
Catcher-Processor	0.3	2.0	13.7	30.5	6.0	27.2	69.4	8.3	17.0	74.4	42.0
Mothership	0.4	0.2	0.0	8.3	0.6	1.7	3.1	0.4	4.6	4.0	11.8

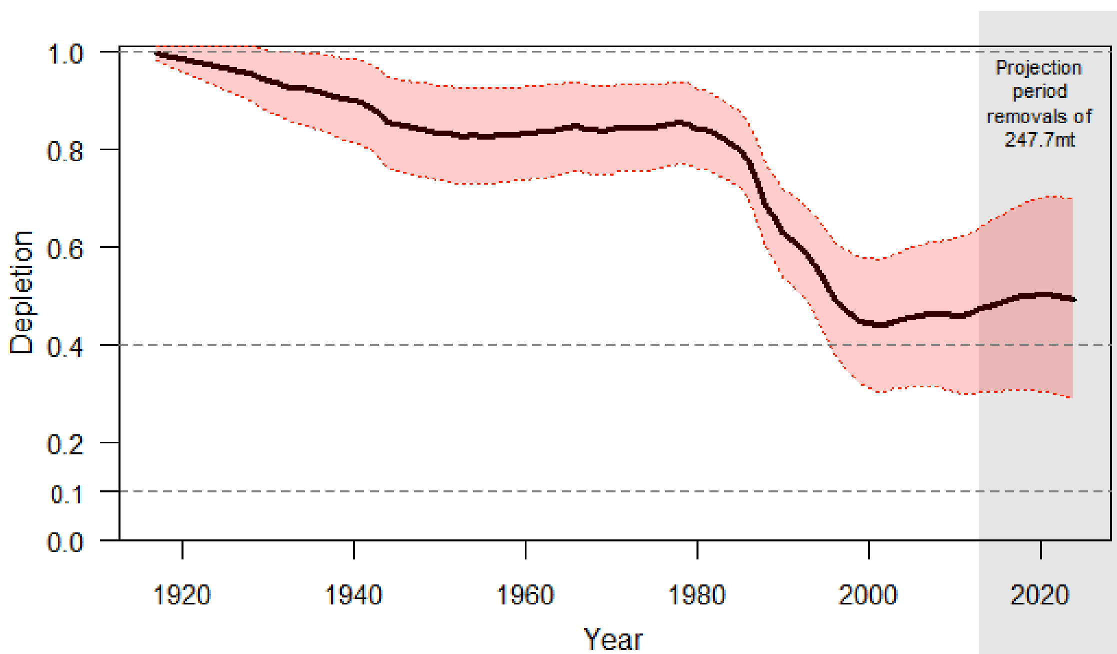
Table A1b: 2002-2012 Coastwide Catch Summary Among Sectors,
Estimated coastwide total mortality catch of Rougheye/Blackspotted/Shortraker (R/S) rockfish, 2002-2012 (including proportional Rougheye/Blackspotted and Shortraker total mortality catch by sector of Rougheye-Shortraker GMR data field by annum)

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total estimated Rougheye/Blackspotted/Shortraker Rockfish coastwide catches by sector, 2002-2012.											
Set-Aside	**11**	**18.6**	**19.7**	**22.6**	**22.9**	**25.2**	**21.3**	**37.5**	**20.1**	**20**	**17.4**
Incidental	3.01	6.43	3.08	1.54	0.53	2.23	1.03	2.27	0.54	0.29	0.88
Pink Shrimp	0	0	1.66	0.38	0	0.14	0.09	0	0.02	0.01	0.01
Tribal At-Sea Hake	0	0	0	0	0	0.06	2.86	0.66	0.03	2.41	0
Tribal Shoreside	7.97	12.2	14.9	20.7	22.3	22.7	17.3	34.6	19.5	17.3	16.5
Non-Trawl	**23.2**	**14.2**	**27.4**	**41.5**	**44**	**48.7**	**81**	**74.5**	**91.7**	**44.3**	**105**
Nearshore Fixed Gear	0.04	0.2	0	0.74	0.01	0	0	0	0	0	0.03
Nonnearshore Fixed Gear	23.2	14	27.4	40.7	44	48.7	81	74.5	91.7	44.3	105
Trawl	**60.2**	**103**	**88.5**	**94.5**	**76**	**154**	**189**	**158**	**200**	**175**	**191**
Limited Entry Trawl Permit - Fixed Gear	0	0	0	0	0	0	0	0	0	15.5	22.9
Limited Entry Trawl Permit - Trawl Gear	59.4	101	72.8	55	69.1	121	116	148	171	73.8	60.6
Shoreside Hake	0.0	0.0	1.4	0.2	0.0	3.2	0.8	1.7	6.6	6.7	52.7
Catcher-Processor	0.41	2.08	14.2	31.1	6.38	27.5	69.7	8.43	17.2	74.6	42.7
Mothership	0.39	0.16	0.02	8.32	0.58	1.73	3.06	0.36	4.61	4.05	11.8

Table A1c: 2002-2012 Coastwide Catch Summary Among Sectors,
Estimated coastwide total mortality catch of Shortraker rockfish, 2002-2012 (including proportional Shortraker total mortality catch by sector of Rougheye-Shortraker GMR data field by annum)

Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total estimated Shortraker Rockfish coastwide catches by sector, 2002-2012.											
Set-Aside	**1.7**	**2.0**	**1.1**	**1.2**	**1.5**	**1.2**	**1.7**	**1.1**	**1.1**	**1.3**	**1.5**
Incidental	0.6	1.4	0.5	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.2
Pink Shrimp	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Tribal At-Sea Hake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tribal Shoreside	1.0	0.6	0.6	1.0	1.4	1.0	1.6	1.0	1.1	1.3	1.3
Non-Trawl	**1.8**	**0.9**	**3.2**	**4.2**	**1.9**	**1.7**	**18.9**	**2.9**	**5.5**	**3.0**	**20.0**
Nearshore Fixed Gear	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonnearshore Fixed Gear	1.8	0.9	3.2	4.1	1.9	1.7	18.9	2.9	5.5	3.0	20.0
Trawl	**15.4**	**25.3**	**15.4**	**9.9**	**8.4**	**29.9**	**29.2**	**27.3**	**28.9**	**23.7**	**20.3**
Limited Entry Trawl Permit - Fixed Gear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3
Limited Entry Trawl Permit - Trawl Gear	15.4	25.2	14.3	9.4	8.0	28.3	28.7	27.0	27.2	20.7	12.7
Shoreside Hake	0.0	0.0	0.6	0.0	0.0	1.2	0.2	0.1	1.4	2.4	5.6
Catcher-Processor	0.1	0.1	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.7
Mothership	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure A1: Rougheye biomass depletion projections from the NWFSC compared with recent average total mortality catch data from 2008 to 2012 (average coastwide catch of 247.7 mt): Projection of potential OFL, landings, and catch, summary biomass (age-10 older), spawning biomass, and depletion for the base case model projected with total catch equal to the recent 5-year total mortality catch average in 2008 to 2012 (landings *with* total mortality discards).



Potential Management Responses/Accountability Measures

Accountability Measures

While not specifically labeled as accountability measures, or AMs, in groundfish regulations or in the FMP, there are several management measures in the groundfish regulations that may be used to prevent ACLs from being exceeded, and to correct or mitigate overages of the ACL if they occur. In accordance with the National Standard 1 Guidelines as specified at §600.310, AMs are identified below in two categories: (1) Inseason AMs, and (2) AMs for when an ACL is exceeded. Some AMs are listed under more than one category depending on how they might be used (inseason, due to exceeding, or to reduce risk).

Inseason AMs

Inseason AMs are actions that can be taken to prevent an ACL from being exceeded. Inseason AMs include, but are not limited to: (1) changes to the RCAs (§660.60(c)).; (2) changes to the type of gear on board; (3) closure of a sector; (4) trip limits.

AMs for when an ACL is exceeded

These are AMs that may be triggered to correct or mitigate if an ACL has been exceeded. AMs for when an ACL is exceeded include, but are not limited to:

1. Inseason AMs
   All of the inseason AMs listed above could also be triggered in the following year if an ACL has been exceed in the previous year. They could be triggered between fishing years or inseason.
2. New AMs
   The Council could recommend new AMs through a minimum of two Council meetings, as described in the Pacific Coast Groundfish FMP at Section 6.2. NMFS would then implement the new AMs through a full notice and comment rulemaking. Management measures currently being considered in the 2015-2016 DEIS include new groundfish closed areas that could minimize mortality of Rougheye rockfish and requiring excluders.

EXCERPTED PORTIONS OF APPENDIX B OF THE PRELIMINARY DRAFT 2015-2016 GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES ENVIRONMENTAL IMPACT STATEMENT RELEVANT TO SLOPE ROCKFISH COMPLEX MANAGEMENT

B.1.1 Rougheye rockfish groundfish closure area (GCA)

To aid consideration of groundfish closure area(s) for rougheye rockfish, an analysis was conducted to identify areas where rougheye may be caught in significantly higher proportion than in other areas. For identification of these "hot spots", a cluster analysis of high catch locations was conducted. Observer data collected from the following sectors were used: at-sea whiting, non-nearshore fixed gear, and individual fishing quota (IFQ). Focus was on midwater trawl gear (at-sea whiting and IFQ sectors), fixed gears (non-nearshore fixed gear), and bottom trawl gear (IFQ sector). Data relative to fixed gears used by the IFQ sector were not analyzed in time for this report. More detail about the data and methods, as well as additional figures resulting from different analytical assumptions, are found below. In addition, our analysis up to this point includes exploration of different methods and assumptions for identifying hot spots. The resulting figures may vary in the location and size of these hot spots. This suggests that further exploration may be needed; also, these results should be considered in addition to other information about the behavior of rougheye rockfish and these fishery sectors (e.g., from fisheries scientists, managers, and participants).

At-sea whiting sector
Areas where statistically significant clusters of high bycatch ratios (rougheye rockfish-to-Pacific whiting) and low bycatch ratios are shown in Figure B-2. All data for this sector were located north of 40° 10' N latitude.

Non-nearshore fixed gear sector
Areas where statistically significant clusters of high bycatch ratios (rougheye-to-sablefish) and low bycatch ratios are shown in Figure B-3. The area north of 42° N latitude was the focus of this figure due to the occurrence of hot spots in this area.

Individual fishing quota sector
Areas where statistically significant clusters of high bycatch ratios and low bycatch ratios are shown in Figure B-4 and Figure B-5. For midwater trawl observations, rougheye rockfish-to-Pacific whiting was the bycatch ratio used in the analysis. The area north of 43° N latitude was the focus of Figure B-4 due to the occurrence of hot spots in this area. For bottom trawl observations, rougheye-to-all other groundfish was the bycatch ratio used. This area north of 42° N latitude was the focus of Figure B-5 due to the occurrence of hot spots in this area.

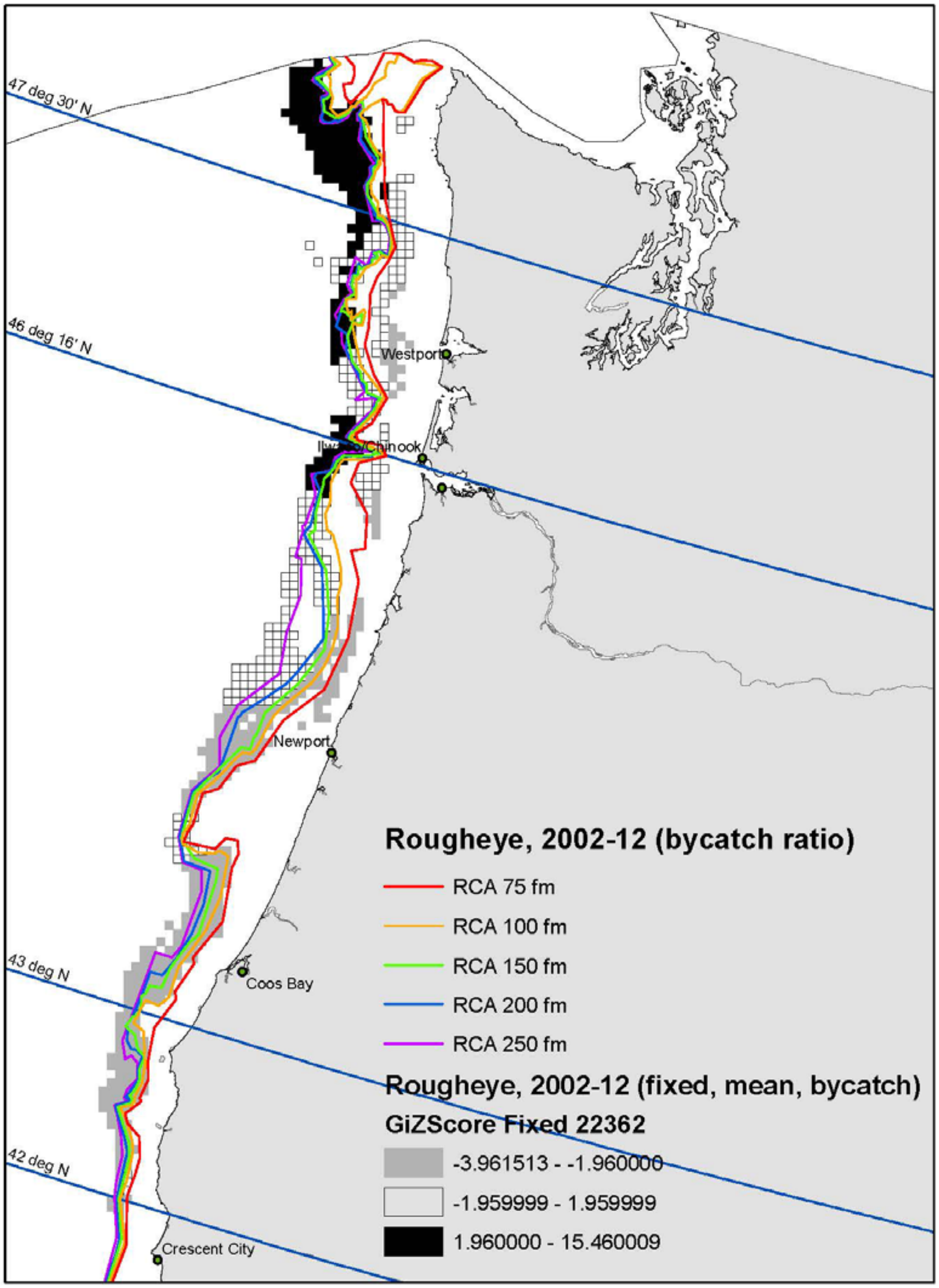


Figure B2. Hot and cold spots of rougheye rockfish in the at-sea whiting sector, 2002-12.

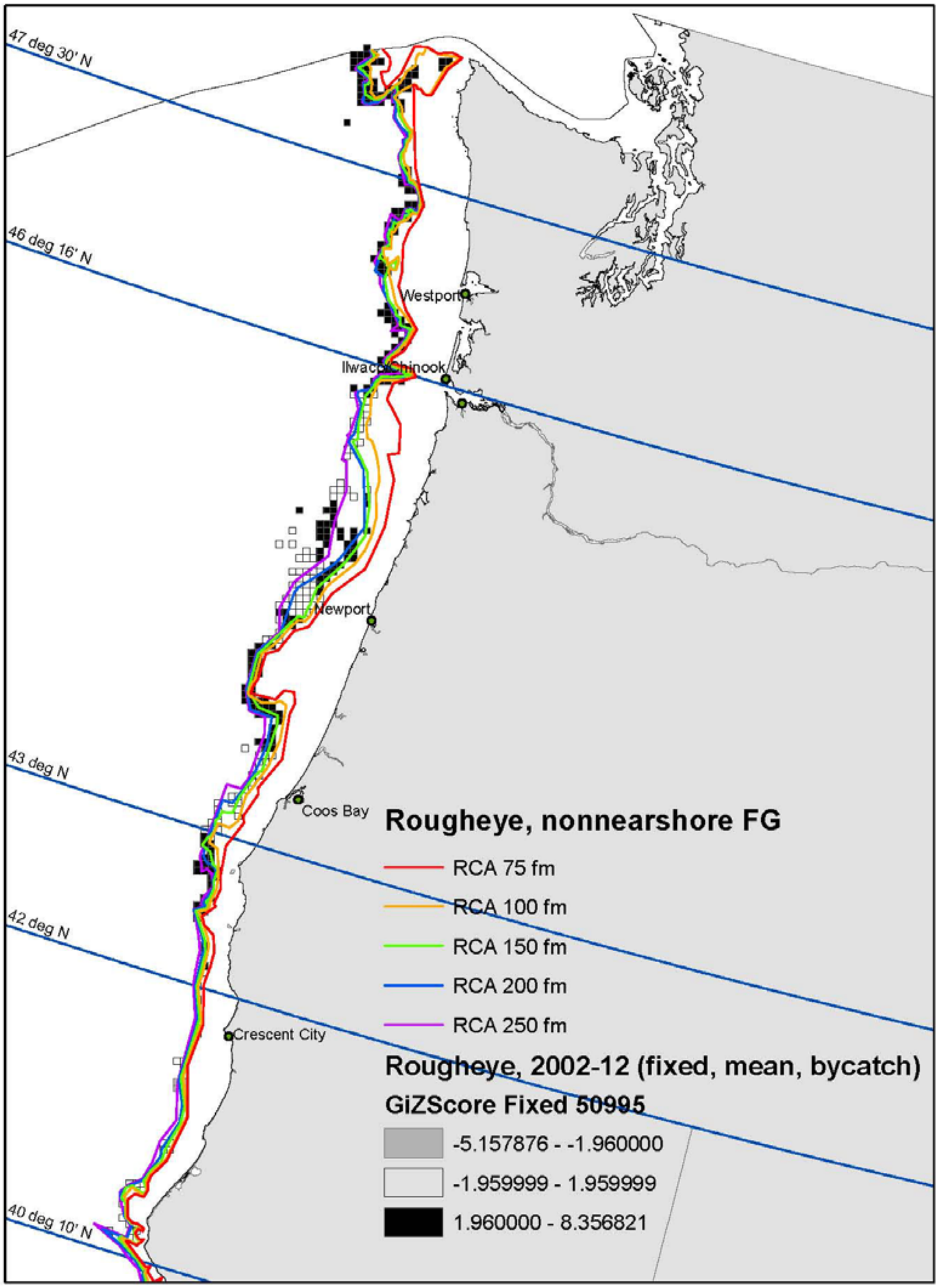


Figure B-3. Hot and cold spots of rougheye rockfish in the non-nearshore fixed gear sector, 2002-12.

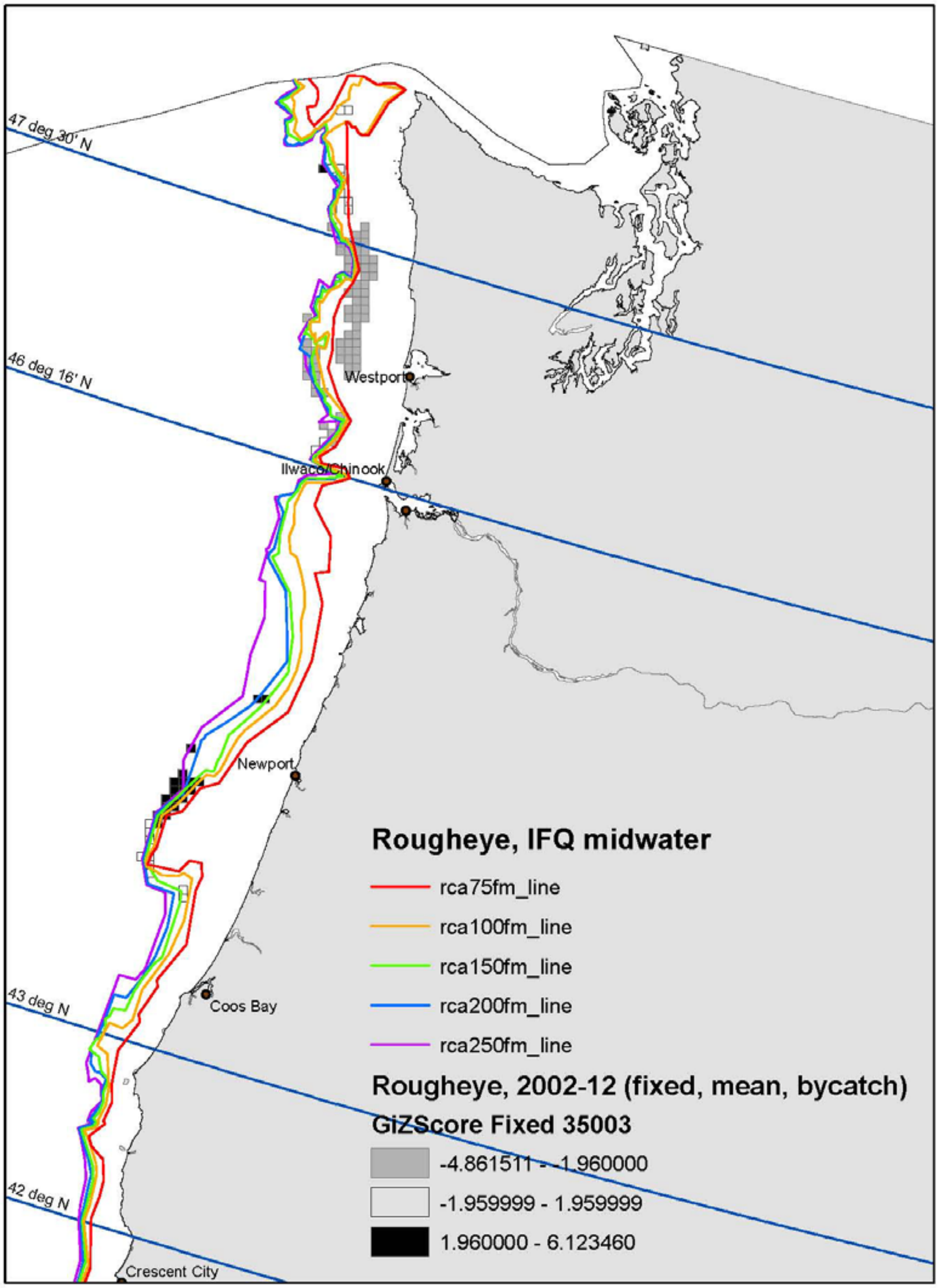


Figure B-4. Hot and cold spots of rougheye rockfish in the IFQ sector, midwater trawl, 2002-11.

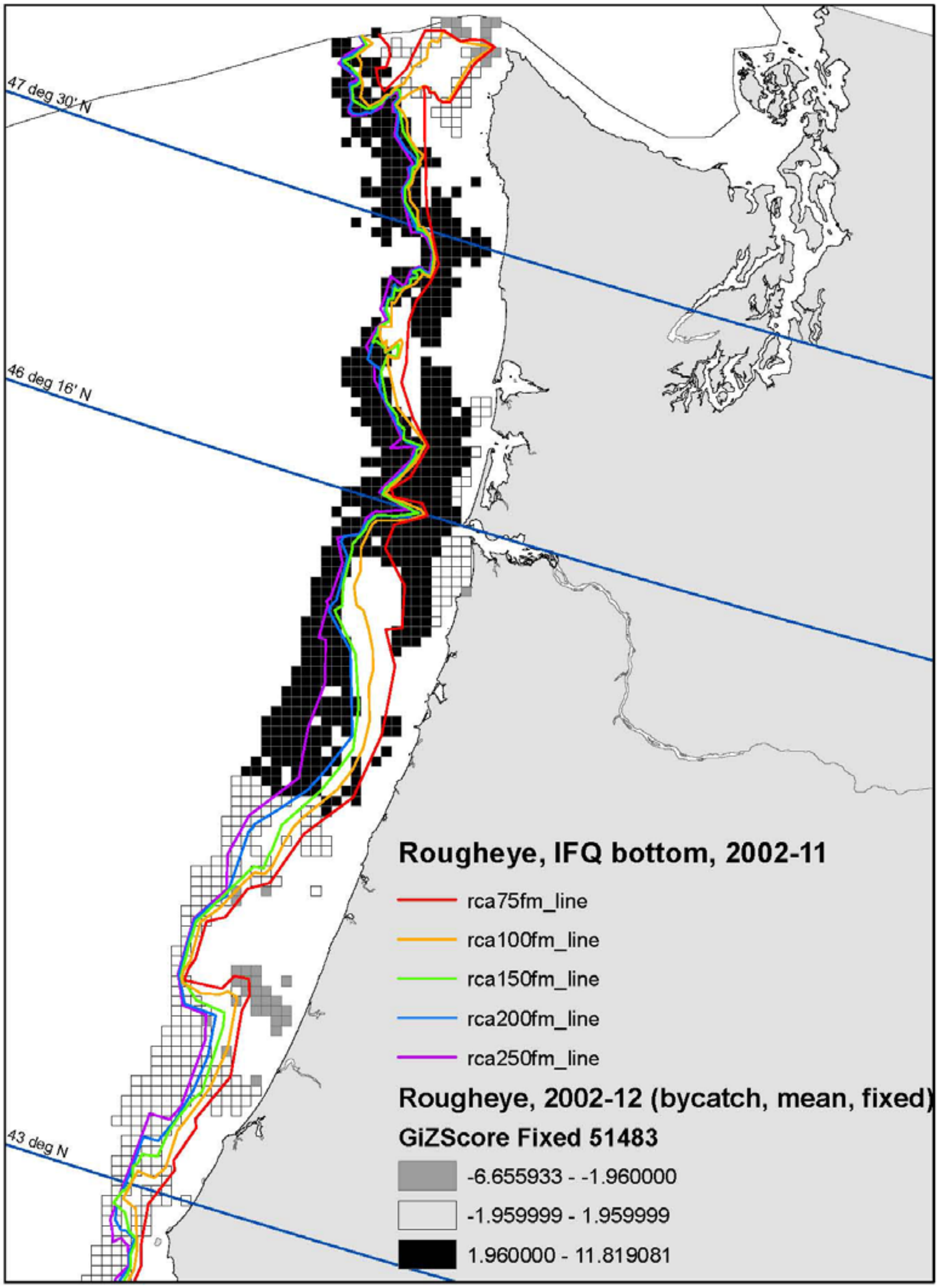


Figure B-5. Hot and cold spots of rougheye rockfish in the IFQ sector, bottom trawl, 2002-11.

B.2 Use of excluder devices to reduce catch of rougheye rockfish in non-tribal at-sea and shoreside Pacific whiting fisheries

Abstract

This analysis evaluates the potential mandatory use of excluder devices for reducing the catch of rougheye rockfish in the non-Tribal at-sea and shoreside Pacific whiting trawl sectors. Alternatives ranged from mandatory use for all trips north of 40° 10′ N latitude, to mandatory use only within limited areas (e.g., areas with highest rougheye rockfish catches). Although this analysis shows that use of excluder devices in these midwater Pacific whiting trawl sectors may reduce the catch of rougheye rockfish, it also shows that these reductions alone may not be enough to prevent exceeding the 2015 component OFL. Numerous assumptions were necessary to perform this analysis. Guidance is sought from various advisory groups (e.g., SSC, GAP, and EC) and the Council regarding these assumptions and to further refine this analysis.

Overview

The National Marine Fisheries Service (NMFS) recommended that the Council analyze removing or reorganizing blackgill, rougheye, and shortraker rockfishes from the minor slope complexes (north and south) because recent average catches (2007-2012) would have exceeded the 2015 OFL contributions for these component species (Agenda Item H.4.b, Supplemental NMFS Report, November 2013). The NMFS believed that management measures applied to address these OFL-contribution overages without removing these species from or reorganizing the slope rockfish complexes may be unnecessarily disruptive to fisheries and result in more complicated regulations. Subsequent Council discussion during the November 2013 meeting resulted in motions to analyze various management measures for reducing catch of rougheye rockfish by west coast commercial fisheries. If proven effective, some of these management measures may reduce the catch of rougheye rockfish (and other slope-rockfish species) with or without removing them from the complexes. One motion was to evaluate the use of excluder devices to reduce the catch of rougheye rockfish in shoreside and at-sea Pacific whiting fisheries (PFMC, Motion 30, November 2013). This analysis focuses on that motion. A hot-spot analysis, designed to identify areas with high catch ratios of rougheye-to-Pacific whiting is also included within this group of management measures, see above. These analyses may be considered collectively.

Background

This report focuses on reducing catch of rougheye rockfish in the non-Tribal at-sea and shoreside-whiting fisheries using bycatch reduction devices (BRDs) that are commonly referred to as excluder devices (e.g., mesh or grid ramps installed in trawls that lead to escape windows). Use of excluder devices to reduce catch addresses species selectivity based on a gear change (i.e., a change in fishing gear that promotes differential selectivity for different species). In this case, the theory is that trawl-gear modifications (e.g., the installation of excluder devices and escape windows) may reduce the catch of rougheye rockfish while minimizing escapement (or loss) of Pacific whiting.

Excluder Devices (general)

Excluder devices, along with escape windows, may be installed in trawls to "sort" fish (and invertebrates) by size and/or species while towing at fishing depth. These devices may take on various designs and shapes, such as rigid or flexible grids/grates/meshes, that "block" the trawl somewhere in front of the codend (e.g., at the fore end of the intermediate), thereby forcing larger individuals or species out of the net through escape windows (e.g., at the top of the trawl) while allowing smaller individuals or species to pass between the bars or meshes and into the codend. Some examples of excluder devices include those placed in shrimp trawls to exclude fishes (Hannah and Jones 2007), bottom trawls to exclude Pacific halibut while retaining groundfish (Lomeli and Wakefield 2013a, 2014), bottom trawls to exclude rockfishes and large roundfishes (e.g., sablefish) while retaining flatfishes (Lomeli (PSMFC) and Wakefield (NMFS-NWFSC), personal communication), and pelagic trawls to exclude salmon and rockfish while retaining most Pacific whiting (Lomeli and Wakefield 2012).

Excluder Devices Tested in Pacific Whiting Fisheries
Initial Trial: Lomeli and Wakefield (2012) described two excluder-device designs that were developed to increase escapement of rockfish and salmon while maintaining the catch of Pacific whiting in pelagic trawls. Although results of this study suggested the potential of these designs for reducing Chinook salmon bycatch, the designs were less effective for reducing the catch of widow rockfish. In addition, the authors described other limitations to this study that included small sample sizes of bycatch species and fishing under non-commercial conditions (i.e., trials were primarily conducted with the terminal end of the codend open).

Second Trial with Improved Results: A pilot study was conducted in 2013 that implemented recommendations made at a collaborative workshop by vessel owners, captains and crew, seafood company operators, regional net manufacturers, and gear researchers (Lomeli and Wakefield 2013b). The workshop participants concluded that a flexible sorting grid showed most promise for an excluder device designed for reducing rockfish bycatch from pelagic trawls targeting Pacific whiting.

The pilot study (Lomeli and Wakefield 2013b) was conducted during 2012 off Oregon and Washington on board a commercial trawl vessel. Results were relatively successful: one design (Design-B) retained a relatively high proportion of Pacific whiting (>93 percent by weight) while reducing the catch of rougheye rockfish by 95 percent, widow rockfish by 83 percent, and yellowtail rockfish by 69 percent (by weight). Note that although the size (length) of Pacific whiting was similar for retained and "escaped" individuals, Pacific whiting encountered during the study were relatively small (mean fork lengths ranged from 36.4 to 40.0 grams, approximately 300 gram fish).

It is important to note that Lomeli and Wakefield (2013b) showed that excluder designs used during this trial were effective only under low-to-moderate fish volumes. When whiting volumes were large, the designs tended to clog and the hauls were aborted early. Tows in this fishery may exhibit catch volumes exceeding 75 mt in less than 30 minutes. For these cases, the excluder design described by Lomeli and Wakefield (2013b) may be ineffective at reducing rougheye rockfish bycatch while maintaining catch levels of target species. This excluder design may be useful for Pacific whiting fishermen during low-to-moderate catch rates, but the authors noted that further refinement of the excluders would be needed to properly function under heavy fish volumes.

Third Trial - Most Promising Results: Additional sea trials were conducted in 2013 to evaluate a new BRD design (Design C) developed to exclude rockfish from pelagic trawls targeting Pacific whiting (Lomeli and Wakefield 2013c; personal communication). During these trials, widow rockfish was the primary rockfish species caught. Results showed their overall bycatch was reduced 26.6 percent by weight. The retention of Pacific whiting was 92.3 percent by weight. Single haul catches of Pacific whiting ranged from 40 to 100 mt. Catches producing over 90 mt of Pacific whiting were observed for haul durations less than 2.5 hours. However, clogging would occur under heaviest fish volumes (i.e., when over 90 mt of Pacific whiting were caught in less than 45 minutes of towing). This excluder design could potentially be useful for Pacific whiting fishermen during moderate-to-high catch rates, but further refinement of the excluder would be needed to properly function under heavy fish volumes.

It was unfortunate that rougheye rockfish and other rockfish species larger than widow rockfish were not encountered during the 2013 trials. The authors of this study suggest that escapement would likely be higher than 26.6 percent for rougheye and other rockfish species that are larger than widow rockfish. Further refinements and testing are needed to improve the performance of this excluder-device design under highest fish volumes (i.e., > 90 mt in less than 45 minutes of towing).
Catch of Rougheye Rockfish – By sector

In order to evaluate any potential effect of this measure to rougheye rockfish mortality, the average catch by sector north of 40º 10´ N latitude was calculated using 2008-2012 WCGOP data (Table B-62). Using these data, non-Tribal at-sea whiting and shoreside whiting catch represent 18.8 percent and 4.7 percent (totaling 23.5 percent) of the rougheye rockfish catch across all sectors. The annual average catch of rougheye rockfish for these sectors combined was 58.8 mt north of 40º 10´ N latitude. Of this 58.8 mt caught by non-Tribal whiting fisheries, 80.1 percent was caught by the at-sea sectors while 19.9 percent was caught by the shoreside whiting fishery. Note that for some cases, inter-annual variation is high within sectors (Table B-62).

Table B-62. Five-year average, minimum, and maximum mortality (mt; 2008-2012) of rougheye rockfish by sector. Data were from WCGOP and includes retained and discarded fish. Note that some landings included a rougheye/shortraker combined category. These combined landings had little effect on sector-specific results, except for the Non-nearshore Fixed Gear sector, where average catch was 72.0 mt (including the rougheye/shortraker category) and 55.9 mt (without the rougheye/shortraker category). These landings do not include blackspotted rockfish.

Sector	5-year Average Catch (mt; 2008-2012)	Min – Max (mt; 2008-2012)
Incidental	0.9	0.3 – 2.2
LE shoreside trawl	90.2	47.7 – 143.8
IFQ Fixed Gear (2011-2012)	18.7	15.6 – 21.7
Nearshore Fixed Gear	0.1	0.0 – 0.05
Non-nearshore Fixed Gear	72.0	41 – 89.1
Non-Tribal At-Sea Pacific Whiting	47.1	8.7 – 78.6
Pink Shrimp	0.0	0 – 0.02
Shoreside Pacific Whiting	11.7	0.6 – 47.1
Tribal At-Sea Pacific Whiting	1.2	0 – 2.9
Tribal shoreside trawl	19.7	15.2 – 33.5

Area of Rougheye Catch by the Non-Tribal At-Sea Whiting Fishery

Table B-62 provides an example of an ongoing analysis intended to identify areas where high or low values of rougheye catch may be clustered spatially during the 2002-2012 time period. More refined results of this analysis and more detail about the methods can be found in section 0 herein. In **Error! Reference source not found.**, any rougheye rockfish caught on a haul was attributed to a point location, the midpoint of that haul, and hauls that did not catch rougheye were excluded. These points were then evaluated spatially to determine whether there were areas where high catch levels of rougheye were clustered. Figure B-21 shows areas where higher levels of catch are clustered (boxes outlined in green) seaward of 150 – 200 fm and north of the Oregon-Washington border. The largest area with higher catch densities is north of 47º 30' N latitude. Areas with moderate catch densities (empty boxes) are generally seen off the Oregon coast. Areas where lower levels of catch are clustered (boxes outlined in purple) were found to occur south of the Oregon-California border. Relative catch densities of Pacific whiting are also shown in Figure B-21, with highest densities occurring in areas with the darkest shading. Pacific whiting catch is typically highest off of northern Washington and numerous areas along the Oregon coast.

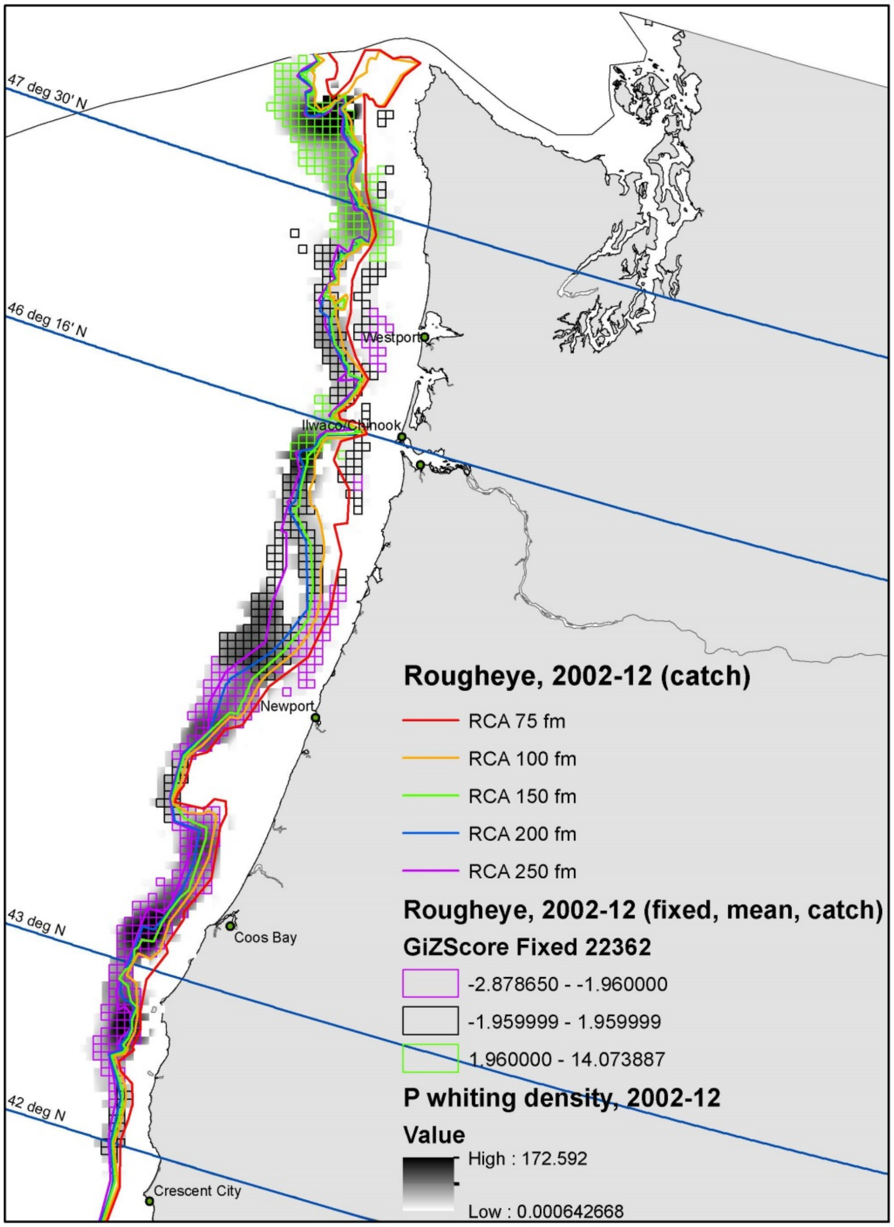


Figure B-21. Catch of rougheye rockfish north of 40º 10′ N latitude by the non-Tribal at-sea whiting sector. Data were acquired from NORPAC (2002-2012). Areas where high levels of catch are clustered are shown by the boxes outlined in green (i.e., north of 47º 30′ N latitude; z-scores greater than or equal to 1.96), moderate catches are shown by the empty boxes, and areas of low catches are shown as boxes outlined in purple (z-scores less than or equal to -1.96). Density plots of Pacific whiting catch are shown in the background (i.e., darkest = highest catch of target species).

More recent catches for rougheye rockfish and Pacific whiting (2008-2012) are shown by depth and area for the non-tribal at-sea whiting sectors (2008-2012) in Table B-63 and Table B-64, respectively. During these years, most rougheye rockfish were caught between 200 fm and 400 fm by the at-sea sectors (Table **Error! Reference source not found.**B-62). Conversely, most whiting catch was also caught over bottom depths ranging from 200 fm and 400 fm (Table **Error! Reference source not found.**B-64). Similar to that shown in Table **Error! Reference source not found.**B-64, although most rougheye rockfish catch by the non-Tribal at-sea whiting sectors occurred off the Washington coast (81.8 percent; Table **Error! Reference source not found.**B-63), whiting catches by these sectors were more evenly distributed between Washington (46.6 percent) and Oregon (51.5 percent; Table **Error! Reference source not found.**B-64).

Table Error! Reference source not found.**B-63. Rougheye rockfish catch (2008-2012) by area and depth for non-Tribal at-sea Pacific whiting sectors, north of 40º 10´ N. latitude. Average catch (mt) and percentage of catch are shown by depth and area. Data were acquired from NORPAC and include only one code for rougheye rockfish. NoCAL = California north of north of 40º 10´ latitude; NoWA = Washington north of 47º 30´ N. latitude; SoWA = Washington between the Oregon-Washington border and 47º 30´ N. latitude.**

(A) Average Rougheye Rockfish Catch (mt), 2008-2012

	Area				
Bottom depth (fm)	**NoCAL**	**OR**	**SoWA**	**NoWA**	**TOTAL**
< 100	0.0	0.0	0.0	0.0	0.0
100-200	0.0	0.4	0.0	0.2	0.6
200-300	0.0	4.7	1.7	15.2	21.6
300-400	0.0	2.4	3.4	13.8	19.5
> 400	0.0	1.3	1.1	4.0	6.4
TOTAL	0.0	8.7	6.2	33.2	48.2

(B) Percent Rougheye Rockfish Catch (mt), 2008-2012

	Area				
Bottom depth (fm)	**NoCAL**	**OR**	**SoWA**	**NoWA**	**TOTAL**
< 100	0.0%	0.0%	0.0%	0.0%	0.0%
100-200	0.0%	0.8%	0.0%	0.5%	1.3%
200-300	0.0%	9.8%	3.6%	31.5%	44.9%
300-400	0.0%	4.9%	7.0%	28.7%	40.5%
> 400	0.0%	2.7%	2.3%	8.2%	13.2%
TOTAL	0.0%	18.1%	12.9%	68.9%	100.0%

Table Error! Reference source not found.**B-64. Percentage of Pacific whiting catch by area and depth (2008-2012) for non-Tribal at-sea Pacific whiting sectors, north of 40º 10´ N. latitude. Data were acquired from NORPAC. NoCAL = California north of north of 40º 10´ latitude; NoWA = Washington north of 47º 30´ N. latitude; SoWA = Washington between the Oregon-Washington border and 47º 30´ N. latitude.**

Percent Whiting Catch (mt), 2008-2012

Bottom depth (fm)	**Area**				**TOTAL**
	NoCAL	**OR**	**SoWA**	**NoWA**	
< 100	0.0%	0.1%	1.5%	0.9%	2.4%
100-200	0.0%	10.3%	0.9%	5.2%	16.4%
200-300	0.3%	32.0%	3.9%	11.6%	47.9%
300-400	0.6%	7.9%	4.1%	9.4%	22.0%
> 400	0.0%	2.3%	3.7%	5.4%	11.4%
TOTAL	1.0%	52.5%	14.0%	32.6%	100.0%

Management Options

Data shown above was used to evaluate alternatives. The baseline catch (mt) for rougheye rockfish north of 40º 10´ N latitude is shown in Table **Error! Reference source not found.**B-62 for non-Tribal at-sea sectors (47.1 mt) and the shoreside whiting sector (11.7 mt). Proportions of rougheye rockfish catch shown in Table **Error! Reference source not found.**B-63 B were then applied to both the non-Tribal shoreside whiting and at-sea whiting catches (Table **Error! Reference source not found.**B-62) to estimate the contribution of catches by depth and area. Although these percentages were based only on at-sea sector catches, we applied them to the shoreside whiting sector to estimate their catch by area and depth. We were unable to analyze depth- and area-specific WCGOP data for the shoreside whiting sector prior to the deadline for this analysis. If requested by the Council, we can provide more accurate depth-area catches of rougheye rockfish for the shoreside whiting sector by June.

Since shoreside whiting is part of the shoreside IFQ sector (IFQ whiting and non-whiting trawl; IFQ fixed gear), for this analysis, we assumed that vessels declaring Pacific whiting mid-water trawl were part of the shoreside-whiting "sector".

For the action alternatives, we assumed that reductions of rougheye rockfish catch when using excluder devices would be similar among all non-Tribal whiting sectors (i.e., non-Tribal shoreside whiting and non-Tribal at-sea whiting sectors).

Lomeli and Wakefield (2013b; personal communication) provided two "rougheye rockfish escapement percentages", depending on gear design and trial (see above). The most effective design resulted in a 95 percent reduction of rougheye rockfish catch (Lomeli and Wakefield, 2013b); however, that design was prone to clogging at high Pacific whiting catch rates. A second design showed 26.6 percent reduction in catch of widow rockfish, even under high catch rates of Pacific whiting (Lomeli and Wakefield 2013c; personal communication). Unfortunately these latter trials were conducted in areas with no rougheye rockfish. It is likely that exclusion of rougheye rockfish would have been greater than that shown by widow rockfish, because rougheye are typically larger. Hence, for this analysis, we assumed that rougheye rockfish reduction would be 50 percent for non-Treaty at-sea whiting and shoreside whiting sectors (which is between 26.6 percent and 95 percent, but weighted closer to the lower escape percentage). This analysis will assume that that the excluder design (and specifications) are similar to that shown by Lomeli and

Wakefield (2013c; personal communication) during the third trial. Specifications for the most appropriate design can be provided by Lomeli (PSMFC) and Wakefield (NOAA).
No Action: Midwater trawl design would be implemented as specified in current regulations, and would be allowed in all areas and periods specified in current regulations. Declaration reports would also be filed as shown in current regulations.

Current regulations do not preclude the use of excluder devices and escape windows by any trawl fishery along the U.S. west coast. Hence, under No Action, excluder devices may be used voluntarily by any of the trawl sectors, if so desired. This voluntary action may reduce the catch of rougheye rockfish by midwater trawl sectors targeting Pacific whiting without additional regulation. However, for this analysis, it is assumed that voluntary use of excluder devices in the various Pacific whiting trawl sectors does not occur, and that fishing behavior will emulate that seen during 2008-2012. It is likely that some voluntary use will occur, and that fishing behavior may change in 2015-2016 relative to the recent past. These changes cannot be easily quantified, however, and are therefore not included in this analysis.
Under no action, it is assumed that the 5-year average (2008-2012) catch of rougheye rockfish will occur, with no impact to whiting catch (Table **Error! Reference source not found.**B-65).

Table Error! Reference source not found.**B-65. Projected rougheye rockfish catch (mt) under No Action. Catch was estimated as the 5-year average (2008-2012) from WCGOP data.**

Variable	Non-Tribal At-Sea Whiting	Non-Tribal Shoreside Whiting	Total
Rougheye Rockfish Catch (mt)	47.1	11.7	58.8 mt
Relative Impact to Whiting Fisheries	None	None	

Option 1 (most restrictive): For all non-Tribal midwater whiting trawl sectors for the area North of 40° 10´ N. latitude, the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
(2) Non-Tribal midwater whiting fisheries (all sectors) shall be allowed in all areas and periods as specified in current regulations, with trawl modifications described in Option 1, (1) above.
(3) Declaration reports would be filed as shown in current regulation.

Under Option 1, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries would escape at fishing depth and survive. Hence, rougheye rockfish catch by these sectors would be 50 percent lower than the 5-year average (or 29.4 mt; Table **Error! Reference source not found.**B-66).

This action would result in some loss of Pacific whiting during each haul (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be needed to fully attain quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 8 percent. This is likely a low estimate, because a much higher percentage of Pacific whiting might escape the trawl at fishing depth (or released (bled) from the trawl at the surface) when clogging of the excluder device occurs. Finally, although it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, impacts would be highest under this alternative (Table **Error! Reference source not found.**B-66).

Table Error! Reference source not found.**B-66. Projected rougheye rockfish catch (mt) under Option 1, where excluder devices would be used for all non-Tribal whiting trips (at-sea and shoreside) north of 40º 10′ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data). Pacific whiting loss may be > 8 percent per haul. Potential impact to whiting fisheries is demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.**

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	23.5	5.9	29.4
Relative Impact to Whiting Fisheries	(----)	(----)	

Option 2: For all non-Tribal midwater whiting trawl sectors and the area North of 40º 10′ N. latitude, if any fishing occurs between the 200 fathom RCA and 400 fathom "GCA" (to be specified at a later date), then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
   a. Midwater trawl specifications shown in current regulations (unmodified) would be allowed only if fishing occurred outside of the 200 fathom – 400 fathom "GCA" (to be determined at a later date) for all hauls during a Pacific whiting declared trip.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 2, (1) above.

(3) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 2, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within the 200 – 400 fm "GCA" north of 40º 10′ N. latitude is conducted with excluder devices installed (and these trips would not venture outside of the "GCA"). Consequently, it follows that all sets made outside of the "GCA" would be conducted without an excluder device. In actual practice, those declaring to fish inside the "GCA" with an excluder would likely make some tows outside of the GCA with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders even if no hauls are made inside a "GCA". Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside the "GCA"), 33.6 mt of rougheye rockfish would be caught (Table **Error! Reference source not found.**B-67): 26.9 mt by the at-sea whiting sectors and 6.7 mt by the shoreside whiting trips (see Table **Error! Reference source not found.**B-63 for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul when excluders are used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to fully attain the whiting quota. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table **Error! Reference source not found.**B-64 shows that 69.6 percent of the Pacific whiting is caught between 200 and 400 fathoms. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 5.6 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl when clogging of the excluder device occurs. In addition, some hauls will likely be made outside of the 200 – 400 fm "GCA" with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely (Table **Error! Reference source not found.**B-67).

Table Error! Reference source not found.**B-67. Projected rougheye rockfish catch (mt) under Option 2, where excluder devices would be used for non-Tribal whiting trips (at-sea and shoreside) made between 200 – 400 fm and north of 40º 10´ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 5.6 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.**

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	26.9	6.7	33.6
Relative Impact to Whiting Fisheries	(--)	(--)	

Option 3: For all non-Tribal midwater whiting trawl sectors, if any fishing occurs between the 200 fathom RCA and 400 fathom GCA (to be specified at a later date) and north of 46º 16´ N. latitude, then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.
   a. Midwater trawl specifications shown in current regulations (unmodified) would be allowed only if fishing occurred outside of the 200 fathom – 400 fathom "GCA" (to be determined at a later date) for all hauls during a Pacific whiting declared trip.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 3, (1) above.

(4) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 3, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within the 200 – 400 fm "GCA" north of 46º 16´ N. latitude would be conducted with excluder devices installed (and these trips would not venture outside of the "GCA"). Consequently, it follows that all sets made outside of the "GCA" would be conducted without an excluder device. In actual practice, those declaring to fish inside the "GCA" off Washington with an excluder would likely make some tows outside of the GCA with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders even if no hauls are made inside of a "GCA". Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside the "GCA"), 38.0 mt of rougheye rockfish would be caught (**Error! Reference source not found.**): 30.4 mt by the at-sea whiting sectors and 7.6 mt by the shoreside whiting trips (see **Error! Reference source not found.** for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul that excluder devices were used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to catch quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table **Error! Reference source not found.**B-64 shows that 29 percent of the Pacific whiting is caught north of 46º 16´ N latitude and between 200 and 400 fathoms. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 2.3 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl when clogging of the excluder device occurs. In addition, some hauls will likely be made outside of the 200 – 400 fm "GCA" when fishing north of 46º 16´ N latitude with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely (Table **Error! Reference source not found.**B-68).

Table Error! Reference source not found.**B-68. Projected rougheye rockfish catch (mt) under Option 3, where excluder devices would be used for non-Tribal whiting trips (at-sea and shoreside) made between 200 – 400 fm for declared trips north of 46º 16´ N. latitude. Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 2.3 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.**

Variable	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	30.4	7.6	38.0
Relative Impact to Whiting Fisheries	(-)	(-)	

Option 4: For all non-Tribal midwater whiting trawl sectors, if any fishing occurs north 47º 30´ N. latitude (all depths), then the current regulations would be modified as follows:

(1) The midwater trawl design, as specified under current regulations, would be modified to require excluder devices and escape windows while fishing for Pacific whiting, to increase escapement of rockfish (including rougheye rockfish) while minimizing escapement of Pacific whiting. Specifications to be provided at a later date through consultations with Dr. Waldo Wakefield (NOAA) and Mr. Mark Lomeli (PSMFC), fishing industry representatives, and net manufacturers.

a. Any declared trips south 47° 30´ N. latitude (where all tows during the declared trips would be made) would not require a rockfish excluder.

(2) Non-Tribal midwater whiting fisheries (all sectors) would be allowed during all periods specified under current regulations, with the additional restrictions shown in Option 4, (1) above.

(3) Declaration reports would be filed as shown in current regulation, but modified to identify the intent of fishing within the "GCA" with an excluder.

Under Option 4, it is assumed that 50 percent of the rougheye rockfish encountered by non-Tribal whiting fisheries when using excluder devices would escape at fishing depth and survive. The highest estimate of rougheye rockfish mortality under this scenario would be to assume that all fishing within "GCA" (i.e., north of 46° 16´ N. latitude) would be conducted with excluder devices installed (and these trips would not venture outside of the "GCA"). Consequently, it follows that all sets made outside of the "GCA" would be conducted without an excluder device. In actual practice, those declaring to fish inside the "GCA" off Washington with an excluder would likely make some tows outside of the "GCA" with the excluder during the same trip. In addition, it is likely that some individuals may voluntarily use excluders, even if no hauls are made inside a "GCA". Hence, under the worst-case scenario (i.e., reductions only applied to rougheye catch inside of "GCAs"), 38.6 mt of rougheye rockfish would be caught (Table **Error! Reference source not found.**B-69): 30.9 mt by the at-sea whiting sectors and 7.7 mt by the shoreside whiting trips (see Table **Error! Reference source not found.**B-63 for proportions among sectors).

This action would result in some loss of Pacific whiting during each haul that excluder devices were used (see Lomeli and Wakefield, 2013b,c), and therefore, additional fishing effort (numbers of hauls) may be required to catch quotas. Lomeli and Wakefield (2013c; personal communication) showed that up to 8 percent of Pacific whiting encountered may escape the trawl when using excluder devices, if clogging does not occur. Table **Error! Reference source not found.**B-64 shows that 32.6 percent of the Pacific whiting is caught north of 47° 30´ N latitude at all depths. Hence this action may increase towing duration (or number of tows) required to achieve whiting allocations by at least 2.6 percent (on average across all areas and depths). This is likely a low estimate, because a much higher percentage of Pacific whiting will escape the trawl (or be released (bled) from the trawl at the surface) when clogging of the excluder device occurs. In addition, some hauls will likely be made outside "GCA" with the excluder device installed. Finally, it is uncertain how much fishing time may be lost due to handling and repair requirements when using excluder devices, but this additional impact is likely and would be lowest among the action alternatives (Table **Error! Reference source not found.**B-69).

Table Error! Reference source not found.**B-69. Projected rougheye rockfish catch (mt) under Option 4, where excluder devices would be used for non-Tribal whiting sector (at-sea and shoreside) trips declared north of 47° 30´ N. latitude (all depths). Rougheye rockfish catch was estimated as 50 percent of the 5-year average (2008-2012; WCGOP data) when excluder devices were used, and 100 percent of the 5-year average when excluder devices were not used. Projected rougheye rockfish catch is divided between at-sea whiting (80.1 percent) and shoreside whiting (19.9 percent). Pacific whiting loss may be > 2.6 percent per haul (on average for all depths combined). Potential impact to whiting fisheries demonstrated by number of negative symbols (largest impact = most negative symbols); this measure is subjective.**

	Non-Tribal At-Sea Whiting (mt)	Non-Tribal Shoreside Whiting (mt)	Total Catch (mt)
Rougheye Rockfish Catch (mt)	30.9	7.7	38.6
Relative Impact to Whiting Fisheries	(-)	(-)	

Biological Impacts

This analysis demonstrated that rougheye rockfish caught by non-Tribal at-sea and shoreside Pacific whiting sectors may range from 58.8 mt (No Action) to 29.1 mt (Option 1; Table **Error! Reference source not found.**B-70). Other options were explored, where excluders would be required only on trips where at least one haul was conducted within specific depth ranges exhibiting highest rougheye rockfish catch (i.e., between 200 and 400 fm, "GCA") and/or within specific latitude ranges (i.e., north of 47° 30' N latitude; Table **Error! Reference source not found.**B-70) regardless of depth. Option 1 provided the largest rougheye rockfish savings but would also result in the most wide-spread use of excluder devices and highest escapement of Pacific whiting across the fleets (i.e., excluders would be required for all trips north of 40° 10′ N latitude). Rougheye rockfish catch for Options 2 – 4 are up to 9 mt higher than that shown for Option 1, but substantially lower than shown under No Action. It is important to note that there is virtually no difference in rougheye rockfish catch (or whiting escapement) between Options 3 and 4 (Table **Error! Reference source not found.**B-70). Option 3 would require excluders along the entire Washington coast when fishing is anticipated to occur between 200 and 400 fm (within the "GCA"), whereas Option 4 would require excluders only be used when fishing occurs north of 47° 30' N latitude (all depths).

The 2015 and 2016 component OFLs for rougheye rockfish north of 40° 10' N latitude are 201.9 mt and 206.8 mt. The five-year average catch (2008-2012) by all fisheries (250.1 mt; Table **Error! Reference source not found.**B-62) would exceed this 2015 component OFL by 48.2 mt under No Action. Options 1 – 4 may reduce the catch of rougheye rockfish by 20.2 mt (Option 4) to 29.4 mt (Option 1). These reductions alone <u>may not</u> be enough to prevent exceeding the 2015 component OFL for rougheye rockfish north of 40° 10' N latitude (i.e., 201.9 mt), or the 2015 component OFL coastwide (i.e., 206 mt). It is important to note that these projections are based on 5-year average catches. Annual projections could be much higher (or lower), if minimum or maximum historical catch values were used, or if some upper or lower percentile for catches were applied to the projection. In addition, including more or fewer years for the baseline average may change interpretations.

Impacts to whiting and bycatch species that escape the trawl under Options 1 –4 relative to No Action are uncertain. The potential mortality for those species escaping the trawl through the escape windows is unknown and would be unaccounted. Escapement at fishing depth of both whiting and bycatch species could be much higher than shown under Options 1 – 4 if clogging of the BRD occurs. Furthermore, if clogging occurs, it is likely that some fish may have to be bled at the surface before bringing the net up the trawl ramp. Mortality for fish bled at the surface would likely approximate 100 percent. These fish would be accounted for by 100 percent observer coverage.

Table Error! Reference source not found.**B-70. Summary of biological and socio-economic impacts by alternative. The "relative impact to whiting fisheries" is a subjective measure, with no quantitative basis.**

Alternative	**Excluder Requirement**	**Rougheye Rockfish Catch (mt)**	**Projected Additional Whiting Escapement (%)**	**Relative Impact to Whiting Fisheries**
No Action	None	58.8	0.0%	No Impact
1	North 40° 10´ N latitude (all depths)	29.4	> 8.0%	(----)
2	North 40° 10´ N latitude (200-400 fm)	33.6	> 5.6%	(---)
3	North 46° 16´ N latitude (200-400 fm)	38.0	> 2.3%	(--)
4	North 47° 30´ N latitude (all depths)	38.6	> 2.6%	(-)

Socioeconomic Impacts
The expense incurred by purchasing flexible excluders for shoreside midwater trawls (and trawls for catcher vessels in the at-sea whiting fishery) may approximate $22,000, based on research gear-related expenses (Lomeli (PSMFC) and Wakefield (NOAA), personal communication). These BRDs are built within a straight tube of netting designed to be inserted (i.e., zippered) between the intermediate section of the trawl and the packer/stuffing tube forward of the codend. The price for catcher-processor (C/P) trawls will likely be higher, because the trawls are larger.

Relative impacts by alternative are shown in Table **Error! Reference source not found.**B-70. Implementation of a new gear regulation requiring use of excluder devices in midwater whiting trawls for non-Tribal at-sea and shoreside whiting sectors may reduce the catch efficiency for whiting (i.e., there will be some additional escapement), increase net handling time (e.g., if fish and debris need to be removed forward of or from the excluder after each haul), and require net modifications. For example, when clogging occurs, the vessel may have to bleed or release fish from the net until the volume at the clog can be brought up the stern ramp without further damaging the intermediate section of the trawl net in front of the excluder. The time required to bleed fish, the economic loss of fish bled from the net, and repair costs to the net will likely represent economic impacts. Since these trips are 100 percent observed, fish bled from the net at the surface would be deducted from the quota. It is uncertain how often this may occur. At any rate, each of these outcomes may increase the operating costs of fishing operations. In addition, reduced efficiency may result in additional hauls and time at sea to attain the quota of Pacific whiting. Additional time at sea equates to not only additional expense, but also additional exposure to hazards.

The most complex regulations may be the most difficult (and expensive) to enforce. Note that some analyses focused on use of excluders only under a single condition (i.e., north or south of a specific latitude), whereas others incorporated both latitudinal split and depth requirements (i.e., 200 – 400 fm). The latter requirements would clearly be the most complex to manage.

Discussion and Considerations
For this report, five options were provided for consideration (including No Action). Additional options may be considered after input from the public and advisory groups (e.g., GAP, EC, SSC, and GMT). Council guidance is needed to refine this analysis (i.e., add and/or delete options). For example, gear regulations are difficult to define and enforce, hence, comments from the EC (and all advisory groups) must be weighed when considering regulatory changes to fishing gear. In addition, regulatory complexity is highest when regulating by latitude and depth, versus regulating by latitude only.

For options where midwater trawls with excluders are required for fishing within specific areas or depths (i.e., to legally fish within a "GCA"), the Council may consider recommending measures to minimize complexity for enforcement. Some examples include: (a) intended fishing trips within these special "GCAs" must be declared prior to leaving port, which would require a new declaration category in regulation, and (b) only a midwater trawl with a legal excluder device installed may be onboard during trips where any hauls occur inside a "GCA" (i.e., no other trawl may be onboard).

If regulations are adopted that define new fishing gear (i.e., installation of an excluder device and escape windows), the regulation could be specific only where needed to ensure adequate escapement of rockfishes at fishing depth. Specificity could be minimal and only apply to the most important aspects of the excluder and escape windows (e.g., length and width of grids within a panel that allow passage of whiting while blocking the passage of larger rockfish). Different sizes of vessels and different operators may require different designs (i.e., placement within the trawl due to different types of nets, etc.). It may be advantageous if fishermen were allowed the flexibility to fine-tune the device for their specific net and fishing operations to ensure that whiting escapement is minimal while maximizing escapement of rockfish. It would be beneficial for experts to convene to help draft regulatory language that ensures appropriate escapement along with adequate flexibility. In addition to NMFS regulatory writers and Council staff, these experts may include Pacific whiting vessel owners/operators (shoreside whiting vessels, catcher vessels, and catcher/processors), net manufactures, and researchers.

For this draft, impacts were estimated using a 5-year average catch of rougheye rockfish in non-Tribal at-sea and shoreside Pacific whiting fisheries. Other averages could be used (e.g., 6-year average, which would reduce the baseline value for rougheye rockfish catch). It has also been suggested that the average and a range (e.g., minimum and maximum catches over a longer time period) be used to estimate rougheye rockfish impacts. This would provide some measure of risk that the Council may evaluate when selecting alternatives. If this measure moves forward, we seek guidance from the SSC and the Council regarding bycatch amounts that may be most appropriate for projecting catches of rougheye rockfish among alternatives (i.e., 5-year average, 6-year average, 75th percentile, etc.).

Interannual variability may result in different outcomes than predicted here. Annual catches of rougheye rockfish are highly variable (see Table **Error! Reference source not found.**B-62). This variability may be due to areas and times that fishing occur (e.g., fishing occurs where Pacific whiting may be most abundant, and this may change from year to year depending on environmental conditions). In addition, Pacific whiting ACLs vary annually, which may directly impact the amount of fishing effort. Finally, sizes of Pacific whiting may vary annually. For example, the majority of the Pacific whiting catch in 2013 was age 3, which approximates individual weights of about 360 grams and lengths of 36-38 cm. In 2014, the majority of Pacific whiting catch is expected to be age 4, which are typically 40-43 cm and may average approximately 500 g. It is likely that larger Pacific whiting may exhibit higher escapement than smaller individuals when using excluder devices. This information collectively illustrates that encounter rates with rougheye rockfish will likely vary from year to year, and retention (or escapement) of Pacific whiting may vary depending on clogging rates and sizes of Pacific whiting available (e.g., larger Pacific whiting may exhibit highest escapement when using excluder devices).

Fishermen behavior should be considered when selecting alternatives. Fishing strategies may change if stock complexes are reorganized, or if consequences of exceeding component OFLs become recognized. Fishermen may voluntarily use excluder devices when fishing in areas with known high concentrations of rougheye rockfish, or may avoid these areas all together if consequences of catching rougheye rockfish are high. On the other hand, fishermen may be more inclined to fish within areas of high rougheye rockfish concentrations if excluder devices selectively enhance their escapement from trawls.

It is important to note that research results are always tenuous. Sample sizes are typically small (i.e., number of vessels, types of vessels, fishing areas, bycatch species encountered, etc.). The effectiveness of a new gear design is uncertain until applied to the commercial fishery under purely commercial conditions. Furthermore, research results described here were conducted on shoreside-whiting vessels. The net types used by these vessels are similar to those used by catcher vessels in the mothership sector. However, nets used by C/Ps are much larger. The design, cost, and effectiveness may be much different for C/Ps. Input from the GAP and others is necessary to help elucidate potential costs and benefits among sectors.

Finally, the potential escapement rate for rougheye rockfish using excluders was assumed to be 50 percent, which was less than the midpoint between rougheye rockfish escapement during Trial 2 (= 95 percent escapement by weight) and widow rockfish escapement during Trial 3 (= 26 percent escapement by weight). There were no rougheye rockfish available to the trawl during Trial 3. The authors of the excluder research projects point out that rougheye rockfish, which are generally larger than widow rockfish, would exhibit higher escapement than widow rockfish using the excluder devices. Guidance is sought from the SSC regarding the most appropriate assumption for rougheye rockfish escapement when excluder devices are used.

To summarize, the socio-economic and biological impacts may be more (or less) than described here. The pros and cons of applying research results to regulation should be considered. Input from the public and advisory groups will be paramount when considering this management measure.

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GROUNDFISH ADVISORY SUBPANEL REPORT ON STOCK COMPLEX RESTRUCTURING

Introduction

The Groundfish Advisory Subpanel (GAP) heard presentations from Council staff and National Marine Fisheries Service (NMFS) staff about stock complex restructuring. The issues at hand appear to be – is there a compelling conservation risk that requires restructuring of the slope complex, and, if yes, what management tools should be considered. As stated in previous GAP reports, the GAP does not think the sum of the scientific evidence available to the Council demonstrates a compelling need to restructure the minor slope rockfish complex. Moreover, Council discussion about this issue has motivated the industry to consider proactive, voluntary measures to reduce impacts on rougheye rockfish. Therefore, the GAP recommends that the Council (1) adopt a Preliminary Preferred Alternative (PPA) to retain rougheye rockfish in the minor slope complex and (2) continue to engage with the affected fleets to use voluntary measures to reduce their catches of rougheye rockfish. The GAP rationale is elaborated below.

Legal Requirements

The GAP reiterates that the legal requirement to determine whether overfishing is occurring is not when a contribution overfishing limit (OFL) value for a component stock is exceeded, but when a complex OFL is exceeded. Managing to an OFL on individual species within a complex is a policy decision that the Council can make, but is not required. Determining OFLs for individual species within a complex and managing to those levels can result in no fishing activity whatsoever without any particular savings to overall complexes. The National Standard 1 Guidelines envisioned the use of complexes; the Council has used complexes to effectively manage the groundfish fishery. While it might be valid to express concerns that future activity may lead to fishing levels that exceed an OFL, overfishing of the minor slope complex has not and is not occurring. The GAP cautions against retrospectively declaring that overfishing occurred in the past.

Rougheye Rockfish Stock Status

The Council began discussing potential management changes for rougheye rockfish after the Productivity and Susceptibility Analysis (PSA). The PSA indicated that OFL levels for rougheye rockfish were about 70 metric tons. When compared to current fishing levels, the PSA analysis was cause for concern. In 2013, a full assessment of rougheye rockfish was conducted, reviewed by a Stock Assessment Review (STAR) panel, approved by the Scientific and Statistical Committee (SSC), and adopted by the Council. The stock assessment concluded that the stock was at 47.32 percent of unfished biomass in 2013. The 2013 stock assessment indicated that annual catch levels in the range of 188 to 209 metric tons would result in improved stock status over the next ten years, up to 52 percent of unfished biomass (see below, figure d and table g from the 2013 stock assessment). The GAP notes that 188 metric tons (the low end of the range) is much higher than the 70 metric tons projected by the PSA. The GAP cautions against letting PSA ghosts haunt current consideration. The best available science indicates that rougheye rockfish is a healthy species and can accommodate catch levels in line with the catch projections in table g (below).

Figure d. Estimated relative depletion with approximate 95% asymptotic confidence intervals (dashed lines) for the base case assessment model.

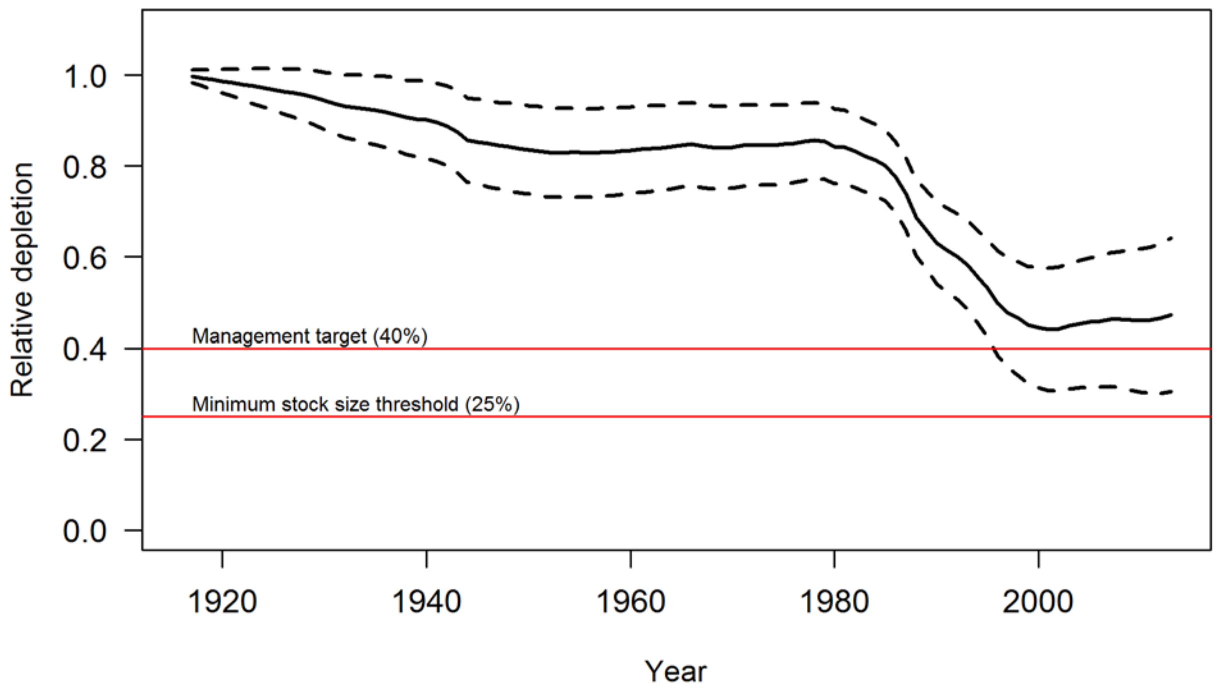

Table g. Projection of potential OFL, landings, and catch, summary biomass (age-10 and older), spawning biomass, and depletion for the base case model projected with total catch equal to the recent 5-year average in 2013 and 2014, and equal to the predicted ABC (adjusted by the 40:10 control rule and 0.9135 to reflect the P^* buffer) afterwards. The predicted OFL is the calculated total catch determined by $F_{SPR=50\%}$.

Year	Predicted OFL (mt)	ABC Catch (mt)	Landings (mt)	Age 10+ biomass (mt)	Spawning Biomass (mt)	Depletion (%)
2013			184	8,176	2,552	47.3%
2014			184	8,220	2,600	48.2%
2015	206	188	183	8,227	2,653	49.2%
2016	210	192	187	8,219	2,706	50.2%
2017	215	197	191	8,225	2,755	51.1%
2018	219	201	195	8,217	2,797	51.8%
2019	222	204	198	8,188	2,829	52.4%
2020	224	206	201	8,136	2,851	52.9%
2021	226	208	202	8,113	2,864	53.1%
2022	227	209	203	8,084	2,868	53.2%
2023	226	209	203	8,052	2,865	53.1%
2024	226	208	203	8,019	2,856	53.0%

Impacts of Removing Rougheye from the Minor Slope Complex

Despite the scientific evidence, NMFS persists in requesting the Council consider removing rougheye from the minor slope N complex. The GAP reiterates our March 2014 comments:

> "The issue presented to the GAP was how best to approach the removal of rougheye and shortraker rockfish from the minor slope rockfish category north of 40°10'. The need to make this change is a result of an earlier decision to set a separate OFL for rougheye based upon the recent stock assessment.
> The GAP notes that removing rougheye rockfish from the complex will cause tremendous disruption to the commercial groundfish fleets. Rougheye rockfish is caught incidentally in the longline, whiting, and bottom trawl fisheries. Therefore, it would be necessary to provide an amount of rougheye rockfish to these fishery sectors in a way that is as least disruptive as possible. Unfortunately, there does not appear to be an easy solution to this situation.
>
> "For longline and whiting, area restrictions may reduce impacts, but would come at a very high cost of loss of fishing opportunity in those areas. For the trawl IFQ fishery, the amount that potentially could be allocated would likely be so low that rougheye rockfish would become a new constraining species in the fishery and cause a significant amount of harm, much like yelloweye and canary rockfish already have. For example, quota share allocations to individual fishermen would be too small to accommodate fishing opportunity.
>
> "These impacts are cumulative on the entire industry.
>
> "Moreover, constraining species in the traditional trawl fishery have largely already pushed trawlers off of the shelf to the slope. With rougheye becoming a new constraining species -- this time on the slope -- the only area left to fish will be in very deep water."

Retain Rougheye Rockfish in the Minor Slope Complex

As noted above, the GAP believes there is no compelling conservation risk that requires the Council to remove rougheye rockfish from the minor slope complex. Species-specific OFL, acceptable biological catch (ABC), and annual catch limit (ACL) values for the stock will be established under status quo, stock complex management. These numbers do not change if the species is pulled out of the complex. Moreover, there are no additional tools available to managers to keep catches below the OFL if the stock is removed from the complex – that is, the same tools are available regardless of whether the stock is contained in the complex or not. In short, removing the species from the complex would be highly disruptive to the industry, and likely delay implementation of 2015/2016 specifications, without providing any additional benefit to management.

The GAP agrees that it is critical to ensure overfishing of rougheye rockfish does not occur. In the GAP's opinion this can be accomplished without removing rougheye rockfish from the minor slope complex. NMFS requested the Council consider further the question of whether rougheye rockfish can be maintained within the minor slope complex. This has been done. The comprehensive analysis developed and considered by the Council over the past year demonstrates this.

Mitigating Concerns about Status Quo

The GAP stresses that, in its opinion, the best available science demonstrates that there is no conservation concern relative to rougheye rockfish. However, the GAP believes the industry has the ability to rise to the call to better understand and to minimize their impacts on rougheye rockfish. The GAP will provide greater detail about these measures under Agenda Item C.9. For consideration in the interim, the GAP suggests that a harvest guideline and sorting requirement would improve information about rougheye catches to help industry refine voluntary measures to reduce catches.

Potential Management Tools

The GAP and industry have discussed use of voluntary measures to avoid areas of higher rougheye rockfish catch occurrence. Voluntary avoidance of these areas would require assistance from the shoreside sampling program to ensure that catch data is transmitted to vessels on an expedited basis so that they can avoid returning to areas where large catches of rougheye rockfish may have been encountered. The whiting fleet continues to explore the use of Sea State to track areas of rougheye rockfish bycatch and provide that information to the whiting fleet in near real time. Establishment of a sorting requirement would enhance the ability of processors and the fleet to identify larger catches of rougheye rockfish. The GAP will also explore, under Agenda Item C.9, Management Measures, identification of areas where higher catches of rougheye rockfish could affect projected annual catch, which could trigger a temporary closure to reduce rougheye rockfish catch rates. This may involve new management lines or other spatial management tools that can be used. The GAP also suggests examining slope rockfish trip limits for the fixed-gear sector to determine whether they will affect fishermen's behavior and reduce targeting on rougheye rockfish. These items will be further discussed by the GAP in preparing our remarks under Agenda Item C.9; the GAP is not recommending action on these items under Agenda Item C.8.

Category 1 or Category 2

Finally, the GAP repeats our recommendation from Agenda Item C.4. The GAP recommends the Council task the SSC with reviewing the SSC decision to reclassify the rougheye rockfish stock assessment from category 1 to category 2. It is critical that this question be addressed. There is a direct link between the OFL and ABC values for 2015/2016 and the stock assessment category designation. In general, adopting lower harvest levels without adequate rationale, especially when there is no compelling conservation risk to the stock, is inappropriate. In specific, given the significant ramifications of the rougheye/blackspotted ABC to all commercial fisheries, it is critical we get it right.

PFMC
04/07/14

Agenda Item C.8.b
Supplemental GMT Report
April 2014

GROUNDFISH MANAGEMENT TEAM REPORT ON FISHERIES IN 2015-2016 & BEYOND: STOCK COMPLEX RESTRUCTURING

The Groundfish Management Team (GMT) reviewed the items contained in the Briefing Book (contained in both Agenda Items C.4 and C.8) and had in-depth discussions, aided by insightful observations with industry. In the discussion below, references to rougheye rockfish is used as shorthand for the combination of rougheye and blackspotted rockfish, which is the subject of the 2013 stock assessment and associated component overfishing limit (OFL) contribution to the status quo Slope Rockfish complex.

The GMT began deliberations on stock complex restructuring by having a discussion about management of rougheye rockfish including whether to a) manage rougheye as part of the existing Slope Rockfish complexes north and south of 40°10 N. latitude b) create a new rougheye/blackspotted and shortraker coastwide complex and c) whether to manage rougheye with stock-specific harvest specifications. The GMT provides the following information to inform Council action under this agenda item.

Historical Management Context

Historically, rougheye rockfish has been managed as part of the Slope Rockfish complexes north and south of 40°10 N. latitude. Management measures were implemented to keep total catch of slope rockfish within the respective Slope Rockfish complex annual catch limits (ACL) north and south of 40°10 N. latitude.

Prior to the inception of the West Coast Groundfish Observer Program (WCGOP) in 2001, there was minimal monitoring of the slope rockfish catches and discards either at the complex or species level from the commercial fisheries. Most species were recorded on commercial fish tickets in general or aggregate categories such as “red rockfish,” “deep water reds,” or “misc. rockfish.” This was due, in part, to the fact that the identified rockfish complexes (minor nearshore, minor shelf, and minor slope) did not exist prior to 2000. When the WCGOP was implemented, observers began collecting data on species composition. Since the beginning of the individual fishing quota (IFQ) program in 2011, there has been 100 percent observer coverage on vessels participating in the IFQ and at-sea fisheries as well as catch monitors at shoreside processing facilities. These steps have led to improvements in data collection by species in recent years. The GMT notes that the current WCGOP target coverage rate for non-IFQ sectors, including the non-nearshore fixed gear sector, is 20 percent.

The 2011 Groundfish Mortality (GM) Report, published in October 2012, was the first occurrence that WCGOP provided the composition mortalities for the component species of complexes. At that time, we had been tracking catch against the complex ACLs, which had low attainment. Furthermore, we were adjusting trip limits based on the Slope Rockfish complex ACLs and were unaware that there was a need for monitoring the rougheye rockfish components.

Directing effort off the shelf and onto the slope was a conscious decision to promote rebuilding of overfished species. In recognition of the challenges presented by rebuilding cowcod, canary and yelloweye rockfishes (i.e., very low harvest specifications), effort was directed away from the shelf as soon as those rebuilding plans were adopted. For example in the 2007-2008 Biennial Specifications Final Environmental Impact Statement (FEIS), overfished species were grouped into shelf north, shelf south, slope, and midwater classifications and rebuilding times compared to optimum yield (OY) alternatives were analyzed (2007-2008 FEIS). That analysis showed that overfished slope species rebuilding times were less sensitive to increases in OY compared to overfished shelf species. As such, management measures, including Rockfish Conservation Areas (RCAs) and cumulative limits, directed effort on to the slope to facilitate the most efficient rebuilding "portfolio" across all areas.

During discussions, a member of the industry noted that awareness of the potential vulnerability of rougheye rockfish has been growing only within the last few years. The industry is therefore interested in voluntary measures to respond to our current rougheye rockfish concerns. These two items were also brought up in Agenda Item C.4.c. Supplemental Public Comment 5. We had some discussion on this matter and provide a history of advisory body statements and recommendations in Appendix 1 as a reference.

Individual Management

Agenda Item C.8.a Attachment 1 shows three alternatives that pull some of the rockfishes out of the Slope Rockfish complex for individual management. These alternatives were analyzed by the GMT at earlier Council meetings (see Appendix 1 for references). **Some on the GMT suggest that the Council focus their discussions on (a) retaining the current slope rockfish complex configurations north and south of 40°10 N. latitude with consideration for a combined harvest guideline (HG) for rougheye/blackspotted/shortraker rockfish, (b) pulling rougheye/blackspotted/shortraker rockfish from the slope rockfish complex and create a new complex that contains the three species (i.e., Agenda Item C.8.a Attachment 2), and (c) implementing stock-specific harvest specifications for rougheye/blackspotted. It is believed that analyzing Alternatives 1, 2, and 3 (Agenda Item C.8.a Attachment 1) are more complex and potentially not feasible by the June Briefing Book deadline.** If the Council desires, analysis for the remaining slope rockfish complex alternatives found in Agenda Item C.8.a Attachment 1 could be prepared for future harvest cycles.

Harvest Guideline vs. Annual Catch Limit Management

The first decision is whether to manage rougheye (1) within the Slope Rockfish complexes north and south, (2) within a coastwide rougheye/shortraker complex, or (3) with stock-specific harvest specifications. If the Council decides to manage rougheye in the Slope Rockfish complexes north and south, the next question is whether to manage to or near the rougheye rockfish component to the Slope Rockfish complex in the north. It is our understanding that mortality compared to the rougheye rockfish OFL and ABC component contribution will be used to evaluate performance of the stock complex.

The GMT notes that the Groundfish Fishery Management Plan (FMP) and regulations speak to the differences between using ACL vs. HG management. It is a policy decision whether one or the other is chosen, but we explain what may be some of the key differences in the two approaches. Groundfish regulations define a HG as a specified numerical harvest objective which is not a quota. Attainment of an HG by one particular sector or all sectors combined does not require closure of a fishery. An ACL is a harvest limit specified equal to or below the allowable biological catch (ABC) in consideration of conservation objectives, socioeconomic concerns, management uncertainty, ecological concerns, and other factors. It includes all sources of fishing-related mortality including landings, discard mortality, research catches, and catches in exempted fishing permit activities. In contrast to an HG, an ACL could require closure upon attainment and may require stronger inseason action upon projected attainment. It is the understanding of some on the GMT that the Council and NMFS cannot plan to exceed an ACL. Given recent catch history and past guidance, setting an ACL may require setting some of the associated management measures that have been analyzed or discussed (e.g. GCAs, excluders, trip limits, or RCA boundary adjustments). Others on the GMT argue that the standard of exceeding the harvest limit (i.e., whether it is characterized as an HG or ACL) is the same and both will require the same level of inseason action. This view holds that the HG is just a means of lowering the likelihood that catch exceeds an ABC contribution. If a HG does not sufficiently lower this likelihood, then other measures would be needed to bring the risk of an overage down to acceptable levels. Similarly, the NMFS report (Agenda Item C.8.a, Attachment 2), asserts that not setting a HG, and managing only to the OFL/ABC is an option available to the Council to aid in industry-led voluntary reduction of catch. Past practice has been based on individual circumstances, so the exact nature of the standard and any difference between the necessary response is unclear to us at this time.

Since 2013, blackgill rockfish have been managed with a HG within the Slope Rockfish complex south of 40°10 N. latitude. Similarly, blue rockfish is also managed within the Nearshore Rockfish complex north and south of 40°10 N. latitude. We elaborate further on blackgill rockfish since it is a Slope Rockfish species caught by both trawl and non-trawl sectors, similar to rougheye. Blackgill rockfish is allocated as part of the Slope Rockfish south complex under Amendment 21 (63 percent to trawl and 37 percent to non-trawl). To improve inseason tracking of blackgill rockfish south of 40°10' N. latitude, the Council recommended HGs which were equivalent to the 40-10 adjusted ACLs calculated for the stock. Further, the Council recommended that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry and 40 percent to open access fixed gears. Furthermore, the blackgill HG automatically enacted a sorting requirement and thus the quality of landings data have been improved (i.e., reporting occurs at the species level instead of estimates derived from species composition). Data from PacFIN indicates that blackgill landings have decreased since the implementation of these HGs. In November 2014, we will receive the 2013 GM Report which will inform whether the mortality (landings plus discard) was within the HG.

A similar concept could be considered for the component species within the Slope Rockfish complex and is evaluated herein. Instead of specifying a HG at the species level, a HG could be set for multiple species. For example, the HG for this case would be defined as the sum of the rougheye rockfish, blackspotted rockfish, and shortraker rockfish ABCs (= 204 mt for 2015 and 209 mt for 2016) shown in Agenda Item C.8.a, Attachment 1, Table 2 and Agenda Item C.8.a. Attachment 2, Table 2). Under Agenda Item C.9, the Council can further consider whether a trawl/non-trawl and/or within trawl HG is necessary.

Allocative Steps within the Alternatives

Managing Rougheye/Blackspotted/Shortraker with a HG within the Slope Rockfish Complex North

The current process for establishing the fishery HG for the Slope Rockfish complex is to first subtract anticipated groundfish mortality in incidental open access fisheries, research, exempted fishing permits, and treaty tribal fisheries. The fishery HG is then allocated 81 percent to the trawl sector and 19 percent to the non-trawl sector, based on the allocations specified in the FMP.

In the event the Council adopts a rougheye/blackspotted/shortraker rockfish HG, it is our understanding that the HG would be implemented within the trawl allocation and/or within the non-trawl allocation. The Council could also consider establishing a rougheye rockfish HG between shorebased IFQ fishery and the at-sea sector. The GMT offers the following flowchart as an example (i.e., the ACL is only an example) of where the various HGs could be implemented. The short-hand R/S is used to indicate the combined rougheye/blackspotted/shortraker HG.

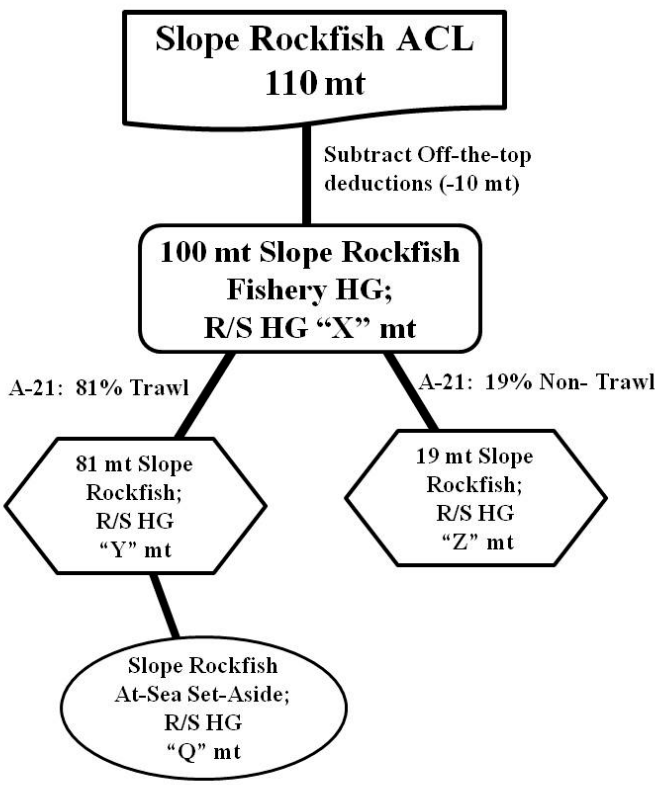

Figure 1. Example of where rougheye/blackspotted/shortraker (R/S) HGs could be implemented. The slope rockfish ACL of 100 mt is for example purposes only.

Managing Rougheye and Shortraker in a Coastwide Complex

In the NMFS report (Agenda Item C.8.a Attachment 2), potential Council decision points are highlighted in Figure 1. The report notes that the need to calculate a fishery HG is based on the need to further allocate the ACL (i.e., whether with HGs or more formal trawl and non-trawl allocations). If there are no sector-specific HGs or allocations, and all sectors are managed under a single ACL, then it becomes more difficult to establish sector-specific tools, such as trip limits for non-trawl or IFQ for the trawl fleet, to keep catch within the ACL.

The GMT notes that the process for the majority of stocks and complexes is to remove the off-the-top deductions from the ACL, establish a fishery HG, and establish trawl and non-trawl allocations - either formal FMP amendments or two-year (see Tables 10-13, Agenda Item C.4.a, Supplemental Revised Attachment 2). The species that do not follow this process are, for the most part, nearshore species that are managed by the states.

In the event the Council chooses to establish a fishery HG and generate trawl and non-trawl allocations, the GMT notes that two-year allocations for rougheye and shortraker could be established. Allocations could be informed by using data in a) Agenda Item C.4.a, Attachment 3, which displays the trawl and non-trawl mortality estimates for rougheye/blackspotted and b) the NMFS report which contains coastwide mortality estimates of rougheye/blackspotted and shortraker. Another table should be created to show historical catches of the species that remain in the Slope Rockfish complexes north and south of 40°10 N. latitude when rougheye and shortraker are removed. The Council could review the historical data and anticipated future catches to determine whether the Amendment 21 allocation is still appropriate for the new Slope Rockfish complexes north and south of 40°10 N. latitude (i.e., without rougheye and shortraker) and consistent with the original objectives. In the event the Council decides the Amendment 21 allocation is no longer applicable, an FMP amendment would be needed and a two-year or long term allocation could be established.

Table 1 contains a comparison of the harvest specifications (ACL vs. HG) and management options available for the Slope Rockfish complex. Options and measures in Table 1 that result in sorting of rougheye - e.g., implementing a scientific sorting requirement, a HG, a coastwide rougheye/shortraker ACL, or stock-specific harvest specifications for rougheye rockfish - would provide more timely information to industry and managers, compared to No Action. Such information could also be used to facilitate voluntary measures to reduce rougheye rockfish mortality.

Table 1. Comparison of management measures available under current management, management of R/S with HGs within the Slope Rockfish complexes (N&S), or creating a new coastwide R/S complex. The management measures shown in the table will be discussed in more detail in the C.9 statement.

Management Measure	Current management (R/S within the Slope (N&S) ACLs)	Managing R/S with a combined HG within the Slope (N&S) ACLs	Create a new coastwide R/S complex and manage the complex with a coastwide ACL	Comments
HG	No	Yes	Yes	-Implementation of a HG requires sorting on fish tickets -Because sorting is required inseason tracking is more accurate over the long term and timely
Scientific Sorting Requirement	No	HG has a sorting requirement (Note: A scientific sorting requirement could be added in lieu of a HG and similar benefits would occur)	ACL has a sorting requirement	-Because sorting is required inseason tracking is more accurate over the long term and timely
Trip limits	Yes (for non-trawl, no sublimit)	Yes, including a sublimit for R/S	Yes, R/S trip limits needed	-No difference in management measures between the two Action Alternatives
IFQ	Issued at the Complex level, not R/S	Issued at the Complex level, not R/S	Options A-C = No Option D = Yes	-R/S complex could have HGs established within IFQ sectors -No difference in management measures between the two Alternatives.
RCA	Yes	Yes	Yes	-No difference in management measures between the two Action Alternatives -May need to establish lines that approximate deeper depths

Management Measure	Current management (R/S within the Slope (N&S) ACLs)	Managing R/S with a combined HG within the Slope (N&S) ACLs	Create a new coastwide R/S complex and manage the complex with a coastwide ACL	Comments
Excluder Device	No	Yes	Yes	-May be disruptive to industry, particularly in high whiting abundance years/areas.
GCA	No	Yes	Yes	-May be disruptive to industry under either Action Alternative. -Implementing broad area closures would be in conflict to industry requests for increased accountability and opening of RCA closure areas

Average catches of rougheye rockfish among the sectors have had a high degree of inter-annual variability due to market demands, distribution and composition of target species (e.g., Pacific whiting), and environmental conditions. The GMT notes that this pattern was also observed with the dogfish mortality impacts analyzed in management measures (Agenda Item C.4.b, REVISED GMT Report). However, the comparison may be valid in that there may be methods in which the Council could further explore complex reorganization as another management measure tool to address controlling catch for stocks that have a recent history of exceeding their contribution OFL/ABC to the complex OFL/ABC. It may be beneficial for the Council to explore strategies that preserve aspects of the inter-annual variability in a manner that avoids some of the disruptions, according to some industry comments, associated with IFQ management, as might be avoided in the NMFS report (options A-C decision points) on slope rockfish reorganization (Agenda Item C.8.a, Attachment 2). However, when ascertaining the appropriate level of risk of balancing increased voluntary industry co-management along with inter-annual/sector variability preservation, it will be important for industry to provide their strategies of controlling catch in advance, and for the Council to determine if voluntary plans to reduce catch are sufficient. The GMT reviewed the public comments in Agenda Item C.4., which applied specifically to the subject matter under this agenda item. The GMT would like to acknowledge the joint industry letter (Agenda Item C.8.c. Supplemental Public Comment 5) and recognize that they have proactively and cooperatively taken the first step to outline their proposed strategies.

Sector-specific ACLs can be specified, especially in cases where a sector has a formal, long-term allocation of the harvestable surplus of a stock or stock complex. Sector-specific ACLs may serve as the basis for invoking adaptive management measures (not to be confused with accountability measures). However, inter-sector HGs may be more appropriate in certain circumstances where greater flexibility is needed. In either scenario, increased regional place-based management may be advanced, while also ensuring that a proper balance is developed coastwide in preventing OFL, ABC, and ACLs from being exceeded.

If the Council were to explore application of the mixed stock exception in this situation, continued mortality exceeding F_{MSY} is permissible in the interim if the appropriate conditions are met as stated in the National Standard Guidelines (e.g., the stock is not overfished). This is a larger issue that should be discussed at greater length outside the specifics of alternatives related to rougheye rockfish. If the mixed stock exception is not applied, then if ACLs are exceeded more than once in the last four years then accountability measures (AMs), such as increasing catch monitoring or increasing stock sampling rates for certain complexes (as in the NMFS proposed R/S complex), may need to be implemented. Inseason adjustments to fisheries may also be needed if industry is not successful in its voluntary catch control efforts, or additional AMs, including setting an annual catch target (ACT), may need to be implemented.

Use of Rockfish Conservation Areas

Stocks fluctuate in temporal and geographic patterns, with some more variable than others. Therefore, prediction of future fishing opportunities is difficult for certain stocks given ecosystem, regulatory, and market changes. Currently, RCA lines are only analyzed and available for use in inseason management out to 250 fathoms, therefore the Council may wish to consider developing deeper management lines for annual or temporary period closures. Further analysis would be required before the Council is able to utilize deeper management lines until such lines could be considered routine relative to inseason rulemaking in order to maintain compliance with: (1) the Administrative Procedures Act (APA) requirements for waiving of notice and comment; and (2) the National Environmental Policy Act (NEPA). During public comment on Agenda Item C.4, an industry member suggested management lines might be needed deeper than the existing 250 fathom lines. For example, there is some evidence of rockfish distribution extending to low oxygen depths well beyond 250 fm (e.g., Field and Pearson 2011). However, it may be important for these RCA lines to be drawn across a wide variety of latitudinal locations to enable as much precision as possible, without unnecessarily compromising access to target species. The GMT envisions such closures to be more temporary in duration than RCAs of the past. However, the GMT notes that the success of voluntary avoidance measures may depend on the incentives in place (e.g., the cost of bycatch avoidance vs. the threat of more stringent regulations in the future). The level of real-time and near real-time precision, as seen this week by the at-sea and shoreside whiting industry, allows for such voluntary measures to be applied due to industry agreements that waive data confidentiality concerns and provide for real-time feedback among the fleet.

Costs to Industry/Management

While the focus of this action to date has primarily been about improving compliance with the National Standard 1 Guidelines, which focus on preventing overfishing, the GMT notes that there are other National Standard Guidelines that need to be considered. For example, National Standard 7 states, "Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication." Likewise, National Standard 8 requires that conservation and management measures ". . . utilize social and economic data to . . . (A) provide for the sustained participation of [fishing] communities and (B) to the extent practicable, minimize adverse economic impacts to such communities."

Currently, the available socio-economic analyses are incomplete. There is a cost to keep rougheye rockfish within either a HG or an ACL, or by closing large areas. The more species that are individually managed, the more complex and costly it may be to sample and track. Additionally, we have heard from industry that there will be realized costs in terms of things like required gear purchases, lost fishing grounds, lost target catch, and increased operational costs while avoiding bycatch, etc. (Agenda Item F.8.b, Supplemental GAP Report, June 2013). There will also be costs to management and monitoring agencies particularly if current funding levels for state sampling programs remains static; costs could include impacts to data quality, state sampling goals, port coverage levels, and/or personnel and time (Agenda Item G.8.b, Supplemental GMT Report, June 2013). For example, the GMT conducted a survey of state port samplers and managers in the spring of 2013. Rougheye rockfish was mentioned as a species that was frequently encountered and sometimes mistaken for shortraker, blackspotted, blackgill, and Pacific ocean perch rockfishes, particularly juvenile or smaller-sized fish. One possible cost to state port sampling programs related to this is the training of agency staff and fishing industry personnel to correctly identify species with new sorting requirements, particularly if turnover of personnel is frequent (Agenda Item G.8.b, GMT Report 3, September 2013) and the existing number of market categories has increased over time (as was stated in Oregon Department of Fish and Wildlife's Agenda Item F.8.b, ODFW Report, June 2013). Please note that the focus of the GMT survey was state sampling personnel; possible costs to fishing operations are better articulated by the fishing industry itself.

Future Catch Projections

The GMT has used a trip limit model for the fixed gear sectors to evaluate slope rockfish trip limits, although we have not specifically examined rougheye rockfish. The GMT does not have a catch projection model for the trawl sectors (i.e., IFQ, Catcher Processor (CP), and Mothership (MS)) for slope rockfish or rougheye rockfish. We could look at what has happened in the past and make some assumptions about what catches might be in the future; however, that would not take into account any changes in management structure or real time responses by industry. Given the recent rationalization of the trawl fishery, such evaluations are more difficult.

In 2012, our understanding of rougheye rockfish stock status and sustainable harvest levels changed with the indications from the data-moderate stock assessment results, then again following the full assessment during 2013 (see Appendix 1). We were informed that once industry became aware of the situation, they began taking measures to reduce impacts to rougheye rockfish on their own. The GMT is having difficulty in figuring out how to link this new information with what has happened in the past in order to predict what might happen in the future.

The GMT conducted a preliminary simulation analysis of the probability of rougheye rockfish catches exceeding the component OFL contribution under alternative assumptions about future catch, including sampling catches from distributions of catch by sector for different periods of recent catch. This analysis is similar to the GMT analysis of at-sea set-asides for spiny dogfish (Section B.9 in Agenda Item C.4.b, REVISED 2 GMT Report, April 2014). This analysis allows a more probabilistic view of the risk of exceeding reference points, but the value of all such analyses is be limited by the extent to which future fishing conditions match either of these time periods of the past, but may provide a better understanding of the variability among years and recent time periods.

Preliminary results are shown in Figure 2. Like with the at-sea set aside analysis in Appendix B, we calculated means and variance in annual catch by sector and used the random number generator to simulate sector level catches that we then summed to a total catch. To explore differences in patterns over time, we ran three simulations: (1) all years (2002-2012), (2) a recent period (2008-2012); and (3) an early period (2002-2007). We assumed that catch follows a lognormal pattern. We compared the simulated total catch by simulation and compared it against the 2015 ABC of 188.1 mt for rougheye. We chose the ABC because it is the maximum level at which the ACL could be set if rougheye were individually managed.

The preliminary results produced overages of the ABC in 46 percent of the simulation run for the all years' scenario, 89 percent of simulation runs for the recent years' scenario, and only 10 percent of runs in the early years' scenario. As with the at-sea spiny dogfish set aside analysis, looking to the more than once in four years standard from the National Standard Guidelines, these results suggest that rougheye catches would be more likely than not to fail that standard unless catch returns to the patterns seen between 2002 and 2007.

GMT Report Summary and Recommendation

1. The GMT recommends the Council consider the information contained in this report including the efficacy of alternatives and management measures – including voluntary industry avoidance – to reduce rougheye rockfish mortality, in light of variability in historical catches, probability of exceeding the harvest specifications, costs to industry and management, etc.

2. Some on the GMT suggest that the Council focus their discussions on
   (a) retaining the current slope rockfish complex configurations north and south of 40°10 N. latitude with consideration for a combined HG for rougheye/blackspotted/shortraker rockfish,
   (b) pulling rougheye/blackspotted/shortraker rockfish from the slope rockfish complex and create a new complex that contains the three species (i.e., Agenda Item C.8.a Attachment 2)
   (c) implementing stock-specific harvest specifications for rougheye/blackspotted.

   The rationale for this recommendation is that the analysis required for Alternatives 1, 2, and 3 (Agenda Item C.8.a Attachment 1) are more complex and potentially not feasible by the June Briefing Book deadline.

Table 2. Binomial probabilities of experience 0-4 total overages over a four year period for given probabilities of annual overages.

# of overages	Annual prob. of an ACL overage																		
	0.05	**0.10**	**0.15**	**0.20**	**0.25**	**0.30**	**0.35**	**0.386**	**0.40**	**0.45**	**0.50**	**0.55**	**0.60**	**0.65**	**0.70**	**0.75**	**0.80**	**0.85**	**0.90**
0	81%	66%	52%	41%	32%	24%	18%	14%	13%	9%	6%	4%	3%	2%	1%	0%	0%	0%	0%
1	17%	29%	37%	41%	42%	41%	38%	36%	35%	30%	25%	20%	15%	11%	8%	5%	3%	1%	0%
2	1%	5%	10%	15%	21%	26%	31%	34%	35%	37%	38%	37%	35%	31%	26%	21%	15%	10%	5%
3	0%	0%	1%	3%	5%	8%	11%	14%	15%	20%	25%	30%	35%	38%	41%	42%	41%	37%	29%
4	0%	0%	0%	0%	0%	1%	2%	2%	3%	4%	6%	9%	13%	18%	24%	32%	41%	52%	66%
Prob. > 1 overage	1%	5%	11%	18%	26%	35%	44%	50%	52%	61%	69%	76%	82%	87%	92%	95%	97%	99%	100%

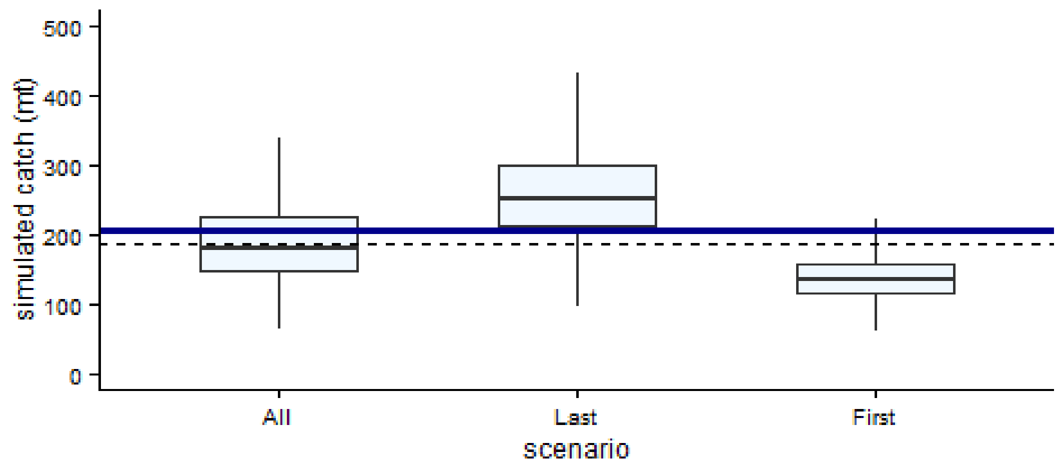

Figure 2. Preliminary results from simulations of sector level annual rougheye/blackspotted catches. The Y-axis is truncated to show more detail in the region of the ABC (dotted line) and OFL (solid line). The three scenarios are: All (2002-2012), Last (2008-2012), First (2002-2007).

Appendix 1. Rougheye rockfish timeline 2009 through 2014. Summary and references of advisory body reports (GMT, GAP, & SSC), March 2009 through April 2014.

Year	Event
March 2009	Request from the GAP to consider increasing minor slope rockfish trip limits including darkblotched rockfish in the LE non-whiting trawl sector (Agenda Item G.2.b, Supplemental GMT Report). The GMT recommended consideration of increases to this trip limit.
April 2009	Request from the GAP to consider increasing minor slope rockfish trip limits if darkblotched rockfish were available. The GMT recommended waiting until June when more data would be available (Agenda Item F.2.b, Supplemental GMT Report).
June 2009	Requests were made in March and April for the GMT to analyze increases in minor slope rockfish trip limits for LE trawl. The GMT did not recommend increases due to darkblotched catch levels (Agenda Item E.7.b, Supplemental GMT Report).
September 2009	The GMT received requests to consider changes to minor slope rockfish cumulative trip limits and RCA boundaries for the LE non-whiting trawl fishery (Agenda Item E.4.b, Supplemental REVISED GMT Report). The GMT recommended considering these changes.
November 2009	The GMT analyzed proposed changes to minor slope rockfish trip limits for LE non-whiting trawl (Agenda Item G.10.b, Supplemental GMT Report).
March 2010	The GMT evaluated vulnerability scores for all groundfish within the west coast groundfish FMP (Agenda Item E.2.b, GMT Report). Rougheye and shortraker rockfishes were found to have high vulnerability scores, with vulnerability measured relative to productivity of the stock, and susceptibility measured as the potential impact of fishing activities on the stock. The GMT then recommended that the Council consider rougheye and shortraker rockfishes (as well as China, copper, and quillback rockfishes) for full stock assessments (Agenda Item E.2.b, Supplemental GMT Report). The GMT suggested that rougheye and shortraker could serve as indicator species for the minor slope rockfish complexes. Also, the GMT recommended maintaining the existing minor slope rockfish trip limits for the shorebased whiting EFP (Agenda Item E.5.b, Supplemental GMT Report). The GMT also examined minor slope rockfish trip limits for a 2010 Exempted Fishing Permit (EFP) proposal and recommended trip limits (Agenda Item E.5.b, Supplemental GMT Report).

Year	Event
April 2010	POP and darkblotched rockfishes limit fishing activity on the slope (Agenda Item I.4.b, Supplemental GMT Report 3). Also, the GMT suggested reducing LE non-whiting trip limits for minor slope rockfishes including darkblotched rockfish (Agenda Item I.5.b, Supplemental GMT Report). GAP refers to the GMT statement about rougheye and shortraker being two of the more vulnerability species in the minor slope rockfish complex (Agenda Item I.2.b, Supplemental GAP Report). The GMT reviewed preliminary data and was concerned that the catch of darkblotched rockfish was higher than previously projected. The GMT recommended reducing the minor slope and darkblotched rockfish trip limit for the LE non-whiting trawl sector for the remainder of the year (Agenda Item I.5.b, Supplemental GMT Report).
June 2010	Regarding the Council's preliminary preferred stock complex alternative, the GMT stated that "sub-complex numbers do not take into consideration reallocation of catch from a bycatch species (e.g. splitnose) to a vulnerable species (e.g. rougheye). This is similar to the issue raised with greenstriped and quillback rockfish [in the discussion] above except that catch is shifted to a more vulnerable species within a sub-complex (i.e. minor slope rockfish north) rather than between sub-complexes. To avoid this, the Council could adopt a low P* value for each of the non-target species that have low vulnerability to reduce their overall contribution to the sub-complex OFL" (Agenda Item B.3.b, GMT Report). Table of catch by sector for rockfish complexes, 2006-08 (Agenda Item B.3.b, Supplemental GMT Report 2).
September 2010	The GMT recommended considering increasing the minor slope and darkblotched rockfish trip limit for the LE non-whiting trawl sector (Agenda Item I.2.b, Supplemental GMT Report).
October 2010	At a working session, the GMT discussed stock complex data needs and data timelines, particularly related to the Slope Rockfish complex and species such as rougheye rockfish.
November 2010	The GMT recommended the following: "For LE non-whiting trawl, adjust seaward trawl RCA boundary to 250 fm and close minor slope rockfish limit beginning December 1, and request voluntary slope rockfish avoidance by the fleet in the meantime to stay within the darkblotched OY; For LE whiting trawl consider adjustments to sector-specific darkblotched bycatch limits and/or closure as needed to stay within the darkblotched OY" (Agenda Item H.3.b, Supplemental GMT Report).
January 2011	100% observer coverage of the IFQ sector, increasing the data available for rougheye rockfish
July 2011	The GMT first made a formal request for rougheye rockfish data, among other data, from the West Coast Groundfish Observer Program (WCGOP).

Year	Event
September 2011	From a GMT Report: "If the Council wanted to retain the status quo configuration of a particular complex or all complexes, yet also follow NMFS guidance to make progress in meeting the NS1 guidelines, the GMT notes that there are ways to do that through changes in management measures for stocks within complexes. The Council is scheduled to make its preliminary decision on management measures next April and its final decision in June. For example, if the Council wished to address the issue of the high splitnose OFL contribution to the minor slope rockfish north subcomplex and its potential impact on vulnerable species such as rougheye rockfish, the Council could consider adopting a sorting requirement and subcomplex trip limits for rougheye that prevents it being a large portion of the minor slope north limits. This is similar to the approach taken for blue rockfish within the minor nearshore south subcomplex last cycle" (Agenda Item G.5.b, Supplemental GMT Report). One recommendation from this report: "Consider differential management measures for component species within stock complexes as a tool to better meet the NS1 guidelines this cycle" (Agenda Item G.5.b, Supplemental GMT Report).
November 2011	Catch of rougheye, aurora, and shortraker: "Based on the preliminary investigation of groundfish removals, three slope species in particular have consistently experienced catches higher than their OFL contributions: aurora, rougheye, and shortraker rockfishes (Table 1). These estimates do not include catch from shoreside whiting or recreational fisheries. Shoreside whiting will bump up catch of some species like rougheye, yet recreational catches will not. These three species also exhibit high vulnerability scores (PSA scores of 2.10, 2.27 and 2.25, respectively) demonstrating they are of management concern. In particular, the PSA productivity scores of these species are low, indicating low resilience to overfishing and underscoring the need for management measures that effectively control catch to their respective OFLs and ABCs. More detailed explorations of these data sets may be possible over the winter; however, as shown in Table 1, this first examination clearly identifies the conservation concern. We have been unable to explore the geographic breakdown of catch in detail yet expect that the minor slope rockfish north complex is of most concern. Over 99% of the OFLs and ABCs for rougheye and shortraker are apportioned to that complex. Aurora rockfish is more evenly split between the north and south complexes and so will have to be looked at closely. Table 1: Table 1. Comparison of Contributing Harvest Specifications with Draft Mortality Estimates for Species in the Slope Rockfish Complex, Coastwide" (Agenda Item E.5.b, Supplemental GMT Report 3). Subsequent GMT report: "The information we presented under Agenda Item E.5 showed that catches of aurora, shortraker, and rougheye rockfishes have been greater than the coastwide OFL for some (if not all) years. Table 3 shows that most of the catches have come in the bottom trawl sector. More time is needed to look into these catch estimates and to explore, to the extent possible, information on the area of catch, and investigate the management measures available by sector to control catch to prevent overfishing. Current estimates have catch of the north minor slope rockfish complex in the IFQ fishery at only 20 percent of the overall catch of that complex in 2010. (Attachment 1) identifies the basic options for addressing catch of aurora, shortraker, and rougheye in the various sectors" (Agenda Item E.9.b, Supplemental GMT Report 3).

Year	Event
March 2012	The GAP recommends aurora rockfish for a full stock assessment, as an indicator stock for "the most vulnerable slope rockfish stocks (i.e., aurora, rougheye, and shortraker rockfish)" in the slope rockfish complex and due to data availability (Agenda Item F.5.b, Supplemental GAP Report).
April 2012	GMT comments on preliminary preferred management measures for rougheye, shortraker, and aurora sorting requirements N of 40 deg. 10' N latitude (Agenda Item I.3.b, Supplemental GMT Report). The GAP "agreed that sorting for these species should be done according to current regulations (that sorting should occur before the first weighing of the fish) in order to obtain better data" (Agenda Item I.3.b, Supplemental GAP Report).
June 2012	The GMT recommended that if bocaccio was planned as an update assessment, rougheye rockfish should be considered for a full assessment in 2013 (Agenda Item D.3.b, Supplemental GMT Report). GMT discussion on final management measures for rougheye, shortraker, and aurora sorting requirements N of 40 deg. 10' N latitude (Agenda Item D.5.b, Supplemental GMT Report); GAP agrees (Agenda Item D.5.b, Supplemental GAP Report).
September 2012	The GMT recommended adding rougheye rockfish as the last available full stock assessment slot for 2013: "On the question of which species to select for the last full assessment slot, the GMT recommends that rougheye take the last available assessment slot. Yellowtail is of low management concern since it has been so lightly exploited in recent decades. We think that will hold true even if additional targeting takes place in the individual fishing quota (IFQ) fishery. Rougheye is of greater concern because it is highly vulnerable and recent exploitation is above the estimate of its overfishing limit contribution to the minor slope rockfish north complex. In addition, there is some concern that there is relatively little survey data available for rougheye; a critical limitation for conducting a Category 2 data-moderate assessment. Moreover, it is our understanding that there is more data (e.g., age data from trawl survey and biological data from catch sampling over the last ten years) to contribute to a full rougheye rockfish assessment, data that cannot be used in the data-moderate approaches. Lastly, a data moderate assessment would be an incomplete and inefficient way to address concern over the potential status of rougheye now. If the Council has that concern, as some of us do, a full assessment for rougheye would provide a more robust picture of the status and sustainable harvest level than a data moderate assessment could provide. In addition, as we understand it, the data situation will not change significantly between this and the next cycle" (Agenda Item H.3.b, Supplemental Report 2). SSC recommended either rougheye or yellowtail rockfish for a full assessment (noting both should be fully assessed), stating that rougheye has the highest vulnerability score of all groundfish FMP species and has never been assessed, whereas yellowtail was first assessed in 2005 (Agenda Item H.3.b, Supplemental SSC Report). The GAP provided their prioritized list of stocks for data moderate assessments, including rougheye and it's high PSA score (Agenda Item H.3.b, Supplemental GAP Report).

Year	Event
October 2012	2011 Groundfish Mortality Report published by WCGOP, the first report to report rougheye rockfish discards specifically, available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/species_management.cfm
December 2012	The GMT received the WCGOP data, including data for rougheye rockfish. Corrections were made and an updated, final dataset was received in April 2013.
April 2013	"Based on the materials reviewed and produced to date, the GMT developed the following prioritization based on the Productivity and Susceptibility Assessment (PSA) results and historical harvest levels. An alternative approach for prioritization could be based on the ease of application and least impact to fisheries (see section below on the costs of changing stock complexes). Slope Rockfish. This complex consists of species that are difficult to discern from one another (e.g., aurora rockfish from splitnose rockfish; shortraker rockfish from rougheye rockfish) and contains species for which vulnerability is high (e.g., rougheye and shortraker rockfish). In addition, evidence suggests that some components of this complex may have been harvested at levels much higher than their ABC contributions to the complex. The GMT recommends that the slope rockfish complex be given high priority for restructuring, taking into account information from the upcoming aurora and rougheye stock assessments" due to the high vulnerability scores of these species (Agenda Item D.3.b, Supplemental GMT Report). The GMT also mentions that shortraker and rougheye are difficult to distinguish so it may make sense to keep them together when restructuring the slope complex (Agenda Item D.3.b, Supplemental GMT Report). This GMT report also includes the following: "Progress Towards Reconfiguring Stock Complexes. The Situation Summary (Agenda Item D.3) provides links to some statements that describe progress towards reconfiguring stock complexes. In addition to these statements, the GMT provided a detailed overview of work towards this goal in Appendix C of the 2013-2014 FEIS Harvest Specifications and Management Measures (FEIS 2013). In addition to this overview, Appendix C of the FEIS (2013) provides information regarding some costs and benefits of moving aurora, shortraker, and rougheye rockfish out of complexes and managing to their own ACL. This information will be considered as the GMT moves forward with creating new alternatives and tools to evaluate the alternatives. A sample schedule for achieving the goal of reconfiguring stock complexes was shown in Agenda Item G.5.b, Supplemental GMT Report, 2011, and reproduced in Figure 1. Even though progress has been delayed relative to the original plan, this figure clearly illustrates the amount of work accomplished by the Council, Council Staff, and advisory bodies towards achieving this objective. It also illustrates what remains to be done. This figure shows that we are near the end and that most of the necessary background work and analyses have been accomplished" (Agenda Item D.3.b, Supplemental GMT Report).

Year	Event

April 2013 (cont.)	The GAP recommends analysis of an alternative where aurora and rougheye rockfishes are removed from the Slope Rockfish complex: "Both of these stocks will be assessed this summer and the Council may desire the flexibility to manage these stocks with stock-specific harvest specifications. In the event one or both of these stocks is determined to be overfished, an option for managing these stocks outside of a complex may be needed" (Agenda Item D.3.b, Supplemental GAP Report).
June 2013	GMT discussion of two clustering approaches for evaluating co-occurrence of stocks with results including "a notable grouping of yellowmouth, bank, shortraker, sharpchin, blackgill, and rougheye rockfishes" (Agenda Item F.8.b, Supplemental GMT Report). Discussion of rougheye in/out of Slope Rockfish complex, co-occurrence/c-score information, and component OFL contribution (Agenda Item F.8.b, Supplemental GMT Report 2). The GAP discusses their support for the Slope Rockfish complex No Action alternative (Agenda Item F.8.b, Supplemental GAP Report).
September 2013	The GMT commented on the rougheye and aurora stock assessments for use in management (Agenda Item G.3.b, Supplemental GMT Report). Selected species scorecard, "Rougheye rockfish is the only species appears to be harvested at or above the component OFL" (Agenda Item G.5.b, Supplemental GMT Report 2). All GMT reports and supplemental reports related to stock complex restructuring including method for evaluation stock complexes, classification of stocks in the groundfish FMP, port sampling survey results, etc.: Agenda Item G.8. The GAP recommended keeping the status quo stock complex for slope rockfish (Agenda Item G.8.b, Supplemental GAP Report). The SSC statement relative to rougheye/blackspotted assessment: Agenda Item G.3.b, Supplemental SSC Report. The GAP supported the recommendation to conduct a full assessment for rougheye/blackspotted rockfish (Agenda Item G.3.b, Supplemental GAP Report). The SSC's recommended 2015 and 2016 OFLs for slope rockfish complex species including rougheye (Agenda Item G.7.b, Supplemental SSC Report).
November 2013	NMFS Report on minor slope rockfish complex: Agenda Item H.4.b, Supplemental NMFS Report. The GMT discusses risk and stock complex evaluations (Agenda Item H.4.b, Supplemental GMT Report). Table of average catch estimates for FMP species flagged by the GMT including unidentified rougheye/shortraker (Agenda Item H.4.b, Supplemental GMT Report 2).The GAP "recommends the Council defer action on this issue to provide more time for NMFS to analyze the issue, which would also provide time for NMFS to work with the affected industries to develop a suite of management approaches for Council consideration. Finally, the GAP recommends NMFS (1) provide notice to the fishing industry that contemplation of future management measures for rougheye rockfish, blackgill rockfish, and shortraker rockfish is underway and (2) that NMFS is seeking input from the fishing industry about measures (both voluntary and regulatory) that would help to maintain catches of these species within their harvest targets "(Agenda Item H.4.b, Supplemental GAP Report).

Year	**Event**

November 2013 (cont.)	The SSC designated the rougheye/blackspotted assessment as category 1 (Agenda Item H.5.b, Supplemental SSC Report). GMT table of species or complexes where the Council adopted P* values lower than 0.45, includes rougheye (Agenda Item H.6.b, Supplemental GMT Report 2). The GMT stated that: "Species that the Council may be interested in keeping in the complex and managing with HGs: rougheye N.; shortraker N.; China N.of either 42° or 40°10'; copper N. of either 42°, or 40°10,' or coastwide", also proposed management measures such as GCAs and rougheye excluder device for trawl vessels (Agenda Item H.10.b, Supplemental GMT Report). GMT discussion regarding "Considerations for Management of Stocks for which Mortality has Regularly Exceeded the ABC or OFL of a Component Stock of a Complex" and selected species scorecard (Agenda Item H.10.b, Supplemental GMT Report 4). The GMT received a request to increase the open access slope rockfish complex bimonthly trip limits for south of 40°10' N. latitude for 2014, the request was that the current 10,000 pound bimonthly trip limits be increased subject to the Council's preference. The GMT concluded that there is not enough time to evaluate and analyze an increase to the slope rockfish complex in time for implementation by January 1, 2014. Linked to that is the team's concern about what the estimated bycatch harvest of blackgill rockfish would be, if such a slope rockfish complex increase were implemented. Another concern is the possibility of an unanticipated sizable increase in the number of participants that would move into this fishery as a result of a trip limit increase" (Agenda Item H.9. b, Supplemental GMT Report).
March 2014	GAP discussion on the proposal to remove rougheye from the Slope Rockfish complex, noting that doing so "will cause tremendous disruption to the commercial groundfish fleets" (Agenda Item D.5.b, Supplemental GAP Report).
April 2014	Agenda Item C.4 included GMT analysis of proposed harvest specifications and management measures, and Council decision on a PPA for restructuring the slope rockfish complex. Status quo would keep rougheye rockfish within this complex. More to come under Agenda Item C.8 and C.9 at this meeting.

Agenda Item C.8.c
Supplemental Public Comment
April 2014

PowerPoint Presentation from Mr. Ralph Brown on Agenda Item C.8 (Rougheye)

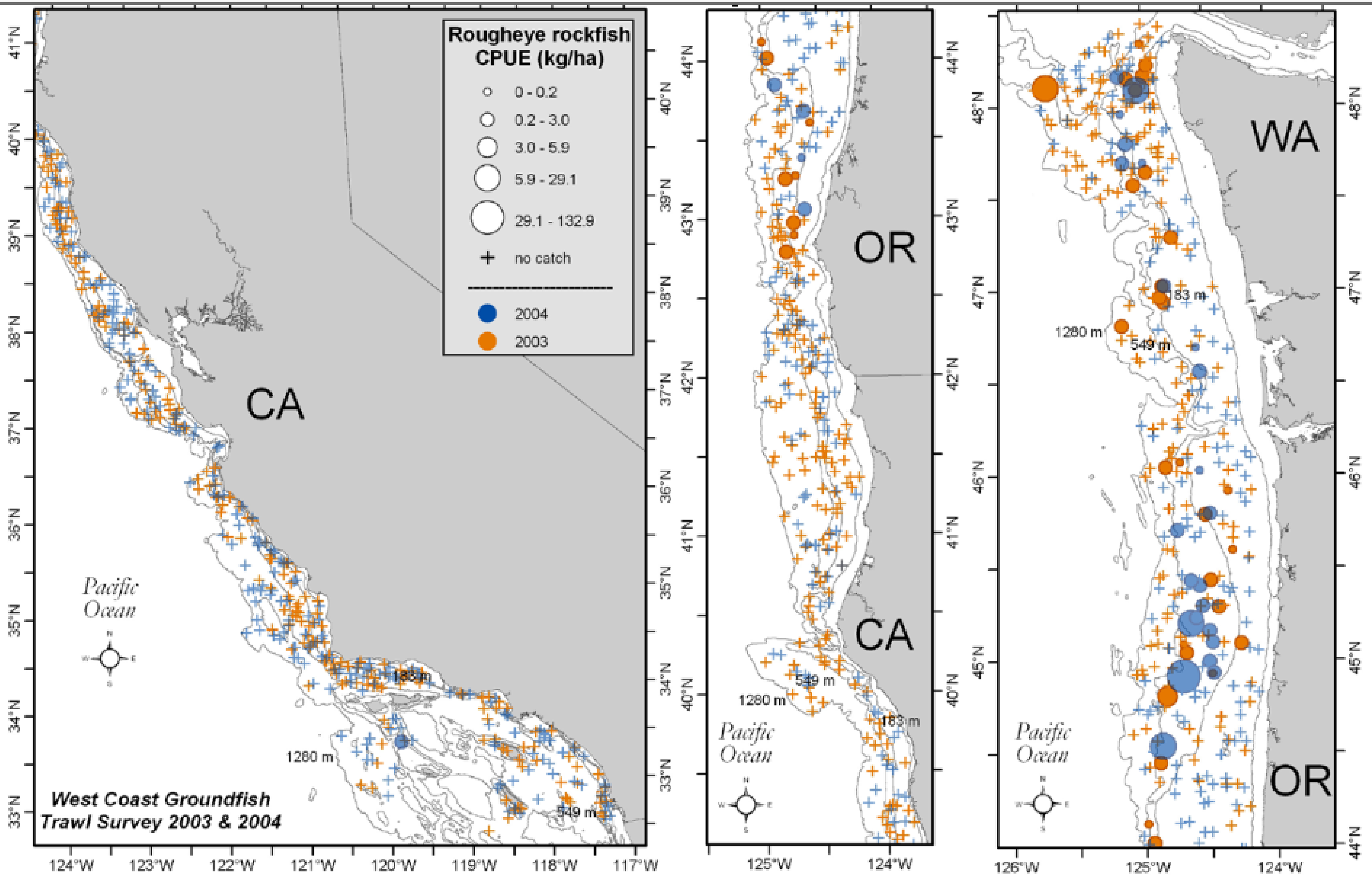

Figure 114. Rougheye rockfish (*Sebastes aleutianus*) distribution and relative abundance (kg ha^{-1}) from the 2003 and 2004 surveys. The five ranges of relative abundance are categorized from top to bottom in the legend as follows: > 0 but ≤ mean CPUE, > mean CPUE but ≤ 1 SD from the mean, between 1 and 2 SDs > mean CPUE, between 2 and 3 SDs > mean CPUE, and more than 3 SDs > mean CPUE.

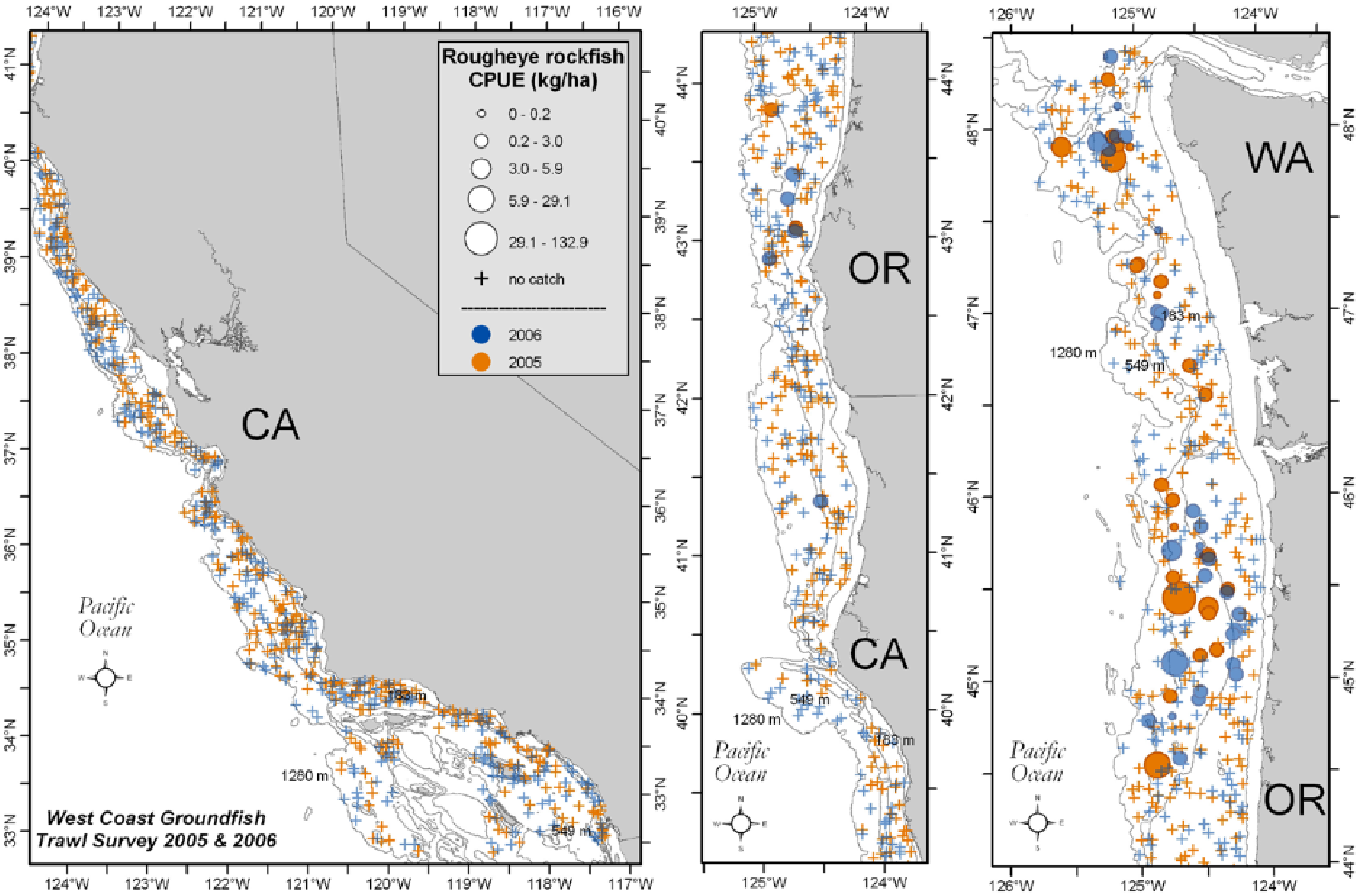

Figure 115. Rougheye rockfish distribution and relative abundance (kg ha^{-1}) from the 2005 and 2006 surveys. The five ranges of relative abundance are categorized from top to bottom in the legend as follows: > 0 but ≤ mean CPUE, > mean CPUE but ≤ 1 SD from the mean, between 1 and 2 SDs > mean CPUE, between 2 and 3 SDs > mean CPUE, and more than 3 SDs > mean CPUE.

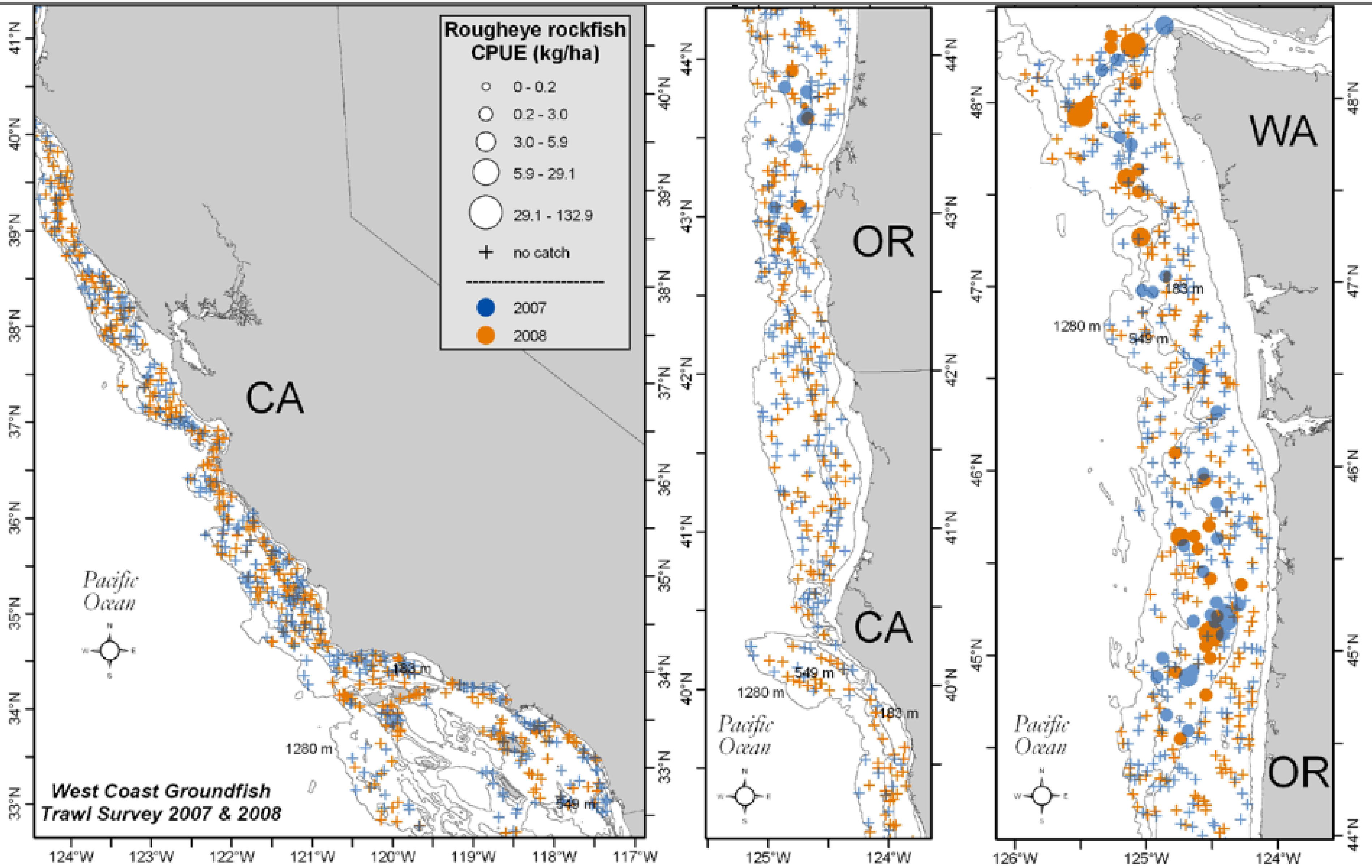

Figure 116. Rougheye rockfish distribution and relative abundance (kg ha^{-1}) from the 2007 and 2008 surveys. The five ranges of relative abundance are categorized from top to bottom in the legend as follows: > 0 but ≤ mean CPUE, > mean CPUE but ≤ 1 SD from the mean, between 1 and 2 SDs > mean CPUE, between 2 and 3 SDs > mean CPUE, and more than 3 SDs > mean CPUE.

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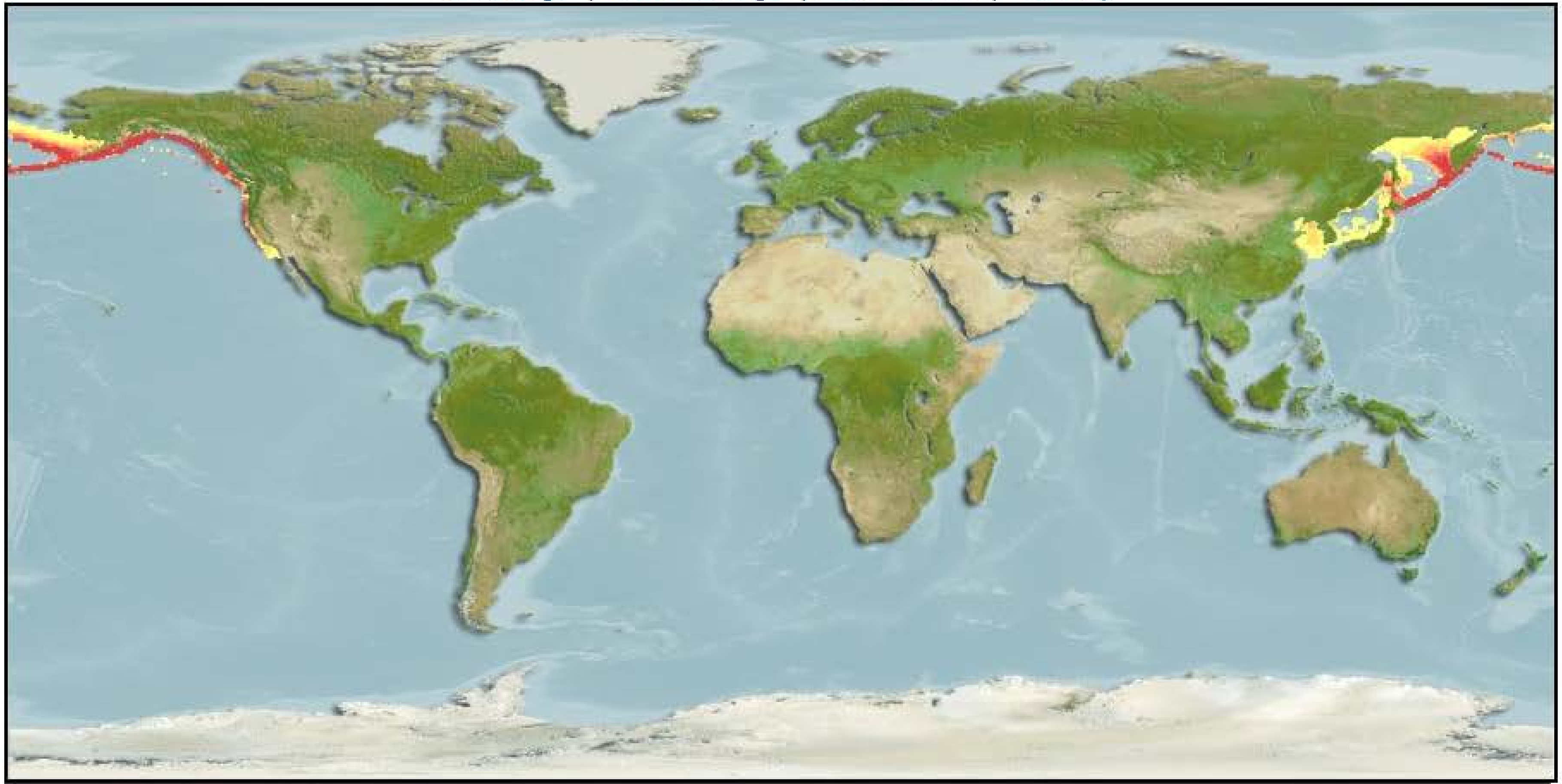
Note: Point data from source were assigned to its corresponding half-degree cell and visualized as such here.

Native Range | Year 2100 Range | Suitable Habitat | Point Map



Relative probabilities of occurrence

0.80 - 1.00
0.60 - 0.79
0.40 - 0.59
0.20 - 0.39
0.01 - 0.19

Explore range map
Explore all suitable habitat
Explore point map

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Session no. 80

Agenda Item C.9
Situation Summary
April 2014

FISHERIES IN 2015-2016 AND BEYOND: ADOPT MANAGEMENT MEASURES PRELIMINARY PREFERRED ALTERNATIVES

This is the final step at this meeting in the process to adopt preferred harvest specifications, preliminary preferred stock complex structures, and preliminary preferred management measures, including allocations, for 2015-2016 groundfish fisheries. The Council is scheduled to take incremental steps earlier at this meeting towards completion of this agenda item. First, preferred harvest specifications will be decided (Agenda Item C.4) and then a preliminary preferred alternative will be adopted for the slope rockfish stock complex structures (Agenda Item C.8). The Council task under this agenda item is to adopt any remaining harvest specifications and adopt preliminary preferred management measures for public review. Final action for 2015-2016 groundfish fisheries, including Amendment 24, is scheduled for the June Council meeting.

Council Action:

1. **Adopt any remaining harvest specifications.**
2. **Adopt preliminary preferred management measures, including allocations.**

Reference Materials:

Accompanying reference materials are provided under Agenda Item C.4.

Agenda Order:

a. Agenda Item Overview — Kelly Ames and John DeVore
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt Any Remaining Harvest Specifications and Preliminary Preferred Alternatives for Management Measures in 2015-2016 and Beyond Fisheries

PFMC
03/21/14

ENFORCEMENT CONSULTANTS REPORT ON FISHERIES IN 2015-2016 AND BEYOND: ADOPT MANAGEMENT MEASURES PRELIMINARY PREFERRED ALTERNATIVES

The Enforcement Consultants (EC) has reviewed Agenda Item C.4.b, REVISED GMT Report, Appendix B and offers the following comments regarding the below sub-sections:

B.1 - Rockfish Conservation Area (RCA) Boundary Adjustments:

The EC has reviewed the proposed adjustments to the 200-fathom modified RCA boundary off Oregon and, should the Council decide to move forward with the adjustments, the EC is prepared to work with NMFS and Pacific Council staff to ensure the adjustments do not present enforcement concerns.

B.2.1 – Groundfish Closure Areas for Rougheye Rockfish:

Similar to B.1 above, should the Council decide to move forward with a closure area(s) for rougheye rockfish, the EC will monitor the process of developing the closed area(s) to ensure they are configured so as not to present enforcement concerns.

B.8 – Analysis of removing gear restrictions for Pacific sanddabs and other flatfish in the California fixed gear commercial fishery. In particular, relative to the summary of options:

Option 1 – No action - Maintain gear restrictions on fishing for ”Other Flatfish” and maintain access to the Groundfish Conservation Areas (GCA), which includes the Cowcod Conservation Areas (CCA), Farallon Islands, Cordell Bank, and RCAs. Only allow “Other Flatfish” in the GCA to be retained when the specified gear is used. This is status quo, but we have enforcement concerns with this option due to the fact that an at-sea enforcement contact would need to be made to determine if fish were taken in a legal area.

Option 2 – Modify the gear restriction to eliminate weight restrictions and limit the number of hooks. Maintain access inside the RCA and prohibit access to the CCA, Farallon Islands and Cordell Bank when targeting the “Other Flatfish” complex. Only allow “Other Flatfish” to be retained in the RCA when the specified gear is used. There are some enforcement concerns with this option due to the fact that an at-sea enforcement contact would need to be made to determine if fish were taken in a legal area.

Option 3 – Eliminate the gear restriction on fishing for “Other Flatfish,” while prohibiting fishing within the GCA~~s~~. This option is very clear and is enforceable.

Option 4 – Fishery participants would not be subject to gear restrictions and may fish both inside and outside the GCAs, but a landing restriction would prohibit landing of any other species than “Other Flatfish” when the vessel fished within any GCA during the trip. This option is very clear and is enforceable. In addition, a violation of this regulation may be determined after the time of landing based on the vessel’s activity as reflected by VMS data.

For sub-section B.8, the EC recommendation is for the Council to only consider adopting Option 3 or 4.

B.10 – Use of excluder devices to reduce catch of rougheye rockfish in non-tribal at-sea and shoreside Pacific whiting fisheries:

Should the Council move forward with mandatory excluder devices, the EC intends to be engaged in the regulatory development process to avoid potential enforcement concerns.

PFMC
04/08/14

GROUNDFISH ADVISORY SUBPANEL REPORT ON BIENNIAL HARVEST SPECIFICATIONS FOR 2015-16 AND BEYOND

The Groundfish Advisory Subpanel (GAP) met with the Groundfish Management Team (GMT) to consider management measures for the 2015-16 cycle and offers the following comments.

First, the GAP reiterates the comments we made under Agenda Item C.4, Supplemental GAP Report, regarding appropriate annual catch limits (ACLs) for widow rockfish and Dover sole:

> **Widow rockfish:** The GAP recommends an ACL of 3,000 mt, which is higher than the default 1,500 mt ACL specified for 2013 and 2014.
>
> **Dover sole:** The Council chose for analysis two ACL alternatives for Dover sole – a 25,000 mt and 50,000 mt ACL; the GAP prefers the higher ACL of 50,000 mt. We want to make clear that our support for this ACL does not imply that Dover sole should be managed under anything other than a normal healthy stock strategy using a P*=0.45 and an ACL=ABC.

Second, we also recap our comments from C.4 regarding Amendment 24. To summarize, the GAP believes the draft Alternative 3 language most closely follows the GAP recommendation from March 2013 and allows sufficient flexibility with regard to setting biennial harvest specifications and management measures.

Third, in this statement, the GAP addresses numbers 9 through 30 of the checklist found at Agenda Item C.4.a, Attachment 1, Action Item. Numbers 1 through 7 were addressed under Agenda Item C.4, biennial harvest specifications; number 8 was addressed under Agenda Item C.8, stock complexes restructuring.

Preliminary Preferred Allocations and Harvest Guidelines (HG)

9. Fishery HG: Confirm or modify amounts set-aside for groundfish mortality in Tribal, non-groundfish fisheries and research

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 10

→ The GAP agrees with the set-aside figures in Table 10 for research, but notes there may be some tribal adjustments requested in June for English sole, Pacific cod, widow rockfish and yellowtail rockfish.

10. HG: Confirm or modify HG for species managed within a complex

- Blue rockfish in California within the nearshore rockfish complexes north and south of 40°10’

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 8

→ The GAP agrees with this alternative of 194 mt in 2015 and 198 mt in 2016 for all California fisheries. This is consistent with how the stock has been managed in the past.

- Blackgill rockfish within the slope rockfish complex south of 40°10'

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 9

→ While this appears to be a status quo option, the GAP is concerned about some IFQ targeting of blackgill in the south. We request the issue of Amendment 21 slope rockfish allocations south of 40°10' N. latitude be re-evaluated to better reflect actual catch history of blackgill rockfish.

The GAP also intends to bring this up under the June omnibus package.

- Rougheye rockfish?

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 3	Pages 31-36

→ GAP members spent considerable time discussing management options for rougheye rockfish. The GAP emphasizes the rougheye stock assessment shows it to be well above a level that would trigger precautionary management and the reason we are considering special management measures for this stock is due to the decisions made on how to categorize the stock assessment. Regardless, we recognize that under the law we need to respond so we make the following suggestions:

- Implement a scientific sorting requirement – as noted in our statement under Agenda Item C.8 and public testimony, the commercial and tribal fisheries are committed to voluntary avoidance of rougheye rockfish. In order to accomplish this successfully, we need to provide real-time data to skippers on their rougheye catch. Mandatory sorting will help accomplish this objective. The GAP notes that cooperation from the Northwest Fisheries Science Center (NWFSC) and Pacific States Marine Fisheries Commission (PSMFC) by providing timely observer and shore monitor data quickly, will also be essential to dissemination rougheye catch data to industry participants.

- Analyze the use of discrete conservation areas that can be implemented as temporary closures in the event rougheye catch approaches the ACL, using whatever fishery data is available. The GAP believes such closures are a measure of last resort as they could have significant impacts on fisheries. The GAP urges the Council to task the GMT with using a more collaborative approach to this analysis. Insights from industry will be invaluable to the analysis.

- As noted in our discussion of other management measures, the GAP is recommending a reduction in fixed gear trip limits for slope rockfish north of 40°10'.

11. Allocations (trawl/non-trawl): confirm or modify 2-year trawl and non-trawl allocations for:

- Overfished species: bocaccio, canary, cowcod, petrale and yelloweye

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 16

→ The GAP recommends the allocations for these species as listed in Table 16.

- Longnose skate: trawl (90%) and non-trawl (10%) allocation

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Tables 11, 12

→ The GAP recommends the allocations for longnose skate as listed above (and in Tables 11 and 12).

- Shelf rockfish north trawl (60.2%) and non-trawl (39.8%) allocation

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Tables 11, 12

→ The GAP agrees with the suggested biennial allocations.

- Shelf rockfish south trawl (12.2%) and non-trawl (87.8%) allocation

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Tables 11, 12

→ The GAP agrees with the suggested biennial allocations.

- Rougheye rockfish?

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Tables 1, 11

→ The GAP believes no formal allocation is necessary at this time and requests no action be taken on this item.

- Spiny dogfish?

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 4 (revised after P* change from 0.35 to 0.4 under Agenda Item C.4)

→ The GAP understands spiny dogfish will have a 2,101 mt ACL in 2015 and a 2,085 mt ACL in 2016. Initial analysis shows there is no compelling reason for a harvest guideline or allocation. Once the set-asides are subtracted from the ACL, adequate fish is available for all fleets. There is no risk of exceeding the

ABC or OFL and any assumed risk is lessened because of the higher P* of 0.40 adopted under Agenda Item C.4.

12. Set-aside: Confirm or modify the at-sea whiting set-asides adopted in November; Consider establishing set-asides from the trawl allocation to account for at-sea whiting bycatch of:

- Spiny dogfish

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 15

→ In line with our remarks under item 11 (above), the GAP thinks it is probably unnecessary to establish an at-sea set aside for spiny dogfish shark because coastwide management of the dogfish HG will likely accommodate current coastwide dogfish impacts. Furthermore, as noted under item 11, the GAP sees no reason for a trawl/non-trawl allocation, which would necessitate an at-sea set-aside.

However, if the Council does establish an at-sea set aside, the GAP recommends 520 metric tons. This is the same amount as the current at-sea "Other Fish" set aside, which is primarily specified to account for dogfish bycatch.

- Rougheye rockfish?

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 3	Pages 31-36

→ The GAP suggests this is unnecessary, as we recommended retaining rougheye in the slope rockfish complex.

13. HG: Confirm or modify 2-year within non-trawl HG or shares for:

- Overfished species including bocaccio, canary, cowcod and yelloweye

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 16

→ The GAP recommends the harvest guidelines for these species.

- Black rockfish: 58% OR, 42% CA

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	Table 4-34

→ The GAP recommends these percentages will work for Oregon and California; they are the same percentages that have been used in the past.

- Blue rockfish 40-10 adjustment for CA

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6 Agenda Item C.4.a Supplemental REVISED Attachment 2	 Table 8

→ The GAP agrees with this; this management measure has been in place since the 2007-08 biennial specifications.

- Blackgill south of 40°10': 40-10 adjustment; 60% limited entry and 40% open access fixed gears

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Supplemental REVISED Attachment 2	Table 9

→ The GAP agrees; these percentages have been in place since the 2013-14 biennial specifications.

- Sablefish south of 36°: 55% limited entry and 45% open access fixed gears

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	Section 4.2.1.8; page 158

→ The GAP agrees; this is status quo as listed in the draft Environmental Impact Statement (DEIS).

- Nearshore rockfish HG north of 40°10' for California (between 40°10' and 42° N. lat.)

Reference document(s)	Page(s), section, table or chart
GMT statement, this agenda item	Option 3, hybrid table

→ The GAP recommends using Option 3, the hybrid option, from the GMT statement under this agenda item (below).

Option 3 Hybrid

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	*0.01*	0.00	0.21	0.79	0.00	0.00	0.01
Blue (CA)	*17.00*	NA	NA	1.00	0.00	0.00	17.00
Blue (OR & WA)	*26.94*	0.07	0.93	NA	1.96	24.98	0.00
Brown	*1.75*	0.00	0.08	0.92	0.00	0.14	1.61
Calico	*0.00*	NA	NA	NA	0.00	0.00	0.00
China	*6.20*	0.26	0.49	0.25	1.60	3.06	1.54
Copper	*9.71*	0.26	0.49	0.25	2.51	4.79	2.41
Gopher	*0.00*	0.00	0.29	0.71	0.00	0.00	0.00
Grass	*0.55*	0.00	0.49	0.51	0.00	0.27	0.28
Kelp	*0.01*	NA	NA	NA	0.00	0.00	0.00
Olive	*0.26*	0.00	0.03	0.97	0.00	0.01	0.25
Quillback	*6.15*	0.26	0.49	0.25	1.59	3.04	1.52
Treefish	*0.18*	0.00	0.00	1.00	0.00	0.00	0.18
Sum Total					7.66	36.29	24.80
							68.75

- China rockfish HG north of 40°10’ by state or by CA and OR/WA combined

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 3	Pages 30-31

→ The GAP understands any proposed HG for China rockfish is negated by the Council’s action under C.4 at this meeting, which retained China in the nearshore complex. Furthermore, the GAP sees no reason for establishing an HG that could constrain this fishery until a future assessment is performed to better inform fisheries management concerns.

Adopt Preliminary Preferred Season Structures

14. Treaty Fisheries: management measures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	

→ The treaty tribes’ representative on the GAP has no requests for changes to current management measures at this time.

15. Shorebased IFQ: Trawl RCA, non-IFQ trip limits

Reference document(s)	Page(s), section, table or chart
September 2013 PFMC minutes and decision document	Page 4

→ The GAP has requested the RCA changes go into effect in period 6 of 2013 and all of 2014, but they have not yet been implemented, despite the Council adopting those changes in September 2013. Ideally, the GAP would like to see those modifications – a seaward boundary of 150 fathoms and a shoreward boundary of 100 fathoms, for all periods – roll over into both 2015 and 2016.
From the September 2013 PFMC decision document:

“Consideration of Trawl Rockfish Conservation Area (RCA) Boundary Modifications

“The Council reaffirmed their April action to establish a trawl RCA configuration between 40°10' and 48°10' N. latitude with a 100 fm shoreward boundary and 150 fm seaward boundary beginning in Period 6 in 2013 through 2014.”

By shrinking the RCA, fishermen will be able to access more areas and species other than slope rockfish. This would aid in reducing effort on rougheye rockfish. Moreover, the trawl fleet is a rationalized fishery and has IFQ for species of concern.

16. Non-nearshore: Non-trawl RCA seaward configuration, trip limits (including sablefish)

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	Tables 4-105, 4-109

→ The GAP recommends the sablefish trip limits under Alternative 3 in the DEIS, which is the Preliminary Preferred Alternative (PPA):

Table 4-105. Alternative 3. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	1,025 lb/week, not to exceed 3,075 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 1,800 lb/ 2 months					
2016	Limited Entry	1,275 lb/week, not to exceed 3,375 lb/ 2 months					
	Open Access	300 lb/ day, or 1 landing per week of up to 1,000 lb, not to exceed 2,000 lb/ 2onths					

Table 4-109. Alternative 3. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed gears for 2015-2016.

Year	Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
2015	Limited Entry	2,100 lb/week					
	Open Access	315 lb/ day, or 1 landing per week of up to 1,575 lb, not to exceed 3,200 lb/ 2 months					
2016	Limited Entry	2,175 lb/week					
	Open Access	325 lb/ day, or 1 landing per week of up to 1,625 lb, not to exceed 3,250 lb/ 2 months					

The GAP further notes that it may be necessary in the future to reduce slope rockfish trip limits for fixed gear north of 40°10'.

17. Nearshore: Non-trawl RCA shoreward configuration, trip limits

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6 Pending GMT statement	Table 4-25

→ The GAP makes no recommendation here until the GMT statement under this agenda item is available. We understand that once an HG is set, routine management measures (trip limits, RCA boundaries) may be set that could be modified during inseason action later. At this time, the GAP recommends no change to the shoreward RCA boundary

18. WA recreational: Season dates, bag limits, area closures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	Section 4.2.2.2.6; Pages 202-206 and Section 4.2.4.2.6, Page 247

→ The GAP agrees with Alternative 3, the Preliminary Preferred Alternative.

19. OR recreational: Season dates, bag limits, area closures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6 Agenda Item C.4.b, REVISED GMT report Appendix B	Section 4.2.2.2.7; Pages 207-211 Section B.14

→ Under all the alternatives in the DEIS, yelloweye impacts – the issue that is the primary driver of the recreational fishery in Oregon – are the same. The GAP approves of all alternatives and understands the expansion of the Stonewall Bank Yelloweye Rockfish Conservation Area (YRCA) is being analyzed for future use but expansion is not an option at this time. Also, a preliminary analysis has been done on a 50-fathom management line, but Oregon anglers understand more analysis is necessary.

20. CA recreational: Season dates, bag limits, area closures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.a Attachment 6	Section 4.2.2.2.8; Pages 211-214; Table 4-76

→ The GAP prefers Option 1 or 2 as listed in the DEIS; Option 3 is too restrictive. Obviously, Option 1 is the most liberal in terms of impacts to overfished and target species, but the difference for each species between Option 1 and Option 2 is negligible, with the exception of the black rockfish ACL. Option 1 also is more liberal in terms of seasons but somewhat more restrictive regarding depth allowances than Option 2, but either provide greater opportunity than status quo. Given the potential to exceed the black rockfish ACL in Option 1, Option 2 is preferred at this time. We also support the lingcod bag limit increase from two to three.

The GAP also requests analysis of the following RCA lines (these would apply to both the sport and commercial fisheries): Changes to the 60-fathom line to more closely approximate the depth contour in the southern California Bight.

Del Mar waypoints, North to South

32° 56’ 72”
117° 19’ 80”

32° 56’ 50”
117° 19’ 72”

32° 56’ 36”

117° 19’ 06”

32° 56’ 24”
117° 19’ 04”

32° 56’ 00”
117° 19’ 16”

32° 55’ 64”
117° 18’ 46”

The following options pertain to a reef in the Southern California Bight. With existing lines, it is difficult to fish the reef in a prevailing current. There is some room to the south and west of the reef that would fix this problem if either of the two options below were implemented. The GAP requests the GMT analyze these options.

Option A: Extend the 60 Fathom line # 206 to:

32° 45’ 88”
117° 21’ 78”

OR

Option B: Add a new waypoint between #206 and #207 at:

32° 45’ 80”
117° 21’ 66”

With regard to the 50-fathom RCA line near the Channel Islands, the GAP also requests GMT analysis of the following waypoints (the waypoints are numbered 1-29; we have concerns for waypoints between 2 and 5 and also between 20 and 26):

WPT 2 stay the same
WPT 3 move to 34° 08’ 770” and 120° 25’ 740”
WPT 4 stay the same
Then add between 4 and 5
1. 34° 05’ 73” and 120° 05’ 93”
2. 34° 06’ 140” and 120° 04’ 860”
3. 34° 05’ 700” and 120° 03’ 170”
4. 34° 05’ 670” and 119° 58’ 980”
5. 34° 06’ 340” and 119° 56’ 780”
WPT 5 stay the same.

WPT 20 stay the same
Then add between 20 and 21
33° 50’ 250” and120° 00’ 000”

21 stay the same
22 move to 33° 51' 060" and 120° 03' 730"
23 stay the same
24 move to 33° 58' 900" and 120° 20' 150"
25 stay the same
Then add between 25 and 26
34° 02' 200" and 120° 30' 370"
26 stay the same

Adjustments to Existing or Routine Measures

21. RCA boundary adjustments to better approximate depth

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.1, Table B-1, Figure B.1

→ The GAP agrees these changes should be made to be conform to depth contours.

22. Using underutilized set-asides in the projections for the shorebased IFQ carryover

Reference document(s)	Page(s), section, table or chart
No analysis yet	

→ The GAP notes that we have commented on IFQ carryover in the past and generally support any reasonable measure that addresses the carryover issue.

23. Trip limit adjustments for lingcod N. of 40°10' N lat., slope rockfish N. of 40°10' N lat., shortspine thornyhead N. of 34°27' N lat., bocaccio S. of 34°27' N. lat., and shelf rockfish S. of 34°27' N. lat.

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.6, Table B-25

→ The GAP believes a full range of options should be available, if routine in-season adjustments need to be made. To that end, we request the following be analyzed for June:

Bocaccio limited entry: 1,000 lbs/2 months; and
Bocaccio open access: 500 lbs/2 months

Bocaccio are nearly rebuilt – if not already rebuilt – and fishermen are encountering more bocaccio in the directed fixed gear nearshore fishery. An increased trip limit of bocaccio would reduce discards and turn them into landed fish.

The GMT already has analyzed a full range of options to make them available during inseason actions.

The GAP also wants to make the Council, advisory bodies and the public aware that inseason requests for slope rockfish trip limits north of 40°10' may be necessary to reduce effort on rougheye rockfish in 2015 and 2016.

24. Modifications to groundfish retention regulations in the Pacific halibut fisheries?

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.13

→ The GAP understands there is no precise decision point here but agrees with the GMT that this should be analyzed so it can be used during the International Pacific Halibut Commission (IPHC) catch-sharing plan process.

New Management Measures

25. Establish rougheye rockfish Groundfish Conservation Area closures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.8.a Supplemental REVISED Attachment 3 Agenda Item C.4.b REVISED 2 GMT Report	Pages 1-5 Section B.2

→ As noted above, the GAP supports analysis of discrete spatial blocks that can be implemented as temporary closures in the event that rougheye catch approaches the ACL, using whatever fishery data is available. The GAP believes such closures are a measure of last resort as they could have significant impacts on fisheries.

The GAP urges the Council to task the GMT with using a more collaborative approach to this analysis. Insights from industry will be invaluable to the process.

26. Establish spiny dogfish Groundfish Conservation Area Closures

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.2

→ The GAP does not recommend any Groundfish Conservation Area (GCA) closures for spiny dogfish, as they are impractical. The risk of exceeding the spiny dogfish ACL/ABC/OFL is extremely low, given the reasons we've mentioned earlier in this statement. Ideally, if closures are necessary, rolling closures would be the preferable way to go, though enforcement may be problematic.

The trawl industry already uses voluntary measures to avoid spiny dogfish and has been successful. To that end, the fleet is applying some of those voluntary measures already used in spiny dogfish to rougheye rockfish avoidance.

27. Require rockfish excluders for the at-sea and shoreside Pacific whiting fisheries

Reference document(s)	Page(s), section, table or chart
Agenda Item C.8.a Supplemental REVISED Attachment 3 Agenda Item C.4.b, REVISED GMT report Appendix B	Pages 6-21 Section B.10

→ The GAP does not support mandatory use of rockfish excluders at this time. As the analysis indicates, during initial trials the Pacific States Marine Fisheries Commission (PSMFC) excluder has had some success at excluding smaller rockfish such as widow, canary and yellowtail rockfish at lower volumes of whiting but there are still significant issues with excluder clogging when the volumes of whiting are higher. Clogged excluders almost always result in abandonment of the haul, which leads to potentially large unnecessary discards of fish, and damage of retained catch that gets clogged in the excluder.

Defining, regulating and enforcing a mandatory rougheye excluder is both difficult and unreasonable at this time. The GAP envisions significant challenges with regulating and enforcing the use of an excluder. First, excluders are not one size fits all, because all nets are not the same. Second, each vessel is different and, operationally, excluder use is different on each vessel. If you are already carrying a salmon excluder and a small fish excluder, adding a rockfish excluder can result in a line of excluders that is longer than the actual net.

There is a financial consideration as well. Early indications are that a rougheye rockfish excluder could cost upwards of $25,000 per excluder. To date, the industry has spent hundreds of thousands of dollars on excluder development. This isn't grant money or government dollars – this is industry money. If the Council and NMFS attempt to implement a mandatory excluder that does not work, it will in all likelihood stop any further development of an excluder that actually *does* work.

The GAP continues to support industry and agency development of a workable excluder and we are confident that development will continue under the voluntary measures that we are advocating for the 2015-16 management period.

28. Provide for lingcod retention in Periods 1, 2 and 6

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.7

→ The GAP understands the GMT is analyzing options that would cover the requests of some fishermen to retain lingcod all year. Specifically, we request analysis of:

LE: 1,600 lbs/2 months during periods 3, 4, 5 and November;
OA: 800 lbs/month during periods 3, 4, 5 and November;

LE: 200 lbs/2 months during periods 1, 2 and December; and
OA: 100 lbs/month during periods 1, 2 and December.

This equates to Option 2b under B.6, "Other Trip Limit Adjustments" and Option 2 under B.7, "Analysis of lingcod retention in the nearshore and non-nearshore fixed gear fisheries in periods 1, 2 and December."

In addition, the GAP requests analysis of the following:

LE: 1,200 lbs/2 months during periods 3, 4, 5 and November;

OA: 600 lbs/month during periods 3, 4, 5 and November;

LE: 500 lbs/2 months during periods 1, 2 and December; and
OA: 250 lbs/month during periods 1, 2 and December.

29. Remove or modify commercial gear restrictions for targeting flatfish in California

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.8

→ The GAP understands the GMT is not going to make a recommendation under this agenda item and also realizes more analysis will be done

However, the GAP encourages analysis of the options that would potentially remove gear restrictions and allow more flexibility for open access fishermen. We note the Enforcement Consultants, in their report under this agenda item, prefer Option 3, as it is clear and enforceable. While we don't have a preference for any option, the GAP expects to make more comment on this in June.

30. Allow canary rockfish retention in the recreational fisheries

Reference document(s)	Page(s), section, table or chart
Agenda Item C.4.b, REVISED GMT report Appendix B	Section B.12

→ In general, the GAP supports the analysis of canary rockfish retention in recreational fisheries. California recreational fishermen are concerned that retention of canary would shorten seasons, although they support the idea for Oregon and Washington fishermen. Oregon and Washington have smaller populations and fewer groundfish anglers; therefore the risk of exceeding the sport HG for canary is much lower than if the California recreational sector were allowed to have even a one-canary bag limit. In short, more people equals more impact. Neither California nor Washington recreational fishermen on the GAP support retention of canary at this time, but the GAP requests this option be left open in the future as canary continues to rebuild.

Alternatively, analyzing this option for all three states could provide more flexibility to the recreational sector as a whole, should it be necessary or desired. States can set more restrictive management measures on federally-managed species; a coastwide option would put the onus on the states to either allow retention (and set corresponding bag limits, seasons and depth restrictions) or prohibit retention.

The GAP understands this has been a frequent request to the GMT and the state of Oregon. The Oregon recreational sector has noted in the past that allowing some canary retention may decrease pressure on nearshore stocks. Furthermore, limited canary retention would discourage targeting and the catch data would help inform future stock assessments.

Items not on the action checklist

1) **Moving 0.6 mt of yelloweye:** The GAP understands the GMT is evaluating the impacts of moving 0.6 mt of yelloweye from the non-nearshore fixed gear sector to the nearshore fixed gear sector. The GAP supports this analysis and will provide more comments on this issue in June.

2) **Midwater sport fishery:** This has been ongoing since 2008 and this issue, while generating a great deal of interest, never seems to get on any agenda or workload schedule. The GAP believes this is a priority for the sport fishing community and the opportunity should be analyzed. The GAP may also comment on this during the June omnibus package.

GROUNDFISH MANAGEMENT TEAM REPORT ON HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES FOR THE 2015-2016 GROUNDFISH FISHERY

Introduction

Under Agenda Item C.4, the Council postponed action on selecting final preferred alternative (FPA) annual catch limits (ACLs) for Dover sole and widow rockfish as well as selection of the FPA for Amendment 24 and providing guidance on the Groundfish Fishery Management Plan (FMP) language. The Groundfish Management Team (GMT) provides the following comments to inform Council action on the FPA ACLs for Dover sole and widow rockfish under this agenda item. GMT comments on Amendment 24 and the associated FMP language can be found in our statement under Agenda Item C.4 (Agenda Item C.4.b, Supplemental GMT Report 2). Further, this report contains information on the preliminary preferred fishery structures analyzed in the preliminary Draft Environmental Impact Statement (DEIS, Agenda Item C.4.a Attachment 6) and highlights areas where, based on Council Action under Agenda Items C.4 and C.8, additional analysis is needed to inform final action in June.

Final Preferred Annual Catch Limits

Dover Sole ACL Alternatives

The Council is considering two Dover sole ACL alternatives for 2015 and 2016: 1) the status quo ACL of 25,000 mt and 2) an ACL of 50,000 mt.

Dover sole harvest has been limited in the past because of constraints due to sablefish allocations (Agenda Item C.4.a. Attachment 3). Figure 1 shows the coastwide catch by all sectors for Dover sole (light bars) and sablefish (black bars) from 2002 to 2012. During this period, the maximum catch of Dover sole was slightly more than 12,000 mt. The catch of Dover sole relative to sablefish has varied markedly among years.

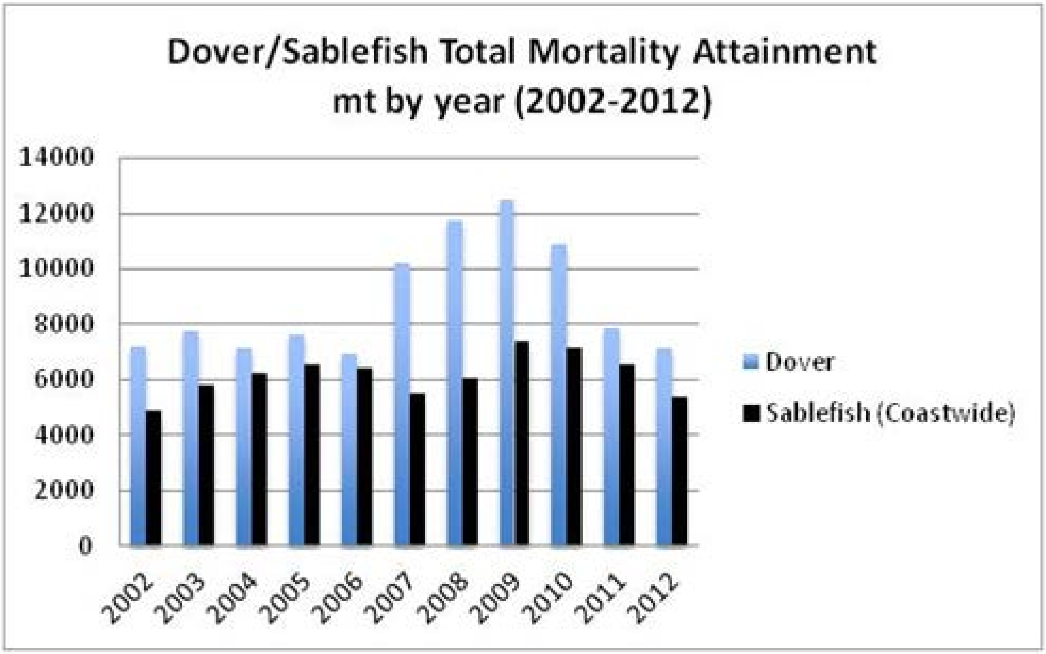

Figure 1. Annual catch and discard mortality of Dover sole and sablefish (mt).

First, although it is clear that Dover sole and sablefish co-exist to some degree (i.e., depth and bottom type), selectivity for one species over the other may change with shifts in fishing location (i.e., fishermen behavior) or as gear types evolve (i.e., use of a selective flatfish trawl or excluder devices may reduce the retention of sablefish relative to flatfish). This change in selectivity is difficult to predict. As such, some on the GMT question whether current selectivity patterns should influence the decision to limit the ACL (unless for some reason it became necessary to limit the Dover sole ACL to reduce the catch of another species with which it closely co-occurs, such as sablefish). Second, recent stock assessments indicate that the Dover sole stock is healthy, and the higher ACL of 50,000 mt is predicted to be sustainable (see Agenda Item C.4.a. Attachment 3).

Impacts of an increase in the Dover sole ACL to overfished species or non-overfished slope rockfish species should be considered; however availability of IFQ for co-occurring species such as sablefish and slope rockfish will likely limit access to the higher Dover sole ACL of 50,000 mt until more selective fishing gear and practices are used. IFQ management has been demonstrated to be an effective bycatch control mechanism that results in lower mortality of overfished species. The body shape and swimming patterns of most slope rockfish are more similar to sablefish than Dover sole; hence selective fishing gears that reduce sablefish catch would also likely reduce catch of slope rockfishes. Although petrale sole are more similar to Dover sole (shape and swimming behavior), petrale sole is projected to be rebuilt this year and are more patchily distributed than Dover sole. Hence, selective fishing practices may increase the ratio of Dover sole catch to petrale sole catch.

The GMT recommends the Council consider this information when recommending a Dover sole ACL.

Widow Rockfish ACL Alternatives
The Council is considering two widow rockfish ACL alternatives for 2015 and 2016: 1) the status quo ACL of 1,500 mt and 2) an ACL of 3,000 mt.

Figure 2 shows the catch of widow rockfish by sector for 2002-2012 (sectors catching less than 3 mt annually were omitted). Widow rockfish harvest has been limited during the past 10 years due to its previously overfished status, which resulted in low ACLs, but was declared rebuilt in 2013 based on the results of the 2013 assessment. Widow rockfish can be efficiently targeted using midwater trawl gear. Midwater trawlers have the ability to catch either ACL (1,500 mt or 3,000 mt), unless overfished species become constraining. Since the limited entry trawl fisheries are managed under IFQ, observer coverage is nearly 100 percent and catch accounting is much more precise than prior to IFQ. Additionally, IFQ management has been demonstrated to be an effective bycatch control mechanism of overfished species. However, even though a 3,000 mt constant catch is predicted to maintain the stock above the target B_{MSY} for the next 10 years under the more likely states of nature, numerous aspects of the stock's dynamics are uncertain (Agenda Item C.4.a. Attachment 3). **The GMT recommends the Council consider this information when recommending a widow rockfish ACL.**

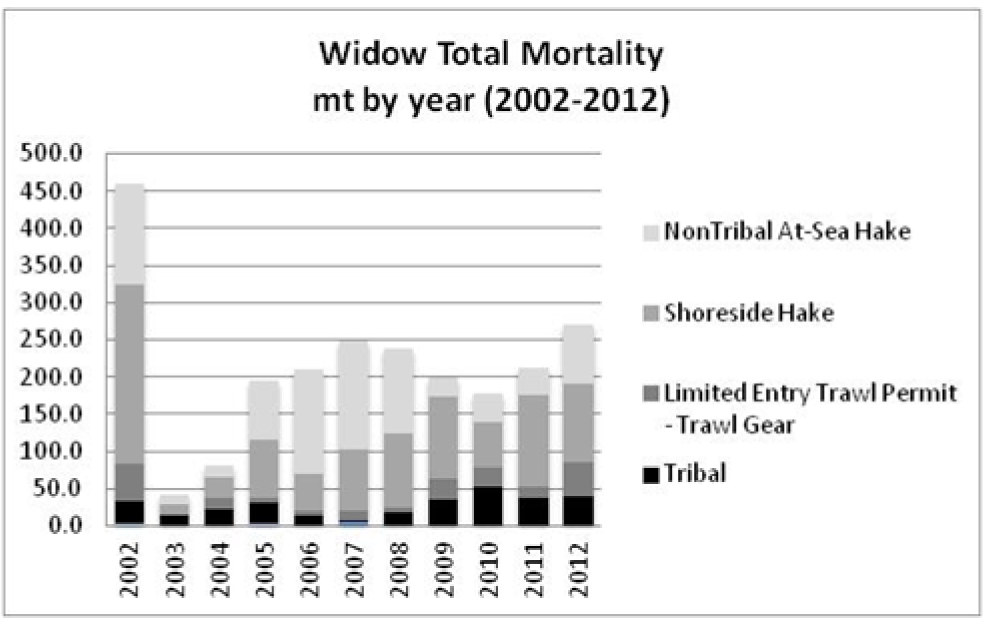

Figure 2. Annual catch and discard of widow rockfish by sector from 2002 to 2012. Sectors catching less than 3 mt annually were omitted.

Fishery Harvest Guidelines (# 9 in the Action Item Checklist)
The GMT has received no new information regarding the off-the-top deductions from the ACLs for tribal, non-groundfish fisheries, and research. **As such, the set-aside values in Tables 10 and 11 in Agenda Item C.4.a, Supplemental** REVISED **Attachment 2 are the best available data for the calculating preliminary preferred Fishery Harvest Guidelines (HG).** The GMT notes that the tribes may refine their off-the-top deduction requests prior to the June 2014 meeting.

HG for Component Species within a Complex (#10 in the Action Item Checklist)
The GMT confirmed the values for the blue rockfish HG in California and blackgill rockfish south of 40°10 N. latitude HG (Tables 8 and 9, Agenda Item C.4.a, Supplemental **REVISED** Attachment 2). The GMT notes that the values are consistent with the status quo approach.

If the Council would like the GMT to analyze a rougheye rockfish HG, in addition to the sorting requirement adopted under Agenda Item C.8, the Council should provide guidance on the range for analysis.

Allocations – Trawl and Non-trawl (#11 in the Action Item Checklist)
Attachment 1 contains the projected mortality of overfished species under Alternative 3, the Preliminary Preferred Alternative (PPA) for ACLs from November 2013 (described in the DEIS (Agenda Item C.4.a Attachment 6 and below). Based on Council action under Agenda Item C.4 **the GMT recommends postponing further consideration of two-year allocations for canary and yelloweye rockfish based on the newly configured Other Fish complex and range of Nearshore Rockfish HGs.** That is, changing the allocation of nearshore rockfish ACL between states will result in changes to the projected overfished species impacts for canary and yelloweye rockfish. Further, the Council requested an analysis that would move 0.6 mt of yelloweye from the non-nearshore to the nearshore fishery, which is described below. All these components are interrelated and thus the Council should consider the holistic analysis at the June meeting. **The GMT does not believe such additional modeling and analysis will impact projections for bocaccio and petrale sole; therefore the Council could select PPA trawl and non-trawl 2-year allocations for those species at this time.**

The GMT notes that the two-year trawl and non-trawl allocations for longnose skate, Shelf Rockfish north and south of 40°10 N. latitude listed in the Action Item Checklist (Agenda Item C.4.a, Attachment 1) are consistent with the allocations under No Action.

The GMT speaks to the need for a spiny dogfish HG under Agenda Item C.9.b Supplemental GMT Report 2.

Set-Asides from the Trawl Allocation (#12 in the Action Item Checklist)
The GMT has received no new information regarding at-sea whiting set-asides since the values were adopted at the November 2013 Council meeting. As such, the set-aside values used in the DEIS analysis represent the best available data (Agenda Item C.4.a Attachment 6).

Supplemental GMT Report 2 under this agenda item discusses further the need to establish a spiny dogfish set-aside for the at-sea whiting fisheries.

HG Within Non-Trawl (#13 in the Action Item Checklist)
As mentioned above, the GMT recommends postponing further consideration of two-year allocations for canary and yelloweye rockfish until analysis is completed on the newly configured Other Fish complex and range of Nearshore Rockfish HGs adopted at this meeting. Similarly, the Council should postpone adoption of a within non-trawl allocation for canary and yelloweye rockfish until June. The GMT does not believe such additional modeling and analysis

will impact projections for bocaccio and petrale sole; therefore the Council could select PPA within non-trawl 2-year allocations for those species at this time.

The GMT notes that the two-year within non-trawl HG for black rockfish south of 42° N. latitude, blackgill south of 40° 10' N. latitude, and sablefish south 36° N. latitude are consistent with the allocations under No Action. A discussion of the range of Nearshore Rockfish HGs is provided below and in Agenda Item C.9.b Supplemental GMT Report 2.

Adopt Preliminary Preferred Fishery Structures (#14-20 in the Action Item Checklist)
In November 2013, the Council adopted a range of P* alternatives for analysis, with Alternative 3 selected as the PPA. The GMT analyzed this range of P* alternatives for 2015-2016 and beyond (Table 1, Alternatives 1-3). The preliminary Draft Environmental Impact Statement (DEIS; Agenda Item C.4.a Attachment 6) contains specific management measures in response to the annual catch limits (ACLs) under the range of P* alternatives for 2015-2016 (see Section 4.2). Furthermore, the DEIS describes the long-term effects (i.e., the "and beyond") of the application on different types of management measures during the biennial management process by linking their potential impacts to the environmental components (see Section 4.9).

Council actions under Agenda Item C.4 (Table 1, Alternative 4) will require the GMT to re-model fishery management measures and projected impacts for the nearshore commercial and recreational fisheries. That is, the Council action to leave in place the Other Fish complex consisting of only kelp greenling (coastwide), cabezon (WA), and leopard shark may result in changes to nearshore fishery management measures and impacts. Further, the Alternative 3 analyzed fishery impacts for most sectors without allocating the Nearshore Rockfish complex north ACL with a Nearshore Rockfish HG (described in detail below). At the time of this writing, the Council had just taken action under Agenda Item C.8 and we have not yet had time to discuss the implications of establishing a rougheye rockfish sorting requirement.

Table 1. Range of P* alternatives analyzed by the GMT for 2015-2016 and beyond in the preliminary DEIS (Alternatives 1-3) and a summary of Council action under Agenda Item C.4.

Alternative	**Key Harvest Specifications Components**
Alternative 1	P* 0.45 Stock complexes consisted of: a) Nearshore rockfish N/S (no HGs) b) Slope rockfish N/S (no HGs) c) Shelf rockfish N/S d) Other Flatfish The No Action Other Fish Complex was deconstructed to: * EC species: finescale codling (a.k.a., Pacific flatnose), soupfin shark, spotted ratfish, all endemic skates - except longnose skate, and all endemic grenadiers. * Stock-specific harvest specifications for spiny dogfish (coastwide), cabezon (WA), kelp greenling (WA, OR, CA), and leopard shark (coastwide)
Alternative 2	P* 0.25, Stock Complexes same as Alternative 1
Alternative 3 - Preliminary Preferred Alternative (see Agenda Item C.4.a, Supplemental **REVISED** Attachment 2, Tables 10-14)	P* of 0.45 for all stocks and complexes except arrowtooth (0.40), sablefish (0.40), spiny dogfish (0.35), starry flounder (0.40), lingcod south (0.40), longspine thornyheads (0.40), shortspine thornyheads (0.40), kelp greenling in WA (0.40), and the Other Flatfish complex (0.40). Stock Complexes same as Alternative 1
Alternative 4 - FPA (Analysis scheduled for June Council Meeting)	P* of 0.45 for all stocks and complexes except arrowtooth (0.40), sablefish (0.40), spiny dogfish (0.40), starry flounder (0.40), lingcod south (0.40), longspine thornyheads (0.40), shortspine thornyheads (0.40), kelp greenling in WA (0.40), and the Other Flatfish complex (0.40). Stock Complexes same as Alternative 1 except: *Other Fish complex consisting of kelp greenling (coastwide), cabezon (WA), and leopard shark (coastwide)

Impact of Moving 0.6 mt of Yelloweye Rockfish from the Non-Nearshore Fishery to the Commercial Nearshore Fixed Gear Fishery

The GMT recommends that the Council postpone adopting a yelloweye rockfish HG at this meeting for two reasons. First, the ACL changes made under Agenda Item C.4 have left us with the need to remodel the nearshore fishery management measures and projected overfished species impacts. Second, we have analysis to explore the uncertainty in our projection models that we were unable to complete at this meeting but expect to have ready for the June Briefing Book.

Recent analysis and data provided to us by the West Coast Groundfish Observer Program (WCGOP) have allowed us to more fully evaluate the point estimates from our model that the Council uses to make allocation decisions, consider the needs of fishing communities, etc. We believe the topic is highly relevant here because allocating 0.6 mt of yelloweye away from the non-nearshore sector would leave no buffer between the HG and the projected impact.

We have completed preliminary analysis but only touch on some general considerations so as to further underscore the relevance of uncertainty. In brief, our point estimates and annual estimates of mortality are uncertain in part because they are subject to sampling error. This is especially so for a stock like yelloweye rockfish that is highly discarded. Some on the team see signs of sampling variation in yelloweye catch estimates in the non-nearshore and nearshore sectors.

Generally speaking, variability in estimates of catch produced from random sampling is a function primarily of the sample coverage rate and the frequency with which the species of interest are encountered. For a given coverage rate, species that are encountered with low frequency will be subject to more variability than species that are encountered with high frequency. Low sampling coverage rates will produce more volatile estimates than high sampling coverage. Volatility in estimates may not manifest for a number of years. That is, it is possible that estimates can remain low for a number of years and then spike when a rare event is observed. This is potentially what has led to increased estimates of yelloweye bycatch in the nearshore sectors; we believe yelloweye catch events to be relatively rare. The percentage of trips with observed yelloweye bycatch in the non-nearshore sector is displayed in Table 2. We have not yet calculated the same statistics for the nearshore sectors but can do so for June. WCGOP coverage rates in the non-nearshore and nearshore sectors are shown in Table 3 and Table 4.

The analysis we plan on producing for June is a simulation-based method where “true” catch is simulated based on patterns observed in the WCGOP data. This simulated dataset of “true” catch is than randomly sampled under realistic levels of sampling coverage we see in the fisheries. Together the simulated “true” and sampled catches allow an evaluation of how much variability we should expect to see. Our preliminary results suggest that the sampling coverage combined with the patterns of catch observed in the fishery suggest that we would expect to see catch estimates that are double the “true” catch about 10 percent of the time, and 50 percent higher 25 percent of the time. While preliminary, our primary modelers for these sectors believe that this level of uncertainty warrants closer scrutiny. We believe the analysis planned for June will better allow the Council to weigh the risk of this proposed reallocation.

Table 2. Percent of non-nearshore trips with observed yelloweye catch north of 36° N. latitude by year.

	2005	2006	2007	2008	2009	2010	2011	2012
% of obs. trips	7.4%	4.9%	3.0%	3.5%	2.7%	0.9%	1.7%	3.4%

Table 3. Estimated WCGOP coverage levels by year in the limited entry and open access non-nearshore sectors north of 36 N. latitude. Coverage is calculated as the percentage of observed sablefish landings to total sablefish landings in these sectors (Source: WGCOP Observer Coverage Rates 2002-2011) .

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Coverage	19%	18%	12%	29%	18%	23%	32%	8%	24%	21%

Table 4. WCGOP coverage levels by year in the Oregon and California nearshore fisheries. Coverage is calculated as the percentage of observed to total landings (lbs) of nearshore species. (Source: WGCOP Observer Coverage Rates 2002-2011).

	2004	2005	2006	2007	2008	2009	2010	2011
Coverage	7%	5%	7%	6%	4%	4%	5%	6%

Further, under the fishery structure described below, the Oregon and California commercial nearshore fisheries will approach or reach their state-specific allocation of yelloweye rockfish. The GMT points out that projected overfished species catch in both states may change depending on modeled results of Council actions taken under Agenda Item C.4 (e.g., ACL decisions regarding kelp greenling and the Other Fish complex, which will be modeled prior to the June Council meeting), and allocation decisions that the Council will make for nearshore rockfish in June. It is possible that both states may require additional yelloweye rockfish, depending on the outcome of June decisions. At the June meeting, the Council will consider the analysis described above to decide (a) whether 0.6 mt will be shifted from the non-nearshore fixed gear fishery to the commercial nearshore fishery and (b) how that amount may be apportioned between the states. We provide the following for your consideration. More detail and more analysis will be provided at the June meeting.

If this action were adopted, increased yelloweye allocation for California could potentially increase to 0.3 mt, as an example, if shared equally with Oregon. The California projected 2015-2016 mortalities for yelloweye north and south of 40°10' N. latitude are 0.2 mt and 0.1 mt, respectively. Using this ratio, and applying it to a 0.3 mt potential increase, would translate to an additional increased amount that equals the existing projected take for both areas in 2015 and 2016.

The formal 2015 and 2016 allocation is set at 1.2 mt for each year (Table 4.37, Agenda Item C.4.a, Attachment 6). Of this amount, California's projected take (0.3 mt) and Oregon's take

(0.9 mt) matches that allocation amount of 1.2 mt if compared to the No Action alternative. The additional 0.3 mt provides a buffer for the nearshore fishery, should the projected take of nearshore species increase during the next biennial cycle. However, since the 2015 and 2016 ACL for the nearshore fishery north of 40°10' N. latitude has been reduced to 69 mt, a 0.2 mt increase for northern California could allow some additional fishing opportunities for the small fleet working this area. Also, if modest trip limit increases are implemented for the lingcod fishery north of 40°10' N. latitude or as a result of opening additional periods, the additional yelloweye rockfish allocated to the state could compensate for the potential increased encounters with overfished species. Prior to the June Council meeting, the nearshore OFS mortality estimates will need to be recalculated as a result of Agenda Item C.4 decisions.

For Oregon, the projected yelloweye rockfish impact (0.9 mt) under Alternative 3 is equal to Oregon's allocation (0.9 mt). Hence, depending on the selection of the nearshore rockfish allocation method in June, and depending on management measure decisions made in June, it may be necessary to increase the state allocation to some level higher than 0.9 mt to continue the fishery under the current structure (i.e., 30 fm RCA coastwide). For example, the Council may consider increasing lingcod trip limits under this agenda item. In addition, there is some variation associated with the output from the overfished species model, so some buffer will help prevent potential disruptions to the fishery. As shown above, OFS mortality estimates will need to be recalculated prior to the June meeting as a result of Agenda Item C.4 decisions.

In the following sections, we describe the preliminary preferred fishery management measures under Alternative 3 noting where updates may be anticipated based on Council action under Agenda Item C.4 (i.e., Alternative 4). Analysis of the final preferred ACLs are anticipated in time to inform final Council action on management measures, which is scheduled for June 2014.

Treaty Tribal

While the treaty tribes have not proposed any changes to off-the-top deductions since November 2013, changes to the treaty off-the-top deductions for some overfished species are likely to occur as a result of bycatch modeling based on the final whiting allocation (i.e., after the final whiting rule). It is also possible that tribes may refine their off-the-top deduction requests prior to the June 2014 meeting. Such updates, depending on the timing, will be analyzed in the final preferred alternative after the June Council meeting.

Shorebased Individual Fishing Quota

Under Alternative 3, the shorebased individual fishing quota (IFQ) fishery was based on the stocks and complexes described in Table 1. The shorebased IFQ fishery would operate under the same management measures as No Action, with a few modifications. The IFQ would be issued based on the 2015-2016 ACLs and resulting trawl allocations under Alternative 3. Legal-sized Pacific halibut individual bycatch quota (IBQ) would be limited to 15 percent of the Area 2A total constant exploitation yield (TCEY) for legal size halibut (net weight), not to exceed 100,000 pounds (45 mt) annually for legal size halibut (net weight), which is a reduction from status quo.[1] Analysis of new management measures for this sector include Groundfish Conservation Areas (GCAs) to reduce the catch of spiny dogfish and rougheye rockfish, if

[1] The change in Pacific halibut IBQ was recommended under Amendment 21-1 and implementing in regulations at 50 CFR 660.55 (m).

necessary and recommended by the Council (Agenda Item C.4.b, REVISED GMT Report). A requirement to use rockfish excluders for shorebased IFQ vessels targeting Pacific whiting was also analyzed and could be available, if necessary and recommended by the Council.

At this time, the GMT has not identified any harvest specifications actions under Agenda Item C.4 which would require additional analysis or projections of impacts for the shorebased IFQ fishery. Depending on the outcome of Agenda Item C.8 Slope Rockfish Restructuring, additional analysis may be needed in time to inform final Council action on management measures, which is scheduled for the June 2014 Council meeting.

The GMT recommends the Council adopt the PPA fishery structures for the shorebased IFQ described briefly above and in the DEIS (Agenda Item C.4.a, Attachment 6). Analysis of adding a sorting requirement, which was adopted under Agenda Item C.8, will be provided in June for final action.

At-Sea Sector

Under the PPA (Alternative 3), the at-sea whiting co-ops (catcher-processors and motherships) would operate under the same management measures described under No Action, with a few modifications. Allocations would be issued based the 2015-2016 ACLs and resulting at-sea trawl allocations under Alternative 3. Adjustments to the at-sea whiting set-asides may be necessary to accommodate the restructuring of the Other Fish complex, which removed spiny dogfish from the complex. A range of spiny dogfish set-asides and GCAs can be analyzed and made available to reduce spiny dogfish catch, if necessary and adopted by the Council (Agenda Item C.4.b, REVISED GMT Report). Management measures to reduce rougheye rockfish catch could be implemented, including rougheye GCAs and/or a requirement to use rockfish excluders for the at-sea whiting vessels, if necessary and adopted by the Council.

At this time, the GMT has not identified any harvest specifications actions under Agenda Item C.4 (Alternative 4), which would require additional analysis or projections of impacts for the at-sea sectors. Depending on the outcome of Agenda Item C.8 Slope Rockfish Restructuring, additional analysis may be needed in time to inform final Council action on management measures, which is scheduled for the June 2014 Council meeting.

The GMT recommends the Council adopt the PPA fishery structures for the at-sea sectors described briefly above and in the DEIS (Agenda Item C.4.a, Attachment 6). Analysis of adding a sorting requirement, which was adopted under Agenda Item C.8, will be provided in June for final action.

Non-Nearshore

Under the PPA (Alternative 3), the non-nearshore fixed gear fishery would operate under the same management measures as No Action, except trip limit increases for several species, including sablefish, are proposed to attain the ACLs. GCAs to reduce catch of spiny dogfish and/or rougheye rockfish could be implemented, if necessary and adopted by the Council (Agenda Item C.4.b, REVISED GMT Report).

At this time, the GMT has not identified any harvest specifications actions under Agenda Item C.4 (Alternative 4), which would require additional analysis or projections of impacts for the non-nearshore sectors. Depending on the outcome of Agenda Item C.8 Slope Rockfish Restructuring, additional analysis may be needed in time to inform final Council action on management measures, which is scheduled for the June 2014 Council meeting.

Nearshore Fisheries

Due to delays in receiving the harvest specifications needed to calculate harvest guidelines (HGs), the commercial and recreational fisheries analyses for Alternatives 1-3 were done without allocating the Nearshore Rockfish north ACL with a Nearshore Rockfish HG or range of China rockfish HGs (Table 1).

The projected landings and/or mortality of nearshore rockfish under Agenda Item C.4 (Table 1, Alternative 4) will require the GMT to re-model fishery management measures and projected impacts for the nearshore commercial and recreational fisheries. That is, the Council action to leave in place an Other Fish complex consisting of only kelp greenling (coastwide), cabezon (WA), and leopard shark may result in changes to nearshore fishery management measures and impacts. Further, under Agenda Item C.4 the Council recommended a range of Nearshore rockfish HGs be analyzed, which is discussed further in Agenda Item C.9.b Supplemental GMT Report 2. The resulting analyses can be provided for consideration by the Council in June.

COMMERCIAL NEARSHORE

Under Alternative 3, the nearshore fixed gear fishery would operate under the same management measures as No Action with a few modifications. Trip limit decreases or non-retention may be required for kelp greenling in Oregon and the Nearshore Rockfish complex north of 40°10' N. latitude to keep mortality at or within the complex ACL under the Alternative 3 (adjustments will be made under the FPA, Alternative 4 – see next paragraph). Some measures are analyzed to increase retention of lingcod in the nearshore fisheries, including the elimination of the prohibition on lingcod retention in Periods 1, 2, and 6, as well as increased lingcod trip limits for the open periods (see Agenda Item C.4.b, REVISED GMT Report). Removing or modifying the gear restrictions on fishing for "Other Flatfish" in the non-trawl RCA, Farallon Islands, Cordell Banks, and in the Cowcod Conservation Areas (CCAs) were analyzed.

Council action under Agenda Item C.4 (Table 1, Alternative 4), will require the commercial nearshore model to be rerun to inform management measures and projected impacts. For example, the kelp greenling landing inputs to the nearshore model were limited by the kelp greenling ACL under the Alternative 3 in the DEIS (Agenda Item C.4.a, Attachment 6), but will now be increased given Council action under Agenda Item C.4 regarding the Other Fish complex. Further, Alternative 4 will be analyzed with the newly adopted nearshore rockfish HG as described under Agenda Item C.4.

For Oregon, essentially all nearshore rockfish, kelp greenling, and cabezon allocated to the commercial fishery would be harvested under the action alternatives. Under all action alternatives shown in the DEIS (Agenda Item C.4.a, Attachment 6), the projected yelloweye rockfish mortality would remain within the Oregon share of the nearshore HG for yelloweye rockfish (i.e., 0.9 mt of yelloweye was allocated, and we projected that yelloweye mortality would approach 0.9 mt). Although complete analysis of Alternative 4 and the Nearshore Rockfish HG cannot be completed until the June Council meeting, it appears that the Oregon share of the yelloweye rockfish HG may be constraining. That is, additional yelloweye rockfish may be need to be allocated to the nearshore fishery; otherwise management measures (e.g., adjustments to the shoreward boundary of the non-trawl RCA) may be required to remain below the 0.9 mt allocation of yelloweye rockfish for Oregon.

Under Agenda Item C.4, changes to kelp greenling management and a narrowed set of options for Nearshore Rockfish HGs were adopted. New modeling will be necessary to estimate catch of overfished species based on the new harvest specifications. For example, higher kelp greenling landings would be allowed under the final preferred ACL, compared to Alternative 3 (Agenda Item C.4.a, Attachment 6). Projected mortality of yelloweye rockfish may also approach the yelloweye HG under Alternative 3. The Council could either revise the yelloweye rockfish HG analyzed under Alternative 3 or recommend additional management measures to keep mortality within the yelloweye rockfish HG (e.g., RCA adjustments). Updated analyses provided in June may indicate that implementation of a Nearshore Rockfish HG may require additional management measures, for example trip limit reductions or non-retention.

For California's northern nearshore fishery, revised ACLs and range of nearshore rockfish HGs may result in more restrictive management measures for the nearshore fishery. While the north of 40°10' N. latitude California fishery is relatively small, with only about 20 participants taking nearshore rockfishes, additional decreases in allowable take (even small decreases), coupled along with such natural events as the 2011 tsunami, have and will continue to negatively impact communities.

WASHINGTON RECREATIONAL

Under the action alternatives, Washington recreational fisheries would operate under the same management measures as No Action, except the season dates for the depth closure in the North Coast (Marine Areas 3 and 4) would be shorter than under No Action. In the South Coast (Marine Area 2), the prohibition on lingcod retention seaward of 30 fathoms in the area south of 46° 58' N. latitude on Fridays and Saturdays from July to August 31 would be removed. Lastly, in the Columbia River Area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved three miles north.

As described previously, under Agenda Item C.4, a narrowed set of options for Nearshore Rockfish HGs were adopted. Updated analyses provided in June may indicate that implementation of a Nearshore Rockfish HG may require additional management measures, for example bag limit reductions or non-retention.

OREGON RECREATIONAL

Under the action alternatives, the Oregon recreational fishery would operate under the same management measures as under No Action. Currently yelloweye rockfish drives all season structure and management measures in the Oregon recreational fishery. However depending on the Nearshore Rockfish HG option, there may be a need for further restrictions to reduce impacts to nearshore rockfish species. Once those decisions are made, the public and state advisory groups will need to be consulted and a range of management measures identified. Updated analysis will hopefully be provided in June, however any additional management measures for nearshore rockfish should not change the projected impacts for canary and yelloweye rockfishes in the current analysis.

As described previously, under Agenda Item C.4, changes to kelp greenling management and a narrowed set of options for Nearshore Rockfish HGs were adopted. New modeling will be necessary to estimate catch of overfished species based on the new harvest specifications. Updated analyses provided in June may indicate that implementation of a Nearshore Rockfish HG may require additional management measures, for example bag limit reductions or non-retention.

CALIFORNIA RECREATIONAL

Season lengths and depth restrictions were explored for the California recreational fisheries, with extension of season length in Management Areas North of Point Conception (34° 27' N latitude) and a return to a 60 fm line depth restriction in the Southern Management Area (south of 34° 27' N. latitude) contemplated in the options analyzed. An increase in the lingcod bag limit from two to three fish can be accommodated given projected impacts. Season and depth restrictions analyzed to date for the California recreational fishery reflect the limitations posed by overfished and non-overfished species assuming continuation of the current management regime for the Nearshore Rockfish complex. The effects of alternative management schemes in which a state harvest guideline is in place will need to be analyzed to determine whether additional management measures will be needed to stay within the harvest guideline under each allocation alternative. Between now and June, California Department of Fish and Wildlife (CDFW) staff can analyze reductions to bag limits or non-retention if needed to reduce catch of nearshore rockfish, including China rockfish, as a result of HG allocations. Public comments received between now and June would provide further guidance as to which management measures would be preferred if any are necessary to reduce mortality. All other management measures would be the same as under No Action.

GMT Recommendations

1. Recall the GMT comments on Amendment 24 and the associated FMP language in Agenda Item C.4.b, Supplemental GMT Report 2.
2. Consider this information in this report when recommending a Dover sole ACL.
3. Consider information in this report when recommending a widow rockfish ACL.
4. Confirm the set-aside values in Tables 10 and 11 in Agenda Item C.4.a, Supplemental **REVISED** Attachment 2.
5. Confirm blackgill rockfish south of 40°10 N. latitude and blue rockfish in California HGs as shown in Tables 8 and 9 in Agenda Item C.4.a, Supplemental **REVISED** Attachment 2.
6. If the Council would like the GMT to analyze a rougheye rockfish HG, in addition to the sorting requirement adopted under Agenda Item C.8, the Council should provide guidance on the range for analysis.
7. Postpone further consideration of the two-year trawl/non-trawl and within non-trawl allocations for canary and yelloweye rockfishes until June. The GMT believes that given action under Agenda Item C.4, including the range of Nearshore Rockfish HGs, further analysis is necessary to inform decision-making. The GMT does not believe such

additional modeling and analysis will impact projections for bocaccio and petrale sole; therefore the Council could select PPA trawl and non-trawl 2-year allocations for those species at this time.

8. Adopt PPA fishery structures for the shorebased IFQ and at-sea whiting fisheries. Analysis of adding a sorting requirement, which was adopted under Agenda Item C.8, will be provided in June for final action.
9. Postpone adoption of the PPA fishery structures for the non-nearshore commercial, nearshore commercial, and recreational fisheries. The GMT believes that given action under Agenda Item C.4, including the range of Nearshore Rockfish HG, further analysis is necessary to inform decision-making.

Attachment 1. Draft scorecard for 2015. Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015, based on analysis of the PPA.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5 April 2014**	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts
Off the Top Deductions	8.3	8.3	15.2	15.2	2.0	2.0	20.8	20.8	236.6	236.6	15.0	15.0	5.8	5.8
EFPc/	3.0	3.0	1.0	1.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Research d/	4.6	4.6	4.5	4.5	2.0	2.0	2.1	2.1	14.2	14.2	5.2	5.2	3.3	3.3
Incidental OA e/	0.7	0.7	2.0	2.0	--	--	18.4	18.4	2.4	2.4	0.6	0.6	0.2	0.2
Tribal f/			7.7	7.7			0.2	0.2	220.0	220.0	9.2	9.2	2.3	2.3
Trawl Allocations	81.9	81.9	56.9	56.9	1.4	1.4	301.3	301.3	2,544.4	2,544.4	135.9	135.9	1.0	1.0
-SB Trawl	81.9	81.9	43.3	43.3	1.4	1.4	285.6	285.6	2,539.4	2,539.4	118.5	118.5	1.0	1.0
-At-Sea Trawl			13.7	13.7			15.7	15.7	5.0	5.0	17.4	17.4		
a) At-sea whiting MS			5.6	5.6			6.5	6.5			7.2	7.2		
b) At-sea whiting CP			8.0	8.0			9.2	9.2			10.2	10.2		
Non-Trawl Allocation	258.8	118.0	49.9	31.9	2.6	1.2	15.9	4.9	35.0		7.2	0.3	11.2	9.7
Non-Nearshore	79.1	0.0	3.8	1.1				4.7		0.3		0.3	1.1	0.5
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.7	7.0				0.2		0.0		0.0	1.2	1.3
Recreational Groundfish														
WA			3.4	0.8				--		--		--	2.9	2.8
OR			11.7	3.2				--		--		--	2.6	2.2
CA (based on Option 2)	178.8	117.6	24.3	19.8		1.2		--		--		--	3.4	2.9
TOTAL	349.0	208.2	122.0	104.0	6.0	4.6	338.0	327.0	2,816.0	2,781.0	158.1	151.2	18.0	16.6
2015 Harvest Specification	**349**	**359**	**122**	**122**	**10.0**	**10.0**	**338**	**338**	**2,816**	**2,816**	**158**	**158**	**18**	18
Difference	0.0	150.8	0.0	18.1	4.0	5.4	0.0	11.0	0.0	35.0	-0.1	6.8	0.0	1.4
Percent of ACL	100.0%	58.0%	100.0%	85.2%	60.2%	46.2%	100.0%	96.7%	100.0%	98.8%	100.1%	95.7%	100.0%	92.0%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1 mt
	(black)	= Fixed Values
	(light blue)	= off the top deductions

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2013-14 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 13-14 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2013-2014 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

GROUNDFISH MANAGEMENT TEAM REPORT ON HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES FOR THE 2015-2016 GROUNDFISH FISHERY

Introduction
The preliminary draft management measure analyses shown in the Groundfish Management Team (GMT) report (Agenda Item C.4.b. REVISED GMT Report) were discussed by the GMT. This report provides a summary of the GMT review of each management measure, including recommendations and guidance regarding (a) the completeness of the analyses and (b) thoughts on whether the management measure should move forward for final analysis in June, be delayed until the off-year cycle (called the Omnibus Package), or be discontinued altogether. If a measure is moved forward for analysis in the 2015-2106 and beyond package, the GMT requests that the Council provide guidance regarding alternatives (i.e., additions and deletions) and metrics they wish to have analyzed.

This document is organized consistently with the Action Checklist (Agenda Item C.4.a Attachment 1) and then by management measure, in the same order as shown in the GMT Report Appendix B (Agenda Item C.4.b. REVISED GMT Report).

Adopt Preliminary Preferred Nearshore Rockfish Allocations
Under Agenda Item C.4, the Council provided guidance on allocation alternatives including a) utilizing the miles of coastline north of 40°10' N. latitude, b) the recent historical catch from 2004-2012 (Agenda Item C.4.b, Supplemental GMT Report 2), and c) a hybrid allocation method, which uses miles of coastline for copper, China, and quillback rockfishes and historical catch from 2004-2012 for the remainder. In both alternatives (b) and (c), blue rockfish apportionment was initially based on stock assessment lines (California vs. Washington-Oregon assessment), with subsequent allocation between Oregon and Washington based historical catch from 2004-2012.

The GMT recommends that the Council postpone further action on selecting a nearshore rockfish harvest guidelines (HG) until June when the complete analyses of the final preferred annual catch limits (ACLs, discussed in detail in Agenda Item C.9.b Supplemental GMT Report), and the analysis of the nearshore rockfish HGs are presented. The Council could choose to narrow the range for analyses; however the GMT believes this is a reasonable range for analysis and can be completed in time for the June Briefing Book.

The projected mortality and landings for each state and sector under the under the Preferred Preliminary Alternative (PPA, Alternative 3) from November 2013 and the HG alternatives are provided in Table 1. There are no projection models for the trawl and non-nearshore fishery, but based on historical data, mortality of nearshore rockfish in these fisheries is expected to be trace (Agenda Item C.4.a, Attachment 3, Table 4-13). The commercial nearshore model projects mortality of overfished species based on the expected landings of nearshore species (e.g., nearshore rockfish, black rockfish, kelp greenling, cabezon, lingcod, and California scorpionfish south of 40°10' N. latitude). There is no nearshore model that projects landings of target species under the various season or depth structures. Mortality (landings and discard) data for the nearshore fishery from the West Coast Groundfish Observer Program (WCGOP) under the action alternatives can be explored for June to provide a mortality estimate for the nearshore fishery. The Washington recreational model relies on historical catch to project landings of nearshore rockfish species. Projections of nearshore rockfish are estimated using the average catch for the recent 10 year period (2004-2012). Table 1 displays the results of the Oregon recreational model projections of nearshore rockfish mortality under Alternative 3. Three options are available for the season structure for the California recreational fishery and the projected mortality (15.6 mt, 15.4 mt and 6.7 mt, respectively) with the highest projected mortality of the Nearshore Rockfish complex north of 40°10' N. latitude displayed in Table 1. At present, the coastwide approximation of projected mortality of the Nearshore Rockfish complex across all states and sectors north of 40°10' N. latitude is 83 mt, but as noted above, the value is expected to be higher when mortality for the nearshore commercial fishery is estimated in June. **The current estimated projected impacts under the PPA (Alternative 3) exceed the ACL of 69 mt, indicating that management measures are likely to be needed to reduce aggregate mortality. The analysis of the Other Fish complex, nearshore rockfish HGs, and associated management measures by fishery sector, which will be included in the June Briefing Book, should be sufficient to keep mortality within the Nearshore Rockfish complex ACL N. of 40°10' N. latitude**.

Table 1. Projected Nearshore Rockfish complex mortality under the preliminary preferred alternative in each state and sector and HG alternatives by state.

State	Sector	Projected Impacts under PPA	HG Opt. 1 Miles of Coastline	HG Opt. 2 Historical Catch	HG Opt. 3 Hybrid
Washington	Recreational Groundfish	10,2			
	Directed OA: Nearshore [1/]	NA			
	Washington Total	10.2	15.7	6.6	7.7
Oregon	Recreational Groundfish	30.5			
	Directed OA: Nearshore	15			
	Oregon Total	45.5	29.9	36.8	36.3
California	Recreational Groundfish	15.6			
	Directed OA: Nearshore [2/]	11.6			
	California Total	27.2	23.2	25.3	24.8
Coastwide Total		**82.9**	**68.8**	**68.8**	**68.8**

[1/] Washington does not have a commercial nearshore sector (from 1995 to present).

[2/] Values provided reflect recent Nearshore Rockfish complex landings used as inputs in the nearshore overfished species projection model; discards are not included, but can be provided in June.

Review of Proposed Management Measures

Attachment 1 contains a summary of the management measures by sector, completeness, and GMT recommendation. The following section describes in detail the measures and rationale for the recommendations.

B.1 Rockfish Conservation Area Boundary Adjustments

Beginning on January 1, 2013, the 200 fathom (fm) rockfish conservation areas (RCA) line was adjusted to better align with depth contours (see 2013-2014 EIS). Unfortunately, the 200 fm modified RCA, which contains cut-outs to provide greater access to petrale sole, was not simultaneously adjusted. This resulted in the closure of areas near Heceta Bank, where the petrale cut-outs were seaward of the 200 fm RCA. This area is very small and potential impacts to overfished species and non-overfished species (e.g., rougheye rockfish) would also be small. This measure would re-open this area that was kept closed unintentionally starting in 2013 (i.e., these areas were open prior to January 1, 2013). **In addition to these recommended RCA corrections, if the Council wishes to consider a range of RCA lines seaward of 250 fm to potentially reduce rougheye rockfish bycatch, the GMT could complete this analysis by June.**

B.11 Off-the-top deductions to cover carryover if trawl allocation is exceeded

In November 2013, the Council requested the GMT evaluate projections for the off-the-top deductions from the ACL when evaluating the risk of exceeding the ACL/ABC/OFL for species eligible for carryover in the shorebased IFQ fishery. We began an analysis of this issue, yet were unable to complete it. **The GMT would therefore recommend moving consideration of the shorebased IFQ carryover analyses under the omnibus management measures discussion (i.e., not included in the 2015-16 EIS), which includes Amendment 20 trawl trailing actions.** In addition to the specific proposal to consider the set-asides and their likelihood of being taken, the analysis we have started could also explore some of the long-term, broader modifications to how risk is evaluated and the carryover program is implemented.

B.6 Other Trip Limit Adjustments

For the 2015-2016 biennial management cycle, the Council is considering trip limit increases for the following non-trawl fixed-gear fishery sectors: lingcod north of 40°10' N. latitude (limited entry and open access), shortspine thornyhead north of 34°27' N latitude (limited entry), and bocaccio and the minor shelf rockfish complex south of 34°27' N latitude (limited entry and open access for both fishery sectors). Reference to the associated trip limit tables for these sectors (that includes the fishery sector trip limit options and the projected mortality for each option) is found in Agenda Item C.4.b. REVISED GMT Report. **The GMT recommends consideration of this matter in June or during the biennium through routine inseason actions.**

B.13 Retain groundfish, lingcod only, or flatfish only during the Pacific halibut fisheries

The GMT and Council staff believes that Council action on this item is not required under this or other groundfish biennial harvest specifications agenda items now or in June. The decision on whether to allow groundfish retention during Pacific halibut all-depth dates will happen during the annual Pacific halibut Catch Sharing Plan process (i.e., the September and November Council meetings). The analysis is included in this groundfish process and EIS due to the potential impacts on yelloweye and canary rockfishes, and is included so it is available for reference in future halibut processes. **The GMT recommends the Council consider the impact analysis contained in the DEIS when making recommendations for the Pacific halibut CSP.**

Due to the regional variability in encounters with all groundfish species, including overfished species and regional differences in the length of the recreational halibut season, consideration for allowing groundfish retention during recreational halibut fishing should be evaluated on a management area basis. In general, lingcod habitat overlaps with that of rockfish, while that of other flatfish (flounders and soles) tends to be over softer bottoms. Therefore, potential impacts to overfished rockfish species are projected to be lower when allowing retention of other flatfish relative to retention of lingcod.

B.2 Groundfish Closure Areas for Rougheye Rockfish and Spiny Dogfish

Groundfish closure areas (GCAs) are a management tool that are being considered for the 2015-2016 biennium and may be useful for limiting catch of rougheye rockfish or spiny dogfish if inseason catch levels are high. More detail about our proposed methodology, as well as examples of "hot spot" maps that resulted from this preliminary analysis, are provided in Section B.2.3 in Agenda Item C.4.b, REVISED 2 GMT Report. Please note that the maps in that report were not intended as final maps for proposing or establishing GCAs; they were provided to help facilitate discussion of our analysis approach.

At this meeting, the team had an opportunity to discuss our preliminary "hot spot" analysis with industry representatives, the Scientific and Statistical Committee (SSC), and the Groundfish Advisory Subpanel (GAP). These discussions were very productive. In particular, we would like to thank Mr. Dave Fraser for his informative presentation of the near real-time bycatch tracking, spatial analysis, and intrasector communication capabilities available to the at-sea and shoreside whiting sectors. Industry representatives and the SSC shared some concerns, such as how confidentiality restrictions relative to using observer data were being applied in our analysis and how this affected the level of location precision in our resulting maps. We appreciate these concerns and have received feedback from the SSC as to how we might better use observer data given confidentiality limitations.

The SSC also voiced concern about estimating discards when haul "bleeding" occurs (when discards unintentionally fall out of a net before being brought onto a vessel), and how observer sampling may contribute to biased estimates of tow-level bycatch (Agenda Item C.4.b, Supplemental SSC Report). Relative to this concern, the GMT notes that Mr. Dave Colpo's (Pacific States Marine Fisheries Commission (PSMFC)) presentation to the Council at this meeting (relative to electronic monitoring experimental fishing permits) indicates that discards are approximately half of one percent of the catch. Despite these concerns, the SSC recommended further development of this approach (Agenda Item C.4.b, Supplemental SSC Report).

GMT discussion to date does not include an analysis of socioeconomic impacts. This would include estimating, in economic or fishing behavioral terms, the degree to which fishing effort is displaced as a result of GCA placement. Similarly, we do not yet include a discussion of enforcement considerations. Both considerations are important when identifying GCA locations, their effectiveness, and feasibility.

The GMT recommends that if GCAs for either spiny dogfish or rougheye rockfish are desired, that they are forwarded for consideration in June 2014 under the omnibus management measures discussion. If tasked by the Council, the GMT can continue to refine our methodology for identifying these areas. As mentioned, refinement of our current methodology can be completed by the June meeting. As for the SSC's suggestion to consider developing a spatial Generalized Additive Mixed Model (GAMM) for identifying bycatch hot spots, we do not think we will have time to do this before the June meeting. However, we would continue development of such a modeling approach in the future, if the measure is recommended under the omnibus process. Also, more time is needed to interpret maps resulting from this refined approach and propose alternatives; these activities would likely be enhanced with industry participation (e.g., from the GAP or a GAP subgroup). Then an evaluation of socioeconomic and enforcement impacts relative to these GCA alternatives must be proposed.

B.10 Use of excluder devices to reduce catch of rougheye rockfish in non-tribal at-sea and shoreside Pacific whiting fisheries

This analysis evaluates the mandatory use of excluder devices for reducing the catch of rougheye rockfish in the non-tribal Pacific whiting fisheries (i.e., shorebased IFQ, catcher-processors, and motherships). Alternatives ranged from mandatory use for all trips north of 40°10' N. latitude to mandatory use only within limited areas (e.g., areas with highest rougheye rockfish catches). Specific alternatives, assumptions, and more detail can be found in Agenda Item C.4.b. REVISED GMT Report. This analysis shows that use of excluder devices on midwater gears targeting Pacific whiting may reduce the catch of rougheye rockfish. Discussions with individuals from the industry and discussions among GMT members, resulted in numerous suggested changes to the assumptions, as well as comments and suggestions regarding (1) the advantages of allowing voluntary use instead of mandatory use, (2) the need for additional research, (3) questions regarding whether current regulations would allow or prevent voluntary use, and (4) impacts of clogging in front of excluders. **The GMT would therefore recommend moving consideration of this measure to the omnibus management measures discussion and removing it from the 2015-2016 package.**

B.7 Analysis of lingcod retention in the nearshore and non-nearshore fixed gear fisheries in Periods 1, 2, and 6

Lingcod retention is prohibited in Periods 1, 2, and part of 6 for both limited entry and open access fixed gears under the status quo regulations. The request was made to retain and land lingcod that are incidentally caught and discarded, with the suggestion that trip limits might be set low enough to prevent changes in fishermen's behavior (i.e., prevent targeting). The proposed change would allow lingcod retention during Periods 1, 2 and 6 in the restricted access state permitted nearshore fisheries in California and Oregon, the open access fixed gear fishery in Oregon, and the limited-entry and open access non-nearshore fixed gear fisheries in California, Oregon and Washington.

Lingcod mortality has been far below the non-trawl allocation (less than 35 percent) and conversion of discards to landings is only expected to increase mortality from the commercial fixed gear fishery by 47 percent (from 79.9 mt to 117 mt) leaving a large residual to buffer against uncertainty from increased targeting in the open access fleet. In addition the Council should also consider the impacts of lingcod season date changes to co-occurring overfished species. Projections of additional mortality of overfished species in the fixed gear fisheries result in an estimated increase in mortality in the nearshore fishery of 6.9 percent (0.08 mt) for yelloweye rockfish, 6.1 percent (0.43 mt) for canary rockfish, 6.5 percent (0.03 mt) for bocaccio, and no increase in cowcod with the current 400 lb per month open access and 800 lb limited entry trip limits during the period in question.

The latent capacity in the open access fishery (i.e., the sector contains participants who are fishing at low levels or who are inactive) presents an uncertainty in overfished species mortality projections. The Council could consider aligning the lingcod and nearshore rockfish seasons south of 40°10 N. latitude to prevent bycatch and discard mortality on nearshore rockfish encountered while pursuing lingcod during the closed season for nearshore rockfish in period 2. This can be achieved by either opening the nearshore rockfish season in period 2, which is closed to fishing under status quo regulation, or by keeping lingcod closed during this period to prevent rockfish bycatch.

One last consideration discussed by the GMT is the potential impact on lingcod reproductive output, which can be further addressed between now and June, though it has been discussed in past analyses, i.e., eliminating the spawning closure in the recreational fishery. **The GMT recommends forwarding this for further refinement and consideration in June, as part of the 2015-16 package.**

B.8 Analysis of removing gear restriction for Pacific sanddabs and Other Flatfish in various GCAs for the California non-trawl commercial fishery.

Current regulations prohibit fishing in various GCAs with non-trawl gear for groundfish. One general exception to these closures is for vessels fishing with hook-and-line gear that meets specific requirements (e.g., no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches)). This analysis explores ways to allow continued targeting of the Other Flatfish complex within the GCAs while removing or reducing the current gear restrictions to increase efficiency and thus attainment of the non-trawl allocation of the Other Flatfish complex.

Pacific sanddabs are the primary target within the Other Flatfish complex. They are found over soft bottom habitat where rockfish are rarely encountered and are primarily distributed in shallower depths than petrale sole. The historical landings data for trips targeting Pacific sanddabs (composing greater than 50 percent of landings) from 1994-1999 prior to gear restrictions and GCAs provided proxy bycatch rates for overfished species. Projected impacts assuming attainment of the non-trawl allocation of Pacific sanddabs resulted in nearly negligible overfished species mortality. Thus liberalization of gear restrictions to increase the likelihood of attainment is not expected to affect other fishing opportunities constrained by overfished species impacts.

B.12 Allow Retention of canary rockfish in the recreational fisheries

The GMT analyzed the retention of canary rockfish in recreational fisheries in Washington, Oregon, and California on a state by state basis. The GMT notes that all three states would not need to implement this management measure concurrently, allowing each state to consider it now or in a later cycle as appropriate. Any decisions regarding allowing the retention of canary rockfish may require an examination of trade-offs with other management measures to maintain current season structures and bag limits. The overarching uncertainty across each state's analysis is that angler behavior is difficult to predict and may result in an increase in mortality beyond what is projected in this analysis. **The GMT recommends this continue for consideration in June as part of the 2015-16 package, with further refinement by June.**

B.14 Modify depth restriction for the Oregon recreational fishery

Currently, the Oregon recreational fishery line is 40 fathoms. In March, the Council chose new mortality rates for recreationally-caught yelloweye and canary rockfishes when released with descending devices. One depth bin within the new rates was 30-50 fathoms. Given the new mortality rates, there will be no difference in the mortality rate of released yelloweye and canary rockfish if the management line is moved from 40 to 50 fathoms. However, the encounter rate may differ. Oregon is requesting to have the 50 fathom line available for use for inseason management, not as part of the preferred season structure, in the event yelloweye rockfish impacts are lower than previously projected. There was no data available for analysis because the recreational fishery in Oregon has not been open outside of 40 fathoms during the peak April to September fishing period since before both stocks were declared overfished. **The GMT recommends removing this management measure for consideration in the 2015-2016 package and forward for consideration in omnibus management measures discussion.**

B.3 Two-Year Trawl and Non-Trawl Allocation of Petrale Sole

The GMT has no further comment.

B.4 Overfished Species Impacts on Trips Targeting Bocaccio Rockfish South of 36° N. Latitude

Harvest for bocaccio for the management areas south of 36° N. latitude has been minimal from 2008 to 2012 with an overall five-year average annual mortality of 1.1 mt for the non-nearshore fixed gear fishery. As a result, industry requested trip limit increases in 2012 and 2013 for the limited entry sector south of 34° 27' N latitude with minimal mortality increases for overfished species (OFS). As part of the 2015-2016 biennial management cycle, the Council is considering modest trip limit adjustments for both sectors (LE and OA) south of 34° 27' N latitude. To better inform the Council's decision, the GMT was tasked with analyzing potential mortality increases for other OFS on trips targeting bocaccio. This analysis covers the areas south of 36° N latitude, which includes the Morro Bay port complex area as well as the area south of 34° 27' N latitude.

WCGOP data were examined for the area south of 36° N latitude to estimate mortality of co-occurring overfished species (canary, darkblotched, and yelloweye rockfishes) that may occur as a result of increases to the bocaccio rockfish trip limits in the LE and OA sectors. From 2002 to 2012, a total of 33 hauls was observed where bocaccio was taken. Examination of these haul data revealed that no OFS were encountered on the observed trips. Given the small sample size of 33 hauls over this 11 year period, it is reasonable to assume that some OFS were probably encountered as bycatch on other trips, albeit in very small and unquantifiable amounts. Given this, it is also reasonable to assume that any possible OFS mortality increases associated with modest trip limit increases would be very minimal.

The GMT recommends the Council consider the impacts described above when adjusting the bocaccio rockfish trip limits in June or during the biennium through routine inseason actions.

B.5 Coastwide Sablefish Trip Limits

The GMT recommends sablefish trip limits proposed under Alternative 3 to align with the FPA sablefish ACLs (Tables B-20 and B-22 in Agenda Item C.4.b. REVISED GMT Report and outlined in Agenda Item C.9.b Supplemental GAP Report)**.** Further, the GMT notes that sablefish trip limits will be reviewed at the November 2014 Council meeting and recommendations for adjustments may be made based on fishery performance.

B.9 At-Sea Set-Asides: Spiny Dogfish Shark

The new ACL adopted under Agenda Item C.4 raised the 2015 spiny dogfish ACL from 1,912 mt to 2,101 mt, and 2016 ACL from 1,897 mt to 2,085 mt**. In brief, the GMT believes it would be reasonable for the Council to forgo establishing at-sea set-asides in this cycle because of the relatively low probability of exceeding the dogfish ACL suggested by Appendix B in Agenda Item C.4.b. REVISED GMT Report.**

We updated the Appendix B analysis with (1) the newly set 2014 Total Allowable Catch (TAC) for Pacific whiting, which is 17 percent higher than last year's TAC; and (2) the 2016 ACL for dogfish. We only focus on 2016 to simplify the results and because it is lower than the 2015 ACL.

The new results are shown in Table 2. We also added a third simulation — "Simulation 3"— to explore the effect of targeting in the fixed gear sectors. Nothing in regulation prohibits resuming targeting in those sectors to the levels prior to 2009. This third simulation updates Simulation 2 by calculating the fixed gear sectors lognormal mean and standard deviation from 2003-2008 catches instead of 2009-2012.

The full GMT reviewed the analysis. If the Council were to take a risk-based approach to prioritizing management measures, the chance of catch exceeding the ACL more than one time in four years would be one standard to focus on. The simulation results suggest that failing that standard for dogfish is low across all three scenarios. As we have raised in Agenda Item C.8 regarding the binomial probability of an ACL overage (i.e., a simple yes/no look at overages), the annual probability of an ACL overage has to be greater than 38 percent before it becomes more likely than not that we will experience more than one overage in a four-year period. The highest annual percentage of an ACL overage is less than half that. If the 2008-2012 period is more reflective of what we will experience in the near term, then we would expect annual overages less than 10 percent of the time. Looking at a four year period, we would only expect more than one overage less than 5 percent of the time. As stated in Appendix B (Agenda Item C.4.b. REVISED GMT Report), we recommend these percentages as rough guides rather than precise predictions. Likewise, changed dynamics in the fisheries could make these past patterns unreflective of what we would see in 2015-2016 and beyond.

On the issue of choosing an at-sea set-aside, this analysis takes an approach the GMT has wished to make progress towards over the past couple of management cycles. Our goal is to better understand and characterize the uncertainty in our catch projections. The at-sea dogfish set-aside choice is one where variability and uncertainty are important. The variability makes the choice of set-asides and harvest guidelines challenging. The simulation results suggest that at-sea set-asides could reduce the likelihood of an ACL overage because of large catch years in the catcher-processor sector to cause overages. The bottom trawl sector appears to be the other major potential source of overages. Yet to elaborate on the challenge, establishing set-asides or HGs that would accommodate most years of catch in both sectors would take up most of the ACL. At the same time, such high set-aside or harvest guideline levels would not be needed in the majority of years.

We omit much of the larger discussion we have in mind for this issue. In brief, some see the circumstances presented for dogfish as calling for a system where the sum of HGs, set-asides, ACTs, etc. established across sectors could add up to an amount greater than the ACL. We see this as a possible beneficial and rational fishery policy where catch is highly variable catch in multiple sectors and low probability that catch in each sector would reach their specific levels in the same year. At this time, we do not expect that the FMP or even the Magnuson-Stevens Act would allow for formal specification of set-asides, HGs, ACTs, etc. that summed to more than the ACL. Yet we do think the approach could be explored in the future for addressing highly variable bycatch species like dogfish.

To reiterate, the GMT believes it would be reasonable for the Council to forgo establishing at-sea set-asides in this cycle because of the relatively low probability of exceeding the dogfish ACL suggested by Appendix B in Agenda Item C.4.b. REVISED GMT Report.

Table 2. Spiny Dogfish Shark: Updated simulation results (detailed in Appendix B) for Simulations 1 and 2 with an additional Simulation 3. See below for explanation of the metrics reported.

						Set Aside Scenarios							
						725 mt		500 mt		300 mt		163 mt	
#	Whiting TAC	Avg. mt	Over %	Avg. Over. mt	At Sea Avg. mt	Over. %	At Sea over. %	Over. %	At Sea over. %	Over. %	At Sea over. %	Over. %	At Sea over. %
1	2014	1,646	18%	409	710	14%	11%	12%	17%	9%	29%	8%	50%
	2013	1,561	14%	389	692	11%	9%	9%	14%	7%	25%	6%	44%
2	2014	1,312	7%	238	1,247	0%	11%	0%	17%	0%	29%	0%	50%
	2013	1,210	5%	200	1,265	0%	9%	0%	14%	0%	25%	0%	44%
3	2014	1,529	7%	238	1,247	3%	11%	1%	17%	0%	29%	0%	50%
	2013	1,425	7%	238	1,247	2%	9%	1%	14%	0%	25%	0%	44%

Performance metrics reported in Table 2.

- *Avg. mt*: the average annual total catch over all simulation runs
- *Over. %*: the percentage of simulation runs were the annual total catch was greater than 2,085 mt
- *Avg. Over. mt:* the average size of overages in metric tons.
- *At Sea Avg. mt:* the average total catch from the At Sea sectors in runs where there was an overage.
- *% of overages if Set Aside = ###* : the percentage of runs with a total catch greater than 2,085 mt if the At Sea sector was capped the set aside amount (e.g., 163 mt, 300 mt, 500 mt, 725 mt)

GMT Recommendations

1. The GMT recommends that the Council postpone further action on selecting a nearshore rockfish harvest HG until June when the complete analyses of the final preferred annual catch limits (ACLs, discussed in detail in Agenda Item C.9.b Supplemental GMT Report) and the analysis of the nearshore rockfish HGs are presented.
2. In addition to the recommended RCA corrections for the 200 fm modified line in Oregon (described in B.1), consider analyzing a range of RCA lines seaward of 250 fm to potentially reduce rougheye rockfish bycatch.
3. Forward consideration of the shorebased IFQ carryover analyses into the new management measures process (i.e., the omnibus package), which includes Amendment 20 trawl trailing actions.
4. The GMT recommends consideration of the trip limit adjustments for lingcod north of 40°10' N. latitude (limited entry and open access), shortspine thornyhead north of 34°27' N latitude (limited entry), and bocaccio and the minor shelf rockfish complex south of 34°27' N latitude (limited entry and open access for both fishery sectors) in June or during the biennium through routine inseason actions.
5. The GMT recommends the Council consider the impact analysis contained in the DEIS when making recommendations for the Pacific halibut CSP (i.e., no action is need at this meeting or in June).
6. The GMT recommends that if GCAs for either spiny dogfish or rougheye rockfish are desired, that they are forwarded for consideration in June 2014 under the omnibus management measures package (i.e., not included in the 2015-16 EIS).
7. The GMT recommends removing the 50 fm management line analysis for the Oregon recreational fisheries for consideration in the 2015-2016 package and forward for consideration in Omnibus Package.
8. The GMT recommends sablefish trip limits proposed under Alternative 3 to align with the FPA sablefish ACLs (Tables B-20 and B-22 in Agenda Item C.4.b. REVISED GMT Report and outlined in the Agenda Item C.9.b Supplemental GAP Report).
9. The GMT recommends the Council consider the impacts described above when adjusting the bocaccio rockfish trip limits in June or during the biennium through routine inseason actions.
10. The GMT believes it would be reasonable for the Council to forgo establishing at-sea set-asides for spiny dogfish because of the relatively low probability of exceeding the dogfish ACL (see Agenda Item C.4.b. REVISED GMT Report).

11. The GMT recommends allowing lingcod retention in Periods 1, 2, and 6 management measure continue for consideration in June as part of the 2015-16 package, with further refinement in time for the June Council meeting
12. The GMT recommends the management measure allowing retention of canary rockfish in the recreational fisheries continue for consideration as part of the 2015-16 package, with further refinement for the June Council meeting.

References

King J.R. and R.E. Withler. 2005. Male nest site fidelity and female serial polyandry in lingcod (*Ophiodon elongatus*, Hexagrammidae). *Molecular Ecology*, 14(2): 653-660.

Attachment 1. Summary of Management Measures by Sector, Completeness, and GMT Recommendation.

Management Measure	Sector	Overview	Substantially Complete?	Can be finished by June?	Retain, Postpone, or End Analysis
B.1 Rockfish Conservation Area boundary adjustments	Trawl	Adjustments to the 200 fm modified line near Heceta Bank to correct coordinates for the petrale cut-outs.	Yes	Yes	Retain
B.1.a New RCA lines seaward of 250 fm	Trawl	The Council may want to consider new RCA fathom contours for the area seaward of 250 fathoms	**New**	Yes	Consider for inclusion in 15-16 package
B.11 Off-the-top deductions to cover carryover if trawl allocation exceeded	Trawl	Evaluate projections for the off-the-top deductions from the ACL when evaluating the risk of exceeding the ACL/ABC/OFL for species eligible for carry-over in the shorebased IFQ fishery	No	No	Remove from 15-16 and forward for consideration in the omnibus package
B.6 Other trip limit adjustments	Non-Trawl	Consider modest trip limit increases for lingcod N. of 40°10’ N. lat., shortspine thornyhead N. of 34° 27’N. lat, and bocaccio and shelf rockfish S. of 34° 27’N. lat.	Yes	Yes	Retain for consideration in June or future inseason adjustments
B.13 Retain groundfish in recreational halibut fisheries	Non-Trawl Rec	Analysis to support modifications to groundfish regulations considered during development of the Catch Sharing Plan (CSP)	Yes	Yes	Retain for consideration in the CSP process
B.2.1 Rougheye	Trawl/		Yes, but	No	Remove for implementation in 15-

Management Measure	Sector	Overview	Substantially Complete?	Can be finished by June?	Retain, Postpone, or End Analysis
rockfish conservation area	Non-Trawl	Groundfish closure areas (GCAs) may be useful for limiting catch of rougheye rockfish if inseason catch levels are high.	substantially more work needed		16 regulation package and forward for consideration in the omnibus package
B.2.2 Spiny dogfish conservation Area	Trawl/ Non-Trawl	GCAs might not work for dogfish. Risk analysis shows low risk but note that may change with increased whiting	Yes, but substantially more work needed	No	Remove for implementation in 15-16 regulation package and forward for consideration in the omnibus package
B.10 Use of excluder devices to reduce catch of rougheye rockfish for the at sea and shoreside Pacific whiting fisheries	Trawl	Continued industry research and experimentation will help improve the effectiveness of excluder devices.	Yes, but more research needed	No	Remove for implementation in 15-16 regulation package and forward for consideration in the omnibus package
B.7 Allow lingcod retention in Periods 1, 2 and 6	Non-Trawl	Lingcod mortality has been below the non-trawl allocation. This would convert discarded catch into landed catch during the winter. Catch of OFS may increase. Trip limits could be set low enough to prevent changes in fishermen's behavior. Potential impacts on lingcod reproductive output can be further addressed between now and June	Yes and the GMT can continue to refine analysis	Yes	Retain
B.8 Remove or modify	Non-Trawl	Needs more team discussion, consider narrowing the range of alternatives	No	Yes	Retain

Management Measure	Sector	Overview	Substantially Complete?	Can be finished by June?	Retain, Postpone, or End Analysis
commercial gear restrictions for targeting flatfish in California					
B.12 Allow canary rockfish retention in recreational fisheries	Rec.	Projected impacts assume no changes in angler behavior, overarching uncertainty across the three states. Trade-offs with current management measures will need to be considered (CA shortened season)	Yes with some revisions to the description of the analysis	Yes	Retain
B.14 Modify Depth restriction for the Oregon Rec. fishery	Rec.	A 50 fathom depth restriction would address new mortality rates reflecting the use of descending devices and would expand inseason management options if yelloweye HGs are higher than projected	No. More work is needed	No	Remove from 15-16 and forward for consideration in the omnibus package

Appendix 1. Nearshore Rockfish Complex alternatives calculations by species

Option 1 Miles of Coastline

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	0.01	0.26	0.49	0.25	0.00	0.01	0.00
Blue (CA)	17.00	0.00	0.00	1.00	0.00	0.00	17.00
Blue (OR & WA)	26.94	0.34	0.66	0.00	9.26	17.68	0.00
Brown	1.75	0.26	0.49	0.25	0.45	0.86	0.43
Calico	0.00	0.26	0.49	0.25	0.00	0.00	0.00
China	6.20	0.26	0.49	0.25	1.60	3.06	1.54
Copper	9.71	0.26	0.49	0.25	2.51	4.79	2.41
Gopher	0.00	0.26	0.49	0.25	0.00	0.00	0.00
Grass	0.55	0.26	0.49	0.25	0.14	0.27	0.14
Kelp	0.01	0.26	0.49	0.25	0.00	0.00	0.00
Olive	0.26	0.26	0.49	0.25	0.07	0.13	0.07
Quillback	6.15	0.26	0.49	0.25	1.59	3.04	1.52
Treefish	0.18	0.26	0.49	0.25	0.05	0.09	0.04
Sum Total	68.76				15.68	29.93	23.15
							68.76

Option 2 Historical Catch

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	0.01	0.00	0.21	0.79	0.00	0.00	0.01
Blue (CA)	17.00	NA	NA	1.00	0.00	0.00	17.00
Blue (OR & WA)	26.94	0.07	0.93	NA	1.96	24.98	0.00
Brown	1.75	0.00	0.08	0.92	0.00	0.14	1.61
Calico	0.00	NA	NA	NA	0.00	0.00	0.00
China	6.20	0.22	0.65	0.13	1.36	4.02	0.82
Copper	9.71	0.20	0.48	0.32	1.94	4.71	3.06
Gopher	0.00	0.00	0.29	0.71	0.00	0.00	0.00
Grass	0.55	0.00	0.49	0.51	0.00	0.27	0.28
Kelp	0.01	NA	NA	NA	0.00	0.00	0.00
Olive	0.26	0.00	0.03	0.97	0.00	0.01	0.25
Quillback	6.15	0.22	0.44	0.34	1.35	2.72	2.08
Treefish	0.18	0.00	0.00	1.00	0.00	0.00	0.18
Sum Total					6.61	36.84	25.30
							68.75

Option 3 Hybrid

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	0.01	0.00	0.21	0.79	0.00	0.00	0.01
Blue (CA)	17.00	NA	NA	1.00	0.00	0.00	17.00
Blue (OR & WA)	26.94	0.07	0.93	NA	1.96	24.98	0.00
Brown	1.75	0.00	0.08	0.92	0.00	0.14	1.61
Calico	0.00	NA	NA	NA	0.00	0.00	0.00
China	6.20	0.26	0.49	0.25	1.60	3.06	1.54
Copper	9.71	0.26	0.49	0.25	2.51	4.79	2.41
Gopher	0.00	0.00	0.29	0.71	0.00	0.00	0.00
Grass	0.55	0.00	0.49	0.51	0.00	0.27	0.28
Kelp	0.01	NA	NA	NA	0.00	0.00	0.00
Olive	0.26	0.00	0.03	0.97	0.00	0.01	0.25
Quillback	6.15	0.26	0.49	0.25	1.59	3.04	1.52
Treefish	0.18	0.00	0.00	1.00	0.00	0.00	0.18
Sum Total					7.66	36.29	24.80
							68.75