HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES FOR 2015-2016 AND BIENNIAL PERIODS THEREAFTER

Includes the Reorganization of Groundfish Stock Complexes, Designation of Ecosystem Component Species and Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan to Establish a Process for Determining Default Harvest Specifications

Final Environmental Impact Statement

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COVER SHEET

Harvest Specifications and Management Measures for the 2015-2016 and Biennial Periods Thereafter

(Pacific Coast Groundfish Fishery Management Plan)

Proposed Action:	The proposed action has three components: 1) Establishing harvest specifications and management measures for the 2015-2016 biennial management period; 2) restructuring groundfish stock complexes and designation of ecosystem component species; and, 3) amending the Groundfish Fishery Management Plan (FMP) to establish default harvest control rules for decision making in future biennial cycles and to clarify the scope of new and routine management measures that would be considered during the biennial process.
Type of Statement:	**Final Environmental Impact Statement**
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Abstract:

Harvest specifications and management measures for the 2015-2016 biennial period are based on the “best available scientific information.” Every 2 years harvest specifications, including the overfishing limits (OFLs), acceptable biological catches (ABCs), and annual catch limits (ACLs) are considered for each management unit consistent with the policies and procedures established in the Groundfish FMP and in compliance with other applicable law. For overfished species, the ACLs are based on the rebuilding plans intended to rebuild the stock in a 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 overfished stock with the marine ecosystem. Accountability measures are proposed to prevent catch from exceeding the annual limits set for management units. The accountability measures include ACL reductions (set asides), allocations, and adjustments to management measures.

The restructuring of stock complexes for Minor Slope Rockfish and “Other Fish” stock complexes are considered for consistency with National Standard 1 Guidelines at 50 CFR 6060.310(d)(8). Most groundfish species managed within stock complexes are data-poor stocks without full stock assessments. The proposed action considers the impacts of management actions on individual stocks within the complexes given the differences in vulnerability, life history, and distribution. The proposed action considers designating “ecosystem component species” (EC species), which, under the National Standard 1 Guidelines, are non-targeted stocks that are not subject to overfishing and have not been determined to be overfished, or approaching the overfished threshold; and that are not generally retained for sale or personal use. EC species are monitored, but ACLs are not set for them. For conservation purposes, the proposed action considers designating several species not managed under any FMP as EC species under the Groundfish FMP as these are species caught during fishing activity managed under the Groundfish FMP.

Amendment 24 to the Groundfish FMP proposes to establish procedures for deriving harvest specifications in the absence of Council action and defining the scope of management actions that may occur along with the harvest specifications. Harvest specification values based on default harvest control rules would be defined for stocks and stock complexes but would not change the Council’s ability to use discretion to modify the harvest control rule in future biennial cycles. The proposed action is intended to reduce the number of decision points needed during Council deliberations on the biennial harvest specifications and management measures.

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Executive Summary

ES-1.0 INTRODUCTION

This document provides information about, and analyses of, setting groundfish harvest specifications and establishing related management measures for 2015-2016 and subsequent years for fisheries covered by the Pacific Coast Groundfish Fishery Management Plan (hereafter, Groundfish FMP or 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 two years for a two-year period. In addition to harvest specifications and management measures for the 2015-2016 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). The EEZ extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. The states manage their fisheries, including Minor Nearshore Rockfish fisheries in the territorial sea, in a manner consistent with or more restrictive than, the Groundfish FMP and Federal implementing regulations.

ES-2.0 THE PROPOSED ACTION

The proposed action has three components: (1) establishing harvest specifications and management measures for the 2015-2016 biennial management period; (2) changing groundfish stock complexes and designating ecosystem component species; and (3) amending the Groundfish FMP to describe how the Council would use default harvest control rules (HCRs) in their decision-making process in future biennial cycles and to clarify what are considered new and routine management measures during the biennial process. The No Action Alternative is also considered in all cases. This Environmental Impact Statement (EIS) includes an analysis of the long-term impacts of biennial harvest specifications and foreseeable adjustments to routine management measures that will be applied to support decision-making in future biennial periods.

ES-3.0 SUMMARY OF THE ALTERNATIVES

ES-3.1 Alternatives for Establishing Harvest Specifications and Management Measures for the 2015-2016 Biennial Management Period

Harvest specifications are established for each managed stock or stock complex in the Groundfish FMP. Specifications include the overfishing limit (OFL), the acceptable biological catch (ABC), and the annual catch limit (ACL). Catch above the OFL constitutes overfishing. The ABC is a precautionary reduction from the OFL designed to account for scientific uncertainty in the OFL. Section 4.4 in the Groundfish FMP describes the methods generally used to determine the ABC. ABCs are based on the Scientific and Statistical Committee's (SSC's) recommended framework, which is referred to as the P* approach. The SSC recommends a precautionary reduction referred to as the sigma value. The Council considers the SSC recommended sigma reduction from the OFL, combined with an additional reduction referred to as the P* value (probability of overfishing). Together, the sigma value and P* value define the corresponding fraction to be used to reduce the OFL to derive an ABC. A lower P* is more risk averse than a higher value, meaning that the probability of the ABC being greater than the "true" OFL is lower. A formula incorporating these two values produces a percentage value representing the precautionary reduction. The Groundfish FMP restricts the P* value from exceeding 0.45.

Overall catch is managed to the ACL. For most stocks, the ACL is set equal to the ABC, but the ACL may be set below the ABC for a variety of reasons. The Council may also set an ACT to establish a higher level of precaution, particularly if there is greater uncertainty about the true level of catch due to an estimation error. Table 2-2 through Table 2-5 shows 2015-2016 harvest specifications under each of the alternatives, including the No Action Alternative.

Management measures include adjustments to and allocations of ACLs, adjustments to existing management measures (including those designated as routine), and adoption of new management measures. During the biennial cycle, existing routine measures may be adjusted, and new measures may be established. These management measures are mainly intended to control groundfish catch and to improve monitoring of the fishery.

Allocations establish overall limits for different groundfish fishery sectors (segments of the overall fishery distinguished by gear type, permit programs, target species, and other factors) as a basis for controlling catch. Many allocations have been included in the FMP, and the same proportions are applied from period to period; others may be modified biennially based on conditions in the fishery. Harvest guidelines (HGs) may also be used to aid the implementation of management measures by taking into account fishing opportunity in different fishery sectors.

Catch control tools for the commercial groundfish fishery include individual fishing quota (IFQ), at-sea fishery allocations and set-asides, sablefish tier limits for certain limited entry fixed gears, cumulative landing (or trip) limits, and closed areas to reduce bycatch of species of concern, predominantly overfished species. Recreational catch control tools include time and area closures and bag limits. Catch monitoring is accomplished by at-sea observers and dockside accounting for commercial catch and landings, as well as sampling and observation of recreational fisheries. Management measure alternatives are structured to provide sufficient fishing opportunity to achieve but not exceed ACLs.

No Action Alternative

Harvest specifications values in place on January 1, 2014, would remain in effect for the 2015-2016 period (see Table 2-2 for the numerical values and the basis for these harvest specifications). Management measures in place on December 31, 2014, would remain in place during the 2015-2016 biennial period. However, the Council may take inseason action to adjust routine management measures during the biennium.

The Preferred Alternative

ACLs for most species are determined based on the ACLs being set equal to the ABCs with a P* 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 36° N. latitude, shortspine thornyhead north and south of 34°27' N. latitude, spiny dogfish, and starry flounder would be determined based on the ACLs being set equal to the ABCs, or adjusted using the 40-10 rule, with a P* value of 0.40. For some stocks, including most overfished stocks and stocks with precautionary adjustments using the 40-10 and 25-5 rules, ACLs would be set below the ABC, in which case the P* value does not necessarily determine the ACL. Overfished species ACLs would be based on harvest control rules contained in the current rebuilding plans. For cowcod south of 40º10' N. latitude, however, the harvest control rule in the current rebuilding plan would be maintained while the target year for rebuilding is being revised. In addition, an ACT would be applied to cowcod. Constant-catch ACLs for Dover sole, widow rockfish, and shortbelly rockfish would be increased from their 2014 values, but they would remain below their respective ABCs. Table 2-3 contains the preferred 2015 and 2016 harvest specifications.

Under the Preferred Alternative, harvest control rules would change for 7 of the 40 stocks or stock complexes (not including Pacific whiting) for which ACLs are established. These changes are as follows:

- The Dover sole constant catch ACL would increase from 25,000 metric ton (mt) to 50,000 mt.
- The ACLs for shortspine thornyhead stocks north and south of 34º27' N. latitude would be proportions of the coastwide ABC; the ABC would be determined using a P* value of 0.40 (0.45 was used to derive the 2014 ACLs under the No Action Alternative).
- Spiny dogfish would be removed from the Other Fish complex and managed with its own ACL, which would be set equal to the ABC using a P* value of 0.40.
- The constant catch ACL for widow rockfish would increase from 1,500 mt to 2,000 mt.
- The constant catch ACL for shortbelly rockfish would increase from 50 mt to 500 mt.
- For the Minor Nearshore Rockfish North complex, the 40-10 precautionary adjustment would be applied to determine the China rockfish contribution to the stock complex ACL (which would be determined as the sum of constituent species' ACL contributions).
- The Other Fish complex would be restructured to include cabezon off Washington, kelp greenling, and leopard shark. The ACL for the restructured complex would be equal to the complex ABC using a P* value of 0.45.

Based on a new stock assessment and rebuilding analysis, harvest specifications for cowcod, an overfished species, would be revised. A new target rebuilding year of 2020 would be specified, but the current rebuilding plan spawning potential ratio- (SPR-) based harvest rate of 82.7 percent (translated into an exploitation rate) would be maintained. A 10-mt ACL would be established for the cowcod stock, which would be consistent with the current rebuilding plan's harvest control rule. The Council recommended establishing an ACT of 4 mt as an additional precautionary measure, and catch would be managed to stay below the ACT. ACLs for 14 of the stocks or stock complexes would increase in 2015 compared to 2014 ACLs (No Action Alternative).

Under the Preferred Alternative, a sorting requirement for shortraker and rougheye/blackspotted rockfish would be implemented. These enhanced accountability measures would allow catch to be tracked more accurately and responsively while the rougheye/blackspotted rockfish stock would remain within the current Slope Rockfish complexes.

Management measures considered as part of the biennial process fall into three broad categories: adjustments to and allocations of ACLs; adjustments to existing management measures, including those designated as routine; and adoption of new management measures. New measures would include the following:

- Applying a sorting requirement for shortraker and rougheye/blackspotted rockfish
- Adjusting rockfish conservation area (RCA) depth contour coordinates
- Removing the prohibition on fixed gear lingcod retention
- Establishing a harvest guideline (HG) in California for minor nearshore rockfish north of 40°10' N. latitude
- Retaining canary rockfish in the Oregon recreational fishery
- Establishing allowances for Washington and Oregon retention of bottom fish during recreational all-depth halibut seasons

- Modifying Washington recreational boundaries for lingcod closures
- Making routine measure adjustments as necessary

Management measures are structured to achieve, but not to exceed, the ACLs and ACTs when specified.

Alternative 1 – Use a P Value of 0.45*

Where applicable, ABCs would be determined based on a P* value of 0.45, and the ACL would be set equal to the ABC. For several stocks, the ACL would be set below the ABC, and the P* value would not necessarily determine the ACL. Instances where the ACL would be below the ABC would include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and use of the harvest rate specified in a rebuilding plan. Table 2-4 shows the harvest specifications for each stock under Alternative 1. Catch control measures would be established and adjusted to attain but not to exceed the Alternative 1 ACLs. New management measures would be the same as the Preferred Alternative.

Alternative 2 – Use a P Value of 0.25*

Where applicable, ACLs would be determined based on the ACLs being set equal to the ABCs with a P* value of 0.25. As described above for Alternative 1, ACLs may be set below the ABC, in which case the P* value does not necessarily determine the ACL. Instances where the ACL would be below the ABC would include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and use of the harvest rate specified in a rebuilding plan. Table 2-5 contains the harvest specifications under Alternative 2. Catch control measures would be established and adjusted to attain but not to exceed the Alternative 2 ACLs. New management measures would be similar to the Preferred Alternative; however, inseason adjustments would likely be necessary to lower limits and shorten seasons.

ES-3.2 Alternatives for Stock Complex Reorganization and Designation of Ecosystem Component Species

The Council considered the following alternatives to address concerns about the status of rougheye/blackspotted and shortraker rockfish, which is grouped in the Minor Slope Rockfish north and the Minor Slope Rockfish south complexes, as well as the Other Fish complex, which includes a variety of incidentally caught species that do not have similar biological or distributional characteristics. Designating current FMP species as ecosystem component (EC) species and adding new species to the FMP as ecosystem component species are included in the Preferred Alternative.

Minor Slope Rockfish Complex Restructuring – No Action (Preferred) Alternative

Under No Action Alternative, the Minor Slope Rockfish complexes would not be reorganized. The Preferred Alternative would maintain the Slope Rockfish stock complexes as they are currently structured north and south of 40°10’ N. latitude. Management measures for shortraker and rougheye/blackspotted rockfish are described in Section 4.2. The measures include a sorting requirement for shortraker and rougheye/blackspotted rockfish to more accurately and responsively track catch.

Minor Slope Rockfish Restructuring – Alternative 1 – Establish a Coastwide Rougheye/blackspotted/shortraker Complex

Under this Alternative, rougheye rockfish (including blackspotted rockfish) and shortraker rockfish would be removed from the slope rockfish complexes north and south of 40º10’ N latitude and they would be managed as a new coastwide rougheye/blackspotted/shortraker (RBS) complex. Stocks may be grouped into complexes for various reasons, including the following:

- Areas where stocks in a multispecies fishery cannot be targeted independent of one another
- Areas where maximum sustainable yield (MSY) cannot be defined on a stock-by-stock basis
- Times when there are insufficient data to measure stock status
- Times when it is not feasible for fishermen to distinguish individual stocks among their catch

Managing RBS as a new complex would distinguish species with similar vulnerabilities. This would increase the range of potential management measures that could more directly control catch of these species to reduce the risk of exceeding a stock's contribution to the complex OFL. For example, IFQs specific to the new stock complex could be issued. However, establishing an ACL for a complex with these species could require various long-term or 2-year allocation considerations.

"Other Fish" Complex Restructuring – No Action Alternative

Under the No Action Alternative, the Other Fish complex would not be reorganized, and no EC species would be designated. The status quo Other Fish complex consists of all the unassessed groundfish FMP species that are neither rockfish (*family Scorpaenidae*) nor flatfish, except for spiny dogfish which was assessed in 2011. These Other Fish complex 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*). The No Action Other Fish complex is an aggregation of species with different life history characteristics, depth distributions, and vulnerabilities to potential overfishing.

"Other Fish" Complex Restructuring – Preferred Alternative

The Other Fish complex would be reorganized. Spiny dogfish would be removed from the complex and managed as a separate stock with its own harvest specifications. Under the Preferred Alternative, the following species would be designated EC species: big skate, California skate, all other endemic skates, soupfin shark, finescale codling, Pacific grenadier, all other endemic grenadier species, and spotted ratfish.

Species not currently in the FMP that would be designated as EC species would include Aleutian skate (*Bathyraja aleutica*), Bering/sandpaper skate (*B. interrupta*), roughtail/black skate (*Bathyraja trachura*), all other skates (endemic species in the family *Arhynchobatidae*), giant grenadier (*Bathyraja aleutica*), and all other grenadiers (endemic species in the family *Macrouridae*) (Table 2-10). The Washington, Oregon, and California kelp greenling stocks, the Washington cabezon stock, and leopard shark would remain in the Other Fish complex.

The EC classification is described in National Standard 1 Guidelines. EC species are monitored, but they do not require specification of an annual catch limit or status determination criteria. They are species that are caught incidentally in relatively small amounts. EC species should be non-targeted stocks, and they should not be subject to overfishing or be determined to be overfished. They should not be approaching the overfished threshold, or should not become overfished in the absence of management measures. They should not generally be retained for sale or personal use. If monitoring indicates an increasing trend in catch for an EC species, reclassification and/or appropriate management measures may be considered.

Catch of these species could be considered within the context of annual mortality. Estimates of catch would likely be based on observer sample data and fish ticket reports in the Pacific Fisheries Information Network (PacFIN) database for the associated market categories.

ES-3.3 Alternatives for Using Default Harvest Control Rules to Compute ACLs (Amendment 24)

Amendment 24 would incorporate a description of the default harvest control rule (HCR) procedures into the Groundfish FMP. Should the Council not take action to modify an HCR, the default applied to the best available scientific information would be used to calculate harvest specifications. During most cycles, the Council reapplies existing harvest policies or makes modest changes consistent with the Groundfish FMP and MSA. This action would evaluate the long-term impacts of setting biennial harvest specifications and management measures. The description of the types of management measures established and adjusted during the biennial process would also be clarified as part of Amendment 24. As part of the biennial process, new management measures may be implemented and existing, routine management measures adjusted. Routine measures are actions that have been designated as routine through at least two Council meetings and that can be implemented by NMFS during the fishing season through a single notice in the Federal Register. For NMFS to enact a routine measure, the scope of the impacts must have already been analyzed for the specific species and gear type, and there must be good cause to waive the notice and public comments on rulemaking procedures otherwise required by the Administrative Procedure Act.

No Action Alternative – The Groundfish FMP is Not Amended

The Groundfish FMP would not be amended to include default HCRs. Each biennium, the Council must consider which HCRs apply. Specifications are generally calculated using the same HCRs that applied during the previous biennial period. Harvest control rules are the various rules and definitions used by the Council to establish OFLs, ABCs, and ACLs. For example, the ABC harvest control rule most consistently used by the Council is the application of P* and sigma values to an estimate of the OFL for a stock; the 40-10 and 25-5 precautionary adjustments are considered ACL harvest control rules, whereby the ACL is set at a level below the ABC, based on the stock’s status.

The Preferred Alternative – Use the HCRs in Place in the Previous Period as the Defaults

The Groundfish FMP would be amended to include default HCRs. The default HCRs would be calculated using the same HCRs that were applied during the previous biennial period. HCRs are the various rules and definitions used to establish OFLs, ABC, and ACLs where applicable. Under the Preferred Alternative, the HCRs from the previous biennial period would be used, combined with the best available scientific information (such as the most recent stock assessment) to establish the harvest specifications during the next biennial cycle. During the biennial harvest specifications process, the Council can take action to establish ABCs and ACLs. For example, the ABC HCR most consistently used by the Council is the application of P* and sigma values to the OFL for a stock. The 40-10 and 25-5 precautionary adjustments are considered ACL HCRs. FMP language describing the types of management measures developed and implemented as part of the biennial process would be revised for clarification. During future biennial harvest specifications processes, the Council could take action to deviate from the default HCRs and make different recommendations to NMFS.

Alternative 1 – Default HCRs Use a P* of 0.45

The default HCRs would use a P* value of 0.45 to determine the ABC, where applicable, using the best available scientific information. Instances where the ACL is below the ABC would include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and use of the harvest rate specified in a rebuilding plan. During the biennial harvest specifications process, the Council could take action to modify the HCR, and harvest specifications for the next biennial period would be recommended based on the modified HCR. FMP language describing the types of management measures developed and implemented as part of the biennial process would be revised for clarification.

Alternative 2 – Default HCRs Use a P of 0.25*

The default HCRs would use a P* value of 0.25 to determine the ABC, where applicable, using the best available scientific information. Instances where the ACL is below the ABC would include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and use of the harvest rate specified in a rebuilding plan. During the biennial harvest specifications process, the Council could take action to modify the HCR, and harvest specifications for the next biennial period would be recommended based on the new HCR. FMP language describing the types of management measures developed and implemented as part of the biennial process would be revised for clarification.

Table ES-1. Schematic of the components of the alternatives.

Components	No Action	Preferred Alternative	Alternative 1	Alternative 2
2015-2016 harvest specifications and management measures	Harvest specifications in place on January 1, 2014.	Overfished species ACLs would be based on the current rebuilding plan. For most non-overfished species, the Council would use a P* of 0.45 with ACL equal to the ABC. For arrowtooth, lingcod south, longspine thornyhead, sablefish, shortspine thornyhead, spiny dogfish, and starry flounder a P* or 0.40 would be used. Dover sole, widow rockfish, and shortbelly rockfish ACLs are 50,000, 2,000, and 500 mt, respectively.	Overfished species ACLs would be based on rebuilding plans. Non-overfished species ACLs would be based on a P*of 0.45, except Dover sole, widow rockfish, and shortbelly rockfish, which are constant catch ACLs of 25,000, 1,500, and 50 mt, respectively.	Overfished species ACLs would be based on rebuilding plans. Non-overfished species ACLs would be based on a P*of 0.25, except Dover sole, widow rockfish, and shortbelly rockfish, which are constant catch ACLs of 25,000, 1,500, and 50 mt, respectively.
	Management measures in on December 31, 2014.	New measures would include a sorting requirement for shortraker and rougheye/blackspotted rockfish, adjustments to depth contour coordinates, removal of the prohibition on fixed gear lingcod retention November to April, HGs for minor nearshore rockfish north of 40°10' N. latitude, canary rockfish retention in Oregon recreational fishery, Washington and Oregon allowance for retention of bottom fish during recreational all-depth halibut seasons, modified or eliminated Washington recreational boundaries for lingcod closures, and routine measure adjustments as necessary.	Same as Preferred Alternative	Same as Preferred Alternative

Table ES-1 (continued). Schematic of the components of the alternatives.

<table>
<tr><th>Components</th><th>No Action</th><th>The Preferred Alternative</th><th colspan="2">Option 1</th></tr>
<tr><td rowspan="3">Stock complex reorganization and designation of Ecosystem Component Species</td><td>Slope Rockfish complex not reorganized.</td><td>Same as No Action Alternative (also see new management measures for sorting).</td><td colspan="2">Rougheye/blackspotted rockfish and shortraker rockfish removed from the complexes and managed coastwide as new complex.</td></tr>
<tr><td rowspan="2">Other Fish complexes not reorganized; EC species not designated.</td><td rowspan="2">Same as Option 1.</td><td colspan="2">Spiny dogfish removed from complex and managed as a coastwide stock. Skates, Pacific grenadier, soupfin shark, spotted ratfish, and finescale codling designated as EC species. The remaining stocks continue to be managed in the Other Fish complex.</td></tr>
<tr><td colspan="2">Designate Aleutian skate, Bering/sandpaper skate, roughtail/black skate, all other skates, giant grenadier, all other grenadiers as EC species</td></tr>
<tr><td></td><td>No Action</td><td>Preferred Alternative</td><td>Alternative 1</td><td>Alternative 2</td></tr>
<tr><td>Amendment 24 (default HCRs and management measure process)</td><td>No Amendment, HCRs reconsidered each biennial cycle.</td><td>Default HCR with ABC based on 2015-2016 P*; amend Section 6.2 to clarify “new” vs. “routine” management measures.</td><td>Default HCR with ABC based on P*=0.45; amend FMP to clarify “new” vs. “routine” measures.</td><td>Default HCR with ABC based on P*=0.25; amend FMP to clarify “new” vs. “routine” measures.</td></tr>
</table>

ES-4.0 IMPACTS OF THE PROPOSED ACTIONS

ES-4.1 Groundfish

Biological Impacts of setting 2015-2016 Harvest Specifications and Management Measures

Sections 4.1 and 4.2 contain evaluations of the biological impacts resulting from setting harvest specifications, ACL deductions, allocations, and modifications to management measures to control catch. Management measures are structured so that ACLs are not expected to be exceeded. Commercial fishery management measures subject to modification include IFQ annual quota pound issuance, establishing tier limits for the limited entry sablefish primary season, modifying cumulative landing limits for other fisheries and species, and making changes to the boundaries of time/area closures to control bycatch of overfished species and other species where there is a conservation concern. Recreational management measures subject to modification include bag limits and time/area closures (seasons).

The best available scientific information indicates that all overfished species are rebuilding consistent with trajectories from current rebuilding plans; therefore, current rebuilding plans would be maintained under all of the alternatives, with the exception of cowcod. The results of the 2013 assessment and rebuilding plan for cowcod indicate that the stock is rebuilding ahead of schedule. Therefore, the T_{TARGET} would be revised from 2068 to 2020 under the Action alternatives. T_{TARGET} is the projected year by which an overfished species will be rebuilt, and it establishes the time period for rebuilding that is as short as possible. Except for petrale sole, the projected attainment of all overfished species has been well below ACLs.

RCA adjustments to align RCA contours more closely to the true depths off California would allow non-trawl vessels increased access to fishing areas while maintaining the intent of the depth contours. To the degree that there is a precise correlation between depth and catch rates, there could be a marginal increase in the catch of overfished species such as such as bocaccio, canary, cowcod, and yelloweye rockfishes under the action alternatives. Trip limit increases for minor shelf rockfish intended to reduce discarding (i.e., turn discards into landed catch and thereby improve catch accounting) and increase attainment of the non-trawl HG may result in a small increase in the catch of overfished species, particularly in the south. However, mortality for bocaccio south of 40°10' N. latitude is projected to be consistent with the rebuilding measures for the stock. Removing the non-trawl prohibition on lingcod retention during the winter months (except in period 2 in the south), would increase the non-trawl lingcod season length, while maintaining moderate trip limits. This would be the most viable means of increasing attainment of the lingcod ACL without increasing interactions with overfished species. Canary rockfish retention in the recreational fisheries would be prohibited under the No Action Alternative. A retention allowance for canary rockfish in the Oregon recreational fishery would likely improve data available for future stock assessments without increasing total catch mortality (incidentally caught fish that would otherwise be discarded could be landed). Increased lingcod bag limits from two to three fish in the California recreational fishery could result in increased overfished species catch if anglers spent more time on the water fishing for an additional lingcod. All total catch mortality would likely be managed within the ACLs.

Relative to non-overfished species, the risk of overfishing under the Preferred Alternative would be similar to the No Action Alternative. The risks under Alternative 1 would be highest for species where catch is relatively high and where there is no additional precaution in the form of ACLs established below ABCs or ABCs established based on lower P* values to address management and scientific uncertainty. These species include minor nearshore rockfish and petrale sole. Alternative 2 would have the most conservative harvest rates and the lowest overall risk of overfishing. However, for stocks and stock complexes where attainment of the ACL is relatively low, the harvest rates under Alternative 2 would have a similar risk of overfishing as under the other alternatives. For stocks and stock complexes that exceed 90 percent of the ACL, including cabezon off Oregon, California scorpionfish, Pacific whiting, sablefish, shortspine thornyhead north, and Minor Nearshore Rockfish complex north, Alternative 2 would have the lowest risk of overfishing, but the greatest impact on fisheries.

Constant-catch ACLs used for three trawl dominant species, Dover sole, widow rockfish, and shortbelly rockfish would continue, but would be increased under the Preferred Alternative. As trawl-dominant species, fishery-dependent observer data are available for monitoring catch season. An increase in the Dover sole ACL from 25,000 mt to 50,000 mt under the Preferred Alternative would not likely result in overfishing or the stock dropping below B_{MSY} (the threshold used to determine if a stock is overfished) in the next 10 years. Dover sole occur coastwide with highest densities found between 110 and 270 fathoms (fm). RCA modifications (change in seaward boundary between 40°10’ and 45°46’ N. latitude from 200 fm depth contour during the November to February period to year-round use of the 200 fm modified depth contour and coordinate changes to the 200 fm modified contour off Oregon) may allow greater access to petrale sole as well as to Dover sole. Sablefish is taken in trawl fisheries targeting Dover sole. Therefore, the projected catch of Dover sole would likely be affected by the sablefish allocation, which would increase under the Preferred Alternative. In addition to sablefish, species historically caught with Dover sole include IFQ species (shortspine and longspine thornyheads, other flatfish—rex sole and minor slope rockfish—and aurora rockfish), trip limit species (longnose skate), species proposed to be designated as EC species (Pacific grenadier and Pacific flatnose), and non-FMP species (roughtail skate, giant grenadier, hagfish, and a diverse complex of eelpouts) (PFMC 2014). Roughtail skate and giant grenadier would be designated as EC species under the action alternatives.

The Preferred Alternative would increase the constant catch ACL for widow rockfish, a healthy stock, from 1,500 mt to 2,000 mt. Widow rockfish is projected to remain above B_{MSY} under all of the alternatives. However, the productivity and status of the stock are highly uncertain, as the available biomass indices are not informative. The highest densities of widow rockfish occur north of 37º N. latitude at depths of 55 to 160 fm. The Trawl RCAs restrict bottom trawling in much of the area with the highest densities. However, north of 40°10’ N latitude midwater trawl is occurring within the RCAs after the start of the primary whiting season for the shorebased IFQ program. At night adults form large schools off bottom where they can be targeted with midwater trawl. Widow rockfish co-occur with Pacific whiting, yellowtail rockfish, chilipepper rockfish, shortbelly rockfish, bocaccio, and minor shelf rockfish (vermilion rockfish and speckled rockfish) and have been associated with canary rockfish (PFMC 2014).

The constant catch ACL for shortbelly rockfish would increase from 50 to 500 mt under the Preferred Alternative. Shortbelly rockfish is a healthy and valuable forage species that is taken incidentally. Shortbelly rockfish are found south of 46º N. latitude with the highest density found between 50 and 155 fm. The Trawl RCAs restrict bottom trawl access to much of the area with the highest shortbelly rockfish density. However, midwater trawl north of 40°10’ N latitude occurs throughout the EEZ after the start of the primary whiting season for the shorebased IFQ program. At times, trawlers targeting other semi-pelagic rockfish (usually chilipepper and widow rockfish) have caught shortbelly rockfish in large numbers. An ACL of 500 mt is less than 10 percent of the ABC and would allow access to co-occurring groundfish without overfishing shortbelly rockfish or jeopardizing its role in the ecosystem.

Removing spiny dogfish from the Other Fish complex and managing it with its own specifications under the action alternatives would reduce the risk of overfishing over the No Action Alternative (managing the stock within the Other Fish complex). The ABC would be based on a P* value of 0.4 and a new $F_{50\%}$ F_{MSY} harvest rate (fishing mortality rate that maximizes catch biomass in the long term) for elasmobranchs used to establish the OFL. Spiny dogfish is a healthy stock with a high Productivity-Susceptibility Assessment (PSA) vulnerability score indicating a high concern for overfishing. Using a more conservative F_{MSY} harvest rates for elasmobranchs buffers against uncertainty even with the higher P* value.

The ABC for shortspine thornyhead stocks north and south of 34º27' N. latitude would be based on a P* value of 0.4 under the Preferred Alternative (0.45 under the No Action Alternative and Alternative 1). Shortspine thornyhead is a healthy stock with a medium concern for overfishing. Under the No Action Alternative, the combined ACLs are a 17-percent reduction from the coastwide OFL. Under Alternative 1, the combined ACLs would be a reduction of9.0 percent from the OFL. Under the Preferred Alternative, the application of a P* of 0.40 would result in an ACL that is a 17 percent reduction from the OFL. Alternative 2 would result in a 38 percent reduction from the OFL. The reductions from OFL would buffer against model and management uncertainty. The added precaution would reduce the risk of overfishing the true OFL. In the north, management uncertainty is low since most of the catch occurs in the trawl fishery, where full observer coverage is required. Management uncertainty is higher in the south were shortspine thornyhead are mostly targeted in the limited entry fixed gear fishery, which is observed at a 20 to 25 percent rate. Limited-entry, non-trawl, trip limit increases for shortspine thornyhead north would be used to reduce discarding to increase attainment of the non-trawl HG and thereby improve catch accounting.

For the Minor Nearshore Rockfish complex north, the 40-10 precautionary adjustment was applied to determine the China rockfish contribution to the stock complex ACL. China rockfish north is a precautionary zone stock with one of the highest PSA vulnerability scores, indicating a major concern relative to the risk of overfishing. China rockfish are an important species in the nearshore recreational and nearshore commercial fisheries, particularly the commercial live-fish fishery. Under the Preferred Alternative and Alternative 1, the Minor Nearshore Rockfish North ACL would be a 22 percent reduction from the OFL, in contrast to No Action Alternative, in which the ACL would be a 15-percent reduction from the OFL. Alternative 2 is the most precautionary alternative relative to Minor Nearshore Rockfish with an OFL to ACL reduction of 55 percent in 2015, and 53 percent in 2016.

Although the Minor Nearshore Rockfish North ACL attainment has been high, reaching 100 percent in 2011, management measures have prevented the ACL from being exceeded. State nearshore management plans and policies mitigate the risks of overfishing. State HGs and a Federal HG for minor Nearshore Rockfish in the area between 40°10' and 42° N. latitude under the Preferred Alternative would reduce the risk of overfishing the complex. Under state management, most, if not all, landed component species within the minor nearshore complex must be sorted according to species. For 2015-2016, the states would take an active, coordinated role in managing these stocks. Because the states might also take inseason action independent of NMFS, the Preferred Alternative would not likely result in overfishing of the complex OFL. There is little observer coverage or data on at-sea discards for catch that is taken in the recreational fisheries and nearshore commercial fisheries. Therefore, the error in total catch mortality estimates is higher than for trawl-dominant species. Overfishing concern could arise if catch allocated within the nearshore complex were shifted to vulnerable species such that the catch of component stock exceeded the OFL contributions. Conversely, the measures necessary to keep catch within the lower 2015-2016 ACLs could also potentially reduce catch of vulnerable species managed within the complex.

The Other Fish complex ACL is equal to the complex's ABC established using a P* value of 0.45 consistent with the removal of many species from the complex, including spiny dogfish. The Other Fish complex under the Preferred Alternative, Alternative 1, and Alternative 2 would consist of shallow-water species that are primarily caught within 3 miles of shore, in state waters. Removing the other existing species for an EC designation reduces the risks to the species left in the complex (cabezon off Washington, kelp greenling, and leopard shark). The risk of overfishing would be reduced because some of the recommended EC species would effectively be inflator stocks to the complex with large OFL contributions to the complex's total OFL, which would increase the risk of overfishing more vulnerable stocks managed in the complex.

A sorting requirement for shortraker rockfish and rougheye/blackspotted would be implemented under the action alternatives. Trawl observers already identify discarded catch to species. Therefore, the requirement would likely improve the data reported on state landing receipts and electronic fish tickets.

Long-term biological impacts of setting harvest specifications

Section 4.8 evaluates the long-term biological impacts of setting harvest specifications. Section 4.9 describes the impacts of the range of potential modifications on routine management measures that may be made in the foreseeable future.

Most of the flatfish species are not caught at levels of high attainment relative to the ACLs, with the exception of petrale sole. Petrale sole is an important trawl target. Given the dominance of flatfish as a trawl species, catch monitoring uncertainty is low. In general, there is low risk of depleting flatfish stocks through overfishing. The projected depletion trends using the base case state of nature indicate that the arrowtooth flounder, petrale sole, English sole, and Dover sole would remain above B_{MSY} under all of the alternatives.

Most Minor Nearshore Rockfish assessments rely on fishery catch per unit of effort (CPUE) indices and the fisheries compositional data (i.e., age and length data from sampled fisheries) to inform stock status and dynamics. Therefore, there is considerably more uncertainty in the long-term projections for the Minor Nearshore Rockfish complex than for the other species analyzed in this EIS. Minor Nearshore Rockfish are dominant in the non-trawl fisheries (both commercial and recreational) and, therefore, have a higher catch monitoring uncertainty than trawl-dominant species. The assessments are also generally more uncertain since there are no fishery-independent indices of abundance informing abundance trends. Black rockfish (California and Oregon), black rockfish (Washington), and gopher rockfish would remain above B_{MSY} under the Preferred Alternative, Alternative 1 and Alternative 2. The No Action Alternative would result in black rockfish off Washington dipping to just below B_{MSY} by 2024. Gopher rockfish would become overfished by 2024 under the No Action Alternative ACL. Projections were not provided for brown, China, and copper rockfish or for California scorpionfish.

Shelf rockfish species (including the Minor Shelf Rockfish complex) are caught by both the trawl and fixed gear sectors, although there is some variation between species based on their relative selectivity to different gear types. For instance, greenstriped rockfish, while not targeted in any fishery, tend to be more readily caught in trawl gear than in fixed gear. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity with more certain catch estimation for those species dominant to the trawl fishery given the 100 percent observer coverage for those fleets. Current overfishing risks are low for shelf rockfish in general and have been low since implementation of RCAs more than 10 years ago. Under all of the alternatives, bocaccio, chilipepper, greenstriped rockfish, widow rockfish, and yellowtail rockfish remain above B_{MSY}. Canary rockfish continues to slowly rebuild, but does not reach B_{MSY} by 2024. Under the 2014 ACL, and with an SPR of 88.7 percent (No Action Alternative and Preferred Alternative) the stock would slowly approach B_{MSY}. Cowcod would slowly continue to rebuild, but it would not reach B_{MSY} under Alternative 1 or 2. It would rebuild by 2020 with an SPR harvest rate of 82.7 percent under the No Action Alternative and the Preferred Alternative. Yelloweye rockfish would rebuild under all of the alternatives except Alternative 1.

Slope rockfish (including the Minor Slope Rockfish complex) are caught by both the trawl and fixed gear sectors, although there is some variation between species based on their relative selectivity to different gears. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity, with more certain catch estimation for those species dominant to the trawl fishery given the level of observer coverage for those fleets. Under all of the alternatives, aurora rockfish, longspine thornyhead, shortspine thornyhead, rougheye/blackspotted rockfish, and splitnose rockfish, and sharpshin rockfish would remain above B_{MSY} throughout the time series. Blackgill south of 40°10’ north latitude would remain above the overfished level, but would only reach B_{MSY} by 2020 with a P* of 0.25 (Alternative 2). Darkblotched rockfish would rebuild by 2015 and would remain above B_{MSY} under all of the alternatives. Under the 2014 ACL and with an SPR of 88.7 percent (No Action Alternative and Preferred Alternative), the canary rockfish stock would slowly approach B_{MSY}. Pacific Ocean perch (POP) would slowly continue to rebuild, but would not reach B_{MSY} under Alternative 1 or Alternative 2. POP would rebuild with an SPR harvest rate of 84.6 percent under the No Action Alternative and the Preferred Alternative.

Under all of the alternatives, lingcod north and south, longnose skate, and spiny dogfish would remain above B_{MSY} throughout the time series. Cabezon off Oregon would remain above $B_{MSY,}$ but would approach B_{MSY} under Alternative 1 (P*=0.45). Sablefish shows an upward trend, but would remain below B_{MSY} under all of the alternatives.

The Council and its advisory bodies evaluate fishery performance throughout the year and may recommend inseason adjustments at appropriate Council meetings. The Council manages the total catch of groundfish species by monitoring landings and incidental catch inseason, then making inseason adjustments to ensure that annual total catch does not exceed allowable harvest amounts. As part of the process, the Groundfish Management Team (GMT) monitors the fishery throughout the year using the most current catch, effort, and other relevant data from the fishery and taking into account any new information that may identify resource issues requiring a management response. From time to time, non-biological issues may arise that require the Council to recommend management actions to address certain social or economic issues in the fishery and attain optimum yield while preventing overfishing. The Council may evaluate current information and issues to determine if social or economic factors warrant adjustments to achieve the Council’s established management objectives. This adaptive approach to management would continue under all of the alternatives.

ES-4.2 Socioeconomic Environment (Fishing Communities)

Under the Preferred Alternative coastwide, non-whiting, ex-vessel revenue would likely increase by $16 million in 2015 compared to the No Action Alternative's 2014 ACLs and management measures. This would represent a $19.3 million increase from annual average, inflation-adjusted, ex-vessel revenue from 2003 to 2012. Recreational angler trips would likely increase between 167,000 and 3.9 million marine angler trips, depending on the management option chosen under the Preferred Alternative. Coastwide combined commercial plus recreational fishery income impacts under the Preliminary Preferred Alternative [1]would likely increase over the No Action Alternative by $27.3 million (11 percent) under California recreational option 1 and by $26.3 million (10 percent) under recreational option 2, but would decrease by $49.2 million (-19 percent) under recreational option 3.

For the foreseeable future, changes in ex-vessel revenue, net revenue (a proxy for commercial fishery profits), recreational angler trips, and personal income would, in part, be a function of fishing opportunity determined by stock yield and management measures. Based on assumptions about yield and potential policies for setting harvest specifications (as described in the Amendment 24 alternatives), catches would likely increase under most model scenarios, assuming that management would succeed in achieving management objectives for stock biomass size and related fishing mortality levels. Fishing opportunity could decline if stock yields were below the base level conditions or if more conservation management policies, such as using a P* value of 0.25 to determine the ABC (Alternative 2), were used for all stocks. Recent average catch mortality is, in most cases, lower than projected ACLs under scenarios combining different assumptions about potential yield and policies for determining ABCs. These scenarios suggest that revenue and personal income is likely to increase over the long term. Historically, however, there has been a lot of inter-annual volatility in ex-vessel revenue in both positive and negative directions. Declines in revenue can occur because of unaccounted-for changes in yield and changing market conditions affecting prices.

ES-4.3 Essential Fish Habitat

Over both the short and the long term, the types of adverse impacts of fishing on groundfish essential fish habitat (EFH) are expected to be similar to adverse impacts experienced in the past under any of the alternatives. These adverse impacts result from fishing gear coming in contact with the seafloor, disrupting both physical characteristics and biogenic habitat such as corals and sponges. To protect EFH from the adverse effects of fishing, the Council has adopted mitigation measures that include gear restrictions and designation of areas that are closed to bottom trawling and bottom contact gear. These mitigation measures would continue under all of the alternatives. Trawl and non-trawl RCAs with generally similar configurations to the No Action Alternative would continue to be in place under all of the alternatives. Although the RCAs were not established as a mitigation measure for EFH, benthic habitat has likely made considerable recovery in areas where bottom trawl effort has been severely reduced or eliminated for extended periods. The impacts of all the alternatives on EFH for all FMPs managed by the Pacific Council, including EFH for coastal pelagic species (CPS), highly migratory species (HMS), groundfish, and salmon, would likely be similar to the No Action Alternative as trawl fishing effort would likely remain stable, based on ongoing actions that would mitigate the adverse effects of fishing on all bottom EFH.

[1] The socioeconomic analysis presents the Council's Preliminary Preferred Alternative and the Preferred Alternative. The Preliminary Preferred Alternative was the recommended specifications and management measure prior to the Council's June 2014 meeting, and that available to the Council for making harvest specification and management recommendations in June. The Preferred Alternative included the revised recommendations from the Council's June meeting.

ES-4.4 California Current Ecosystem

The Atlantis California Current Ecosystem Model was used to simulate the ecosystem effects of the range of harvest policies that may be implemented in the foreseeable future. Since ecosystem effects take a long time to be manifested, it is not possible to distinguish between short-term and long-term policy choices. The alternatives considered for the 2015-2016 biennial harvest specifications parallel those considered under Amendment 24. In general, the alternatives with a more conservative policy (2015-2016 Alternative 2 and Amendment 24 Alternative 2, P*=0.25) can be equated, as can the alternatives with the most risk prone policy (2015-2016-Alternative 1, Amendment 24-Alternative 1, P*=0.45). Scenarios bracketing the range of harvest policies and ecosystem productivity regimes were modeled. Scenarios with very high harvest levels and low ecosystem productivity had the most pronounced effects, resulting in significant direct effects (effects of fishing on harvested stocks) and detectable indirect effects (effects on other species in the ecosystem in response to changes in the abundance of harvested stocks). The scenarios are deterministic; in other words, there is no provision for a management response to new information about stock status. Realistically, the Council and NMFS would respond to information showing that substantial adverse effects are occurring by reducing catch limits.

When harvest policy and ecosystem productivity regimes were modeled, the estimates of total system biomass, a general measure of indirect effects, ranged from a decline of 8 percent when recent average catch was combined with the most likely ecosystem productivity state (the benchmark scenario) to an increase of 5 percent when the high ecosystem productivity state was combined with the low catch scenario. For most stocks, low catch was represented by recent average catch streams. Thus if catch were not to change substantially from recent levels, few if any indirect effects would be predicted.

One important caveat to these simulations is that catch levels for Pacific whiting were not varied. However, this species has an important structuring role in the California Current Ecosystem, both as forage during early life stages and as a piscivore when an adult. Pacific whiting stock size varies highly in response to conditions affecting recruitment of juveniles into the fishable, adult population. Though the model does not include these episodic recruitment events, the high and low ecosystem productivity states considered here may bracket the productivity of Pacific whiting, as well as the other groundfish stocks evaluated within this EIS. After 25 to 30 years, the productivity of Pacific whiting under a high productivity scenario (under recent average catches) yields abundance that is 1.16 times higher than base productivity, and low productivity yields abundance that is 0.78 times that of base productivity. Therefore, the model results address alternative levels of whiting productivity, though not alternative whiting harvest levels.

ES-4.5 Protected Species

Protected species include those listed under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). The effects of actions on seabirds not listed under ESA are also considered. ESA-listed species that interact with fishing under the groundfish FMP include eulachon, green sturgeon, salmon, the humpback whale, the leatherback sea turtle, and the short-tailed albatross.

Similar to other environmental components, the impacts of the proposed action on protected species during the 2015-2016 biennial period, measured in terms of take and resulting mortality, is only relevant within a long-term context considering the effect of such take on population size and viability. For ESA-listed species, NMFS Protected Resources Division and the U.S. Fish and Wildlife Service have consulted on the effects of the groundfish fishery. Information on effects is provided in biological opinions, which contain incidental take statements (ITSs). The ITSs include estimates of the number of listed species likely to be taken, a determination of whether take levels jeopardize the continued existence of the species, and measures that NMFS must implement to minimize estimated levels of take. If these take levels are exceeded, consultations may be reinitiated and new mandatory measures identified. The ITSs represent the best estimate of the expected impact, in terms of take, of the proposed action.

All marine mammals are protected under the MMPA. The objective of the MMPA is to allow marine mammals to reach their optimum sustainable population level and to reduce human-caused serious injury and mortality to the maximum extent practicable. Through periodic stock assessments, the potential biological removal level of a stock is estimated. A marine mammal population can meet or sustain the optimum sustainable population when human-caused mortality is below this level. Takes for all segments of the groundfish fishery, except for the sablefish pot fishery, have been determined to have a remote likelihood of, or no known, serious injuries or mortalities. The sablefish pot fishery has been determined to cause occasional serious injury or mortality.

At-sea observer coverage allows total marine mammal interactions to be estimated. Non-ESA listed marine mammal species taken in the groundfish fishery include the following:

- California sea lion: shoreside groundfish trawl, California halibut trawl, non-nearshore fixed gear sablefish, nearshore fixed gear, at-sea hake (Pacific whiting)[2]
- Harbor seal: California halibut trawl, non-nearshore fixed gear sablefish, nearshore fixed gear, at-sea hake (Pacific whiting)
- 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

If estimated takes were to increase so substantially that overall human-caused serious injury or mortality would exceed potential biological removal, remedial actions would be taken. Section 3.5.3 summarizes estimates of historical take of non-ESA listed marine mammals in the groundfish fishery.

Non-ESA-listed seabirds are also taken in the groundfish fishery. The only species with more than negligible observed takes is the black-footed albatross. Mitigation measures currently being implemented to reduce the risk of takes of ESA-listed, short-tailed albatross will likely have a mitigating effect on black-footed albatross as well.

The level of protected species take is expected to be similar under all of the alternatives, with no measureable change over the No Action Alternative in the short term, in the long term, or cumulatively. For the groundfish fishery, an adaptive management approach is used in which new data are considered relative to the previous risk assessments and biological opinions prepared for the groundfish FMP. The adaptive management process provides for an evaluation of current data and allows action to be taken if changes occur such that there is a conservation concern.

[2] California halibut trawl is a state-managed fishery and is only subject to the proposed action with respect to catch accounting to ensure that ACLs are not exceeded.

ES-4.6 Non-Groundfish Species

The West Coast Groundfish Observer Program's (WCGOP's) Groundfish Management Multiyear Data Product (Bellman *et al.* 2013) includes catch estimates of non-groundfish species in groundfish fisheries. Focusing on groundfish-directed fisheries (limited-entry permit vessels, open-access vessels targeting groundfish, tribal fisheries targeting groundfish), approximately 334 non-groundfish species or groups (including partially or unidentified species) were observed to be caught from 2002 to 2012. Non-groundfish catch, by weight, accounts for approximately 2 percent of the total catch in these fisheries. Table 3-43 shows the most commonly caught non-groundfish by weight in rank order and accounting for just over 90 percent of the catch. Approximately 54 percent of the non-groundfish catch by weight is invertebrate species, including crabs, followed by grenadiers and sharks, each accounting for approximately 5 percent.

Commercially important species, such as Pacific halibut, Dungeness crab, and salmon, are commercially valuable and have directed fisheries. Commercially valuable species are managed under other Council FMPs, other Federal authority, or by the states. Fishing mortality in the groundfish fishery is taken into account (i.e., incidental catch reductions before harvest specifications are set) when managing such directed fisheries.

Increased midwater trawling would likely occur under the Preferred Alternative over the other alternatives given the larger widow rockfish and shortbelly rockfish ACLs. These increased ACLs could allow greater opportunity to target yellowtail, widow, and chilipepper rockfish. If this were to occur, non-groundfish species that co-occur with groundfish species targeted with midwater trawl, such as northern anchovy, Pacific sardine, American shad, squid, and Pacific herring, could increase, but would not likely differ substantially from the No Action Alternative.

It is reasonable to conclude that non-groundfish catch across all the alternatives would not differ substantially in the short term or long term from the No Action Alternative, which is considered to be the average level during the baseline period (2002 to 2012). Fishery monitoring allows any such change to be detected. If continuing catch of a non-groundfish species in the groundfish fishery were to trigger a conservation concern over the long term, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

ES-5.0 CHANGES FROM THE DEIS IN THE FEIS

In response to Council action taken at its November 2014 meeting, comments received from NMFS experts on climate change, the designation of critical habitat for ESA-listed rockfish in Puget Sound, legal review, and public comments, the following changes to the content of the draft EIS (DEIS) were made in this final EIS (FEIS):

- Public comment letters received on the DEIS are in Appendix D.
- Response to public comments are in a new Chapter 8.
- Mis-specifications of OFLs for English sole, yellowtail rockfish north of 40°10' N lat., sharpchin rockfish, and rex sole have been corrected. The DEIS OFLs were based on maximum likelihood estimates, the common metric for determining OFLs for assessed stocks. However, the SSC recommended that the 2015 and 2016 OFLs from the Bayesian data-moderate assessments be based on the median of the posterior distribution of estimated OFLs.
- In response to a review by NMFS experts on climate change, clarifications were made to discussions in Sections 3.4.5, 3.5.1, 4.5, 4.6, 4.8, and 4.12.

- On November 13, 2014, NMFS announced the designation of critical habitat for ESA listed Puget Sound/Georgia Basin Rockfish (79 FR 68041, November 13, 2014). Discussion on the relationship of the newly-designated critical habitat for Puget Sound/Georgia Basin Rockfish and this action was added in Section 3.5.5.
- In response to public comments, discussion relative to how optimum yield (OY) is derived such that it meets the requirements of MSA was added to Section 5.2.
- EFH descriptions for the non-groundfish fisheries in the action area that are managed under the MSA were added to Chapter 3.

In addition to the changes identified above, non-substantive editorial changes were made throughout the document for readability.

ES 6.0 AREAS OF CONTROVERSY

Controversy is assessed through the Council's deliberations on issues and related public comment. The following topics prompted particular comment and discussion.

Stock Complexes: As discussed above in Section ES-3.2, the Council considered a wide range of alternatives for reorganizing stock complexes for 2015 and beyond. A variety of comments from both Council members and the public were heard at several Council meetings. Some commenters requested that the No Action Alternative be chosen because they asserted there is a very low risk of overfishing component stocks with the way the groundfish fishery is managed. Some commenters recommended minimal changes to stock complexes so that concerns for overfishing component stocks would be mitigated while not imposing much additional burden to the states for monitoring catches of additional species or species groups. Some commenters requested that alternatives that would require a reallocation be dismissed from further consideration due to the high level of controversy regarding allocation decisions. Some commenters requested that the Council recommend alternatives that would end or prevent overfishing on component stocks.

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Acronyms and Abbreviations

ABC	Acceptable biological catch
ACL	Annual catch limit
ACS	American Community Survey
ACT	Annual catch target
AFSC	Alaska Fisheries Science Center
AM	Accountability measure
APA	Administrative Procedures Act
B_0	Biomass, unfished
BRA	Bycatch reduction area
BRD	Bycatch reduction device
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CA/OR/WA	California, Oregon, and Washington
CCA	Cowcod Conservation Area
CCE	California Current Ecosystem
CCIEA	California Current Integrated Ecosystem Assessment
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CP	Catcher-processor
CPFV	Commercial passenger fishing vessel
CPS	Coastal pelagic species
CPUE	Catch per unit of effort
CRFS	California Recreational Fisheries Survey
CV	Coefficient of variation
CZMA	Coastal Zone Management Act
DB-SRA	Depletion-based stock reduction analysis
DCAC	Depletion-corrected average catch
DEIS	Draft Environmental Impact Statement
DO	Dissolved oxygen
DPS	Distinct population segment
DTL	Daily trip limit (fishery)
DTS	Dover sole, thornyheads, and sablefish
E	Exploitation
EA	Environmental Assessment
EC	Ecosystem component
EDC	Economic Data Collection (Program)
EEZ	Exclusive Economic Zone
EFH	Essential fish habitat
EFHRC	Essential Fish Habitat Review Committee
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
ENSO	El Niño Southern Oscillation
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionary significant unit
EwE	Ecopath with Ecosim
F	Fishing mortality
FEIS	Final Environmental Impact Statement
FEP	Fishery Ecosystem Plan

FM	Fathom
FMP	Fishery Management Plan
GAP	Groundfish Advisory Subpanel
GCA	Groundfish Conservation Area
GIS	Geographic information system
GMT	Groundfish Management Team
H	Stock-recruitment function
HA	Hectares
HAPC	Habitat Areas of Particular Concern
HCR	Harvest control rule
HG	Harvest guideline
HMS	Highly Migratory Species
IBQ	Individual bycatch quota
ID	Identification
IEA	Integrated Ecosystem Assessment
IFQ	Individual fishing quota
IOPAC	Input-output model for West Coast fisheries
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental take statement
IUCN	International Union for the Conservation of Nature
LE	Limited entry
LEFG	Limited entry fixed gear
LOF	List of Fisheries
M	Instantaneous rate of natural mortality
MBTA	Migratory Bird Treaty Act
MEI	Multivariate ENSO Index
MFMT	Maximum Fishing Mortality Threshold
MHHW	Mean higher high water level
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act, Magnuson-Stevens Act
MSE	Management strategy evaluation
MSST	Minimum Stock Size Threshold
MSY	Maximum sustainable yield
MT	Metric ton
MTC	Mean temperature of catch
MTL	Mean trophic level
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NID	Negligible Impact Determination
NMFS	National Marine Fisheries Service
NMNU	Non-market and non-use
NOI	Notice of Intent
NORPAC	North Pacific Database Program
NPGO	North Pacific Gyre Oscillation
NWFSC	Northwest Fisheries Science Center
OA	Open access
ODFW	Oregon Department of Fish and Wildlife
OFL	Overfishing limit

OFS	Overfished species
ORBS	Ocean Recreational Boat Survey
OY	Optimum yield
PacFIN	Pacific Fisheries Information Network
PBR	Potential biological removal
PCGW	Pacific Coast Groundfish and Endangered Species Workgroup
PDO	Pacific Decadal Oscillation
PMFC	Pacific Fishery Management Council (used in references)
POP	Pacific Ocean perch
PR	Private/rental boats
PRD	NMFS Protected Resources Division
PSA	Productivity-susceptibility analysis
QP	Quota pounds
QS	Quota share
QSM	Quota species monitoring
Rec	Recreational
RecFIN	Recreational Fisheries Information Network
RBS	Rougheye/blackspotted/shortraker (rockfish complex)
RCA	Rockfish Conservation Area
RCG	Rockfish, cabezon, and greenling
RES	Research
RIR	Regulatory Impact Review
ROD	Record of Decision
SAFE	Stock Assessment Fishery Evaluation
SCWC	South and Central Washington Coast
SFD	Sustained Fisheries Division
SPID	Species identification code
SPR	Spawning potential ratio
SSC	Scientific and Statistical Committee
STAR	Stock Assessment Review
TAC	Total allowable catch
TCEY	Total constant exploitation yield
Trib	Tribe
USFWS	United States Fish and Wildlife Service
V	Vulnerability
VMS	Vessel monitoring system
WCGOP	West Coast Groundfish Observer Program
WDFW	Washington Department of Fish and Wildlife
WOC	Washington, Oregon, and California
XDB-SRA	Extended Depletion-based Stock Reduction Analysis
YOY	Young-of-the-year
YRCA	Yelloweye Rockfish Conservation Area

Chapter 1 INTRODUCTION

1.1 How this Document is Organized

This document considers environmental effects resulting from setting groundfish harvest specifications and establishing related management measures under the Pacific Coast Groundfish Fishery Management Plan (hereafter, Groundfish FMP or FMP), which are developed by the 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 2015-2016, 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). The EEZ extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. Each state manages fisheries in its territorial sea in a manner consistent with, or more restrictive than, the Groundfish FMP and Federal 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 into the following chapters and appendices:

- Chapter 1 explains why the action is being considered for the groundfish fisheries in 2015-2016 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 2015-2016 and beyond. A second set of alternatives is used to evaluate a decision-making framework for establishing future harvest specifications, which would be incorporated into the FMP through Amendment 24. This set of alternatives serves as the basis for evaluating the long-term impacts of setting harvest specifications and management measures. Options were used to evaluate restructuring of stock complexes for the Minor Slope Rockfish and Other Fish complexes. The preferred options for each were then included within the integrated 2015-2016 harvest specification alternatives and long-term measures under Amendment 24.
- Chapter 3 describes the environmental components affected by the proposed action. The affected components include 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 the 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 other applicable laws and Executive Orders, in addition to the MSA, with which an action must be consistent. This chapter also describes the NEPA process for this action in greater detail, 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.
- Chapter 8 is the Response to Comments on the DEIS.
- Chapter 9 is the Index.
- 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, Detailed Analysis of Management Measures, contains a focused evaluation of the performance and effects of new management measures or adjustment to existing management measures and the range of options considered by the Council and NMFS.
- Appendix C, FMP Amendment Language, contains changes to the Groundfish FMP proposed by the Council as part of the proposed action.
- Appendix D, Letters of Comment on the DEIS.

If implemented, the 2015-2016 harvest specifications and management measures will succeed those established for the 2013–2014 biennial period. The measures will stay in place until subsequent changes are made in future biennial cycles.

1.2 Proposed Actions, Purpose and Need

1.2.1 The Proposed Action

The proposed actions are presented in three components: 1) establishing harvest specifications and management measures for the 2015-2016 biennial management period, 2) changing groundfish stock complexes and amending the Groundfish FMP for designating ecosystem component species, and 3) amending the Groundfish FMP to describe how the Council would use default harvest control rules (HCRs) in their decision-making process in future biennial cycles and to clarify what are considered new and routine management measures during the biennial process. In all cases, the No Action Alternative is also considered. This EIS includes an analysis of the long-term impacts of biennial harvest specifications and foreseeable adjustments to routine management measures to support decision-making in future biennial periods.

1.2.1.1 2015-2016 Biennial Harvest Specifications and Management Measures

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. Using the best available scientific information, the Council considers harvest specifications every two 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 in the Groundfish FMP for these actions and in compliance with other applicable laws.

Seven Pacific Coast groundfish species are designated as "overfished" and are managed under rebuilding plans. 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. It establishes the time period for rebuilding that is as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, the recommendations by international organization in which the United States participates, and the interaction of the stock of fish within the marine ecosystem. T_{TARGET} and the underlying harvest control rule are defined in both the rebuilding plan and regulation. Adjustments to harvest specifications may involve changing the underlying harvest control rule. [2]

Every 2 years, the Council considers the best available scientific information (principally new or updated stock assessments). It then determines whether it is necessary to adjust any of the existing harvest specifications, rebuilding plans, or management measures to achieve, but not to exceed, ACLs.

1.2.1.2 Stock Complex Reorganization and Designation of Ecosystem Component Species

The proposed action includes consideration of changes to the organization of the Minor Slope Rockfish and Other Fish stock complexes. National Standard 1 Guidelines at 50 CFR 600.310(d)(8) describe stock complexes, and the reasons for using stock complexes 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." Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another and maximum sustained yield (MSY) cannot be defined on a stock-by-stock

[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.

[2] "Harvest control rule" means the methods adopted to determine harvest specifications, based on criteria in the MSA and the 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.

basis, where there are insufficient data to measure their stock status, or when it is not feasible for fishermen to distinguish individual stocks among their catch. Most groundfish species managed in a stock complex are data-poor stocks without full stock assessments. However, some stocks within the complexes have been assessed.

The Council considered restructuring the Minor Slope Rockfish complexes by removing rougheye/blackspotted rockfish[3] and shortraker rockfish and managing these stocks in a new complex. Doing so would reduce risk of future overfishing for these component stocks, but could disrupt limited entry trawl and fixed gear fisheries. New management measures that do not involve creating a new stock complex were also considered.

The Other Fish complex historically contained various non-target species that occurred as bycatch (not retained, landed, sold, or kept for personal use) while targeting other species. The ecosystem component (EC) species designation is described in National Standard 1 Guidelines at 50 CFR 600.310(d)(5). Under the National Standard 1 Guidelines, EC species should be a non-target stock, not subject to overfishing, determined to be overfished or approaching the overfished threshold, or likely to become so in the absence of management measures, and not generally retained for sale or personal use. Many of the species in the Other Fish complex fit the criteria for designating EC species. EC species are not considered "in the fishery" and, OFLs, ABCs, and ACLs are not set for EC species. Additional species not currently included in the Groundfish FMP are considered for EC species designation because they occur as bycatch in the groundfish fishery. Monitoring catch of these species could aid in identifying potential conservation problems. Catch of these species could be considered within the context of annual mortality. Estimates of catch would likely be based on observer sample data and fish ticket reports in the Pacific Fisheries Information Network (PacFIN) for the associated market categories.

1.2.1.3 Default Harvest Control Rules

The proposed action includes Amendment 24 to the Groundfish FMP, which modifies the harvest specification procedures described in the FMP so that, in the absence of Council action, harvest specification values would be established based on default HCRs. During any biennial decision-making process, the Council may depart from these default values by deciding to modify the HCR for one or more management units. Such changes would form the basis of the action alternatives in future impact analyses. Reducing the number of decision points is expected to reduce the amount of Council and committee time spent on harvest specification deliberations.

1.2.1.4 Evaluation of the Long-term Impacts of Setting Biennial Harvest Specifications and Management Measures

To evaluate the environmental impacts of harvest specification policy over a longer time period, estimates of harvest specification values for a 10-year sample period (2015 to 2024) are evaluated in Chapter 4. The ability to establish and adjust harvest levels is the first major tool at the Council's disposal to exercise its resource stewardship responsibilities. Each biennial fishing period, the Council assesses the biological, social, and economic conditions of the groundfish fishery and updated MSY estimates or proxies for specific stocks (management units) where new information on the population dynamics is available. Using the best available scientific information, the Council evaluates the current level of total catch mortality relative to the MSY level for stocks where sufficient data are available. The Council recommends harvest specifications to NMFS for the subsequent 2 years. If NMFS determines that the Council recommendation is consistent with the FMP, the MSA, and other applicable law, the recommended harvest specifications are published in Federal regulations. The evaluation of the long-term

[3] Rougheye and blackspotted are not easily distinguished and are treated as one stock.

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 in future biennial management periods beyond 2015-2016. Section 6.6 discusses the methods that may be used to evaluate unforeseen environmental impacts in future biennial periods (2017-2018 and subsequent periods).

1.2.2 Purpose and Need

The purpose of the proposed action is to conserve and manage groundfish fishery resources to prevent overfishing, to rebuild overfished stocks, to ensure conservation, to facilitate long-term protection of EFH, and to realize the full potential of the United States' 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 HCRs (Amendment 24), coupled with 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 simultaneously maintaining consistency with the MSA and other applicable laws. Evaluating the environmental impacts of setting harvest specifications and apportioning 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, as appropriate. This two-tier approach to evaluating harvest specifications should meet the following objectives:

- Maintain or improve the timeliness of best scientific information available in 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.[4]
- Include decision-making procedures for setting harvest specifications that allow reasonably accurate forecasts of impacts for a period longer than 2 years. Including consideration of adopting default procedures for setting harvest specifications (which the Council could override should circumstances warrant).
- Present information to decision-makers and the public in an effective and usable format.
- Ensure a transparent process where decisions and their rationales are clearly explained to the public prior to Council decisions so that the public has the opportunity to provide meaningful input.
- Build an administrative record that effectively explains the rationale for the Council's and NMFS' decisions.

[4] See the March 6, 2012, Memorandum from Nancy H. Sutley, Chair, Council on Environmental Quality, on this topic.

Reorganizing stock complexes has to be considered to minimize the risk that overfishing could occur on stocks managed within complexes. This supports the objectives of the MSA, as described above. Stock complex harvest specifications are set consistent with the harvest management framework described in Chapter 4 of the Groundfish FMP.

1.2.3 Geographic Context

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 (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 Groundfish FMP.[5]

[5] The impact evaluation focuses on the Federal fishery management area, which is distinct from the action area, as defined by the Endangered Species Act (ESA) and specified in applicable biological opinions.

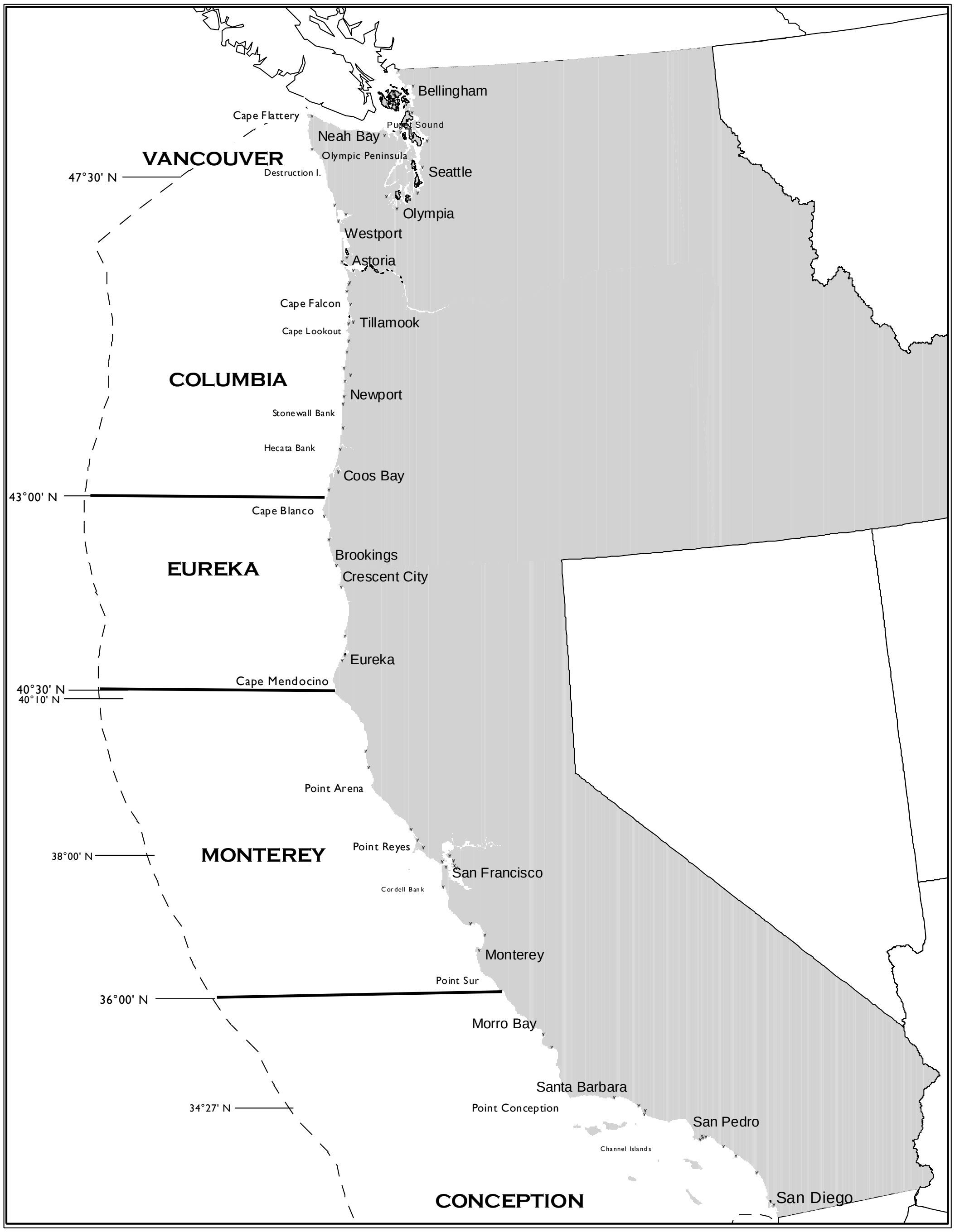


Figure 1-1. The fishery management area, showing major coastal communities and groundfish management areas.

Chapter 2 ALTERNATIVES

Each of the following three components of the proposed action has multiple alternatives as described in Section 1.2.1:

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.

Reorganizing the Other Fish and Minor Slope Rockfish Complexes and Designating Ecosystem Component Species: Changing the composition of the Minor Slope Rockfish and Other Fish complexes, creating a new stock complex for some component species of the Minor Slope Rockfish complexes, removing stocks from the Other Fish complex for single stock management or designation as EC species, and designating species not already in the FMP as EC species.

Amending the Groundfish FMP to Describe Default Harvest Control Rules and Management Measures Considered during the Biennial Decision Cycle (Amendment 24): Default HCR framework used to calculate default ACLs. Default OFLs, ABCs, and ACLs if applicable, would be implemented for the next biennial periods (i.e., 2017-2018 and beyond) according to the default HCR framework adopted. The Council could still recommend changes from the default HCRs in future biennial periods. Management measures considered during the biennial management and regulatory amendment processes would be better described.

The analysis of alternative harvest specifications and management measures for the 2015-2016 biennial period and Amendment 24 focuses on the Preferred Alternatives for stock complex reorganization and EC species designation. Table 2-1 summarizes the alternatives, which are described in subsequent sections.

Table 2-1. Schematic of the components of the alternatives.

<table>
<tr><th>Components</th><th>No Action Alternative</th><th>Preferred Alternative</th><th>Alternative 1</th><th>Alternative 2</th></tr>
<tr><td rowspan="2">2015-2016 harvest specifications and management measures</td><td>Harvest specifications in place on January 1, 2014, would be applied.</td><td>Overfished species ACLs would be based on current rebuilding plan. Most non-overfished species would use a P* of 0.45 with an ACL equal to the ABC. For arrowtooth, lingcod south, longspine thornyhead, sablefish, shortspine thornyhead, spiny dogfish, and starry flounder, a P* of 0.40 would be used. Dover sole, widow and shortbelly rockfish, ACLs would be 50,000, 2,000, and 500 metric tons (mt), respectively.</td><td>Overfished species ACLs would be based on rebuilding plans. Non-overfished species ACLs would be based on P*of 0.45, except Dover sole, widow and shortbelly rockfish, which would be constant catch ACLs of 25,000, 1,500, and 50 mt, respectively.</td><td>Overfished species ACLs would be based on rebuilding plans. Non-overfished species ACLs would be based on P*of 0.25, except Dover sole, widow and shortbelly rockfish, which would be constant catch ACLs of 25,000, 1,500, and 50 mt, respectively.</td></tr>
<tr><td>Management measures on December 31, 2014, would be applied.</td><td>New measures would include a sorting requirement for shortraker and rougheye/ blackspotted rockfish, adjustments to depth contour coordinates, removal of the prohibition on fixed gear lingcod retention November to April, harvest guidelines (HGs) for minor nearshore rockfish north of 40°10' N. lat., canary rockfish retention in the Oregon recreational fishery, Washington and Oregon allowance for retention of bottom fish during recreational all-depth halibut seasons, modified or eliminated Washington recreational boundaries for lingcod closures, and routine measure adjustments, as necessary.</td><td>Would be the same as the Preferred Alternative.</td><td>Would be the same as the Preferred Alternative.</td></tr>
<tr><th>Components</th><th>No Action Alternative</th><th>The Preferred Alternative</th><th colspan="2">Option 1</th></tr>
<tr><td rowspan="3">Stock complex reorganization and designation of Ecosystem Component Species</td><td>Slope Rockfish complex would not be reorganized.</td><td>Would be the same as the No Action Alternative.</td><td colspan="2">Rougheye/blackspotted rockfish and shortraker rockfish would be removed from the complexes and managed coastwide as new complex.</td></tr>
<tr><td rowspan="2">Other Fish complexes would not be reorganized; EC species not designated.</td><td rowspan="2">Would be the same as Option 1(also see new management measures for sorting).</td><td colspan="2">Spiny dogfish would be removed from the complex and managed as a coastwide stock. Skates, Pacific grenadier, soupfin shark, spotted ratfish, and finescale codling would be designated as EC species. The remaining stocks would continue to be managed in the Other Fish complex.</td></tr>
<tr><td colspan="2">Would designate Aleutian skate, Bering/sandpaper skate, roughtail/black skate, all other skates, giant grenadier, all other grenadiers as EC species.</td></tr>
<tr><th>Components</th><th>No Action Alternative</th><th>Preferred Alternative</th><th>Alternative 1</th><th>Alternative 2</th></tr>
<tr><td>Amendment 24 (default HCRs and management measure process)</td><td>No Amendment 24 HCRs would be reconsidered each biennial cycle.</td><td>Would be the default HCR with ABC based on current P*; would amend Section 6.2 to clarify new vs. routine measures.</td><td>Would be default HCR with ABC based on P*=0.45; amend FMP to clarify new vs. routine measures.</td><td>Would be default HCR with ABC based on P*=0.25; amend FMP to clarify new vs. routine measures.</td></tr>
</table>

2.1 Alternatives for Establishing Harvest Specifications and Management Measures for the 2015-2016 Biennial Management Period

This section describes integrated alternatives, including the No Action Alternative, that could be implemented to manage groundfish fisheries during the 2015-2016 period. The integrated alternatives are described in Sections 2.1.1.1 through 2.1.1.2. The alternatives are integrated in the sense that each alternative includes a suite of harvest specifications (including the Preferred Alternative for Minor Slope Rockfish and Other Fish complexes) and related management measures, thus comprising a complete management program. These measures are described in 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.

Harvest specifications include ACLs for all stocks and stock complexes managed under the Groundfish FMP. Management measures are designed to keep the mortality of these stocks and stock complexes at or below the ACLs. 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 OFL, indicating a level of catch mortality above which overfishing is occurring. The OFL is the MSY harvest level associated with the current stock abundance. When setting OFLs for stocks that have been assessed (category 1 and category 2 stocks), 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 the MSY is also referred to as the F_{MSY} (fishing mortality rate that maximizes catch biomass in the long term) control rule or maximum fishing mortality threshold (MFMT) harvest rate.
- The ABC is the stock or stock complex's OFL reduced by an amount associated with scientific uncertainty. The Scientific and Statistical Committee (SSC) quantified major sources of scientific uncertainty in the estimate of OFL for category 1 stocks and recommended a precautionary reduction referred to the sigma value. The Council then considered the SSC recommended sigma reduction from the OFL, combined with an additional reduction referred to as the P* value (probability of overfishing). Together, the sigma value and P* value define the corresponding fraction that would be used to reduce the OFL to derive an ABC. A lower P* is more risk averse than a higher value, meaning that the probability of the ABC being greater than the "true" OFL is lower.
- The ACL is set at or below the ABC and is generally the basis for managing catch mortality. If a stock biomass is larger than B_{MSY} (the threshold used to determine if a stock is overfished), the ACL may be set equal to or lower than the ABC. In general, when recommending ACLs, the Council follows a risk-averse policy by recommending an ACL that is below the ABC when there is a perception that the stock is below its B_{MSY}, or to accommodate management uncertainty, socioeconomic concerns, or other considerations. Decreasing harvest rates below the ABC level when a biomass is estimated to be below B_{MSY} is a harvest control rule designed to prevent a stock or stock complex from becoming overfished.

Existing management measures include deductions from the ACLs that are used to account for catch in research activities; tribal, recreational, and incidental catch in non-groundfish fisheries; allocation of fishing opportunity to various components or "sectors" of the fishery (long-term formal allocations in the FMP or short-term, 2-year allocations); and various management measures that may be adjusted through regulatory action (described in detail as part of the No Action Alternative, Section 4.2). The Council also proposes several new management or 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.

2.1.1 Harvest Specifications

The harvest specifications alternatives for 2015-2016 are consistent with the Amendment 24 alternatives described in Section 2.3. OFLs and ABCs are described below.

Overfishing Limits

The OFL is the MSY harvest level associated with the current stock abundance. It is the estimated or proxy MSY harvest level, which is the harvest threshold above which overfishing occurs. The methods for determining the OFL are based on the best available scientific information and the recommendation of the SSC; therefore, alternatives are not developed for this reference point.

The Groundfish FMP, Section 4.2, describes 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, including a relatively data-poor quantitative assessment or non-quantitative assessments. The third category (category 3) includes minor species that are caught and for which the only available information is generally catch-based data. For determining OFLs for category 1 species, the F_{MSY} harvest rate or its 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 the maximum fishing MFMT harvest rate. Category 2 stocks may also have an assessment that was judged to be relatively data-poor (data-moderate) by the SSC. For stocks with data-poor stock assessments or no stock assessments (category 2 and 3 stocks), there is greater scientific uncertainty in the estimate of OFL.

New stock assessments, stock assessment updates, and rebuilding analyses the SSC recommended 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. For species that did not have new stock assessments or updates prepared, the Council considered an OFL derived from the most recent stock assessment or update, the results of rudimentary stock assessments, or historical landings data.

Acceptable Biological Catch

The 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, purely due to scientific uncertainty in estimating the OFL). The ABC is the catch level that ACLs may not exceed. 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 value. Because the OFL is calculated by applying the harvest rate assumed to produce MSY (i.e., F_{MSY}) to the exploitable biomass, and because the assumed proxy F_{MSY} harvest rates are by taxa, 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*). Applying the P* value to the sigma value determines the amount by which the OFL is reduced to establish the ABC. Each P* value links to a corresponding fraction that is used to reduce the OFL and to derive an ABC. As the P* value is reduced, the probability of the ABC being greater than the "true" OFL becomes lower. The Council then determines its preferred level of risk aversion by selecting an appropriate P* value. The P*-sigma approach for quantifying scientific uncertainty is the default approach for category 1 species unless an SSC recommends a different method, and it is adopted by the Council during the biennial specification process.

2.1.1.1 No Action Alternative

The No Action Alternative harvest specifications would be those that were in place in 2014. When setting harvest specifications, the Council generally proposes the same harvest control rules applied during the previous biennial period. Harvest control rules are the various rules and definitions the Council uses to establish OFLs, ABCs and ACLs. For example, the ABC harvest control rule the Council uses most consistently is the application of P* and sigma values to an estimate of the OFL for a stock; the "40-10" and "25-5" precautionary adjustments are considered ACL harvest control rules. Default harvest control rules are not currently described in the FMP.

For the purpose of analysis, it is assumed that management measures and harvest specifications in place on December 31, 2014, would remain in effect for the 2015-2016 period under the No Action Alternative (Table 2-2). To evaluate the long-term effects of setting harvest specifications and management measures, average catch from the recent past would be used to approximate fishing mortality and revenue.

A detailed description of existing management measures and their associated impacts on groundfish stocks under the No Action Alternative is presented in Section 4.2 by fishery.

2.1.1.2 Preferred Alternative

Table 2-3 contains the preferred 2015 and 2016 harvest specifications. The ACLs for most species are determined based on the ACLs being set equal to the ABCs with a P* 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 36° N. latitude, shortspine thornyhead north and south of 34°27' N. latitude, spiny dogfish, and starry flounder would be determined based on the ACLs being set equal to the ABCs, or with the 40-10 precautionary adjustment with respect to sablefish, with a P* value of 0.40. As described above for Alternative 1, ACLs may be set below the ABC, in which case the P* value does necessarily determine the ACL. The impacts of adjusting and implementing new management measures (described in Section 2.1.2) in response to the harvest specifications under The Preferred Alternative are presented in Section 4.2 by fishery.

[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.

The Preferred Alternative would change the ACLs for Dover sole, widow, and shortbelly rockfish, from the No Action Alternative constant catch strategies of 25,000 mt, 1,500 mt, and 50 mt, respectively, for the three species to 50,000 mt, 2,000 mt, and 500 mt, respectively. An additional ACL alternative of 3,000 mt for widow rockfish is analyzed in Chapter 4.

The status quo Slope Rockfish complexes north and south of 40º10' N. latitude would be preferred; however, unlike the status quo, a new management measure in the form of a sorting requirement would be specified for rougheye and blackspotted rockfish. An alternative structure for the Slope Rockfish complexes where rougheye/blackspotted and shortraker rockfish would be removed from the current complexes and managed in a new coastwide complex is analyzed in Chapter 4.1.5 of this EIS.

The Preferred Alternative for the Other Fish complex would also differ from the No Action Alternative. Spiny dogfish would be removed from the status quo Other Fish complex and managed with stock-specific harvest specifications. All the skates and Pacific grenadier currently managed under the Other Fish complex, along with all other endemic skates (other than longnose skate) and grenadiers would be designated as EC species. Additionally, spotted ratfish, soupfin shark, and finescale codling would be designated as EC species under the Preferred Alternative. The remaining stocks managed under the preferred Other Fish complex are the California, Oregon, and Washington stocks of kelp greenling; the Washington stock of cabezon; and leopard shark.

Section 2.2 further describes the options relative to the slope and other fish complexes.

2.1.1.3 Alternative 1 – would use a P* Value of 0.45

Table 2-4 contains the harvest specifications under Alternative 1. Where applicable, ABCs would be determined based on a P* value of 0.45, and the ACL is set equal to the ABC. The rightmost column in Table 2-4 shows the ACL HCR for each stock under Alternative 1. For several stocks, the ACL would be set below the ABC, so the P* value would not necessarily determine the ACL. Instances where the ACL would be 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 2.1.2) in response to the harvest specifications under Alternative 1 are presented in Section 4.2 by fishery.

The No Action Alternative ACLs of 25,000 mt and 1,500 mt for Dover sole and widow rockfish, respectively, are analyzed under Alternative 1. The Minor Slope Rockfish and Other Fish complexes under Alternative 1 would be structured the same as under the Preferred Alternative.

2.1.1.4 Alternative 2 – would use a P* Value of 0.25

Table 2-5 contains the harvest specifications under Alternative 2. Where applicable, ACLs would be determined based on the ACLs being set equal to the ABCs, with a P* value of 0.25. As described above for Alternative 1, ACLs may be set below the ABC, in which case the P* value would not necessarily determine the ACL. Instances where the ACL would be below the ABC include specification of a fixed or constant catch level, precautionary adjustments using the 40-10 and 25-5 rules, and use of the harvest rate specified in a rebuilding plan. The impacts of adjusting and implementing new management measures (described in Section 2.1.2) in response to the harvest specifications under Alternative 2 are presented in Section 4.2 by fishery.

The No Action Alternative ACLs of 25,000 mt and 1,500 mt for Dover sole and widow rockfish, respectively are analyzed under Alternative 2. The Minor Slope Rockfish and Other Fish complexes under Alternative 2 would be structured the same as under the Preferred Alternative, but the ACLs would be based on setting the contribution ABCs of component stocks based on a P* of 0.25.

Table 2-2. Harvest specifications for stocks and stock complexes for 2015-2016 under the No Action Alternative (i.e., 2014 harvest specifications). The harvest control rule that would be used to calculate the ACLs is shown in the right column.

Stock*	Area	OFL	ABC	ACL	ACL Harvest Control Rule
Bocaccio	S of 40º10' N. lat.	881	842	337	Spawning Potential Ratio (SPR) = 77.7%
Canary	Coastwide	741	709	119	SPR = 88.7%
Cowcod	S of 40º10' N. lat.	12	9	3	SPR = 82.7% (F = 0.007)
Darkblotched	Coastwide	553	529	330	SPR = 64.9%
Pacific Ocean Perch	N of 40º10' N. lat.	838	801	153	SPR = 86.4%
Petrale Sole	Coastwide	2,774	2,652	2,652	25-5 rule (P* = 0.45)
Yelloweye	Coastwide	51	43	18	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	Coastwide	3,304	2,752	NA	NA
	N of 34º27' N. lat.	NA	NA	1,958	ACL = prop. of coastwide ABC (P* = 0.4)
	S of 34º27' N. lat.	NA	NA	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[a/]	Coastwide	--	--	--	--

Table **2-2 (continued). Harvest specifications for stocks and stock complexes for 2015-2016 under the No Action Alternative (i.e., 2014 harvest specifications). The harvest control rule that would be used to calculate the ACLs is shown in the right column.**

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); 40-10 adj.
	S of 36º N. lat.	NA	NA	1,560	ACL = prop. of coastwide ABC (P* = 0.4) 40-10 adj
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 = 2012 ACL
Slope Rockfish S	S of 40º10' N. lat.	685	622	622	ACL = ABC (P* = 0.45); Blackgill HG based on 40-10 adj.

*Overfished stocks in CAPs; stock

[a/]The Pacific whiting harvest specifications are established consistent with the U.S. Canada Pacific Whiting Treaty.

Table 2-3. Preferred harvest specifications for stocks and stock complexes for 2015-2016. The harvest control rule that would be used to calculate the ABCs and ACLs is shown in the right column.

Stock*	Area	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL	Harvest Control Rule
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	68	62	10	SPR = 82.7% (E = 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	43	18	52	43	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)
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	50,000	59,221	56,615	50,000	50,000 mt constant catch
English sole	Coastwide	10,792	9,853	9,853	7,890	7,204	7,204	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
Pacific whiting[a/]	Coastwide	--	--	--	--	--	--	--
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) 40-10 adj
	S of 36º N. lat.	NA	NA	1,719	NA	NA	1,880	ACL = prop. of coastwide ABC (P* = 0.4) 40-10 adj

Table 2-3 (continued). Preferred harvest specifications for stocks and stock complexes for 2015-2016. The harvest control rule that would be used to calculate the ABCs and ACLs is shown in the right column.

Stock*	Area	2015			2016			Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
Shortbelly	Coastwide	6,950	5,789	500	6,950	5,789	500	500 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	2,101	2,101	2,503	2,085	2,085	ACL = ABC (P* = 0.4)
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	2,000	3,990	3,790	2,000	2,000 mt constant catch
Yellowtail	N of 40º10' N. lat.	7,218	6,590	6,590	6,949	6,344	6,344	ACL = ABC (P* = 0.45)
Nearshore Rockfish N	N of 40º10' N. lat.	88	77	69	88	77	69	ACL = ABC (P* = 0.45); 40-10 adj. for blue in CA + China
Nearshore Rockfish S	S of 40º10' N. lat.	1,313	1,169	1,114	1,288	1,148	1,006	ACL = ABC (P* = 0.45); 40-10 adj. for blue N of Pt. Con.
Shelf Rockfish N	N of 40º10' N. lat.	2,209	1,944	1,944	2,218	1,953	1,952	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted in CA
Shelf Rockfish S	S of 40º10' N. lat.	1,918	1,625	1,624	1,919	1,626	1,625	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted N of Pt. Con.
Slope Rockfish N	N of 40º10' N. lat.	1,831	1,693	1,693	1,844	1,706	1,706	ACL = ABC (P* = 0.45)
Slope Rockfish S	S of 40º10' N. lat.	813	705	693	814	705	695	ACL = ABC (P* = 0.45); 40-10 adj. for blackgill
Other Flatfish	Coastwide	11,453	8,749	8,749	9,645	7,243	7,243	ACL = ABC (P* = 0.4)
Other Fish	Coastwide	291	242	242	291	243	243	ACL = ABC (P* = 0.45)

*Overfished stocks in CAPs; stock complexes in *italics*.

[a/]The Pacific whiting harvest specifications are established consistent with the U.S. Canada Pacific Whiting Treaty, biological and socio-economic impacts associated with a range of specifications are considered in Sections 4.1 and 4.3.

Table 2-4. Harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 1. The harvest control rule that would be used to calculate the ACLs is shown in the right column. Overfished stocks are designated in all caps.

Stock*	Area	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL	ACL Harvest Control Rule
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	68	62	10	SPR = 82.7% (E = 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)
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	10,792	9,853	9,853	7,890	7,204	7,204	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	626,364	NA	269,745	626,364	NA	269,745	The U.S. 2013 total allowable catch (TAC) is used as the ACL proxy
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); 40-10 adj
	S of 36º N. lat.	NA	NA	1,798	NA	NA	1,961	ACL = prop. of coastwide ABC (P* = 0.45); 40-10 adj

Table 2-4 (continued). Harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 1. The harvest control rule that would be used to calculate the ACLs is 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	
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	2,286	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.	7,218	6,590	6,590	6,949	6,344	6,344	ACL = ABC (P* = 0.45)
Nearshore Rockfish N	N of 40º10' N. lat.	88	77	69	88	77	69	ACL = ABC (P* = 0.45); 40-10 adj. for blue in CA + China
Nearshore Rockfish S	S of 40º10' N. lat.	1,313	1,169	1,114	1,288	1,148	1,006	ACL = ABC (P* = 0.45); 40-10 adj. for blue N of Pt. Con.
Shelf Rockfish N	N of 40º10' N. lat.	2,209	1,944	1,944	2,218	1,953	1,952	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted in CA
Shelf Rockfish S	S of 40º10' N. lat.	1,918	1,625	1,624	1,919	1,626	1,625	ACL = ABC (P* = 0.45); 40-10 adj. for greenspotted N of Pt. Con.
Slope Rockfish N	N of 40º10' N. lat.	1,831	1,693	1,693	1,844	1,706	1,706	ACL = ABC (P* = 0.45)
Slope Rockfish S	S of 40º10' N. lat.	813	705	693	814	705	695	ACL = ABC (P* = 0.45); 40-10 adj. for blackgill
Other Flatfish	Coastwide	11,453	8,749	8,749	9,645	7,243	7,243	ACL = ABC (P* = 0.45)
Other Fish	Coastwide	291	242	242	291	243	243	

*Overfished stocks in CAPs; stock complexes in *italics*.
[a/]The Pacific whiting harvest specifications would be established consistent with the U.S. Canada Pacific Whiting Treaty; biological and socioeconomic impacts associated with a range of specifications are considered in Sections 4.1 and 4.3. 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 that would be used to calculate the ACLs is 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	38	10	68	39	10	SPR = 82.7% (E = 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)
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	10,792	6,637	6,637	7,890	4,852	4,852	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
Pacific whiting [a/]	Coastwide	--	--	--	--	--	--	--
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)

Table 2-5 (continued). Harvest specifications for stocks and stock complexes for 2015-2016 under Alternative 2. The harvest control rule that would be used to calculate the ACLs is shown in the right column.

Stock*	Area	2015			2016			ACL Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
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	1,551	1,551	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	1,432	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.	7,218	4,439	4,439	6,949	4,274	4,274	ACL = ABC (P* = 0.25)
Nearshore Rockfish N	N of 40º10' N. lat.	88	45	40	88	45	41	ACL = ABC (P* = 0.25); 40-10 adj. for blue in CA + China
Nearshore Rockfish S	S of 40º10' N. lat.	1,313	725	693	1,288	710	694	ACL = ABC (P* = 0.25); 40-10 adj. for blue N of Pt. Con.
Shelf Rockfish N	N of 40º10' N. lat.	2,209	1,142	1,142	2,218	1,148	1,148	ACL = ABC (P* = 0.25); 40-10 adj. for greenspotted in CA
Shelf Rockfish S	S of 40º10' N. lat.	1,918	802	802	1,919	803	803	ACL = ABC (P* = 0.25); 40-10 adj. for greenspotted N of Pt. Con.
Slope Rockfish N	N of 40º10' N. lat.	1,831	1,232	1,232	1,844	1,243	1,243	ACL = ABC (P* = 0.25)
Slope Rockfish S	S of 40º10' N. lat.	813	390	389	814	391	390	ACL = ABC (P* = 0.25); 40-10 adj. for blackgill
Other Flatfish	Coastwide	11,453	5,701	5,701	9,645	4,589	4,589	ACL = ABC (P* = 0.25)
Other Fish	Coastwide	291	110	110	291	110	110	ACL = ABC (P* = 0.25)

*Overfished stocks in CAPs; stock complexes in *italics*.

[a/]The Pacific whiting harvest specifications would be established consistent with the U.S. Canada Pacific Whiting Treaty. Biological and socioeconomic impacts associated with a range of specifications are considered in Sections 4.1 and 4.3.

2.1.2 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 management measures; including those designated as routine; and adoption of new management measures. Existing measures include the following:

- Limited entry permits that restrict the number of participants 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 [CPs]) 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. RCA changes can also be accommodated to provide greater access to target species when bycatch of species of concern is low. For example if overfished species mortality is projected to be lower than an allocation or ACL, RCA adjustments may be made to provide greater access to target species (e.g., changing from 20 to 30 fathoms [fm]). Enforcement of these closed areas is supported by requirements for commercial vessels retaining groundfish to carry a vessel monitoring system (VMS) that transmits their positions to enforcement officials.
- Catch control tools such as IFQs in the shoreside trawl sector, co-ops, and associated allocations in the at-sea whiting sectors; permit and sablefish tier limits in the limited entry fixed gear sector; and 2-month cumulative landing limits are used in all sectors for certain species and/or at certain times of the year. Bycatch in the at-sea whiting fishery is accommodated by allocations and set-asides from the trawl allocation. Recreational catch is controlled primarily by time/area closures, bag limits, and size limits.

Several new management measures or adjustments to existing measures, including routine measures, are recommended for implementation in 2015 to meet the goals and objectives specified in the FMP. The following section provides an overview of the new measures, which are evaluated under all of the action alternatives. A detailed evaluation of the performance and effects of the new management measures that would be implemented beginning in 2015-2016 and carried forward into the future and the range of options considered can be found in Appendix B, and the biological impacts of the measures are summarized in Chapter 4.2. Details regarding the adjustments made to existing management measures, including routine measures, and the associated impacts can be found in Section 4.2. and Section 4.9. Section 2.5.7 contains the measures that were considered but rejected for implementation at this time.

2.1.2.1 Modifications to the Coordinates Defining Existing RCAs

RCAs are large, depth-based area closures intended to reduce the catch of an array of species, such as overfished Shelf Rockfish complex 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. The RCA structures are implemented by gear and/or fishery (e.g., trawl RCA, non-trawl RCA, and recreational RCAs). Under the action alternatives, changes to selected coordinates are proposed that more closely approximate the boundaries with depth contours that are based on the best available depth data. These modifications would maintain the intent of the RCAs by providing improved and more efficient access to target species, while minimizing interactions with overfished species.

Modifications to the No Action Alternative depth contours used to define RCAs in Oregon and California are proposed; they are designed to better approximate actual depth. Starting on January 1, 2013, new waypoints, designed to better approximate depth, were implemented for the 200-fathom (fm) line in

Oregon. This resulted in areas where the modified 200-fm line was deeper than the 200-fm line. The modified 200-fm line was intended to have shallower areas (petrale sole cut-outs) that would provide greater access to the petrale sole fishing grounds. Updated coordinates for the modified 200-fm line are proposed to resolve this problem. In California, adjustments are proposed off Del Mar, San Diego, and Channel Islands to better approximate the true depth so that greater access is provided to non-trawl fishing grounds while maintaining the intent of the depth contour. VMS is currently required for all open access vessels, and this allows such adjustment without reducing enforceability of the depth contours.

2.1.2.2 Allow Retention of Lingcod by Fixed Gear Vessels in Periods 1, 2, and 6

Lingcod retention is prohibited in Periods 1, 2, and 6 for both the limited entry and open access fixed gear sectors, and this prohibition would remain under the No Action Alternative. The prohibition has been in place since the 1990s when lingcod was an overfished species; it has been maintained to improve the conservation of lingcod after the stock was declared overfished. The closure was intended to minimize impacts on lingcod during their spawning season, which is from December to April (Hamel et al. 2009). Females move into 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 concentrate in these shallow waters guarding the eggs during winter and spring months (Love 1996). The season closure for the fixed gear fishery was designed to reduce catch of these concentrated males during the nest-guarding season to facilitate rebuilding of the stock. Lingcod is no longer overfished and is currently above B_{MSY}. Under the action alternatives, lingcod retention would be allowed during Periods 1, 2, and 6 for limited entry and fixed gear vessels (except south of 40°10’ N. latitude during period 2) at a level that should reduce discarding, but that would not result in targeting. Additionally, trip limit increases for lingcod are proposed.

2.1.2.3 Minor Nearshore Rockfish Management of North of 40°10' N. latitude

Starting in 2015, the states will be managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs. If harvest levels in Washington or Oregon approach 75 percent of the state-specific HGs (Table 2-6; also see Appendix B, Section B.7), which are based on status quo harvest levels, the states will consult via a conference call and determine whether inseason action is needed. The HGs for Washington and Oregon would be state HGs and would not be established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area of 40°10' N. latitude to 42° N. latitude. In the event inseason action is needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings. At its June 2014 meeting, the Council confirmed that the new HGs would be associated with an ongoing inseason dialogue among the states with the intent to keep mortality within the Nearshore Rockfish north of 40°10' N. latitude ACL.

Table 2-6. Annual state-specific harvest guidelines (HGs) for the Minor Nearshore Rockfish complex north of 40°10' N. latitude for 2015-2016, and 75 percent of each HG that would trigger consultation and coordination.

	Harvest Guideline	75% of HG
Washington [a/]	10.5	8
Oregon [a/]	48.4	36
California [b/]	23.7	18
Total	82.6	62.0

[a/]The values for Washington and Oregon would be state HGs.
[b]The California HG would be specified in Federal regulation and would apply only in the area 40°10 N. latitude to 42° N. latitude.

2.1.2.4 Oregon Recreational Fisheries: Canary Rockfish Bag Limit

Canary rockfish is an overfished species managed under a rebuilding plan. For the recreational fisheries, canary retention would be prohibited under the No Action Alternative. The prohibition on retention in the recreational fisheries has been in place since 2003. It was enacted in response to the 2002 canary rockfish assessment showing that recreational removals (both landed and bycatch mortality) have a disproportionately negative effect on rebuilding trajectories compared to commercial removals due to recreational fishing effort occurring in shallower areas and, therefore, removing smaller (younger) fish.

The model and the resulting rebuilding projections in the most recent assessment and rebuilding analysis are age-structured and assume the fleet harvest from the sector allocations in 2011-2012. When necessary, catch averaged over the three most recent years (2008 to 2010) has been split by fishery sectors for use in the stock assessment. Because fleet allocations have not changed substantially since 2011-2012, and since 2015-2016 are not substantially different from 2011-2012, the 2011 rebuilding trajectories are not biased by fleet. Sub-bag limits for canary rockfish in Washington, Oregon, and California are analyzed in Appendix B, Section B.11. The Preferred Alternative option included under the action alternatives would be to allow a sub-bag limit of one canary rockfish in the Oregon recreational fisheries. A one-fish, sub-bag limit would be intended to minimize discards of canary rockfish and provide fishery-dependent data to inform the stock assessments, while not promoting targeting. Allowing incidental catch to be retained would be expected to minimize discards of canary rockfish, improve the accuracy of total catch mortality estimates, and provide data to better inform the stock assessment.

2.1.2.5 Washington and Oregon Recreational – Would 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 for the recreational fisheries off Washington and Oregon. This would continue under the No Action Alternative in both the Pacific halibut and groundfish regulations. This management measure would change the retention of groundfish in the Pacific halibut fishery. Change in the retention allowances could reduce discard mortality of incidentally caught groundfish in the Pacific halibut fishery so yelloweye rockfish mortality would stay within the HGs. The primary tools used to keep yelloweye rockfish mortality within the HGs are regulations that limit recreational opportunity over deep-water reefs (more than 40 fm; 240 feet). Recreational anglers fishing deep reefs more commonly encounter yelloweye rockfish than those fishing shallower reefs, and a higher percentage of the yelloweye rockfish released die due to barotrauma-inflicted injuries. Allowing retention of groundfish by Pacific halibut anglers on “all-depth” days could create an opportunity where anglers would target groundfish on all-depth days, reducing the effectiveness of the groundfish depth restrictions. If allowed to retain groundfish, some halibut anglers would be expected to target deepwater reefs near Pacific halibut fishing grounds. Under the Pacific Halibut Catch Share Plan, changes to the restrictions on groundfish retention during the Pacific halibut season for 2015-2016 were proposed by the Council at its November 2014 meeting, including modifications to the groundfish retention rules during the Pacific halibut openings. Changes to allowance of retention of bottom fish during all depth recreational Pacific halibut seasons in Washington are due to changes to the Council’s Pacific halibut Area 2A Catch Sharing Plan.

2.1.2.6 Washington Recreational – Would Modify or Eliminate Boundaries for Lingcod Closures

Yelloweye rockfish is an overfished species currently managed under a rebuilding plan. In 2012, deepwater 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. Under the action alternatives, modifications of the boundary lines would be proposed to reduce encounters with yelloweye and canary rockfish more effectively and to streamline regulations making them easier for recreational anglers to understand.

2.2 Stock Complex Reorganization and Designation of Ecosystem Component Species

Reorganizing the Minor Slope Rockfish complex would be considered due to the risk of overfishing individual stocks managed within the complex. Harvest rates of rougheye/blackspotted rockfish have been close to or above the F_{MSY} proxy of $F_{50\%}$ since the mid-1980s, including at least 4 of the last 10 years. National Standard 1 Guidelines at 50 CFR 600.310(d)(8) describe stock complexes as “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.”

After consideration at the June and September 2013 Council meetings, the Council adopted alternatives for restructuring the Minor Slope Rockfish complexes north and south of 40º10’ N latitude. However, given the time constrains of restructuring complexes within the biennial specifications, at its March 2014 meeting, the Council recommended that the analysis on stock complexes be narrowed to the No Action Alternative and an alternative that narrowed the focus to similar species with the greatest risk of overfishing when managed within the slope complex. That alternative would remove rougheye/blackspotted and shortraker rockfish from the Minor Slope Rockfish complexes, both north and south, and would move them into a new coastwide complex referred to as the RBS complex. Council deliberations focused on concern with fishing mortality on rougheye/blackspotted rockfish. A new stock assessment (Hicks et al. 2013) indicates that spawning biomass declined relatively steeply in the 1980s and 1990s, while cumulative coastwide catch since 2008 has exceeded the rougheye/blackspotted OFL contribution to the Minor Slope Rockfish complexes. However, the assessment also indicated that rougheye/blackspotted stock is currently above target biomass, with a spawning biomass estimated to be 47 percent relative to its unfished equilibrium at the start of 2013. The stock has also been estimated to be healthy throughout the time series in the new assessment.

The Other Fish complex contains various species that historically were non-target species, but that were encountered as bycatch (not retained, landed, sold, or kept for personal use). Stock complexes composed of species with similar distribution and/or life history characteristics are preferable, so the component stocks are similar in terms of vulnerability to overfishing and susceptibility to particular fisheries (by gear type, for example). In addition to the National Standard 1 Guidelines description of stock complexes, it also describes EC species at 50 CFR 600.310(d)(5). EC species should be a non-targeted stock; not subject to overfishing, determined to be overfished, approaching the overfished threshold, or likely to become so in the absence of management measures; and not generally retained for sale or personal use. Many of the species in the Other Fish complex fit the criteria for designating EC species. EC species are not considered to be “in the fishery,” and OFL, ABCs or ACLs are not set for them.

The alternatives described in Section 2.2 are designed to consider restructuring the following stock complexes: Minor Slope Rockfish and Other Fish. The alternatives are designed to consider managing some species as EC species, as well as to bring new species into the FMP as EC species.

2.2.1 Minor Slope Rockfish Restructuring – No Action Alternative (Preferred)

Under the No Action Alternative, the Minor Slope Rockfish complexes north and south of 40°10’ N. latitude would not be restructured. Table 2-7 shows the current structure of the complex, including each stock’s contribution to the complex’s OFL and ABC. New management measures proposed under the integrated action alternatives that could improve management data for shortraker rockfish and rougheye/blackspotted rockfish over the No Action Alternative while they remain within the current Minor Slope Rockfish complexes are discussed in Section 4.2. The management measures would include a sorting requirement for shortraker rockfish and rougheye/blackspotted rockfish. This would be a more detailed sorting requirement than under the No Action Integrated Alternative where all minor slope rockfish would be recorded together as a group. Additional measures that were considered for use under the current complex structure (No Action Alternative), but that were not moved forward for inclusion in the action alternatives, are addressed in Appendix B. Section B.6. addresses non-trawl trip limit reductions; Section B.14.1 addresses closed areas; and Section B.17 addresses rockfish excluders for Pacific whiting vessels.

Table 2-7. The No Action Alternative slope rockfish complexes north and south of 40º10' N latitude with associated preferred 2015 and 2016 ACLs (stocks with new assessments in bold; component stock in *italics*).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Slope Rockfish Complex North of 40º10' N latitude	1,831	1,693	1,693	1,844	1,706	1,706
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	***332.8***	***303.8***	***303.8***	***323.2***	***295.1***	***295.1***
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 latitude	813	705	693	814	705	695
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	***83.2***	***76.0***	***76.0***	***80.8***	***73.8***	***73.8***
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*

2.2.2 Slope Rockfish Restructuring – Alternative 1 – Would Establish a Coastwide Rougheye/blackspotted/shortraker Complex

Under Alternative 1, rougheye rockfish (including blackspotted rockfish) and shortraker rockfish would be removed from the slope rockfish complexes north and south of 40º10' N latitude and managed as a new coastwide rougheye/blackspotted/shortraker (RBS) complex. Table 2-8 shows the Alternative 1 structure of the complex, including each stock's contribution to the complex OFL and ABC. An OFL, ABC, and ACL would be established for the proposed RBS complex.

Stocks may be grouped into complexes for various reasons, including when it is not feasible for fishermen to distinguish individual stocks in their catch. Rougheye and blackspotted rockfish where jointly assessed because it is very difficult to visually distinguish the two species. These two separate species have been identified in recent genetic studies (Gharrett et al. 2005, Hawkins et al. 2005). Historical data lump these species into one category, rougheye rockfish. Furthermore, rougheye rockfish and blackspotted rockfish are closely related to shortraker rockfish, and they are sometimes difficult to distinguish from shortraker without looking at the gill rakers. In some years, historical landing and observer data have substantial catch reported only to the rougheye/shortraker grouping. Due to the difficulty in distinguishing these three species, coupled with the lack of historical separation in the data, the RBS complex is considered under Alternative 1.

Managing RBS as a new complex would increase the range of potential management measures that could be used to control catch of these species directly, including IFQ specification. However, establishing an ACL for the RBS complex could require various long-term or 2-year allocation considerations.

Table 2-8. Alternative 1 – slope rockfish complexes north and south of 40º10' N latitude and an RBS complex coastwide with associated preferred 2015 and 2016 ACLs (stocks with new assessments in bold; component stock in *italics*).

Stock Complexes and Component Stocks	2015 OFL	2015 ABC	2015 ACL	2016 OFL	2016 ABC	2016 ACL
Slope Rockfish Complex North of 40º10' N latitude	1610.4	1493.5	1493.5	1618.5	1501.7	1501.7
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*
Sharpchin	***332.8***	***303.8***	***303.8***	***323.2***	***295.1***	***295.1***
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 latitude	808.9	700.9	689.6	809.5	***701.4***	***690.8***
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*
Sharpchin	***83.2***	***76.0***	***76.0***	***80.8***	***73.8***	***73.8***
Yellowmouth	*0.8*	*0.7*	*0.7*	*0.8*	*0.7*	*0.7*
RBS Complex Coastwide	***224.8***	***203.8***	***203.8***	***229.8***	***208.4***	***208.4***
Rougheye/Blackspotted	***206.0***	***188.1***	***118.1***	***211.0***	***192.7***	***192.7***
Shortraker	***18.8***	***15.7***	***15.7***	***18.8***	***15.7***	***15.7***

2.2.3 Other Fish Complex Restructuring – No Action Alternative

Under the No Action Alternative, the Other Fish complex would not be reorganized, and no EC species would be designated. Under the No Action Alternative, the Other Fish complex would consist of all the unassessed groundfish FMP species that are neither rockfish (family *Scorpaenidae*) nor flatfish, except for spiny dogfish, which was assessed in 2011. The Other Fish complex includes 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*). Under the No Action Alternative, the Other Fish complex would be an aggregation of species with different life history characteristics, depth distributions, and vulnerabilities to potential overfishing (Table 2-9).

2.2.4 Other Fish Complex Restructuring – Preferred Alternative

The Preferred Alternative would restructure the other fish complex by removing spiny dogfish and managing this stock coastwide with its own harvest specifications (see Section 4.1.4.17), as well as removing all the skates, Pacific grenadier, soupfin shark, spotted ratfish, and finescale codling by designating them as EC species (see Section 4.1.6). The remaining stocks (i.e., kelp greenling, Washington cabezon, and leopard shark) would be the only stocks managed in the Other Fish complex in 2015-2016.

The harvest specification values for individual stocks are the same as those specified for 2015 and 2016 integrated alternatives and shown at the complex level in Table 2-2 and Table 2-3. The Other Fish complex OFLs and ABCs are the sum of OFL and ABC contributions of those component stocks with an SSC-endorsed OFL estimate. The SSC endorsed OFL estimates for kelp greenling in California (118.9 mt based on a depletion-based stock reduction analysis [DB-SRA] estimate calculated in 2011), leopard shark (167.1 mt based on a DB-SRA estimate calculated in 2011), and the Washington substock of cabezon. The SSC endorsed a new OFL estimate for Washington cabezon based on a DB-SRA methodology that assumes depletion in 2010 equals that inferred from the 2009 assessment for Oregon (48 percent) (Cope and Key 2009). Because the 2016 harvest specifications are based on assumed ABC removals of Washington cabezon in 2015, the 2016 specifications are dependent on the preferred P*. The Council chose a P* of 0.45 for Washington cabezon, which determines 2015 and 2016 OFL contributions of 4.5 mt and 4.8 mt, respectively (Table 2-). The SSC originally recommended a similar methodological approach for estimating OFL contributions for kelp greenling in Oregon and Washington that used a depletion estimated from the 2005 kelp greenling assessment for the Oregon substock (Cope and MacCall 2006). However, the SSC did not endorse the 2015 and 2016 OFLs for the Oregon and Washington substocks of kelp greenling after realizing that the catch stream used to determine the DB-SRA OFL estimate of kelp greenling in Oregon was dramatically different than the catch stream in the 2005 assessment. Therefore, there are no SSC-recommended OFL or ABC contributions for kelp greenling in Washington and Oregon to inform the 2015 and 2016 harvest specifications for the reconfigured Other Fish complex. The preferred 2015 and 2016 OFL for the Other Fish complex is 291 mt. The preferred 2015 and 2016 ABCs for the Other Fish complex are 242 mt and 243 mt, respectively, and are based on a P* of 0.45 for the component stocks with known OFL contributions.

Table 2-9. Other Fish Complex Harvest Specifications under No Action Alternative and the Preferred Option.**Stock**	**No Action Option (2014)**			**Preferred Option 2015/ 2016**		
	OFL	**ABC**	**ACL**	**OFL**	**ABC**	**ACL**
Other Fish	6,802	4,697	4,697	291	242/243	242/243
Big skate	*458.0*	*317.9*		*EC species*		
Cabezon (WA)	*a/*	*a/*		*4.5/4.8*	*3.4/4.4*	
California skate	*86.0*	*59.7*		*EC species*		
Finescale codling	*a/*	*a/*		*EC species*		
Kelp greenling (CA)	*118.9*	*82.5*		*118.9*	*99.2*	
Kelp greenling (OR & WA)	*a/*	*a/*		*EC species*		
Leopard shark	*167.1*	*116.0*		*167.1*	*139.4*	
Pacific grenadier	*1,519.0*	*1,054.2*		*EC species*		
Ratfish	*1,441.0*	*1,000.1*		*EC species*		
Soupfin shark	*61.6*	*42.8*		*EC species*		
Spiny dogfish	*2,950.0*	*2,024*		*Stock Specific management*		

[a/] There is no OFL contribution for these stocks given the lack of an approved method for estimating it.

Under the Preferred Alternative, the following species would be designated as EC species: big skate, California skate, all other endemic skates, soupfin shark, finescale codling, Pacific grenadier, all other endemic grenadier species, and spotted ratfish (Table 2-10). A species can be designated as an EC species if it is not targeted, is not subject to overfishing or being overfished in the absence of conservation measures, and is not generally retained for sale or personal use. No harvest specifications or management reference points are required for EC species; however, there is a monitoring requirement to determine changes in their status or their vulnerability to the fishery.

If new information shows that an EC species' vulnerability to overfishing has increased, the stock should be reclassified as "in the fishery." Any designation of a species as an EC species or a change from an EC designation to a species considered to be "in the fishery" requires an FMP amendment. Catch of these species could be considered within the context of annual mortality. Estimates of catch would likely be based on observer sample data and fish ticket reporting in Pacfin for the associated market categories.

Table 2-10. Groundfish species proposed to be designated as Ecosystem Component species.

Proposed EC Species	Previous Status
Aleutian skate (*Bathyraja aleutica)*	Not previously in the FMP
Bering/sandpaper skate (*B. interrupta)*	Not previously in the FMP
Big skate (*Raja binoculata)*	MUS (Other Fish)
California skate (*R. inornata)*	MUS (Other Fish)
Roughtail/black skate (*Bathyraja trachura)*	Not previously in the FMP
All other skates (Endemic species in the family *Arhynchobatidae)*	Not previously in the FMP
Pacific grenadier (*Coryphaenoides acrolepis)*	MUS (Other Fish)
Giant grenadier (*Albatrossia pectoralis)*	Not previously in the FMP
All other grenadiers (Endemic species in the family *Macrouridae)*	Not previously in the FMP
Finescale codling (aka Pacific flatnose) (*Antimora microlepis)*	MUS (Other Fish)
Ratfish (*Hydrolagus colliei)*	MUS (Other Fish)
Soupfin shark (*Galeorhinus zyopterus)*	MUS (Other Fish)

2.3 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 OFL. Chapter 4 in the Groundfish FMP describes the policies and procedures used to establish HCRs and to determine the numerical values for harvest specifications (OFLs, ABCs, and ACLs). HCRs include the following elements (although not all elements apply to all stocks):

- F_{MSY} harvest rate used to determine the OFL
- Reduction from the OFL to the ABC (P*-Sigma adjustment)
- ACL adjustment below the ABC based on overfished species rebuilding plans (T_{TARGET} and rebuilding control rule), constant catch policies, precautionary reduction for stocks where biomass is below B_{MSY} (40-10 and 25-5 harvest policies), etc.

Table 2-11 summarizes the typical adjustments that are based on stock status

Table 2-11. 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).	Impose precautionary reduction[9] from the ABC: • 40-10 for non-flatfish • 25-5 for flatfish	Implement rebuilding plan.

The Amendment 24 action alternatives would amend the Groundfish FMP to include a “default HCR framework” for determining default ACLs. Under this framework, unless the Council were to take explicit action to change a default HCR, the ACL implemented for a stock would be based on the default HCR applied to the best available scientific information. In the event of a change in stock status, the HCR appropriate for the stock’s new status would be applied. For stocks managed under the Groundfish FMP, the most recent stock assessment approved by the Council has generally been considered the best available 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. However, this is not always the case. Exceptions have occurred when the Council preferred to wait for new scientific data to better inform harvest levels and rebuilding periods. Such exceptions may continue in future cycles.

Under the action alternatives, the default HCRs would include a specified P* value used to derive default ABCs. However, the Council could also choose a harvest specification value different from the default value, provided that the new value would be consistent with the Groundfish FMP and the MSA, and the rationale for the change is sufficiently documented. The action alternatives would also add FMP language to clarify what are considered new and routine management measures during the biennial process.

2.3.1 No Action Alternative – The Groundfish FMP Would Not Be Amended

Under No Action Alternative, the FMP would not be amended to describe the default HCR framework.

[9] Section 4.6.1 in the Groundfish FMP describes the 40-10 and 25-5 precautionary reductions. These numbers define the linear reduction in the ACL from the ABC in relation to stock depletion. In the case of 40-10, this means that the linear reduction begins when depletion is at 40 percent, and the ACL reaches zero when depletion is at 10 percent (a rebuilding plan would be implemented when depletion falls below 25 percent). Similarly, 25-5 defines a linear reduction starting at 25 percent depletion and a zero ACL at 5 percent depletion (likewise superseded by an overfished threshold of 12.5 percent).

For the purpose of analysis, it is assumed that, under the No Action Alternative, 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 would be used to approximate fishing mortality and revenue.

2.3.2 The Preferred Alternative – Would Use the HCRs in Place in the Previous Period as the Defaults

Under this alternative, the Groundfish FMP would be amended to describe the HCR framework and to better delineate the types of new and routine management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be based on the P* from the previous period. Default ACLs would be based on the HCR in place during the previous period (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC). Like Alternative 1 and Alternative 2, a change in stock status would trigger a change in the default ACL.

The Council chose preferred harvest specifications for the 2015-2016 period (Table 2-2). The HCRs used to determine 2015-2016 harvest specifications would be the default HCRs for the next (2017-2018) biennial period. In addition, these harvest specifications would be used as the defaults to analyze this alternative.

2.3.3 Alternative 1 – Default HCRs Would Use a P* Value of 0.45

Under this alternative, the Groundfish FMP would be amended to describe the HCR framework. The FMP would also be modified to better describe the types of management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be based on a P* of 0.45. Default ACLs would be based on the HCR currently in place (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC) unless a new assessment showed that stock biomass had changed such that a different procedure would be specified in the FMP and a different HCR would apply. For example, if stock biomass fell below the MSY proxy, the appropriate precautionary adjustment would be applied (e.g., 40-10 or 25-5 rules applied to the ABC) to derive the default ACL; if stock biomass fell below the overfished/rebuilding threshold, the interim rebuilding rule (application of the 40-10 or 25-5 harvest policy) would be used to determine the default ACL. Likewise, if an increase in stock biomass were to change stock status, the procedure for the updated status would be used to compute the default ACL.

2.3.4 Alternative 2 – Default HCRs Would Use a P* Value of 0.25

Under this alternative, the Groundfish FMP would be amended to describe the HCR framework. It would better describe the types of management measures considered during the biennial management and regulatory amendment processes.

Default ABCs would be computed by using P*=0.25. Default ACLs would be based on the HCR currently in place (e.g., ACL=ABC, constant catch, precautionary reduction from the ABC) unless a new assessment were to show that stock biomass had changed such that a different procedure would be specified in the FMP and a different HCR would apply. For example, if stock biomass fell below the MSY proxy, the appropriate precautionary adjustment would be applied (e.g., 40-10 or 25-5 rules applied to the ABC) to derive the default ACL or if stock biomass fell below the overfished/rebuilding threshold, the interim rebuilding rule would be used to determine the default ACL. Likewise, if an increase in stock biomass changed stock status, the procedure for the updated status would be used to compute the default ACL.

2.4 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 measures may be classified as routine through the specifications and management measures or through a full rulemaking process. Routine management measures are those that the Council determines are likely to be adjusted on an annual or more frequent basis to achieve the intended purpose effectively. For a measure to be classified as routine, the Council determines that the measure is appropriate to address an issue at hand and may require further adjustment to achieve its purpose. Once a management measure has been classified as routine, it may be modified thereafter through a single Council meeting if the modification is proposed for the same purpose as the original measure, and the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine.

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, and the new measure must be implemented through full rulemaking 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, although this is not always the case. If measures are beyond the scope of what was previously considered, or the use is for a different purpose, full rulemaking may be required.

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 as a separate process. As part of this prioritization process, the Council could, for example, consider whether the measure is necessary to meet conservation objectives for the next biennial cycle or whether those objectives could be achieved by adjusting routine measures. Section 6.2 in the Groundfish FMP describes the regulatory amendment procedure, 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.

2.5 Alternatives Considered but Rejected from Further Analysis

2.5.1 Revising Rebuilding Plans (Amendment 24)

Groundfish FMP Section 4.6.3.4 describes guidelines for revising rebuilding plans in response to new information on the progress towards rebuilding. Consideration was given to revising this section to describe more specific decision rules based on an overfished species management strategy evaluation (MSE) being developed by Dr. Andre Punt, University of Washington, and the Council's SSC. The MSE tool was not completed in time for 2015-2016; it is anticipated that results may be available to address the question of decision rules during a future biennial management cycle.

2.5.2 P* Values Outside of the 0.25 – 0.45 Range

Section 4.4 of the Groundfish FMP states that "In cases where the P* approach is used, the upper limit of P* values considered will be 0.45." Therefore, ABCs based on P* values greater than 0.45 were not analyzed in this EIS. The Council formally adopted Alternative 2 for analysis in this EIS, which contemplates setting all 2015 and 2016 ABCs using a P* value of 0.25. Lowering the P* value reduces the ABC below the OFL, providing greater precautions relative to the risk of exceeding the true OFL. ABCs resulting from P* values lower than 0.25 were not considered to be necessary to prevent the true OFL from being exceeded for most groundfish stocks, and they are not considered as a harvest control rule in the analysis.

2.5.3 Reorganizing Minor Nearshore Rockfish Stock Complexes

The Council initially considered alternative structures for the Minor Nearshore Rockfish complexes north and south of 40º10' N. latitude. Because the No Action Alternative Minor Nearshore Rockfish complexes would be made up of species with similar life histories and distributions and would be managed under relatively conservative state nearshore FMPs and/or management strategies, alternatives for restructuring the status quo complexes were rejected.

2.5.4 Reorganizing the Shelf Rockfish Stock Complexes

The Council initially considered alternative structures for the Shelf Rockfish complexes north and south of 40º10' N. latitude. The Council rejected any alternatives to the No Action Alternative complexes because it was determined that there was no compelling need to restructure them, given that the stocks would be well protected from overfishing by the current RCA configurations.

2.5.5 Additional Alternatives for Reorganizing the Minor Slope Rockfish Stock Complexes

The Council recognized concerns regarding the management of slope rockfish stocks within a complex when the stocks have apparent dissimilar vulnerabilities. Initially the Council considered several additional restructuring alternatives for the Slope Rockfish complexes north and south of 40º10' N. latitude. Restructuring the slope rockfish complex required a thorough analysis to support any decision. Increasing the number of management units over the No Action Alternative would require trawl/non-trawl allocations to be reconsidered, including possible new quota shares for reformed stock complexes. Overall, the biennial harvest specification cycle did not provide adequate time for a thorough analysis, including involvement of the affected stakeholders in reallocation considerations. A single option was analyzed, in addition to the No Action Alternative, and it is presented in Section 2.2.2 and Section 4.1.3. The additional slope rockfish restructuring alternatives rejected from detailed analysis are documented in Agenda Item C.8.a, Attachment 1 in the April 2014 Council briefing book.

2.5.6 Reorganizing the Other Flatfish Stock Complexes

The Council initially considered alternative structures for the Other Flatfish complex. Alternatives for reorganizing the complex were rejected because it was determined that the Other Flatfish complex consisted of species with similar life histories, distributions, and vulnerabilities to potential overfishing.

2.5.7 Various New Management Measures

Several new management measures described in the section were considered by the Council, but were rejected for implementation in 2015-2016. Some measures were rejected entirely, while others were forwarded for consideration in the off-year management measures process. Descriptions of the management measures are provided below, and detailed analyses can be found in Appendix B.

Establish New Groundfish Conservation Areas (GCAs).

Management measures designed to reduce the catch of shortraker and rougheye/blackspotted rockfish by all commercial sectors were proposed under the action alternatives to prevent overfishing. Harvest rates of rougheye/blackspotted rockfish have been close to or above the F_{MSY} proxy of $F_{50\%}$ for rockfish since the mid-1980s, including 4 of the last 10 years. The Council initially considered establishing new Groundfish Conservation Areas (GCAs) to reduce mortality of rougheye/blackspotted rockfish. The GCAs would have been available for use in one or more commercial sectors, if other existing management measures proved ineffective. The SSC reviewed the initial analysis of a rougheye/blackspotted rockfish GCA (contained in Appendix B, Section B.14) and noted that spatial management was just one of the potential tools that could be used to reduce catch. Observer sampling data were used as the basis for identifying high catch areas. The SSC expressed concern about 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 considered a spatial management approach to be worth further development as a management tool (Agenda Item C.4.b, Supplemental SSC Report, April 2014.)

The proposed measures were not considered ready for use in management without further analysis and incorporation of SSC recommendations for improving the methodology. Spatial closures may be more effective for controlling bycatch for some species than others, depending on how consistently the species are distributed spatially and seasonally. The Council considered the draft analysis, but rejected it for implementation in 2015-2016 because the methodological changes could not be accomplished in a timely manner. The first rougheye/blackspotted rockfish assessment was prepared in 2013. It indicates that the West Coast stock is currently 47 percent of the unexploited biomass (above the B_{MSY} proxy of $B_{40\%}$). Similarly, under the action alternatives, spiny dogfish is proposed to be removed from the Other Fish complex and managed with stock-specific harvest specifications. GCAs were initially considered to reduce mortality of spiny dogfish for one or more fishing sectors if other existing management measures proved ineffective. The Council considered but rejected implementation of spiny dogfish GCAs given that the results of an analysis indicated a very low probability of exceeding the proposed spiny dogfish ACL (see Appendix B, Section B.16). The existing management measures were considered sufficient to keep spiny dogfish catch within the proposed ACLs. Further consideration of spiny dogfish GCAs was rejected.

Remove Prohibition on Commercial Fixed-gear Fishing in Select Groundfish Conservation Areas, Including the Cowcod Conservation Areas when Targeting Flatfish.

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 (CCA), Farallon Islands, and Cordell Banks. The Council considered proposals and analyses that would modify or remove the gear restrictions (Appendix B, Section B.19), but rejected the measures for implementation in 2015-2016 given several issues that could not be resolved in a timely manner. The Council determined it was more appropriate to consider these measures outside the harvest specifications management measures process.

Establish New Trawl RCAs Coordinates Approximating 300 and 350 fm.

The Council did not recommended implementing RCA coordinates for use as RCA seaward boundaries north of 40°10' N. latitude approximating the 300- and 350-fm depth contours, which may be used to reduce rougheye/blackspotted rockfish mortality. These lines were to be used inseason, if necessary, to move fishing effort into deeper waters and to aid in reducing catch of rougheye/blackspotted rockfish. These lines could have been available through routine action to prevent exceeding the OFL contributions for rougheye/blackspotted rockfish, which are managed within the slope rockfish complex.

Require Rockfish Excluder for Trawl Vessels Targeting Pacific Whiting.

As noted previously, the Council is exploring management measures designed to reduce the catch of rougheye/blackspotted rockfish for all commercial sectors. Initially, the Council considered requiring rockfish excluder devices to reduce the catch of rougheye/blackspotted rockfish in whiting fisheries (i.e., Pacific whiting IFQ trips, CP, and mothership trawl sectors). While some research has been conducted on rockfish excluders in the Pacific whiting fisheries, additional work is needed to resolve performance issues (e.g., clogging when Pacific whiting catch rates are high) and to explore the efficacy of the excluder on a broader range of vessel lengths (e.g., CPs). Further, additional time is needed to conduct an appropriate impact analysis, including estimated costs to purchase an excluder if the regulation were to be implemented. The Council considered the draft analysis of this measure (Appendix B, Section B.17), but rejected it for implementation in 2015-2016, given several complex issues that could not be resolved in a timely manner.

Establish Shorebased IFQ Surplus Carryover.

Current regulations provide for a carryover provision that allows a limited amount of surplus quota pounds (QP) or individual bycatch quota (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 carryover provision was designed to increase individual flexibility for harvesters, improve economic efficiency, and achieve OY, while preserving the conservation of stocks. The Council requested consideration of the 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 individual fishing quota (IFQ) fishery in the event that the trawl allocation for a species has been exceeded, but there is surplus quota eligible for carryover (Appendix B, Section B.3). Projections and unused set-asides are already considered when evaluating surplus carryover, therefore, no changes to management measures or methodologies are necessary.

Washington and Oregon Recreational Fisheries: Implement a 50-fathom Management Line.

Depth restrictions are commonly used in the Washington and Oregon recreational fisheries to reduce mortality of overfished species, while providing access to target species. Initially the proposed measure analyzed implementing the necessary coordinates for establishing a 50-fm management line in Oregon (Appendix B, Section B.22). After further consideration, the Council recommended such consideration for Washington, as well. The Council considered, but rejected, implementing the 50-fm management line in 2015-2016, given complexities in the analysis that could not be resolved in a timely manner. The Council determined that it was more appropriate to consider these measures outside of the harvest specifications management measures process.

Establish Harvest Guidelines for China Rockfish North of 40º10’ N. Latitude.

The Council requested analysis of a Minor Nearshore Rockfish HG north of 40°10 N. latitude for California (between 40°10 and 42° N. latitude). The Council also requested that 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 Council initially considered an analysis of state-specific or regional HGs of China rockfish north of 40º10’ N. latitude, given its status in the precautionary zone, but chose to focus on the Minor Nearshore Rockfish complex’s HG between the states (Appendix B).

The Council rejected nearshore management of the complex at a species level, in part, because 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 ACL. Recognizing that the overharvest of China rockfish has resulted 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 imposed 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 Minor Nearshore Rockfish complex until a better understanding of the status of the stock and an appropriate species-specific ACL was considered prudent. The Council postponed changes to management of nearshore stocks until fully vetting a framework for consistent management of complexes. Postponing changes is intended to enable development of criteria for the management of component species with different stock assessment categories and with varying stock status (Agenda Item C.4.b, Supplemental GMT Report 2, April 2014).

Chapter 3 AFFECTED ENVIRONMENT

This chapter describes the environment of the area affected by the alternatives under consideration in terms of environmental components. The affected environment reflects conditions as they exist before the proposed actions would be 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 species are managed under the Groundfish FMP. These species include more than 60 rockfish, including all genera and species from the family *Scorpaenidae* (*Sebastes*, *Scorpaena*, *Sebastolobus*, and *Scorpaenodes*); 12 flatfish species; 6 roundfish species; and 6 miscellaneous fish species that include sharks, skates, grenadiers, rattails, and morids. The species managed under the FMP are distributed throughout the EEZ and occupy diverse habitats at all stages in their life history.[10] 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 for stock assessments and how the stocks are managed. This is because fishing changes population abundance of the target species, as well as affecting life-history traits and population dynamics. Fishing may also affect yield.

Rockfish vary 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 (Love et al. 2002). Rockfish inhabit varied depths, ranging from nearshore kelp forests and rock outcroppings to deepwater (more than 150 fm) habitats on the continental slope. Despite the range of behaviors and habitats, most rockfish share general life history characteristics, including slow growth rates, bearing live young, and having large infrequent recruitment events. These life history characteristics contribute to relatively low average productivity that may reduce their ability to withstand heavy exploitation (Parker et al. 2000), especially during periods of unfavorable environmental conditions.

[10] For management purposes, species occurrence and habitat are identified at a gross level according to latitudinal and depth boundaries. Nearshore and continental shelf and slope zones define depth-habitat regions (with the latter two commonly referred to as the shelf and the slope). Important latitudinal biogeographic boundaries incorporated into management include Point Conception (34°27’ N. latitude) and Cape Mendocino including the undersea Cape Mendocino Ridge (for management, a line just south of the Cape at 40°10’ N. latitude is a primary boundary).

Roundfish managed under the Groundfish FMP include lingcod, cabezon, kelp greenling, Pacific cod, sablefish, and Pacific whiting. In general, roundfish share similar morphology, are faster growing, have shorter life spans, and have external fertilization with some species having large and highly variable recruitment events. Adult lingcod are a relatively sedentary species found coastwide on the rocky shelf and in nearshore habitats. Lingcod grow rapidly, reaching 12 inches in the first year, and have a maximum lifespan of 20 years. Cabezon is a coastwide species primarily found nearshore in intertidal areas and jetty rocks (Love 1996; Miller and Lea 1972). The cabezon's lifespan may exceed 20 years (Wilson-Vandenberg 1992). Kelp greenling is relatively common. Adults are found in rocky reefs in shallow nearshore areas. The estimated maximum age for kelp greenling is 16 years (Howard 1992). Pacific cod are widely distributed from Alaska to Santa Monica, California (Hart 1988; Love 1996). Although Pacific cod prefer shallow, soft-bottom habitats in marine and estuarine environments (Garrison and Miller 1982), adults have been found associated with coarse sand and gravel substrates (Garrison and Miller 1982; Palsson 1990). Compared to the other roundfish, adult sablefish are a longer-lived species. Adult sablefish commonly occur over sand and mud (McFarlane and Beamish 1983) in deep marine waters, but have also been found over hard-packed mud and clay bottoms in the vicinity of submarine canyons (MBC 1987). The coastal stock of Pacific whiting is semi-pelagic and is the most abundant single-species groundfish population in the California Current system (Stewart et al. 2011a). The stock is characterized by highly variable recruitment patterns and a relatively short lifespan.

Flatfish species (*Pleuronectiformes*) have asymmetrical skulls with both eyes on the same side of the head. The 12 flatfish species in the Groundfish FMP include assessed species, such as arrowtooth flounder, Dover sole, English sole, petrale sole, and starry flounder, and unassessed species 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 with the exception of arrowtooth flounder, butter sole, and flathead sole, which are found north of central California. Flatfish species are primarily found in waters of the continental shelf, but vary in depth distribution. Flatfish species primarily found in 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 flatfish show more variation in depth distribution. Many flatfish 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 (Pearson and Owen 1992) and, in the case of arrowtooth flounder, occasionally are found over low-relief rock-sponge bottoms.

Distribution of groundfish by species is shown in Table 3-1. 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, entitled, "The Pacific Coast Groundfish FMP, EFH Designation and Minimization of Adverse Impacts" (NMFS 2005). The 2014 Stock Assessment and Fishery Evaluation (SAFE) document (PFMC 2014), available on the Council website at www.pcouncil.org, describes distribution and life history, stock status and management history, stock productivity, and fishing mortality attributes of each assessed stock in detail. The SAFE document also describes stock assessment methods employed and the harvest specification framework, including methods used to determine these specifications.

Table 3-1. Latitudinal and depth distributions of groundfish species (adults) managed under the FMP.

Common Name	Scientific Name	Latitudinal Distribution		Depth Distribution (fm) [a/]	
		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.	17-140	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
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 dalli*	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
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	*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 lentiginosus*	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

Table 3-1 (continued). Latitudinal and depth distributions of groundfish species (adults) managed under the FMP.

Common Name	Scientific Name	Latitudinal Distribution		Depth Distribution (fm) [a/]	
		Overall	Highest Density	Overall	Highest Density
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 [d/]	*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
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

Table 3-2 (continued). Latitudinal and depth distributions of groundfish species (adults) managed under the FMP.

Common Name	Scientific Name	Latitudinal Distribution		Depth Distribution (fm) [a/]	
		Overall	Highest Density	Overall	Highest Density
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 suckleyi*	Coastwide	Coastwide	0->640	0-190
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. Coastwide	85-1,350	500-1,350
Ratfish	Hydrolagus colliei	Coastwide	Coastwide	0-499	55-82

[a/]Data are drawn from Casillas et al. 1998; Eschmeyer et al. 1983; Hart 1988; Love et al. 2002; Miller and Lea 1972 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 areas.
[c/]Only the southern stock of bocaccio south of 40º10' N. latitude is listed as depleted.
[d/]Only two occurrences of harlequin rockfish occur south of 51º N. latitude (off Newport, Oregon, and La Push, Washington; Casillas et al. 1998).

3.1.1 Stock Assessment Overview

Fishery specifications include OFLs, ABCs, and ACLs. The OFLs and ABCs characterize the biological condition of the stocks. Stock assessments are used for setting harvest specifications by providing estimates of MSY, OFL, the MFMT, the minimum stock size threshold (MSST), ABC, OY, and ACLs. A stock assessment is the scientific and statistical process where the status of a fish population or subpopulation (stock) is assessed in terms of 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} or proxy thereof, translated into exploitation rate; 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.

Pacific whiting is the only groundfish species that is assessed annually, as specified in the Agreement with Canada on the species. Groundfish stock assessments are conducted on a 2-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 have generally been conducted every 2 years, although data reports can be substituted for an assessment to monitor compliance with adopted rebuilding plans. The process for setting groundfish specifications involves 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 concerning 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 respond 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, and 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 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 define 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 system 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 an opportunity for public comment, and to ensure that the results are as accurate and error-free as possible.

Sources of uncertainty in stock assessments include the inherent variability in populations, errors in sampling due to variations associated with the process of observing and measuring populations, and errors in model specifications (NRC 1998). The stock assessment process relies on a foundation of sound scientific data used in appropriate models to characterize the status of stocks with accuracy. The dynamics of fish stock growth, together with fluctuations in environmental conditions, result in stochastic variation in fish abundance (NRC 1998). Gathering information on the stocks is important and generally leads to greater certainty and confidence. However, increased data do not necessarily solve the problem of uncertainty in assessments. In general, stock assessments for species where there are abundant and reliable data tend to be more robust with respect to estimating stock trends and abundance.

Scientific uncertainty in stock assessments is considered 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 F_{MSY}. The SSC considered 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) 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 sigma 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. In cases where the P* approach is used, the upper limit of P* values considered is 0.45.

Abundance-based reference points are defined in the Groundfish FMP. For each species with a stock assessment, a depletion level is estimated, which is current biomass relative to its unfished stock biomass (B_0 or $B_{unfished}$). The OFL is calculated by applying an estimated or proxy F_{MSY} harvest rate to the estimated abundance of the exploitable stock. The biomass level that produces MSY (i.e., B_{MSY}) is generally unknown and is assumed to vary over time due to long-term fluctuations in ocean conditions, so that no single value is appropriate. The proxy MSY abundance for all West Coast groundfish species other than assessed flatfish species is currently 40 percent of B_0 (denoted $B_{40\%}$). The proxy MSY abundance threshold for assessed flatfish stocks is 25 percent of B_0 or $B_{25\%}$. The proxy threshold for declaring all groundfish stocks other than assessed flatfish stocks overfished is $B_{25\%}$, and that for assessed flatfish stocks is $B_{12.5\%}$. The National Standard 1 guidelines refer to this threshold as the MSST. Stocks estimated to be above the depletion threshold, yet below an abundance level that supports MSY, are considered to be in the “precautionary zone” (between $B_{25\%}$ and $B_{40\%}$). The Groundfish FMP specifies precautionary reductions in harvest rate to better ensure future increases in the stock’s abundance to B_{MSY}. The stock assessment process used for Pacific Coast groundfish stocks is further described in the 2014 SAFE document (PFMC 2014).

3.1.2 Overfished Stocks

Overfished stocks are those with spawning biomasses that have dropped below the MSST. The Groundfish FMP requires overfished stock to be rebuilt to B_{MSY} through harvest restrictions and conservation measures (Table 3-2). Furthermore, the MSA requires the rebuilding periods to be the shortest time possible while considering the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem. A rebuilding analysis that considers alternate harvest levels and rebuilding times is prepared for each overfished species. New assessments were conducted for cowcod, darkblotched rockfish, and petrale sole, and an assessment update was conducted for bocaccio (Table 3-3).

Table 3-3. Overfished stocks managed under the FMP.

Common Name	Scientific Name
Bocaccio south of 40°10’ N. lat.	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Cowcod south of 40°10’ N. lat.	*Sebastes levis*
Darkblotched rockfish	*Sebastes crameri*
Pacific ocean perch	*Sebastes alutus*
Petrale sole	*Eopsetta jordani*
Yelloweye rockfish	*Sebastes ruberrimus*

Table 3-3. Overfished stocks – biomass reference points in the most recent stock assessment.

Species	Last Assessed	Estimated Depletion in Year of Last Assessment
Bocaccio south of 40°10' N. lat.	2013 update	31.4%
Canary rockfish	2011 update	24%
Cowcod south of 40°10' N. lat.	2013	33.9%
Darkblotched rockfish	2013	36%
Pacific ocean perch	2011	19.1%
Petrale sole	2013	22.3%
Yelloweye rockfish	2011 update	21.3%

3.1.3 Healthy Stocks

Healthy groundfish stocks are those with estimated spawning biomass levels at or greater than the B_{MSY} proxy (Table 3-4). Healthy species with new stock assessments in 2013 include Aurora rockfish, brown rockfish, China rockfish (S of 40º10' N. latitude), copper rockfish (N. and S. of Pt. Conception), English sole, longspine thornyhead, Pacific sanddabs, Pacific whiting, rex sole, rougheye/blackspotted rockfish, sharpchin rockfish, shortspine thornyhead, stripetail rockfish, yellowtail rockfish. The detailed information on life history, historical catch, and management information for each healthy groundfish stock can be found in the 2014 SAFE document (PFMC 2014).

Table 3-4. Healthy stocks – reference points from most recent stock assessment.

Species	Last Assessed	Estimated Depletion in Year of Last Assessment
Flatfish Species		
Arrowtooth flounder	2007	79%
Dover sole	2011	84%
English sole	2013	89%
Pacific Sanddabs	2013	96%
Rex sole	2013	79%
Starry flounder	2005	North 44% South 62%
Rockfish Species		
Aurora rockfish	2013	64%
Black rockfish south	2007	71%
Black rockfish north	2007	53%
Blackgill rockfish (coastwide)	2005	52%
Brown rockfish	2013	42%
California scorpionfish	2004	58%-80%
Chilipepper rockfish	2007	70%
China rockfish S.	2013	66%
Copper rockfish N.	2013	48%
Copper rockfish S.	2013	76%
Greenstriped rockfish	2009	81%
Gopher rockfish	2005	97%
Longspine thornyhead	2005	75%
Rougheye/blackspotted rockfish	2013	47%
Shortbelly rockfish	2007	73%
Shortspine thornyhead	2005	74%
Splitnose rockfish	2009	66%

Table 3-4 (continued). Healthy stocks – reference points from most recent stock assessment.

Species	Last Assessed	Estimated Depletion in Year of Last Assessment
Stripetail rockfish	2013	>77.5%
Widow rockfish	2011	51.1%
Yellowtail rockfish	2013	69%
Roundfish Species		
Cabezon (off CA)	2009	48%
Cabezon (off OR)	2009	52%
Kelp greenling	2005	49%
Lingcod N.	2009	62%
Lingcod S	2009	74%
Pacific whiting	2013	72%
Miscellaneous Species		
Longnose skate	2007	66%
Spiny dogfish	2011	63%

3.1.4 Precautionary Zone Stocks

Precautionary zone groundfish stocks are those with estimated spawning biomass levels lower than the B_{MSY} proxy and higher than the MSST that have not been declared overfished (Table 3-5). Biological characteristics of precautionary zone stocks that are relevant to biological resources that may be affected by implementation of the alternatives are summarized in Table 3-5. Detailed information regarding life history, historical catch, and management information for each precautionary zone groundfish stock can be found in the 2014 SAFE document (PFMC 2014).

Table 3-5. Precautionary zone stocks – reference points from most recent stock assessment.

Species	Last Assessed	Estimated Depletion in Year of Last Assessment
Blackgill rockfish (south of 40°30' N. lat	2011	30.2%
Blue rockfish	2007	29.7%
China rockfish N.	2013	37%
Greenspotted rockfish N.	2010	30.6%
Greenspotted rockfish S.	2010	37.4%
Sablefish	2011	33%

3.1.5 Unassessed Groundfish Stocks

Unassessed groundfish stocks are category 3 species that include species managed in complexes (i.e., the Minor Rockfish complexes, Other Flatfish, and Other Fish (Table 3-6). For category 3 species, it is usually impossible to determine stock status or an overfished threshold quantitatively. Relatively data-poor, catch-based methods such as DB-SRA and DCAC (depletion-corrected average catch) are used to determine the OFL for category 3 species.

3.1.6 Stock Complexes

Most of the component stocks comprising the stock complexes are unassessed category 3 stocks with OFLs that are determined using data-poor methods, data-moderate methods (sometimes classified as category 2 stocks), or average historical catch (PFMC 2014). The OFL estimates should not vary from year to year for these stocks. 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. Stocks within complexes with assessments in 2013 include aurora rockfish, brown rockfish, China rockfish (north and south of 40º10' N. latitude), copper rockfish (north and south of Point Conception), English sole, Pacific sanddabs, rex sole, rougheye/blackspotted rockfish, sharpchin rockfish, and stripetail rockfish.

Table 3-6. Specified OFLs (mt) in 2014 for stock complexes (species' contributions to a stock complex specification in italics, stocks with new assessments in bold).

Stock Complexes	2014 OFL
Minor Nearshore Rockfish North	110
Black and yellow	*a/*
Blue (CA)	*27.4*
Blue (OR & WA)	*32.3*
Brown	*5.5*
Calico	*a/*
China	*9.8*
Copper	*26.0*
Gopher	*a/*
Grass	*0.7*
Kelp	*a/*
Olive	*0.3*
Quillback	*7.4*
Treefish	*0.2*
Minor Shelf Rockfish North	2,195
Bronzespotted	*a/*
Bocaccio	*284.0*
Chameleon	*a/*
Chilipepper	*129.6*
Cowcod	*a/*
Flag	*0.1*
Freckled	*a/*
Greenblotched	*1.3*
Greenspotted 40°10' to 42° N. latitude	*9.4*
Greenspotted N. of 42° N. latitude (OR & WA)	*6.1*
Greenstriped	*1,268.3*
Halfbanded	*a/*
Harlequin	*a/*
Honeycomb	*a/*
Mexican	*a/*
Pink	*a/*
Pinkrose	*a/*
Puget Sound	*a/*
Pygmy	*a/*
Redstripe	*269.9*
Rosethorn	*12.9*
Rosy	*3.0*
Silvergray	*159.4*
Speckled	*0.2*
Squarespot	*0.2*
Starry	*a/*

Table 3-4 (continued). Specified OFLs (mt) in 2014 for stock complexes (species' contributions to a stock complex specification in italics, stocks with new assessments in bold).

Stock Complexes	2014 OFL
\ ***Stripetail***	*40.4*
Swordspine	*a/*
Tiger	*1.0*
Vermilion	*9.7*
Minor Slope Rockfish North	1,553
Aurora	*15.4*
Bank	*17.2*
Blackgill	*4.7*
Redbanded	*45.3*
Rougheye/Blackspotted	*71.1*
Sharpchin	*214.5*
Shortraker	*18.7*
Splitnose	*974.1*
Yellowmouth	*192.4*
Minor Nearshore Rockfish South	1,160
Shallow Nearshore Species	NA
Black and yellow	*27.5*
China	*16.6*
Gopher (N. of Point Conception)	*153.0*
Gopher (S. of Point Conception)	*25.6*
Grass	*59.6*
Kelp	*27.7*
Deeper Nearshore Species	NA
Blue (assessed area)	*187.8*
Blue (S. of 34°27' N. latitude)	*72.9*
Brown	*204.6*
Calico	*a/*
Copper	*141.5*
Olive	*224.6*
Quillback	*5.4*
Treefish	*13.2*
Minor Shelf Rockfish South	1,913
Bronzespotted	*3.6*
Chameleon	*a/*
Flag	*23.4*
Freckled	*a/*
Greenblotched	*23.1*
Greenspotted	*80.3*
Greenstriped	*232.7*
Halfbanded	*a/*
Harlequin	*a/*
Honeycomb	*9.9*
Mexican	*5.1*
Pink	*2.5*
Pinkrose	*a/*
Pygmy	*a/*
Redstripe	*0.5*
Rosethorn	*2.1*
Rosy	*44.5*
Silvergray	*0.5*

Table 3-5 (continued). Specified OFLs (mt) in 2014 for stock complexes (species' contributions to a stock complex specification in italics, stocks with new assessments in bold).

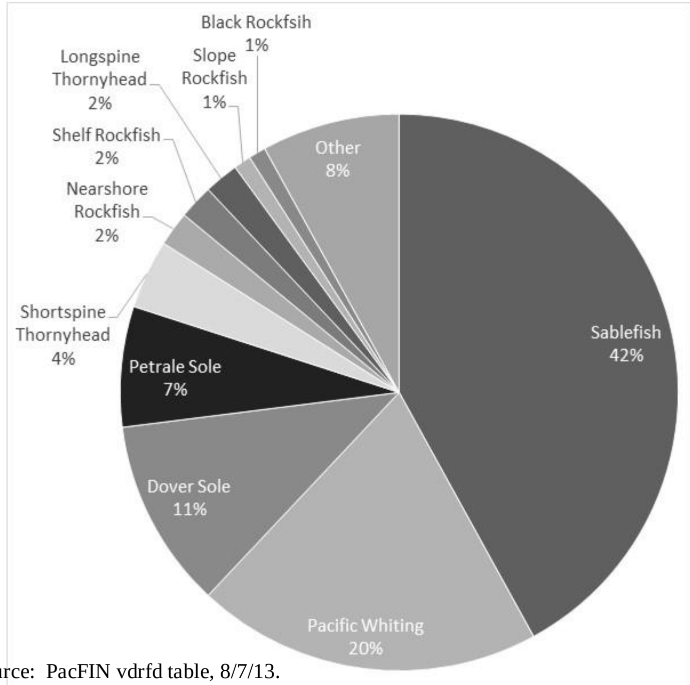
Stock Complexes	2014 OFL
Speckled	*39.4*
Squarespot	*11.1*
Starry	*62.6*
Stripetail	*23.6*
Swordspine	*14.2*
Tiger	*a/*
Vermilion	*269.3*
Yellowtail	*1,064*
Minor Slope Rockfish South	685
Aurora	*26.1*
Bank	*503.2*
Blackgill	*134.0*
Pacific ocean perch	*a/*
Redbanded	*10.4*
Rougheye/Blackspotted	*0.4*
Sharpchin	*9.8*
Shortraker	*0.1*
Yellowmouth	*0.8*
Other Flatfish	10,060
Butter sole	*4.6*
Curlfin sole	*8.2*
Flathead sole	*35.0*
Pacific sanddab	*4,801.0*
Rex sole	*4,371.5*
Rock sole	*66.7*
Sand sole	*773.2*
Other Fish b/	6,802
Big skate	*458.0*
Cabezon (WA)	*c/*
California skate	*86.0*
Finescale codling	*c/*
Kelp greenling (CA)	*118.9*
Kelp greenling (OR & WA)	*c/*
Leopard shark	*167.1*
Pacific grenadier	*1,519.0*
Ratfish	*1,441.0*
Soupfin shark	*61.6*
Spiny dogfish	*2,950.0*

3.2 Socioeconomic Data

Section 3.2 in the 2013-14 Groundfish Harvest Specifications FEIS, as well as EISs for earlier biennial periods, describe commercial fisheries targeting groundfish and characterize 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 are summarized here to highlight current fishery trends. Long-term historical landings, revenue, and price data (the full PacFIN database time series and a recent 10-year baseline period from 2003 to 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[11]) accounted for 92 percent 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 percent of all revenue. For that reason, when considering commercial fisheries, the socioeconomic evaluation in this EIS focuses 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 they are discussed in Section 3.2.5. Furthermore, other species may have greater economic importance within particular groundfish fisheries. In the summaries of trends in these fisheries, or "sectors," below, the species with greater economic importance are highlighted.



Source: PacFIN vdrfd table, 8/7/13.

Figure 3-1. Proportion 2003 to 2012 nominal shoreside commercial and tribal groundfish ex-vessel revenue by species and species groups.

[11] Rockfish species comprising these groups may be found in on the PacFIN website; see http://pacfin.psmfc.org/pacfin_pub/data_rpts_pub/code_lists/sp.txt.

Figure 3-2, Table 3-7, 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).[12] The panels in Figure 3-3 present trends in the same way for each of the 10 highest revenue earning species referenced above. Table 3-7 shows the long-term (1981 to 2012) and recent past (2003 to 2012) values for landings, revenue, and price-per-pound, as well as the ratio of recent past values and long-term values.

As seen in Table 3-7, the long-term trend in shoreside groundfish revenue shows a sharp decline from 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 to 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 to 2012) compared to the long term, while the average revenue ratio is 77 percent due to declines in average price-per-pound (Table 3-7). Examining changes by groundfish species and groups shows a mix of trends. Perhaps the most notable 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 percent of shoreside revenue, while the share was 38 percent in 2012. The domestic Pacific whiting fishery did not develop until the early 1990s; in 1992, shoreside whiting had an 8 percent share; in 2012, it was 38 percent. [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 percent share of revenue in 1981 to an 8 percent share in 2012 (PFMC 2014, Table 2b).

Looking more closely at Table 3-7, four species show increases in revenue when comparing the recent past to the long term: sablefish, Pacific whiting, Minor 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 showed 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 sablefish in Figure 3-3), sablefish revenue has been somewhat volatile, but an increasing trend has been apparent since 2002 even without the 2011 revenue spike.

Table 3-8 shows the coefficient of variation (CV) for inflation-adjusted, annual ex-vessel revenue over the long term (1981 to 2012) and the baseline period (2003 to 2012) for the highest revenue species and species groups. CV is the standard deviation divided by the mean, and it 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 enable 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 lower 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 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

[12] Shoreside data were obtained from the PacFIN vdrfd table, while at-sea data comes from the npac4900_spcomp table.

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.

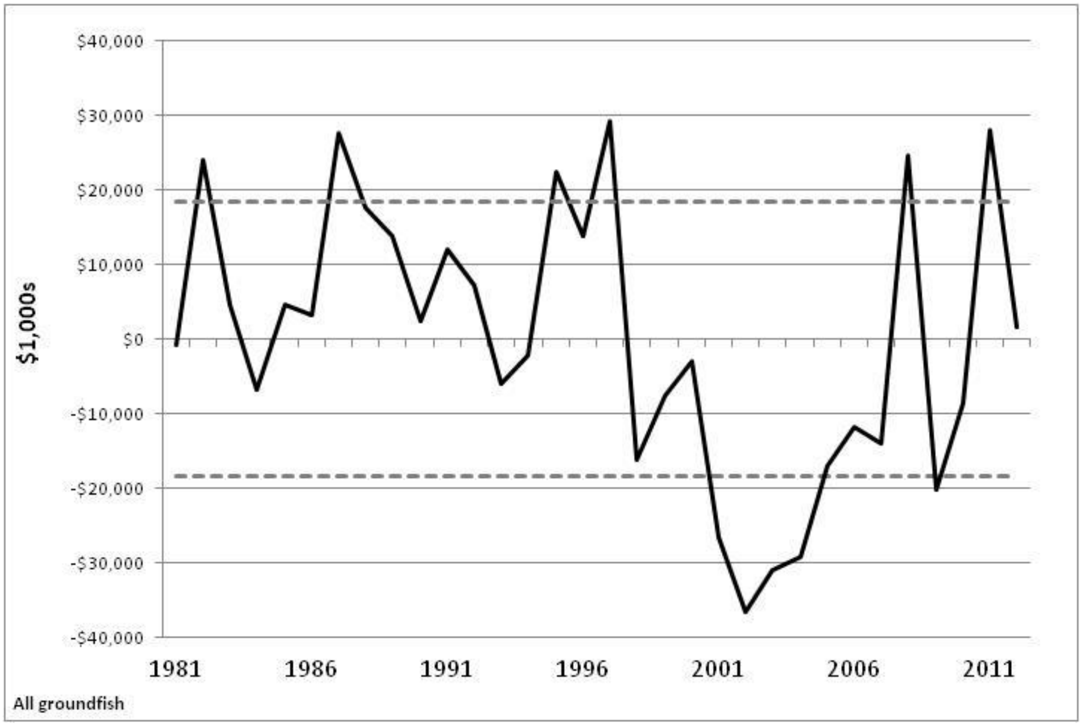


Figure 3-2. Deviation from long-term mean (1981 to 2012) for total groundfish ex-vessel revenue ($1,000s inflation adjusted, 2012). Dashed lines are +/- one standard deviation from the mean.

Table 3-6. 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.

	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**

Source: PacFIN vdrfd, 8/7/2013.

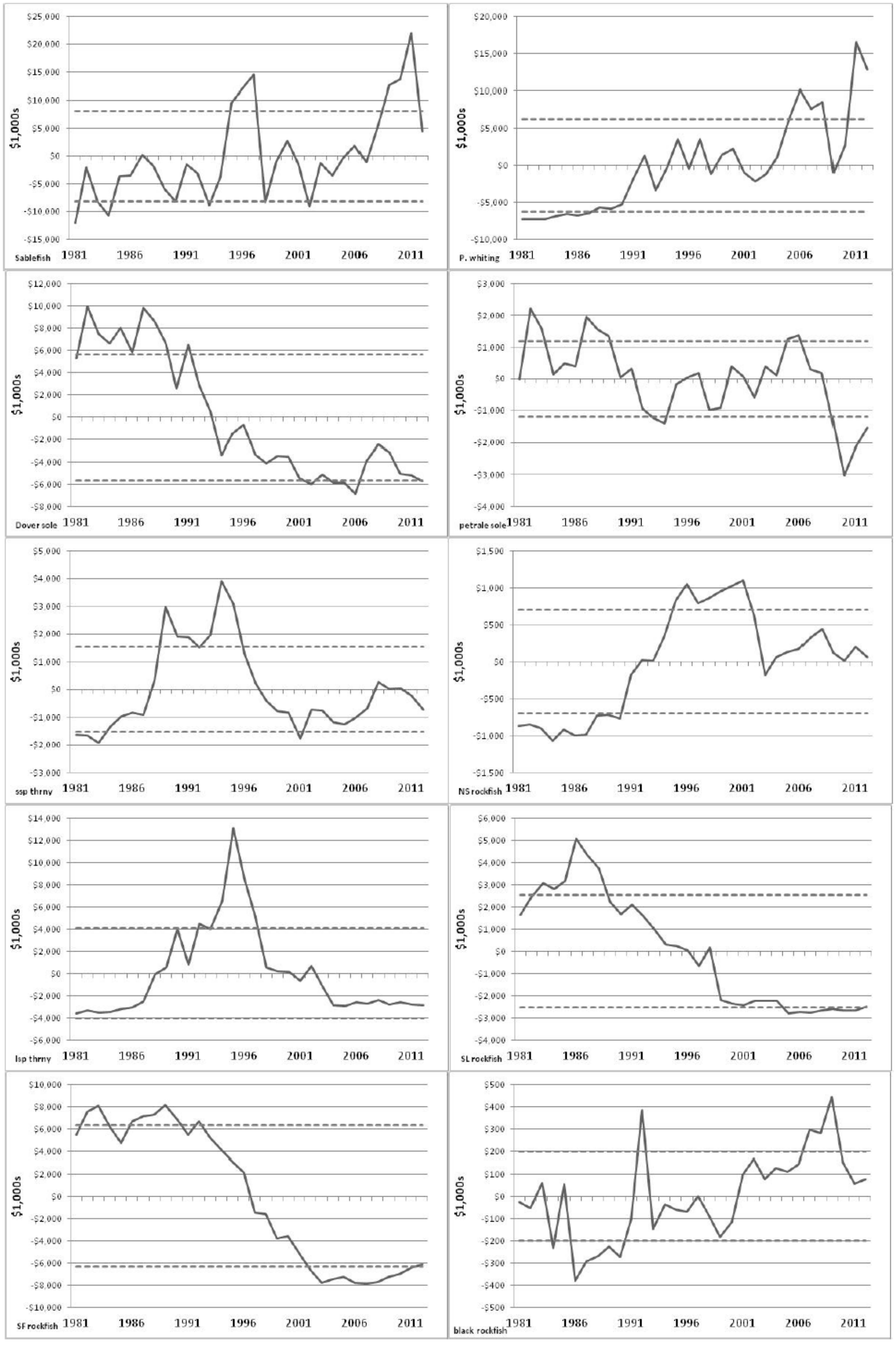


Figure 3-3. Deviation from long-term mean (1981 to 2012) of ex-vessel revenue ($1,000s, inflation adjusted, 2012) for selected groundfish species and groups. Dashed lines are +/- one standard deviation from the mean.

Table 3-7. Coefficient of variation for inflation-adjusted ex-vessel revenue for selected species and species groups by two time periods.

Species/Species\ Group	A 1981 to 2012 (long term)	B 2003 to 2012 (baseline)	B/A Ratio
Sablefish	0.341	0.268	0.788
Pacific 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

3.2.2 Revenue Trends in Commercial Groundfish Fishery Sectors

Fishery managers frequently view groundfish fisheries in terms of fishery sectors.[13] 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., an HG) or simply as an accounting mechanism to prevent ACLs from being exceeded. Section 4.2 describes the allocation schemes under consideration as part of the proposed action.

The characterization of commercial groundfish fisheries is presented in terms of the following fishery sectors:

- **Pacific whiting trawl** consists of at-sea and shoreside fisheries (which is a segment of the IFQ fishery, described below). The at-sea sector is subdivided between mothership processing vessels accepting fish from catcher boats and CP) vessels. The shoreside fishery delivers product to processing plants on land, with Westport and Ilwaco, Washington, and Astoria, Oregon, being the principal ports for shoreside landings.
- **The non-whiting trawl/shorebased 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 IFQ program. This fishery is now usually referred to as "shorebased IFQ," because an important feature of its management program is a relaxation on allowed gear types used by these permitted vessels. As a result, landings of sablefish by gear types other than trawl have emerged

[13] 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 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 that are landed in a West Coast port, are, thus, not included in the landings figures for these sectors.

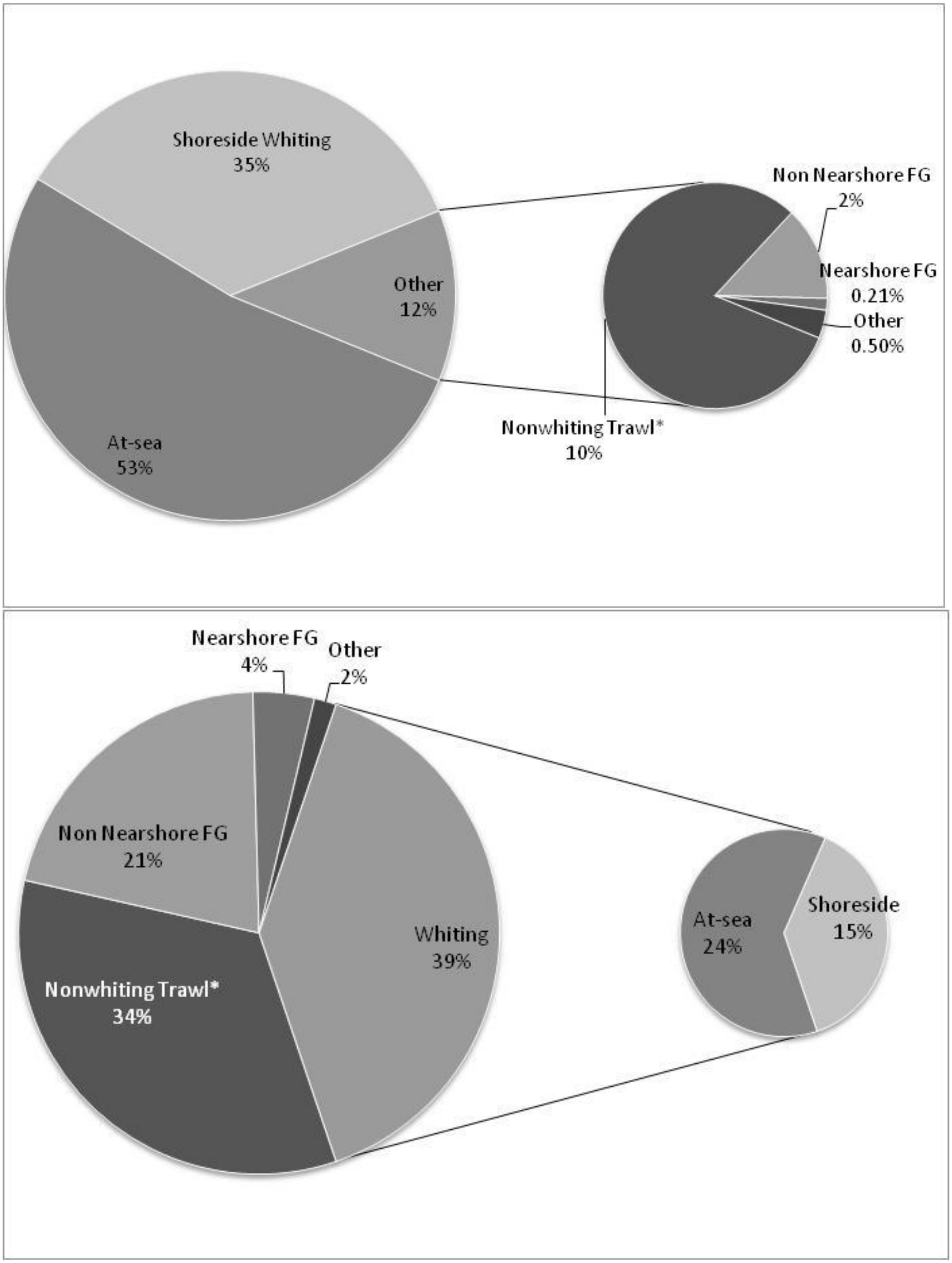
as an important part of the revenue earned by permitted vessels in this sector. In addition, midwater trawl is being used to target non-whiting species.

- **Fixed gear (longline and pot) fisheries** are divided between “limited entry” and “open access” from a regulatory standpoint, but fishery managers more commonly characterize a “non-nearshore” sector, which primarily targets sablefish, and a “nearshore” sector, which targets various nearshore groundfish species.
- **A variety of other sectors** have been characterized for the purpose of management and data presentation, but they account for a very small proportion of landings and revenue in aggregate.

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 to 2012 baseline period. Pacific whiting fisheries dominate in terms of landings, accounting for 88 percent of the total. Because whiting fetches a low price per pound, however, those sectors accounted for only 39 percent of inflation-adjusted, ex-vessel revenue. Shorebased IFQ accounts for the next largest share of landings and revenue, 10 percent and 34 percent, respectively. Fixed-gear landings fetch a relatively higher price, so, while those sectors accounted for only a little more than 2 percent of landings, they garnered a quarter of groundfish revenue, primarily in the non-nearshore sector that targets sablefish.[14]

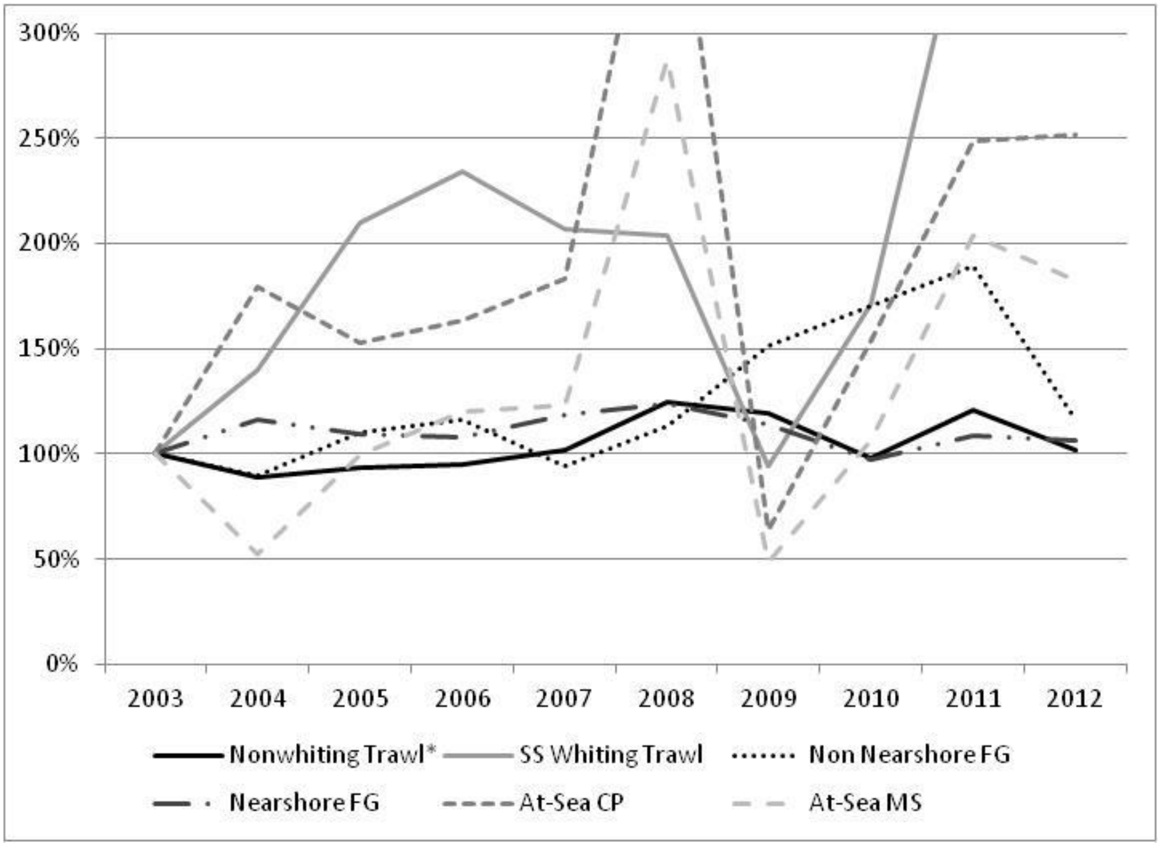
Figure 3-5 shows revenue trends for groundfish sectors over the baseline period. Revenues have been more stable for non-whiting sectors compared to whiting. One way of assessing variability is the coefficient of variation (the standard deviation divided by the mean). The values for the sectors (over 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 CPs: 0.503; at-sea mothership catcher vessels: 0.551.

[14] The dahl_sector column in the PacFIN vdrfd table is used to categorize landings and revenue by groundfish fishery sectors.



Source: *2011-2012 non-whiting trawl includes IFQ non-trawl landings (PFMC 2014, Tables 12a-b and 14a-b).

Figure 3-4. Share of groundfish landings (top) and inflation-adjusted, ex-vessel revenue (bottom) by fishery sector, 2003 to 2012.



. (Source: PFMC 2014 Tables 12b and 14b).

Figure 3-5. Ex-vessel revenue trends (inflation-adjusted, 2012, from groundfish only) for groundfish-fishery sectors, 2003 to 2013; 2003=100. *Non-whiting trawl includes non-trawl IFQ in 2011-2012. Value outside figure scale (>300 percent): 2008 at-sea CP whiting 408 percent, 2011 shoreside whiting 342 percent

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.[15] 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 percent to shoreside catcher vessels, 34 percent to the CPs, and 24 percent to mothership catcher vessels. Figure 3-6 shows the share of revenue among these sectors during the baseline period. There is a 4 percent difference between the allocation shares and revenue for CPs and shoreside catcher vessels, indicating that CP vessels have, on average, commanded a higher price for whiting deliveries or else harvested relatively more of their allocation. However, CP 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.

[15] 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 percent whiting are classified as part of the shoreside whiting fishery.

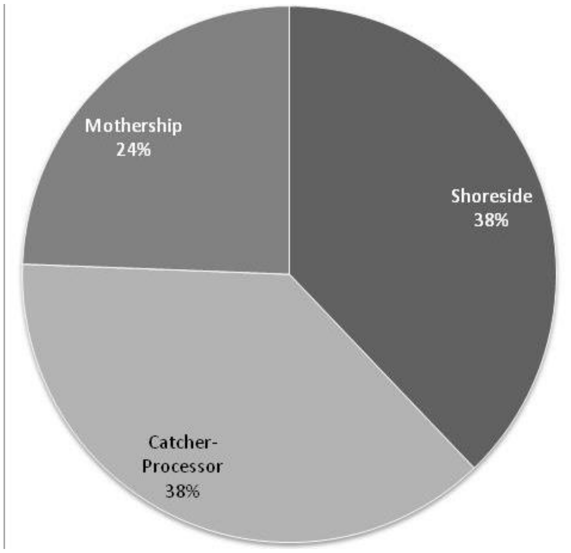
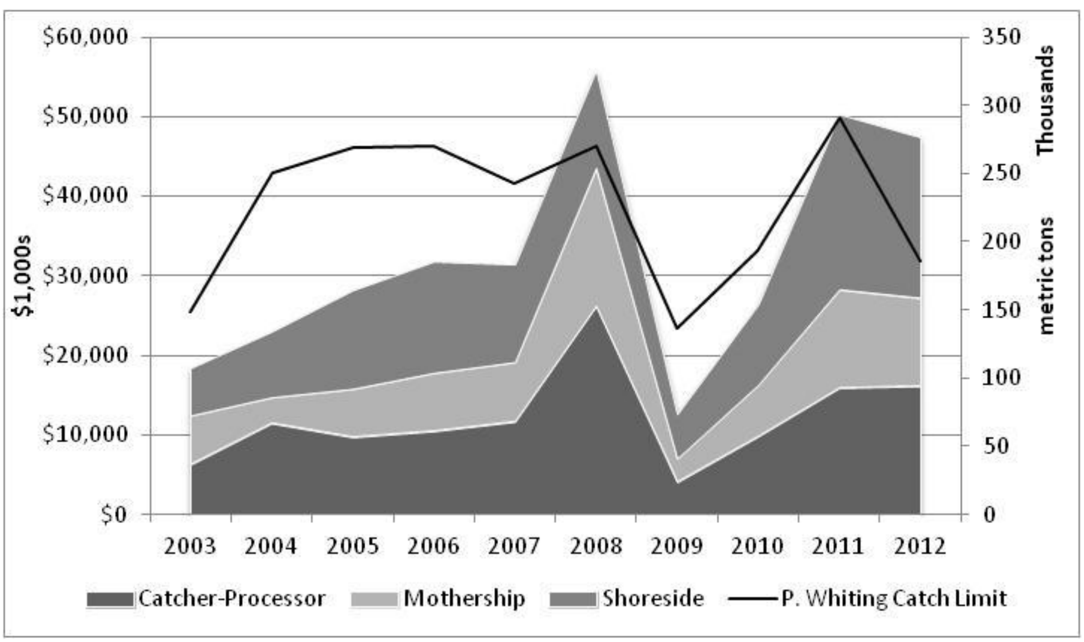


Figure 3-6. Share of inflation-adjusted (2012) ex-vessel revenue for unprocessed Pacific whiting by fishery sector, 2003 to 2012.

As noted above, whiting catch and revenue can vary considerably 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 ACLs (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.



Source: PFMC 2014, Table 14b and various groundfish harvest specifications EISs.

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 to 2012.

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 share 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 3-9 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 almost exclusively.

Table 3-10 compares the two segments with respect to the top-earning species, sablefish, for the period from 2009 to 2012, which brackets implementation of the shorebased IFQ program. As discussed above, 2011 was anomalous because of the historically high prices sablefish fetched. Perhaps partly due to this, in the latter 2 years, the non-trawl segment garnered 40 percent of the ex-vessel revenue from sablefish, even though they represent only about a third of the vessels in the fishery (Table 3-11). Another feature of the shorebased IFQ fishery highlighted by Table 3-11 is the specialization by gear type; only 4 to 5 percent of the participating vessels used both trawl and non-trawl in either 2011 or 2012.

Table 3-8. 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 to 2010, 2011-2012) and IFQ non-trawl fishery (2011-2012). For the non-trawl fishery Other Groundfish includes thornyheads.

	Trawl 2003 to 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%		
Pacific 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%

Source: PFMC 2014; Tables 4b and 5b.

Table 3-9. Landings, nominal revenue, and price-per-pound for sablefish in the trawl and non-trawl segments of the shorebased IFQ fishery, 2011-2012.

	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	

Source: PacFIN vdrfd 8/9/13

Table 3-10. Number of vessels participating in the IFQ fishery by type of gear used, 2011-2012.

Gear	2011	2012
Both	5	4
Trawl only	67	63
Non-trawl only	26	23
Total	**98**	**90**

Source: PacFIN vdrfd 8/9/13.

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 the need to rebuild overfished stocks resulted in increased management restrictions. Both the rebuilding of the widow rockfish stock and implementation of IFQ management have 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.

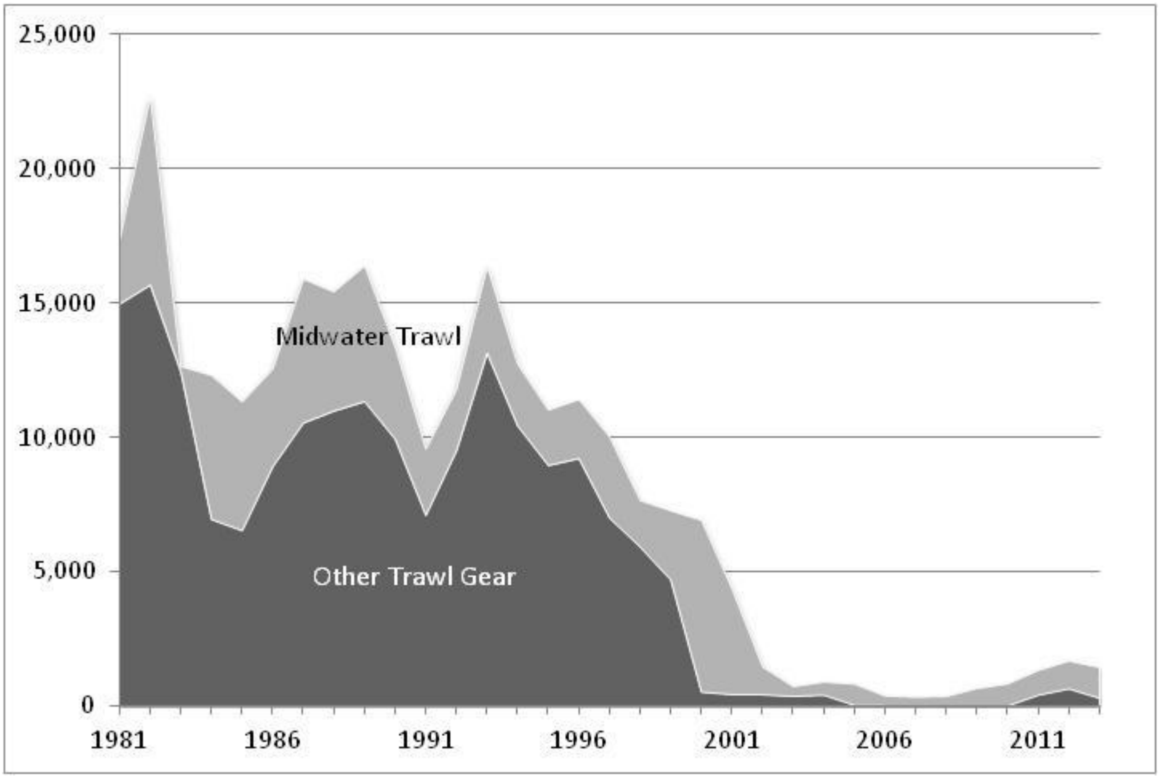


Figure 3-8. Landings of widow and yellowtail rockfish by trawl gear, 1981 to 2013

Figure 3-8 indicates an uptick in landings of these species since 2009. Looking more closely at the midwater fishery, Table 3-12 shows landings and revenue from trips in the commercial fishery where widow and yellowtail rockfish made up at least 50 percent 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 from 2011 to 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 landings were made up of other species.

Table 3-11. Landings and inflation adjusted revenue for trips with midwater trawl gear targeting widow/yellowtail, 2010 to 2013.

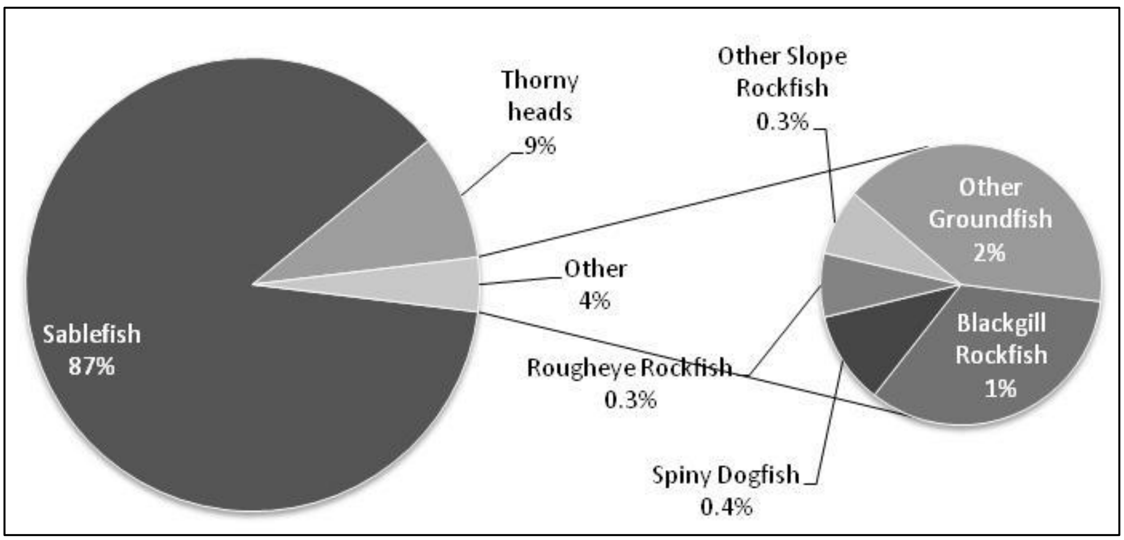
Species	2010		2011		2012		2013	
	MT	Dollars	MT	Dollars	MT	Dollars	MT	Dollars
Widow	**25**	**$22,103**	**12**	**$9,981**	**9**	**$9,547**	**214**	**$226,943**
Yellowtail	**166**	**$136,648**	**11**	**$13,421**	**239**	**$283,181**	**391**	**$415,777**
Pacific Whiting	**0**	**$0**	**11**	**$2,522**	**9**	**$1,291**	**11**	**$1**
Other	**24**	**$1,546**	**<1**	**$145**	**5**	**$2,606**	**5**	**$3,874**

Source: PacFIN vdrfd 3/18/2014.

3.2.2.3 Non-nearshore Fixed Gear Fishery

The non-nearshore, fixed-gear fishery consists 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.[16] Vessels with Federal limited entry permits accounted for 77 percent of overall inflation-adjusted revenue from sablefish during the baseline period, even though open-access vessels accounted for 68 percent 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, accounts for the remainder of groundfish landings and revenue.

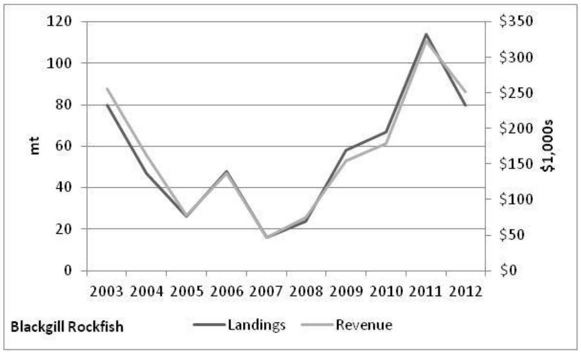


Source: PacFIN vdrfd 8/14/13.

Figure 3-9. Non-nearshore, fixed gear, ex-vessel revenue by groundfish species or species group in inflation-adjusted (2012) dollars, $1,000s, 2003 to 2012.

Blackgill rockfish and spiny dogfish have been of particular interest to fishery managers over stock conservation concerns. Tables 8a and 8b in the 2014 Groundfish SAFE (PFMC 2014) provide landings and revenue data for species important in the non-nearshore 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 the figures for spiny dogfish 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 were reduced for blackgill rockfish. Preliminary PacFIN data (vdrfd table, 3/19/2014) show that 16 mt valued at $50,000 were landed in 2013, a substantial decline from the peak in 2011.

[16] Although a distinction is made for data and management between trips targeting sablefish and trips where sablefish are not landed (implying some other target), during the baseline period 97 percent of revenue was earned on sablefish-targeted trips.



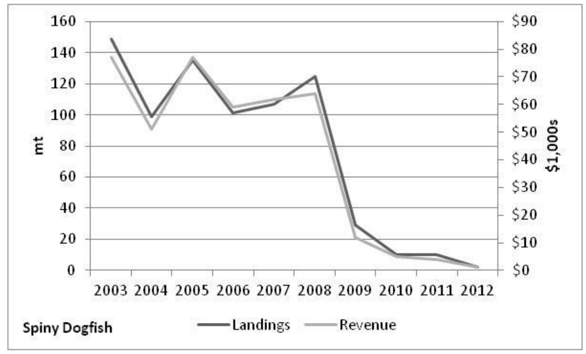


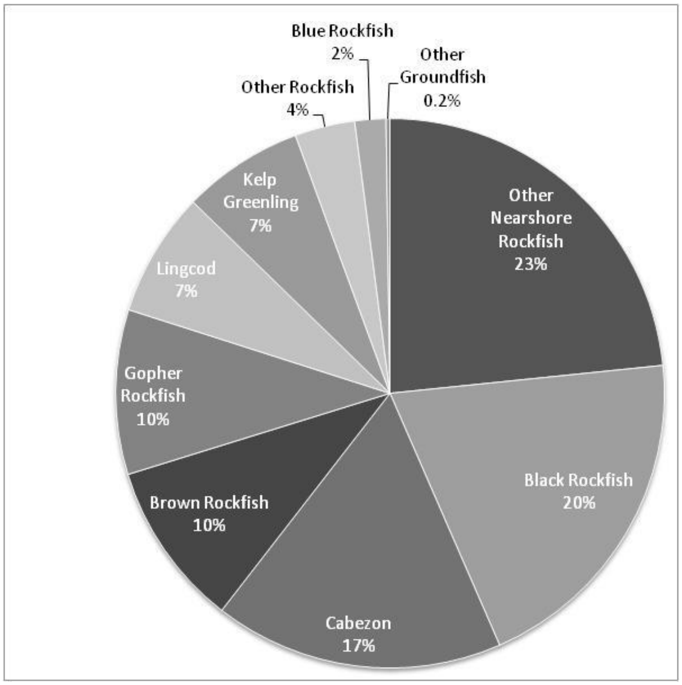
Figure 3-10. Landings and revenue (inflation adjusted, 2012) for blackgill rockfish (left) and spiny dogfish (right) in the non-nearshore fixed fishery.

3.2.2.4 Nearshore Fixed Gear Fishery

Although the nearshore fixed gear fishery accounted for less than 0.5 percent of coastwide groundfish landings during the baseline period, it garnered 5 percent 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 3.2.8.

Figure 3-11 shows the distribution of revenue for the nearshore fixed gear fishery 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 for almost three-quarters of the revenue, a diverse array of other rockfish species is also caught and makes up the balance of the landings (Table 3-13). Although a few species account for a majority of landings, a wide range of rockfish species is landed as indicated by the list of species listed in Table 3-13 for the remaining 5 percent.[17]

[17] The names in this table are from the CNAME column associated with PacFIN species identification codes (SPID), which include species and various market categories. Species composition adjustments are applied in generating the PacFIN vdrfd table.



Source: PFMC 2014, Table 9b.

Figure 3-11. Nearshore, fixed gear, ex-vessel revenue by groundfish species or species group in inflation-adjusted (2012) dollars, $1,000s, 2003 to 2012. SAFE.

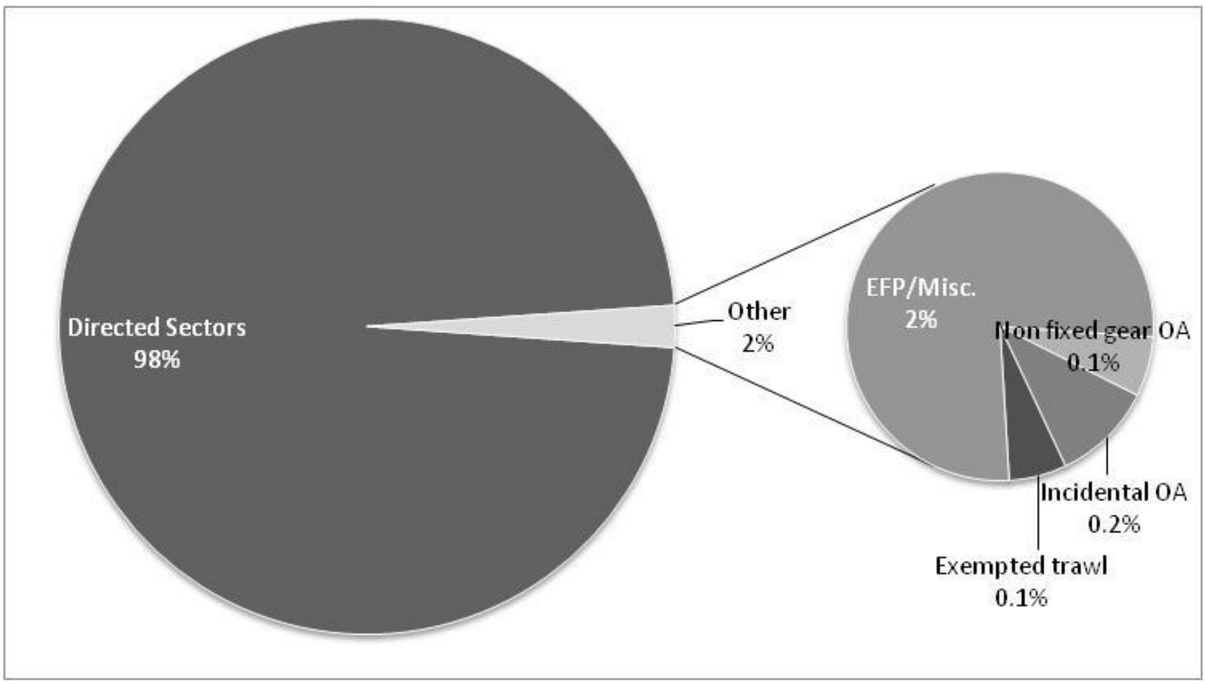
Table 3-13. Rockfish species specified as "Other Nearshore Rockfish" in SAFE Table 9b and proportion of landings in this category, 2003 to 2012.

PacFIN Species	Pct. Of Landings
Vermilion Rockfish	59.66%
California Scorpionfish	10.22%
Yellowtail Rockfish	8.71%
BOCACCIO	4.28%
Unsp. Reds Rockfish	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. Small Reds Rockfish, Speckled Rockfish, Mexican Rockfish, Unsp. Slope Rockfish, Nor. Unsp. Shelf Rockfish, Splitnose Rockfish, Unsp. Rosefish Rockfish, 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	4.91%
Total	**100%**

Source: vdrfd 8/15/13, based on procedure for SAFE Table 9b.

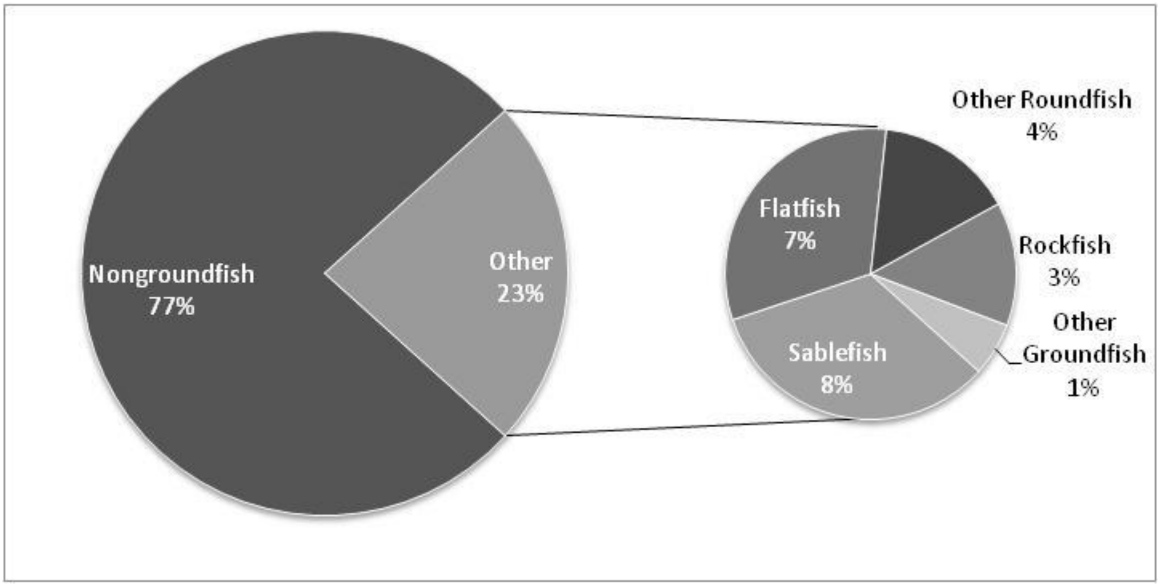
3.2.2.5 Other Commercial Fisheries Catching Groundfish

Groundfish are caught in a variety of other circumstances including by vessels targeting them with gear types other than trawl or fixed gear, fisheries for species other than groundfish that catch groundfish incidentally (referred to by managers as the "incidental open access sector" and the "exempted trawl sector"), vessels targeting groundfish pursuant to an extended fishing permit (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 percent of inflation-adjusted groundfish ex-vessel revenue during the baseline period. This catch can, however, 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 comes from species other than groundfish, which is expected since most of the sectors discussed here are not targeting groundfish.



Source: vdrfd 8/15/13.

Figure 3-12. Share of inflation-adjusted, ex-vessel revenue (2012) from non-fixed gear open access incidental, and other minor sectors, 2003 to 2012.



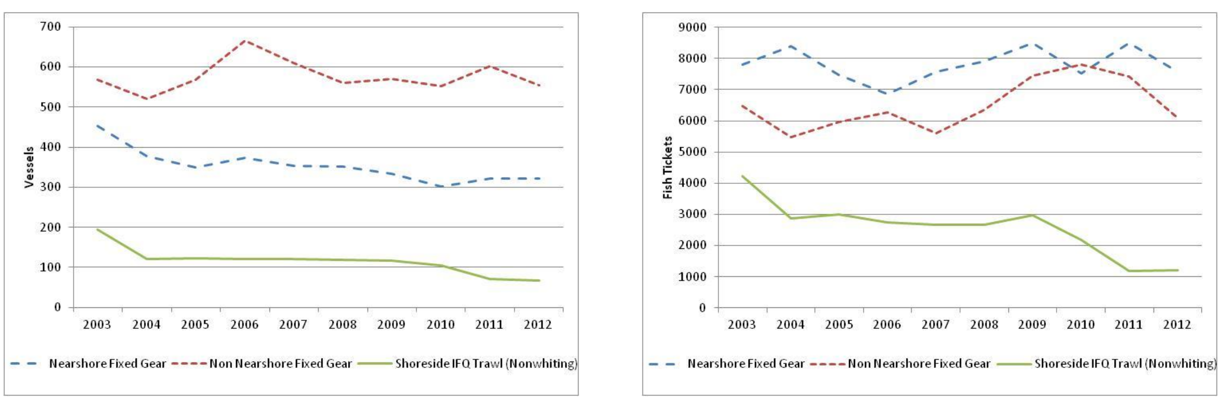
Source: vdrfd 8/23/13 based on procedure for Table 10a-b in the 2014 Groundfish SAFE (PFMC 2014).

Figure 3-13. Inflation-adjusted, ex-vessel revenue by species composition from non-target and other miscellaneous groundfish sectors, 2003 to 2012.

3.2.3 Participation Trends in Commercial Groundfish Fisheries

Source: PacFIN vdrfd 05/04/14.

Figure 3-14Figure 3-14 shows annual counts of vessels (based on vessel identification [ID]) and landings (based on fish ticket ID) for the nearshore and non-nearshore fixed gear sectors and the non-whiting IFQ trawl sector during the baseline period. Participation in the nearshore fishery and trawl fisheries declined over the baseline period, while non-nearshore participation remained relatively stable. In the nearshore fishery, 453 vessels made landings in 2003, declining to 321 vessels in 2012. However, the annual number of landings in the nearshore fishery has remained fairly stable. The IFQ trawl fishery saw steep declines in 2004 (due to the vessel buyback program) and 2011 (likely a result of the implementation of IFQ management) in both vessel participation and the number of landings. The non-nearshore fixed fishery has remained fairly stable with respect to both metrics.



Source: PacFIN vdrfd 05/04/14.

Figure 3-14. Number of vessels (left) and landings (right) by sector, 2003 to 2012.

3.2.4 Tribal Groundfish Fisheries

Past Groundfish Harvest Specifications EISs, including the 2013–2014 FEIS, describe tribal fisheries. 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 or not they are formally allocated, tribal catches are accounted for through set-asides, which are deducted along with certain other sources of catch to determine the fishery harvest guideline, the overall limit to which the commercial and recreational fisheries are managed.

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, described below, are 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 to 2012 period at 70 percent, followed by bottom trawl, accounting for 28 percent (PFMC 2014; Table 13b). In the hook-and-line fishery, 97 percent 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 percent, followed by Pacific cod, petrale sole, Dover sole, and sablefish. Together, these species accounted for 84 percent of baseline period tribal non-whiting sector revenue for trawl gear.

While all four coastal tribes have longline fleets, only the Makah Tribe currently has a trawl fleet. The Makah Tribe’s trawl fleet has declined 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. Makah trawl fisheries pursue two basic strategies—bottom trawl and midwater trawl.

In an agreement with NMFS and the Council, the Makah Tribe has had an observer program in place since 2003 to monitor maximum retention. Maximum retention is defined as retention of all marketable species and all overfished species. The program has a target observation rate of approximately 15 percent of all trawl trips in a given year, though recent staffing issues and fishing patterns have made that difficult to achieve across both midwater and bottom trawl strategies in all years. For example, there were insufficient observations to conduct an analysis on 2011 bottom trawl fisheries. Likewise, there was not enough effort in 2013 midwater trawl to conduct an analysis due to confidentiality requirements, and the bottom trawl coverage was similar to 2011 levels. However, for 2011 and 2012 midwater and 2012 bottom trawl, coverage was above target levels (i.e., 45.7 percent, 24.4 percent, and 23 percent, respectively). As such, the analysis here is conducted for midwater trawl in 2011 and both midwater and bottom trawl in 2012. Prior years’ analyses can be found in past Specifications and Management Measures EISs.

Management of the Makah trawl fishery is focused on avoidance of canary rockfish (an overfished species) in both strategies and widow rockfish in midwater trawls. Makah Fisheries Management combines the tribe's maximum retention policy with an observer program to verify the accuracy of bycatch accounting (i.e., if observed bycatch rates are not substantially different than unobserved bycatch rates, managers are reasonably certain that landings reflect total mortality for overfished species).

For 2012, comparisons of bycatch rates in observed versus unobserved landings were conducted for bottom trawl to test for differences in retention of canary rockfish (Table 3-14 and Table 3-15). Separate analyses (*t* tests) were performed for vessels that carried an observer and all vessels combined (i.e., including those vessels that had no observer coverage during the year). Bycatch rates were also compared for three separate target strategies in bottom trawl (these are labeled "flatfish," "deep," and "Pacific cod") in addition to examining all targets combined to examine whether bycatch was more prevalent in one strategy than the other. The flatfish strategy was defined as trips that focused on the most predominantly targeted flatfishes: Dover, English, and petrale soles. The deep strategy focused on landings composed mostly of Dover sole, shortspine thornyhead, and skates. The Pacific cod strategy was defined as trips where that was the predominant species landed. Two-tailed *t* tests found no significant difference between observed and unobserved trips for vessels that carried an observer during the year. Likewise, no significant difference was measured between all observed and unobserved trips. Bycatch was not predominantly associated with a particular target strategy for bottom trawl in 2012.

Midwater trawl fisheries were similarly analyzed for differences in retention of both canary and widow rockfish (either of which may be constraining), as a proportion of target species (i.e., yellowtail and redstriped rockfish). Two-tailed paired *t* tests were conducted for both 2011 and 2012 since all vessels carried an observer during each year (Table 3-16 and 3-17). No significant differences were found between observed versus unobserved landings for either canary or widow rockfish in either year.

Table 3-14. Comparisons of canary rockfish bycatch rates (measured as pounds of canary rockfish divided by pounds of target category) for bottom trawl vessels that carried an observer at least once during 2012.

Year	Target Species	Mean Bycatch Rates		d.f.	*t*	*p*
		Observed	Unobserved			
2012	Flatfish	0.005601	0.003717	4	0.791121	0.47314
	Deep	0.043549	0.009598	4	1.178613	0.303876
	Pacific cod	0.01196	0.005157	4	1.185394	0.301471
	All Targets	0.003403	0.001557	4	1.474319	0.21441

Table 3-15. Comparisons of canary rockfish bycatch rates (measured as pounds of canary rockfish divided by pounds of target category) for all observed and unobserved bottom trawl vessels in 2012.

Year	Target Species	Mean Bycatch Rates		d.f.	*t*	*p*
		Observed	Unobserved			
2012	Flatfish	0.003501	0.003239	9	0.134277	0.896138
	Deep	0.027218	0.014679	9	0.592772	0.567927
	Pacific cod	0.007475	0.004036	8	0.820329	0.435787
	All Targets	0.001575	0.001215	9	0.431581	0.6762

Table 3-16. Comparisons of canary and widow rockfish bycatch rates (measured as pounds of bycatch divided by pounds of yellowtail plus redstriped) for midwater trawl vessels in 2011.

Year	Species	Mean Bycatch Rates		d.f.	*t*	*p*
		Observed	Unobserved			
2011	Canary	0.00336	0.003418	2	-0.04048	0.971386
	Widow	0.12773	0.10101	2	1.526941	0.26633

Table 3-17. Comparisons of canary and widow rockfish bycatch rates (measured as pounds of bycatch divided by pounds of yellowtail + redstriped) for midwater trawl vessels in 2012.

Year	Species	Mean Bycatch Rates		d.f.	*t*	*p*
		Observed	Unobserved			
2012	Canary	0.004668	0.001495	2	2.347229	0.143455
	Widow	0.130594	0.091766	2	0.710896	0.550872

3.2.5 Recreational Fisheries

Recreational fisheries are an important part of fishery-related economic activity. Because recreational catch is not sold, however, 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 economic impacts from recreational fishing activities.

Recreational fisheries are broadly subdivided between private anglers and commercial passenger fishing vessels, commonly referred to as charter vessels. Private anglers fish from shore or from their own boats, while charter vessels take paying passengers.

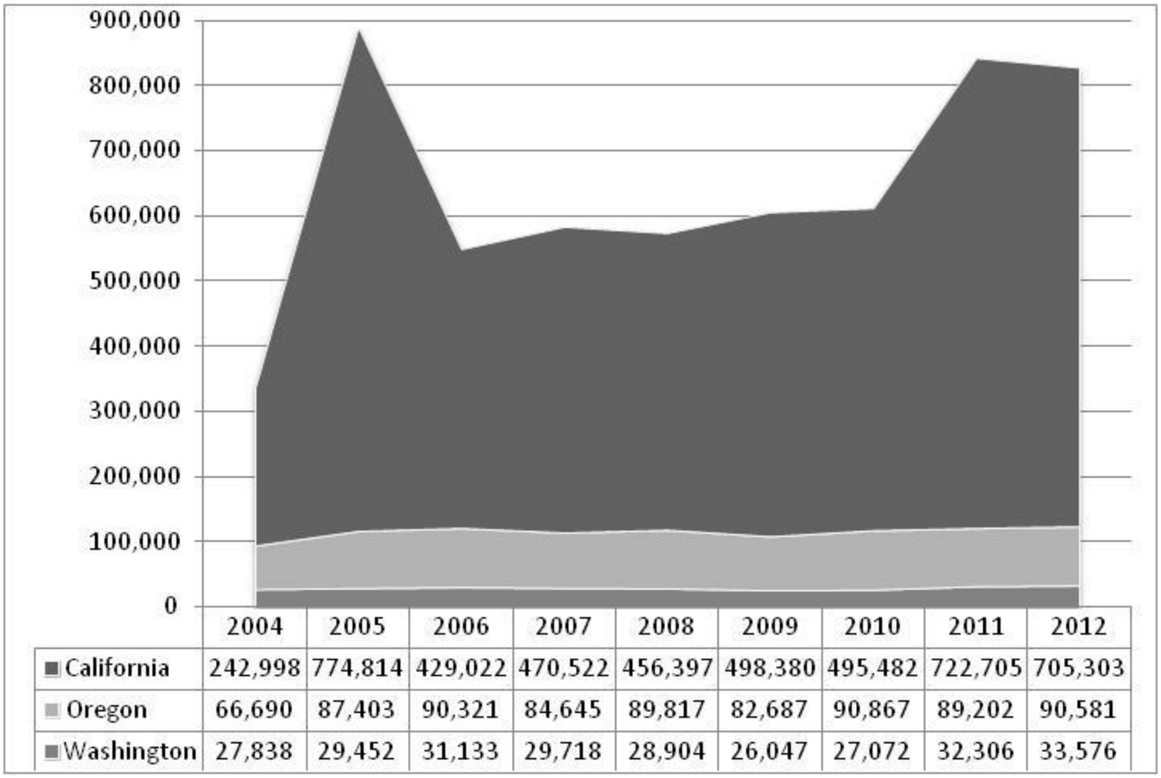
Table 3-18 shows bottomfish/halibut angler trips compared to trips targeting other species.[18] Overall, private and charter trips, which are subject to management measures described in this EIS, comprise 19 percent of all trips. Figure 3-15 shows bottomfish/halibut trips by state and year, and Figure 3-16 shows the distribution of these trips by port area. Overall, the number of angler trips has shown a 77 percent increase over the 2004 to 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 3-18. Total Angler trips by type and mode, 2004-2012.

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%)

Source: GMT state reps.

[18] 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 from 2004 to 2012, because 2003 data are incomplete.



	2004	2005	2006	2007	2008	2009	2010	2011	2012
California	242,998	774,814	429,022	470,522	456,397	498,380	495,482	722,705	705,303
Oregon	66,690	87,403	90,321	84,645	89,817	82,687	90,867	89,202	90,581
Washington	27,838	29,452	31,133	29,718	28,904	26,047	27,072	32,306	33,576

Figure 3-15. Bottomfish plus Pacific halibut marine angler boat trips by state, 2004 to 2012.

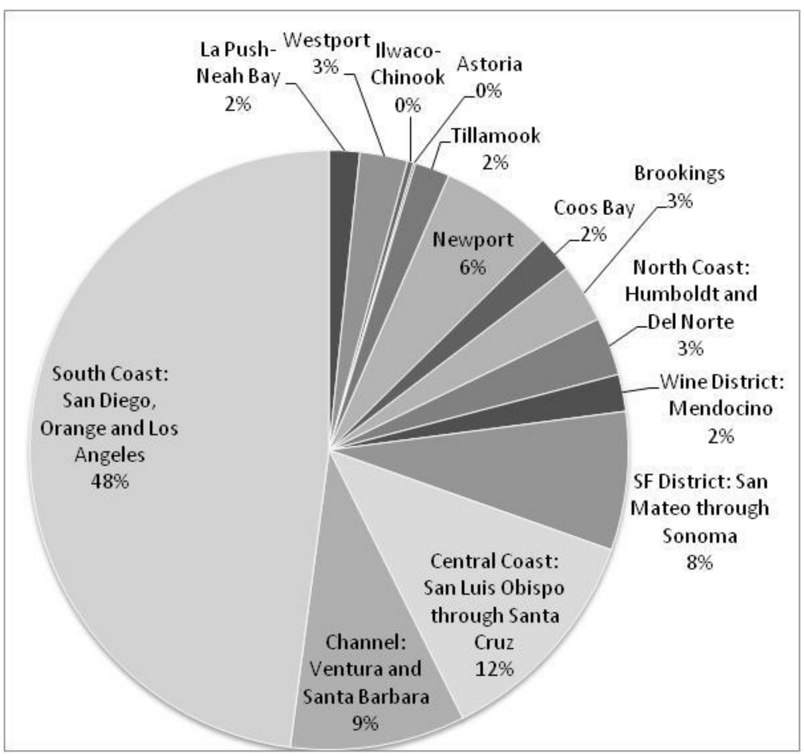
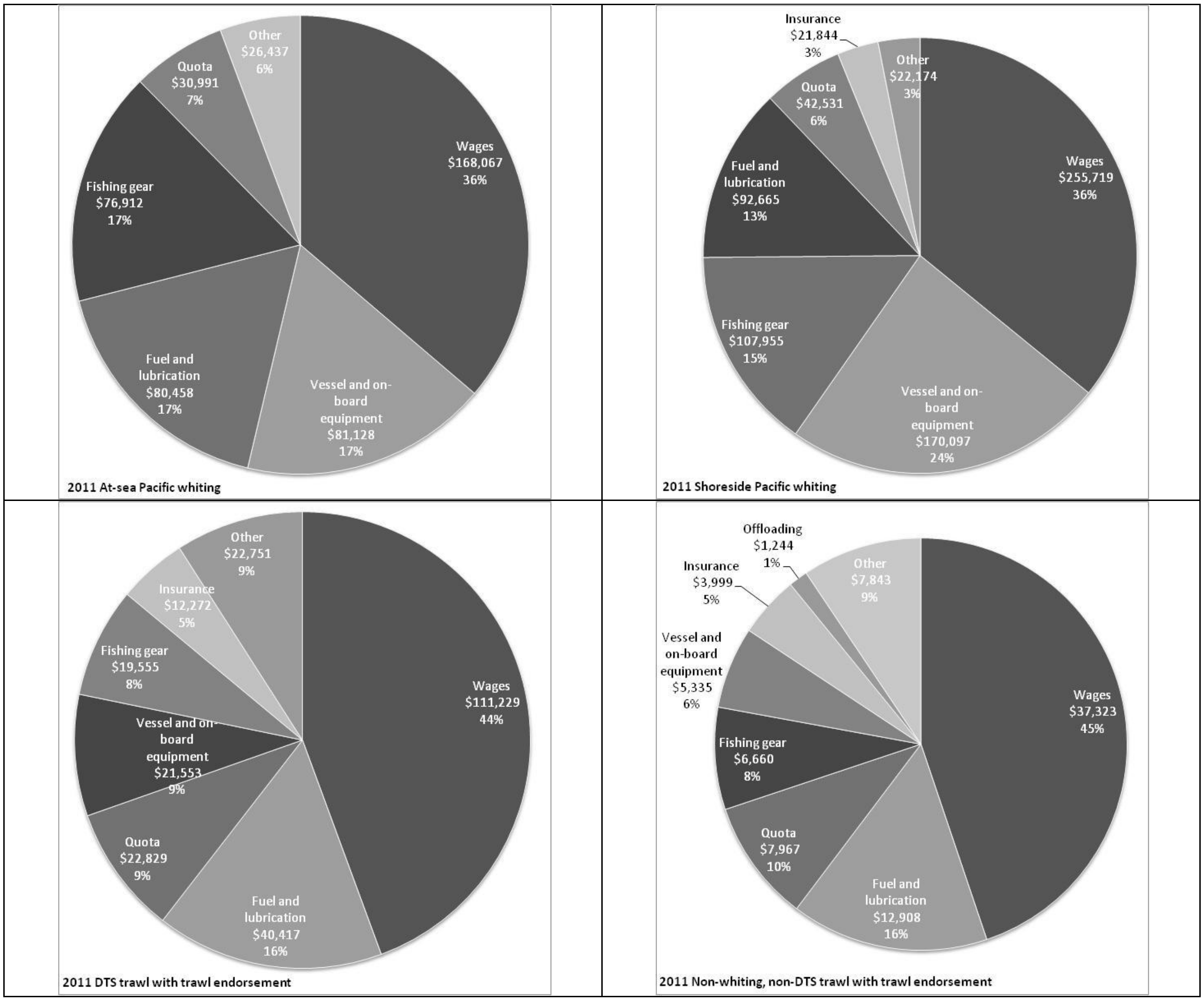


Figure 3-16. Bottomfish plus Pacific halibut marine angler boat trips by reporting area, from 2004 to 2012.

3.2.6 Costs in Commercial Groundfish Fisheries

Figure 3-17 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 groundfish trawl fishery to a catch share (IFQs, co-ops) program.



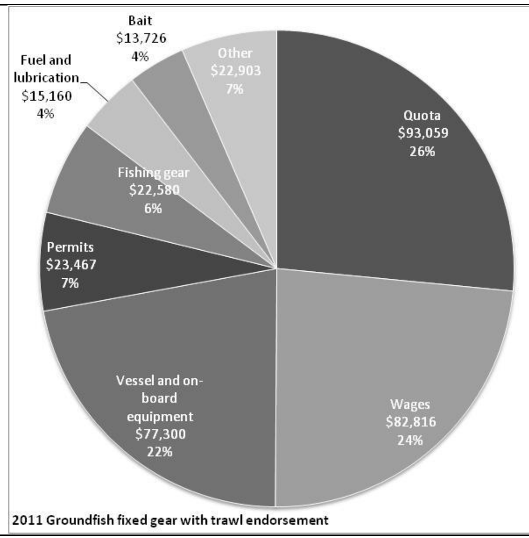


Figure 3-17. Estimated costs in different segments of the trawl fishery.

3.2.7 Buyers and Processors

Table 3-19 and Table 3-20 show the geographic and sector distribution of first receivers based on the processor ID field in the PacFIN database. 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 percent, both for those accepting groundfish and those accepting any species. From a sector perspective, the greatest 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 3-12. Count of first receivers (based on processor ID) that accepted groundfish and total number (accepting any species) by state and coastwide, 2003 to 2012.

	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

Source: vdrfd 8/29/13.

Table 3-13. Count of first receivers (based on processor ID) that accepted groundfish, by major groundfish fishery sector, 2003 to 2012.

Groundfish Fishery Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Shorebased 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
Shorebased 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

Source: vdrfd 8/29/13.

Table 3-21 shows the distribution of first receivers of groundfish with respect to purchase amounts over the entire 2003 to 2012 baseline period. Note that the bin intervals are logarithmic, emphasizing the highly skewed distribution of purchases. While 91 percent of first receivers purchased $1,000 or less over the period, they accounted for less than 0.1 percent of total purchases during the baseline period. At the end of the scale, only 5 percent of first receivers recorded total purchase amounts of $1 million or more, but accounted for 94 percent of total purchases.

Table 3-14. Distribution of groundfish first receivers (by ID) by total purchase amount (nominal dollars), 2003 to 2012.

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%

Source: vdrfd 3/19/2014.

3.2.8 Fishing Communities

As in the Proposed Harvest Specifications and Management Measures for the 2013-2014 Pacific Coast Groundfish Fishery and Amendment 21-2 to the Pacific Coast Fishery Management Plan (PFMC and NMFS 2012), fishing communities are described below in terms of landings by Input-output Model for West Coast Fisheries (IOPAC) port group. See Table 9 in the NOAA Technical Memorandum NMFS-Northwest Fisheries Science Center (NWFSC)-111 for ports included in these port groups. IOPAC is used to evaluate personal income impacts of proposed management measures.

The 18 port groups used in IOPAC are as follows:

Washington State:

1. Puget Sound
2. North Washington Coast
3. South and Central Washington Coast (SCWC)

Oregon:

4. Astoria (and other Columbia River ports in Oregon)
5. Tillamook
6. Newport
7. Coos Bay
8. Brookings

California[19]:

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)

Fisher characteristics of these port groups are shown in Table 3-22 and Table 3-26. Port groups (and, as applicable, California recreational reporting regions) are also used to organize the evaluation of impacts to fishing communities in Chapter 4.

3.2.8.1 Dependence and Engagement in Groundfish Fisheries

Table 23 in the 2014 Groundfish SAFE document (PFMC 2014) presents values for community engagement and dependence on commercial groundfish fisheries. For purposes of this EIS, engagement is defined as groundfish ex-vessel revenue in the port as a percent of coastwide groundfish ex-vessel revenue for the 2003 to 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 by 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 3-22 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), the SCWC, 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 SCWC port group to Fort Bragg, California. The non-nearshore fixed gear fishery is important in central and southern California and the Puget Sound region. The North Washington Coast port group includes ports in the Straits of Juan de Fuca at the entrance to Puget Sound.

[19] The regions noted in parentheses show the approximate correlation between port groups and California State reporting regions for recreational fisheries.

Table 3-15. Commercial fishery engagement and dependence scores and rank, primary and secondary fisheries, for the 2003 to 2012 baseline period for each port group. Figures are 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 Washington coast	6.6%	5	44.7%	2	Non-nearshore Fixed Gear	Shoreside Non-whiting Trawl*
South and central Washington 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 3-23 shows engagement and dependence values for recreational fisheries. While the central and southern California regions dominate in terms of engagement in recreational groundfish fisheries, some more northerly regions—such as Brookings, Newport, and La Push-Neah Bay—depend highly on groundfish targeted trips.

Table 3-16. Recreational fishery engagement and dependence scores and rank for the 2003 to 2012 baseline period.

Region	Engagement	Engagement Rank	Dependence	Dependence Rank
La Push-Neah Bay	2%	12	49%	6
Westport	3%	8	32%	12
Ilwaco-Chinook	0%	13	3%	14
Astoria	0%	14	7%	13
Tillamook	2%	11	39%	9
Newport	6%	5	62%	2
Coos Bay	2%	10	35%	11
Brookings	3%	6	62%	3
North Coast: Humboldt and Del Norte	3%	7	44%	8
Wine District: Mendocino	2%	9	36%	10
SF District: San Mateo through Sonoma	7%	4	45%	7
Central Coast: San Luis Obispo through Santa Cruz	12%	2	61%	4
Channel: Ventura and Santa Barbara	9%	3	69%	1
South Coast: San Diego, Orange, and Los Angeles	48%	1	52%	5

Table 3-24 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 SCWC 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. Non-nearshore fixed gear fisheries are also important in these three ports, as evidenced by the primary and secondary fisheries identified in Table 3-22. Table 3-24 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 percent and 70 percent respectively (for nearshore fishery sectors, the top two ports alone account for 58 percent of coastwide sector revenue).

Table 3-17. Top-ranked ports by groundfish fishery sector, based on inflation-adjusted, ex-vessel revenue 2003 to 2012. The percent share of coastwide sector revenue for the entire baseline period is shown in parenthesis, and the total share is accounted for by the three top-ranked ports in each category, shown in the bottom row.

	Whiting Trawl	Non-whiting Trawl*	Non-nearshore	Nearshore
1	Newport (33%)	Astoria (28%)	Newport (15%)	Morro Bay (31%)
2	South & Central Washington Coast (31%)	Coos Bay (13%)	South & Central Washington Coast (11%)	Brookings (27%)
3	Astoria (30%)	Newport (12%)	Puget Sound (9%)	Crescent City (12%)
Total share:	94%	53%	35%	70%

*Includes the non-trawl IFQ sector in 2011-2012.
Source: vdrfd 8/27/13, based on method used for data in the 2014 Groundfish SAFE Table 20.

The rankings and shares shown in Table 3-24 are also consistent with the use of the Gini coefficient in the 2013-2014 Groundfish Harvest Specifications EIS to summarize the uniformity of the distribution of groundfish ex-vessel revenue across sectors and ports.[20] Using this statistic, the shoreside whiting trawl sector is the most concentrated with respect to distribution across ports. Relatively few ports have any shoreside whiting sector landings at all. The nearshore sector ranks second. Table 3-25 repeats the across-port evaluation included in the 2013–14 Groundfish Harvest Specifications EIS using inflation-adjusted, ex-vessel revenue for the baseline period and the fishery sectors listed in Table 3-24 (except that the non-whiting trawl and the 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).

Table 3-18. Distribution of ex-vessel revenue among commercial groundfish fishery sectors within port groups, 2003 to 2012, using the 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

[20]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 would indicate 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 Groundfish 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.

Figure 3-18 contains panels showing trends in top-ranked ports' share of revenue during the baseline period for each major fishery sector listed in Table 3-24. 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 percent indicate the share is higher than in 2003, while values below 100 percent indicate the share is lower 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 percent from its 2003 share of coastwide sector revenue. At 12 percent 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 percent of coastwide sector revenue. While Newport's share of revenue declined over the baseline period, Astoria and the SCWC (essentially, Westport and the port of Ilwaco) show an inverse correlation in revenue changes. In 2009, for example, Astoria's share increased, while SCWC's share decreased, while the reverse is true in 2010. 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 percent of coastwide sector revenue in 2005 to 27 percent 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 3-19 displays data used for Table 3-24 and Figure 3-18 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 percent of coastwide revenue.

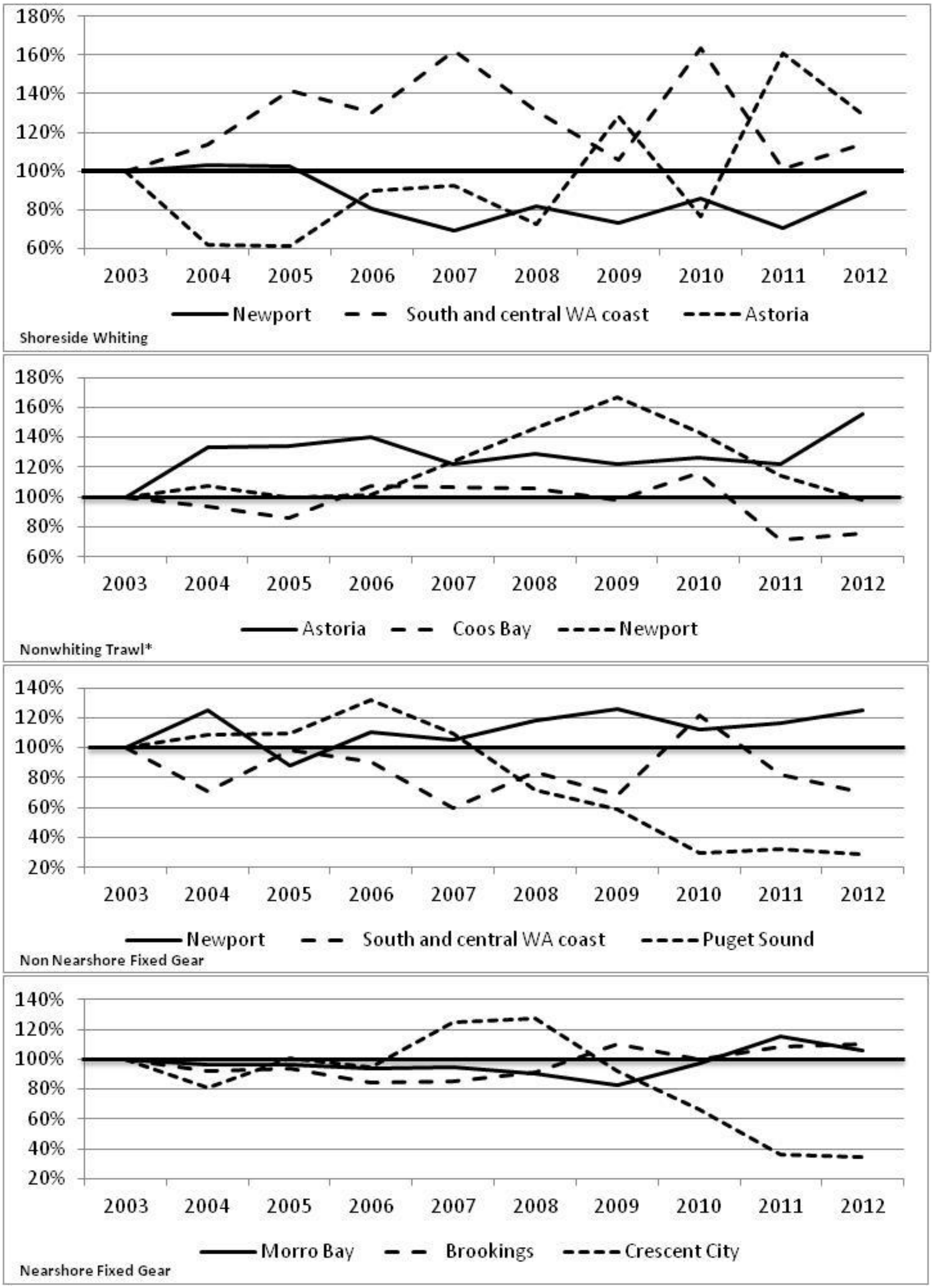


Figure 3-18. Trends in top-ranked ports' share of inflation-adjusted ex-vessel revenue by fishery sector. (2003=100%). *Non-whiting trawl includes non-trawl IFQ sector landings in 2011 and 2012.

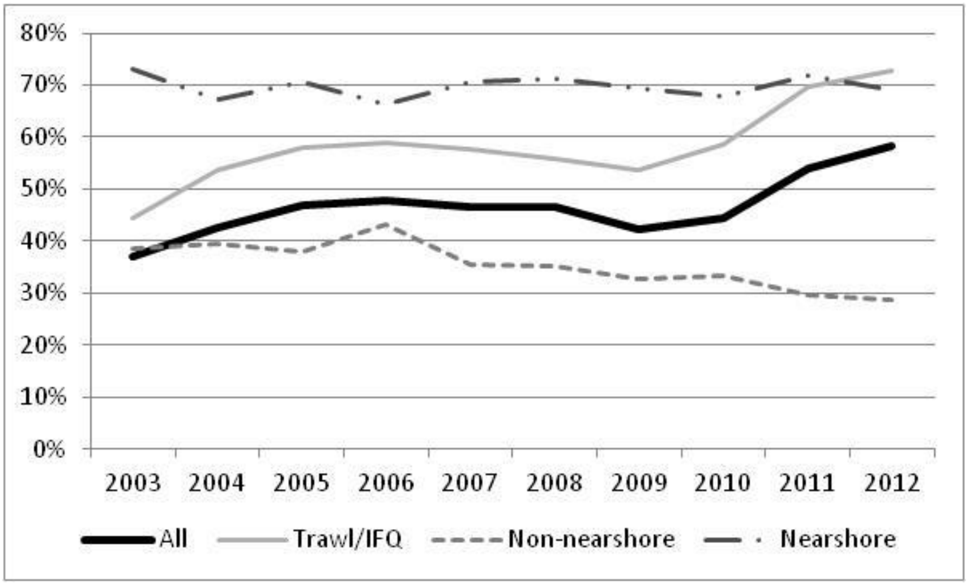


Figure 3-19. Share of inflation adjusted ex-vessel revenue for top three ranked ports for all sectors and selected fishery sectors, 2003 to 2012.

3.2.8.2 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. 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;…."

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.[21] While the 2007-2008 EIS used ports, the 2011-2012 and 2013–2014 EIS analyses used counties as the unit of analysis. Beginning with the 2013–2014 EIS, a social vulnerability index prepared by the Hazards and Vulnerability Research Institute at the University of South Carolina was used in place of resiliency scores developed specifically for the EIS analysis. The use of this index is carried forward, using an updated version available from the Institute's

[21] 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). 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. 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, there are not statistically meaningful differences in demographic characteristics even at the county level (given the margin of error in sample data) between adjacent counties. Therefore, attempting a vulnerability analysis at a finer scale may be misleading.

website (the SoVI® 2006-10 Index).[22] 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.[23]

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 ranked 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 3-26, are based on inflation-adjusted, ex-vessel revenue during the 2003 to 2012 baseline period. Table 3-26 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 3-27 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 3-28, along with the scaled, population-adjusted SoVI scores.

[22] 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."

[23] 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. The SoVI Index contains both positive and negative values. To simplify calculation, the index values for each county were rescaled 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.

Table 3-19. Scaled engagement and dependence scores for commercial fisheries, based on inflation-adjusted, ex-vessel revenue, 2003 to 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 Washington coast	0.365	5	0.369	9	Non Nearshore Fixed Gear	Shoreside Nonwhiting IFQ*
South and central Washington 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	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

*2011-2012 only.

Table 3-20. Scaled scores for charter and private recreational fisheries and the combined score based on angler trips, 2004 to 2012.

	Charter Recreational		Private Recreational		Combined Scores		Combined Ranking	
	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 Washington coast	0.105	0.484	0.024	0.177	0.072	0.368	10	16
South and central Washington 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 3-21. 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 3-20 shows the component scores for each port in a stacked bar chart to aid in assessing the relative level of vulnerability. These results can be interpreted multiple ways to classify ports as vulnerable and, as in past analyses, "most vulnerable." Table 3-29 presents the results in a simple ranking (1 equals the highest composite score) and compares that to the results from previous vulnerability analyses. The top third-ranked ports (1 to 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 analyses. 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 third of ranked ports in the current analysis.[24] 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 3-21, along with Morro Bay, and Los Angeles. Recreational engagement accounts for a large component of the Los Angeles summed value as seen in Table 3-27, 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 factors 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).

[24] The unit of analysis in the first two analyses was counties, so the status of IOPAC port groups, the current unit of analysis was inferred, as described in the table footnotes.

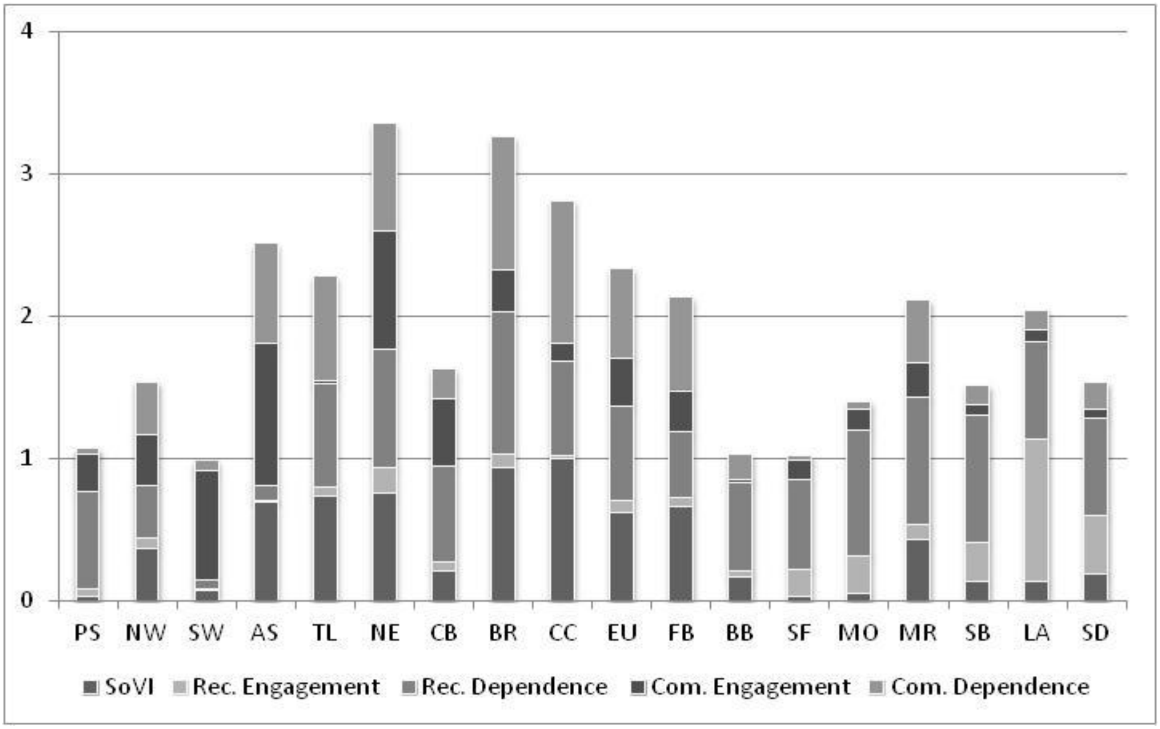


Figure 3-20. Visual representation of scaled scores.

Key to port symbols: PS: Puget Sound / NW: north Washington coast / SW: south and central Washington 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 3-22. 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†	2015-2016 Composite Rank‡
Puget Sound				15
North Washington coast	Y		Y	11
South and central Washington 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 are rated vulnerable/most vulnerable.
†One or more counties are rated high for engagement or dependence and vulnerability.
‡Top one-third (1 to 6) port groups are bolded.

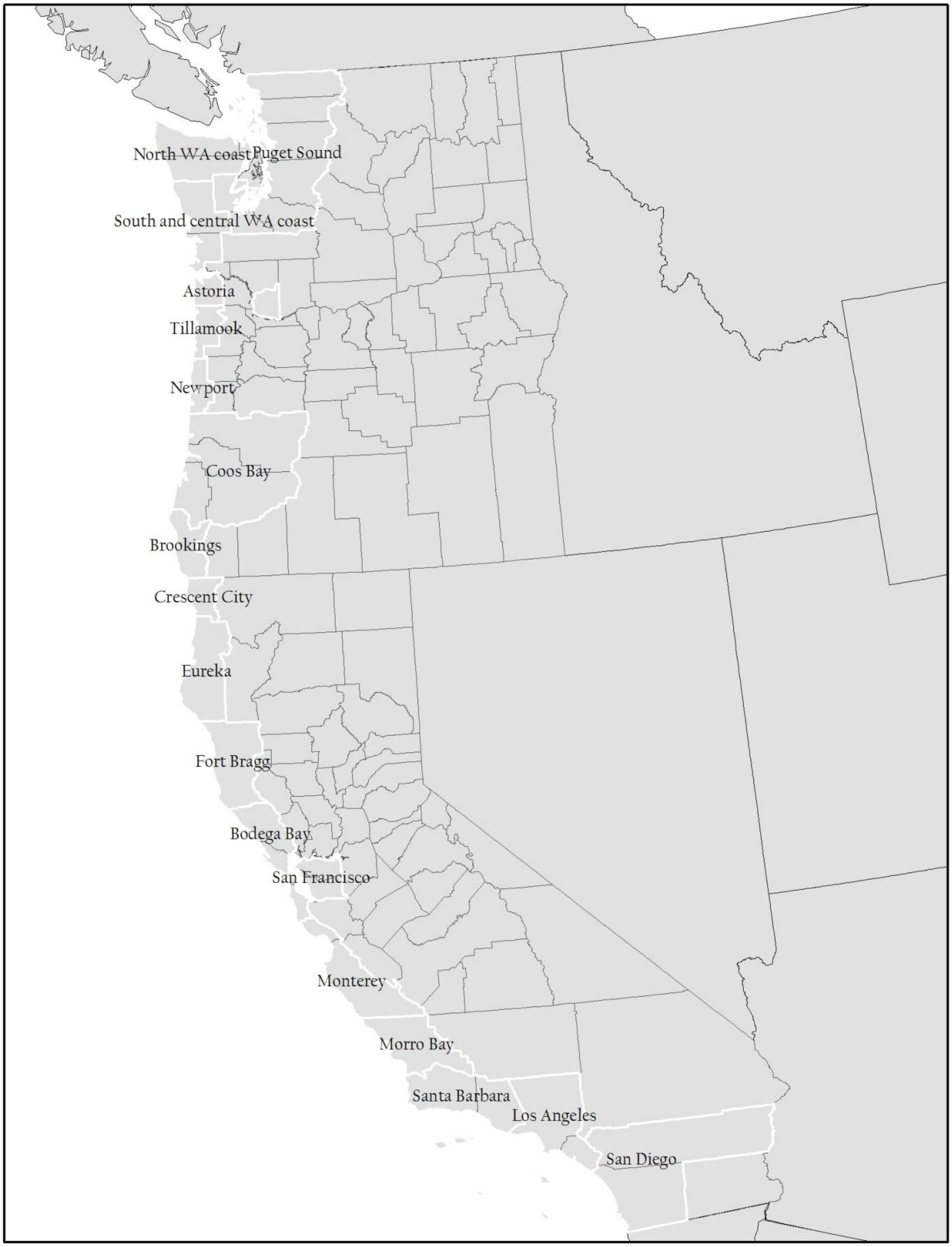


Figure 3-21. IOPAC port group areas.

3.3 Essential Fish Habitat

The MSA (sec. 303(a)(7)) requires Councils to include a description of essential fish habitat (EFH) in each FMP 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 [CPS], highly migratory species [HMS], 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 follows:

- 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 (HAPCs) 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 the following 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. The Council also established measures to mitigate the adverse impacts of fishing on groundfish EFH; These measures 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 2013d) for a Council-proposed change to the

[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.

Trawl RCA that would open areas that had been closed to trawl fishing for several years, resulting in a new baseline environment. This action, like many other actions, has changed the baseline for considering impacts of the proposed action on EFH. Further information may be found in the environmental assessment titled, "Trawl Rockfish Conservation Area (RCA) Boundary Modifications," February 2014 (http://www.westcoast.fisheries.noaa.gov/publications/nepa/groundfish/misc_ea/rca_ea_3_4_14.pdf) and in the FEIS prepared for FMP Amendment 19 (NMFS 2005; http://www.westcoast.fisheries.noaa.gov/publications/nepa/groundfish/groundfish_efh_eis/front-pages-chapters-1-and-2.pdf).

In 2010, the Council developed a process and schedule 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 2013b). A synthesis report based on these data was published in April 2013 (NMFS 2013b), completing the second phase. In the third phase of the review, now underway, the Council is considering proposals for potential modifications to EFH conservation areas (discussed further below), which were implemented as part of Amendment 19 to the Groundfish FMP.

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 the Amendment 19 FEIS contains a comprehensive and detailed description of fishing gear that is, or has been, used in the fishery management area and details how the gear interacts with benthic habitat. Section 3.2.4 in the same FEIS summarizes the relative impacts of gear types by habitat type with those conclusions further consolidated in Table 3-30 of this FEIS, which shows the range of recovery times by habitat category and gear type.[26] Generally, for a given habitat type, dredge gear and bottom trawl gear are likely to have greater effects than other bottom-contacting gear types[27] 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 form sensitive ecosystems that may be substantially modified with relatively little fishing effort; the section indicates the following:

> 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 (NMFS 2005).

[26] See Appendix 10 of the Risk Assessment (MRAG Americas Inc.*et al*. 2004) for a full description of the methodology for the derivation of these recovery times Table 4-1 in NMFS 2014b shows recovery times by gear type and habitat type as adapted from the EFH FEIS and Phase 2 Synthesis Report (NMFS 2005; NMFS 2013b). The categories and resulting values differ somewhat from what is displayed here. Bottom trawl, for example, ranges from 0.4 year for soft shelf habitat to 2.8 years for various hard and mixed habitats. Single values, rather than ranges, are presented for habitat/fishing gear categories in Table 4-1, so the 0.4 to 2.8 range refers to all habitat categories.

[27] Bottom contact gear means fishing gear designed or modified to make contact with thebottom. This includes, but is not limited to, beam trawl, bottom trawl, dredge, fixed gear, set net, demersal seine, dinglebar gear, and other gear (including experimental gear) designed or modified to make contact with the bottom. Gear used to harvest bottom dwelling organisms (e.g. by hand, rakes, and knives) are also considered bottom contact gear for purposes of this subpart.

The full phase one report (Groundfish Essential Fish Habitat Review Committee 2012) cites more recent work that suggests recovery times on the order of 100 years for hard corals found off of Alaska. The longest recovery time shown in Table 3-30 is the upper range for recovery of offshore biogenic habitat from dredge gear (which was prohibited under Amendment 19). This likely represents an estimate for deepwater hard corals.

Table 3-30. Average recovery times, in years, for constituent habitat types by habitat category and fishing gear type, based on (a) Table 3-1 in Amendment 19 FEIS (NMFS 2005) and (b)Table a.3.2 in Appendix to Groundfish EFH Synthesis Report (NMFS 2013a) (a).

Habitat Category	Bottom Trawl	Dredge Gear	Hook and Line	Nets	Pots and Traps
Nearshore Biogenic	1.5 – 9	2.6 – 11	0 – 1	0.5 – 4	0 – 1
Nearshore Hard Bottom	1 – 2	1.5 – 2.5	0 – 0.5	0.5 – 1	0 – 0.5
Nearshore Unconsolidated Bottom	0.1 – 0.3	0.2 – 0.6	0 – 0.5	0 – 0.5	0 – 0.5
Offshore Biogenic	2.3 – 55.7	2.7 – 63	0.1 – 17.6	1.2 – 41.5	0.2 – 17.2
Offshore Hard Bottom	1.8 – 10	1.8 – 12	0.3 – 3	0.8 – 7	0.3 – 2.6
Offshore Unconsolidated Bottom	0.5 – 5.7	0.7 – 6.5	0.1 – 1.9	0.4 – 4.6	0.1 – 2.8

(b)

Substrate Type	Bottom Trawl	Midwater Trawl	Fixed Gear Distance	Fixed Gear Point
Hard shelf	2.8	na	0.1	0.1
Hard upper slope	2.8	na	0.3	0.1
Hard lower slope	2.8	na	0.3	0.1
Mixed shelf	2.8	na	0.4	0.1
Mixed upper slope	2.8	na	0.4	0.1
Mixed lower slope	2.8	na	0.4	0.1
Soft shelf	0.4	na	0.4	0.1
Soft upper slope	1.0	na	0.4	0.1
Soft lower slope	1.0	na	0.4	0.1

Fixed Gear Distance: Fixed gear is represented by a distance metric (i.e., longline gear and pot gear).

Fixed Gear Point: Fixed gear is represented by a point metric (i.e., hook-and-line gear other than longline gear).

Structure-forming benthic macro invertebrates 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 macro invertebrates as groundfish habitat. The synthesis report (NMFS 2013b), 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 2013b, p. 27).

Table 3-31 summarizes information from Table 4a.2 in the synthesis report (NMFS 2013b) on the distribution of fishing effort by habitat type.[28] For all gear types most fishing effort occurred on soft substrate on the upper slope (continental slope areas shallower than 700 fm), ranging from 77 percent for midwater trawl to 55 percent for fixed gear. Table 3-32 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 percent for each gear type). By this measure, the greatest relative impact has been on mixed substrate on the upper slope. However,

[28] The synthesis report (NMFS 2013b) includes the Salish Sea (Puget Sound region) in its summary; this region is excluded here because it is outside of 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.

mixed substrate comprises only 1 percent of the total area by substrate type, while soft substrate accounts for 91 percent. The lower slope (continental slope areas waters deeper than 700 fm) is essentially unaffected, because, aside from the difficulty of fishing at greater depth, Amendment 19 included a mitigation measure which prohibits bottom trawling in depths greater than 700 fathoms. 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.

Table 3-31. Distribution of fishing effort, 2002 to 2010, (percent) by gear type and habitat type (substrate x depth zone) summarized from Tables A3a.5, A3a.6, and A3.a7 in NMFS 2013b.

Substrate	Depth Zone			
	Shelf	**Upper Slope**	**Lower Slope**	**All Depth**
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 3-32. 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 2013b.

Substrate	Depth Zone		
	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.

As noted above, landings data suggest that groundfish trawl vessels are using midwater trawl gear to target species other than whiting, principally widow and yellowtail rockfish. This fishery would likely have impacts similar to the midwater trawl fishery for Pacific whiting, except that it may occur in different times and areas. Less restrictive chafing gear restrictions on the codends of midwater trawl nets was effective on January 1, 2015. The codend is a baglike apparatus at the terminus of the net where the fish collect. It has a zipper mechanism that allows it to be detached or opened to retrieve the fish once the net has been brought aboard the vessel. Chafing gear protects the codend; in the case of midwater gear, this is more relevant to when the codend is pulled up the stern ramp of the vessel, rather than its contact with the seafloor. The environmental assessment (EA) associated with the chafing gear rulemaking (PFMC and NMFS 2013) describes potential impacts of the gear modification, including its habitat impacts. In summary, because of the way midwater trawl nets are designed, while harvesters try to avoid bottom contact, the gear does make occasional bottom contact.

3.3.2 Non-fishing Impacts

Adverse effects from activities other than fishing are not part of the proposed action, but they contribute to cumulative effects (Section 4.15). Appendix D of the Groundfish FMP incorporates a 2003 report NMFS prepared that catalogs 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 2013b) 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 8 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 occurs more frequently. 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 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 has been made with fixed gear, to which the non-trawl closed area restrictions apply.[29] See Section 3.7.2.2 of the Groundfish FMP for more information. In 2011-2012. fixed gear landings in the IFQ fishery accounted for about 40 percent of total landings by weight and 21 percent 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 with fixed gear effort, and fixed gear has fewer adverse impacts on groundfish EFH (for example as measured by recovery time, shown in Table 3-30). Estimated recovery times for fixed gear interactions with hard substrate are shorter than for bottom trawl, even comparing recovery from trawl on soft substrate to fixed gear on hard substrate. Thus, even though rocky habitat is more accessible by fixed gear when compared to trawl, the net effect of such gear switching is likely beneficial.

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

[29] Note that vessels using fixed gear in the shorebased IFQ program are subject to the non-trawl RCAs.

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 (NMFS 2005) 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 3-33 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 percent of the remaining areas, and fishing is restricted in 36 percent of the areas. Recreational fishing gear, which is predominantly hook-and-line, has minimal adverse impacts on EFH.

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 they 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 CCAs off southern California and RCAs designated for specified gear types. The CCAs have had the same boundaries since they were implemented in 2001. Trawl RCA boundaries change periodically during the year and annually since first implemented in September 2003 (Table 3-34). Changes in RCA configurations and the recovery times for constituent habitat types are considerations in defining the environmental baseline relative to new management actions.

Table 3-33. West Coast MPA area (sq. km.) summarized by fishing restrictions.

	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		1.9			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

Source: National MPA Center, March 2013 MPA Inventory, http: //marineprotectedareas.noaa.gov/dataanalysis/mpainventory/.

Table 3-34. Limited entry trawl RCA depth boundaries by year and month, 2002 to 2012, including inseason changes.

<table>
<tr><th>Year</th><th>Area</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="6">2013[a]</td><td>North of 48°10’</td><td colspan="2">0 – [m]200</td><td colspan="2">0 – 200</td><td colspan="4">0 – 150</td><td colspan="2">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>48°10’ – 45°46’</td><td colspan="2" rowspan="2">70 – [m]200</td><td colspan="2">75 – 150</td><td colspan="6">100 – 150</td><td colspan="2">75 – 150</td></tr>
<tr><td>45°46’ – 40°10’</td><td colspan="2">75 – 200</td><td colspan="6">100 – 200</td><td colspan="2">75 – [m]200</td></tr>
<tr><td>40°10’ – 34°27’</td><td colspan="12" rowspan="2">100 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="6">2012[a]</td><td>North of 48°10’</td><td colspan="2">0 – [m]200</td><td colspan="2">0 – 200</td><td colspan="4">0 – 150</td><td colspan="2">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>48°10’ – 45°46’</td><td colspan="2" rowspan="2">70 – [m]200</td><td colspan="2">75 – 150</td><td colspan="6">100 – 150</td><td colspan="2">75 – 150</td></tr>
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<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="6">2011[a]</td><td>North of 48°10’</td><td colspan="2">0 – [m]200</td><td colspan="2">0 – 200</td><td colspan="4">0 – 150</td><td colspan="2">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
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<tr><td>South 34°27’ (mainland)</td></tr>
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<tr><td rowspan="6">2010[a]</td><td>North of 48°10’</td><td colspan="2">0 – [m]200</td><td colspan="2">0 – 200</td><td colspan="4">0 – 150</td><td colspan="2">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>48°10’ – 45°46’</td><td colspan="2" rowspan="2">75 – [m]200</td><td colspan="2" rowspan="2">75 – 200</td><td colspan="2">75 – 150</td><td colspan="2">100 – 150</td><td colspan="2" rowspan="2">75 – 200</td><td colspan="2" rowspan="2">75 – [m]200</td></tr>
<tr><td>45°46’ – 40°10’</td><td colspan="2">75 – 200</td><td colspan="2">100 – 200</td></tr>
<tr><td>40°10’ – 34°27’</td><td colspan="12" rowspan="2">100 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="6">2009[a]</td><td>North of 48°10’</td><td colspan="3">0 – [m]200</td><td>0 – 200</td><td colspan="4">0 – 150</td><td colspan="2">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>48°10’ – 45°46’</td><td colspan="3" rowspan="2">75 – [m]200</td><td rowspan="2">75 – 200</td><td colspan="2">75 – 150</td><td colspan="2">100 – 150</td><td colspan="2" rowspan="2">75 – 200</td><td colspan="2" rowspan="2">75 – [m]200</td></tr>
<tr><td>45°46’ – 40°10’</td><td colspan="2">75 – 200</td><td colspan="2">100 – 200</td></tr>
<tr><td>40°10’ – 34°27’</td><td colspan="12" rowspan="2">100 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="10">2008[a]</td><td>North of 48°10’</td><td colspan="2">0 – [m]200</td><td colspan="2">0 – 200</td><td colspan="6">0 – 150</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>48°10’ – 46°38.17’</td><td colspan="2" rowspan="4">75 – [m]200</td><td colspan="2">60 – 200</td><td colspan="5">60 – 150</td><td rowspan="2">75 – 150</td><td colspan="2" rowspan="4">75 – [m]200</td></tr>
<tr><td>46°38.17’ – 46°16’</td><td colspan="4">60 – 200</td><td colspan="3">60 – 150</td></tr>
<tr><td>46°16’ – 45°46’</td><td colspan="2">75 – 200</td><td colspan="4">75 – 150</td><td colspan="2">75 – 200</td></tr>
<tr><td>45°46’ – 43°20.83’</td><td colspan="8">75 – 200</td></tr>
<tr><td>43°20.83’ – 42°40.50’</td><td colspan="2">0 – [m]200</td><td colspan="8">0 – 200</td><td colspan="2">0 – [m]200</td></tr>
<tr><td>42°40.5’ – 40°10’</td><td colspan="2">75 – [m]200</td><td colspan="2">75 – 200</td><td colspan="5">60 – 200</td><td>75 – 200</td><td colspan="2">75 – [m]200</td></tr>
<tr><td>40°10’ – 34°27’</td><td colspan="12" rowspan="2">100 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="11">2007[a]</td><td>North of 48°10’</td><td colspan="2" rowspan="7">75 – [m]200</td><td rowspan="7">75 – 250</td><td colspan="5">0 – 150</td><td>0 – 200</td><td>75 – 200</td><td colspan="2" rowspan="7">75 – [m]200</td></tr>
<tr><td>48°10’ – 46°38’</td><td colspan="5">75 – 150</td><td colspan="2">75 – 200</td></tr>
<tr><td>46°38’ – 46°16’</td><td colspan="5">60 – 150</td><td colspan="2">60 – 200</td></tr>
<tr><td>46°16’ – 45°03’</td><td colspan="4">75 – 150</td><td colspan="3">75 – 200 =</td></tr>
<tr><td>45°03’ – 43°20’</td><td colspan="7">75 – 200</td></tr>
<tr><td>43°20’ – 42°40’</td><td colspan="6">0 – 200</td><td>75 – 200</td></tr>
<tr><td>42°40’ – 40°10’</td><td colspan="7">75 – 200</td></tr>
<tr><td>40°10’ – 38’</td><td colspan="2">100 – [m]200</td><td colspan="8">100 – 150</td><td colspan="2">100 – [m]200</td></tr>
<tr><td>38° – 34°27’</td><td colspan="12" rowspan="2">100 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="5">2006[a]</td><td>North 40°10’</td><td colspan="2">75 – [m]200</td><td colspan="4">75 – 200</td><td colspan="2">100 – 250</td><td colspan="2">75 – 250</td><td colspan="2" rowspan="2">75 – [m]200</td></tr>
<tr><td>40°10’ – 38’</td><td colspan="2" rowspan="3">75 – 150</td><td colspan="4">100 – 200</td><td colspan="2">100 – 150</td><td colspan="2">100 – 250</td></tr>
<tr><td>38’ – 34°27’</td><td colspan="4" rowspan="2">100 – 150</td><td colspan="4" rowspan="2">100 – 150</td><td colspan="2" rowspan="2">75 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
</table>

Table 3-34 (continued). Limited entry trawl RCA depth boundaries by year and month, 2002 to 2012, including inseason changes.

<table>
<tr><th>Year</th><th>Area</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="6">2005[a]</td><td>North 40°10’</td><td colspan="2">75 – [m]200</td><td colspan="7">100 – 200</td><td colspan="3" rowspan="2">0 – 250</td></tr>
<tr><td>40°10’ – 38’</td><td colspan="2" rowspan="4">75 – 150</td><td colspan="2">100 – 200</td><td colspan="5">100 – 150</td></tr>
<tr><td>38’ – 36’</td><td colspan="7" rowspan="3">100 – 150</td><td colspan="3">0 – 200</td></tr>
<tr><td>36’ – 34°27’</td><td colspan="3" rowspan="2">50 – 200</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="9">0 – 150</td><td colspan="3">0 – 200</td></tr>
<tr><td rowspan="6">2004</td><td>North 40°10’</td><td colspan="2">75 – [m]200</td><td colspan="2">60 – 200</td><td colspan="2">60 – 150</td><td colspan="3">75 – 150</td><td colspan="3" rowspan="2">0 – 250</td></tr>
<tr><td>40°10’ – 38’</td><td colspan="4" rowspan="4">75 – 150[z]</td><td colspan="4" rowspan="4">100 – 150[z]</td><td rowspan="4">70 – 150[z]</td></tr>
<tr><td>38’ – 36’</td><td colspan="3">0 – 200[z]</td></tr>
<tr><td>36’ – 34°27’</td><td colspan="3" rowspan="2">0 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="12">0 – 150</td></tr>
<tr><td rowspan="5">2003</td><td>North 40°10’</td><td colspan="2">100 – [m]250</td><td colspan="2">100 – 250</td><td colspan="2">50 – 200</td><td colspan="2">75 – 200</td><td colspan="2">50 – 200</td><td colspan="2" rowspan="5">0 – [m]200</td></tr>
<tr><td>40°10’ – 38’</td><td colspan="2">50 – [m]250</td><td colspan="2">60 – 250</td><td colspan="6" rowspan="2">60 – 200</td></tr>
<tr><td>38’ – 34°27’</td><td colspan="2">50 – 150</td><td colspan="2">60 – 150</td></tr>
<tr><td>South 34°27’ (mainland)</td><td colspan="4">100 – 150</td><td colspan="6">100 – 200</td></tr>
<tr><td>South 34°27’ (islands)</td><td colspan="4">0 – 150</td><td colspan="6">0 – 200</td></tr>
<tr><td>2002</td><td>North 40°10’</td><td colspan="12">Within DBCA – CLOSED TO TRAWLING, September – December, special footrope requirements outside DBCA</td></tr>
</table>

[m] The modified" depth line excludes certain petrale sole areas from the RCA.
[a] Selective flatfish trawl is required shoreward of the RCA north of 40°10' N. latitude.
[z] Additional closure ranges from 0 to 10 fms around the Farallon Islands.

In April 2013, the Council recommended changing the trawl RCA boundaries north of 40°10'. N. latitude to 100 and 150 fm. The Trawl RCA configuration in the area varies somewhat during the year, with a maximum extent of 75 to 200 fm (Table 3-28). Because the baseline environment had changed as a result of the long-term RCA closures, it was determined that a full rulemaking with notice and comment and an updated NEPA analysis were required to implement the proposed changes. A major factor in making this determination was that substantial recovery of the long-term closed areas has likely occurred in the absence groundfish bottom trawling (see estimates shown in Table 3-30).

NMFS published a final rule on April 17, 2014 (79 FR 21639), implementing a modification of the Council proposal, and made the final EA available (NMFS 2014b). The EA evaluated the Council recommendation and the NMFS modification. The change NMFS implemented retains a seaward boundary of 200 fathoms between 40°10'. N. latitude and 45°46'. N. latitude (Cape Falcon, Oregon) but otherwise implements the Council’s recommendation.[30]

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.

[30] From November through February, a modified 200-fathom line is implemented, which has cutouts to allow access to areas productive for Petrale sole catch.

Table 3-35 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 3-35. 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).

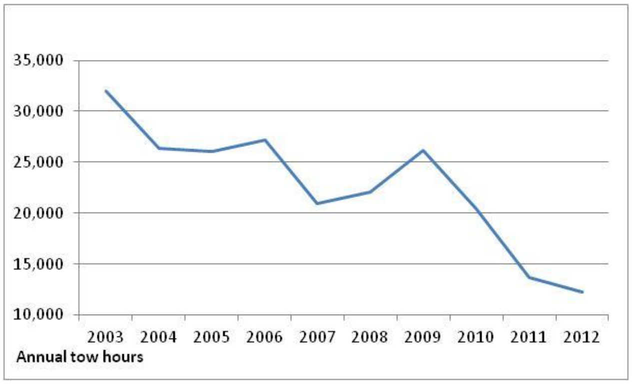
State	Gear Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Washington	Fixed Gear	108	89	112	124	91	68	74	70	84	63
	Trawl	28	19	23	27	25	19	16	19	14	12
Oregon	Fixed Gear	252	226	278	295	267	263	270	240	242	232
	Trawl	103	75	75	81	84	82	85	80	59	60
California	Fixed Gear	541	479	424	479	488	454	458	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 3-22 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.[31] 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, catch per unit of effort (CPUE), measured by dividing landings by tow distance, increased after implementation of IFQ management in 2011. Some of the inter-annual variations could be based on incomplete reporting in logbooks.[32]

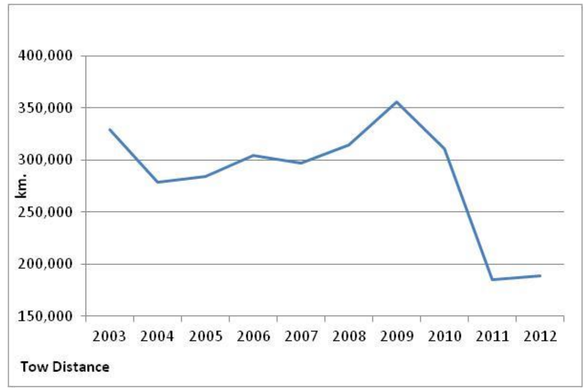
[31] No filters were applied on the records, aside from the dates; thus, the totals cover a range of trawl strategies. Using the PacFIN_target field in the lbk_tow table, the most common targets (based on number of tows) are Dover sole, thornyheads, and sablefish, individually or combined (DTS) accounting for 43 percent of tows in the time period. The second most common strategy, at 15 percent, is “nearshore mixed,” which covers vessels fishing shoreward of the RCA mainly for flatfish. Pacific whiting accounts for 8 percent of tows, and 8 percent of tows had no target identified. California halibut and ridgeback prawn, non-groundfish targets, accounted for 4 percent of tows.

[32] An analysis of the tow location fields indicated that about 2 percent of the 205,328 tows made in the 2003 to 2012 period had a zero or null value in one or more of the location fields. An additional 2 percent, 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, dropping from 4.6 percent in 2003 to 0.04 percent in 2012.

a.



b.



c.

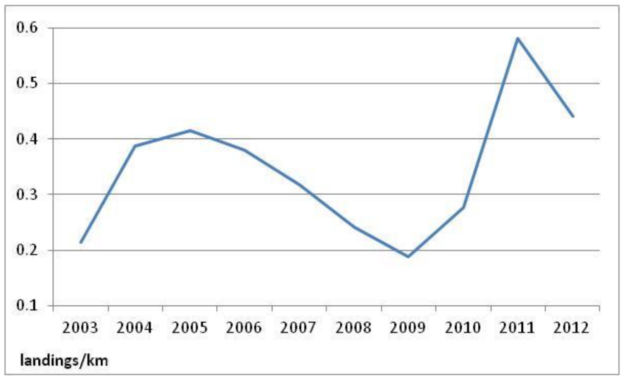


Figure 3-22. a. Total annual tow hours based on set and retrieval times in trawl logbooks. b. Total annual tow distance based on set and retrieval positions (longitude and latitude) in trawl logbooks. c. Annual catch-per-unit-effort in the shoreside groundfish trawl fishery based on tow distance and landings from 2014 Groundfish SAFE Table 4.a (PacFIN, lbk_tow, 1/29/14).

3.3.3.4 Non-groundfish EFH

The CPS and salmon FMPs each describe EFH for the collection of species within those FMPs and, to the extent that necessary data are available, for each individual species within each FMP. The HMS FMP describes EFH for each of the component species within the FMP, but not for the collection of fishery management unit species as a whole. The EFH for non-groundfish is summarized below where there is an overlap in the action area considered in this FEIS.

Coastal Pelagic Species

The east-west geographic boundary of EFH for each individual CPS finfish and market squid is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range from 10° C to 26° C. The southern boundary of the geographic range of all CPS finfish is consistently south of the U.S.-Mexico border, indicating a consistency in sea surface temperatures at below 26° C, the upper thermal tolerance of CPS finfish. Therefore, the southern extent of EFH for CPS finfish is the U.S.-Mexico maritime boundary. The northern boundary of the range of CPS finfish is more dynamic and variable due to the seasonal cooling of the sea surface temperature. The northern EFH boundary is, therefore, the position of the 10° C isotherm, which varies both seasonally and annually. The position of the 10° C isotherm during August is off Canada and Alaska in years with both cold and warm summer sea surface temperatures.

Pacific Salmon

Pacific coast salmon EFH includes those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. In the estuarine and marine areas, salmon EFH extends from the extreme high tide line in nearshore and tidal submerged environments within state territorial waters out to the full extent of the EEZ (200 nautical miles, or 370.4 km) offshore of Washington, Oregon, and California north of Point Conception. Foreign waters off Canada, while still salmon habitat, are not included in salmon EFH because they are outside U.S. jurisdiction. Pacific coast salmon EFH also includes the marine areas off Alaska designated as salmon EFH by the North Pacific Fishery Management Council for stocks also managed by the Pacific Fishery Management Council. The geographic extent of freshwater EFH is identified as all water bodies currently or historically occupied by Council-managed salmon in Washington, Oregon, Idaho, and California. Salmon EFH includes aquatic areas above all artificial barriers except impassible barriers (dams). However, activities occurring above impassable barriers that are likely to adversely affect EFH below impassable barriers are subject to the EFH consultation provisions of the MSA.

Highly Migratory Species

Common Thresher Shark

- Neonate/early juveniles – Found in epipelagic, neritic, and oceanic waters off beaches, in shallow bays, in near surface waters from the U.S.-Mexico EEZ border north to off Santa Cruz (37° N. latitude), over bottom depths of 6 to 400 fm, particularly in water less than 100 fm deep and, to a lesser extent, further offshore between 200 and 300 fm.
- Late juveniles/subadults – Found in epipelagic, neritic, and oceanic waters off beaches and open coast bays and offshore, in near-surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, California (37° 10' N. latitude), from the 6-fm to 1,400-fm isobaths.
- Adults – Found in epipelagic, neritic, and oceanic waters off beaches and open coast bays, in near surface waters from the U.S.-Mexico EEZ border north seasonally to Cape Flattery, Washington, from the 40-fm isobath westward to about 127° 30' W. longitude, north of the Mendocino Escarpment, and from the 40- to 1,900-fm isobath south of the Mendocino Escarpment.

Pelagic Thresher Shark

- Late juveniles/subadults – Found in epipelagic and predominantly oceanic waters along coastal California from the U.S.-Mexico border as far north as 34° N. latitude, from the 100-fm isobath approximately out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach, California (line extends south from the Santa Rosa-Cortes Ridge to a point on the EEZ boundary at 31° 36' N. latitude and 118° 45' W. longitude), and associated with sea-surface temperatures of 21°C or warmer.
- Adults – Found in epipelagic and predominantly oceanic waters along coastal California from the U.S.-Mexico border as far north as 34° N. latitude, from the 100-fm isobath about out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach, California (line extends south from the Santa Rosa-Cortes Ridge to a point on the EEZ boundary at 31° 36' N. latitude and 118° 45' W. longitude), and associated with sea-surface temperatures of 21°C or warmer.

Bigeye Thresher Shark

- Late juveniles/subadults – Found in coastal and oceanic waters in epi- and mesopelagic zones from the U.S.-Mexico border north to 37° N. latitude off Davenport, California, south of 34° N latitude from the 100-fm isobath to the 2,000-fm isobath, north of 34° N. latitude, and from the 800-fm isobath out to the 2,200-fm isobath.

- Adults – Found in coastal and oceanic waters epipelagic and mesopelagic zones from the U.S.-Mexico border north to 45° N. latitude off Cascade Head, Oregon, in southern California south of 34° N. latitude from the 100-fm isobath out to the 2,000-fm isobath, and north of 34° N. latitude, from the 800-fm isobath out to the outer EEZ boundary.

Shortfin Mako Shark

- Neonate/early juveniles – Found in oceanic and epipelagic waters of the U.S. West Coast from the 100-fm isobath out to the 2,000-fm isobath (and possibly beyond) from the Mexico border to Point Pinos, California, especially the Southern California Bight, from the 1,000-fm isobath out to the 2,000-fm isobath, from Monterey Bay north to Cape Mendocino; and from the 1,000-fm isobath out to the EEZ boundary north of Cape Mendocino to latitude 46° 30' N. latitude northerly habitat during warm water years.
- Late juveniles/subadults – Found in oceanic and epipelagic waters from the U.S.-Mexico EEZ border north to 46° 30' N. latitude from the 100-fm isobath out to the EEZ boundary north to San Francisco, California (38° N. latitude), from 1,000 fm out to the EEZ boundary north to San Francisco (38° N. latitude), and from the 1,000-fm isobath out to the EEZ boundary north of San Francisco.
- Adults – Found in epipelagic oceanic waters from the U.S.-Mexico EEZ border north to 46° 30' N. latitude extending from the 400-fm isobath out to the EEZ boundary south of Point Conception, California, from the 1,000-fm isobath out to the EEZ boundary and beyond north of Point Conception, and from the 1,000-fm isobath out to the EEZ boundary and beyond, north of Point Conception.

Blue Shark

- Neonate/early juveniles – Found in epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border, from the 1,000-fm isobath seaward to the outer boundary of the EEZ and beyond, and extending inshore to the 100-fm isobath south of 34° N. latitude.
- Late juveniles/subadults – Found in epipelagic, oceanic waters from the U.S.-Mexico border north to 37° N. latitude (off Santa Cruz, California) from the 100-fm isobath seaward to the outer boundary of the EEZ and beyond, and north to the U.S.-Canada border from the 1,000-fm isobath seaward to the EEZ outer boundary.
- Adults – Found in epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1,000-fm isobath seaward to the outer boundary of the EEZ and beyond, extending inshore to the 200-fm isobath south of 37° N. latitude off Santa Cruz, California.

Albacore Tuna

- Juvenile – Found in oceanic, epipelagic waters generally beyond the 100-fm isobath from the U.S.-Mexico EEZ border north to the U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Habitat concentrations occur off southern and central California and the Columbia River Plume area.
- Adults – Found in oceanic, epipelagic waters generally beyond the 100-fm isobath from the U.S.-Mexico EEZ border north to the U.S.-Canada border, and westward to the outer edge of the EEZ boundary.

Bigeye Tuna

- Juvenile – Found in oceanic, epipelagic, and mesopelagic waters beyond the 200-fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, California, some years extending northward to Monterey Bay, California (37° N. latitude). Habitat is concentrated in the Southern California Bight, primarily south of 34° N. latitude from the 100-fm isobath out to the 1,000-fm isobath.
- Adults – Found in oceanic, epipelagic, and mesopelagic waters beyond the 200-fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, California, some years extending northward to Monterey Bay, California (37° N. latitude). Habitat is concentrated in the Southern California Bight, primarily south of 34° N. latitude from the 100-fm isobath out to the 1,000-fm isobath.

Northern Bluefin Tuna

- Juvenile – Found in oceanic, epipelagic waters beyond the 100-fm isobath from the U.S.-Mexico EEZ border north to the U.S.-Canada border, and westward to the outer edge of the EEZ boundary; associated with SST between 14°C and 23°C. The northernly migratory extension appears dependent on the position of the North Pacific Subarctic Boundary.
- Adults – There is no regular habitat within the U.S. West Coast EEZ, although large fish are occasionally caught near the Channel Islands off Southern California, and rarely off the central California coast.

Skipjack Tuna

- Adult – Found in oceanic, epipelagic waters beyond the 400-fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border northward to Point Conception, California, and northward beyond the 1,000 fm-isobath north to approximately 40° N. latitude. Habitat is concentrated, especially in warm years, in the Southern California Bight primarily south of 33° N. latitude.

Yellowfin Tuna

- Juveniles – Found in oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to Point Conception, California, some years extending northward to Monterey Bay, California (37° N. latitude). Found south of Point Conception from the 100-fm isobath out to the EEZ boundary, and north of Point Conception from the 300-fm isobath out to the EEZ boundary.
- Adults – Adult yellowfin tuna do not regularly occupy habitat within the U.S. West Coast EEZ.

Striped Marlin

- Adults – Found in oceanic, epipelagic waters of the Southern California Bight, above the thermocline, from the 200-fm isobath from the U.S.-Mexico EEZ border to approximately 34° N. latitude (Point Hueneme, California), east of the Santa Rosa-Cortes Ridge (a line from South Point, Santa Rosa Island, southeast to the EEZ boundary at approximately 31° 36' N. latitude and 118° 45' W. longitude). Preferred water temperature is bounded by 68° to 78°F (20 to 25°C).

Swordfish

- Juvenile – Found in oceanic, epipelagic, and mesopelagic waters from the U.S.-Mexico EEZ border north to 41° N. latitude. They also occur in the Southern California Bight, primarily south of the Santa Barbara Channel Islands, from the 400-fm isobath out to the EEZ boundary, and north of Point Conception from the 1,000-fathom isobath westward to the EEZ outer boundary and northward to 41° N. latitude.

- Adults – Found in oceanic, epipelagic, and mesopelagic waters out to the EEZ boundary, inshore to the 400-fm isobath in southern and central California, from the U.S.-Mexico EEZ border north to 37° N. latitude, and beyond the 1,000-fm isobath northward to 46° 40' N. latitude. Food species within the U.S. West Coast EEZ have not been documented for this size category.

Dorado or Dolphinfish

- Spawning, eggs and larvae – Primarily found outside of the U.S. West Coast EEZ. Spawning is restricted to water 24°C; off southern Baja California, Mexico, with peak larval production in August and September.
- Juveniles and subadults – Epipelagic and predominantly oceanic waters offshore to the 6-fm isobath along coastal California from the U.S.-Mexico border generally as far north as Point Conception, California (34° 34' N. latitude), and within the U.S. West Coast EEZ primarily east of the Santa Rosa-Cortes Ridge. The line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N. latitude and 118° 45' W. longitude. Prefers sea surface temperatures 20°C and higher during warm water incursions.
- Adults – Found in epipelagic and predominantly oceanic waters offshore to the 6-fm isobaths, along coastal California from the U.S.-Mexico border, generally as far north as Point Conception, California (34° 34' N. latitude), and within the U.S. West Coast EEZ, primarily east of the Santa Rosa-Cortes Ridge. The line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N. latitude and 118° 45' W. longitude. Prefers sea surface temperatures 20° C and higher during warm water incursions.

Although the alternatives considered in this FEIS would occur within areas described as EFH for Pacific Coast Salmon, CPS, and HMS, EFH for Salmon, CPS, and HMS within the affected area is pelagic and is not subject to adverse impacts by fishing gear.

3.4 California Current Ecosystem

In April 2013, the Council adopted the Pacific Coast Fishery Ecosystem Plan (FEP) for the U.S. portion of the large marine California Current Ecosystem (CCE) (PFMC 2013, Pacific Coast FEP). This document contains a wealth of information on characteristics of the large marine CCE, where the groundfish fishery occurs, and on the types of impacts fisheries and other anthropogenic activities have on ecosystem dynamics and marine habitat. Information from the Pacific Coast FEP is incorporated by reference. The information in Sections 3.4.1 and 3.4.2 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 3.4.3), other human activities (Section 3.4.4), and climate (Section 3.4.5).

Coincident with the development of the Pacific Coast FEP, NMFS has been developing the Integrated Ecosystem Assessment (IEA) of the CCE. This assessment 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 3.4.7 summarizes recent IEA reports on CCE status using these indicators. For the purpose of impact analysis, the ecosystem is characterized as the web of trophic relationships within the system and an indication of how system structure (relative abundance of constituent organisms) may change in response to human activities, specifically fisheries targeting groundfish.[33]

3.4.1 Overview of California Current Ecosystem

The CCE consists 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 CPSs 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; they 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.

[33] 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.

3.4.2 Role of Groundfish in the California Current Ecosystem

3.4.2.1 Groundfish Trophic Role

The mid- and higher trophic level fishes and invertebrates of the CCE, including groundfish, are described as a trophic group in Section 3.2.1.3 of the FEP. 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/blackspotted 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 (redstriped, yelloweye, black, and blue rockfish); midwater 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 that 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 to 55 cm length, and are almost exclusively piscivorous by the time they reach 70 to 80 cm.

3.4.2.2 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 Marine Mammal Protection Act (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, combined 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 generally to characterize the trophic roles of non-groundfish species that prey upon or that are the prey of groundfish:

- Piscivorous Marine Mammals and Seabirds: This group includes all CCE pinnipeds, small cetaceans, and all toothed whales except transient killer whales, which feed on other mammals. The group includes all CCE seabirds, which are primarily or exclusively piscivorous (Dufault et al. 2009, feeding guilds C and I).
- High trophic level carnivorous fish: This group includes 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: This group includes 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 crab, grooved tanner crab, bairdi, scarlet king crab, and California king crab); deep vertical migrators (myctophids, blue lanternfish, California headlight fish, 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).

3.4.3 Effects of Managing to B_{MSY}

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). Yield is thought to be maximized (MSY) when stock size is about half its unfished size (although B_{MSY} for individual stocks 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 are indirectly related to the action (fishing). 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 dispensatory 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.

Kaplan et al. (2012) used the Atlantis ecosystem simulation model to assess the cumulative effects of fisheries on the CCE.[34] This work provides the most specific assessment of the effects of fishing by different fleets on various ecosystem components and indicators of ecosystem health. Their simulation starts with initial conditions approximating 2005 to 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 with status quo defined as all fisheries operating at constant fishing mortality 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.[35]
- Fixed gear indirectly affected mesozooplankton (copepods), which increased.
- Pacific 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, the CPS purse seine fleet 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 the large planktivore biomass increased 2.65 times from the status quo level (all fisheries operating), because of increases in large zooplankton.

The authors also evaluated 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 3-23, adapted from Kaplan et al. (2012) Figure 3, shows the effect of these fleets on selected ecosystem attributes (chosen because they varied by greater or less than 5 percent 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 3-23, 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 (more than 5 percent) positive effects on the krill attribute, and bottom trawl was the only fleet to have a negative effect on the healthy assessed stocks attribute.

[34] See Horne, et al. (2010) for a description of the structure and parameterization of the CCE implementation.
[35] The model uses 60 functional groups, some containing single species and others species aggregations.

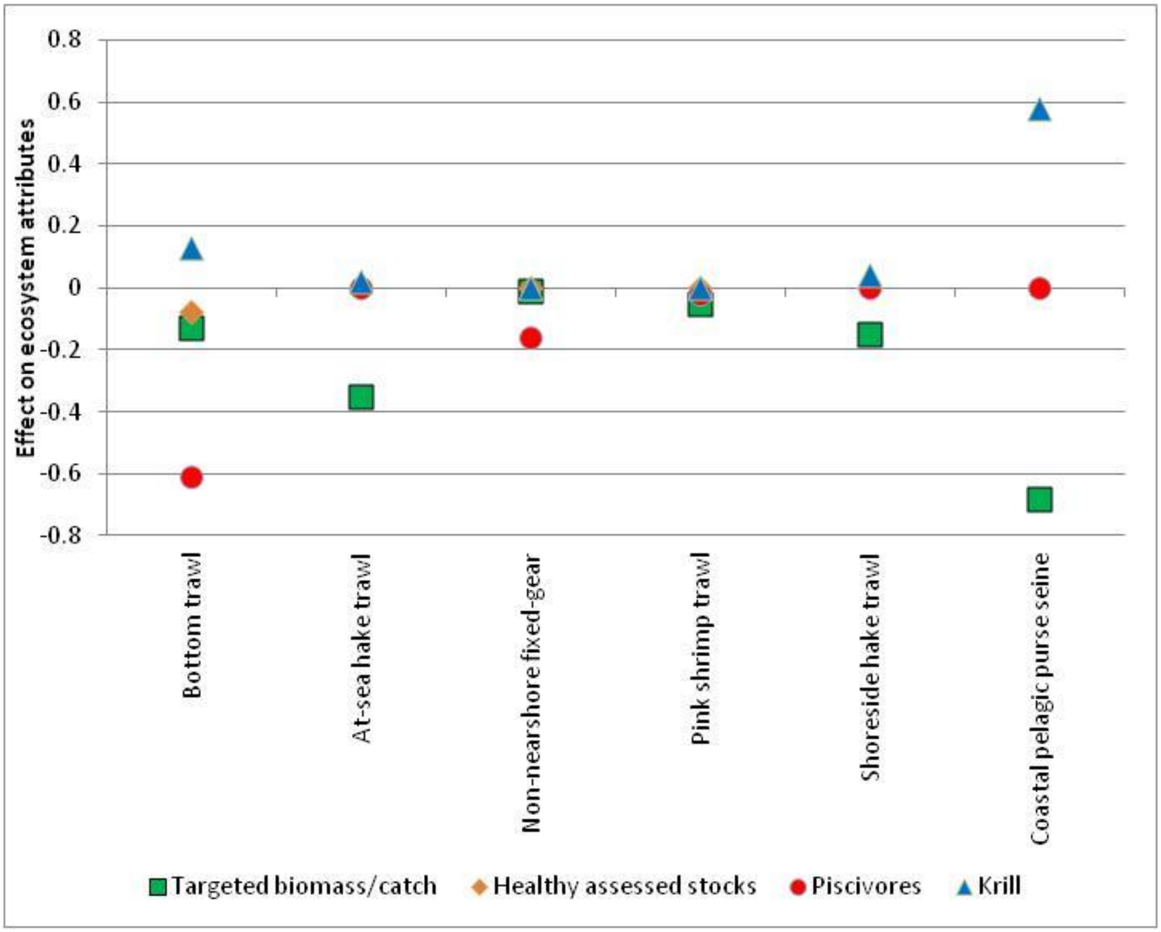
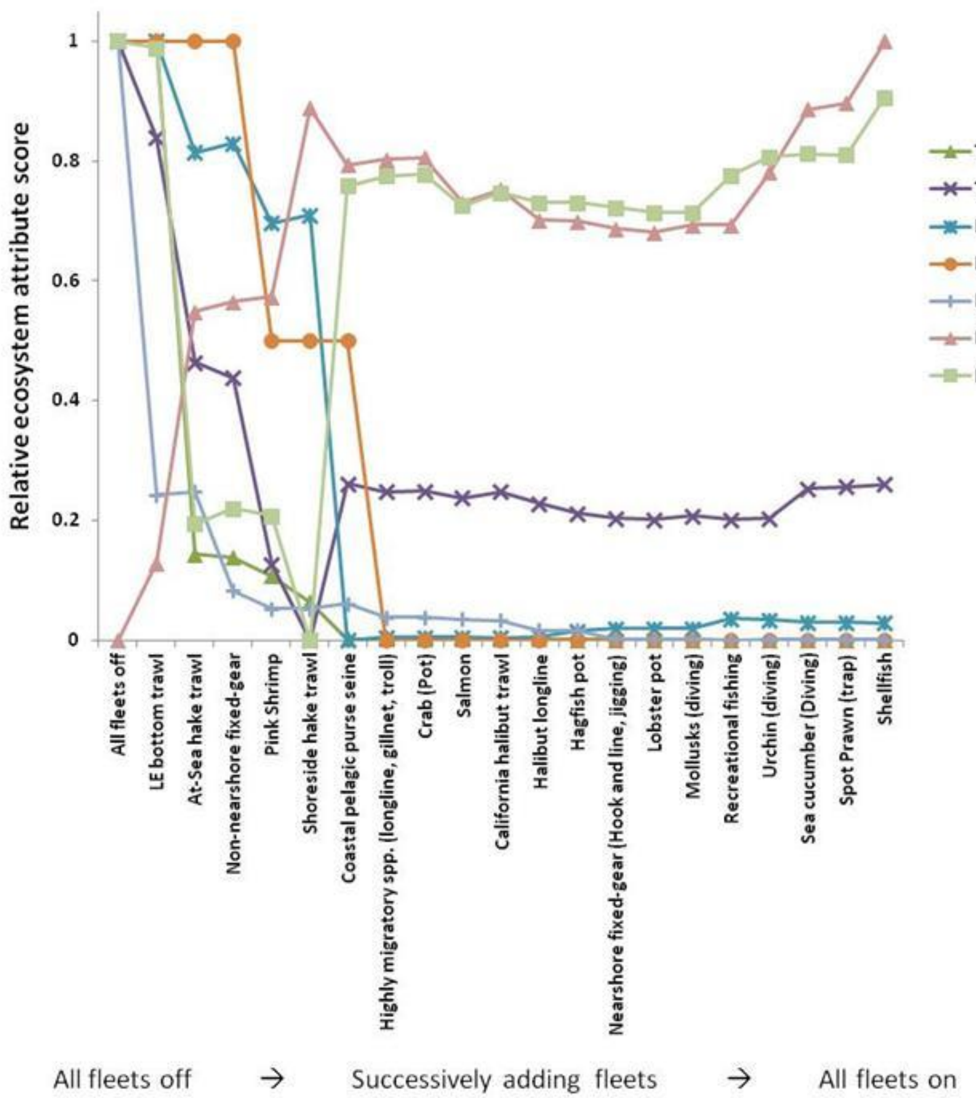


Figure 3-23. Effect of six individual fleets on four ecosystem attributes.

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 3-24 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. 2012, 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.



Source: Figure S1 in the Supplement to Kaplan et al. (2012).

Figure 3-24. 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.

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 generally were additive (equal to the sum of the individual fleet effects), representing 93 percent of interactions in the case of changes in the biomass of functional groups. Only 2 percent 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 enough information is available, size/age truncation can be accounted for in stock assessments, but indirect effects may remain unquantified. Larger/older females are not only relatively more fecund, but they 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.

3.4.4 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).[36] 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 anchoring, modify or destroy 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. These impacts may include 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.

The 2014 Annual State of the California Ecosystem Report (NMFS 2014a) reports the following:

- Non-fisheries human activities in the CCE that may negatively impact the ecosystem are generally low with stable or declining trends. Nutrient input is an exception: it is elevated, although it shows a declining trend at the coast-wide scale.

[36] Human-induced climate change is discussed in the following section.

3.4.5 System Forcing and Climate Change

Climate is controlled by a variety of physical forces affecting the input of energy into the CCE and the distribution of energy and material through the system.. The CCE is characterized by fluctuations in physical conditions over multiple time scales. Climate change is a long-term trend over a time scale that makes it essentially unidirectional in relation to human activities. This physical forcing in the CCE is correlated with changes in species' biomass and population productivity.

Cyclical climate events 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, NPGO). ENSO is a higher-frequency, inter-annual phenomenon, while the PDO and NPGO fluctuate at lower frequency (years or decades). While the CCE tends to fluctuate between two states, a warm-water regime and a cold-water regime, conditions can vary regionally within the CCE. This cyclical variability is characterized both by these conditions and by other indicies and signals. Particular system states favor some species over others.

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 CPS, 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 NPGO is linked to changes in the intensity of the central and eastern branches of the north Pacific gyre, which in turn reflects variation in salinity, nutrients, and chlorophyll-a (a remotely sensed indicator of primary production).

The introduction to Section 4.5 in the FEP discusses 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 on 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 deepwater oxygen.

By 2050, globally, ocean temperatures on average are expected to rise at least 1°C (by the most conservative estimates in Intergovernmental Panel on Climate Change [IPCC] 2007), while, simultaneously, ocean pH in the upper 500 m has steadily been decreasing (becoming more acidic, also known as ocean acidification) at a rate of approximately -0.0017 pH per year (Byrne et al. 2010). On a more regional basis within the CCE, deepwater oxygen levels have shown a steady and relatively rapid decrease since the mid-1980s (Bogradet al. 2008; McClatchieet al. 2010). While increasing atmospheric CO_2 is the proximate cause of ocean acidification, ocean temperature affects the rate of ocean acidification. Thus, 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 (Gillyet al. 2013). All three factors show long-term trends and decadal-scale variance similar to changes in the PDO (Mantuaet al. 1997) and the NPGO (Di Lorenzoet 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 (the relationship between a periodic biological phenomenon and climatic conditions) (Bogradet al. 2009), and changes in the frequency and intensity of existing interannual and interdecadal climate patterns (Yehet al. 2009, California Current Integrated Ecosystem Assessment [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 for the future productivity and sustainability of anadromous resources such as salmon (Crozieret al. 2008; Mantua and Francis 2004).

As discussed at greater length in Section 4.5 of the FEP, climate change effects may include the following:

- 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 decline 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 by making it more difficult to form shells; these are 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 shift plankton species, which, as the base of the food chain, would have far-reaching effects. Corals and sponges, important habitat-forming benthic organisms, will also be affected by acidification.
- Through various processes, dissolved oxygen (DO) 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 DO water moves into the continental shelf benthic zone. A decline in DO 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, but may also bring de-oxygenated and/or highly acidic water into the photic zone.
- Changes in the frequency, intensity, and duration of major climate patterns discussed above (ENSO, PDO, NPGO) may be linked to warming.
- The timing of seasonal upwelling seems to be changing, with an earlier start in the south and a later start in the north, as observed in the past 5 years (Bjorkstedtet al. 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).

3.4.6 Implications of Climate Change for Groundfish Fisheries

Water temperature, current patterns, water chemistry, and other features contributing to system dynamics, such as coastal upwelling, are likely to be affected by climate change. These physical factors, in turn, will affect biological components such as physiology, productivity, and species distribution. On a global scale, Cheung et al. (2013) demonstrate that the mean temperature of the catch (MTC) has increased across 52 large marine ecosystems. MTC reflects species' temperature preferences, changing distribution, and resulting changes in catch composition. At a local scale, Pinsky and Fogarty (2012) examined the interaction between the northward shift in target species distribution and fishery response in the Northeast U.S. In most cases, MTC increased, while the mean latitude of catch was slower to shift compared to the mean latitude of species (based on fishery-independent data for four target species). Both operational factors (e.g., home port preference) and the regulatory environment contributed to slowing the geographic shift in fishing compared to target species distribution.

Focusing on the Northeast Pacific, Ainsworth et al. (2011) used five Ecopath with Ecosim (EwE) foodweb models representing regions from Southeast Alaska to the Northern California Current to model climate change in terms of primary production, zooplankton community structure, range shifts, ocean acidification, and deoxygenation. Landings and biomass for composite species groups and ecosystem-scale biodiversity were used as response variables. Cumulatively, landings fell by 77 percent to 85 percent, depending on the strength of climate effect scenario used, which is a substantial decline.

According to Ainsworthet al. (2011) range shift as a single factor accounts for a 54 percent reduction in fisheries landings with the model's domains and is the dominant aspect of climate change in the analysis. Examined as a single factor, it contributed to an increase in biomass, but effects varied by functional group. The distribution of pelagic species was most affected, while range shift resulted in declines in large piscivorus fish biomass. The shifting of ranges also strongly influences the mean trophic level of both catch and the ecosystem. In the models, the shifting of ranges is also the only factor that had an appreciable effect on biodiversity.

3.4.7 Baseline Status of the California Current Ecosystem

Andrewset 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 (NOAA NMFS 2012). The IEA team provides a report to the Council on the current status of the CCE annually. The Council received the most recent Annual State of the California Current Ecosystem Report (NMFS 2014a) at its March 2014 meeting. These reports and indictors are used to characterize the baseline status of the CCE briefly here.

Figure 3-25 (excerpted from NMFS 2014a) shows trends in the Multivariate ENSO Index (MEI), PDO, and NPGO. The symbols to the right of each graph indicate that there is no recent trend in these indices, and the most recent 5-year mean is within one standard deviation of the full mean time series. Between 2010 and 2012, the tropical Pacific moved from La Niña conditions to ENSO-neutral conditions, and strong upwelling in 2012 (off central and southern California) and 2013 (coastwide) promoted higher productivity. These years recorded some of the highest upwelling anomalies (deviation from the mean for relevant indices) ever recorded.

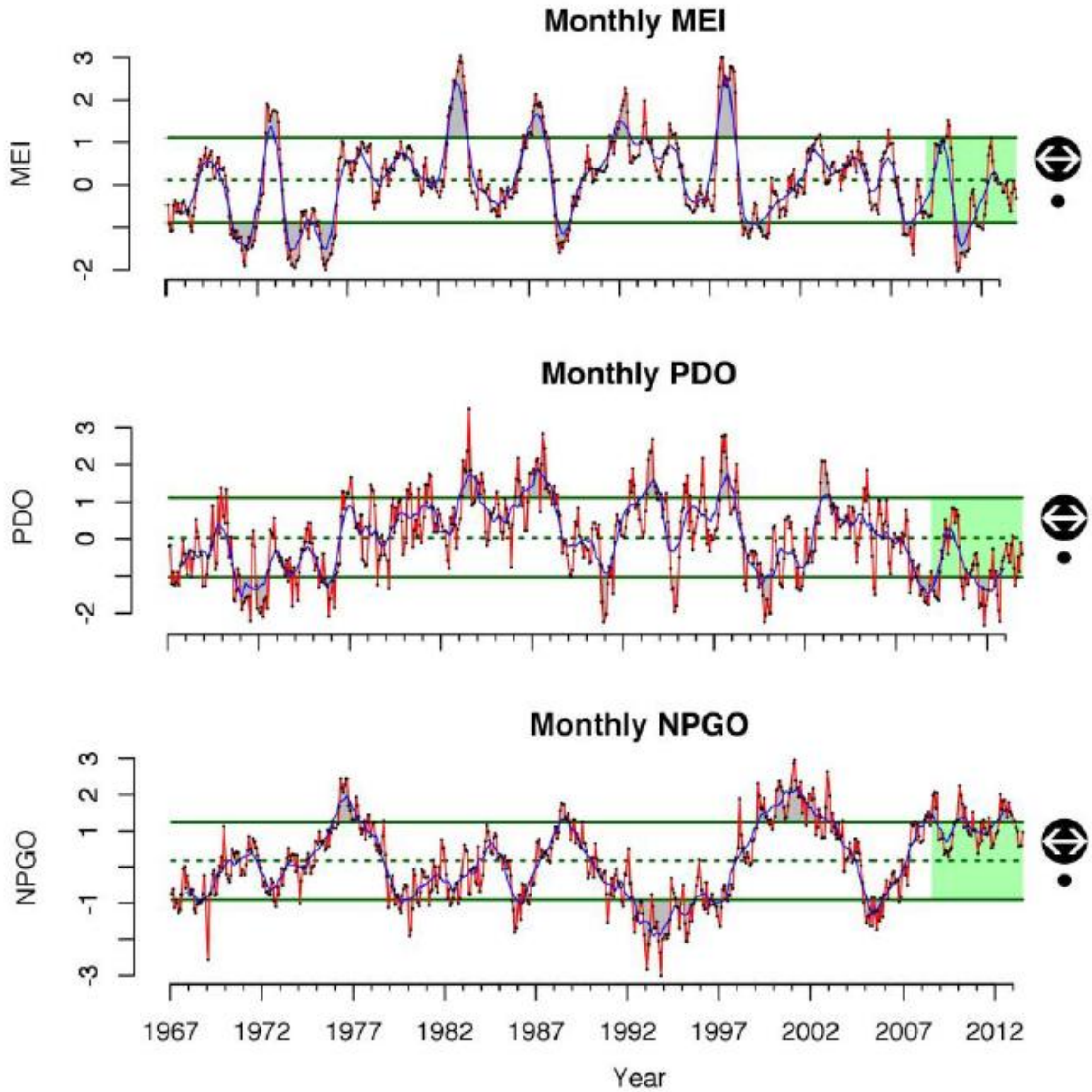


Figure 3-25. Monthly values of basin-scale climate indicators used to assess environmental variability impacts in the California Current ecosystem.

The three time series are MEI, PDO, and NPGO. The blue line shows the 12-month running average (excerpted from NMFS 2014a).

Low DO, a function of upwelling bringing oxygen-poor water into coastal waters, is of concern because it can result in the die off of less mobile organisms (e.g., benthic invertebrates) and habitat compression for pelagic species. Because DO is associated with upwelling, low-oxygen (hypoxic) conditions are more common in summer months. While DO levels at monitoring stations showed no trend and were within one standard deviation of the time series mean, the location of these stations may not adequately catalog hypoxic conditions in nearshore waters.

Ocean acidification results from increasing amounts of carbon dioxide absorbed in oceanic waters and can affect marine organisms with calcium carbonate structures. Acidification is measured indirectly by the aragonite saturation with values near or less than 1 indicating acidic conditions for at least two key animals: the larvae of oysters and the pelagic snail *Limacina helicina*. *L. helicina* is an important food source for pink salmon and herring and, to a lesser degree for other salmonids. There is no clear temporal trend in aragonite saturation; however, seasonal pulses of acidified water that occur off Oregon are believed to be of natural origin, caused by the decomposition of organic matter and carbon dioxide release as it sinks toward the seafloor.

The Report presents these indices to characterize ecological integrity:

- Northern copepod biomass anomaly
- Copepod species richness off Washington and Oregon
- Anchovy, sardine, and forage diversity
- Chinook salmon abundance
- Groundfish stock status
- Mean trophic level of West Coast groundfishes
- California sea lion pup production

This range of metrics is intended to characterize the relative condition of ecologically important, managed, or protected species assemblages.

Northern copepod species are a valuable source of nutrition for pelagic species and have been relatively more abundant (but without clear trend) in recent years. Copepod species richness negatively correlates with southward transport of sub-Arctic waters, high abundance of lipid-rich northern copepods, and increased growth and survival of some species. Northern anchovy and sardine along with other larval fish are important components of the forage base. Survey data collected in 2013 off the Central CCE show a marked increase in forage, especially young-of-the-year (YOY) rockfish, while there has been a decline in forage abundance in the Northern CCE region.

Chinook salmon, aside from their cultural and economic importance, migrate over great distances and are part of both marine and freshwater ecosystems. An index of escapement (adult salmon reaching spawning grounds) for various runs is used to assess condition. Generally, escapement has been near the time series average.

Harvest specifications are intended to control fishing mortality with respect to stock status, so that indicator from the Annual State of the California Current Ecosystem Report is partially a function of the proposed action. Figure 3-26 (excerpted from NMFS 2014a) shows a phase or "Kobe" plot to summarize groundfish stock status. The vertical axis shows fishing mortality relative to the ABC (representing a precautionary reduction from the overfishing threshold), while the horizontal axis shows current biomass in proportion to B_{MSY}, the management target. The Report concludes, "In general, results suggest that most groundfish populations that have been formally assessed in the CCE are at or above their target biomass levels, and most are at or below half of the total allowable catch or mortality level." The Report presents an ecosystem mean trophic level (MTL) index, the weighted average of the trophic levels in a sample, based on the West Coast Bottom Trawl Survey. The ecosystem MTL declined from 2000 to 2009, but has remained at a low, but fairly stable, level over the past 5 years. Changes in MTL are strongly driven by the abundance of Pacific hake (whiting), spiny dogfish, and sablefish, which are higher trophic-level groundfish species. These conditions may be beneficial for other predators such as squid, salmon, tuna, and seabirds.

California sea lion pup production is used as an indicator of the status of upper trophic level species, because sea lions are common throughout the CCE and sensitive to changing conditions. In 2012, pups at the San Miguel Island rookery (a monitoring site) were in poor condition, and emaciated animals were stranding on mainland beaches, leading NMFS to declare an Unusual Mortality Event for sea lion pups in March 2013. Thus, despite robust growth in the California sea lion population overall, the cause of this event is being investigated with an eye towards forage dynamics.

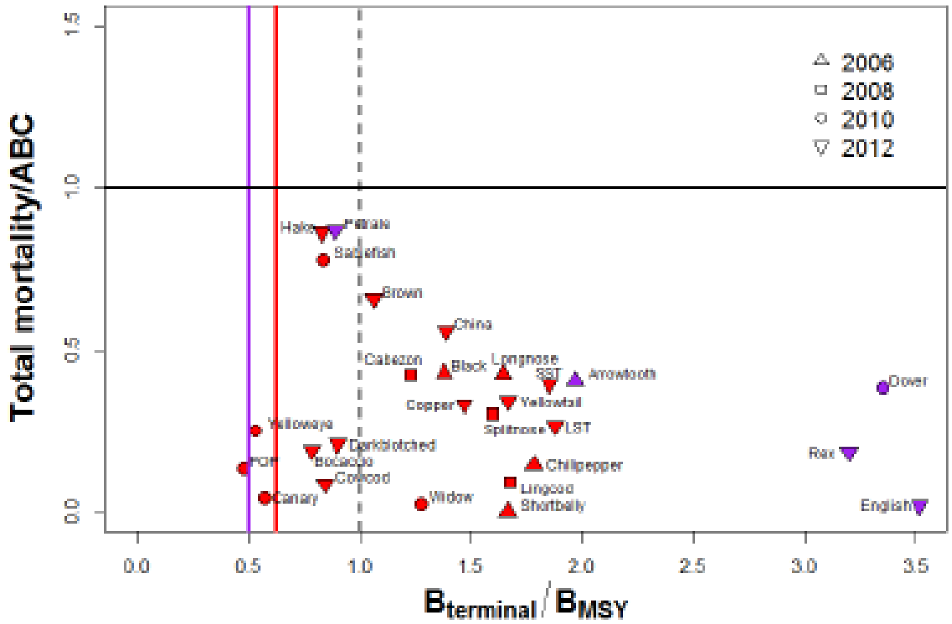


Figure 3-26. Stock status of all California Current groundfish assessed since 2007.

The vertical broken line indicates the target biomass reference point. The vertical solid lines indicate the limit reference point showing an overfished status (red for elasmobranchs, rockfishes, and roundfishes; purple for flatfishes). The horizontal line indicates overfishing threshold wherein total mortality exceeds the acceptable biological catch (ABC). Symbols indicate the terminal year of the assessment in which the reference points are determined (excerpted from NMFS 2014a).

3.5 Protected Species

The term "protected species" refers to organisms for which killing, capture, or harm is prohibited under several Federal laws, unless authorized. Incidental take of these species in the course of operations may be allowed under provisions of applicable law.[37] 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.

3.5.1 Applicable Law

Protected species are species listed under the ESA, the MMPA, the Migratory Bird Treaty Act (MBTA), and Executive Order (EO) 13186. See Chapter 6 for further discussion of these laws.

- The ESA protects species at risk of extinction "throughout all or a significant portion of its range," and protects critical habitat from Federal actions that would appreciably reduce its value for species recovery. The ESA defines "species" as "any subspecies of fish or wildlife or plants, and any Distinct Population Segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." A species is listed as "endangered" if it is in danger of extinction throughout all, or 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 portion, 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, EO 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. NMFS has entered in such a Memorandum of Understanding. All migratory seabird species are protected under the MBTA and EO 13186, regardless of species or stock listings under the ESA.

3.5.2 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.

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[37] 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 MMPA as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal (50 CFR 216.4).

On December 7, 2012, NMFS released a biological opinion on the effects of the continued operation of the fishery (NMFS 2012a) on certain marine species. On November 21, 2012, the USFWS 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).[38] The information in these documents is incorporated by reference.

3.5.2.1 Salmonids Covered by the 2006 Biological Opinion

Salmon caught in the groundfish fisheries are anadromous, spending part of their life in fresh water streams and rivers from central California to Alaska and part of their life in marine waters. During their marine phase, they occur along the U.S. and Canada seaward into the north central Pacific Ocean, including Canadian territorial waters and the high seas. There are 31 West Coast salmon and steelhead ESUs or DPSs in the action area (Table 3-36). The concepts of ESUs and DPSs are used by NMFS for applying the ESA to salmon and steelhead. Of the ESA-listed species, Chinook are most likely to be encountered in the fishery Figure 3-27). The Chinook ESUs that NMFS has concluded to be affected by the groundfish fisheries include Snake River fall Chinook, Upper Willamette River Chinook, Lower Columbia River Chinook, Puget Sound Chinook, Sacramento River Winter-run Chinook, California Coastal Chinook, and Central Valley Spring-run Chinook (NMFS 2006).

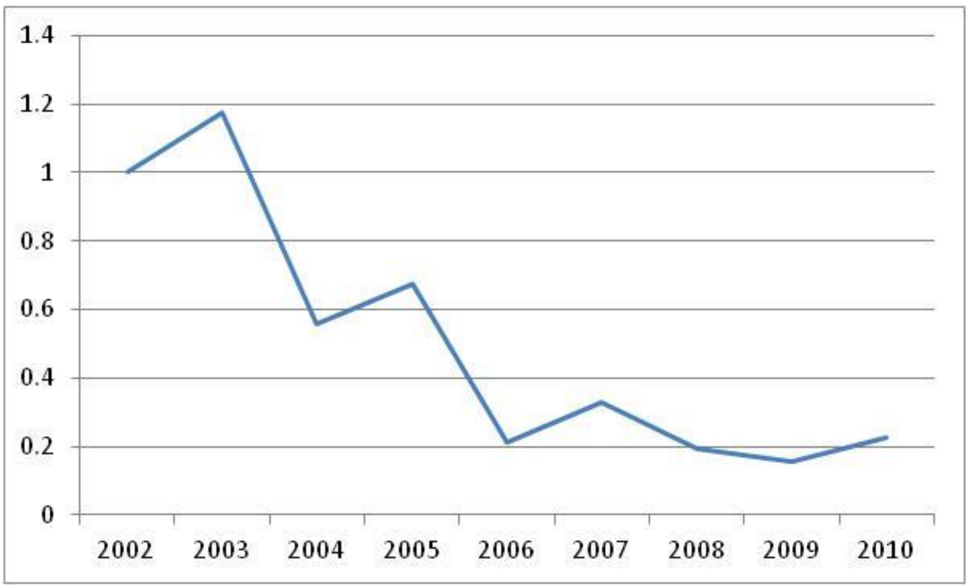
Table 3-36. Endangered Species Act Status of West Coast salmon and steelhead (highlighted ESUs are those subject to the 2006 consultation).

Species	ESU	Status
Salmon		
Sockeye	Snake River	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

[38] 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 not yet completed. At this time, the biological opinion for this consultation is not available, and its conclusions cannot be described in this EIS.

Table 3-36 (continued). Endangered Species Act Status of West Coast salmon and steelhead (highlighted ESUs are those subject to the 2006 consultation).

Species	ESU	Status
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



Source: Al-Humadh et al., Table 5.

Figure 3-27 . Relative change in Chinook salmon bycatch in groundfish fisheries, 2002 to 2010. 2002 = 1.

NMFS first consulted under the ESA on the effects of the fishery on listed salmonids in 1990 and reinitiated consultation several times thereafter. The incidental take statement (ITS) 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 these estimates in 2005 for the whiting fishery and in 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). On January 22, 2013, NMFS requested the reinitiation of the biological opinion for listed salmonids to address changes in the fishery occurring since implementation of the trawl rationalization program and the emerging midwater trawl fishery. More recently, the best available information also indicates that the 2014 Pacific whiting fishery exceeded the 11,000 Chinook and 0.05 Chinook salmon/mt whiting reinitiation triggers. Accordingly, the reinitiated consultation will also be addressing that exceedance.

Chinook salmon accounted for 91 percent of all salmonids caught in groundfish fisheries from 2002 to 2010, and the Pacific whiting fishery sectors caught two-thirds of the total (Table 3-37). On an annual basis, there is temporal and spatial variation in the catch of salmon that is associated with the behavior and biology of incidentally caught salmon in the Pacific whiting fishery, as shown in Table 3-38.

Table 3-37. Summary from Table 5 in 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 3-38. Summary from Table 5 in 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									Percent
			2002	2003	2004	2005	2006	2007	2008	2009	2010	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 WCR reports.

Dashes (--) signify years when the fishery/sector was not observed, or data were not available. Because the panel for salmonids other than Chinook sums original values for several, species, instances of non-observation are not represented.

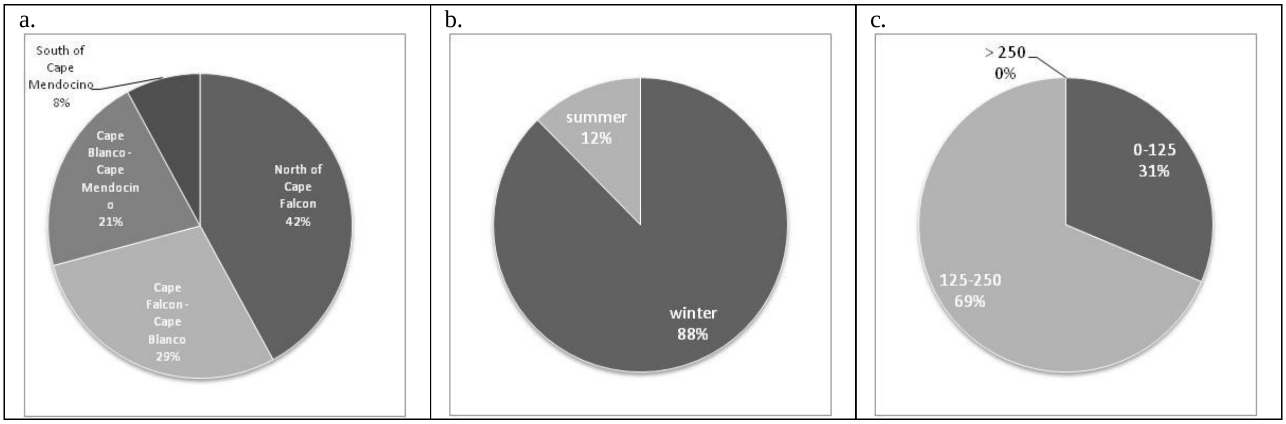
Most interactions are with Chinook salmon, although other salmon species are also encountered. Bycatch rates tend to be higher closer to shore and earlier in the season. Higher bycatch rates have been observed in the tribal sector, since these vessels fish within the tribal usual and accustomed areas, and they have less flexibility to make spatial adjustments in response to salmon bycatch. The shorebased sector, for cost and operational reasons, also tends to fish closer to shore. However, no such factors adequately account for inter-annual variation in bycatch. Previous work found no "obvious or consistent correlation" between annual Chinook abundance and bycatch (NMFS 2006). Ocean conditions may play a role, but specific causative factors, at least any that can be used predicatively, have not been identified.

Estimates of Chinook bycatch in the non-whiting fisheries from 2006 through 2010 remained considerably lower than 2005 (Table 3-22). Coho salmon bycatch occurs in the fixed gear nearshore groundfish fishery. Coho bycatch observations were all made north of Cape Mendocino. Pink salmon bycatch was first observed in the limited entry bottom trawl fishery during 2009. One individual pink salmon was observed during the summer season in depths shallower than 125 fm south of Cape Mendocino. Chum and sockeye salmon were not observed as bycatch from 2005 to 2009.

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. Other groundfish fishery sectors have not had full observer coverage, and bycatch must be estimated. However, the groundfish bottom trawl fishery (or shorebased 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 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/shorebased IFQ fishery since 2011, uncertainty in bycatch estimates has been reduced. (Almost all bycatch occurs in trawl fisheries.)

Figure 3-28 shows Chinook salmon bycatch in the groundfish bottom trawl fishery by geographic area, season, and depth range from 2006 to 2010 based on data in Table 1 in Al-Humadh*et al.* [That report presents bycatch estimates by strata that combine these dimensions.] Table 3-39 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 to 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 to 250 fathoms
- North of Cape Falcon, winter, 125 to 250 fathoms
- Cape Blanco to Cape Mendocino, winter, 125 to 250 fathoms
- North of Cape Falcon, winter, 0 to 125 fathoms
- South of Cape Mendocino, summer, 0 to 125 fathoms
- North of Cape Falcon, summer, 0 to 125 fathoms



Source: Al-Humad et al., Table 1.

Figure 3-28. Chinook salmon bycatch in the groundfish bottom trawl fishery, 2006 to 2010, by a. geographic area, b. season, and c. depth (fathoms).

Table 3-39. 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 to 2010.

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				

Source: Al-Humadh et al., Table 1.

3.5.2.2 Species Covered by the 2012 NMFS Biological Opinion

Section 1.2 in the most recent biological opinion (NMFS 2012a) describes the past ESA Section 7 consultations on the continued operation of the Pacific Coast groundfish fishery.[39] Among other sources, this biological opinion used a biological assessment completed in mid-2012 by NMFS Northwest Region Sustained Fisheries Division (SFD) (NMFS 2012b) and a risk assessment the NMFS NWFSC drafted in early 2012 (NWFSC 2012). Based on this information and previous interactions observed in the Pacific Coast groundfish fishery, NMFS's Protected Resources Division (PRD) determined that the fishery is likely to affect the following listed species and critical habitat adversely:

- Eulachon (*Thaleichthys pacificus*)
- Green sturgeon (*Acipenser medirostris*) and their critical habitat
- Humpback whales (*Megaptera novaeangliae*)
- Steller sea lions (*Eumetopias jubatus*)[40]
- Leatherback sea turtles (*Dermochelys coriacea*) and their critical habitat

[39] NMFS's 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.
[40] 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 have 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.

The following ESA-listed species occur in the fishery management area, but NMFS's 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 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 to 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 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.[41] 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'S PRD documented the effects of continued operation of the Pacific Coast groundfish fishery on species and habitat. These finding are summarized below.

Eulachon – Southern DPS (Threatened)

Eulachon are found in the north eastern Pacific Ocean from northern California to southwest Alaska and into the southeastern Bering Sea. The eulachon southern DPS is defined from the Mad River in northern California, north to the Skeena River in British Columbia. Eulachon are an anadromous fish. Adults migrate from the ocean to freshwater creeks and rivers where they spawn from late winter through early summer. The offspring hatch and migrate back to the ocean to forage until maturity. Once juvenile eulachon enter the ocean, they move from shallow nearshore areas to deeper areas over the continental

[41] 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).

shelf. There is little information available about eulachon movements in nearshore marine areas and the open ocean.

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."

NMFS recently 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 was required.

Green Sturgeon – Southern DPS (Threatened)

The North American green sturgeon southern DPS is defined as coastal and Central Valley populations, south of the Eel River in California. Green sturgeon critical habitat is designated from 0 to 60 fm (74 FR 52300).

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 the 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 to 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 sturgeon caught in the groundfish fishery are expected to be released alive. 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 on green sturgeon prey resources support 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.

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 (CA/OR/WA) currently considered one stock. The most recent population estimate of humpback whales in the North Pacific Ocean is 21,808 (coefficient of variation [CV] equals 0.04). The most recent estimated abundance of the California/Oregon/Washington 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 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's 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'S 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. On average, however, 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). 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 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 3.5.3 for an explanation of these MMPA fishery categorizations.

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 ranges 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 such as those 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 annually, incidental to groundfish fishing. 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 (Allen and 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 3.5.3 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.

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 ESA 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 et al. 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 2012a). NMFS' PRD concluded that 0.38 turtles would be killed annually due to groundfish fishing, and 5.82 turtles would be killed due to all activities occurring in the ESA 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 in 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 on 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 on those of other human sources. It also determined 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 in 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.

Incidental Take Statement

The current biological opinion contains an 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 ITS. 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 the potential for 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 (shorebased 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 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 (shorebased 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.

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 ITS. These must be carried out for the exemption to the general ESA prohibition of take resulting from the consultation to apply. The current ITS enumerates reasonable and prudent measures and associated terms and conditions that are summarized below:

- 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 shorebased IFQ program and biennially report results. The PCGW will provide recommendations on the design of the analysis.
- The West Coast Groundfish Observer Program (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. The 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).

3.5.2.3 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 3.5.2. In the consultation, USFWS concurred with NMFS's conclusion (NMFS 2012b) 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 2012).

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.[42] 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; 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 have 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 2012) 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 2011-2012 breeding season, the population is estimated at 3,441 birds and 851 breeding pairs. The population growth rate is estimated at about 6.5 percent.

Injury and mortality occur 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.

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

[42] 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.

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 are 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.[43] 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 (a 0 percent dropoff rate, lower 90 percent confidence interval on WCGOP estimate) and 1.9 (a 45 percent dropoff rate, upper confidence interval on WCGOP estimate). Although unquantified in the sensitivity analysis, 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 approximately one short-tailed albatross per year will not appreciably affect the population growth rate.

The incidental take allowed 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 2-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 ITS 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.[44]

3.5.3 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.

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.

[43] A complete description of the methodology can be found on pages 24 to 28 of the biological opinion (USFWS).
[44] Section 1.2 in NMFS (2013c) 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."

As discussed above, 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 et al. 1995). PBR is reported in stock assessment reports, and the most recent estimates of PBR can be found in Carretta et al. (2013).[45]

Table 3-40 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. (2013). (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. 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. (2011).[46] 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 3-41 is similar to Table 3-40 in format; however, it 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 percent 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 percent and 10 percent of PBR. The average annual mortality estimate for California sea lion derived from Jannot et al. (2011) 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)[47]
- Harbor seal: California halibut trawl, non-nearshore fixed gear sablefish, nearshore fixed gear, at-sea hake (Pacific whiting)
- Northern elephant seal: Shoreside groundfish trawl, California halibut trawl, non-nearshore fixed gear sablefish, at-sea hake (Pacific whiting)

[45] Marine mammal stock assessment reports are available at http://www.nmfs.noaa.gov/pRBSars/region.htm.
[46] Jannot et al. (2011) report estimated takes by year. These values are averaged in Table 3-40 to derive the annual estimate.
[47] California halibut trawl is a state managed fishery and is only subject to the proposed action with respect to catch accounting to ensure that ACLs are not exceeded.

- 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. Andersonet al. (Andersen 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 gear, 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 3-40. 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 2002-2009	WCGOP Average Annual Fishery Estimate, 2002-2009	WCGOP Average Annual Fishery Estimate, 2002-2009 Upper Cl
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 OR/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 3-41. 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.

3.5.4 Seabirds not Listed under the Endangered Species Act

Section 3.1.4.5 in the 2013-2014 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 et al. 2005). 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 (Ainley et al. 2005; Tyleret al. 1993). 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 et al. 1993). On the West Coast, upwelling is most intense south of Cape Blanco, Oregon (42° 50’ N. latitude) (Bakunet al. 1974; Barth et al. 2000).

Three distinct oceanic seasons have traditionally been defined for the U.S. West Coast: the Upwelling, Oceanic, and Davidson Current seasons. 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 et al. 1993). In the fall (Oceanic Current 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 et al. 1993). 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 3-42 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

3.5.5 Designation of Critical Habitat for Puget Sound Rockfish

On November 13, 2014, NMFS announced the designation of critical habitat for threatened yelloweye rockfish and canary rockfish and endangered bocaccio in Puget Sound (79 FR 68041, November 13, 2014). The primary impact of critical habitat designation stems from the requirement under section 7(a)(2) of the ESA that Federal agencies ensure that their actions are not likely to result in the destruction or adverse modification of critical habitat. Many forms of human activities have been identified as having a potential to affect the essential features of listed rockfish species, including fishing activity.

On February 11, 2015, the designation of approximately 590 square miles of nearshore habitat for Puget Sound canary rockfish and bocaccio, and 414.1 square miles of deepwater habitat for Puget Sound yelloweye rockfish, canary rockfish, and bocaccio will become effective. The critical habitat designations largely overlap with existing critical habitat designations for Puget Sound Chinook salmon and Hood Canal summer-run chum, bull trout, Southern Resident killer whales, and the southern DPS of green sturgeon. However, there is no overlap between the action area for the proposed action considered in the FEIS and the newly designated critical habitat. Puget Sound and Georgia Basin make up the southern arm of an inland sea that connects to the Pacific Ocean by the Strait of Juan de Fuca. The west entrance of the Strait of Juan de Fuca adjoins the action area for the proposed action considered in the FEIS. Because the range of the Puget Sound rockfish includes all waters of Puget Sound, the Strait of Juan de Fuca east of Victoria Sill (located south of the city of Victoria and east of Port Angeles), and south of the North Strait of Georgia, there is no overlap between the coastal fisheries and the newly designated critical habitat, since the Pacific Coast groundfish fishery is prosecuted outside of Puget Sound.

A relatively small proportion of the vessels participating in the Pacific Coast groundfish fishery transit through Puget Sound and the Strait of Juan de Fuca to the ports in Puget Sound (primarily Bellingham, Seattle, and Tacoma). Although vessel traffic may have an indirect effect on the listed stocks, it was not identified as major habitat concern for the Puget Sound stocks.

Table 3-42. 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.

Species	Shoreside Trawl	CA Halibut Trawl	Fixed Gear	At-sea Hake	WCGOP Average Annual Fishery Estimate, 2009-2009	WCGOP Average Annual Fishery Estimate, 2002-2009 Upper Cl	Actual No. Years When Observations Made, 2002-2009	IUCN Red List Status	IUCN Red List Population 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

Sources: Jannot *et. Al* and www.iucnredlist.org/

3.6 Non-groundfish Species Caught in Groundfish Fisheries

The 2013-2014 Groundfish Harvest Specifications FEIS (PFMC and NMFS 2012) describes non-groundfish catch with particular attention to commercially important species. These economically important species include the following:

- 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, summarized here:

- Pacific halibut (*Hippoglossus stenolepis*) is a bottom-dwelling, right-eyed flatfish species from the family of flounders called *Pleuronectidae.* Pacific halibut are taken with trawl, as well as commercial and recreational fixed gears as they co-occur with groundfish stocks, including canary and yelloweye rockfish. As part of the trawl rationalization program, Pacific halibut bycatch is managed with individual bycatch quota (IBQ), which limits bycatch mortality to quota levels. According to observer data, halibut bycatch in the trawl fishery averaged 204 mt annually from 2003 to 2010 but was only 32 mt in 2011. This demonstrates that IBQ has been effective in reducing halibut bycatch.
- California halibut (*Paralichthys californicus*) are a left-eyed flatfish of the family *Bothidae*. California halibut is taken incidentally in the groundfish fishery.
- Off the West Coast, Dungeness crab is most abundant in nearshore areas from central California to the Washington State-Canada border. Dungeness crab is found to a depth of about 180 m. Dungeness crab is taken incidentally, or harmed unintentionally, by groundfish gears. In some areas, interactions with Dungeness crab by nearshore flatfish trawls are a concern. Concentrating vessel effort in shallow water during the summer months (<75 fm) affects Dungeness crab in the north because they are less likely to survive discard during their summer molting season.
- Off the U.S. West Coast, Pacific pink shrimp (*Pandalus jordani*) are harvested with trawl gear from northern Washington to central California, with the majority of the catch taken off the coast of Oregon. Concentrations of pink shrimp are associated with well-defined areas of green mud and muddy-sand bottoms. Most of the pink shrimp catch is taken with trawl gear with a minimum mesh size of 1 inch to 3/8-inch between the knots. Shrimp trawlers commonly take groundfish in association with shrimp, rather than the reverse. In the past, the pink shrimp fishery had been responsible in some years for a large proportion of canary rockfish incidental catch. However, the catch of groundfish has been reduced through the use of bycatch reduction devices (BRDs) which are required on all vessels in this fishery. BRDs are added to the trawl net, and they divert finfish out of the codend of the net, where the shrimp catch is accumulated.
- Salmon are anadromous fish, spending a part of their life in ocean waters, but returning to freshwater rivers and streams to spawn and then die. Groundfish fisheries catch salmon incidentally, and the salmon troll fishery has an incidental catch of groundfish. Biological opinions addressing the take of ESA-listed salmon are summarized in Section 3.5.2.

- Ridgeback prawns (*Sicyonia ingentis*) are found from Monterey, California south to Baja California, Mexico, in depths of 145 m to 525 m. Spot prawns (*Pandalus platyceros*) are the largest of the pandalid shrimp and range from Baja California, Mexico, north to the Aleutian Islands and west to the Korean Strait. The Ridgeback prawn fishery occurs exclusively in California, centered in the Santa Barbara Channel and off Santa Monica Bay. Spot prawn fisheries are state-managed. The use of trawl gear to target spot prawns has been banned in all three states; the spot prawn pot fishery that remains is considered to have no incidental bycatch of depleted groundfish species.

As suggested above, for most of these species, it is the incidental catch of groundfish in fisheries targeting these species rather than the other way round. Groundfish catch in non-groundfish fisheries is accounted for through set-asides, described in Section 4.2.

The WCGOP's Groundfish Management Multiyear Data Product (Bellman et al. 2013) includes catch estimates of non-groundfish species in groundfish fisheries. Focusing on groundfish-directed fisheries (limited entry permit vessels, open access vessels targeting groundfish, tribal fisheries targeting groundfish), some 334 non-groundfish species or groups (including partially or unidentified species) were observed caught from 2002 to 2012. Non-groundfish catch, by weight, accounts for about 2 percent of total catch in these fisheries. Table 3-43 shows the most commonly caught non-groundfish by weight in rank order and accounting for just over 90 percent of the catch. About 54 percent of the non-groundfish catch by weight is invertebrate species, including crabs followed by grenadiers and sharks, each accounting for about 5 percent.

Table 3-43. Most commonly caught non-groundfish species, by weight, 2002 to 2012.

	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%

Source: Bellman et al. 2013.

As shown in Table 3-44, Dungeness crab, which is the most economically important species listed above, are mostly caught in the shoreside trawl and tribal shoreside fisheries.

Table 3-44. Total catch of economically important non-groundfish (mt) by fishery sector, 2002 to 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%

Figure 3-29 shows catch of all non-groundfish by fishery sector. The tribal shoreside accounted for the largest share, 32 percent.

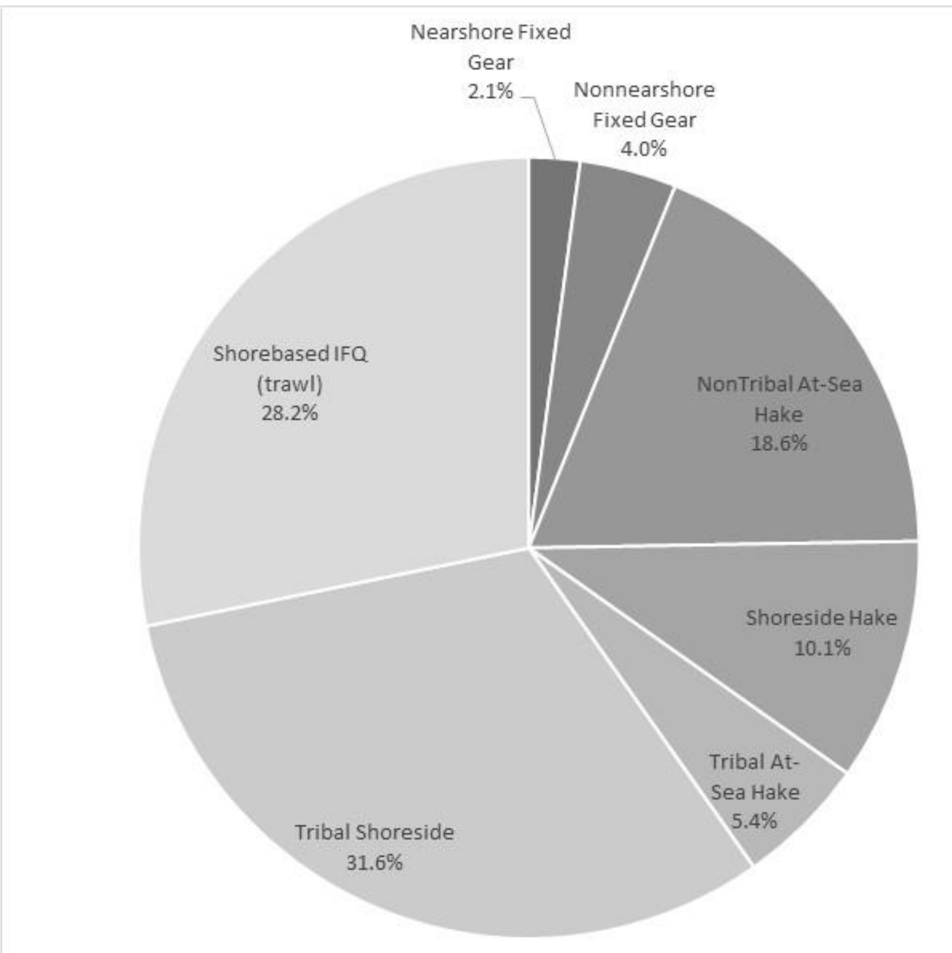


Figure 3-29. Catch of non-groundfish by groundfish fishery sector, 2003 to 2011. Shorebased IFQ includes the limited entry trawl sector before 2011 and the non-trawl IFQ sector in 2011.

Figure 3-30 shows the catch of non-groundfish species as a percent of total catch during the baseline period for groundfish fishery sectors (as shown in Figure 3-29). The proportion varies between 1.4 percent (3,801 mt) in 2011 and 5.9 percent (8,551 mt) in 2009. Non-groundfish catch amounts show no correlation with total catch during this period (R-squared = 0.031).

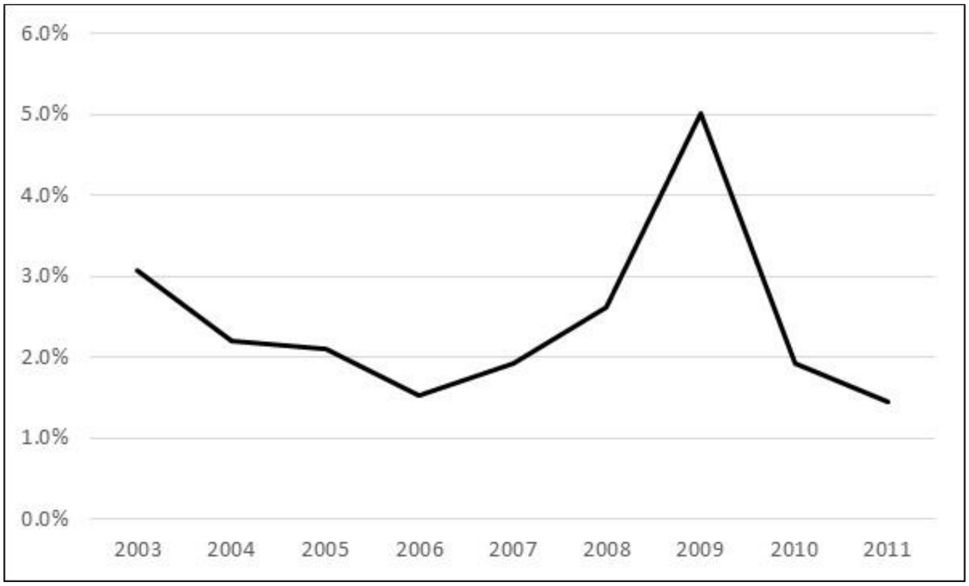


Figure 3-30. Catch of non-groundfish species as a percent of total catch in groundfish fishery sectors, 2003 to 2011.

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 non-groundfish. Sections 4.8 through 4.14 consider 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. Section 4.15 evaluates cumulative impacts. The impacts of proposed changes to Slope Rockfish and Other Fish complexes and the designation of ecosystem component species are described in Section 4.1.

4.1 Biological Impacts of 2015-2016 Biennial Harvest Specifications on Groundfish Stocks

This section evaluates the biological impacts of preferred 2015-2016 harvest specifications on a select list of groundfish stocks. Section 4.1.1 first considers the consequences of the alternatives on the biological environment relative to groundfish stocks. The types of biological effects considered in this EIS relative to groundfish are addressed in Section 4.4.1. The OFLs and ABCs for all groundfish stocks and stock complexes are addressed in Section 4.1.2. The biological consequences of setting ACLs for overfished groundfish species are discussed in section 4.1.3. ACL alternatives considered for non-overfished species managed with stock-specific harvest specifications are described in Section 4.1.4. Effects of the alternatives on groundfish species managed in stock complexes are discussed in Section 4.1.5. The effects of the alternatives on ecosystem component species are discussed in Section 4.1.6. A summary of the biological impacts is in Section 4.1.7.

4.1.1 Effects on Groundfish Species

Section 2.1 describes four integrated alternatives that could be implemented to manage groundfish fisheries in 2015-2016, including the No Action Alternative. 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. Because the OFL specifications do not vary between the integrated alternatives, the biological consequences of these parameters are addressed first by assessing the risk of overfishing relative to the proposed OFLs for all groundfish stocks and stock complexes using the best available scientific information. Alternative P* values that result in different ABC values between the alternative are discussed in relation to the risk of overfishing.

The HCRs used to derive ACLs for overfished species do not vary between the integrated alternatives, nor do the management measures or accountability measures (AMs) necessary to constrain the catch of all species, including overfished species, to the specified ACLs or ACTs. For most non-overfished groundfish stocks and stock complexes, the ACLs varied between the integrated alternatives, given the alternative P* values that result in different ABCs. However, additional constant-catch ACLs for Dover sole, widow rockfish, and shortbelly rockfish were considered. The biological consequences of the alternative ACLs for individual non-overfished species are further addressed in Section 4.1.1.4. The biological consequences of the alternative ACLs for non-overfished species that are managed within stock complexes are discussed in Section 4.1.1.5. Relative to the integrated alternatives, this EIS considers the effect of the groundfish harvest specifications on the groundfish species in the FMP with respect to two biological indicators of resource health (stock productivity and fishing mortality).

The effects associated with two other biological indicators, genetic structure and prey availability, are not differentiated between ACL alternatives; such effects are considered cumulative. The risk of altering the genetic structure of local groundfish populations would most likely be related to local depletion from fishing or the age-specific selectivity of fisheries and is primarily a concern for depleted stocks. The 2011-2012 Harvest Specifications FEIS analysis of cumulative impacts concluded that productivity or overall fitness of the stocks would not be altered by setting the harvest specifications (PFMC and NMFS 2011). Harvest levels and management measures in 2015-2016 are similar to 2011-2012; therefore, a similar effect would be expected. The 2011-2012 Groundfish Harvest Specifications FEIS (PFMC and NMFS 2011) also evaluated the effect of fishing on predator-prey relationships for overfished species within the cumulative impacts. The effect of the proposed action on predator-prey relationships results from cumulative application of harvest specifications and management measures over more than one management cycle. Similar effects are expected in 2015-2016. In the cases where these indicators are important attributes in deciding a stock's ACL, they are directly discussed (e.g., prey availability as a consideration in deciding the shortbelly rockfish ACL).

Stock Productivity

- Are fishing practices likely to change the reproductive success of groundfish stocks?
- Are fishing operations likely to interfere with or disturb spawning and reproductive behavior or juvenile survival rates such that it raises concern about a stock's ability to maintain its biomass at or above B_{MSY}?

Fishing Mortality

- Are harvest levels likely to result in overfishing?
- For healthy and precautionary zone stocks, are harvest levels likely to remove a portion of the spawning population from the stock such that the stock is likely to become overfished?
- For overfished stocks, are harvest levels likely to rebuild the stock by T_{TARGET}?

Genetic Structure

- Are changes in the time and location of fishing likely to result in changes to the genetic structure of the groundfish populations?
- Will fishing on particular substocks or targeting fish with certain characteristics (e.g., large size) alter the genetic structure of the population over time?

Prey availability

- Is harvesting likely to change the availability of groundfish that are prey species such that it could affect the survival of species that prey on them?

4.1.2 OFLs and ABCs for All Groundfish Stocks and Stock Complexes

A primary goal of the groundfish FMP is to rebuild to or maintain spawning stock biomass of each groundfish stock and stock complex at or above B_{MSY}. For the non-overfished groundfish stocks, this EIS considers the projected fishing mortality relative to vulnerability to overfishing and becoming overfished. For overfished stocks, this EIS considered the projected fishing mortality relative to the time necessary to rebuild the stock to B_{MSY}.

The OFLs define the point above which overfishing occurs on a stock. The ABC is a reduction from the OFL to account for scientific uncertainty in the estimate of OFL. The ACL, which is set at the ABC level or lower, defines the upper limits on allowable total catch (retained plus discarded catch) for a fishing year. The ACLs are set for each species or species complex in the fishery, including overfished species, non-overfished target species, and non-target species. The management measures developed for each integrated alternative are structured such that the projected total catch mortality, based on the best available data, does not exceed the ACLs for any stock or stock complex.

Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that is above the stock's capacity to produce MSY (an estimate of the largest average annual catch or yield that can be taken over the long term under prevailing ecological and environmental conditions). This level is also referred to as MFMT in the FMP. Under the Groundfish FMP provisions, OFLs for all species will be set based on the MFMT. None of the 2015 or 2016 OFLs will be set higher than the MFMT or its proxy applied to a stock's abundance. The corresponding ABCs will be set below the OFLs, and the ACLs will be set at or below the ABCs. The groundfish management measures are designed to keep harvest levels within specified ACLs or ACT.

The OFLs projected from older stock assessments are biased low (i.e., underestimated) since the projections assume annual removals of the entire projected OFL when actual removals are often much lower. For some stocks, such as overfished species and those that reside almost entirely on the continental shelf within the core of the RCAs, these biased OFLs have little impact on fisheries since ACLs are usually much lower (e.g., overfished rockfish), or the ACL cannot be effectively attained (e.g., shelf species). However, this bias can effectively limit ACL options and directly affect fisheries for some species. Assuming the entire OFL is removed each year when projecting 2015 and 2016 OFLs could have a substantial effect on the calculated OFLs, ABCs, and ACLs, resulting in values that are lower than they would be if actual total mortalities were updated in the projections.

In 2013, the SSC presented the results of an analysis of F_{MSY} proxies used for spiny dogfish and longnose skate. For spiny dogfish, the mean SPR at F_{MSY} was estimated at $F_{SPR49\%}$; for longnose skate, the mean SPR was calculated to be $F_{SPR45\%}$. The average mean SPR at F_{MSY} across both distributions was $F_{SPR47\%}$. The longnose skate assessment expresses reproductive output in spawning biomass (in common with most fish stocks), which may not accurately reflect elasmobranch reproductive biology; therefore, it is reasonable to place more weight on the spiny dogfish result. Even in this case, $F_{SPR50\%}$ is the highest fishing mortality rate that does not exceed the F_{MSY} value with 50 percent probability for either longnose skate or spiny dogfish. The SSC's groundfish subcommittee indicated that elasmobranch SPR analysis represented the best available science and recommended that the Council adopt $F_{SPR50\%}$ as the default proxy fishing mortality rate for elasmobranch species in the West Coast (Agenda Item G.7.b, SSC Groundfish Subcommittee Report, September 2013)

As noted in Chapter 2, the amount by which OFL was reduced to get the ABC for each stock was determined based on the SSC's recommended sigma value and the Council's choice of overfishing risk policy, or P*. Lower P* values are associated with larger reductions from OFL and correspondingly smaller ABC values and, thus, a lower risk of the catch of a stock exceeding the "true" OFL, or the OFL that would be determined, but for scientific uncertainty regarding that value. However, as described in subsequent sections, the projected total catch mortality of the integrated alternatives on the non-overfished stocks is generally substantially lower than the ABCs or the ACLs. Low attainment of ACLs results from management measures that are structured to keep the catch of the overfished species below their rebuilding ACLs, as well as economic reasons (i.e., too costly to harvest relative to market value, or unmarketable species). The general impact of the integrated alternatives with respect to the non-overfished species involves a very low risk of overfishing, and this would be the case even if the ABCs or ACLs for the non-overfished species were higher (Preferred Alternative and Alternative 1) or lower (Alternative 2).

The basis for the proposed ABCs under each of the alternatives is shown in Tables 2-2 to 2-5. Most of the proposed ABCs are calculated using the sigma-P* process. The primary difference between the ABC under each alternatives is the use of different P* values to derive the ABC. Alternative 1 ABCs would be based on a P* value of 0.45, Alternative 2 ABCs would be based on a P* value of 0.25. For the Preferred Alternative, ABCs would be based on a P* value of 0.45 with the exception of arrowtooth flounder, lingcod, longspine thornyhead, sablefish, shortspine thornyhead, spiny dogfish, starry flounder and other flatfish which would be based on a P* of 0.40. This is in contract to the No Action Alternative, where ABCs would be based on a P* of 0.45 with the exception of arrowtooth, longspine thornyhead, sablefish, starry flounder, other flatfish, and other fish, which would be based on a P* of 0.40, and spiny dogfish, which would be based on a P* of 0.30.

For 2015 and 2016, the Council continued the general policy of using the SSC-recommended sigma values for each species category. However, an exception to the general sigma policy was made for aurora rockfish and widow rockfish. As a result of a new stock assessment, the species category for aurora rockfish was revised for 2015 and 2016 from category three to category one. For aurora rockfish, the SSC recommended a larger sigma value of 0.39, rather than the 0.36 that would typically be used for category one stocks to better represent uncertainty in the estimated spawning biomass caused by sensitivity to the natural mortality rates, which are considered the major source of uncertainty in the aurora rockfish assessment. As in 2013 and 2014 for widow rockfish, the SSC recommended a larger sigma value of 0.41, rather than the 0.36 that would typically be used for category one stocks to better represent uncertainty in stock-recruit steepness, which is considered the major source of uncertainty in the widow rockfish assessment. In addition, several species changed categories in 2015-2016 as a result of updated stock assessments or due to being assessed for the first time.

For 2015 and 2016, the Council recommended using P* values of 0.45 for most species under the Preferred Alternative. Exceptions were made for lower P* values for arrowtooth, lingcod south, longspine thornyhead, sablefish, shortspine thornyhead, spiny dogfish, and starry flounder as a P* value of 0.40 was used. Model uncertainty for these Category 2 species (all species listed above except sablefish) led the Council to the more risk averse P* values. Added precaution was taken with sablefish, a Category 1 stock, since it is a valuable stock with high rates of attainment. Additional precaution is intended to prevent the stock from falling into an overfished status. For each of the stock complexes, the component species' ABCs were summed to derive the complex ABC. P* values are shown in Tables 2-2 to 2-5. For stocks managed within complexes, a range of ABCs by P* value are shown in Table 12 and Table 13 of the 2014 SAFE document (PFMC 2014).

Productivity and Susceptibility Assessment – Vulnerability of Stocks to Overfishing

The vulnerability of a stock to potential overfishing in 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) to identify stock complexes. In addition, the vulnerability scores were considered when prioritizing stock assessments and determining data collection needs.

The 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 consists of several attributes (10 productivity and 12 susceptibility attributes), and the weighted mean score of all attributes defines the overall productivity and susceptibility score. Scores are presented in two dimensions, with productivity on the x-axis and susceptibility on the y-axis (Figure 4-1). Cope et al. (2011) established vulnerability reference points of unassessed West Coast groundfish stocks to determine vulnerability (V) 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 (greater than 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. 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.

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, as well as an updated understanding of the stock’s interaction with the fishery. As susceptibility scores change, so do the vulnerability scores. The current productivity and vulnerability scores for each stock are presented in the 2014 SAFE document (PFMC 2014).

4.1.3 Overfished Groundfish Stocks

There are currently six overfished rockfish stocks (bocaccio south of 40º10’ N. latitude, canary rockfish, cowcod south of 40º10’ N. latitude, darkblotched rockfish, Pacific ocean perch, and yelloweye rockfish) and one overfished flatfish stock (petrale sole) managed under rebuilding plans. All stocks show progress towards rebuilding. Some overfished stocks are projected to rebuild sooner than previously projected.

Both a stock assessment and rebuilding analysis was prepared for cowcod. The rebuilding analysis indicates that the maximum time to rebuild the stock (T_{MAX}) is earlier than the existing target year (T_{TARGET}) to rebuild the stock in the current rebuilding plan. The Council’s Preferred Alternative would maintain all the existing rebuilding plans with the exception of cowcod, for which a new T_{TARGET} would be specified.

For the overfished species other than cowcod, rebuilding considerations were informed by rebuilding analyses prepared in 2011, which were thoroughly reviewed in the 2013-2014 harvest specifications and management measures process (PFMC and NMFS 2012). 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.

At the Council's March and June 2012 meetings, stock assessments scheduling for 2013 was considered. NMFS NWFSC identified its intent to streamline the assessment process by preparing data reports for canary and yelloweye rockfish (Agenda Item F.5.b, Supplemental NOAA Fisheries PowerPoint, March 2012.)

The SSC concurred with the NWFSC because yelloweye and canary rockfish historical catch data from 1930 to 1969 for Washington was not expected to be reviewed and digitized in time for the updates to be performed in 2013. The SSC noted that the canary and yelloweye rockfish assessments were stable. Because the rebuilding times are very long, the SSC indicated that there was little justification for performing updates every cycle (Agenda Item F.5.b, Supplemental SSC Report, March 2012). The SSC discussed bocaccio and Pacific Ocean perch (POP) and indicated that a data report would also be most appropriate for POP, rather than an assessment update. The SSC's decision was predicated on little new information being available since the last full assessment; the SSC also indicated that an assessment update would be appropriate for bocaccio (Agenda Item D.3.b, Supplemental SSC Report, June 2012). New assessments were conducted for darkblotched rockfish and petrale sole, and an assessment update was conducted for bocaccio. The SSC indicated that preparing new rebuilding analyses was unnecessary for darkblotched rockfish, petrale sole, or bocaccio (Agenda Item F.5.b, Supplemental SSC Report, June 2013).

Criteria for Evaluating Alternative ACLs for Overfished Species

The following discussion considers the biological impacts associated with overfished species' ACLs. The impacts on overfished species are evaluated using the following criteria: stock productivity, fishing mortality, rebuilding duration (median time to rebuild), and the estimated probabilities of rebuilding these stocks successfully over time. The discussion below also addresses cumulative impacts associated with two biological indicators (genetic diversity and prey availability) that cannot be quantitatively assessed relative to alternative ACLs and integrated alternatives.

Stock Productivity Relative to Rebuilding Success

The predicted median times to rebuild overfished species (with 50 percent probability) relative to the amount of allowable harvest are determined in rebuilding analyses recommended by the SSC and adopted by the Council. Cowcod is the only overfished species with a new rebuilding analysis in 2013. The rebuilding analyses evaluate allowable harvest versus rebuilding duration relative to T_{MAX} and the target year to rebuild the stock (T_{TARGET}).

A mandate in the MSA is that stock rebuilding cannot exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the U.S. participates dictate otherwise. Therefore, T_{MAX} is 10 years, if T_{MIN} is less than or equal to 10 years. If T_{MIN} is greater than 10 years, T_{MAX} is equal to T_{MIN} plus one mean generation. Defining T_{MAX} with one mean generation is a relative biological index of stock productivity. Therefore, the range of allowable rebuilding periods is bounded by the biological limit of T_{MIN} or $T_{F=0}$, where all stock mortality is natural mortality. Stocks exhibiting low productivity will necessarily have longer predicted rebuilding periods due to longer mean generation times. Projections of different $T_{TARGETs}$ are determined from the productivity of the stock, its current status, and the ACL.

Table 4-1. Estimated time to rebuild and harvest control rule relative to a range of 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 2020).

	Current T_{TARGET}	Current SPR or Harvest Control Rule	Pref. T_{TARGET}	ACL Alternative	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 Current T_{TARGET}	Prob. of Rebuilding by T_{MAX}
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%
				Pref. Alt, Alt 1 & Alt 2	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	2030	88.7%	2030		0	0	100%	2028	0	68.0%	75.0%
					50	52	95.1%	2028	0	62.5%	75.0%
					106	109	90.0%	2029	1	55.8%	75.0%
				Pref. Alt, Alt 1& Alt 2	122	125	88.7%	2030	2	54.6%	75.0%
					154	158	85.9%	2030	2	50.0%	75.0%
					191	196	82.9%	2031	3	44.6%	75.0%
					224	230	80.3%	2032	4	39.7%	74.9%
					310	316	74.0%	2035	7	30.6%	73.6%
					401	407	67.9%	2040	12	26.9%	66.3%
					454	459	64.7%	2045	17	25.7%	59.4%
					496	500	62.2%	2050	22	25.3%	50.0%
Cowcod	2068	82.7%	2020		0	0	E = 0 [b/]	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%
					3.6	3.7	E = 0.0027	2019	0	94.4%	91.9%
				Pref. ACT	4.2	4.4	E = 0.0031	2019	0	94.0%	91.5%
					4.8	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	6.2	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	8.7	E = 0.0063	2019	0	91.5%	89.2%
					9.1	9.3	E = 0.0067	2019	0	91.2%	88.8%
				Pref. Alt, Alt 1& Alt 2 ACL	9.5	9.7	E = 0.007	2020	1	90.9%	88.4%
					9.7	10.0	E = 0.0072	2020	1	90.9%	88.5%

Table 4-1 (continued). Estimated time to rebuild and harvest control rule relative to a range of 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 2020).

	Current T_{TARGET}	Current SPR or Harvest Control Rule	Pref. T_{TARGET}	ACL Alternative	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 Current T_{TARGET}	Prob. of Rebuilding by T_{MAX}
Cowcod (continued)					27.7	28.1	E = 0.0203	2022	3	76.7%	74.3%
					38.1	38.4	E = 0.0281	2025	6	67.5%	65.7%
					48.3	48.5	E = 0.0356	2030	11	60.6%	59.2%
					53.0	53.0	E = 0.0391	2035	16	57.5%	56.4%
					55.5	55.4	E = 0.0409	2039	20	55.0%	53.4%
					62.1	61.9	E = 0.0458	2057	38	51.4%	50.0%
Darkblotched	2025	64.9%	2025		0	0	100%	2016	0	100.0%	100.0%
				Pref. Alt, Alt 1& Alt 2	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%
POP	2051	86.4%	2051		0	0	100%	2043	0	67.6%	85.5%
					62	64	94.3%	2045	2	61.6%	81.0%
					138	143	88.0%	2050	7	52.6%	75.0%
				Pref. Alt, Alt 1& Alt 2	158	164	86.4%	2051	8	50.0%	73.0%
					166	172	85.8%	2052	9	49.1%	72.6%
					191	198	83.9%	2054	11	45.7%	70.1%
					209	216	82.6%	2055	12	43.6%	68.0%
					258	266	79.2%	2060	17	38.1%	62.0%
					303	312	76.2%	2065	22	34.2%	55.8%
					341	350	73.8%	2071	28	31.8%	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%
				Pref. Alt & Alt 1 [c/]	2,816	2,910	25-5 Rule	2013	0	100.0%	100.0%

Table 4-1 (continued). Estimated time to rebuild and harvest control rule relative to a range of 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 2020).

	Current T_{TARGET}	Current SPR or Harvest Control Rule	Pref. T_{TARGET}	ACL Alternative	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 Current T_{TARGET}	Prob. of Rebuilding by T_{MAX}
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%
				Pref. Alt, Alt 1 & Alt 2	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 percent to represent the portion of the stock south of 40°10' N lat.

b/ The Depletion-Based Stock Reduction Analysis does not provide the information required to calculate SPRs. Therefore, age-specific quantities from the 2009 rebuilding analysis were used to translate harvest control rules (SPR=82.7 percent) into exploitation rates (E=0.007 calculated as catch/estimated age 11+ biomass).

c/ The petrale sole ACL varies by alternative because the 25-5 rule is applied to the ABCs, and the ABCs are derived using different P* values. Alternative 2 ACLs are 2,310 mt for 2015 and 2,386 mt for 2016.

Depending on the productivity of a particular species, fishing mortality or harvest rate will mean different things for different stocks. For fast-growing species (those with individuals that mature quickly and produce many young that survive to an age where they are caught in the fishery), a higher fishing mortality rate may be used. Fishing mortality rate policies must account for several complicating factors, including the capacity of mature individuals to produce young over time and the optimal stock size necessary for the highest level of productivity within that stock.

The overfished species' ACLs analyzed in this EIS are based on harvest rates estimated from the rebuilding simulation program, and they are calculated using an instantaneous rate of fishing mortality (F), which may be converted to an SPR (SPR equals spawner per recruit at the current population level, relative to that at the stock's unfished condition). For ease of comparison among stocks, and to standardize the basis of rebuilding calculations, it is useful to express any specific fishing mortality rate in terms of its effect on SPR. Given fishery selectivity patterns and basic life-history parameters, there is a direct inverse relationship between F and SPR. When there is no fishing, each new female recruit is expected to achieve 100 percent of its spawning potential. As fishing intensity increases, expected lifetime reproduction declines due to this added source of mortality. Conversion of F into the equivalent SPR has the benefit of standardizing for differences in growth, maturity, fecundity, natural mortality, and fishery selectivity patterns. As a consequence, the Council's SSC has recommended routine use of SPR.

Based on the most recent round of assessments, each overfished species is estimated to be at a different level of spawning stock biomass relative to its unfished spawning stock biomass (relative level of depletion). The relative level of depletion, combined with other biological characteristics of the stock, influences the sensitivity of a stock's rebuilding time to changes in ACLs. The lower the relative depletion of a stock's spawning biomass, the more risk there is in deciding higher ACLs. Therefore, stocks below the MSST at the start of 2015, such as yelloweye rockfish, are considered to have a higher sensitivity to higher fishing mortality rates.

Risks associated with increased ACLs are higher for stocks with greater uncertainty in fishing mortality estimates (catch and/or discard mortality). Stocks for which recreational fisheries account for a large percentage of total mortality are generally more susceptible to catch uncertainty than commercially targeted species, and this uncertainty increases for stocks that are rarely observed in sampling programs.

Fishing Mortality

Systems for monitoring groundfish mortalities (landings plus discard mortalities) on the West Coast vary in their effectiveness, depending on whether the species is caught primarily in commercial or recreational fisheries and how well at-sea discards are monitored. In general, fishing-related mortalities of commercially caught species are better documented than those for stocks primarily caught by recreational fisheries because commercial landings and discards are tracked more closely. Commercial landings are recorded on fish receiving tickets, which are used to document the weight and ex-vessel value of landed catch, while recreational catches are mostly monitored using a random, stratified census of anglers. The degree of at-sea monitoring of discards also varies by fishing sector with commercial discards estimated in directed groundfish fisheries by the WCGOP. Recreational discards are estimated in the same recreational census programs used to monitor recreational landings. Sampling rates in these discard estimation programs vary by sector, with the limited entry trawl sector observed at the highest at-sea observer rates (100 percent of trips); limited entry fixed gear sablefish (approximately 20 to 25 percent of trips observed); directed open access (approximately 5 percent of trips observed); California commercial passenger fishing vessel (CPFV) or California recreational charter; and California non-CPFV, Oregon, and Washington recreational. The Makah Tribe, the most active tribe targeting groundfish on the West Coast, observes its own fisheries and requires full retention of rockfish species.

Rebuilding Duration

The MSA §304(e) requires overfished stocks to be rebuilt to the MSY biomass in a time period that is as short as possible, taking into account the status and biology of the overfished stocks, the needs of fishing communities, and the interaction of the overfished stock within the marine ecosystem. One criterion used to evaluate the rebuilding duration for an overfished species is $T_{F=0}$, which is the shortest time possible estimated to rebuild a stock. The needs of fishing communities are considered by allowing limited harvest of an overfished species. In general, allowing the harvest of an overfished species increases the rebuilding period relative to $T_{F=0}$.

A new rebuilding analysis was prepared for cowcod in 2013. The 2011 rebuilding analyses were used for the other overfished stocks. The rebuilding analysis is used to project the status of the overfished resource into the future under a variety of alternative harvest strategies and to estimate the number of years it will take for the stock to reach B_{MSY} (or its proxy). Minimum requirements for rebuilding analyses in routine situations have been established by the SSC and are applied with a computer package developed by Dr. André Punt (University of Washington). The SSC encourages analysts to explore alternative calculations and projections that may more accurately capture uncertainties in stock rebuilding and that may better represent stock-specific concerns. In the event of a discrepancy between the calculations resulting from Dr. Punt's program, the SSC groundfish subcommittee reviews the issue and recommends which results to use. The SSC also encourages explicit consideration of uncertainty in projections of stock rebuilding, including comparisons of alternative states of nature using decision tables to quantify the impact of model uncertainty.

The rebuilding analyses include an estimate of B_0; B_{MSY} or its proxy; the selection of a method to generate future recruitment; the specification of the mean generation time, or the number of years predicted for a spawning female to replace herself in the population; a calculation of the minimum possible rebuilding time from the first year rebuilding measures were implemented (T_{MIN}); and the identification and analysis of alternative harvest strategies and rebuilding times. Rebuilding analyses also estimate the median number of years needed to rebuild to the target stock size if all future fishing mortality is eliminated from the first year for which the Council is making a decision in the biennial specifications process ($T_{F=0}$). This will sometimes differ from T_{MIN}. T_{MIN} is defined as the median time for a stock to recover to the target stock size, starting from the time when a rebuilding plan was first implemented (usually the year after the stock was declared overfished) to when the target level is first achieved, assuming no fishing-related mortality. Rebuilding analyses also report the maximum time to recovery recommended in NS1 guidelines (T_{MAX}), which is T_{MIN} plus one mean generation time.

Rebuilding Probabilities

Rebuilding analyses estimate the probability of successfully rebuilding the stock to the B_{MSY} target by T_{MAX} and by the target year specified in adopted rebuilding plans (T_{TARGET}). As stated above, T_{MAX} is defined as the minimum time a stock can rebuild biologically if no fishing-related mortality is allowed (T_{MIN}), plus one mean generation time. Mean generation time, or the predicted time it takes a spawning female to replace herself in the population, is a measure of relative stock productivity. The probability of rebuilding by T_{MAX} (P_{MAX}) is, therefore, one of the criteria used to evaluate risk of alternative harvest levels for overfished species since it is a metric that relates management risk (i.e., risk of not meeting the rebuilding target by T_{MAX}) to a stock's relative productivity. Likewise, the probability of rebuilding by T_{ARGET} (P_{TARGET}) is an important criterion, since it probabilistically measures the performance of management under the rebuilding plan to meet the goal of rebuilding the stock in the specified time. T_{TARGET} is typically chosen as the median time to rebuild the stock under a preferred rebuilding strategy, which, at the outset, is a 50 percent probability of successfully rebuilding by the target year. The SSC has identified the importance of increasing the probability of rebuilding by T_{TARGET} above 50 percent, especially when approaching the target year. Increased probabilities better ensure that rebuilding goals are met in the expected timeline. When a new assessment indicates an overfished stock has a less than 50 percent probability of rebuilding by T_{TARGET}, the Council could consider modifying the rebuilding plan by changing T_{TARGET}.

Genetic Diversity

Frequently, a fish stock is a collection of somewhat genetically differentiated sub-stocks, with relatively low exchange rates of individuals and genes between the sub-stocks. Fishing activity can have greater adverse impacts on some sub-stocks than on others. Geographic and temporal changes in harvest that lead to a detectable reduction in genetic diversity could jeopardize the ability of an overfished stock to rebuild to B_{MSY}. Localized depletion may be a concern if genetically important sub-populations are depleted within a distinct local region. This may be more of a concern for rockfish species that have a stock structure distributed within a relatively small region. In the long term, targeting fish with certain characteristics, such as large size, can lead to selection for fish with non-preferred traits such as faster or slower growth rates. In general, if fishing mortality is maintained below the OFL, the likelihood of adverse effects on genetic structure and reproductive success is reduced. The effects of ACL alternatives on genetic diversity and stock structure cannot be directly differentiated and are, therefore, not used as a criterion in evaluating ACL alternatives. Such effects are considered cumulative (see Section 4.15 for more discussion relative to cumulative effects). Discussion of what is known regarding the genetic diversity of overfished West Coast groundfish species is summarized in the 2011 and 2012 Harvest Specifications and Management Measures FEIS (PFMC and NMFS 2011).

Prey Availability

Harvesting activity may change the availability of a species as prey for other groundfish and non-groundfish species. However, there is relatively little information available on the prey relationships, particularly those involving larval or post-larval rockfish. Part of the reason is it is hard to distinguish larval rockfish. Genetic methods of identifying individual species are available in some cases, but they are expensive, and visual identification is not possible in most cases. Moreover, the predator-prey relationships are complex in that, for example, the same species may be a predator as well as a prey of another species at different life stages. The overall result is that fishing can increase or decrease the prey availability for both the fished species and others.

The effects of ACL alternatives on prey availability cannot be directly differentiated and are, therefore, not used as a criterion in evaluating ACL alternatives. Such effects are considered cumulative (see Section 4.15 for more discussion relative to cumulative effects). Discussion of what is known regarding the prey availability and such ecological interactions regarding overfished West Coast groundfish species is summarized in the 2011 and 2012 Harvest Specifications and Management Measures FEIS (PFMC and NMFS 2011).

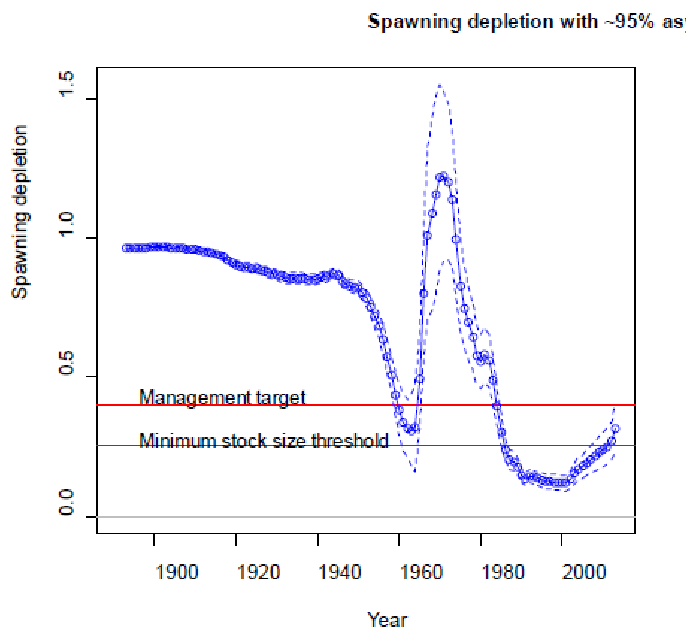
4.1.3.1 Bocaccio South of 40º10’ N. Latitude

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 stock assessment authors made 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 median year to rebuild of 2021, or one year earlier than the target rebuilding year (Field 2011a).

An update of the 2011 bocaccio assessment model was prepared in 2013, which confirmed that 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 with a full assessment being done in 2015 to confirm the depletion level. For 2015 and 2016 management, the SSC recommended continuing to use the current rebuilding SPR to define the ACL. The SSC indicated that a rebuilding analysis was unnecessary and would provide no new information given the projected two-year timeframe for rebuilding (Agenda Item F.5.b, Supplemental SSC Report, June 2013).

Stock Productivity Relative to Rebuilding Success

Bocaccio stock production is characterized by high episodic recruitment and relatively rapid juvenile growth rates (Field et al. 2009). Adult abundance varies highly, even in the absence of fishing (MacCall 2002). Several year classes of moderate strength (2003 and 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. These strong year classes are already estimated to have resulted in an increase in abundance and spawning output. This increase 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 YOY rockfish of many species (including bocaccio) in 2013, suggesting that 2013 will also be a strong recruitment year for bocaccio, as well as for other species. However, these data are not yet incorporated into the 2013 update, which only includes data through 2012 (Field 2013).



Source: Field 2013.

Figure 4-1. Time series of estimated depletion for bocaccio under the base model.

Fishing Mortality

Since 2002, catches have generally been less than 200 tons per year, with the largest fraction of catches coming from the southern California recreational fishery. The potential of a banner 2010 year class in the bocaccio stock was not entirely unexpected. Juvenile bocaccio recruit to shallow waters, where they are caught in nearshore recreational fisheries. Dramatic spikes in both catch rates and the percentage of the total southern California rockfish catch that is bocaccio tend to follow 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. For most species, rebuilding analyses can 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. The bocaccio ACLs under all of the action alternatives would be 349 mt in 2015 and 362 mt in 2016. The No Action Alternative ACL would be 337 mt. The mortality projections in 2015 would be well within the ACL under all of the alternatives. Projected bocaccio mortality would be 137.2 mt under the Preferred Alternative and Alternative 1 and 136.8 mt under Alternative 2. This is in contrast to a mortality estimate of 119 .8 mt under the No Action Alternative (Table 4-132 and Table 4-133) for 2015 and 2016. The mortality projections in 2016 would also be well within the ACL under all of the alternatives. Bocaccio mortality would be 137.7 mt for the Preferred Alternative and Alternative 1 and 136.8 for Alternative 2, in contrast to 119.8 mt under the No Action Alternative (Table 4-132 and Table 133). The ACLs are expected to create a harvestable surplus large enough to buffer a large recruitment event with inseason management adjustments if the 2010 and 2013 year classes are greater than the revised base model in the assessment indicates.

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. The preferred bocaccio ACL alternative would maintain the strategy and policies of the current rebuilding plan. The strategy of adopting higher ACLs than the average total mortalities projected in association with preferred management measures in the rebuilding plan is better able to avoid unanticipated disruptions of ongoing fisheries, especially those south of Point Conception if there is a large recruitment event. Table 4-2 shows management performance relative to harvest specifications for 2010 to 2012.

Table 4-2. Estimated annual fishing mortality and management reference points for bocaccio, 2010 to 2012.

		Management Reference Points (Harvest Specifications)					
Year	Estimated Fishing Mortality	ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	75.36	288	26%	793	10%	793	10%
2011	111.95	263	43%	704	16%	737	15%
2012	187.54	274	68%	700	27%	732	26%

Rebuilding Duration

Biomass projections and probabilities are based on the rebuilding analysis and the current understanding of productivity applied forward in time. The action alternatives would maintain the rebuilding plan and wait for the next assessment to confirm whether the estimated strong recruitment would result in successfully rebuilding the stock as predicted.

Under the action alternatives, the probability of successful rebuilding by the T_{TARGET} of 2022 would be 60 percent, and the probability of rebuilding by T_{MAX} would be 90 percent using the projections from the 2011 rebuilding analysis. The probabilities would likely be higher if a new bocaccio rebuilding analysis were prepared based on the 2013 assessment, since the strength of recent recruitments was higher than previously estimated.

4.1.3.2 Canary Rockfish

A catch report that considered revised catch data was prepared to update the status of the canary rockfish. The catch report concluded that the management performance has been consistent with the rebuilding plan. The last full assessment was performed in 2007 (Stewart 2008). Updates for canary rockfish were performed in 2009 (Stewart 2009) and 2011 (Wallace et al. 2011). The resource was modeled as a single stock using the most up-to-date version of Stock Synthesis available at the time. A new canary rockfish rebuilding analysis was not prepared for 2013; therefore, the 2011 rebuilding analysis (Wallace 2011) was used to inform the rebuilding projections in Table 4-1.

The 2007 canary assessment's estimated relative depletion level was 32.4 percent at the start of 2007 (Stewart 2008b). This was a substantial departure from the previous assessment and was 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 percent) 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 percent, was implemented in 2009.

The 2009 canary assessment (Stewart 2009c), an update of the 2007 assessment, estimated stock depletion at 23.7 percent at the start of 2009. This change in stock status was due to a lower estimate of initial B_0 largely attributable to the inclusion of revised historical California catches from a formal reconstruction of 1916 to 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 percent 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 percent SPR harvest rate; the revised rebuilding plan was implemented in 2011.

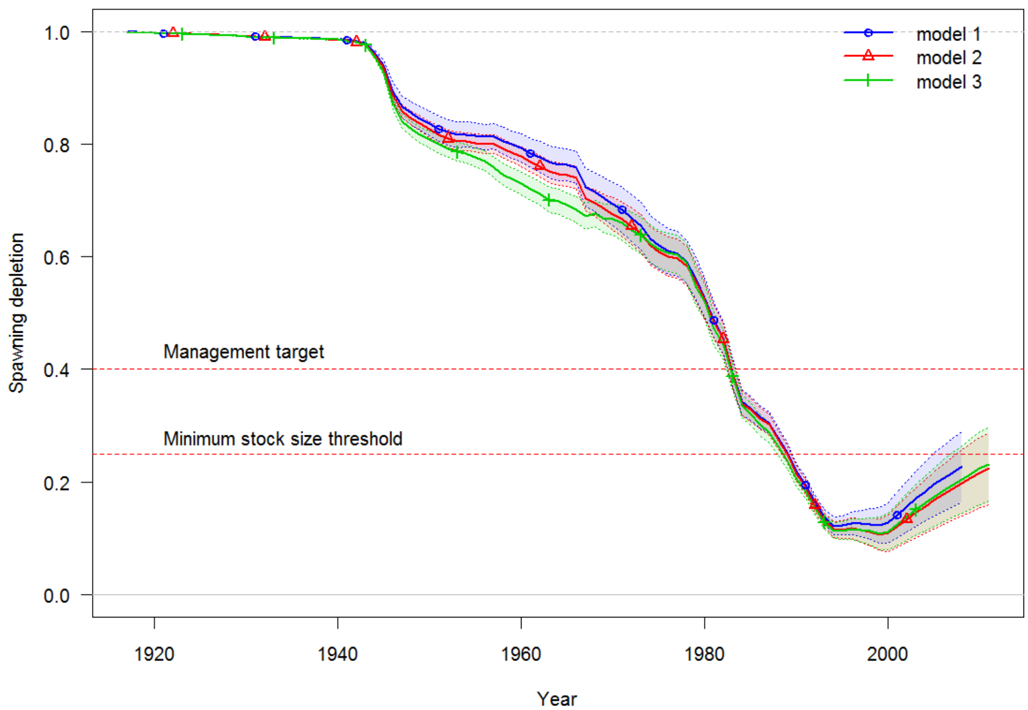
An assessment update was prepared in 2011 (Wallace and Cope 2011), which estimated stock depletion was 23.2 percent at the start of 2011. This change in stock status was due to a higher estimate of initial B_0, largely attributable to the inclusion of revised historical Oregon catches from a formal reconstruction of Oregon catch data. For the period from 2000 to 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 percent probability. The rebuilding plan was revised slightly by changing the target to rebuild the stock to 2030 while maintaining the 88.7 percent SPR harvest rate; the revised rebuilding plan was implemented in 2013.

Stock Productivity Relative to Rebuilding Success

The deviation from T_{TARGET} in 2013-2014 was due primarily to changes in the understanding of stock productivity and depletion due to re-estimation of the time series of historical catches in Oregon. The changes represented fundamental revisions to the understanding of the status of canary rockfish. The change in canary rockfish status (i.e., depletion or the ratio of current biomass to initial biomass or B_0) from the 2011 assessment relative to the previous assessment conducted in 2009 was not due to a substantial reduction in the estimate of current biomass, but rather due to estimation of a much higher initial biomass in the 2011 assessment. Estimates of initial biomass are sensitive historical removals and the change in the historical Oregon time series of catches led to this higher B_0 estimate.

The projected increase in the canary rockfish biomass is very sensitive to the value for steepness (state of nature), and is projected to slow as recent (and largely below-average) recruitments begin to contribute to the spawning biomass. From 2000 to 2011, the spawning biomass was estimated to have increased from 11.2 percent to 23.2 percent of the unfished biomass level.



Source: Wallace and Cope 2011.

Figure 4-2. Estimated spawning biomass time-series (1916 to 2008) for the 2009 assessment base-case model (model 1) with approximate asymptotic 95 percent confidence interval (dashed lines), the 2011 base model without the Oregon historical catch reconstruction (model 2), and the 2011 base-case model (model 3).

Fishing Mortality

Canary rockfish is caught coastwide in all sectors of the fishery. Canary rockfish mortality has been managed using the following measures: prohibited retention in commercial fixed gear and recreational fisheries, small allocations to the limited entry trawl sectors to accommodate unavoidable bycatch, required use of selective flatfish trawl gear shoreward of the RCA north of 40º10' N. latitude, required use of small footrope trawls shoreward of the RCA south of 40º10' N. latitude, and RCA boundaries that limit fishing in areas of higher canary rockfish density.

A canary catch report provided in 2013 (Agenda Item F.5.a, Attachment 9, June 2013), indicated 2010 to 2012 total catches were below specified ACLs/OYs. Table 4-3 shows the estimated annual fishing mortality and management reference points for canary rockfish from 2010 to 2012. The total fishing mortality estimates have been well below the ACLs established for rebuilding.

The canary ACLs of 122 in 2015 and 125 in 2016 are the same under all of the action alternatives. In 2015, the total catch mortality is projected to be similar under all of the alternatives with the projected catch ranging from 67.8 mt under the No Action Alternative to 68.8 mt under the Preferred Alternative and Alternative 1 (Table 4-131). In 2016, the projected catch would range from 67.8 mt under the

No Action Alternative to 69.6 under the Preferred Alternative (Table 4-132). The total fishing mortality estimates are projected to be within the ACLs established for rebuilding under all of the action alternatives.

Catch monitoring uncertainty in non-trawl fisheries is high, given that retention of canary is prohibited, which requires estimation of bycatch to assess total fishing mortality. A substantial amount of the total fishing mortality of canary occurs in recreational fisheries, the sector with the highest catch monitoring and projection uncertainty. Prior to trawl rationalization (pre-2011), catch monitoring uncertainty was high in the non-whiting trawl sector relative to canary discard mortalities. With mandatory 100 percent observer coverage in the rationalized trawl fishery, management using IFQs in the shoreside trawl sector, and total catch limits in the at-sea whiting sectors, catch monitoring uncertainty and accountability of canary rockfish catch in trawl fisheries have vastly improved.

Table 4-1. Estimated annual fishing mortality and management reference points for canary rockfish.

Year	Estimated Fishing Mortality	Management Reference Points (Harvest Specifications)					
		ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	43	105	41%	-	-	940	5%
2011	52	102	51%	586	9%	614	9%
2012	80	102	75%	594	13%	622	13%

Source: Agenda Item F.5.a, attachment 9, June 2013.

Rebuilding Duration

The current canary rockfish rebuilding plan T_{TARGET} and HCR would be maintained under all of the action alternatives as no new information was available to compel a change in course. The probabilities of rebuilding by the specified canary T_{TARGET} of 2030 and the estimated T_{MAX} of 2050 are 54.6 percent and 75 percent, respectively.

4.1.3.3 Cowcod South of 40°10’ N. Latitude

A new cowcod assessment for the stock in the Southern California Bight (U.S. waters south of Point Conception – 34° 27' N. latitude) was conducted in 2013 (Dick and MacCall 2013). The estimated stock depletion was 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 base model indicates that the stock increased to 34 percent of unfished biomass in 2013.

The 2013 assessment used the Extended Depletion-Based Stock Reduction Analysis modeling platform to estimate stock status, scale, and productivity (Dick et al. 2013). Dick et al. (2013) fit five fishery-independent data sources: four time series of relative abundance (California Cooperative Oceanic Fisheries Investigations [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.

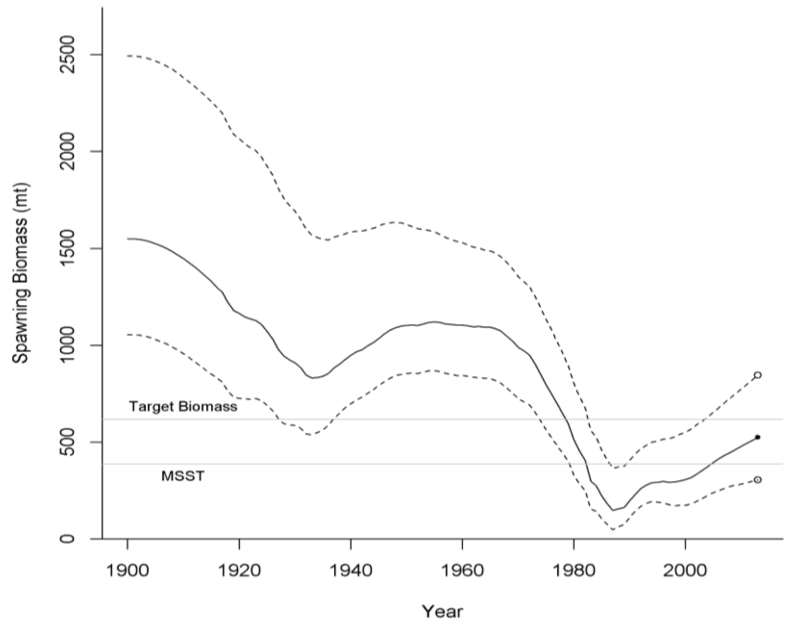
The 2013 rebuilding analysis (Dick and MacCall 2014) was unique in that the Punt rebuilding program (Punt 2005) was not used given its incompatibility with Depletion-Based Stock Reduction Analysis. In each rebuilding model run, 15,000 simulated trajectories were generated using draws from the joint posterior distribution. Since Depletion-Based Stock Reduction Analysis does not provide the information required to calculate spawning potential ratios, age-specific quantities from the 2009 rebuilding analysis were used to translate harvest control rules (SPR = 82.7 percent) into exploitation (E) rates (E equals 0.007, calculated as catch/estimated age 11 plus 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.

The action alternatives all maintain the HCR rate in the current cowcod rebuilding plan. The SSC recommended that the cowcod ACL contribution for the area north of Point Conception be estimated by applying the fishing mortality rate corresponding to the ACL for the area south of Point Conception to the biomass north of Point Conception from DB-SRA. This was considered more scientifically justified than the past approach of doubling the ACL value from south of Point Conception to produce the ACL for the entire area, since the DB-SRA estimate of biomass north of Point Conception is considerably lower than that for the stock in the assessed area in the Southern California Bight.

The 2015 and 2016 ACLs under the action alternatives, using the current HCR rate, is 10 mt, which compares to a 16 mt ACL calculated using the previous approach of doubling the assessed area ACL. The Council's Preferred Alternative would also specify an ACT of 4 mt, which defines the allowable harvest in all fisheries. The 6 mt difference between the ACL and the ACT allows for more research activities to collect data necessary for future stock assessments including an expansion of the NWFSC's hook-and-line survey in the Southern California Bight to better estimate stock size.

Stock Productivity Relative to Rebuilding Success

The 2013 cowcod assessment suggests that the stock in the Southern California Bight constitutes a smaller, but more productive, stock than was estimated from recent assessments. In 2013, the NOAA Fisheries Santa Cruz Laboratory encountered the highest numbers of cowcod in the 30-year history of their annual rockfish recruitment and ecosystem assessment survey. The survey was originally confined to central California (Monterey Bay to Point Reyes) from 1983 to 2003 and was expanded in 2004 to include almost the entire California coast (San Diego to Mendocino). While cowcod were more consistently collected from 2004 onward due to the expanded survey area, the catches in 2013 exceeded all previous years combined (Figure 4-3) (Dick and MacCall 2014). Continued monitoring of each data source is essential to verify current estimates of stock productivity as the stock rebuilds.



Source: Dick and MacCall 2014.

Figure 4-3. Distribution of cowcod spawning biomass trajectories from the 2013 base model.

(Median = solid line, 5th and 95th percentile = dashed lines), relative to target biomass (40 percent of unfished biomass) and the MSST (25 percent of unfished biomass). Circles indicate values in 2013.

Fishing Mortality

An extremely low incidental harvest rate has been used to achieve rebuilding progress. Cowcod harvest is prohibited in all fisheries and the primary habitats where adult cowcod are known to occur are closed. Closure of the CCAs in the southern California Bight in 2001 effectively reduced harvest to very low levels, a strategy anticipated to work well for reducing adult cowcod mortality, given their sedentary nature.

Adult cowcod are primarily encountered in depths greater than 50 fm (Butler et al. 2003). Though cowcod do occur from 20 fm to 267 fm (Love et al. 2002), submersible surveys at the northern end of the Southern California Bight indicate that juvenile cowcod were most common from 49 fm to 82 fm, and adults were most common at depths of 66 fm to 115 fm (Butler et al. 2003). These trends in the depth distribution were also observed in the proportion of catch by depth from the trawl fishery in the Southern California Bight where cowcod were predominantly encountered in depths deeper than 65 fm (Butler et al. 1999). Recent submersible surveys indicate that juvenile cowcod occur over a wide range of habitat types, at depths between 28 fm and 180 fm; they typically avoid soft sediment substrate, favoring hard substrate such as cobble and boulder fields or rock ridges (Love and Yoklavich 2008).

Catch monitoring uncertainty is high for cowcod. Retention of cowcod is prohibited, which requires estimation of bycatch to assess total mortality, and few cowcod have been observed by the WCGOP. Without observer data, estimates of commercial discard are highly uncertain. This changed in 2011 for the limited entry trawl fishery upon implementation of the trawl rationalization program and mandatory 100 percent observer coverage. Recreational discard rates have not been thoroughly assessed. Some recreational observer data are available for the CPFV fleets, but little is known about discard from private boats. In addition, a portion of the recreational rockfish catch has not been identified to species (the "rockfish genus" category in the Recreational Fisheries Information Network [RecFIN]) and is not included in current estimates of total fishing mortality for rockfish species. Cowcod have been a small component of rockfish catch in recent years, but given the low OYs/ACLs, even a small fraction of cowcod in the total "unidentified catch" category may influence management decisions. Recent recreational catch is estimated using the new 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. Neither survey is designed to produce inseason catch nor effort estimates with the precision needed to manage to the low ACLs needed to rebuild cowcod.

Although current total fishing mortality estimates are highly uncertain, the CCAs appear to be effective at minimizing fishing mortality over offshore rocky habitat in the southern California bight. Available catch estimates and mortality reports suggest that landings have not exceeded the OY limits in recent years. In most recent years, the total estimated take of cowcod has been well below 3 mt. Table 4-4 shows the estimated annual fishing mortality and management reference points for cowcod from 2010 to 2012.

In contrast to the No Action Alternative's ACL of 3 mt, the cowcod ACLs of 10 mt in 2015 and 2016 would be the same under all of the action alternatives. However, the Preferred Alternative would include an ACT of 4 mt in each year. The total catch mortality in 2015 and 2016 is projected to range from 1.2 mt under the No Action Alternative to 3.3 mt under all of the alternatives (Table 4-131 and 4-132). The total fishing mortality estimates are projected to be within the ACLs established for rebuilding under all of the action alternatives.

Table 4-2. Estimated annual fishing mortality and management reference points for cowcod.

Year	Estimated Fishing Mortality	Management Reference Points (Harvest Specifications)					
		ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	1.20	4	30%	14	9%	14	9%
2011	0.85	3	28%	10	9%	13	7%
2012	0.84	3	28%	10	8%	13	6%

Source: Dick and MacCall 2013.

Rebuilding Duration

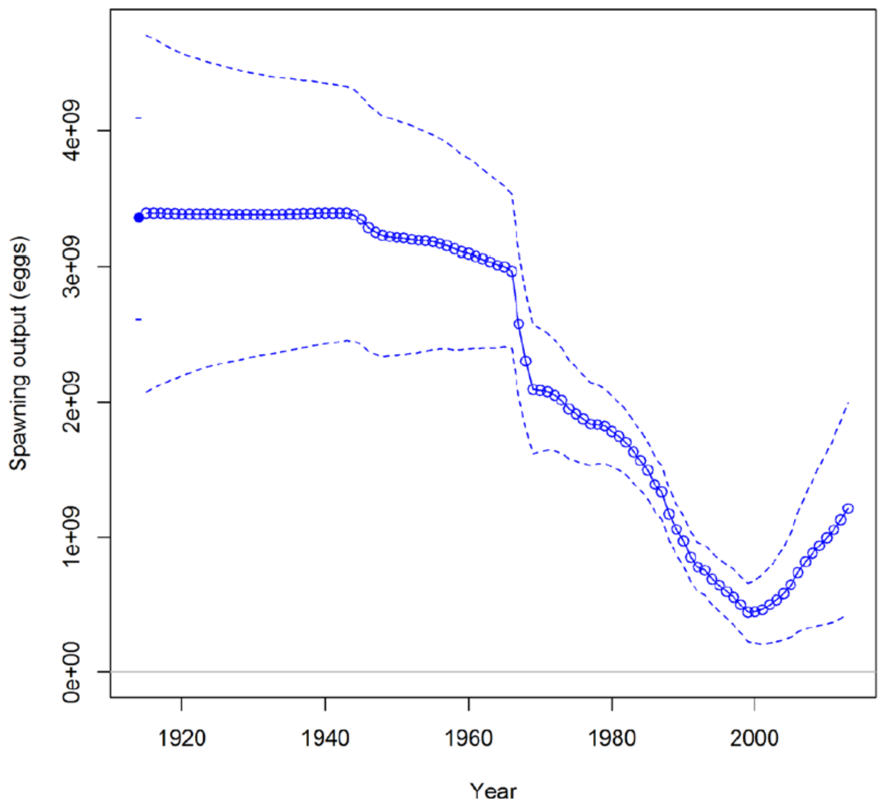
The current T_{TARGET} in the cowcod rebuilding plan is 2068, which is 9 years later than the new estimate of T_{MAX} of 2057. The estimate of median time to rebuild under the current harvest rate (2020) is 48 years earlier than the current target year of 2068. Therefore, the Council's Preferred Alternative would specify a target rebuilding year of 2020, the median year to rebuild the stock under the preferred status quo harvest rate. The probability of rebuilding by the new T_{MAX} of 2057 under the action alternatives would be 88.4 percent; however, if total catches were maintained closer to the ACT of 4 under the Preferred Alternative, the probability of rebuilding by T_{MAX} would be estimated to be closer to 91.5 percent.

4.1.3.4 Darkblotched Rockfish

A full darkblotched stock assessment was prepared in 2013 (Gertseva and Thorson 2013) and estimated a stock depletion of 36 percent at the start of 2013. The assessment also predicts that 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 plan; 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 performing a full assessment in 2015 to confirm the status. The SSC noted that a new rebuilding analysis was not necessary as the current assessment already provides the population projections needed to forecast population status through the next 2 years, and a new formal rebuilding analysis would be redundant (Agenda Item F.5.b, Supplemental SSC Report, June 2013). Therefore, the 2011 rebuilding analysis was used for 2015-2016 (Stephans 2011).

Stock Productivity Relative to Rebuilding Success

Since 2000, the spawning output has been slowly increasing, which corresponds to decreased removals due to management regulations (Figure 4-4). This rate of increase is expected to continue under all of the action alternatives.



Source: Gertseva and Thorson 2013.

Figure 4-4. Estimated spawning biomass time series (1915– to 2013) with 95% interval (dashed line).

Fishing Mortality

Darkblotched rockfish are caught almost exclusively by groundfish trawl gear and predominantly bottom trawls operating on the outer continental shelf and slope north of 38º N. latitude between 100 and 200 fm. The main strategies used to control darkblotched rockfish catch mortality prior to implementation of the trawl rationalization program in 2011 were limited entry trawl trip limits for the northern and southern slope rockfish, bycatch limits in the Pacific whiting fisheries, and trawl RCAs. Darkblotched rockfish total catch mortality is now controlled by IFQ management and trawl RCAs in the shorebased sector, and allocations in the at-sea whiting sectors.

For the last 10 years, the total catch mortality (as estimated in the assessment) exceeded the ACL in 2003, 2004, 2009, and 2010. The total catch mortality also exceeded the OFL by 4 percent in 2003 and by 2 percent in 2004. Overall, total catch mortality of darkblotched rockfish for the last decade has been at 57 percent of the sum of the OFLs and 81 percent of the sum of the ACLs/OYs (Gertseva and Thorson 2013). Table 4-5 shows the estimated annual fishing mortality and management reference points for darkblotched rockfish.

The darkblotched rockfish ACLs of 349 mt in 2015 and 362 in 2016 would be the same under all of the action alternatives. In 2015, the total catch mortality would be projected to be similar under all of the alternatives, with the projected mortality ranging from 149.1 mt under the No Action Alternative to 152.7 mt under the Preferred Alternative (Table 4-131). In 2016, the projected mortality would range from 149.1 mt under No Action Alternative to 156.7 mt under Alternative 1 (Table 4-132). The total fishing mortality estimates would be projected to be within the ACLs established for rebuilding under all of the action alternatives. Catch monitoring uncertainty is low for darkblotched rockfish, since it a trawl-dominant species where there is 100 percent observer coverage.

Table 4-3. Estimated annual fishing mortality and management reference points for darkblotched rockfish.

Year	Estimated fishing mortality	Management reference points (harvest specifications)					
		ACL/OY (mt)	Estimated mortality (% ACL)	ABC	Estimated mortality (% ABC)	OFL	Estimated mortality (% OFL)
2010	350	291	120%	440	80%	440	80%
2011	120	298	42%	485	25%	508	24%
2012	96	296	32%	475	20%	497	19%

Source: Gertseva and Thorson 2013.

Rebuilding Duration

For 2015 and 2016 management, the SSC recommended continuing to use the current rebuilding SPR to define the ACL (Agenda Item F.5.b, Supplemental SSC Report, June 2013). Given the projections from the 2011 rebuilding analysis, maintaining the current rebuilding plan under the action alternatives would result is a 100 percent probability of rebuilding by the T_{TARGET} of 2025, and a 100 percent probability of rebuilding by T_{MAX} (Table 4-1).

4.1.3.5 Pacific Ocean Perch

A catch report that considered revised total mortality catch data was prepared to update the status of POP. The catch report concluded that the management performance has been consistent with the rebuilding plan, good recruitment years coincide in Oregon and Washington, and no significant genetic differences have been found off the U.S. coast (Agenda Item F.5.a, Attachment 10, June 2013), The last full assessment was prepared in 2011 and estimated a stock depletion of 19.1 percent at the start of 2011 (Hamel and Ono 2011). The 2011 rebuilding analysis was used to inform the rebuilding projections shown in Table 4-1 (Hamel 2011).

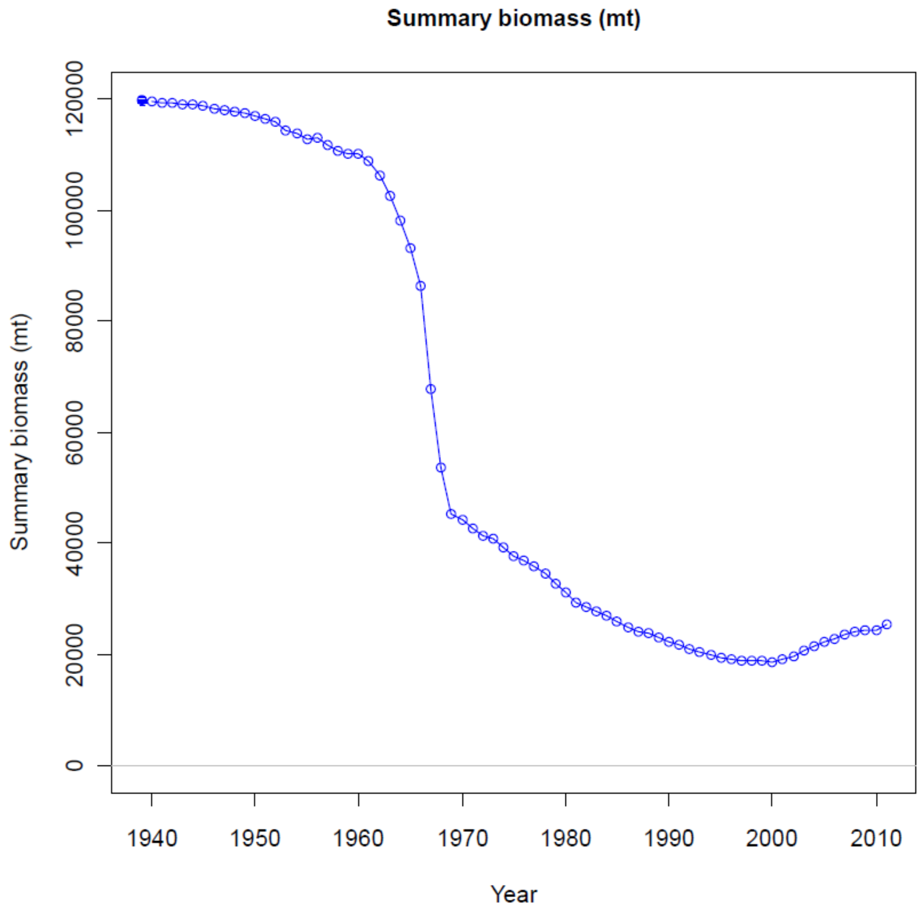
The substantial decrease in the estimated depletion of the stock in the 2011 assessment was largely due to a much higher estimate of initial B_0. The estimated B_0 is much larger (119,914 mt vs. 83,850 mt), and therefore, so is the unfished spawning output. Previous assessments assumed that a large recruitment 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 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 percent 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 percent.

Stock Productivity Relative to Rebuilding Success

Stock-recruitment steepness was estimated external to the 2011 POP stock synthesis 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, the 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. 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 4-5). The point estimates of summary (age 3+) biomass also show an upward trend over the past decade, increasing approximately 50 percent in that time.

Fishing practices under any of the alternatives are unlikely to have any effect on stock productivity, given the low fishing mortality levels proposed. There is no indication that fishing operations are likely to substantially interfere with or disturb reproductive behavior or juvenile survival.



Source: Hamel and Ono 2011.

Figure 4-5. POP time series summary of (3+) biomass

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. latitude. POP are distributed from 30 to 350 fm, with the core distribution between 110 and 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, during which period the stock has begun to rebuild.

A POP catch report provided in 2013 (Agenda Item F.5.a, Attachment 10, June 2013) indicated that 2010 to 2012 total catches were below specified ACLs/OYs. The report also showed the estimated annual fishing mortality and management reference points for POP from 2010 to 2012 (Table 4-6). The total fishing mortality estimates have been well below the ACLs established for rebuilding.

The POP ACLs of 158 in 2015 and 164 in 2016 are the same under all of the action alternatives. In 2015, the total catch mortality is projected to be similar under all of the alternatives, with the projected catch ranging from 82.1 mt under the No Action Alternative to 83.4 mt under the Preferred Alternative and Alternative 1 (Table 4-131). In 2016, the projected catch would range from 83.4 mt under the No Action Alternative to 85.5 mt under the Preferred Alternative and Alternative 1 (Table 4-132). The total fishing mortality estimates are projected to be within the ACLs established for rebuilding under all of the action alternatives. Catch monitoring uncertainty is low for POP rockfish because it a trawl-dominant species, and the trawl fishery is subject to 100 percent observer coverage.

Table 4-4. Estimated annual fishing mortality and management reference points for POP.

Year	Estimated Fishing Mortality	Management Reference Points (Harvest Specifications)					
		ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	159	200	80%	-	-	1,173	14%
2011	62	180	34%	981	6%	1,026	6%
2012	150	183	82%	962	16%	1,007	15%

Source: Agenda Item F.5.a, attachment 10, June 2013.

Rebuilding Duration

The current POP rebuilding plan T_{TARGET} and HCR would be maintained under all of the action alternatives as no new information was available to compel a change in course. The action alternatives would maintain the rebuilding plan and wait for new information that might compel a change in course. The probabilities of rebuilding by the specified POP T_{TARGET} of 2051 and the estimated T_{MAX} of 2071 would be 50 percent and 73 percent, respectively (Table 4-1).

4.1.3.6 Petrale Sole

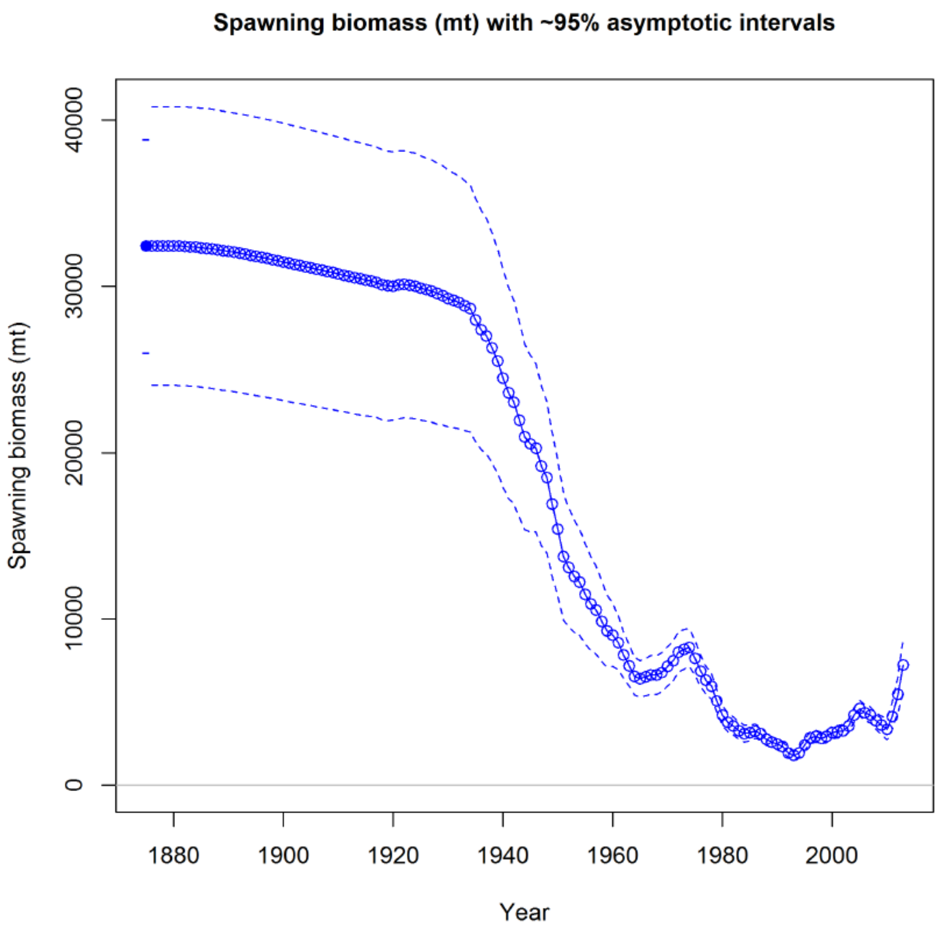
Full assessments of petrale sole were conducted in 2009, 2011, and 2013. The 2009 assessment found the stock to be overfished, while the 2011 and 2013 assessments indicated that the stock was above the MSST, but not yet rebuilt to B_{MSY}. The 2013 petrale assessment (Haltuch et al. 2013) estimated a stock depletion of 22.3 percent of its unfished biomass at the start of 2013, above the 12.5 percent MSST for flatfish, but below the 25 percent B_{MSY} proxy. The 2011 rebuilding analysis projected spawning biomass to reach the B_{MSY} target by the start of 2014. Because the full assessments for petrale sole show that the stock is rebuilding and projected to be rebuilt by 2015, the SSC indicated that a new rebuilding analysis was not needed given the 1- to 2-year timeframe for rebuilding. Therefore, the 2011 rebuilding analysis was used to inform the rebuilding projections.

The 2013 coastwide stock assessment was restructured to summarize petrale sole landings by the port of landing. It also 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 1-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 petrale sole ACLs vary by the 2015-2016 P* alternatives analyzed in this EIS. This is because the rebuilding strategy for petrale sole is to use the 25-5 rule, which progressively lowers the ACL relative to ABC the farther below the stock is from the B_{MSY} target of $B_{25\%}$. However, since the petrale stock is predicted to be above the B_{MSY} target in 2015 and 2016, the ACLs equal the ABCs and are affected by the P* choice. The Preferred Alternative (and Alternative 1) 2015 and 2016 ACLs under a P* of 0.45 would be 2,816 mt and 2,910 mt, respectively. The Alternative 2 ACLs would be 2,310 mt and 2,386 mt in 2015 and 2016, respectively, under a P* of 0.25. Implementation of Alternative 2 ACLs would predict a higher petrale biomass in the foreseeable future because removals would be lower in 2015 and 2016. Under Alternative 2, the P* choice would not directly affect rebuilding probabilities, because the stock is projected to be rebuilt before the start of 2015.

Stock Productivity Relative to Rebuilding Success

The petrale sole spawning stock biomass is estimated to have increased slightly from the late 1990s, peaking in 2005, in response to above average recruitment (Figure 4-6). However, the stock declined between 2005 and 2010, most likely due to strong year classes having passed through the fishery. Since 2010, the total biomass of the stock has increased, as large recruitments during the late 2000s appear to be moving into the population.



Source: Haltuchet al. 2013.

Figure 4-6. Biomass time series for petrale sole.

Fishing Mortality

Petrale sole catch statistics exhibit marked seasonal variation, with substantial portions of the annual harvest taken from the spawning grounds in December and January. Fishing mortality rates in excess of the current F-target for flatfish of $SPR_{30\%}$ are estimated to have begun during the 1950s and continued until 2010 (Haltuch et al. 2013). Recent coastwide annual landings have not exceeded the ACL.

The petrale sole ACL under the Preferred Alternative and Alternative 1 in 2015 and 2016 would be 2,816 mt and 2,910 mt, respectively. Under Alternative 2, the ACLs would be 2,310 mt and 2,386 mt in 2015 and 2016, respectively with a P* of 0.25. In 2015 and 2016, the total catch mortality would be projected to be lower than the ACL for each alternative and within the ACLs established for rebuilding under all of the action alternatives. The total fishing mortality estimates for 2015 would be 2.491.4 mt under the No Action Alternative, 2.646.9 mt under the Preferred Alternative and Alternative 1, and 2,167.6 mt under Alternative 2 (Table 4-131). The total fishing mortality estimates for 2016 would be 2.491.4 mt under the No Action Alternative, 2,735.6 mt under the Preferred Alternative and Alternative 1, and 2.167.6 mt under Alternative 2 (Table 4-132).

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. RCA structures for petrale sole could vary seasonally if RCA management is needed to control fishing mortality (Table 4-7). The general pattern for petrale sole is a shallower depth distribution during periods 3 and 4 and a deeper depth distribution during periods 1 and 6. Petrale sole are typically in transition as they migrate between shallow and deeper depths during periods 2 and 5. Catch monitoring uncertainty is low for petrale sole, since it is a trawl-dominant species, and the trawl fishery is subject to 100 percent observer coverage under trawl rationalization.

Table 4-5. Estimated annual fishing mortality and management reference points for petrale sole.

Year	Estimated Fishing Mortality	Management Reference Points (Harvest Specifications)					
		ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	870	1,200	73%	2,751	32%	2,751	32%
2011	787	976	81%	976	81%	1,021	81%
2012	1,144	1,160	99%	1,222	94%	1,279	94%

Source: Haltuchet al. 2013.

Rebuilding Duration

The current petrale sole rebuilding plan T_{TARGET} and HCR would be maintained under all of the action alternatives, as no new information was available that would compel a change in course. The probabilities of rebuilding by the specified petrale TTARGET of 2016 and the estimated TMAX of 2021 are 100 percent (Table 4-1).

4.1.3.7 Yelloweye Rockfish

A catch report that considered revised total catch mortality data was prepared to update the status of the yelloweye rockfish. The catch report concluded that the management performance has been consistent with the rebuilding plan. The last full assessment was performed in 2009 (Stewart 2009), and an update for yelloweye rockfish was done in 2011 (Taylor and Wetzel 2011). The 2011 rebuilding analysis was used to inform the rebuilding projections.

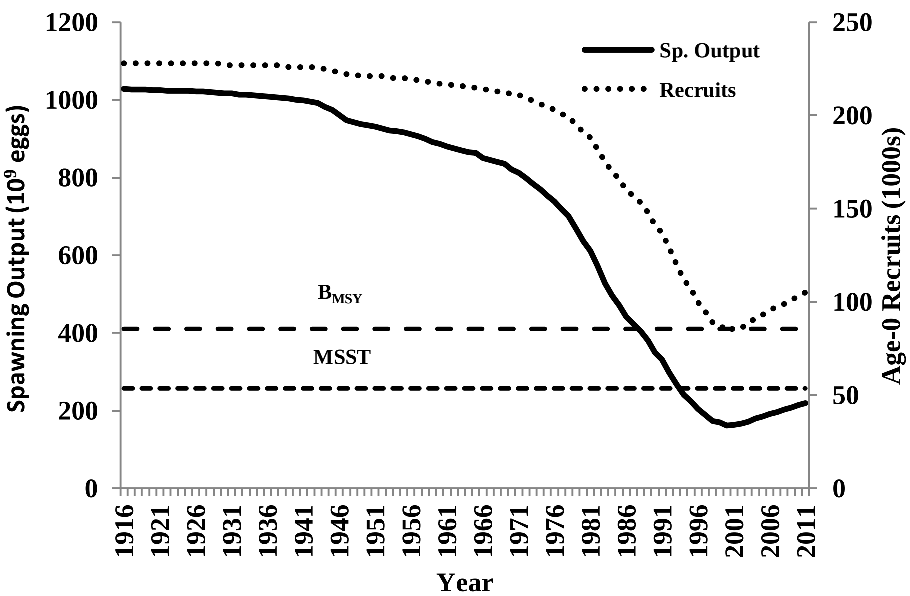
The 2009 yelloweye assessment estimated a stock depletion of 20.3 percent of initial, unfished biomass at the start of 2009 (Stewart et al. 2009). The resource was modeled as a single stock, but with three explicit spatial areas: Washington, Oregon, and California. Each area was modeled simultaneously 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 percent) 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 that the rebuilding progress was on schedule, and no revisions were made to the rebuilding plan.

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 4-7). 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). The relatively low stock productivity and a long mean generation time of 46 years result in a slow recovery rate, even with very low harvest rates, as specified in the yelloweye rebuilding plan.



Source: Taylor and Wetzel 2011.

Figure 4-7. Time series of estimated yelloweye rockfish spawning output and recruitments for the base-case model in the 2011 assessment.

Fishing Mortality

A yelloweye rockfish catch report provided in 2013 (Agenda Item F.5.a, Attachment 11, June 2013) indicated that recent total catches have been below specified the ACLs/OYs established for rebuilding. Table 4-8 shows the estimated annual fishing mortality and management reference points for yelloweye rockfish from 2010 to 2012.

The yelloweye ACLs of 18 mt in 2015 and 19 mt in 2016 would be projected under all of the action alternatives. In 2015, the total catch mortality would be projected to be similar under all of the alternatives, with the projected catch ranging from 13.9 mt under the No Action Alternative to 15.2 mt under Alternative 2 (Table 4-131). In 2016, the projected total catch mortality would range from 13.9 mt under the No Action Alternative, to 15.9 mt under Alternative 1 (Table 4-132). The total fishing mortality estimates would be projected to be within the ACLs established for rebuilding under all of the action alternatives.

Table 4-6. Estimated annual fishing mortality and management reference points for yelloweye rockfish

Year	Estimated Fishing Mortality	Management Reference Points (Harvest Specifications)					
		ACL/OY (mt)	Estimated Mortality (% ACL)	ABC	Estimated Mortality (% ABC)	OFL	Estimated Mortality (% OFL)
2010	8	17	47%	-	-	32	25%
2011	9	17	52%	46	19%	48	18%
2012	16	17	94%	46	35%	48	33%

Source: Agenda Item F.5.a, attachment 11, June 2013.

Rebuilding Duration

The current yelloweye rockfish rebuilding plan T_{TARGET} and HCR would be maintained under all of the action alternatives as no new information was available that would compel a change in course. The probabilities of rebuilding the yelloweye rockfish stock by the current T_{TARGET} of 2074 and T_{MAX} of 2083, are 62.1 percent and 72.9 percent, respectively (Table 4-1).

4.1.4 Non-overfished Stocks

4.1.4.1 Arrowtooth Flounder

The last full stock assessment of arrowtooth flounder (Kaplan and Helser 2008) indicated the spawning biomass to be at 79 percent of the estimated unfished spawning biomass at the start of 2007. Scientific uncertainty in the arrowtooth flounder assessment is relatively high. The SSC categorized the arrowtooth stock as a category 2 species since highly uncertain historical discards and estimates of natural mortality make this a less certain assessment than those for other assessed stocks. Arrowtooth flounder are a very productive stock with fast growth rates, high natural mortality, and high stock-recruitment steepness. The 2007 assessment projects a very healthy stock through 2018 under catch streams much higher than have been realized since then. Arrowtooth received a relatively high productivity score of 1.95 in the PSA analysis.

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 to 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 incidental 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. In 2015, the estimated mortality under the No Action Alternative would be 2,482 mt, 2,487 mt under the Preferred Alternative, 2,489 mt under Alternative 1, and 1,870 under Alternative 2 (Table 4-131). In 2016, the estimated mortality under the No Action Alternative would be 2,482 mt, 2,491 mt under the Preferred Alternative, 2,494 mt under Alternative 1, and 1,757 under Alternative 2 (Table 4-132). Attainment since implementation of IFQ has ranged between 18 and 21 percent of the ACL. The risk of overfishing would be low as the estimated mortality would be well below the ACLs under all of the alternatives (Tables 2-3 through 2-5). The No Action Alternative ACL would be 5,758 mt. Under the Preferred Alternative, the ACLs would be 5,497 mt in 2015 and 5,328 mt in 2016. Under Alternative 1, the ACLs would be 6,025 mt in 2015 and 5,840 mt in 2016. Under Alternative 2, the ACLs would be 4,058 mt in 2015 and 3,934 mt in 2016.

4.1.4.2 Black Rockfish

Black rockfish off California and Oregon are a healthy stock with a biomass above the target level of 40 percent. Spawning biomass depletion is projected to remain healthy through 2016 under the 1,000 mt constant catch strategy implemented since 2009 and that would be maintained under the No Action Alternative, the Preferred Alternative, and Alternative 1. Under Alternative 2 the ACL would be reduced to 922 mt in 2015 and 927 mt in 2016. The PSA productivity score of 1.33 indicates a stock of moderate productivity (PFMC 2014).

In 2015 and 2016, the estimated mortality under the No Action Alternative would be 675 mt, 731 mt under the Preferred Alternative and Alternative 1, and 752 under Alternative 2 (Table 4-131 and Table 4-132). Attainment in 2011 and 2012 has ranged between 52 and 56 percent of the ACL. The risk of overfishing is low, as the estimated mortality would be well below the ACLs under all of the alternatives (Tables 2-2 through 2-5). The ACL would be 1,000 mt under the No Action Alternative, the Preferred Alternative, and Alternative 1; under Alternative 2, ACLs would be 922 mt in 2015 and 927 mt in 2016. 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 black rockfish stock off Washington is healthy and is projected to remain healthy under the level of harvest proposed for 2013 and 2014. In 2015 and 2016, the estimated mortality under all of the alternatives would be 252 mt (Table 4-131 and Table 4-132). Attainment in 2011 and 2012 has ranged between 49 and 60 percent of the ACL. The risk of overfishing is low, as the estimated mortality would be well below the ACLs under all of the alternatives. The No Action Alternative ACL would be 409 mt. Under the Preferred Alternative and Alternative 1, the ACLs would be 402 mt in 2015 and 404 mt in 2016; under Alternative 2, the ACLs would be 330 mt in 2015 and 332 mt in 2016.

4.1.4.3 Cabezon Oregon

Cope and Key (2009) estimated the spawning biomass depletion of the Oregon substock of cabezon (*Scorpaenichthys marmoratus*) to be at 52 percent 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 from 2004 to 2012 is provided in Table 4-9, with an estimated average annual catch of 43.1 mt. Oregon recreational catches were obtained from a March 23, 2014, RecFIN query by querying for landed catch (A) plus the reported dead catch (B1).

Table 4-7. Estimated total catch (in mt) of cabezon in Oregon by sector, 2004 to 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
Oregon 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 are 49 mt and 47 mt (P* = 0.45), respectively. Total estimated catch of Oregon cabezon from 2004 to 2012 has not exceeded the amount considered for the 2015 OFL or ABC (Figure 4-8). However, the total catch in 2011 was equal to the ABC considered under the Preferred Alternative. The estimated cumulative 2004 to 2012 catch was 87.9 percent and 91.9 percent of the 2015 OFL and ABC, respectively. Attainment in 2011 and 2012 has been very high (Table 4-133). Continued management of this stock under the default harvest control rules is predicted to be sustainable in that it would not result in the stock becoming overfished.

The No Action Alternative ACL would be 47 mt. The Preferred Alternative for Oregon cabezon would be the same as Alternative 1, 47 mt in both 2015 and 2016 (ACL = ABC using a P* of 0.45). The Alternative 2 ACL would be 38 mt in 2015 and 2016. Alternative 2 would likely cause the Oregon recreational cabezon season to be shorter. However, it may not have a major impact on projected angler trips because non-retention of cabezon would likely be the management response. If the recreational fishery targets many different groundfish species, non-retention of cabezon is not likely to deter anglers. The nearshore commercial landings of cabezon would likely be lower under Alternative 2.

Most catch occurs in the recreational and nearshore fisheries, where the error in catch accounting is likely greater than fisheries with high rates of at-sea observer monitoring. The risk of a catch accounting error resulting in the true OFL being exceeded would be greater under the Preferred Alternative and Alternative 1 than under Alternative 2.

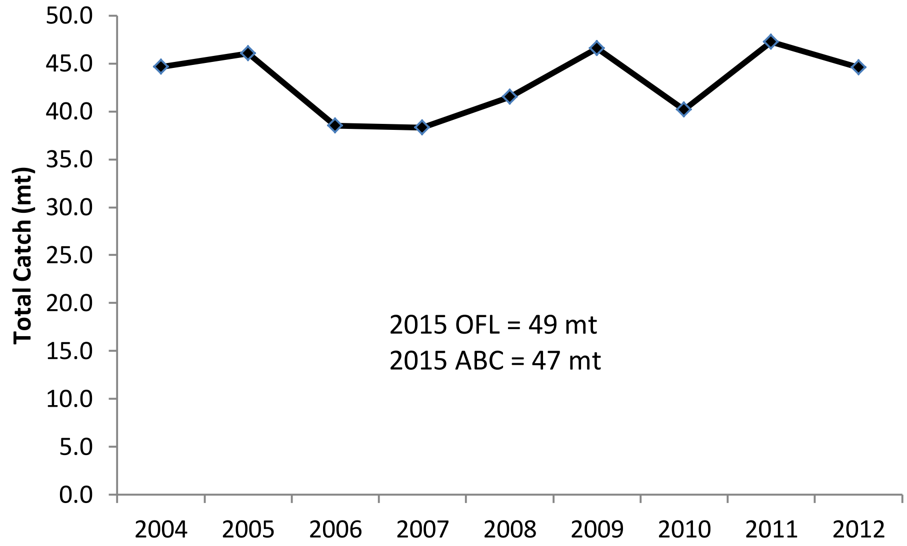


Figure 4-8. Estimated total catch of cabezon in Oregon, 2004 to 2012, relative to the preferred 2015 OFL and ABC.

4.1.4.4 Cabezon California

The most recent stock assessment for the cabezon stocks of California was done in 2009. The 2009 assessment modeled two California substocks, and it 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. The assessment estimated a healthy spawning biomass of cabezon off California of 48.3 percent of unfished biomass at the start of 2009. The PSA productivity score of 1.72 indicates a stock of relatively high productivity.

In 2015 and 2016, the estimated mortality under the No Action Alternative would be 59 mt, 97 mt under the Preferred Alternative and Alternative 1, and 87 mt under Alternative 2 (Table 4-131 and Table 4-132). Attainment in 2011 and 2012 has ranged between 28 and 44 percent of the ACL. The risk of overfishing would be low, as the estimated mortality would be well below the ACLs under all of the alternatives Tables 2-2 through 2-5. The No Action Alternative ACL would be 158 mt. Under the Preferred Alternative and Alternative 1 the ACLs would be 154 mt in 2015 and 151 mt in 2016; under Alternative 2, the ACLs would be 126 mt in 2015 and 124 mt in 2016.

4.1.4.5 California Scorpionfish

California scorpionfish were assessed in 2005 south of Point Conception (34°27' N. latitude). The stock assessment indicated that the California scorpionfish stock was healthy with an estimated spawning stock biomass of 79.8 percent of its initial, unfished biomass in 2005. The PSA productivity score of 1.83 indicates a stock of relatively high productivity, especially for a rockfish. In most years, 99 percent or more of the landings occur in the southern California ports.

In 2015 and 2016, the estimated mortality under the No Action Alternative would be 78 mt, 81 mt under the Preferred Alternative and Alternative 1, and 63 mt under Alternative 2 (Table 4-131 and Table 4-132). Attainment since 2011 has ranged between 77 and 95 percent of the ACL. The No Action Alternative ACL would be 117 mt. Under the Preferred Alternative and Alternative 1, the ACLs would be 114 mt in

2015 and 111 mt in 2016; under Alternative 2, the ACLs would be 93 mt in 2015 and 91 mt in 2016. The risk of overfishing would be low, as the estimated mortality would be below the ACLs under all of the alternatives. The stock is projected to remain healthy, while accommodating the current level of catch.

4.1.4.6 Chilipepper Rockfish

The last full assessment of chilipepper rockfish was conducted in 2007 (Field 2008). It indicated that the stock was healthy with a spawning stock biomass estimated to be at 70 percent of its initial, unfished biomass in 2006. The PSA productivity score of 1.83 indicates a stock of relatively high productivity, especially for a rockfish.

Chilipepper rockfish has been an important commercial target species in California and has also been taken in the recreational fishery in southern California waters. 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. The lowest ACLs would occur under Alternative 2 and would be 1,335 mt in 2015 and 1,328 in 2016. The projected mortality would be well under the ACLs in Tables 2-2 to 2-5 for all the alternatives. In 2015, the estimated mortality of chilipepper south of 40°10' N. latitude would range from 291 mt under the No Action Alternative and Alternative 2 to 308 mt under the Preferred Alternative and Alternative 1 (Table 4-131). In 2016, the estimated mortality of chilipepper south of 40°10' N. latitude would range from 291 mt under the No Action Alternative and Alternative 2 to 306 mt under the Preferred Alternative and Alternative 1 (Table 4-132). Attainment in 2011 and 2012 was only 17 percent of the ACL. The risk of overfishing is low. There is little concern that fishing in 2015 and 2016 will have any negative impacts on the chilipepper rockfish stock, since the center of the stock's distribution is in the core RCA. Chilipepper ACLs/OYs have been substantially under harvested since implementation of the RCAs in 2003.

4.1.4.7 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 assessment indicates that Dover sole have been lightly exploited, and the spawning biomass has remained well above target levels; however, recent low recruitment, coupled with a slight increase in catch, has caused the trend in spawning biomass to level. The 2011 Dover sole assessment is data-rich, and the species is readily tracked in the NMFS trawl survey.

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. Estimates of recruitment appear to oscillate between periods of low and high recruitment.

Groundfish trawl fisheries land the majority of Dover sole. Fixed gears, shrimp trawls, and recreational fisheries have a small impact on total catch mortality. Shrimp trawls use excluders, which has reduced bycatch of many species, including Dover sole. The trawl fisheries typically catch Dover sole while targeting Dover sole, sablefish, shortspine thornyhead, and longspine thornyhead (DTS). Discarding occurs in these fisheries due to small size, but also possibly due to trip limits prior to trawl rationalization or less desirable large Dover sole in a "jellied" or soft state (Sampson 2005).

Flatfish species in addition to Dover sole found in deeper waters include flathead sole, rex sole, and petrale sole. Other species that frequently co-occur in these deep waters include a complex of slope rockfishes, longnose skate, roughtail skate, Pacific grenadier, giant grenadier, Pacific flatnose, Pacific hagfish and a diverse complex of eelpouts (PFMC 2014). Dover sole is also found in the same habitats as stripetail, splitnose rockfish, and greenstriped rockfish, and they occur in catches with aurora rockfish (PFMC 2014). If Dover catch were to increase as a result of the increased ACL under the Preferred Alternative, catch of the co-occurring species would likely occur.

Two ACL alternatives for 2015 and 2016 are analyzed: an ACL of 25,000 mt (the No Action Alternative, Alternative 1, and Alternative 2) and an ACL of 50,000 mt (the Preferred Alternative). Given the productivity of the stock, projections assuming a 25,000-mt constant annual catch indicate that the stock would remain above the target B_{MSY} level in the next 10 years, even under the more pessimistic and less likely low state of nature (stock assessments runs that assume the stock is less productive than the approved model assumes) in the assessment decision table (Table 4-10). Table 3-1 on depth distribution indicates that the highest density of adult Dover sole occurs in 110 to 270 fm waters, much of which is within the core trawl RCAs. The higher ACL of 50,000 mt is predicted to be sustainable as the stock would not drop below $B_{25\%}$ under the base case model; Table 4-10 indicates that future mortalities assuming full OFL removals from 2013 to 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 10-year projection to a level above the B_{MSY} target; the decline would be predicted to be lower 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 to 2022 catch in Table 4-10, assuming OFL removals, is higher (50,350 mt) than the alternative ACL of 50,000 mt.

A 50,000 mt Dover sole ACL is likely to improve supply and create a better market for Dover sole. The effective limit of Dover sole in the 2015 and 2016 shorebased IFQ fishery is likely to be driven by the sablefish allocation, which would increase slightly relative to the No Action Alternative.

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., British Columbia and the Gulf of Alaska fisheries). It may be the case that the supply and demand will remain limited until there is an increased harvestable surplus of sablefish above the levels preferred 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.

The preferred Dover ACL of 50,000 mt would be accommodated under Alternative 1 since the 2015 and 2016 ABCs calculated using a P* of 0.45 would be greater than 50,000 mt. While the preferred Dover ACL would be accommodated under Alternative 2 in 2015, it would not be accommodated in 2016, since the ABC calculated using a P* of 0.25 would be lower than 50,000 mt (46,429 mt). The No Action Alternative ACL of 25,000 mt would be accommodated under all the alternatives.

Dover sole is a trawl-dominant species managed using IFQs in the rationalized fishery. An ACL of 25,000 mt would be considered under the No Action Alternative, Alternative 1, and 2, while an ACL of 50,000 mt would be considered under the Preferred Alternative. In 2015, the estimated mortality under the No Action Alternative and Alternative 1 would be 7,720 mt, 15,942 mt under the Preferred Alternative, and 7,718 mt under Alternative 2 (Table 4-131). In 2016, the estimated mortality under the No Action Alternative would be 7,720 mt, 15,943 mt under the Preferred Alternative, 7,721 mt under Alternative 1, and 7,719 under Alternative 2 (Table 4-132).

Despite Dover sole being an important target species, attainment since implementation of IFQ has been low, ranging between 29 and 32 percent of the ACL which was set at 25,000 mt. The risk of overfishing would be low, as the estimated mortality would be well below the ACLs under shown in Tables 2-2 through 2-5 for all of the alternatives.

Table 4-8. 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.

			State of Nature			
			Low		Base Case	
			M_f = 0.110		M_f = 0.117	
			M_m = 0.125		M_m = 0.142	
Catch Stream	Year	Catch (mt)	Spawning Biomass (mt)	Depletion	Spawning Biomass (mt)	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%

Source: Hicks and Wetzel 2011.

4.1.4.8 English Sole

The 2007 assessment of English sole estimated the spawning biomass to be at 116 percent of the exploited equilibrium level at the start of 2007. However, the influence of the strong 1999 year class on projected spawning biomass has diminished through natural and fishing mortality. The English sole assessment is relatively data-rich, and this species is readily tracked in the trawl survey. The PSA productivity score of 2.25 indicates a very productive stock, which is true for most nearshore and shelf flatfishes.

In 2015, the estimated mortality under the No Action Alternative and Alternative 2 would be 137 mt, and it would be 152 mt under the Preferred Alternative and Alternative 1 (Table 4-131). In 2016, the estimated mortality under all of the alternatives, including the No Action Alternative, would be 137 mt (Table 4-132). Attainment since implementation of IFQ has ranged between 1 and 2 percent of the ACL. The risk of overfishing would be low as the estimated mortality would be well below the ACLs under all of the alternatives shown in Tables 2-2 through 2-5. The No Action Alternative ACL would be 5,546 mt. Under the Preferred Alternative and Alternative 1, the ACLs would be 9,853 mt in 2015 and 7,204 mt in 2016. Under Alternative 2, the ACLs would be 6,637 mt in 2015 and 4,852 mt in 2016. English sole are a trawl-dominant species. Management uncertainty is low with the 100 percent observer coverage. Low trawl effort on the shelf, given RCA configurations, may explain low attainment rates.

4.1.4.9 Lingcod

The 2009 lingcod assessment modeled two West Coast stocks, both of which were estimated to be healthy in 2009 with depletion rates of 74 percent for the southern stock and 62 percent for the northern stock. The PSA productivity score of 1.75 indicates a stock of relatively high productivity. The SPR for northern lingcod has been above the proxy target of 45 percent (indicating fishing mortality rates below the target) since 1998; in recent years, it has been far above that level. The SPR for the southern lingcod stock has been above the proxy target of 45 percent since 2001; in recent years, it has been far above that level.

Management measure changes (Section 4.2) would be expected to result in substantial increases in landings in the south under the action alternatives. For lingcod north in 2015, the estimated mortality under the No Action Alternative would be 522 mt, 566 mt under the Preferred Alternative, 568 mt under Alternative 1, and 564 under Alternative 2 (Table 4-131). For lingcod north in 2016, the estimated mortality under the No Action Alternative would be 522 mt, 560 mt under the Preferred Alternative, 558 mt under Alternative 1, and 565 under Alternative 2 (Table 4-132). For lingcod south in 2015, the estimated mortality under the No Action Alternative would be 114 mt, 449 mt under the Preferred Alternative, 457 mt under Alternative 1, and 368 under Alternative 2 (Table 4-131). For lingcod south in 2016, the estimated mortality under the No Action Alternative would be 114 mt, 446 mt under the Preferred Alternative, 453 mt under Alternative 1, and 368 under Alternative 2 (Table 4-132). Attainment in the north since 2011 has ranged between 25 and 34 percent of the ACL; in the south, it has been between 13 and 16 percent. Although attainment is projected to increase substantially in the south, the estimated mortality is projected to be below the ACLs (Tables 2-2 through 2-5) in both areas under all of the alternatives.

4.1.4.10 Longnose Skate

The results of a 2007 assessment indicate that the longnose skate stock is healthy and would be projected to remain in a healthy status under all of the alternatives. The PSA productivity score of 1.53 indicates a stock of moderate productivity.

In 2015, the estimated mortality under the No Action Alternative would be 69 mt, 76 mt under the Preferred Alternative, 79 mt under Alternative 1, and 65 mt under Alternative 2 (Table 4-131). In 2016, the estimated mortality under the No Action Alternative would be 69 mt, 83 mt under the Preferred Alternative, 86 mt under Alternative 1, and 72 mt under Alternative 2 (Table 4-132). The modeled catch projections are lower than recent attainment. However, limitations on catch projection models are likely the reason for low projections. Attainment of the longnose skate ACL since 2011 has ranged between 74 and 84 percent of the ACL. The estimated mortality would be projected to remain below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. The ACL would be 2,000 mt under the No Action Alternative, the Preferred Alternative, and Alternative 1. Under Alternative 2 the ACLs would be 1,920 mt in 2015 and 1,885 mt in 2016.

4.1.4.11 Longspine Thornyhead

The most recent stock assessment (Fay 2006) indicated that the longspine thornyhead stock was healthy with an estimated spawning stock biomass at 71 percent of its initial, unfished biomass in 2005. The impact of recruitment variability on the biomass for longspine thornyhead is low due to the long-lived nature of the species. The bulk of the biomass for this stock is contained in a large number of old age-classes. The PSA productivity score of 1.47 indicates a stock of moderate productivity.

Longspine thornyhead are estimated to be well above the management target, and the current fishing mortality rate is substantially lower than the F_{MSY} proxy of $F_{50\%}$. Longspine are distributed in depths from 167 fm to greater than 833 fm (PFMC 2014). The bottom trawl fishery is prohibited from operating in waters deeper than 700 fm, which is shallower than the distribution of longspine. This substantially reduces any biological risk to the stock resulting from fishing pressure. Longspine thornyhead is not targeted in the Conception area and is caught in incidental amounts that are well below the preferred ACLs.

Longspine thornyhead has been managed with separate ACLs/OYs north and south of at 34º27' N. latitude since 2007. For the northern area in 2015, the estimated mortality under the No Action Alternative would be 939 mt, 1,524 mt under the Preferred Alternative, 1,684 mt under Alternative 1, and 1,126 under Alternative 2 (Table 4-131). For the northern area in 2016, the estimated mortality under the No Action Alternative would be 939 mt, 1,459 mt under the Preferred Alternative, 1,601 mt under Alternative 1, and 1,070 under Alternative 2 (Table 4-132). For the southern area in 2015, the estimated mortality under the No Action Alternative would be 939 mt, 1,534 mt under the Preferred Alternative, 1,684 mt under Alternative 1, and 1,126 under Alternative 2 (Table 4-131). For the southern area in 2016, the estimated mortality under the No Action Alternative would be 939 mt, 1,459 mt under the Preferred Alternative, 1,601 mt under Alternative 1, and 1,070 under Alternative 2 (Table 4-132). Attainment in the north since 2011 has ranged between 44 and 45 percent of the ACL and in the south between 5 and 6 percent of the ACL. The risk of overfishing would be low, as the estimated mortality would be well below the ACLs under all of the alternatives (Tables 2-2 through 2-5). Longspine thornyhead is a trawl-dominant species in the north. Catch monitoring uncertainty is low, given the level of observer monitoring in the trawl fisheries.

4.1.4.12 Pacific Cod

Pacific cod is a transboundary stock with most of the biomass distributed north of the U.S.-Canada border. They are harvested primarily in the limited entry trawl fishery north of 40º10' N. latitude. Pacific cod have never been formally assessed on the U.S. West Coast. Pacific cod is the only unassessed, data-poor groundfish stock currently managed with stock-specific harvest specifications on the West Coast. The harvest levels are based on historical landings. The PSA productivity score of 2.11 indicates a stock of relatively high productivity. The effective fishing mortality rate for Pacific cod in West Coast fisheries is very low. In 2015 and 2016, the estimated mortality would be 268 mt under the No Action Alternative, the Preferred Alternative, and Alternative 1 and would be 181 mt under Alternative 2 (Table 4-131 and Table 4-132). Attainment since 2011 has ranged between 38 and 40 percent of the ACL. The estimated mortality would be well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. The ACL would be 1,600 mt under No Action, the Preferred Alternative, and Alternative 1. Under Alternative 2, the ACLs would be 1,213 mt in both 2015 and 2016.

4.1.4.13 Pacific Whiting

The setting of the Pacific whiting TACs in 2015 and 2016 is not part of the proposed action. This is because the whiting TAC is set annually under an Agreement with Canada on Pacific Hake/Whiting. However, a range of whiting TACs is analyzed to understand the potential bycatch implications of ACLs considered in this biennial specifications process. The nontribal commercial share of whiting (U.S. ACL reduced by set-asides for open access incidental, research, EFPs and tribal allocations) is allocated to limited entry whiting trawl sectors as follows: 42 percent for the Pacific whiting shorebased IFQ sector, 24 percent for the at-sea mothership sector, and 34 percent for the at-sea catcher/processor sector.

Since 2011, long-term allocations of non-whiting groundfish have been established between the trawl and nontrawl sectors of the groundfish fishery. Trawl allocations are further split between the at-sea trawl and shoreside trawl sectors. The shoreside fishery, whiting, and non-whiting fisheries are managed as one sector under the shorebased IFQ program. Because the catch of non-whiting groundfish must be maintained within the individual's quota pounds, the bycatch implications of the trawl IFQ fishery, including vessels targeting Pacific whiting are discussed relative to individual species and complexes. Overfished species most commonly encountered in the Pacific whiting fishery are canary, darkblotched and POP. Non-overfished groundfish species commonly caught in the at-sea sectors and the tribal fishery are shown in Table 4-11. Yellowtail rockfish, spiny dogfish, arrowtooth flounder, splitnose rockfish, lingcod, shortspine thornyhead, unidentified rockfish, and other flatfish had the highest average incidental catch between 2007 and 2011. Groundfish regulations specify set-asides for the non-tribal, at-sea sectors.

Table 4-9. Non-whiting groundfish catch (mt) in the tribal and At-sea sectors of the Pacific whiting fishery, 2006-2011.

	2007	2008	2009	2010	2011	AVG (07-11)
Pacific Whiting	126,239.000	180,496.000	72,164.000	106,308.000	128,074.000	122,656.200
Arrowtooth	3.000	6.290	5.750	12.990	48.980	15.402
Black rockfish	0.000	0.000	0.020	0.000	0.000	0.004
Chilipepper rockfish	0.320	0.670	2.450	1.070	0.010	0.904
Dover sole	0.060	0.770	0.120	1.860	1.180	0.798
English sole	0.000	0.010	0.170	0.010	0.020	0.042
Lingcod	6.220	5.560	2.870	0.990	0.320	3.192
Longspine thornyhead	0.000	0.450	0.000	0.000	0.390	0.168
Minor shelf rockfish	Not available	Not available	Not available	Not available	0.930	--
Minor slope rockfish [a/]	Not available	Not available	Not available	Not available	81.220	--
Other flatfish	0.270	0.460	0.470	10.420	1.920	2.708
Pacific cod	0.000	0.070	0.510	0.000	0.040	0.124
Petrale sole	0.010	0.000	0.000	0.000	3.950	0.792
Shortbelly rockfish	0.010	0.000	0.050	0.000	0.000	0.012
Shortspine thornyhead	2.730	5.350	0.500	3.970	13.280	5.166
Spiny dogfish	154.710	674.260	162.560	277.630	783.760	410.584
Splitnose rockfish	2.180	0.660	1.220	43.530	11.910	11.900
Starry flounder	0.000	0.000	0.000	0.000	0.000	0.000
Thornyhead, unid.	0.000	1.430	0.000	0.000	0.130	0.312
Yellowtail rockfish	79.630	173.990	90.910	150.060	101.180	119.154
Unidentified rockfish	32.765	76.230	1.240	24.680	0.030	26.989
All other groundfish	2.020	20.320	14.230	0.580	0.000	7.430

Source: NMFS whiting fishery annual report.
[a/] Slope rockfish catch largely consists of rougheye/blackspotted rockfish. Impacts on these species relative to the whiting fishery are specifically discussed in Section 4.1.5.

Table 4-12 shows the 2014 set-asides under the No Action Alternative, and Table 4-13 shows the 2015-2016 set-asides under the action alternatives. The reduction of the other fish set-aside due to spiny dogfish being removed from the complex is the most notable difference. The proposed Other Fish complex contains nearshore species that are not typically encountered in the at-sea whiting sectors. As such, the Council determined it was not necessary to specify an Other Fish complex set-aside. A range of spiny dogfish set-asides from 163 mt to 725 mt was analyzed, along with a risk analysis for all sectors of exceeding the spiny dogfish ACL (Section B.16, Appendix B). The effectiveness of GCAs to reduce spiny dogfish mortality was also explored in Appendix B. Given the low risk of exceeding the spiny dogfish ACL, the Council did not recommend spiny dogfish set-asides, nor did it recommend spiny dogfish GCAs for the at-sea sectors. No species-specific set-aside is established for spiny dogfish. Allocations for canary, darkblotched, POP, and widow rockfish are decided in the biennial harvest specifications.

Table 4-10. At-sea Whiting Fishery Annual Set-asides, 2014 and Beyond (No Action Alternative).

Species or Species Complex	**Area**	**Set-aside (mt)**
Arrowtooth Flounder	Coastwide	**20**
Bocaccio	S. of 40°10 N. lat.	**NA**
Canary Rockfish	Coastwide	**Allocation**
Chilipepper	S. of 40°10 N. lat.	**NA**
Cowcod	S. of 40°10 N. lat.	**NA**
Darkblotched	Coastwide	**Allocation**
Dover Sole	Coastwide	5
English Sole	Coastwide	5
Lingcod	N. of 40°10 N. lat.	15
Lingcod	S. of 40°10 N. lat.	NA
Longnose Skate	Coastwide	5
Longspine Thornyhead	N. of 34°27 N. lat.	5
Longspine Thornyhead	S. of 34°27 N. lat.	NA
Minor Nearshore Rockfish	N. of 40°10 N. lat.	NA
Minor Nearshore Rockfish	S. of 40°10 N. lat.	NA
Minor Shelf Rockfish	N. of 40°10 N. lat.	35
Minor Shelf Rockfish	S. of 40°10 N. lat.	NA
Minor Slope Rockfish	N. of 40°10 N. lat.	100
Minor Slope Rockfish	S. of 40°10 N. lat.	NA
Other Fish	Coastwide	520
Other Flatfish	Coastwide	20
Pacific Cod	Coastwide	5
Pacific Halibut	Coastwide	10
Pacific Ocean Perch	N. of 40°10 N. lat.	Allocation
Pacific Whiting	Coastwide	Allocation
Petrale Sole	Coastwide	5
Sablefish	N. of 36° N. lat.	50
Sablefish	S. of 36° N. lat.	NA
Shortspine Thornyhead	N. of 34°27 N. lat.	20
Shortspine Thornyhead	S. of 34°27 N. lat.	NA
Starry Flounder	Coastwide	5
Widow Rockfish	Coastwide	Allocation
Yelloweye	Coastwide	0
Yellowtail	N. of 40°10 N. lat.	300

Table 4-11. At-sea Whiting Fishery Annual Set-asides, 2015-2016 (Preferred Alternative, Alternative 1, and Alternative 2).

Species or Species Complex	Area	Set-aside (mt)
Bocaccio	S. of 40°10 N. lat.	NA
Canary Rockfish	Coastwide	Allocation
Cowcod	S. of 40°10 N. lat.	NA
Darkblotched	Coastwide	Allocation
Pacific Ocean Perch	N. of 40°10 N. lat.	Allocation
Petrale Sole	Coastwide	5
Yelloweye	Coastwide	0
Arrowtooth Flounder	Coastwide	45
Chilipepper	S. of 40°10 N. lat.	NA
Dover Sole	Coastwide	5
English Sole	Coastwide	5
Lingcod	N. of 40°10 N. lat.	15
Lingcod	S. of 40°10 N. lat.	NA
Longnose Skate	Coastwide	5
Longspine Thornyhead	N. of 34°27 N. lat.	5
Longspine Thornyhead	S. of 34°27 N. lat.	NA
Minor Nearshore Rockfish	N. of 40°10 N. lat.	NA
Minor Nearshore Rockfish	S. of 40°10 N. lat.	NA
Minor Shelf Rockfish	N. of 40°10 N. lat.	35
Minor Shelf Rockfish	S. of 40°10 N. lat.	NA
Minor Slope Rockfish	N. of 40°10 N. lat.	100
Minor Slope Rockfish	S. of 40°10 N. lat.	NA
Other Fish	Coastwide	NA
Other Flatfish	Coastwide	20
Pacific Cod	Coastwide	5
Pacific Halibut	Coastwide	10
Pacific Whiting	Coastwide	Allocation
Sablefish	N. of 36° N. lat.	50
Sablefish	S. of 36° N. lat.	NA
Shortspine Thornyhead	N. of 34°27 N. lat.	20
Shortspine Thornyhead	S. of 34°27 N. lat.	NA
Starry Flounder	Coastwide	5
Widow Rockfish	Coastwide	Allocation
Yellowtail	N. of 40°10 N. lat.	300

The at-sea sectors of the Pacific whiting fishery may be closed if a total catch limit (allocation or HG) of an overfished species has been reached before the sector's whiting allocation is reached. Total catch limits in the primary Pacific whiting fishery may be established or adjusted as routine management measures. Therefore, the impacts of a range of Pacific whiting TACs on overfished species are limited by the overfished species allocations.

Projected mortalities for overfished species assume that the full at-sea allocation for overfished species is taken and that projected catch is within the ACLs established for rebuilding. Non-overfished species set-asides are evaluated on an annual basis, and the need to modify values to maintain the total catch within the trawl allocations is considered to prevent exceeding the trawl allocation. Management of the at-sea fleet through allocations and set-asides reduces the risk of overfishing non-whiting groundfish species regardless of the whiting allocations. Spiny dogfish is a common bycatch species in the whiting fisheries. A Pacific whiting ACL that is higher than the No Action ACL is likely to result in increased bycatch of spiny dogfish. Without IFQ for the shoreside fishery, or set-asides for the at-sea fisheries, total catch mortality would have to be monitored closely inseason to reduce the risk of exceeding the ACL. The Pacific whiting fisheries are well-monitored, reducing the error in estimates of true total catch mortality and the risk of exceeding a harvest specification. An area of concern is the component stocks within the minor slope rockfish complex, as catch largely consists of rougheye/blackspotted rockfish. Impacts on these species relative to the whiting fishery are specifically discussed in Section 4.1.5. Under the action alternatives, the set-aside for arrowtooth flounder would increase by 25 mt. Table 4-14 shows the range of allocations considered in this EIS.

Table 4-14 shows a range of possible whiting sector allocations derived from an historical analysis of Pacific whiting harvest limits (OY, U.S. TAC) from 2005 to 2013. Shoreside-sector Pacific whiting allocations shown in Table 4-14 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 that occurred in 2013 and 40,738 mt in 2009, respectively. By comparison, the allocation assumed for the shoreside sector under the alternatives for 2015-2016 would be 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 for 2015-2016 would be 48,969 mt, the original mothership sector allocation in 2013. Allocations under the alternative TACs for the CP sector would 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 CP sector assumed under the alternatives for 2015-2016 would be 69,373 mt, the original CP sector allocation in 2013.

Table 4-12. Range of potential Pacific whiting allocations by sector based on actual annual 2005 to 2013 final sector allocations compared with values projected under the alternatives (mt).*

ACL Scenario	Shoreside Sector		Mothership Sector		Catcher-Processor Sector		Total Implied Combined Commercial Whiting Sectors' TAC (mt)
	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). The potential sector allocations shown do not necessarily adhere to intersector allocation shares in the FMP.

4.1.4.14 Sablefish North of 36° N. Latitude

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 that was not explicitly accounted for in this analysis. Sablefish are found in waters from 27 to 1,000 fm, but they are most common in 110 to 550 fm.

Sablefish is a major target species in offshore fixed gear and bottom trawl fisheries. With the exception of some livefish fisheries, sablefish 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 36° N. latitude, since long-term formal allocations have been decided for the portion of the population north of 36° N. latitude. Only the population north of 36° N. latitude has experienced catches with high attainment rates relative to specified ACLs/OYs; the percent difference in the cumulative 2002 to 2012 catch of sablefish south of 36° N. latitude has been 27.1 percent of the cumulative 2015 ACL.

The preferred coastwide OFL of 7,857 mt is projected from the 2011 assessment. The preferred ABC of 7,173 mt is based on a P* of 0.4. The coastwide ABC is apportioned 73.6 percent to the north based on the average annual 2003 to 2010 proportion of estimated swept-area biomass from the NWFSC trawl survey.

Total catches by sector of sablefish north of 36° N. latitude are provided in Table 4-15. The cumulative 2002 to 2012 total catch of sablefish north of 36° N. latitude was 19.5 percent higher than the cumulative 2015 ACL amount. In hindsight, total catch mortality exceeded the 2015 ACL amount in 9 of the 11 years (Figure 4-9). Table 4-15 shows that sablefish north of 36° N. latitude attainment of the ACL is very high and greater than 90 percent attainment in most years, but the ACL has not been exceeded. Similar attainment is likely to continue given the high value of sablefish.

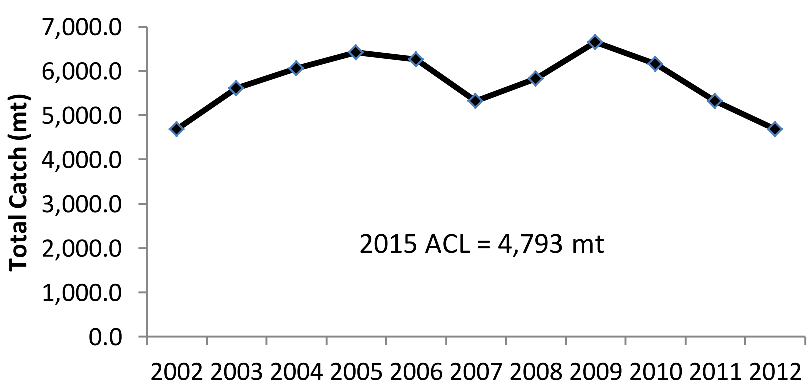


Figure 4-9. Estimated total catch of sablefish north of 36° N. latitude, 2002 to 2012, relative to the preferred 2015 ACL.

Table 4-13. Estimated total catch by sector of sablefish north of 36º N. latitude, 2001 to 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**

The preferred ACLs for sablefish north of 36º N. latitude are 4,793 mt and 5,241 mt in 2015 and 2016, respectively, and they are based on an ABC using a P* of 0.4 and application of the 40-10 rule to calculate the ACLs. In contrast, the Alternative 1 ACLs of 5,012 mt and 5,467 mt in 2015 and 2016, respectively, would be based on a higher ABC with the 40-10 rule applied. The Alternative 2 ACLs of 4,114 mt and 4,540 mt in 2015 and 2016, respectively, would be based on a lower ABC with the 40-10 rule applied. Therefore, with fewer 2015-2016 sablefish removals relative to Alternative 1, the stock would reach the B_{MSY} target faster under the Preferred Alternative. However, the preferred removals would be higher than under Alternative 2, which would project a slower attainment of the B_{MSY} target under the Preferred Alternative relative to Alternative 2.

Because sablefish is a precautionary zone species that is usually fished to a high level of attainment, inseason monitoring and management are especially important when managers are trying to make decisions that may result in exceeding or attaining sector ACLs. Accurate and timely data are needed to prevent overfishing. Since implementation of the limited entry fixed gear sablefish permit stacking program in 2002, inseason management of the primary and daily trip-limit (DTL) fishery sablefish fixed-gear fisheries has been based on two types of information: (1) paper landing receipts that typically have a 2-month time lag between the date of landing and when the landing data are available in PacFIN, and (2) the Quota Species Monitoring (QSM) Best Estimate Report, which fills in the 3-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, the current catch accounting system is subject to inaccuracy and time delays that are being addressed through a separate rulemaking that would implement electronic fish tickets for limited entry primary and DTL fisheries and open access fisheries, similar to what is used in the trawl IFQ program.

4.1.4.15 Shortbelly Rockfish

Shortbelly rockfish is a healthy and valuable forage species that is not targeted in any commercial or recreational fisheries, but is taken incidentally. The PSA vulnerability score is 1.13, which indicates a low overfishing concern. The PSA productivity score of 1.94 indicates a stock of relatively high productivity, among the highest for any West Coast rockfish.

Two ACL alternatives were considered, 50 mt for the No Action Alternative and Alternatives 1 and 2 and 500 mt under the Preferred Alternative. The Council previously recognized shortbelly rockfish for its value as a forage fish, and the low ACL (relative to the ABC) was established for ecological considerations, given its importance as a forage fish species. The low level of fishing mortality is intended to accommodate small amounts that are incidentally caught, while recognizing the stock's importance as a forage fish. Fishing mortality has been negligible in recent years (Table 4-133), with incidental total catch mortality of shortbelly rockfish ranging between 1 and 12 mt. In response to public testimony, the Council added the higher shortbelly ACL to the Preferred Alternative at its June meeting to ensure access to co-occurring species, which could be limited by the very low shortbelly ACL. The 500 mt ACL is less than 10 percent of the ABC, and it is anticipated to continue to allow access to co-occurring species without jeopardizing shortbelly rockfish or its role in the ecosystem.

The 2007 shortbelly rockfish stock assessment illustrates the stock's population fluctuations over time, despite the lack of any target fishing for shortbelly rockfish (Field et al. 2007). Shortbelly rockfish bycatch has also been low relative to overall biomass over time, with some modest increases during the pre-MSA years, when foreign fishing for Pacific whiting occurred south of Cape Mendocino, and shortbelly rockfish appeared as bycatch in that fishery and area. Field et al. (2007) estimated a shortbelly rockfish mean unfished total biomass north of Point Conception of 98,400 tons and a mean unfished spawning biomass of 49,500 tons. Field et al. (2007) reviewed historic shortbelly rockfish catch rates and concluded that it was unlikely that fishing mortality had had any impact on the stock since the pre-MSA era, when as much as 7,500 tons of shortbelly rockfish were taken in any one year. Therefore, an increase of the shortbelly rockfish ACL from 50 to 500 mt is not expected to have any effect on the abundance of the stock itself, nor is it expected to measurably affect the availability of shortbelly rockfish to its many non-human predators.

4.1.4.16 Shortspine Thornyhead

The 2013 shortspine thornyhead assessment indicated a stock depletion of 74.2 percent at the start of 2013 (Taylor and Stephans 2013). The PSA productivity score of 1.33 indicates a stock of moderate productivity. This is a slow-growing species, with continuous length increases on the order of 1 cm/year.

Shortspine thornyhead has been managed with separate ACLs/OYs north and south of Point Conception at 34º27' N. latitude since 2007. The No Action Alternative ACL would be 1,525 mt in the north (North of Point Conception) and 393 mt in the south. Under the Preferred Alternative, the ACL for the north would be 1,745 mt in 2015 and 1,726 mt in 2016. Under Alternative 1, the ACL for the north would be 1,913 mt in 2015 and 1,892 mt in 2016, and under Alternative 2 the ACLs would be 1,288 mt in 2015 and 1,275 mt in 2016. For the south, the Preferred Alternative would be 923 mt in 2015 and 913 mt in 2016. Under Alternative 1, the ACLs would be 1,012 mt in 2015 and 1,001 in 2016. Under Alternative 2, the ACLs would be 682 mt in 2015 and 674 mt in 2016. In the north in 2015, the estimated mortality under the No Action Alternative would be 755 mt, 870 mt under the Preferred Alternative, 956 mt under Alternative 1, and 734 under Alternative 2 (Table 4-131). In the north in 2016, the estimated mortality under the No Action Alternative would be 755 mt, 862 mt under the Preferred Alternative, 947 mt under Alternative 1, and 736 under Alternative 2 (Table 4-132). In the south in 2015 and 2016, the estimated mortality under all of the alternatives would be 4 mt (Table 4-131 and Table 4-132). Attainment since 2011 has ranged between 51 and 53 percent of the ACL in the north and 32 and 45 percent of the ACL in the south. The estimated mortality would be well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. Management uncertainty is low for shortspine in the north, since most of the catch is in the trawl fishery, which is observed at a 100 percent rate. In the south, shortspine are mostly targeted in the limited entry fixed gear fishery, which is observed at a 20 to 25 percent rate.

4.1.4.17 Spiny Dogfish

Gertseva and Taylor (2011) estimated the spawning stock output of spiny dogfish to be 44,660 thousands of fish, which represented 63 percent 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 percent was predicted to reduce the spawning output severely over the long term because of the extremely low productivity and other reproductive characteristics of the stock. Following the 2011 stock assessment, the SSC's groundfish subcommittee conducted a meta-analysis to evaluate the proxy F_{MSY} harvest rate used to calculate the OFLs for elasmobranchs. The results was a recommendation to change the proxy F_{MSY} harvest rate from an SPR of 45 percent to an SPR of 50 percent, which would result in a more conservative OFL (analysis is further discussed in PFMC 2014). The preferred 2015 and 2016 OFLs of 2,523 and 2,503 mt, respectively under the action alternatives would be based on the 50 percent SPR harvest rate. This would contrast with the 2015 and 2016 OFLs based on a 45 percent SPR harvest rate of 2,921 and 2,893 mt, respectively.

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 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, 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 that 100 percent 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 (CPs and mothership) were generated from a NMFS Alaska Fisheries Information Network North Pacific Database Program (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 4-10 shows the 2004 to 2012 annual total catches of spiny dogfish relative to the 2016 OFL and ABCs specified for all of the action alternatives. The 2016 values are slightly lower than those for 2015. Total catch in 2005 and 2008 exceeded the 2016 ABC values under the Preferred Alternative and Alternative 1, primarily due to high bottom trawl catches (Table 4-16).

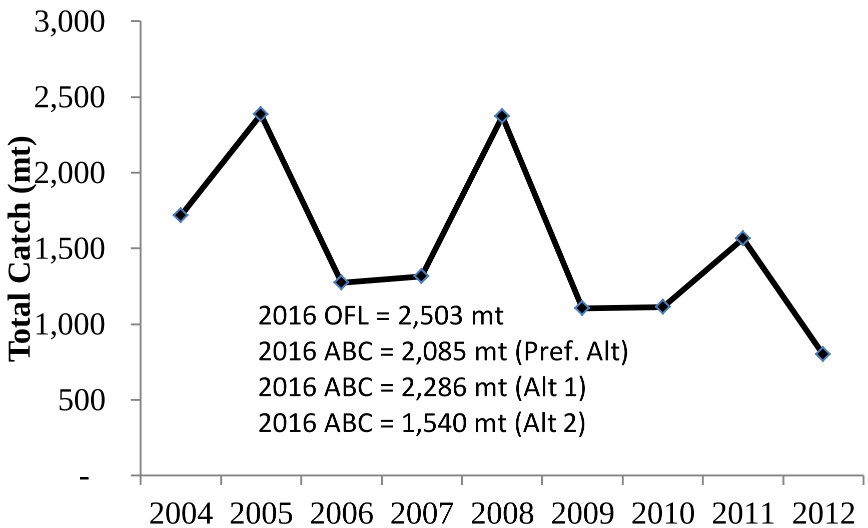


Figure 4-10. Estimated total catch of spiny dogfish, 2004 to 2012 relative to the preferred 2016 OFL and ABCs.

The action alternatives set a species-specific ACL for spiny dogfish in 2015 and 2016. The 2015 and 2016 Preferred Alternative ACLs would be equal to the ABCs calculated using a P* of 0.4. These ACLs would be 2,101 mt and 2,085 mt in 2015 and 2016, respectively. The choice of a higher P* (thus higher ABCs) in 2015 and 2016 than the 2014 No Action ABC contribution of spiny dogfish to the Other Fish complex (i.e., P* = 0.3) was based on the SSC addressing the uncertainty in the proxy F_{MSY} harvest rate used to decide the spiny dogfish OFL. The SSC meta-analysis of proxy F_{MSY} harvest rates for elasmobranchs led to a more conservative proxy harvest rate of SPR = 50 percent. Therefore, with less uncertainty in estimating the OFL, the Council preferred a higher P* and lower ABC buffer to determine the ACL than was done under the No Action Alternative. The Preferred Alternative ACLs for spiny dogfish would be lower than the Alternative 1 ACLs (2,303 mt and 2,285 mt in 2015 and 2016, respectively) and higher than the Alternative 2 ACLs (1,551 mt and 1,540 mt in 2015 and 2016, respectively). Therefore, predicted spiny dogfish biomass in the foreseeable future would be lower under Alternative 1 and higher under Alternative 2 relative to the Preferred Alternative.

Dogfish catch occurs in almost every fishery on the West Coast, and most of the catch is discarded. In reviewing the spiny dogfish ACLs relative to the historical catch from 2004 through 2012, the spiny dogfish total catch mortality in 2 of the 9 years was greater than the amounts proposed for the 2015 and 2016 ACLs under the Preferred Alternative and Alternative 1, and it was greater than the Alternative 2

ACLs in 4 of the 9 years. Although dogfish is taken in most fisheries, the majority has been taken in the trawl fisheries. While spiny dogfish is not an IFQ species, the distribution of bottom trawl effort in the shorebased IFQ sector has 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 under the action alternatives would provide more direct catch accounting and control when compared to the No Action Alternative. There does not appear to be a high risk of the stock being subject to overfishing in the next management cycle. Cumulative landing limits and area closures would continue to be available as catch control tools for spiny dogfish (PFMC and NMFS 2012).

Table 4-14. Annual total catches of spiny dogfish by sector, 2004 to 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 California and Oregon, and of unidentified shark catches (A + B1), assumed to be spiny dogfish, in Washington.
[b/] Catches generated from a NORPAC query (03/14/2014).

4.1.4.18 Splitnose Rockfish

A new splitnose rockfish assessment was done in 2009 (Gertseva et al. 2009). Splitnose rockfish is a healthy stock with spawning depletion estimated at 66 percent of its unexploited level at the beginning of 2009. The PSA productivity score of 1.28 indicates a stock of relatively low productivity. 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.

Splitnose rockfish have been taken incidentally in fisheries such as the trawl fisheries targeting for POP, mixed slope rockfish, and other deepwater targets, but they have not been a commercial target species. Splitnose is managed with stock-specific specifications south of 40º10’ N. latitude and within the Minor Slope Rockfish complex in the north. In the south in 2015, the estimated mortality under the No Action Alternative would be 53 mt, 54 mt under the Preferred Alternative and Alternative 1, and 44 mt under

Alternative 2 (Table 4-131). In 2016, the estimated mortality under the No Action Alternative would be 53 mt, 55 mt under the Preferred Alternative and Alternative 1, and 45 mt under Alternative 2 (Table 4-132). Attainment since 2011 has ranged between 2 and 4 percent of the ACL. The risk of overfishing is low as the estimated mortality is well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. The No Action Alternative ACL would be 1,670 mt. Under the Preferred Alternative and Alternative 1, the ACL would be 1,715 mt in 2015 and 1,746 mt in 2016. Under Alternative 2, the ACLs would be 1,406 mt in 2015 and 1,432 mt in 2016.

4.1.4.19 Starry Flounder

Starry flounder was assessed in 2005 (Ralston 2006), and both the northern (Washington and Oregon) and southern (California) populations were estimated to be above the target level of 40 percent of unfished spawning biomass (44 percent in Washington-Oregon and 62 percent in California), although the status of this data-poor species remains fairly uncertain compared to that of many other groundfish species. The SSC categorized starry flounder as a category 2 stock due to a very uncertain catch history, a lack of age or size composition data, and poor tracking in the NMFS trawl survey. The PSA productivity score of 2.15 indicates a very productive stock, which is true for most nearshore and shelf flatfishes.

In 2015 and 2016, the estimated mortality under the No Action Alternative, the Preferred Alternative, and Alternative 1 would be 9 mt and 6 mt under Alternative 2 (Table 4-131 and Table 4-132). Attainment since 2011 has ranged between 1 and 2 percent of the ACL. The risk of overfishing would be low as the estimated mortality would be well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. The No Action Alternative ACL would be 1,528 mt. Under the Preferred Alternative, the ACL would be 1,534 mt in 2015 and 1,539 mt in 2016. Under Alternative 1, the ACLs would be 1,681 mt in 2015 and 1,686 mt in 2016. Under Alternative 2, the ACLs would be 1,132 mt in 2015 and 1,136 mt in 2016. Management uncertainty is relatively low due to a substantial trawl catch, where there is mandatory 100 percent observer coverage. Starry flounder are also caught in recreational fisheries where management uncertainty is greater.

4.1.4.20 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, and the estimated relative spawning stock biomass never dropped below the 25 percent MSST.

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 midwater trawl target fishery for widow rockfish, which effectively disappeared as the stock was depleted and was further reduced as the need to rebuild overfished stocks resulted in increased management restrictions. Both the rebuilding of the widow rockfish stock and implementation of IFQ management have facilitated the reemergence of this fishery on a limited scale. 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. 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.

Three ACL alternatives for 2015 and 2016 are analyzed for widow rockfish: (1) the No Action Alternative ACL of 1,500 mt, (2) an ACL of 3,000 mt, and (3) the Preferred Alternative ACL of 2,000 mt. Decision table projections in the 2011 assessment assumed constant annual catches varying between 1,500 mt and 3,000 mt. A 3,000 mt constant annual catch is predicted to maintain the stock above the target B_{MSY} level in the next 10 years under the more likely state of nature in the assessment. However, there is great uncertainty in the stock's estimated biomass, relative productivity (steepness was fixed), and other aspects of the stock's dynamics.

The widow rockfish ACL would be 1,500 mt under the No Action Alternative, Alternative 1, and Alternative 2 and 2,000 mt under the Preferred Alternative. These ACLs are intended to provide opportunity to target this healthy stock and healthy co-occurring yellowtail rockfish. The Preferred Alternative of 2,000 mt would provide a slightly higher allowable harvest than under the No Action Alternative, while maintaining a relatively conservative management strategy for widow rockfish given the great uncertainty in the stock's estimated biomass, productivity and depletion. The Preferred Alternative widow rockfish ACL of 2,000 mt would be lower than the 2015 and 2016 ABCs calculated under a P* of 0.25 (the lowest ABC rule analyzed). Likewise, the No Action Alternative ACL of 1,500 mt would be accommodated for the same reason.

In 2015, the estimated mortality under the No Action Alternative would be 429 mt, 677 mt under the Preferred Alternative, 434 mt under Alternative 1, and 433 mt under Alternative 2 (Table 4-131). In 2016, the estimated mortality under the No Action Alternative would be 429 mt, 677 mt under the Preferred Alternative, and 434 mt under Alternative 1 and Alternative 2 (Table 4-132). Attainment since implementation of IFQ has ranged between 36 and 46 percent of the ACL. The risk of overfishing is low as the estimated mortality is well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. Management uncertainty is low since widow rockfish is a trawl-dominant species, and there is mandatory 100 percent observer coverage in trawl fisheries.

Table 4-15. Widow rockfish decision table.

			State of Nature			
			h = 0.41		Base case (*h*=0.76)	
Management Decision	Year	Catch (mt)	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
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

Table 4-16 (continued). Widow rockfish decision table.

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 (2,500 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

Source: He et al. 2011.

4.1.4.21 Yellowtail Rockfish North of 40°10' N. Latitude

A 2013 yellowtail rockfish stock assessment was conducted for the portion of the population north of 40°10' N. latitude. The estimated stock depletion is 69 percent of its unfished biomass in 2013.

For yellowtail rockfish north of 40°10' N. latitude, the ACL under the No Action Alternative would be 4,382 mt. Under the preferred Alternative and Alternative 1, the ACL would be 6,590 mt in 2015 and 6,344 mt in 2016. Under Alternative 2, the ACLs would be 4,439 mt in 2015 and 4,274 mt in 2016.

In 2015, the estimated mortality under the No Action Alternative would be 845 mt, 2,513 mt under the Preferred Alternative and Alternative 1, and 1,619 mt under Alternative 2 (Table 4-132). In 2016, the estimated mortality under the No Action Alternative would be 845 mt, 2,372 mt under the Preferred Alternative and Alternative 1, and 1,523 under Alternative 2 (Table 4-133). Attainment since implementation of IFQ has ranged between 31 and 36 percent of the ACL. There has been relatively little fishing pressure on yellowtail since 2004, resulting in low attainment of the ACLs.

The risk of overfishing is low as the estimated mortality would be well below the ACLs (Tables 2-2 through 2-5) under all of the alternatives. Yellowtail rockfish co-occur with canary rockfish, widow rockfish, and several other rockfishes (Nagtegaal 1983; Tagart 1987; Rogers and Pikitch 1992). Association with these and other rockfish species has substantially altered fishing opportunity for yellowtail rockfish. Actual removals have been much lower than the ACLs, given RCA restrictions. Yellowtail rockfish south of 40°10' N. latitude are managed within the Minor Shelf Rockfish complex, as discussed in Section 4.1.5 below.

4.1.5 Stock Complexes and Component Stocks Currently Managed in Stock Complexes

Harvest specifications for stock complexes are set for each complex in its entirety. National Standard 1 Guidelines at 50 CFR 600.310(d)(8) describe stock complexes as "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." Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another and MSY cannot be defined on a stock-by-stock basis, where there is insufficient data to measure their stock status, or when it is not feasible for fishermen to distinguish individual stocks among their catch. Most groundfish species managed in a stock complex are data poor stocks without full stock assessments. However, some stocks within the complexes have been assessed.

For the 2013-2014 biennial cycle, the Council explored measures to increase the accuracy of catch reporting to inform future OFL estimates, as well as a more comprehensive analysis on stock complex restructuring. Accuracy in reporting is essential to determine if mortality of the component species within stock complexes are at unsustainable levels, which could result in long-term biological impacts. OFLs are set for stock complexes, rather than for individual stocks within a complex. The SSC recommended a comparison of recent catches of the component species to the OFL contributions to identify whether stock complexes are working as they were intended. If catches regularly exceed OFL contribution values, this could indicate a problem with how the stock complexes are structured and justify management actions such as removing the species concerned from the complex, or prioritizing a stock for a full assessment. The need for additional analysis and further management considerations resulted in the Council delaying restructuring consideration of the 2015-2016 biennial cycle.

Early during the 2015-2016 biennial cycle, the Council considered restructuring the Minor Nearshore Rockfish, Minor Shelf Rockfish, Minor Slope Rockfish, Other Flatfish, and Other Fish complexes (PFMC April 2013, Agenda D.3.). The Council expressed concerns that the biennial harvest specifications timeline could be affected if the Council was scheduled to deal with both the stock assessments and stock complexes at the same time. At this same meeting, the SSC recommended that steps be taken to look at spatial groupings of stocks in complexes and to refine the metrics used to evaluate current stock complexes with a focus on the ratio of total cumulative catch to total cumulative component OFL and the mean difference between total catch and total component OFL over time (Agenda Item D.3.b., Supplemental SSC report, April 2013). The Council recommended prioritizing analysis on the restructuring on the Minor Slope Rockfish complexes and Other Fish complex. The designation of some species as EC species was also to be addressed in June. Slope Rockfish was prioritized because the complex consists of species that are difficult to discern from one another (e.g., aurora rockfish from splitnose rockfish and 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 stocks' contributions to the complex.

Other Fish was recommended for priority because the Other Fish complex clearly consists of species that have very disparate life histories, ecological associations, vulnerabilities, and susceptibility to fisheries. Some of the individuals within this complex (e.g., California skate, spiny dogfish) received high vulnerability scores from the PSA. Potential restructuring of the Slope Rockfish complexes and the Other Fish complex is addressed in Sections 4.1.5.4 and 4.1.5.5, respectively. The designation of ecosystem component species as part of restructuring the Other Fish complex is further discussed in Section 4.1.6.

4.1.5.1 Other Flatfish

The Other Flatfish complex is constructed of unassessed, category 3 flatfish stocks. OFLs for the component stocks were derived using catch-based methods. Unlike the other complexes, other flatfish consists of species with similar life history characteristics, distributions, and low relative vulnerabilities to overfishing (Table 4-18). A coastwide assessment of Pacific sanddab was done in 2013, indicating the stock was at 95.5 percent of its unfished biomass (He et al. 2013). In 2013, the SSC recommended that this assessment not be used for deciding harvest specifications since the scale of the stock's biomass could not be adequately estimated. However, the status estimate was precise enough to conclude the stock was well above the B_{MSY} proxy of $B_{25\%}$. An English sole assessment was completed in 2013 using the data-moderate exSSS model platform; the assessment indicated that the stock was at 89 percent of its unfished biomass (Cope et al. 2014).

The Preferred Alternative ACL for the Other Flatfish complex would be 8,749 mt in 2015 and 7,243 in 2016, which is higher than the No Action Alternative ACL of 4,884. Alternative 1 ACLs would be the highest at 10,007 mt in 2015 and 8,356 mt in 2016. Alternative 2 is most similar to the No Action Alternative with ACLs of 5,701 in 2015 and 4,589 in 2016. The 2005 to 2012 catches of Other Flatfish have been well under the preferred ACL. Other flatfish are primarily caught in the bottom trawl fishery under the shorebased IFQ program. In 2011 and 2012, catches were under 20 percent of the ACL. When compared to the No Action Alternative, catch under the Preferred Alternative and Alternative 1 would be projected to increase substantially. Catch under Alternative 2 would be similar to the No Action Alternative. However, a substantial increase in projected catch under Alternative 1 would still result in less than 20 percent of the ACL being taken. The OFL and ABC contributions of individual stocks to the complex specifications are shown in the 2014 SAFE documents in Table 9, Table 12, and Table 13 (PFMC 2014).

Table 4-17. The relative vulnerability of stocks managed under the Other Flatfish complex.

	PSA Results Vulnerability	
Stock Complex and Component Stocks	**Score**	**Level**
Other Flatfish		
Butter sole	1.18	Low
Curlfin sole	1.23	Low
Flathead sole	1.03	Low
Pacific sanddab	1.25	Low
Rex sole	1.28	Low
Rock sole	1.42	Low
Sand sole	1.23	Low

4.1.5.2 Minor Nearshore Rockfish North and South of 40º10' N. Latitude

Minor Nearshore Rockfish North

The Minor Nearshore Rockfish complex north of 40°10' N latitude is composed of black and yellow rockfish, blue rockfish, brown rockfish, calico rockfish, China rockfish, copper rockfish, gopher rockfish, grass rockfish, kelp rockfish, olive rockfish, quillback rockfish, and treefish. Of the stocks managed in the minor nearshore rockfish complex north, Gopher, blue, brown, China, and copper rockfish have been assessed. Gopher rockfish north of Point Conception (34°27' N latitude) was estimated to be at 97 percent of its unfished biomass in 2005 and is, therefore, a healthy stock. The blue rockfish stock occurring in waters off California north of Point Conception (34°27' N latitude to 40°10' N latitude) was estimated to be at 29.7 percent of its unfished biomass in 2007 and is considered to be a precautionary zone stock. A coastwide data-moderate assessment of China rockfish conducted in 2013 (Cope et al. 2013) considered the stock to be in the precautionary zone with an estimated depletion at 33 percent of its unfished biomass (detailed discussion on China rockfish follows below). A coastwide data-moderate assessment of brown and copper rockfish conducted in 2013 (Cope et al. 2013) found both stocks to be healthy with depletion levels of 42 percent and 76 percent of unfished biomass at the start of 2013, respectively. Stock assessments have not yet been conducted for the remaining nearshore species, primarily due, in part, to the lack of available information. Thus, the overall stock biomass and age structure is unknown. The OFL and ABC contributions of individual stocks to the complex specifications are shown in the 2014 SAFE documents in Table 9, Table 12, and Table 13 (PFMC 2014).

The 2015 and 2016 ACL under the Preferred Alternative and Alternative 1 would be 69 mt for the complex, which would be a 26.6 percent decrease from the 2014 ACL of 94 mt. This compares to the Alternative 2 ACL of 40 mt. The decrease is due to new assessments for brown, China, and copper rockfish, as well as a blue rockfish ACL contribution that is trending downwards. In recent years, the ACL/OY for the Minor Nearshore Rockfish complex north of 40º10’ N. latitude has had high attainment rates, with 100 percent of the ACL taken in 2011 and 97 percent taken in 2012 (Table 4-133). The bulk of the harvest has occurred in nearshore recreational fisheries in all three states and nearshore commercial fisheries in California and Oregon. Figure 4-11 shows the annual total catch estimated from 2004 to 2012 for the complex relative to the 2015 OFL and the ABCs under the action alternatives. The total catch in most years has been higher that the proposed action alternative ABCs for 2015. In hindsight, total catch has been at or above the preferred 2015 OFL in 5 of the 9 years analyzed. The Alternative 2 ACL would reduce the risk of the true OFL from being exceeded and may provide greater conservation benefits to component stocks of concern if reductions in the complex OFL translate to reduced impacts for component stocks.

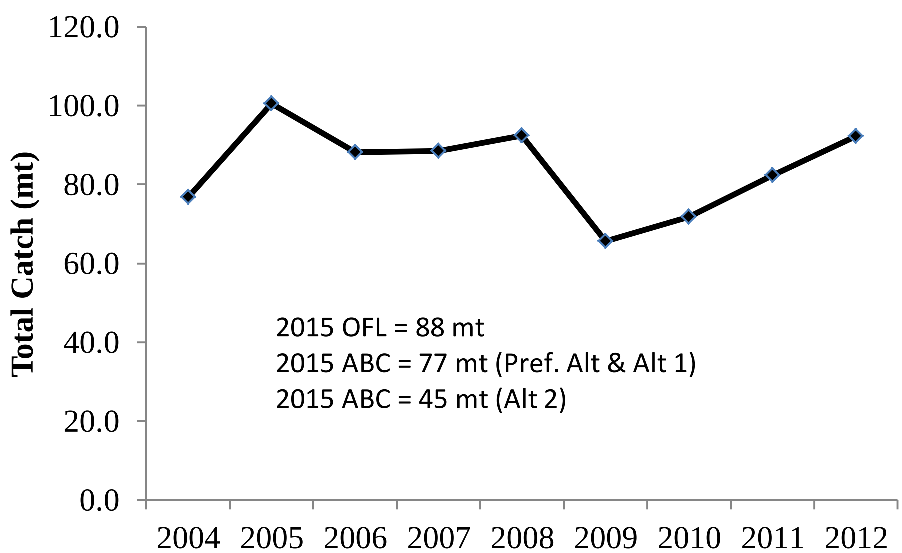


Figure 4-11. Estimated total catch of Minor Nearshore Rockfish north of 40º10’ N. latitude from 2004 to 2012, relative to the preferred 2015 OFL and ACL.

Table 4-19 shows the 2004 to 2012 total catches of species in the Minor Nearshore Rockfish complex north by sector. Northern Minor 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 MRFSS, which was the basis of California recreational catch estimates prior to implementation of the CRFS in 2004. Northern Nearshore Rockfish complex 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. latitude. Catches for all other sectors were generated from the Groundfish Mortality Multiyear Data Product database provided by the NMFS NWFSC WCGOP program.

Table 4-18. Annual total catches of Nearshore Rockfish north of 40º10' N. latitude by sector, 2004 to 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
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

Table 4-19 (continued). Annual total catches of Nearshore Rockfish north of 40º10' N. latitude by sector, 2004 to 2012.

Sector and Stocks	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
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
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**

Blue rockfish catches in California have been managed with a statewide HG since 2009. Because blue rockfish north of Point Conception is an assessed stock, the HG was calculated using the default 40-10 ACL harvest control rule. Total mortality has been maintained within the HG, and the blue rockfish stock is predicted to be increasing in abundance. Under the Preferred Alternative, the West Coast states would monitor and manage catches of Minor Nearshore Rockfish north of 40°10' N. latitude. If harvest levels in

Oregon or Washington approached 75 percent of the state-specific HGs (Table 2-6), which are based on status quo harvest levels, the states would consult via a conference call and determine whether inseason action would be needed. The HGs for Washington and Oregon would be state HGs and not established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area 40°10' N. latitude to 42° N. latitude. In the event inseason action would be needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

Most catch is taken in the recreational fisheries and nearshore fixed gear fisheries where there is little observer coverage or data on at-sea discards. Therefore, the error in total catch mortality estimates is higher than for trawl-dominant species. The potential for exceeding component stock OFL contributions for vulnerable species within the northern Minor Nearshore Rockfish complex, particularly China, copper, and quillback rockfish, is a concern, as these species were all identified as highly vulnerable with a major concern based on the 2011 PSA analysis (PFMC 2014). However, the results of the 2013 assessments for copper rockfish show that the stocks are in a healthy condition. Overfishing concern could arise if catch allocated within the Minor Nearshore Rockfish complex is shifted to vulnerable species. Under the action alternatives, state nearshore management plans and policies would mitigate these risks. In addition, the state HGs discussed above under the Preferred Alternative reduced the risk of overfishing the complex, as well as the contributions of component stocks. Under state management, most if not all, landed component species within the minor nearshore complex must be sorted to species. For 2015-2016, the states will take an active, coordinated role in managing these stocks. Because the state may also take inseason action independent of NMFS, the Preferred Alternative would not be expected to result in overfishing of the complex OFL, and the risk of exceeding a component stock OFL contribution would be reduced.China Rockfish North of 40º10’ N. Latitude

The populations of China rockfish (*Sebastes nebulosus*) north and south of 40º10’ N. latitude were assessed by Cope et al. (2014) in a new 2013 data-moderate assessment. The southern population was estimated to be healthy with an estimated depletion of 72 percent at the start of 2013. However, the northern population, managed as a component stock within the Minor Nearshore Rockfish Complex north, was estimated to be at 33 percent of unfished biomass at the start of 2013; it is, therefore, considered to be a precautionary zone stock.

China rockfish have a shallow distribution and are most common in the 10 to 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 4-20 provides the estimated annual catches of China rockfish north of 40º10’ N. latitude by sector from 2004 to 2012. The average annual total catch in 2004 to 2012 is estimated to be 13.8 mt.

Table 4-20. Annual total catches of China rockfish north of 40º10' N. latitude by sector, 2004 to 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**

As a component stock in the Minor Nearshore Rockfish complex, China rockfish is managed to harvest specifications for the complex. The estimated 2015 OFL contribution of China rockfish in the Minor Nearshore Rockfish complex north of 40°10' N. latitude is 7.2 mt. Under the Preferred Alternative P* of 0.45, the 2015 ABC contribution would be 6.6 mt, and the 40-10 adjusted ACL contribution would be 6.2 mt. Figure 4-12 depicts total estimated catch of China rockfish north of 40º10' N. latitude relative to the 2015 OFL and ACL contributions to the complex. The cumulative 2004 to 2012 total estimated catch of China rockfish north of 40º10' N. latitude was 191 percent and 221 percent of the cumulative 2015 OFL and ACL contributions, respectively. Maintaining these catch levels is predicted to lead to continued stock decline.

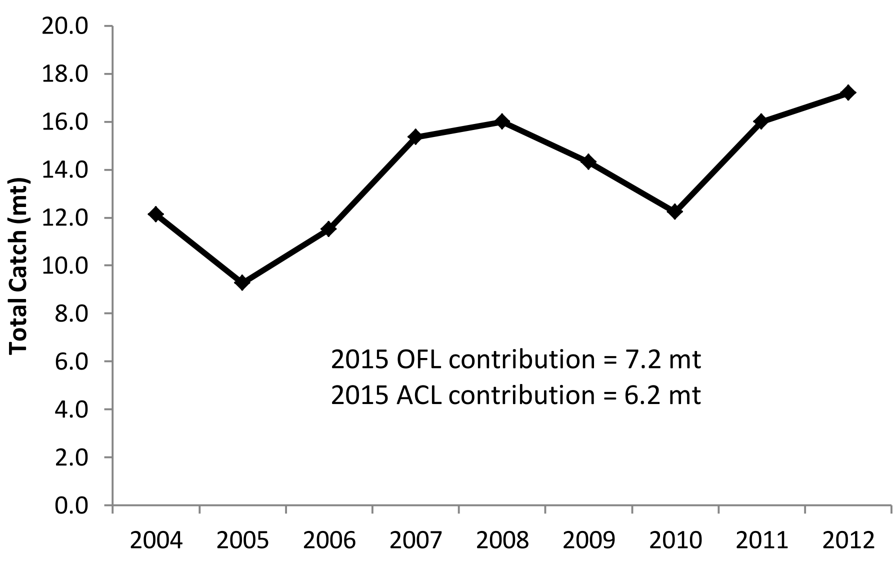


Figure 4-12. Estimated total catch of China rockfish north of 40º10' N. latitude in 2004 to 2012 relative to the preferred 2015 OFL contribution and ACL contribution.

If it is assumed that China rockfish's vulnerability is similar to other species in the Minor Nearshore Rockfish Complex north, and ACL decreases for the complex would result in lower catch, it would reduce the risk of overfishing the China rockfish contribution. Therefore, the Alternative 2 ACL would have a lowest risk of overfishing China rockfish than the Preferred Alternative or the Alternative 1 ACL.

A lack of data to inform the data-moderate stock assessment prepared for China Rockfish was a concern raised by the Council and its advisory bodies. Keeping China rockfish within the Minor Nearshore Rockfish complex while stock-specific data are collected may provide a better understanding of the status of the stock and the development of a species-specific ACL (Agenda Item C.4.b, Supplemental GMT Report 2, April 2014). Stocks within the Minor Nearshore Rockfish complex are thought to have more similar vulnerabilities than some of the other complexes.

Minor Nearshore Rockfish South

The Minor Nearshore Rockfish complex south of 40°10' N latitude is subdivided into the following management categories: 1) shallow nearshore rockfish consisting of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish, and 2) deeper nearshore rockfish consisting of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish. Most of the Minor Nearshore Rockfish complex south species have not been assessed. However, a few stocks have had quantitative assessments prior to 2013, and several had data-moderate assessments in 2013.

The blue rockfish stock occurring in waters off California north of Point Conception (i.e., 34°27' N. latitude to 40°10' N. latitude) was estimated to be at 29.7 percent of its unfished biomass in 2007; therefore, the stock is in the precautionary zone. Gopher rockfish north of Point Conception (34°27' N. latitude) was estimated to be at 97 percent of its unfished biomass in 2005. A coastwide, data-moderate assessment of brown rockfish, china rockfish, and copper rockfish was conducted in 2013 (Cope et al. 2014). The brown rockfish, and china rockfish south are healthy with depletions of 42 percent, and 66 percent of their unfished biomass at the start of 2013. Separate data-moderate assessments of copper rockfish north and south of 34°27' N. latitude were conducted, and both populations were estimated to be healthy, with depletions of 76 percent and 48 percent of unfished biomass at the start of 2013, respectively. Stock assessments have not yet been conducted for the remaining nearshore species, primarily due, in part, to the lack of available information. Thus the overall stock biomass and age structure is unknown. The OFL and ABC contribution of individual stocks to the complex specifications are shown in the 2014 SAFE documents in Table 9, Table 12, and Table 13 (PFMC 2014).

It is unlikely that the preferred 2015-2016 ACL for the Minor Nearshore Rockfish South complex would be exceeded under the action alternatives. Nearshore rockfish species are commercially landed under state permits in California, and all commercial landings must be sorted. The state has catch-accounting programs to actively monitor and manage these species inseason. The state may also take inseason action independent of NMFS, if necessary, to prevent exceeding an ACL.

If necessary to reduce the risk of overfishing, trip limits for the complex may be adjusted inseason, including sub-limits for blue rockfish to keep catch within the statewide HG. Concerns have been raised about overfishing component stocks within the Minor Nearshore Rockfish complexes. When considering the risk of overfishing to the nearshore species, the biological impact to the stock must be considered. All rockfish comprising the nearshore complexes have longevities of at least 20 years, with many being much greater. Stocks with greater longevities are more resilient to short-term fluctuations in environmental conditions or fishing practices, assuming older individuals are retained in the population. If older individuals are not retained, and the stock becomes overfished, rebuilding the stock would likely require a lengthy rebuilding period.

The potential for exceeding component stock OFL contributions for vulnerable species within the northern Minor Nearshore Rockfish complex, particularly China, copper, and quillback rockfish, is a concern, as these species were all identified as highly vulnerable with a major concern for overfishing based on the 2011 PSA analysis (PFMC 2014). However the results of the 2013 assessments for china and copper rockfish show that the stocks are in a healthy condition. All three of these species are structure-based, longer-lived, deeper-dwelling nearshore rockfish, and, thus, are prone to serial depletion. Concern for these species could arise if catch allocated within the nearshore complex were shifted to vulnerable species. Under the action alternatives, state nearshore management plans and policies are considered adequate to mitigate these risks. The risk of exceeding the preferred 2015-2016 ACL for the Minor Nearshore Rockfish South complex is low, considering that California manages its nearshore fishery. While the percent of ACL/OY attainment has been between 43.56 and 82.7 percent from 2007 to 2012, the OY was exceeded in 2006 by about 16 percent. No subsequent catch overage of the Minor Nearshore Rockfish South OY has occurred after 2006.

Table 4-21. The relative vulnerability of rockfish stocks managed in the Minor Nearshore Rockfish complex south of 40º10’ N. latitude ranked by relative level of vulnerability within the complex.

Stock Complex and Component Stocks	PSA Results Vulnerability Score	PSA Results Vulnerability Level
Minor Nearshore Rockfish South	NA	NA
China	2.23	Major
Copper	2.27	Major
Quillback	2.22	Major
Blue (assessed area)	2.01	Med/High
Blue (S of 34º27’ N. latitude)	2.01	Med/High
Brown	1.99	Med
Grass	1.89	Med
Olive	1.87	Med
Black and yellow	1.70	Low
Calico	1.57	Low
Gopher (N of Pt. Conception)	1.76	Low
Gopher (S of Pt. Conception)	1.76	Low
Kelp	1.59	Low
Treefish	1.73	Low

4.1.5.3 Shelf Rockfish North and South of 40°10’ N. Latitude

Minor Shelf Rockfish North of 40º10’ N. Latitude

The species comprising the Minor Shelf Rockfish North complex are all unassessed, except for chilipepper rockfish, which was assessed in 2007 (Field 2008); greenstriped rockfish, which was assessed in 2009 (Hicks et al. 2009); and greenspotted rockfish in waters off California, which was assessed in 2011 (Dick et al. 2011). A data-moderate stock assessment was conducted for stripetail rockfish (Cope et al. 2014) that estimated the stock to be healthy with a depletion level of more than 78 percent of the unfished biomass in 2013. All other stocks are category 3 stocks with catch-based approaches for determining the OFL contribution of the stock. These coastwide assessments were apportioned north and south of 40º10’ N. latitude so that the appropriate OFL and ABC contributions could be made. The OFL and ABC contributions of individual stocks to the complex specifications are shown in the 2014 SAFE documents in Table 9, Table 12, and Table 13 (PFMC 2014).

The PSA analysis of the relative vulnerability of stocks to overfishing indicated that a number of the component rockfish stocks have a medium to high relative vulnerability to overfishing (Table 4-22). However, the RCAs implemented to reduce mortality on overfished species greatly protect shelf rockfish, leading to reduced concerns regarding overfishing. Given that the projected total catch mortality of the action alternatives and the No Action Alternative and the estimated attainment of Minor Shelf Rockfish North would be well below the ACL, there would be a low risk of overfishing this complex. Under the action alternatives, RCA protections would remain in place for the core areas of the northern shelf in 2015 and 2016. Trawl access to shelf rockfish would be limited. The 2005 to 2012 catches of northern Minor Shelf Rockfish were well under the specified OYs, averaging less than 10 percent of the specified OYs.

Table 4-20. The relative vulnerability of rockfish stocks managed in the Minor Shelf Rockfish complex north of 40º10' N. latitude ranked by relative level of vulnerability within the complex.

	PSA Results Vulnerability	
Stock Complex and Component Stocks	**Score**	**Level**
Minor Shelf Rockfish North	NA	NA
Bronzespotted	2.12	High
Cowcod	2.13	High
Greenblotched	2.12	High
Redstripe	2.16	High
Speckled	2.10	High
Chameleon	2.03	Med/High
Pink	2.02	Med/High
Rosethorn	2.09	Med/High
Silvergray	2.02	Med/High
Tiger	2.06	Med/High
Vermilion	2.05	Med/High
Bocaccio	1.93	Med
Flag	1.97	Med
Greenspotted	1.98	Med
Greenstriped	1.88	Med
Harlequin	1.94	Med
Honeycomb	1.97	Med
Mexican	1.80	Med
Pinkrose	1.82	Med
Rosy	1.89	Med
Squarespot	1.86	Med
Stripetail	1.80	Med
Swordspine	1.94	Med
Freckled	1.55	Low
Halfbanded	1.38	Low
Puget Sound	1.59	Low
Pygmy	1.55	Low
Starry	1.02	Low

Minor Shelf Rockfish South of 40º10’ N. Latitude

The species comprising the Minor Shelf Rockfish South complex are all unassessed species except for greenstriped rockfish, which was assessed in 2009 (Hicks et al. 2009) and greenspotted rockfish, which was assessed in 2011 (Dick et al. 2011). All stocks other than greenstriped and greenspotted rockfish are category 3 stocks with catch-based approaches for determining the OFL contribution of the stock. The OFL contributions for greenstriped and greenspotted rockfish are based on application of the proxy MSY harvest rate of $F_{50\%}$ to the projected exploitable biomass estimates in their respective assessments. Both the greenstriped and greenspotted stocks are categorized as category 2 stocks. The greenstriped stock categorization is based on relatively high assessment uncertainty due to uncertain estimates of historical discards (greenstriped rockfish are rarely landed due to their small size and lack of market value and desirability). The greenspotted stock categorization is based on the fact that annual recruitments are not estimated in the assessment since length and age composition data for greenspotted rockfish contain insufficient information to resolve year-class strength reliably. The OFL and ABC contributions of individual stocks to the complex specifications are shown in the 2014 SAFE documents in Table 9, Table 12, and Table 13 (PFMC 2014).

The PSA analysis of the relative vulnerability of stocks to overfishing indicated that a number of the component rockfish stocks have a medium to high relative vulnerability to overfishing (Table 4-23). However, the RCAs implemented to reduce mortality on overfished species greatly protect shelf rockfish, leading to reduced concerns regarding overfishing. Given that the projected total catch mortality of the action alternatives and the No Action Alternative and the estimated attainment of Minor Shelf Rockfish south would be well below the ACL, there would be a low risk of overfishing this complex under the action alternatives. Under the action alternatives, RCA protections would remain in place for the core areas of the southern shelf and would limit trawl access to shelf rockfish. The 2005 to 2012 catches of Minor Shelf Rockfish south were well under the specified OYs, ranging between 29.7 and 56.3 percent of the specified OYs.

Table 4-23. The relative vulnerability of rockfish stocks managed in the Minor Shelf Rockfish complex north of 40º10' N. latitude ranked by relative level of vulnerability within the complex.

Stock Complex and Component Stocks	PSA Results Vulnerability Score	Level
Minor Shelf Rockfish South	NA	NA
Bronzespotted	2.12	High
Greenblotched	2.12	High
Redstripe	2.16	High
Speckled	2.10	High
Chameleon	2.03	Med/High
Pink	2.02	Med/High
Rosethorn	2.09	Med/High
Silvergray	2.02	Med/High
Tiger	2.06	Med/High
Vermilion	2.05	Med/High
Flag	1.97	Med
Greenspotted	1.98	Med
Harlequin	1.94	Med
Honeycomb	1.97	Med
Swordspine	1.94	Med
Greenstriped	1.88	Med
Mexican	1.80	Med
Pinkrose	1.82	Med
Rosy	1.89	Med
Squarespot	1.86	Med
Stripetail	1.80	Med
Yellowtail	1.88	Med
Freckled	1.55	Low
Halfbanded	1.38	Low
Pygmy	1.55	Low
Starry	1.02	Low

4.1.5.4 Minor Slope Rockfish Complexes North and South of 40º10' N. Latitude

The slope rockfish complexes contains species with different relative vulnerabilities to overfishing, including two species with major concerns (rougheye and shortraker rockfish) and two species with high concerns (aurora and blackgill rockfish) for overfishing[48] (PFMC 2014). Some stocks managed within the Minor Slope Rockfish complexes under the No Action Alternative have experienced catch above their OFL contributions (e.g., rougheye).

Two alternatives for restructuring the Minor Slope Rockfish complexes were considered, primarily due to concerns about catches exceeding OFL contributions for rougheye/blackspotted and shortraker rockfish. The two alternatives are the No Action Alternative Minor Slope Rockfish complexes north and south of 40º10' N. latitude (Preferred Alternative) and an alternative structure where rougheye, blackspotted, and shortraker rockfish are removed from the complexes and managed with in a new coastwide complex (Alternative 1). Section 2.2.2 further describes the Minor Slope Rockfish alternatives. The following sections address the biological impact on species in the Minor Slope Rockfish complexes associated with those alternatives. The OFL and ABC contribution of individual stocks to the complex specifications are shown in the 2014 SAFE documents and in Table 2-2 and 2-3 of this DEIS.

Description of Restructuring Alternatives for the Minor Slope Rockfish Complexes

No Action Alternative (Preferred Alternative): The No Action Alternative would maintain the Minor Slope Rockfish complexes as they are currently structured north and south of 40°10' N. latitude.

- The Minor Slope Rockfish complex north of 40°10' N latitude is composed of the following species: aurora rockfish; bank rockfish, blackgill rockfish, blackspotted rockfish, redbanded rockfish, rougheye rockfish, sharpchin rockfish, shortraker rockfish, splitnose rockfish, and yellowmouth rockfish.
- The Minor Slope Rockfish complex south of 40°10' N latitude is composed of the following species: aurora rockfish, bank rockfish, blackgill rockfish, POP, redbanded rockfish, rougheye rockfish, sharpchin rockfish, shortraker rockfish, and yellowmouth rockfish.

Alternative 1 (RBS complex): Alternative 1 would remove rougheye/blackspotted rockfish and shortraker rockfish from the Minor Slope Rockfish complexes in both the north and south (of 40° 10' N. latitude). The area would be managed as a new coastwide RBS complex. Under this alternative, an OFL, ABC, and ACL would be established for the RBS complex. Alternative 1 would establish a shared fishery harvest guideline that would be used as the limit for non-tribal groundfish fisheries.

In addition, new management measures considered for the No Action Alternative and Alternative 1 would include restructuring the Minor Slope Rockfish complexes. These measures are addressed in Section 4.2 and Appendix B of this DEIS.

Biological Environment Specific to Restructuring the Minor Slope Rockfish Complexes

The Minor Slope Rockfish complexes north and south of 40º10' N latitude consist of both assessed and unassessed species. Of the stocks, aurora rockfish, blackgill rockfish (south of 40º10' N latitude), rougheye/blackspotted rockfish, and splitnose rockfish have had full assessments.

[48] Table 2 of the 2014 SAFE document (PFMC 2014) shows the overall scores and results of the PSA rankings from most to least vulnerable to overfishing relative to the current West Coast fishery based on the GMT's scoring.

Co-occurring groundfish target species in the slope environment are Dover sole, shortspine and longspine thornyheads, sablefish, and various other flatfish species, such as rex sole and bank rockfish. Adult overfished slope rockfish such as darkblotched and POP are also found in slope depths. Longspine thornyhead are more abundant in the deeper waters, while shortspine thornyhead are significantly more abundant. Sablefish are an important species that migrate long distances throughout the West Coast slope and shelf habitats, with some vertical migration between seasons (larger fish on the shelf in summer months). Table 4-24 shows slope rockfish species that co-occur in WCGOP trawl data (2002 to 2011). Figure 4-13 shows the distribution of slope species observed in surveys by depth and latitude, and Figures 4-14a through 4-14c show the distribution of Minor Slope Rockfish species in commercial catches by gear type (trawl, longline, and pot). Co-occurrence among species can be used to identify stock complexes that are most similar in terms of geographic distribution and vulnerability to fisheries. The degree to which species co-occur in the catch determines how easily they can be managed together. Species that occur together often are more likely to have similar responses to management measures.

Table 4-24. Slope rockfish species co-occurrence in WCGOP trawl data (2002 – 2011) at the haul level. This table represents the percentage of all hauls containing the species on a particular column that also has the species on the particular row. Darkest shading equals highest co-occurrence.

	Darkblotched Rockfish (6,933)	Splitnose Rockfish (6,534)	Aurora Rockfish (5,650)	Pacific Ocean Perch Rockfish (4,358)	Redbanded Rockfish (3,018)	Rougheye/ Blackspotted Rockfish (1,521)	Blackgill Rockfish (1,249)	Sharpchin Rockfish (855)	Shortraker Rockfish (604)	Bank Rockfish (337)	Yellowmouth Rockfish (39)
Darkblotched Rockfish	XXXX	47%	32%	62%	66%	65%	50%	64%	55%	48%	72%
Splitnose Rockfish	45%	XXXX	39%	55%	77%	58%	64%	78%	51%	82%	77%
Aurora Rockfish	26%	34%	XXXX	30%	37%	44%	61%	21%	50%	29%	36%
Pacific Ocean Perch Rockfish	39%	37%	23%	XXXX	53%	55%	25%	63%	52%	8%	67%
Redbanded Rockfish	29%	36%	20%	37%	XXXX	45%	28%	55%	38%	28%	49%
Rougheye/Blackspotted Rockfish	14%	14%	12%	19%	23%	XXXX	15%	21%	45%	5%	44%
Blackgill Rockfish	9%	12%	14%	7%	12%	12%	XXXX	8%	14%	26%	21%
Sharpchin Rockfish	8%	10%	3%	12%	16%	12%	5%	XXXX	8%	8%	41%
Shortraker Rockfish	5%	5%	5%	7%	8%	18%	7%	6%	XXXX	2%	10%
Bank Rockfish	2%	4%	2%	1%	3%	1%	7%	3%	1%	XXXX	15%
Yellowmouth Rockfish	0%	1%	0%	1%	1%	1%	1%	2%	1%	2%	XXXX

Source: Agenda Item F.8.b., GMT Report, June 2013.

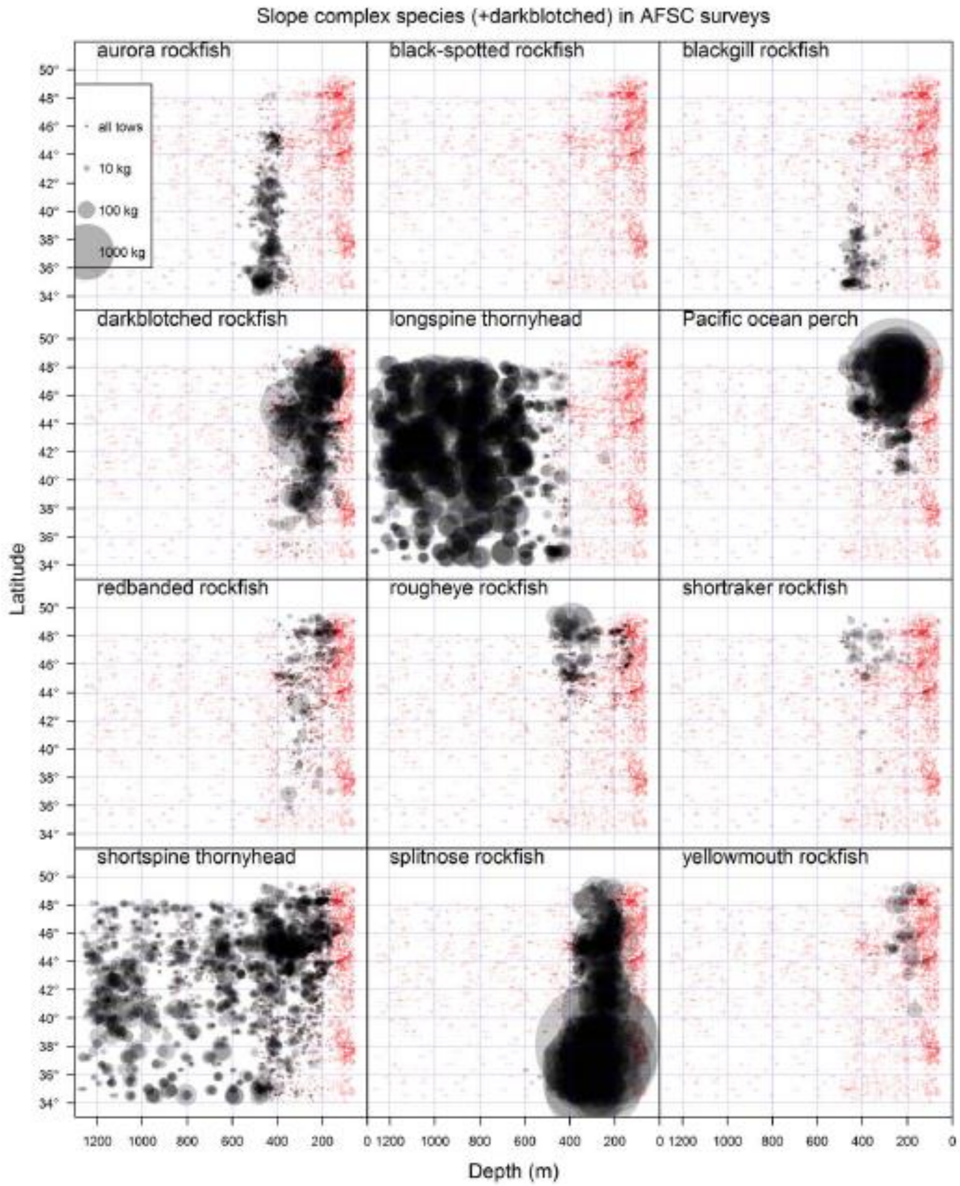


Figure 4-13. Distribution of West Coast slope rockfish species as determined by CPUE (catch/tow) in the Alaska Fisheries Science Center (AFSC) survey.

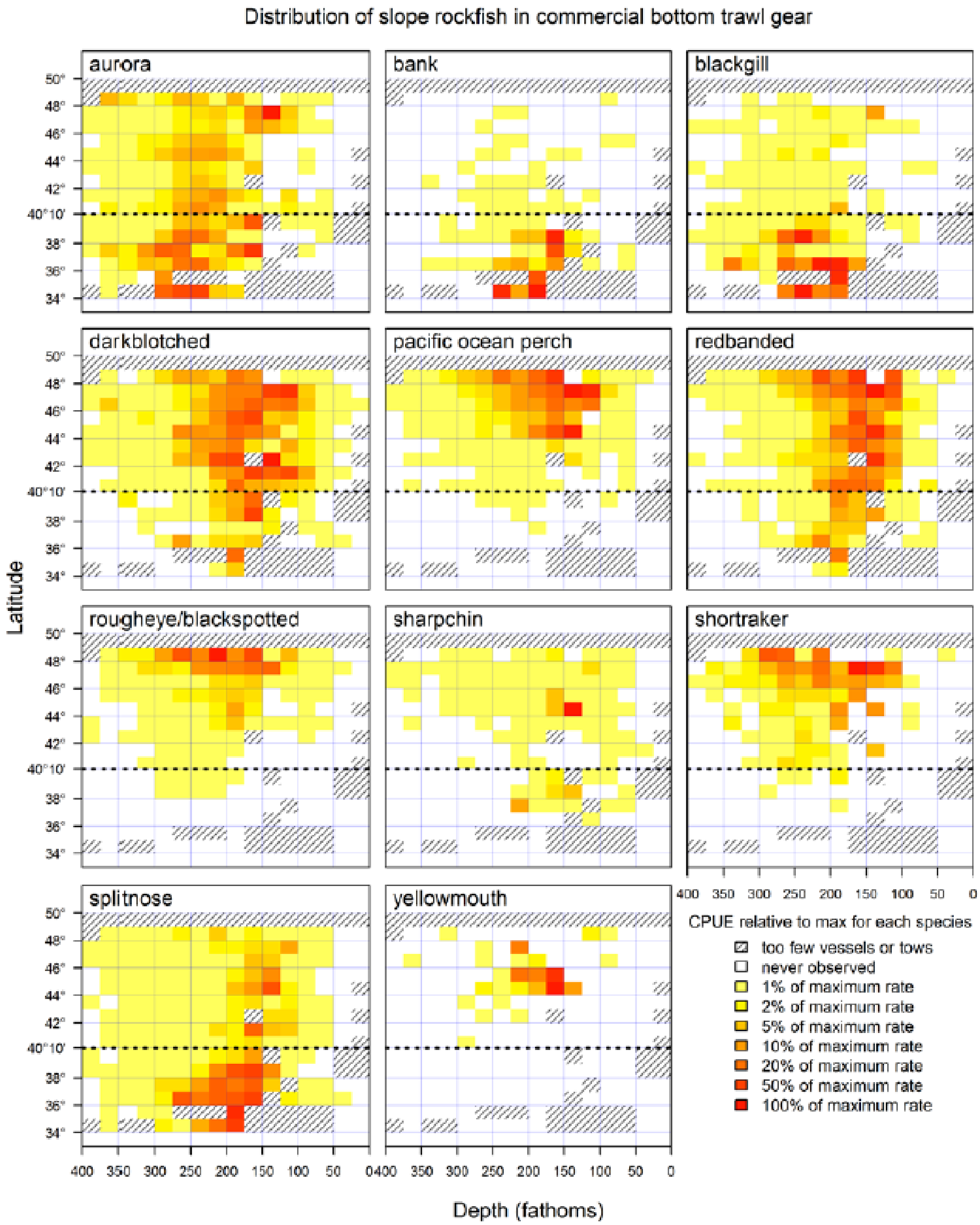


Figure 4-14a. Spatial distribution of slope rockfish in WCGOP trawl data (2002 to 2011).

Colors represent CPUE relative to the maximum within each species (see the legend below). Darkest red equals the highest CPUE; lightest yellow equals the lowest CPUE. Data for hatched boxes could not be displayed because of confidentiality (only one or two vessels carrying observers fished in the area) or because no vessels carrying observers fished in the area. White areas are places where three or more vessels fished and carried observers, but the species in question was not caught. Source: Agenda Item F.8.b., GMT Report, June 2013.

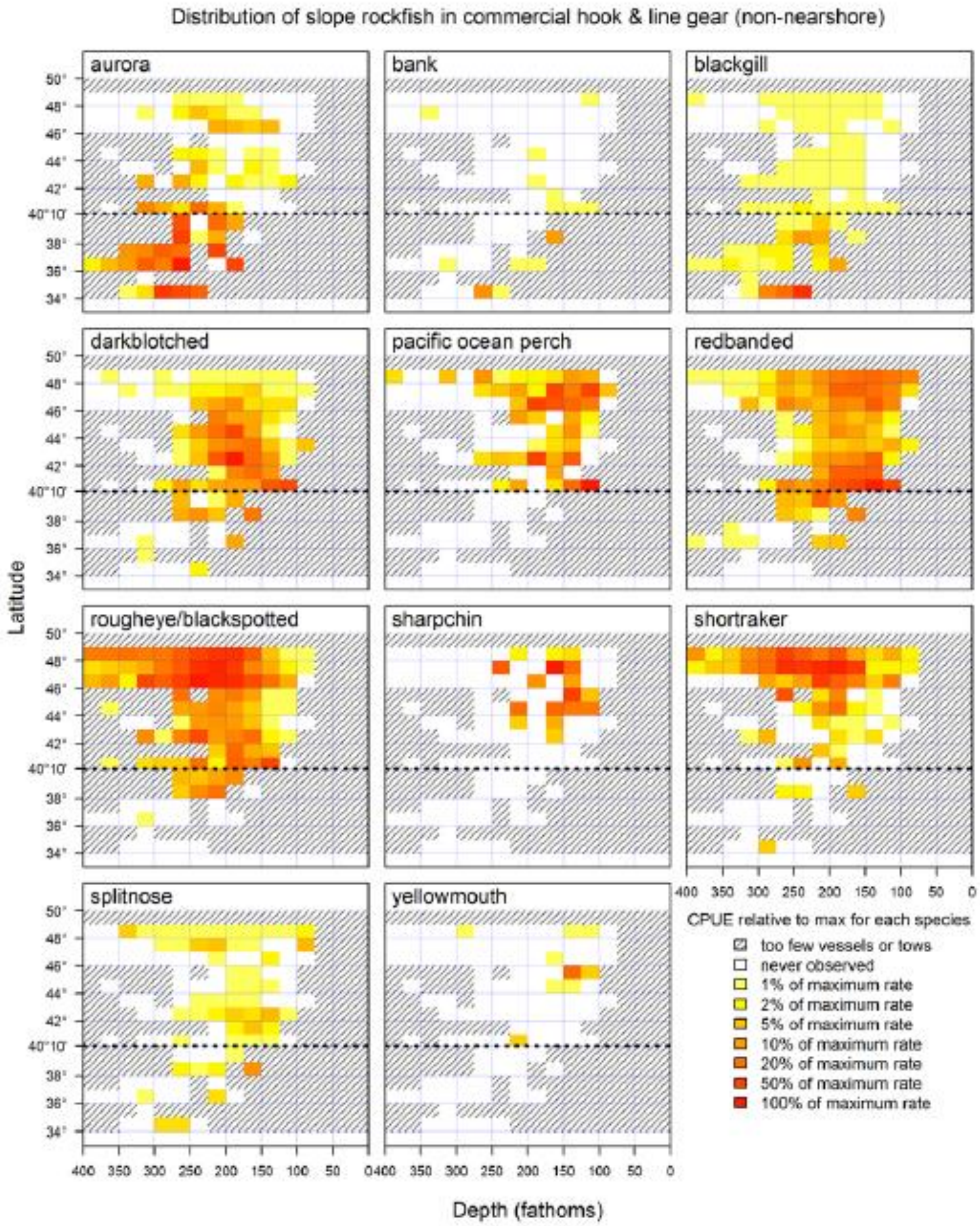


Figure 4-14b. Observed relative CPUE of slope rockfish species by depth and latitude in West Coast commercial non-nearshore, hook-and-line fisheries.

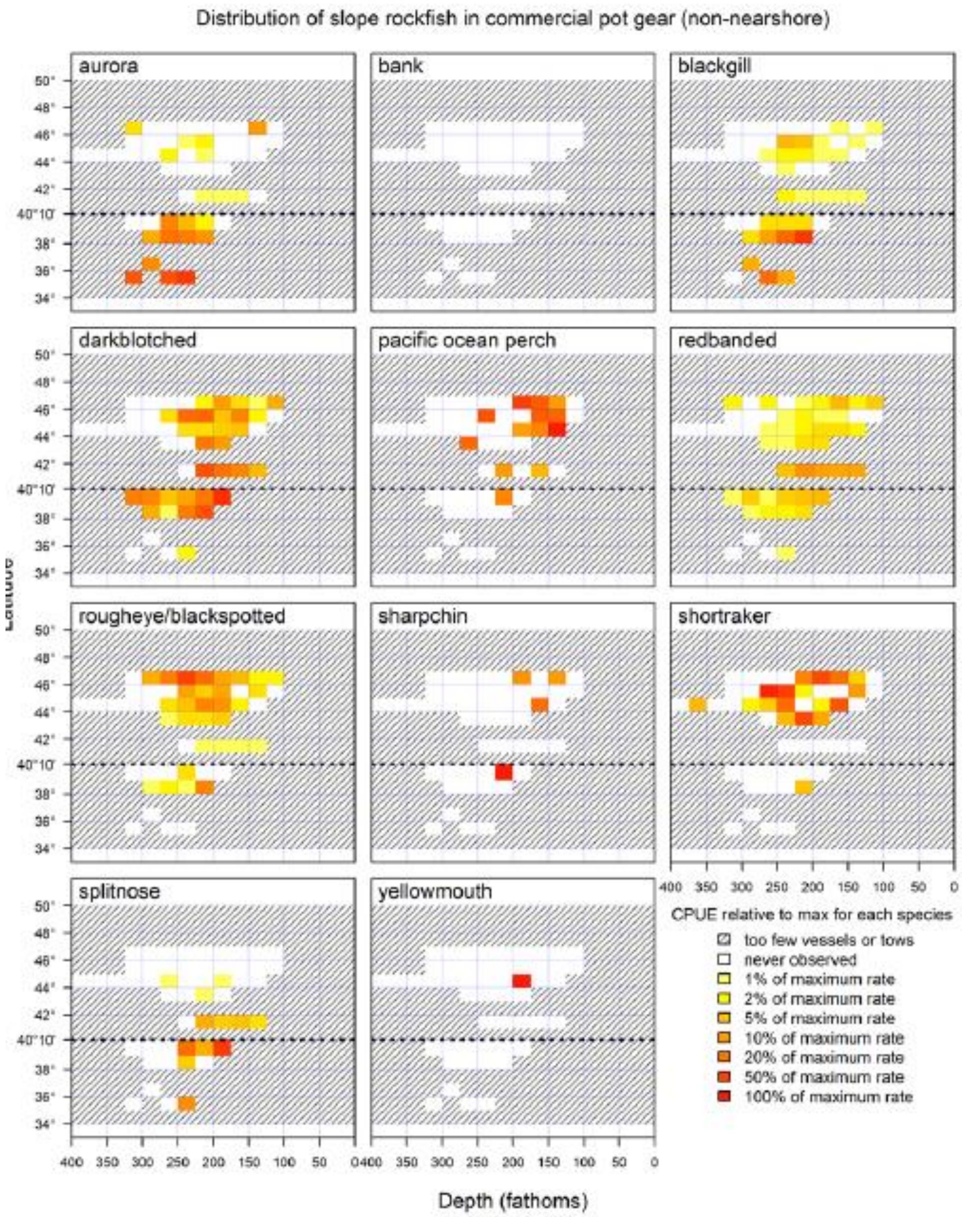


Figure 4-14c. Observed relative CPUE of slope rockfish species by depth and latitude in West Coast commercial non-nearshore pot gear fisheries.

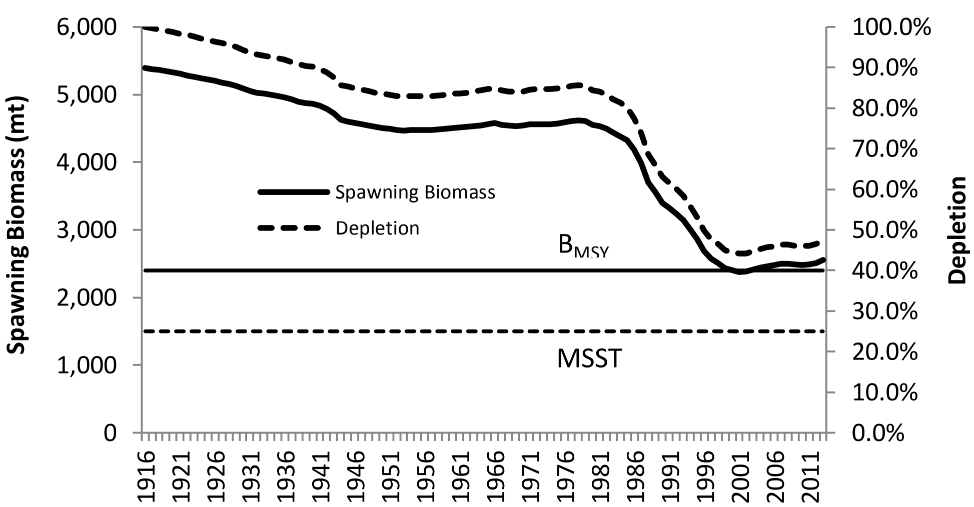
Rougheye/Blackspotted Rockfish

Rougheye/blackspotted rockfish are currently managed in the Minor Slope Rockfish complexes north and south of 40º10' N. latitude.[49] 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

[49] The 2013 stock assessment for rougheye and blackspotted rockfish jointly considers the stocks in the assessment.

distinguish between the two species in the field. The two species have persistently been confused in surveys and catches. It has only been from recent genetic studies in the early 2000s that the two species have been identified and described (Orr and Hawkins 2008). Consequently, the vast majority of data that are available include pooled contributions from both rougheye rockfish and blackspotted rockfish. The highest depth distribution density of rougheye and blackspotted rockfish is between 27 to 250 fm (49 to 457 m), with a coastwide latitudinal distribution density strongest north of 40° 10' N. latitude. Rougheye rockfish are sometimes found in small schools and ascend to as much as 10 meters off bottom, but are commonly observed near bottom on steep-sloped boulder fields surrounded by soft substrata (Love et al. 2002).

Hicks et al. (2013) conducted the first assessment of the U.S. West Coast stock of rougheye/ blackspotted rockfish as a complex of two species. Due to the difficulty in distinguishing these two species and the lack of historical separation of the species in all of the data, this assessment combines any data for blackspotted rockfish with rougheye rockfish and provides management advice for the two species combined. 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 4-15).



Source: Hicks et al. 2013.

Figure 4-15. Time series of estimated spawning biomass and depletion of rougheye/blackspotted rockfish, 1916 to 2013.

Shortraker Rockfish

Shortraker rockfish (*Sebastes borealis*) is one of the largest rockfish species, with a broad distribution throughout the North Pacific, ranging 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 less common on the U.S. West Coast. Shortraker are found north of 39°30; N. latitude, with the highest density north of 44° N. latitude and in depths between 110 and 220 fm.

Fishermen have reported schooling behavior above rugged, steep-slope habitat with most of the fish being relatively small (less than 5 kg) (Groundfish FMP Appendix B2). A study in the Gulf of Alaska observed large shortraker rockfish (more than 7 kg) to be solitary individuals on or near the bottom and among moderately sloped, smooth habitat (Krieger 1992). Shortraker rockfish can be found on soft bottom (Eschmeyer et al. 1983).

Shortraker are caught in both trawl and fixed gear fisheries on the slope, 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. 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.

Shortraker is an unassessed category 3 groundfish stock with OFL contribution values estimated by depletion-based stock reduction analysis (DB-SRA). 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 Pacific Coast groundfish fisheries will have little effect on overall stock status.

Restructuring the Minor Slope Rockfish Complexes

The vulnerability of a stock to becoming overfished is defined in the National Standard 1 guidelines as a function of its productivity and its susceptibility to the fishery. The guidelines note that the "vulnerability" of fish stocks should be considered when (1) deciding if a stock considered to be “in the fishery” or if it is an ecosystem component stock; (2) considering whether stock complexes should be established or reorganized, and (3) deciding performance standards for the effectiveness of accountability measures. Species within the Minor Slope Rockfish complexes, both north and south, have widely different contributions to the complex OFL, as well as having different vulnerabilities. The following analysis considers the risks of overfishing at the complex level and the risk of the component stocks becoming overfished or experiencing catch in excess of their OFL contributions under both the No Action Alternative and Alternative 1.

Splitnose rockfish is a slope species currently managed in the Minor Slope Rockfish complex north of 40º10’ north latitude, but as an individual species south of 40º10’ north latitude. Splitnose rockfish has been managed separately north and south of 40º10’ north latitude because the previous stock assessment was only for the southern portion of the stock. The PSA analysis considered splitnose rockfish to have a medium concern for overfishing. Following a 2009 assessment for splitnose rockfish, the Council considered removing the stock from the Minor Slope Rockfish complex north. The stock’s large contribution to the complex with little fishing pressure (i.e., inflator stock) raised concerns about the catch of stocks with small contributions. Inflator stocks in a complex raise concerns that greater fishing pressure could occur on desirable stocks with small contributions such that the stocks’ contributions to the OFL are often exceeded. Ultimately, the Council recommended leaving splitnose in the Minor Slope Rockfish complex north because removing a stock from a complex creates substantial complications for the management system. New sorting and reporting programs would be required for industry and the states. The Amendment 21 allocation structure could also be affected. In 2015 and 2016, splitnose rockfish is projected to contribute 55 to 60 percent of the weight of the Minor Slope Rockfish in the complex; however, historical catch has been approximately 9 percent of the OFL contribution.

A blackgill rockfish assessment was prepared in 2011 for the stock south of 40°10’ N. latitude. Blackgill rockfish depletion was estimated to be 30 percent of its unfished biomass at the start of 2011, which placed the stock in the precautionary zone. The stock is managed within the Minor Slope Rockfish South complex. However, since the start of 2013, an HG equal to the 40-10 adjusted ACL has been used to manage blackgill and prevent exceeding the stock’s contribution to the complex OFLs north and south. The blackgill OFL contribution to the 2013 and 2014 complex OFLs was projected from the 2011 assessment using the proxy $F_{50\%}$ F_{MSY} harvest rate. The SSC categorized blackgill rockfish as a category 2 stock because recruitments were not estimated in the new assessment. The PSA analysis considered blackgill rockfish to have a high concern for overfishing. Bank rockfish, an inflator stock in the south, was assessed in 2000, but the results are not used in current management. The PSA analysis considered bank rockfish to have a medium concern for overfishing.

Although the PSA analysis identified aurora rockfish as a species with a high concern for overfishing, a new 2013 stock assessment modified the concern. The 2013 stock assessment for aurora rockfish was estimated at 64 percent of its unfished equilibrium at the start of 2013. As a result of the assessment, the OFL contribution of aurora rockfish to both the northern and southern Minor Slope Rockfish complexes is proposed to increase substantially in 2015 and 2016, reducing the risk of exceeding the stock’s OFL contribution. The 2014 OFL contribution for aurora rockfish in the north was 15.4 mt, and it would be proposed to increase 2 mt to 17.4 mt and 17.5 mt under the integrated Preferred Alternative. The 2014 OFL contribution for aurora rockfish in the south was 26.1 mt, and it would be proposed to increase by 48.2 mt to 74.3 mt in 2015 and 2016 under the integrated Preferred Alternative. Based on the increases, recent coastwide catches are projected to remain below the OFLs.

While there is concern for component stocks that contribute an inordinately larger catch contribution to the complex (i.e., inflator stocks), this concern is accentuated when there is high interannual variation in catch. The presence of inflator stocks in a complex can risk overfishing of other stocks in the complex, since it inflates the complex OFL. Two important concepts in the structure of stock complexes are the scale of removals and the ratio of stock removal to overall stock complex removals.

Figure 4-16 (north) and Figure 4-17 (south) display the historical catch of component stocks in the Minor Slope Rockfish complex north from 2002 to 2012 relative to the stocks’ OFL contributions for 2014 and 2015-2016. Catch above the 2014 OFL line indicates historical mortality that would be in excess of a stock’s contribution to the 2014 complex OFL.

In the north, species such as sharpshin, splitnose, yellowmouth mouth rockfish made up 89 percent of the 2014 OFL contribution, while the average annual catch from 2002 to 2012 made up 29 percent of the landed catch for the complex, or only 8 percent of the complex OFL. In contrast, aurora, rougheye/ blackspotted, and shortraker rockfish together contribute only 7 percent to the complex OFL, but they make up 59 percent of the landed catch for the complex, or 15 percent of the complex OFL. In the south, species such as bank and sharpshin rockfish made up 85 percent of the 2014 OFL contribution, while the average annual catch from 2002 to 2012 made up 31 percent of the landed catch for the complex, or only 11 percent of the complex OFL. This is in contrast to aurora and blackgill rockfish that together contribute only 23 percent to the 2014 complex OFL, but make up 63 percent of the landed catch for the complex, or 23 percent of the complex OFL. In most years between 2002 and 2012, aurora, rougheye/ blackspotted, and shortraker rockfish catch in the north would have exceeded the stocks’ 2014 contribution to the OFL. Similarly, in the south, aurora and blackgill rockfish catch would have exceeded the stocks’ 2014contribution to the OFL between 2002 and 2012.

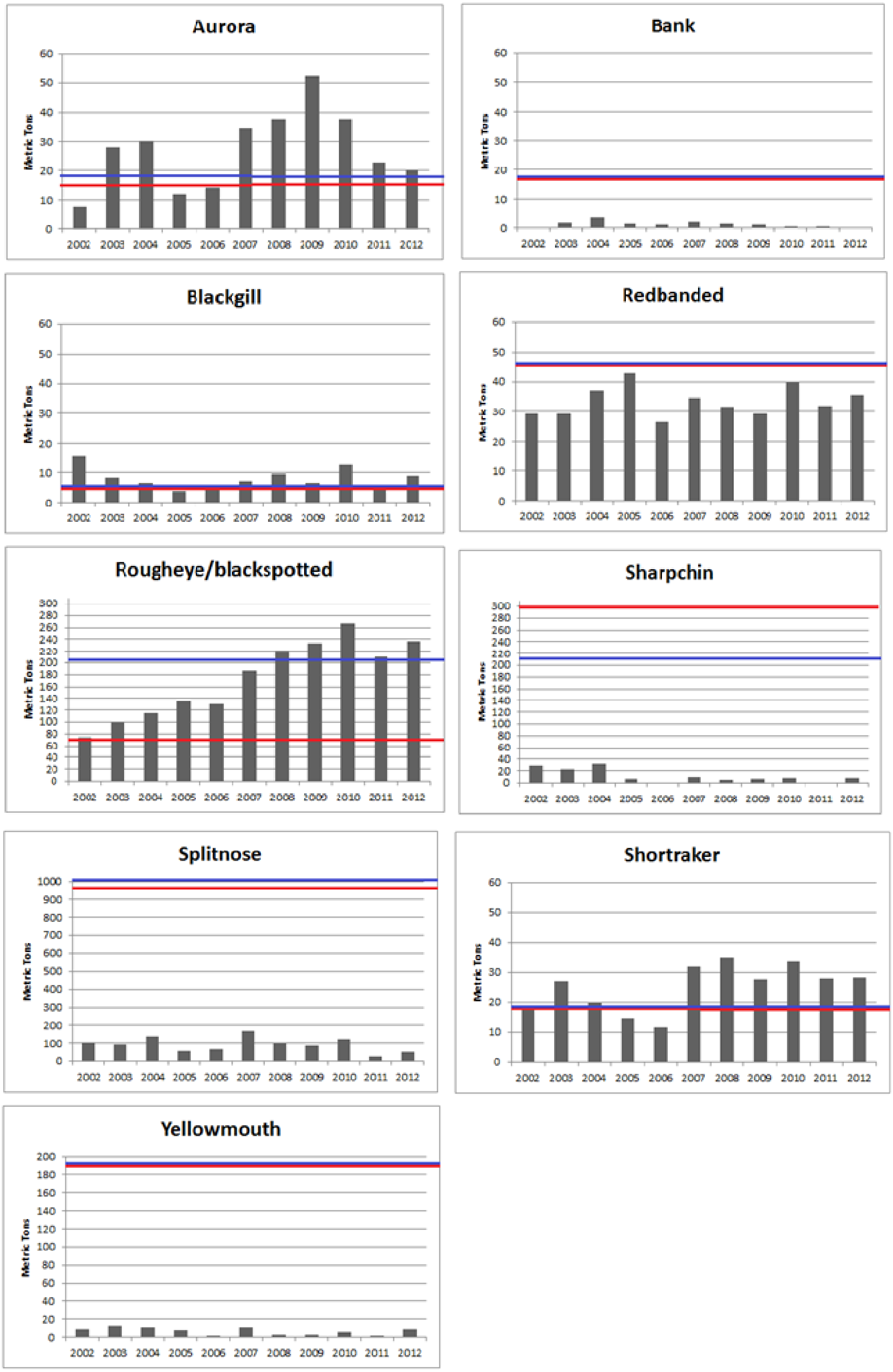


Figure 4-16. Minor Slope Rockfish complex north, component species total catch in relation to 2014 component species OFL contribution (red line) and the 2015-2016 component species OFL contribution under the Preferred Alternative (blue line).

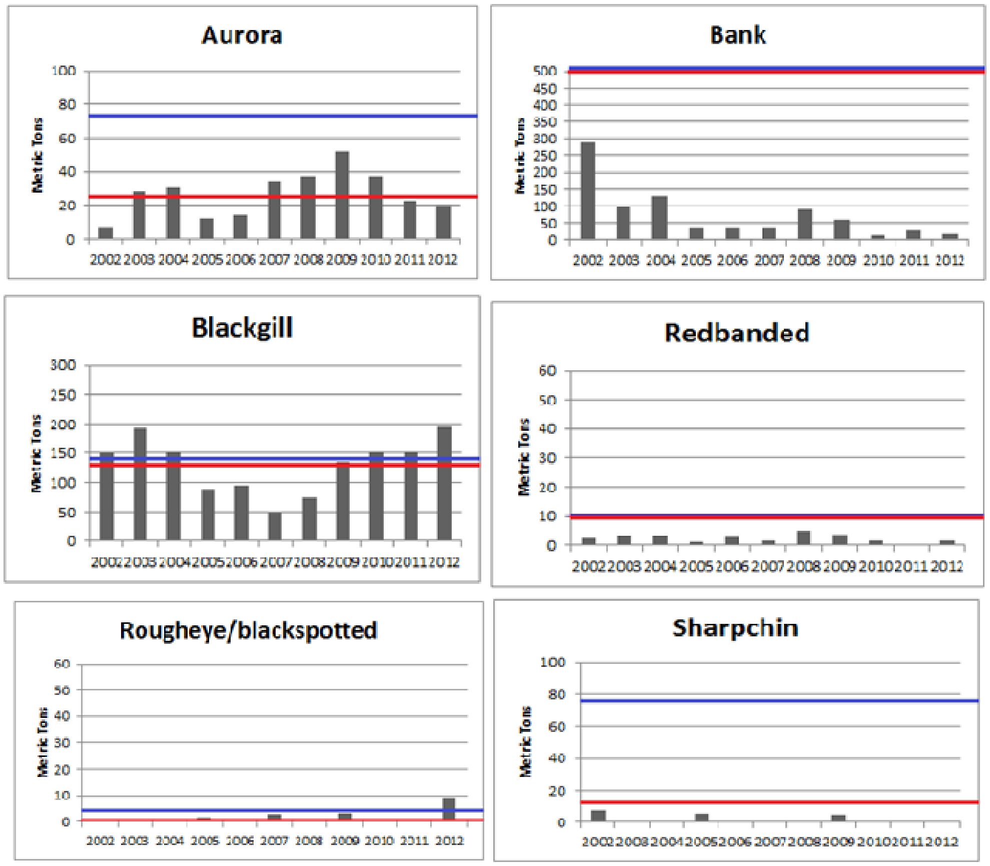


Figure 4-17. Minor Slope Rockfish complex south, component species total catch in relation to 2014 component species OFL contribution (red line) and the 2015-2016 component species OFL contribution under the Preferred Alternative (blue line). POP, shortraker, and yellowmouth rockfish are excluded because of small OFL contributions and minor catch levels.

Occasionally exceeding a component stock's OFL contribution, especially by a small magnitude, is less of a conservation concern than frequently exceeding the OFL contribution by large amounts, particularly for the long-lived slope rockfish stocks. Similarly, exceeding a stock's contribution to either the north or south Minor Slope Rockfish complex is less of a conservation concern if the stock has a coastwide distribution, and the sum of the catches for both the north and the south do not exceed the sum of the stock's OFL contributions for both complexes.

Alternative 1 would create a new complex by removing rougheye/blackspotted and shortraker rockfish from both the north and south Minor Slope Rockfish Complexes, creating a new RBS complex. Alternative 1 would remove the most vulnerable stocks from the complex and would be intended to result in three complexes (Minor Slope Rockfish north, Minor Slope Rockfish south, and RBS) with stocks of more similar vulnerabilities. Creating a new RBS complex and establishing the associated harvest specifications would allow management to occur at the RBS complex level and should reduce the risk of exceeding component OFLs of the RBS stocks over the No Action Alternative. Managing an RBS complex may also allow for more direct management measures on the most vulnerable stocks. The Council could implement new trawl/non-trawl harvest guidelines (2-year or long-term) at the RBS complex level or consider managing catch to the RBS complex ACL without establishing sector harvest guidelines. Potential management responses include in-season changes to trip limits and closed areas or post-season changes to management measures. Appendix B provides further consideration of potential

AMs. Alternative 1 would group species that are also found in similar market categories (shortraker-rougheye/blackspotted rockfish is considered a market category). Aligning species complexes with market categories may be beneficial in addressing data quality issues.

Total estimated annual catches of Minor Slope Rockfish north and south by groundfish sector for 2002 to 2012 are provided in Tables 4-25 and 4-26. Catches by sector in the non-tribal, at-sea hake fishery (CPs 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 are the sum of rougheye/blackspotted rockfish catches, plus the proportion of rougheye/blackspotted rockfish catches reported in the shortraker-rougheye/blackspotted market category.

Stocks may be grouped into complexes for various reasons, including when it is not feasible for fishermen to distinguish individual stocks among their catch. Rougheye and blackspotted rockfish where jointly assessed because it is very difficult to visually distinguish the two species. Historical data lump these species into one category, rougheye rockfish. Furthermore, rougheye rockfish and blackspotted rockfish are closely related to shortraker rockfish and sometimes difficult to distinguish from shortraker without looking at the gill rakers. In some years, historical landing and observer data have substantial catch reported only to the rougheye/shortraker grouping. Due to the difficulty in distinguishing these three species and the lack of historical separation of the species data, the RBS complex was constructed (Alternative 1) as a reasonable alternative for addressing the concern of overfishing the component stocks most at risk.

The 2015 and 2016 OFLs and ABCs for the alternative coastwide RBS complex (Alternative 1) would be the summed contribution of the OFLs and ABCs of the three component stocks. The 2015 OFL and ABC for the alternative RBS complex would be 225 mt and 204 mt, respectively (Table 4-27). Table 4-27 displays the new complex OFLs in 2015-2016 under Alternative 1 in relationship to recent catches (2011 and 2012). Although, catch estimates from 2002 to 2012 best show the variability in catch over time, management of the groundfish fishery changed substantially with implementation of the trawl rationalization program. Therefore, catch estimates from 2011-2012 best represent likely future catch under the current management structure. Because catches have generally exceeded the OFL contributions for species in the RBS complex, establishing an RBS complex under Alternative 1 would potentially require additional, more-restrictive management of the fishery than the No Action Alternative would to prevent exceeding the OFL of the new complex.

While rougheye/blackspotted and shortraker rockfish have been the focus of the Minor Slope Rockfish restructuring, the biological impacts of stock complex management on the other component stocks in the complex should also be considered. In the Minor Slope Rockfish complex, there are other species that could be at risk of catch exceeding the OFL contribution. Stocks identified as having a high risk of overfishing include aurora and blackgill rockfish in the Minor Slope Rockfish complexes, both north and south. Restructuring of the complexes under Alternative 1 would not reduce the risk of overfishing these stocks, nor would it appear to increase the risk. Assuming similar catch levels to historical levels shown in Tables 4-25 and 4-26, then the 2015-2016 contribution OFLs for aurora and blackgill rockfish north of 40º10’ N. latitude and blackgill south of 40º10’ N. latitude would be at risk of being exceeded under both alternatives. However, the HGs that have been established for blackgill rockfish since 2013 have allowed for trip limits to be established in the nontrawl fisheries and have effectively reduced the risk of overfishing. Aurora rockfish is a coastwide stock. When looking at the combined catches for both complexes relative to the combined OFL contributions, only 41 percent of the OFL contribution for the stock would be taken with the stock remaining within the Minor Slope Rockfish complexes under Alternative 1. Based on considering coastwide catch compared to the coastwide OFL contributions, aurora rockfish would not appear to be at risk of having catch exceed OFL contributions in 2015-2016.

Table 4-25. Estimated total catch of stocks managed in the Slope Rockfish complex north of 40º10’ N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Slope rockfish (North of 40°10' N. lat.)	**311.7**	**357.3**	**405.8**	**305.1**	**301.6**	**501.3**	**488.8**	**510.8**	**568.5**	**334.1**	**448.0**	**4,533.0**
Aurora Rockfish	**7.6**	**27.9**	**30.1**	**12.1**	**14.0**	**34.4**	**37.5**	**52.1**	**37.5**	**22.9**	**19.8**	**296.1**
Incidental		0.0	0.3	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.3
Nearshore Fixed Gear	0.0	0.0		0.0				0.0	0.0			0.0
Non-nearshore Fixed Gear	0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.3	0.1	0.1	0.2	1.4
Non-Tribal At-sea Hake	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.1	0.0	0.2
Pink Shrimp			0.0			2.4	0.3	0.3	0.1	0.1	0.1	3.4
Shoreside Hake	0.0	0.0	0.2	0.0	0.0	0.3	0.0	0.0	13.1	0.3	0.5	14.4
Tribal Shoreside	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.7
Limited Entry Trawl Permit – Trawl Gear	7.5	27.2	29.5	11.8	14.0	31.5	37.1	51.5	24.2	22.3	18.9	275.5
Limited Entry Trawl Permit – Fixed Gear										0.0	0.1	0.1
Bank Rockfish	**0.2**	**1.6**	**3.6**	**1.4**	**1.1**	**2.0**	**1.3**	**1.0**	**0.5**	**0.6**	**0.3**	**13.6**
Incidental			0.0			0.0		0.0		0.0		0.0
Nearshore Fixed Gear						0.0	0.0	0.0	0.0			0.0
Non-nearshore Fixed Gear	0.0		0.0	0.0	0.1	0.6	0.1	0.0	0.0	0.2	0.0	1.2
Non-Tribal At-sea Hake	0.1		0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.7
Pink Shrimp										0.0		0.0
Shoreside Hake			0.0		0.1	0.0	0.0		0.0	0.0		0.2
Tribal Shoreside										0.0		0.0
Limited Entry Trawl Permit – Trawl Gear	0.1	1.6	3.4	1.3	0.9	1.2	1.1	1.0	0.4	0.2	0.3	11.5
Limited Entry Trawl Permit – Fixed Gear										0.0	0.0	0.0
Blackgill Rockfish	**16.0**	**8.2**	**6.4**	**3.8**	**5.1**	**7.0**	**9.7**	**6.4**	**12.6**	**4.8**	**8.9**	**89.0**
Incidental	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Nearshore Fixed Gear	1.4	0.1		0.0				0.0	0.0	0.0		1.6
Non-nearshore Fixed Gear	8.1	2.2	1.0	1.6	1.2	1.6	3.0	1.4	6.1	1.4	3.4	30.9
Non-Tribal At-sea Hake	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.2
Pink Shrimp				0.0				0.0		0.0	0.0	0.0
Shoreside Hake	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1		0.2	0.4
Tribal Shoreside	0.3	0.3	0.3	0.2	0.1	0.0	0.2	0.2	0.0	0.0	0.0	1.4
Limited Entry Trawl Permit – Trawl Gear	6.1	5.4	4.9	2.0	3.8	5.3	6.6	4.8	6.4	3.1	4.7	53.0
Limited Entry Trawl Permit – Fixed Gear										0.3	0.5	0.9

Table 4-25 (continued). Estimated total catch of stocks managed in the Slope Rockfish complex north of 40º10’ N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Blackspotted Rockfish							**0.2**	**0.8**	**1.2**	**1.1**	**0.4**	**3.8**
Incidental							0.0	0.0	0.0	0.0	0.0	0.0
Non-nearshore Fixed Gear							0.1	0.5	0.8	0.3	0.2	1.9
Shoreside Hake										0.1		0.1
Tribal Shoreside							0.0	0.1	0.1	0.0	0.0	0.3
Limited Entry Trawl Permit – Trawl Gear							0.1	0.2	0.3	0.6	0.2	1.4
Limited Entry Trawl Permit – Fixed Gear										0.0	0.0	0.0
Redbanded Rockfish	**29.1**	**29.3**	**37.0**	**42.7**	**26.6**	**34.7**	**31.6**	**29.1**	**39.7**	**31.9**	**35.6**	**367.2**
Incidental	0.8	2.2	2.4	2.6	0.2	0.9	0.3	0.3	0.1	0.1	0.2	10.1
Nearshore Fixed Gear	0.1	0.2		0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Non-nearshore Fixed Gear	10.8	11.9	14.5	29.4	14.8	17.0	17.3	13.8	23.5	18.7	21.9	193.5
Non-Tribal At-sea Hake	0.0	0.0		0.0			0.0		0.0	0.0	0.0	0.1
Pink Shrimp			0.2	0.1		0.1	0.0	0.0	0.1	0.1	0.0	0.5
Shoreside Hake	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8	1.1
Tribal Shoreside	5.6	5.5	6.0	5.6	6.0	6.7	3.9	5.1	4.1	8.2	6.1	62.7
Limited Entry Trawl Permit – Trawl Gear	11.7	9.5	14.1	4.5	5.6	9.8	10.0	9.9	11.8	4.1	5.9	96.9
Limited Entry Trawl Permit – Fixed Gear										0.7	0.8	1.4
Rougheye/blackspotted Rockfish	**74.4**	**98.9**	**115.3**	**135.7**	**130.1**	**186.4**	**221.7**	**233.5**	**265.1**	**209.2**	**236.4**	**1,906.8**
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
Nearshore Fixed Gear	0.0	0.2		0.6	0.0	0.0		0.0	0.0	0.0	0.0	0.9
Non-nearshore Fixed Gear	20.7	12.5	23.9	32.1	41.7	42.8	43.1	67.2	75.9	40.5	52.5	452.9
Non-Tribal At-sea Hake	0.7	2.2	13.7	35.9	6.6	29.0	72.7	8.6	21.6	78.5	54.0	323.7
Pink Shrimp			1.7	0.2		0.1	0.0	0.0	0.0	0.0	0.0	2.0
Shoreside Hake	0.0	0.0	0.8	0.2	0.0	1.9	0.6	1.6	5.1	4.1	47.1	61.5
Tribal At-sea Hake						0.1	2.9	0.6	0.0	2.4		6.0
Tribal Shoreside	6.9	11.6	14.3	19.8	20.9	21.8	15.7	33.5	18.3	16.1	15.2	193.9
Limited Entry Trawl Permit – Trawl Gear	43.6	67.4	58.4	45.3	60.4	88.7	85.7	119.8	143.7	52.5	47.4	812.9
Limited Entry Trawl Permit – Fixed Gear										14.9	19.5	34.3
Sharpchin Rockfish	**28.6**	**22.1**	**31.5**	**6.5**	**1.5**	**10.3**	**4.9**	**7.6**	**8.6**	**1.2**	**9.5**	**132.4**
Incidental	0.6	0.0	0.5	0.1	0.0		0.0	0.0	0.0			1.2
Non-nearshore Fixed Gear	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.1		0.0	0.2
Non-Tribal At-sea Hake	0.1	2.5	0.3	0.0	0.0	0.8	0.0		0.0	0.0	0.0	3.9

Table 4-25 (continued). Estimated total catch of stocks managed in the Slope Rockfish complex north of 40º10’ N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Pink Shrimp			0.5	0.1		1.3	0.1	0.0	0.0	0.0	0.0	2.0
Shoreside Hake	0.1		0.0				0.0	0.0	0.0	0.0	0.7	0.8
Tribal At-sea Hake	0.0		0.0						0.0			0.0
Tribal Shoreside	0.3	0.8	0.4	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.2	2.2
Limited Entry Trawl Permit – Trawl Gear	27.5	18.8	29.8	6.1	1.4	8.2	4.7	7.5	8.5	1.2	8.5	122.1
Limited Entry Trawl Permit – Fixed Gear											0.0	0.0
Shortraker Rockfish	**18.9**	**27.1**	**19.7**	**14.8**	**11.7**	**31.8**	**34.8**	**27.8**	**33.6**	**28.0**	**28.3**	**276.5**
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
Nearshore Fixed Gear				0.1							0.0	0.1
Non-nearshore Fixed Gear	1.8	0.9	3.2	3.8	1.9	1.7	4.6	2.7	4.2	3.0	6.5	34.3
Non-Tribal At-sea Hake	0.1	0.1	0.5	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.7	3.3
Pink Shrimp				0.2		0.0	0.1					0.3
Shoreside Hake		0.0	0.6			1.2	0.2	0.1	1.4	2.4	5.6	11.6
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
Limited Entry Trawl Permit – Trawl Gear	15.4	24.1	14.3	9.4	8.0	27.4	28.0	23.7	26.6	20.7	12.7	210.2
Limited Entry Trawl Permit – Fixed Gear										0.4	1.3	1.7
Shortraker/Rougheye/Blackspotted Rockfish	**0.3**	**9.6**	**0.4**	**6.4**	**1.1**	**5.7**	**34.3**	**1.4**	**10.8**	**0.3**	**38.5**	**108.7**
Non-nearshore Fixed Gear	0.2	0.5	0.4	3.1	0.3	1.3	33.0	0.6	10.8	0.2	36.4	86.6
Non-Tribal At-sea Hake				3.1		0.0	0.1			0.0	0.0	3.3
Limited Entry Trawl Permit – Trawl Gear	0.1	9.1	0.0	0.2	0.8	4.4	1.2	0.7		0.0		16.4
Limited Entry Trawl Permit – Fixed Gear										0.2	2.2	2.3
Slope Rockfish Unid	**25.1**	**25.4**	**13.5**	**13.9**	**38.7**	**9.9**	**10.7**	**58.5**	**30.3**	**6.5**	**10.4**	**242.8**
Incidental	0.3	0.0	0.0	0.2	0.6	0.1	0.0	0.1	0.0	0.1	0.7	2.2
Nearshore Fixed Gear		0.0	0.1	0.0	0.0	0.1	0.0	0.0			0.0	0.3
Non-nearshore Fixed Gear	5.1	5.6	5.5	6.5	4.7	3.2	3.6	6.0	3.7	1.5	6.6	52.0
Non-Tribal At-sea Hake				0.0		0.0	0.0	0.0			0.0	0.0
Pink Shrimp	0.2			0.0						0.0	0.1	0.3
Shoreside Hake	0.4	0.5	2.0	3.2	0.4	0.3	0.2	2.2	7.8	0.1	0.1	17.1
Tribal Shoreside	0.7	0.3	0.6	1.7	0.1	0.7	0.1	0.0	0.7	1.1	0.4	6.5
Limited Entry Trawl Permit – Trawl Gear	18.4	18.9	5.2	2.3	32.9	5.5	6.8	50.1	18.1	2.7	1.4	162.2
Limited Entry Trawl Permit – Fixed Gear										1.0	1.2	2.1

Table 4-25 (continued). Estimated total catch of stocks managed in the Slope Rockfish complex north of 40º10’ N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Splitnose Rockfish	**103.3**	**94.2**	**137.3**	**60.4**	**70.0**	**169.0**	**99.4**	**89.7**	**123.3**	**26.2**	**50.9**	**1,023.6**
Incidental	0.9	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
Nearshore Fixed Gear	0.0	0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0		0.1
Non-nearshore Fixed Gear	0.0	0.0	0.0	0.0	0.1	0.4	0.4	1.3	0.2	0.2	0.2	2.9
Non-Tribal At-sea Hake	11.5	12.0	7.3	15.1	1.1	2.2	0.9	0.1	43.5	11.9	20.5	126.0
Pink Shrimp			51.2	5.6		14.1	13.8	1.7	0.2	2.0	1.1	89.6
Shoreside Hake	0.0	0.0	0.6	0.6	2.4	14.6	0.0	0.8	19.8	3.7	16.4	58.9
Tribal At-sea Hake						0.0	0.0	0.0		0.2		0.2
Tribal Shoreside	0.0	0.0	0.0	0.0	0.0	0.7	1.1	0.1	0.0	0.1	0.0	2.2
Limited Entry Trawl Permit – Trawl Gear	90.9	81.1	77.9	39.0	66.4	137.1	83.1	85.7	59.6	8.1	12.7	741.5
Limited Entry Trawl Permit – Fixed Gear										0.0	0.0	0.0
Spotted Rockfish Unid					**0.1**	**0.0**						**0.1**
Non-nearshore Fixed Gear					0.1	0.0						0.1
Yellowmouth Rockfish	**8.3**	**13.1**	**10.9**	**7.3**	**1.6**	**10.3**	**2.7**	**2.9**	**5.2**	**1.3**	**8.9**	**72.4**
Incidental	0.0	0.0	0.3		0.0	0.0	0.0	0.0	0.1		0.0	0.4
Non-nearshore Fixed Gear	0.0	0.0	0.0		0.1	0.1	0.9	0.4	1.2	0.0	1.3	3.9
Non-Tribal At-sea Hake	0.6	0.0	0.0		0.0	0.0	0.1	0.0	0.1	0.1	0.3	1.1
Pink Shrimp									0.0			0.0
Shoreside Hake						0.2	0.1				0.5	0.9
Tribal At-sea Hake									0.0	0.0		0.0
Tribal Shoreside	0.0	0.0	0.0			0.0	0.4	0.0	0.0		0.0	0.4
Limited Entry Trawl Permit – Trawl Gear	7.6	13.1	10.6	7.3	1.6	10.0	1.2	2.5	3.8	1.1	6.6	65.5
Limited Entry Trawl Permit – Fixed Gear										0.0	0.2	0.2

Table 4-26. Estimated total catch of stocks managed in the Slope Rockfish complex south of 40º10' N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Slope Rockfish (South of 40°10' N. lat.)	**508.0**	**357.4**	**351.9**	**181.8**	**247.6**	**128.8**	**185.0**	**232.1**	**176.1**	**191.5**	**254.2**	**2,814.5**
Aurora Rockfish	**47.7**	**48.7**	**53.4**	**41.8**	**46.0**	**29.7**	**11.5**	**16.2**	**4.9**	**6.8**	**24.9**	**331.4**
California Halibut	0.0											0.0
Incidental	0.0		0.1	0.1	0.0		0.0	0.1	0.1			0.4
Nearshore Fixed Gear	0.0	0.0	0.0		0.0		0.0	0.0	0.0			0.0
Non-nearshore Fixed Gear	1.3	3.0	1.7	0.6	0.3	0.3	1.0	7.0	0.8	0.7	0.3	17.1
Pink Shrimp			0.0									0.0
Shoreside Hake	0.0			0.0								0.0
Limited Entry Trawl Permit – Trawl Gear	46.4	45.6	51.5	41.0	45.7	29.4	10.5	9.0	4.0	6.0	24.4	313.6
Limited Entry Trawl Permit – Fixed Gear										0.1	0.2	0.2
Bank Rockfish	**290.4**	**101.4**	**130.3**	**37.0**	**37.3**	**36.6**	**92.2**	**57.9**	**13.5**	**28.9**	**18.1**	**843.6**
California Halibut	0.0											0.0
Incidental	18.6	14.8	19.4	10.4	11.3	7.5	1.1	0.1			1.0	84.4
Nearshore Fixed Gear	0.1	0.0	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.8
Non-nearshore Fixed Gear	2.3	1.1	1.0	1.8	3.7	1.1	0.3	0.2	0.1	1.1	0.4	13.2
Pink Shrimp	0.0											0.0
Shoreside Hake	22.6			0.4								23.0
Limited Entry Trawl Permit – Trawl Gear	246.7	85.5	109.8	24.2	22.1	27.9	90.8	57.5	13.4	27.8	16.6	722.2
Blackgill Rockfish	**149.8**	**192.7**	**153.0**	**88.4**	**95.2**	**48.3**	**74.4**	**135.4**	**152.1**	**151.2**	**195.1**	**1,435.7**
California Halibut	0.0											0.0
Incidental	1.2	9.9	1.9	0.3	1.2	0.2	3.1	0.5	5.6			23.9
Nearshore Fixed Gear	4.4	4.1	3.2	2.0	3.8	0.3	0.4	2.4	0.5	0.4	2.3	23.9
Non-nearshore Fixed Gear	72.7	123.9	67.5	33.9	54.0	22.1	33.3	79.0	84.8	134.8	113.7	819.9
Pink Shrimp	0.0											0.0
Shoreside Hake	0.0				0.0							0.0
Limited Entry Trawl Permit – Trawl Gear	71.5	54.8	80.4	52.1	36.2	25.7	37.6	53.4	61.2	14.3	73.1	560.2
Limited Entry Trawl Permit – Fixed Gear										1.7	6.0	7.8
Blackspotted Rockfish											**8.9**	**8.9**
Nearshore Fixed Gear											0.0	0.0
Non-nearshore Fixed Gear											8.8	8.8
Limited Entry Trawl Permit – Trawl Gear											0.1	0.1

Table 4-26 (continued). Estimated total catch of stocks managed in the Slope Rockfish complex south of 40º10' N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Redbanded Rockfish	**2.3**	**3.3**	**3.3**	**1.3**	**2.8**	**1.7**	**4.9**	**3.6**	**1.6**	**0.5**	**1.7**	**27.1**
California Halibut	0.0											0.0
Incidental	0.1	0.0	0.1	0.0			0.0			0.0		0.2
Nearshore Fixed Gear	0.2		0.2		0.0	0.0		0.0		0.0	0.0	0.4
Non-nearshore Fixed Gear	0.5	0.5	2.4	0.6	2.0	0.3	2.0	1.3	0.3	0.3	1.0	11.2
Pink Shrimp	0.0		0.0									0.0
Shoreside Hake	0.0											0.0
Limited Entry Trawl Permit – Trawl Gear	1.5	2.8	0.7	0.6	0.8	1.4	3.0	2.3	1.3	0.2	0.7	15.3
Rockfish Unid	**5.4**	**0.0**	**1.8**	**0.0**	**51.6**	**3.3**		**6.8**		**0.1**	**0.0**	**69.0**
Non-nearshore Fixed Gear	4.8	0.0				0.0						4.8
Limited Entry Trawl Permit – Trawl Gear	0.6		1.8	0.0	51.6	3.3		6.8		0.1	0.0	64.2
Rougheye/Blackspotted Rockfish	**0.9**	**0.2**	**0.1**	**1.7**	**0.2**	**3.0**	**0.2**	**3.2**		**0.4**	**0.5**	**10.3**
Nearshore Fixed Gear		0.0			0.0			0.0				0.0
Non-nearshore Fixed Gear	0.5	0.1		1.7	0.2	3.0	0.2	3.1		0.3	0.2	9.5
Limited Entry Trawl Permit – Trawl Gear	0.3	0.0	0.1				0.0	0.0		0.0	0.2	0.7
Sharpchin Rockfish	**7.5**		**0.8**	**5.6**	**0.2**	**0.2**		**4.7**	**0.6**	**0.0**	**0.3**	**19.8**
Non-nearshore Fixed Gear								0.0			0.0	0.1
Pink Shrimp			0.0									0.0
Limited Entry Trawl Permit – Trawl Gear	7.5		0.8	5.6	0.2	0.2		4.7	0.6	0.0	0.3	19.7
Shortraker Rockfish	**0.0**		**0.0**			**0.7**	**0.7**	**3.5**	**0.6**		**0.0**	**5.7**
Non-nearshore Fixed Gear								0.2				0.2
Limited Entry Trawl Permit – Trawl Gear	0.0		0.0			0.7	0.7	3.3	0.6		0.0	5.5
Shortraker/Rougheye/Blackspotted Rockfish		**0.0**										**0.0**
Non-nearshore Fixed Gear		0.0										0.0
Slope Rockfish Unid	**3.8**	**11.1**	**8.1**	**5.9**	**14.2**	**5.1**	**0.9**	**0.8**	**2.9**	**3.6**	**4.6**	**61.1**
California Halibut								0.0				0.0
Incidental	0.3	1.2	0.3	0.3	4.8	0.0	0.0	0.0	0.1	0.1	0.0	7.0
Nearshore Fixed Gear	0.5	0.1	0.2	0.3	0.4	0.1	0.1	0.0	0.0	0.0	0.1	1.8
Non-nearshore Fixed Gear	2.7	7.5	6.9	4.8	2.0	1.3	0.5	0.7	2.0	1.7	3.5	33.7
Pink Shrimp	0.2	0.1	0.0	0.0				0.0	0.0			0.4
Limited Entry Trawl Permit – Trawl Gear	0.1	2.2	0.7	0.6	7.0	3.7	0.3		0.8	1.6	1.0	17.9
Limited Entry Trawl Permit – Fixed Gear										0.3	0.0	0.3

Table 4-26 (continued). Estimated total catch of stocks managed in the Slope Rockfish complex south of 40º10’ N. latitude by sector, 2002 to 2012.

Complex and Stocks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Spotted Rockfish Unid										**0.0**		**0.0**
Limited Entry Trawl Permit – Trawl Gear										0.0		0.0
Yellowmouth Rockfish					**0.0**			**0.0**			**0.0**	**0.1**
Nearshore Fixed Gear					0.0			0.0				0.0
Non-nearshore Fixed Gear					0.0			0.0				0.0
Limited Entry Trawl Permit – Trawl Gear											0.0	0.0
Pacific Ocean Perch	**0.1**	**0.0**	**1.1**	**0.0**	**0.1**	**0.2**	**0.2**	**0.1**	**0.0**	**0.0**	**0.1**	**2.0**

Table 4-27. Alternative 1, complex OFLs in relationship to average catch since implementation of trawl rationalization (2011-2012).

Minor Slope Rockfish Complexes and Component Stocks	2015 OFL	2016 OFL	Average Catch 2011-2012	Average Catch as a Percent of OFL (Contribution)
North of 40º10' N lat.	**1,583.20**	**1,592.90**	**119.85**	**8%**
Aurora	*17.4*	*17.5*	*21.35*	*123-122%*
Bank	*17.2*	*17.2*	*0.45*	*3%*
Blackgill	*4.7*	*4.7*	*6.85*	*146%*
Redbanded	*45.3*	*45.3*	*33.75*	*75%*
Sharpchin	*332.8*	*323.2*	*5.35*	*2%*
Splitnose	*1,000.60*	*1,018.20*	*38.55*	*4%*
Yellowmouth	*192.4*	*192.4*	*5.10*	*3%*
Minor Slope Unidentified			*8.45*	*NA*
South of 40º10' N lat.	***802.1***	***803.1***	***213.85***	***27%***
Aurora	*74.3*	*74.3*	*15.85*	***21%***
Bank	*503.2*	*503.2*	*23.5*	*5%*
Blackgill	*137*	*140*	*173.15*	*124%*
Pacific ocean perch	**-**	**-**	*0.05*	*NA*
Redbanded	*10.4*	*10.4*	*1.1*	*11%*
Sharpchin	*83.2*	*80.8*	*0.18*	*0.2%*
Yellowmouth	*0.8*	*0.8*	*0*	*0%*
Slope Unidentified			*0.05*	*NA*
RBS Complex Coastwide	***224.8***	***229.8***	***280.1***	***125-122%***
Rougheye/Blackspotted	*206*	*211*	*228.45*	*110-108%*
Shortraker	*18.8*	*18.8*	*28.15*	*147%*
Rougheye/Blackspotted/Shortraker			*23.5*	*NA*

Alternative 1 could reduce the risk of exceeding the component stocks' OFL contribution over the No Action Alternative, but could also disrupt the limited entry trawl and fixed gear fisheries if additional management measures and allocations were required (see Socioeconomic Impacts Section 4.3.2). While the No Action Alternative management of Minor Slope Rockfish, might lead to a logical prediction that catches of rougheye/blackspotted would remain above the component OFL and ABC in the absence of any change to fleet behavior, the risk of driving stock depletion down below the target B_{MSY} level is also discussed below. Managing these stocks in a separate coastwide RBS complex (Alternative 1) would be one way to address these concerns. However, the Preferred Alternative is to manage these stocks in the No Action Alternative complexes with a scientific sorting requirement for shortraker and rougheye/ blackspotted rockfish. Having the sorting requirement to the species level for rougheye/blackspotted and shortraker rockfish (Preferred Alternative), as opposed to at the minor slope rockfish level (No Action), would improve the catch accounting needed to improve stock assessments for future consideration of species-specific management measures (i.e., hot spot closures).

Landings data are currently reported in PacFin and can be in very general categories consisting of many species (i.e., "unspecified slope rockfish"), as well as in smaller groups with just a few species (i.e., shortraker-rougheye/blackspotted). Within the fish-ticket tables, these groups are known as a fish-ticket market category. States sample these market categories regularly, resulting in proportions that describe the composition of these various categories in terms of the actual species observed. This market category sampling occurs in various ports and for distinct gear-types, producing proportions for individual species by port (or port group), gear (or gear group), and month (or quarter). For some PacFIN data sources, area is also a sampling dimension. The PacFIN system combines monthly summations of market categories with corresponding species composition proportions to produce the best estimate of catch for individual species, where possible. If all possible combinations of market category, gear-type, port, month, and area (where applicable) were actually sampled, then the resulting PacFIN reports/data would contain catch for only individual scientifically defined species. As it is, there are situations that result in unsampled strata; thus, PacFIN reports/data potentially include both individual species and market categories (www.nwfsc.noaa.gov/research/divisions/fram/observation/pdf/PacFIN_processing_details_GM2013_Final2012Data.pdf).

Specification of a sorting requirement for rougheye and blackspotted rockfish (Preferred Integrated Alternative) would improve catch estimation reported on state landing receipts and electronic fish tickets and inseason monitoring for these stocks. Observers generally sort discarded catch to species. However, some situations may result in observers using aggregate categories (i.e., longline dropoffs). Managing a coastwide rougheye/blackspotted/shortraker rockfish complex would improve catch accounting. However, catches would be monitored and estimated at the level of the complex aggregation for the three species combined (i.e., the species would not be separately sorted). The No Action Alternative, combined with a sorting requirement for rougheye/blackspotted and shortraker rockfish, could provide better-quality data for future stock assessments and management measure development. At the Council's September 2013 meeting, the SSC endorsed the use of the 2013 rougheye/blackspotted rockfish assessment as the best scientific information available for status determination and management. However, the SSC recommended that the next assessment be full, with the expectation that progress can be made in addressing major assessment uncertainties, such as determining the biology and distribution of rougheye rockfish and blackspotted rockfish individually, as well as increasing the amount of age data available for the assessment. The sorting requirements are consistent with the SSC recommendation.

Management Measures and Inseason Response

Management measures that control slope rockfish mortality in the trawl sectors include IFQ for the shorebased IFQ fishery and co-op management of set-asides for the at-sea sectors (CPs and motherships). In the non-trawl sectors, the primary management measure that controls slope rockfish landings is bimonthly cumulative limits (i.e., trip limits) for the limited entry and open-access, fixed-gear fleets. RCAs are also available for both sectors. Slope rockfish are included in the recreational bag limits for the three states; however, they are not the most common target in recreational fisheries.

Slope rockfish have formal FMP trawl and non-trawl allocations, which could remain under the No Action Alternatives. Alternative 1 would require new IFQ management units based on new long-term or 2-year trawl allocations for the RBS complex. Current regulations at §660.140(c)(3)(vii) address reallocation with changes in management areas and subdivision of species groups for quota share in quota share accounts. Further, the at-sea sectors would have new set-asides (north of 40º10' N latitude) under the action alternatives. For the non-nearshore fixed gear sector, trip limit models would have to be developed, and adjustments to the existing trip limits may be needed to keep catch within the complex specifications under the action alternatives. Figure 4-18 shows the numerous likely decision points associated with restructuring under Alternative 1.

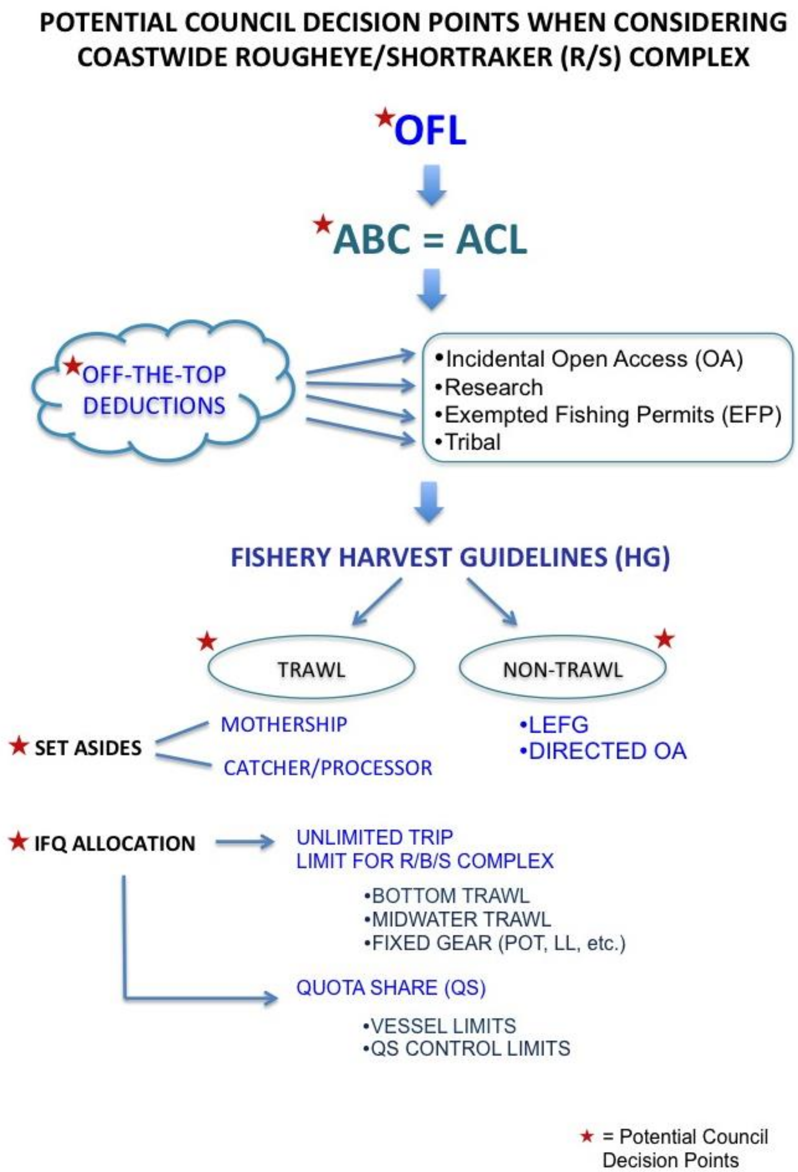


Figure 4-18. Potential Decision Points for the Council to consider relative to complex restructuring.

Risk of Component Stocks Becoming Overfished

The average coastwide catch of rougheye/blackspotted rockfish from 2002 to 2012 (excluding rougheye/blackspotted reported in aggregate market categories) is 85 percent of the 2015 OFL and 83 percent of the 2016 OFL. However, the average coastwide catch since implementation of trawl rationalization in 2011 is 110.9 percent of the 2015 OFL and 108.3 percent of the 2016 OFL. This indicates a concern that the stock's contribution to the OFL could be exceeded in 2015 and 2016 if the harvest levels were similar to those observed in 2011 to 2012.

Since 2011, Minor Slope Rockfish targeting in the bottom trawl fishery has decreased dramatically (only 17 percent of the 2011 quota of the northern Minor 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/blackspotted in the 2011 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 Pacific whiting were aggregated.

The average 2015 to 2024 catch predicted to stabilize the population at the proxy B_{MSY} level of $B_{40\%}$ is 266 mt, or 145.8 percent and 116.4 percent of the average 2002 to 2012 and 2011-2012 catches, respectively (Table 4-28). However, a substantial amount (3.9 mt in 2011 and 47 mt in 2012) of Minor Slope Rockfish was reported in the aggregate rougheye/blackspotted/shortraker rockfish category and is not represented in these percentages. The 2015 to 2024 equilibrium yield catch assumes the F_{MSY} harvest rate estimated in the 2013 assessment (SPR = 29.6 percent). To the extent that the actual F_{MSY} harvest rate for the stock would be closer to or over the estimated F_{MSY} harvest rate in the 2013 assessment, the risk of future overfishing under status quo management would be lessened. Additionally, a forward projection of rougheye/blackspotted depletion using the base model in the 2013 assessment and assuming annual removals in the next 10 years equal to the 2008 to 2012 average total catch of these species of 247.7 mt predicts the stock(s) would remain healthy, with a depletion above the B_{MSY} proxy of 0.4 (Figure 4-19).

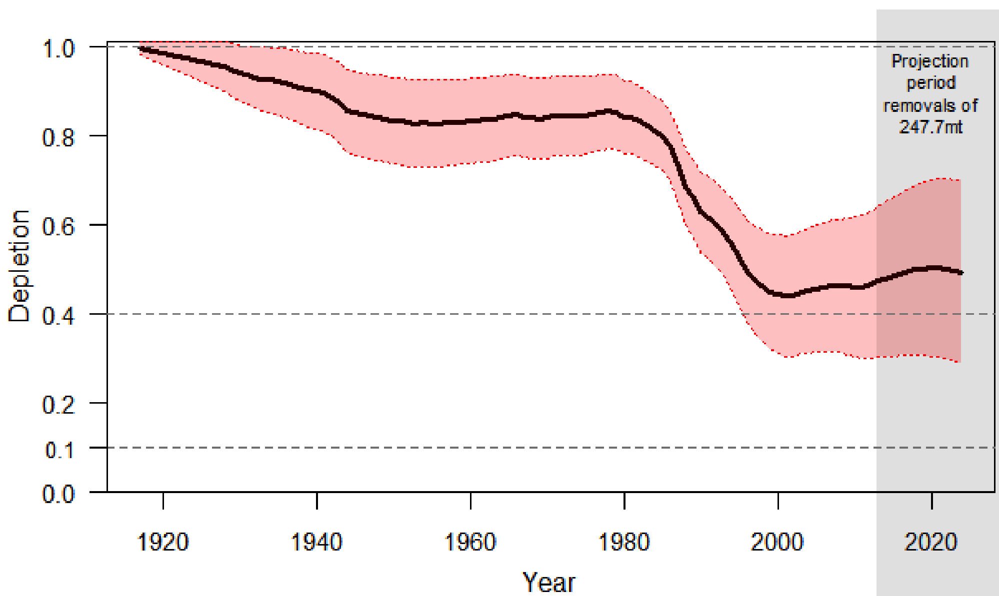


Figure 4-19. Projected depletion of rougheye/blackspotted rockfish through 2024 assuming annual removals of 247.7 mt. Shading indicates the estimated 95 percent confidence interval about estimated depletion.

Table 4-28. Summary 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 and line, and at-sea) and are also used as status quo catches.

			State of Nature					
			Low $M = 0.037$		Base Case *M* Estimated at 0.042		High $M = 0.047$	
Relative Probability			0.25		0.5		0.25	
Management Decision	Year	Catch (mt)	Spawning Biomass (mt)	Depletion	Spawning Biomass (mt)	Depletion	Spawning Biomass (mt)	Depletion
ABC (sigma = 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%

Source: Hicks et al. 2013.

Risk of Overfishing at the Complex Level

The preferred harvest alternative for the Minor Slope Rockfish complex north of 40º10’ N. latitude specifies 2015 OFLs and ABCs of 1,831 mt and 1,693 mt, respectively. Total estimated catches from 2002 to 2012 have been well under the preferred harvest specifications for the next management period, with the maximum catch during that period (568.5 mt) being 34 percent of the proposed 2015 ABC for the complex (Figure 4-20a). The preferred harvest alternative for the Minor Slope Rockfish complex south of 40º10’ N. latitude specifies 2015 OFLs and ABCs of 813 mt and 705 mt, respectively. Total estimated catches from 2002 to 2012 have been well under the preferred harvest specifications for the next management period, with the maximum catch during that period (508 mt) being 72 percent of the proposed 2015 ABC for the complex (Figure 4-20b). There is little risk of exceeding the proposed harvest limits for these two complexes in 2015 or 2016 given the low levels of attainment in recent years and projected catch that is well below the complex ACL.

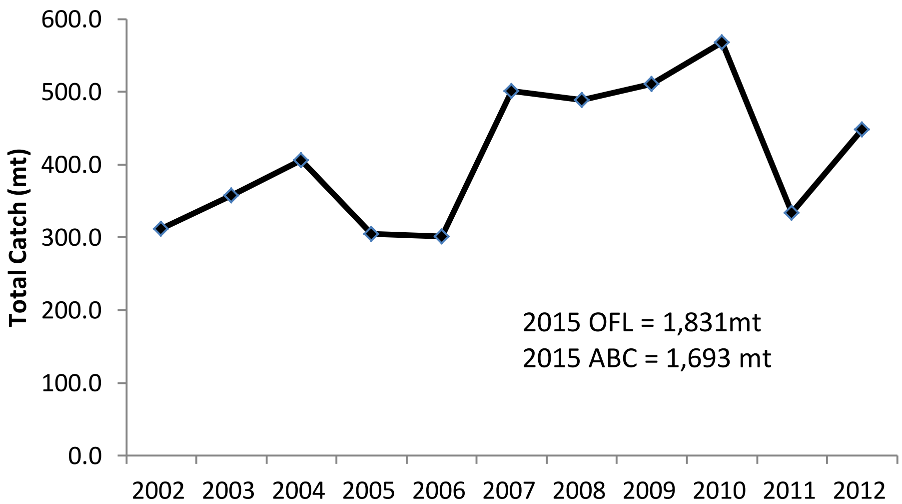


Figure 4-20a. Estimated total catch of stocks in the Slope Rockfish complex north of 40º10' N. latitude, 2002 to 2012.

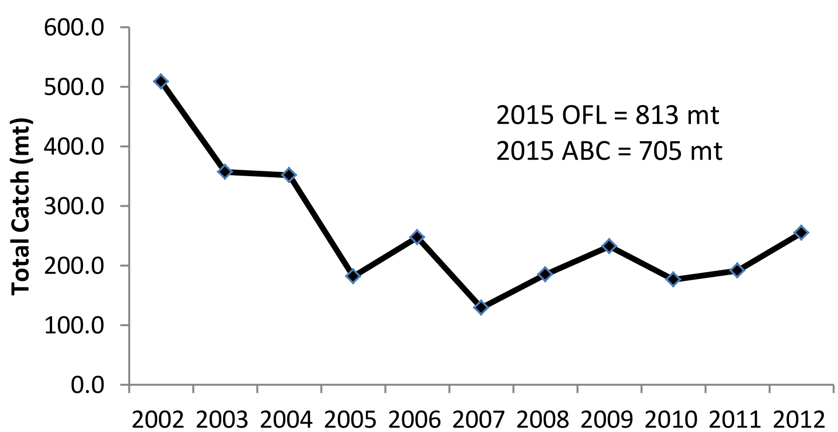


Figure 4-20b. Estimated total catch of stocks in the Slope Rockfish complex south of 40º10' N. latitude by sector, 2002 to 2012.

4.1.5.5 Other Fish

The status quo Other Fish complex is comprised of all the unassessed groundfish FMP species that are neither rockfish (family *Scorpaenidae*) nor flatfish, except for spiny dogfish, which was assessed in 2011. These species include big skate, California skate, leopard shark, soupfin shark, spiny dogfish, finescale codling, Pacific grenadier, ratfish, cabezon off Washington, and kelp greenling. The status quo Other Fish complex is an aggregation of species with different life history characteristics, depth distributions, and vulnerabilities to potential overfishing. The Other Fish complex includes species that do not co-occur.

Under the No Action Alternative, some stocks within the Other Fish complex occur primarily or exclusively in state waters due to their association with nearshore habitats. Some of the species are already managed individually by the states as part of recreational bag limits and other measures. Examples of such species include cabezon, kelp greenling and all other greenlings, California skate, and leopard shark. Leopard shark is primarily caught in the California recreational fishery within state waters; they are also encountered in the trawl fishery outside 3 miles of shore.

Under the No Action Alternative, only one species, spiny dogfish, within the Other Fish complex is known to have experienced historical catches that approached the stocks component OFL. Table 4-29 shows the 2011 PSA vulnerability scores for the component stocks. California skate, leopard shark, soupfin shark and spiny dogfish were considered to have a high rate of vulnerability to overfishing in the 2011 PSA analysis. The Other Fish complex includes stocks that have very low OFLs (e.g., California skate) or very high OFLs (e.g., spotted ratfish). Disparate OFLs within a single complex may increase the risk of overfishing susceptible stocks with relatively low OFL contributions to the complex OFL.

Table 4-29. The relative vulnerability of stocks managed under the Other Fish complex.

	PSA Results Vulnerability	
Stock Complex and Component Stocks	**Score**	**Level**
Other Fish		
California skate	2.12	High
Leopard shark	2.00	High
Soupfin shark	2.02	High
Spiny dogfish	2.13	High
Big skate	1.99	Med
Pacific rattail	1.82	Med
Cabezon (WA)	1.68	Low
Finescale codling	1.48	Low
Kelp greenling	1.56	Low
Ratfish	1.72	Low

Two alternatives for restructuring are considered in detail this EIS, the No Action Alternative and the Preferred Alternative. The Preferred Alternative would be carried forward into the integrated Preferred Alternative for 2015-2016 harvest specifications. The Preferred Alternative would restructure the complex by removing spiny dogfish and managing the stock coastwide with its own harvest specifications and removing all the skates, Pacific grenadier, soupfin shark, spotted ratfish, and finescale codling from the complex and designating them as EC species (Section 4.1.6). The remaining stocks, kelp greenling, Washington cabezon, and leopard shark, would comprise the new Other Fish complex beginning in 2015-2016. Table 4-30 compares the harvest specifications under the No Action Alternative and the Preferred Alternative.

Table 4-30. Other Fish Complex Harvest Specifications under the No Action Alternative and the Preferred Alternative.

Stock	No Action Alternative (2014)			Preferred Alternative 2015/2016		
	OFL	ABC	ACL	OFL	ABC	ACL
Other Fish	6,802	4,697	4,697		242/243	242/243
Big skate	*458.0*	*317.9*		*EC species*		
Cabezon (WA)	[a]	[a]		*4.5/4.8*	*3.4/4.4*	
California skate	*86.0*	*59.7*		*EC species*		
Finescale codling	[a]	[a]		*EC species*		
Kelp greenling (CA)	*118.9*	*82.5*		*118.9*	*99.2*	
Kelp greenling (OR & WA)	[a]	[a]		*EC species*		
Leopard shark	*167.1*	*116.0*		*167.1*	*139.4*	
Pacific grenadier	*1,519.0*	*1,054.2*		*EC species*		
Ratfish	*1,441.0*	*1,000.1*		*EC species*		
Soupfin shark	*61.6*	*42.8*		*EC species*		
Spiny dogfish	*2,950.0*	*2,024*		*Stock specific mgmt*		

[a] There is no OFL contribution for these stocks as there was no approved methodology for estimating.

Harvest specifications for the Other Fish complex are the summed OFL and ABC contributions of the component stocks. The SSC endorsed OFL estimates for kelp greenling in California (118.9 mt based on a DB-SRA estimate calculated in 2011), leopard shark (167.1 mt based on a DB-SRA estimate calculated in 2011), and the Washington substock of cabezon. The SSC endorsed a new OFL estimate for Washington cabezon based on a DB-SRA methodology that assumes depletion in 2010 equals that inferred from the 2009 assessment for Oregon (48 percent, (Cope and Key 2009).

Since the 2016 harvest specifications are based on assumed ABC removals of Washington cabezon in 2015, the 2016 specifications are dependent on the preferred P*. The Council chose a P* of 0.45 for Washington cabezon, which determines 2015 and 2016 OFL contributions of 4.5 mt and 4.8 mt, respectively. The SSC originally recommended a similar methodological approach for estimating OFL contributions for kelp greenling in Oregon and Washington that used a depletion estimated from the 2005 kelp greenling assessment for the Oregon substock (Cope and MacCall 2006). However, the SSC did not endorse the 2015 and 2016 OFLs for the Oregon and Washington substocks of kelp greenling after realizing the catch stream used to determine the DB-SRA OFL estimate of kelp greenling in Oregon was dramatically different than the catch stream in the 2005 assessment. Therefore, there are no SSC-recommended OFL or ABC contributions for kelp greenling in Washington and Oregon to inform the 2015 and 2016 harvest specifications for the reconfigured Other Fish complex. The preferred 2015 and 2016 OFL for the Other Fish complex is 291 mt. The preferred 2015 and 2016 ABCs for the Other Fish complex are 242 mt and 243 mt, respectively, and they are based on a P* of 0.45 for the component stocks with known OFL contributions. Total catches of stocks in the reconfigured Other Fish complex (Preferred Alternative) have not exceeded the preferred 2015 OFL or ABC during 2004 to 2012 (Figure 4-21). Total estimated annual catches of stocks in the Other Fish complex by sector of the groundfish fishery from 2004 to 2012 are provided in Table 4-32.

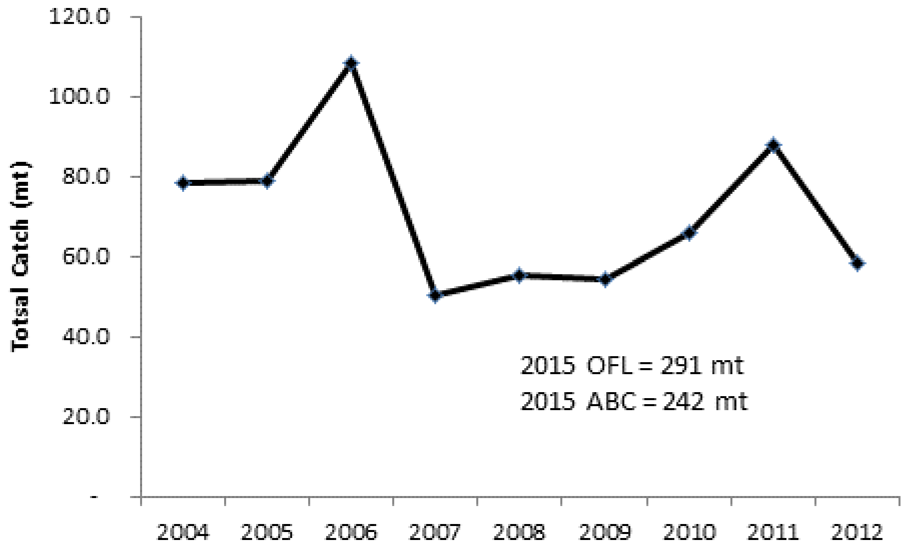


Figure 4-21. Estimated total catch of stocks in the Other Fish complex, 2004 to 2012 relative to the preferred 2015 OFL and ABC.

All commercial catch estimates were from the WCGOP Multi-year Data Product, and recreational catches of Washington cabezon and leopard shark were obtained from March 22 and 23, 2014, RecFIN queries of landed catch (A) and reported dead catch (B1) (Table 4-31). Recreational catches of kelp greenling by state were provided by the GMT. The average annual total catch of stocks under the Preferred Alternative from 2004 to 2012 was 70.9 mt (Table 4-32). The cumulative 2004 to 2012 catch under the Preferred Alternative was 24.3 percent and 29.3 percent of the preferred 2015 OFL and ABC, respectively. Under the Preferred Alternative, there would be a low risk of the complex OFL or ABC of being exceeded in the 2015-2016 management cycle.

The preferred 2015 and 2016 ACLs of 242 and 243 mt, respectively would be the same as under integrated Alternative 1. This compares to the 2015 and 2016 ACL of 110 mt under integrated Alternative 2. The Alternative 2 ACL would have a higher risk of being exceeded (assuming the same management measures and no inseason adjustment) than the preferred ACLs. Total catch in 2006 was slightly lower (108.5 mt) than the Alternative 2 ACL).

Table 4-31. Washington Cabezon OFLs and ABCs for 2015 and 2016, assuming different depletion levels and ABC catches in 2015 (preferred harvest specification contributions to the Other Fish complex in bold).

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 4-32. Annual total catches of stocks in the Other Fish complex by sector, 2004 to 2012.

Sectors	2004	2005	2006	2007	2008	2009	2010	2011	2012	Grand Total
Kelp Greenling – Coastwide										
Set-aside	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**			**0.0**	**0.0**	**0.1**
California Halibut		0.0								0.0
Incidental	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.1
Non-trawl	**44.3**	**34.9**	**28.9**	**31.4**	**37.4**	**43.3**	**45.8**	**55.8**	**24.4**	**346.2**
Nearshore Fixed Gear	25.7	23.0	17.0	20.1	24.1	23.1	20.4	23.6	24.4	201.4
Non-nearshore Fixed Gear			0.6							0.6
Washington Recreational	2.0	1.9	1.3	1.2	1.0	1.3	2.7	2.1		13.6
Oregon Recreational	4.4	4.1	3.1	3.5	3.6	4.2	6.8	7.5		37.2
California Recreational	12.3	5.8	6.9	6.6	8.8	14.6	15.8	22.6		93.4
Trawl	**0.1**	**0.1**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.7**
Limited Entry Trawl Permit–Trawl Gear	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.7
Non-Tribal At-sea Hake		0.0	0.0							0.0
Kelp Greenling Total	**44.4**	**35.0**	**29.0**	**31.5**	**37.4**	**43.3**	**45.8**	**55.9**	**24.6**	**347.0**
Washington Cabezon										
Non-trawl	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**2.7**	**8.7**	**6.5**	**49.8**
Washington Recreational	5.9	7.9	5.8	4.3	2.7	5.2	2.7	8.7	6.5	49.8
Washington Cabezon Total	**5.9**	**7.9**	**5.8**	**4.3**	**2.7**	**5.2**	**5.3**	**8.7**	**6.5**	**52.4**
Leopard Shark										
Set-aside	**5.9**	**13.3**	**12.1**	**9.1**	**4.6**	**2.5**	**2.3**	**7.6**	**1.7**	**59.1**
California Halibut	1.0	7.8	4.9	1.2	2.8	1.2	0.5	5.6	0.0	25.1
Incidental	4.9	5.5	7.1	7.9	1.8	1.3	1.8	2.0	1.6	33.9
Pink Shrimp	0.1		0.0				0.0		0.0	0.1
Non-trawl	**22.0**	**21.8**	**61.6**	**5.2**	**10.7**	**3.3**	**12.3**	**15.6**	**25.4**	**177.9**
Nearshore Fixed Gear	0.2	0.5	1.1	1.0	0.4	0.1	0.2	0.2	0.2	3.9
Non-nearshore Fixed Gear	5.6	5.8	2.6	1.8	0.7	0.3	0.7	0.2	1.0	18.7
California Recreational	16.2	15.5	58.0	2.4	9.6	2.8	11.4	15.2	24.2	155.2
Trawl	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**1.2**
Limited Entry Trawl Permit–Trawl Gear	0.0	0.9	0.0	0.0				0.0	0.3	1.2
Leopard Shark Total	**28.0**	**36.0**	**73.7**	**14.3**	**15.3**	**5.7**	**14.6**	**23.2**	**27.3**	**238.2**
Other Fish Total	**78.4**	**79.0**	**108.5**	**50.2**	**55.4**	**54.3**	**65.7**	**87.7**	**58.4**	**637.7**

The Preferred Alternative for a restructured Other Fish complex is more consistent with National Standard 1 guidelines than the No Action Alternative structure because stocks with similar vulnerabilities to overfishing, similar distributions, and similar fishery interactions would be managed within one complex. The Other Fish complex under the Preferred Alternative would be composed of shallow-water species that are primarily caught within 3 miles of shore, in state waters. Removing spiny dogfish from the complex and managing that stock on its own would also reduce the risk of overharvesting that stock relative to the status quo strategy of managing spiny dogfish within the complex. There are no immediate concerns with managing kelp greenling, Washington cabezon, and leopard shark together in a complex.

Under the Preferred Alternative, spotted ratfish, all the skates, soupfin shark, finescale codling and Pacific grenadier would be designated as EC species. Spotted ratfish are distributed coastwide in depths from 0 to 499 fm, with the highest densities occurring between 55 and 82 fms (PFMC 2014). Generally, spotted ratfish is a deepwater species that prefers low-relief rocky bottoms, but also prefers exposed gravel and cobble as a habitat and is not common on sand or over boulders (Allen 1982). However, adults have been found in habitat consisting of mud, and sea urchins and have been found to have noteworthy seasonal and diel migrations (Groundfish FMP Appendix B). Spotted ratfish are, in turn, preyed upon by Pacific halibut, soupfin shark, and spiny dogfish (Hart 1973, Love 1996, Mathews 1975, Quinn et al. 1980). There is no directed fishery for spotted ratfish, but they are taken quite often as bycatch in bottom trawls. Spotted ratfish are not sought by recreational fishers, but are caught occasionally while fishing for other demersal species (Love 1996). Within the Other Fish Complex (No Action Alternative), ratfish may be considered an inflator species, because it has a large OFL contribution relative to many of the Other Fish species. Catch of ratfish is largely affected by the trawl RCAs. Catch of spotted ratfish relative to the

2015 OFL (1,441 mt) averaged 12 percent from 2003 to 2012 and only 7 percent from 2009 to 2012. The maximum catch of spotted ratfish during that period was 304 mt in 2006, and the most recent reported catch was only 74 mt in 2011.

California skate are distributed coastwide in depths from 0 to 367 fm, with the highest densities occurring between 0 and 10 fms (PFMC 2014). California skate have little commercial value, although the trawl fleets account for the majority of catch as bycatch (Groundfish FMP Appendix B). California skates typically inhabit inshore muddy bottoms (Roedel and Ripley 1950). California skate would be removed from the Other Fish complex and designated an EC species under the Preferred Alternative. The 2015 OFL contribution for California skate was exceeded once in 9 years. The 2005 catch of 89 mt was higher than the 2015 California skate OFL contribution of 86 mt. However, catches of California skate have not exceeded 18 mt since 2007. Big skate are found coastwide in depths from 2 to 110 fm, with the greatest concentrations south of 46° N. latitude and in depths between 27 and 110 fm. The majority of catch is taken as bycatch by the trawl fleet (PFMC 2014). The big skate occupy inner and outer shelf areas (Allen and Smith 1988), particularly on soft bottom. Big skate would be removed from the Other Fish complex and designated an EC species under the Preferred Alternative. The catch of this species has averaged 95 mt from 2007 to 2011 (20 percent of the No Action Alternative OFL contribution). Catch data for skates are discussed further in the following section.

Soupfin shark are distributed coastwide in depths from 0 to 225 fm (PFMC 2014). The soupfin shark was one of the most economically important of the sharks on the West Coast during the late 1930s and 1940s (Ripley 1946b). In recent years, most catches are bycatch in commercial or recreational fishers. Soupfin shark would be designated an EC species under the Preferred Alternative. The catch of this species averaged 8 mt per year from 2007 to 201; however, less than 1 mt on average was caught by Groundfish FMP sectors (see Agenda Item H.4.b, GMT Report 2, November 2013). In 2012, the total catch mortality was estimated at 2.66 mt (WGCOP 2012 total mortality report).

Finescale codling (Pacific flatnose) are distributed coastwide in depths from 190 to 1,588 fm, with the highest densities occurring between 190 and 470 fms north of 38° N. latitude (PFMC 2014). There is no directed fishery for Pacific flatnose. Though these species are encountered with some regularity, they are not retained. These species are not marketable due to poor flesh quality. If designated as an EC species, as proposed under the Preferred Alternative, mortality could be monitored, while acknowledging that they are not targeted in the fishery.

Pacific grenadier are distributed coastwide in depths from 85to 1,350 fm, with the highest densities occurring between 500 and 1,350 fms north of 38° N. latitude (PFMC 2014). Pacific grenadier is considered to be a high-quality fish, and it is sold as fresh or frozen fillets for human consumption (Abbott 2006). Historically, Pacific grenadier had been taken for surimi (Matsui et al. 1990). Pacific grenadiers were targeted off California, where catches peaked at approximately 1,200 mt in 1996 (Pearson et al. 2008). The high abundance of Pacific grenadier off California and the high quality of its flesh means there is potential for a directed fishery to occur again, and concerns exist over whether the species can sustain harvest (Matsui et al. 1990). Only a fraction of the biomass of any grenadier species is currently fished, as they are distributed into far deeper depths than are currently accessed by the groundfish fishery. Catch data for grenadiers are discussed further in the following section.

Given the small amount of incidental catch, there would likely be no changes in groundfish fishing as a result of these species being designated as EC species under the Preferred Alternative. Existing landings of Pacific grenadier for human consumption could continue. No new reporting and sorting requirements are specified for EC species under the Preferred Alternative. Species currently reported in Other Fish (No Action Alternative) could be reported in the most appropriate market category or unspecified categories allowed by the state of landing. Observers in the at-sea seactors would likely continue to report discard to the species level whenever possible.

4.1.6 Ecosystem Component Species

Under the Preferred Alternative, the following species would be designated EC species: big skate, California skate, all other endemic skates, soupfin shark, finescale codling, Pacific grenadier, all other endemic grenadier species, and spotted ratfish. Under the National Standard 1 Guidelines, a species can be designated as an EC species if it is not targeted, is not subject to overfishing or being overfished in the absence of conservation measures, and not generally retained for sale or personal use. No harvest specifications or management reference points are required for EC species; however, there is a monitoring requirement to determine changes in their status or their vulnerability to the fishery. If new information shows that an EC species' vulnerability to overfishing has increased, the stock should be reclassified as "in the fishery." Any designation of a species as an EC species or a change from an EC designation to a species considered to be "in the fishery" requires an FMP amendment.

Consistent with the SSC recommendation (Agenda Item D.3.b, Supplemental SSC Report, April 2013), the Council directed the Groudfish Management Team (GMT) to focus on species in the Other Fish complex for reclassification of their FMP status. The GMT evaluated the species currently in the Other Fish complex and also took a broader look at non-FMP species to evaluate whether these species should be included in the FMP. Non-FMP species were considered for either being in the fishery or in the FMP as an EC species to address ecosystem considerations or to enhance monitoring of other EC species. In consideration of determining whether species were in the fishery or not, the GMT analyzed fish species caught predominantly in Federal waters and not managed under other FMPs or by the states. Further filtering of candidate FMP species for an EC designation was done by flagging species that had either less than 1 mt of average catch per year from 2007 to 2011, or more than a 1 mt of catch (rounded to the nearest mt), but less than 50 percent retention (i.e., 50 percent or more of the catch is discarded) and a PSA score of approximately 2.0 and lower. Then to create an overlapping range of non-FMP species, all stocks related to species in the Other Fish complex with an average catch per year of 1 mt and higher were included.

The GMT also evaluated NWFSC trawl survey catches and provided some ad hoc biomass and OFL estimates for non-FMP species. Survey biomass estimates and associated OFL estimates are included in Table 4-33 and Figure 4-24. Biomass estimates have also been calculated for all additional species that are encountered by the NWFSC Groundfish Trawl Survey. Biomass estimates are based on the most recent 3 years of survey abundance available at the time of this analysis and are only calculated for species that were encountered in all 3 years. A small subset of these species that were encountered annually, were seen in so few tows that the survey biomass estimates are unlikely to provide reliable estimates of biomass or OFL contributions. These species are Aleutian skate, Pacific sleeper shark, other slickheads (including tubeshoulders), and snailfish, all of which have occurred in fewer than 100 tows total (and never more than 20 tows in any given year). Of these species, Aleutian Skate is the only one for which an OFL contribution was presented.

Landings of skates and grenadiers are often not identified to the species level. The OFL contributions for Other Skates and Other Grenadiers should not be directly compared to the average catches listed in these categories. Landings in both of these groups have often not been identified to the species level. For instance, for the years 2007 to 2011, the average catch of unidentified skates was 725 mt, but this average includes longnose skate in the years prior to the individual management of that species. For the years 2010 to 2012, when longnose skate was landed separately, the unidentified skate landings averaged 305 mt, but this number still likely included large amounts of big skate, as species within complexes are not required to be sorted and reported to species unless there is a specified scientific or management need. In contrast, the estimated 24.9 mt OFL contribution for Other Skates is based on survey observations of only starry skate and deepsea skate. Likewise, in the case of grenadiers, the average catch of unidentified grenadiers has been 135 mt for the years 2007 to 2011, but this is likely to include large amounts of Pacific grenadier that were not identified by species in landings records. That number should, therefore, not be compared to the 40.1 mt estimated OFL contribution for Other Grenadiers, which is based on survey observations of smooth grenadier, popeye grenadier, softhead grenadier and California grenadier. If all species are combined, then the sum of all skate catches have been below the sum of all skate OFL contributions, and the sum of all grenadier catches has been below the sum of all grenadier OFL contributions.

Big skate, California skate, and Pacific grenadier are FMP species currently managed in the Other Fish complex. The GMT recommended bringing all the other endemic skates in the family *Arhynchobatidae* and the endemic grenadiers in the family *Macrouridae* into the FMP, whether or not they are designated as EC species. The practical reason for this is skates and grenadiers have been landed in unspecified market categories and, with little or no available compositional sampling of these landings, the landed amounts of each species are uncertain. Therefore, more accurate estimation of OFLs using catch-based methods such as DCAC or DB-SRA can be made for the respective aggregations of skates and grenadiers. The Preferred Alternative adds these species to the FMP. The Preferred Alternative also designates these species as EC species, which entails a monitoring requirement to better understand fishing impacts.

Longnose skate is not proposed for an EC designation, and continued management of longnose skate with stock-specific harvest specifications is preferred. The amount of unidentified skate catch has lowered from what is reported in Table 4-34 to an average of 305 mt over 2010 to 2012. The main reason for this is that longnose skate was removed from the Other Fish complex beginning in 2009, when sorting of the species was implemented. Considering the 305 mt of unidentified skate catch still occurring, there are no data to inform species composition. Assuming that none is longnose skate, then the average catch of all other skates would be about 50 percent of their combined OFLs for all other skates. Aleutian skate, the skate species with the highest catch relative to its estimated OFL in Table 4-33, was seen in fewer than 20 tows over the course of several years of the trawl survey (Figure 4-24). Aleutian skate is abundant in the waters off Alaska, with a biomass estimate for the eastern Bering Sea and Aleutian Islands of 33,293 mt (Ormseth 2012). This is second only to Alaska skate in estimated abundance in that area. This suggests that the biomass estimate of 72 mt for the West Coast represents the tail of the stock's distribution. Monitoring of the catch of all endemic skates by bringing them into the FMP and the Federal management framework, coupled with an EC designation, will provide a better sense if this is targeted catch or unavoidable bycatch that is landed because there is some market value.

Grenadiers are present and occasionally caught on the West Coast with Pacific grenadier being the most frequently landed. Giant grenadier show higher landings, although this species is neither desired nor readily marketed (http://www.nmfs.noaa.gov/stories/2014/01/1_13_14giant_grenadiers.html). Giant grenadier are not explicitly targeted, and their low value does not provide an incentive to develop target strategies. The majority of grenadier catch has occurred in the bottom trawl sector where the observation rate has been high in this period (approximately 25 percent of effort annually observed from 2002 to 2010 and approximately 100 percent of observed effort in 2011-2012). Figure 4-22 and Table 4-34 show a highly variable retention rate of grenadier species with Pacific and giant grenadier having higher retention rates. Figure 4-23 shows the magnitude of the observed annual catch of grenadier species and indicates very small amounts of grenadier being caught—less than 5 mt of total observed catch in any year—for most grenadier species, with Pacific and giant grenadier being caught at higher amounts (observed total annual catch of Pacific and giant grenadier approaching 100 mt; catches of unidentified grenadiers are assumed to be primarily composed of these two species). The estimated expanded annual total catch[50] of any of these grenadier species is less than 200 mt, which is much lower than the estimated catch-based OFLs (Table 4-33). Despite that, the "Catch/OFL" and "Biomass Estimate" metrics shown in Table 4-33 are misleading for grenadier. Grenadiers are distributed as deep as 1,350 fm. The depth limit for the West Coast trawl fishery is 700 fm, and the NMFS trawl survey only goes as deep as 550 m (300 fm).

[50] Expanded total catch of a species is the total estimated fishing mortality of that species expanded to unobserved trips assuming the same bycatch and discard rates as the observed trips in any sampling stratum. See the annual reports of estimated discard and catch of groundfish species provided by the WCGOP at http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/species_management.cfm for how the statistical catch expansions are done.

Therefore, OFLs are underestimated for grenadiers since neither the fishery nor the survey operates in the species' overall depth distribution, which will bias catch-based or survey-based estimates low. This is also an indicator of the low vulnerability of grenadiers to potential overfishing considering current depth restrictions.

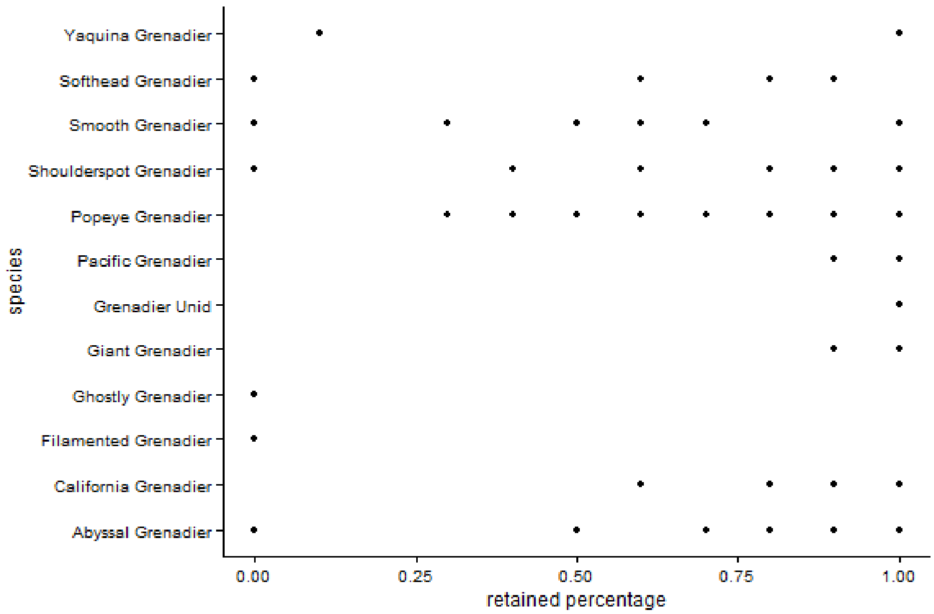


Figure 4-22. Annual retention of grenadier species from observed trips across all sectors monitored by the West Coast Groundfish Observer Program, 2002 to 2012.

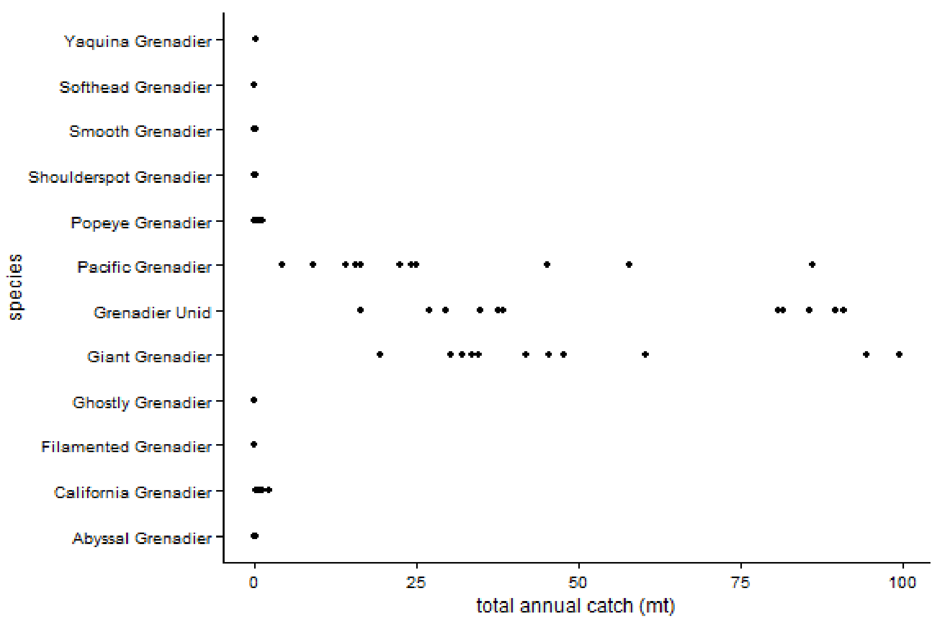


Figure 4-23. Annual observed total catch of grenadier species across all sectors, 2002 to 2012. Estimates are not expanded and are intended to show relative catches among grenadier species.

A designation of spotted ratfish as an EC species is based on the fact that this species is easily identifiable and is not marketed. The catch relative to its estimated OFL is just over 10 percent (Table 4-33). Likewise, finescale codling (aka Pacific flatnose) and soupfin shark are not targeted and are good candidates for an EC designation. Soupfin shark have not been targeted since the end of the Vitamin A fishery (synthetic vitamin A now supplies any demand). The stock may extend into deeper waters, but it is largely taken by gillnet gears in California that target species not managed in the Groundfish FMP. Based on the 2007 to 2011 averages, over 80 percent of the catch comes from sectors managed elsewhere. The Council's ability to control catch through this FMP is, therefore, limited.

All of the proposed EC species designations reflect the lack of a conservation concern for these species, the lack of significant targeting of these species, and the lack of an ability to control harvest of these species effectively, since much of the bycatch of these species occurs in fisheries outside the Council's jurisdiction. There is also a benefit to establishing a monitoring requirement through an EC designation to ensure that these fishery conditions do not change, resulting in risks due to potential overfishing of these species. The inclusion of all endemic skates in the family *Arhynchobatidae* and the endemic grenadiers in the family *Macrouridae* into the FMP will allow more precise catch monitoring without the need for a sorting requirement for these species, since skates and grenadiers are generally landed in unidentified species' market categories (e.g., Unidentified Skates). Estimates of catch would likely be based on observer sample data and fish ticket reports in Pacfin for the associated market categories.

The Preferred Alternative of removing the existing FMP species recommended for an EC designation from the Other Fish complex would also reduce the risks to the other species left in the complex (Table 4-35). This is because some of the recommended EC species were effectively inflator stocks to the complex with relatively larger OFL contributions that increased the risk of overfishing more vulnerable stocks managed in the complex. For example, under the No Action Alternative for the Other Fish complex, Pacific grenadier contributed 1,519 mt to the complex OFL, which increased the risk of overharvesting comanaged species of concern such as spiny dogfish.

Table 4-33. PSA scores, average catch, OFL estimates, and biomass estimates for Other Fish-related candidate stocks from Agenda Item H.4.b, GMT Report 2, November 2013.

Species Groups	Species	PSA Score	Average Catch (mt)	OFL Estimate	Catch/OFL	Biomass Estimate	Notes
Skates and Rays	Aleutian Skate	1.71	3	3.6	83%	72*	*Biomass estimate based on few encounters.
	Bering/Sandpaper Skate	1.8	70	177.4	39%	5,727	
	Big Skate	1.99	95	540.8	18%	10,376	
	Black/Roughtail Skate	1.68	44	184.8	24%	6,497	
	California Skate	2.12	14*	129.6	11%	2,487	*Only 29% from FMP sectors.
	Deepsea Skate	--	1	--	--	*	*Biomass estimate included with "Other Skates."
	Other Skates	--	725*	24.9	--	785	*Unidentified catch, should not be compared to OFL estimate.
	Thornback Skate	--	2	--	--	--	
Cat Sharks	Brown Cat Shark	1.84	90	320	28%	9,918	
	Filetail Cat Shark	--	11	--	--	5,176	
	Longnose Cat Shark	--	3	--	--	1,808	
Other Chondrich	Leopard Shark	2	35*	--	--	--	*Only 3% from FMP sectors (other than CA Recreational = 82%).
	Pacific Black Dogfish	--	1	--	--	--	
	Pacific Sleeper Shark	--	8	--	--	228*	*Only 16% from FMP sectors.
	Salmon Shark	--	1	--	--	--	
	Soupfin Shark	2.02	8*	--	--	--	
	Spotted Ratfish	1.72	146	1,272.40	11%	19,846	
Slickheads	California Slickhead	1.1	28	6,248.80	0.40%	26,118	
	Threadfin Slickhead	--	1	--	--	369	
	Other (incl. Tubeshoulders)	--	1	--	--	10*	*Biomass estimate based on few encounters.

Table 4-33 (continued). PSA scores, average catch, OFL estimates, and biomass estimates for Other Fish-related candidate stocks from Agenda Item H.4.b, GMT Report 2, November 2013.

Species Groups	Species	PSA Score	Average Catch (mt)	OFL Estimate	Catch/OFL	Biomass Estimate	Notes
Grenadiers	California Grenadiers	--	4	--	--	--	*Biomass estimate included with "Other Grenadiers."
	Giant Grenadiers	1.87	170	638.6	27%	17,634	
	Other Crenadiers	--	135*	40.1	--	1,108	*135 mt of unidentified catch. Other species in data all < 1 mt per year. Should not be compared to OFL estimate.
	Pacific Grenadier	1.82	131	1,386.00	9%	38,344	
Eelpouts	Bigfin Eelpout	--	3	--	--	3,965	
	Twoline Eelpout	--	3	--	--	4,830	
	Other Eelpouts	1.51	43	--	--	4,639	
Misc. Fish	Cabezon*	1.68	101	--	--	--	*Included b/c they're potentially distributed in state waters.
	Duckbill Barracudina	--	1	--	--	--	
	Finescale Codling/Pacific Flatnose	1.48	13	316	4%	3,091	
	Kelp Greenling*	1.59	43	--	--	--	*Included b/c they're potentially distributed in state waters.
	King-of-the-Salmon	--	6	--	--	--	
	Longnose Lancetfish	--	1	--	--	--	
	Ragfish	1.8	43	--	--	--	
	Snailfish spp.	--	5	--	--	3*	*Biomass estimate based on few encounters.
	Walleye Pollock	--	4	--	--	--	*Prior to 2007, catch has reached 1,000s of metric tons in some years.

Biomass estimates with darker shading are those for which the survey has few encounters and is unlikely to provide reliable estimates. The Catch/OFL column represents the ratio of average catch (2007 to 2011) to the OFL estimate for those cases where these values are both available and reasonable to compare.

Table 4-34. Average catch estimates for the non-FMP species meeting the GMT's first filtering criteria (the "% FMP" column refers to the percentage of catch coming from sectors regulated under the Groundfish FMP).

	Avg. catch (mt)					Avg. catch (mt)			
Species	FMP Sectors	All Sectors	% FMP	Retained %	Species	FMP Sectors	All Sectors	% FMP	Retained %
1. Skate Unid.	725	741	97.8%	95.8%	25. Hornyhead Turbot	0	4	5.5%	55.6%
2. Giant Grenadier	170	170	100.0%	0.0%	26. Longnose Cat Shark	3	3	100.0%	0.0%
3. Slender Sole	21	149	14.4%	0.0%	27. Aleutian Skate	3	3	100.0%	0.0%
4. Grenadier Unid.	135	135	99.9%	93.8%	28. Bigfin Eelpout	2	3	75.5%	0.0%
5. Shark Unid.	114	116	97.8%	7.2%	29. Twoline Eelpout	3	3	100.0%	0.0%
6. Brown Cat Shark	90	90	99.8%	12.6%	30. Eel Unid.	0	2	7.7%	100.0%
7. Bat Ray	26	75	35.5%	34.3%	31. Thornback Skate	1	2	33.6%	32.4%
8. Bering/sandpaper skate	70	70	99.9%	0.1%	32. Threadfin Slickhead	1	1	100.0%	0.0%
9. Black/Roughtail Skate	44	44	100.0%	0.1%	33. Gray Smoothhound Shark	1	1	100.0%	87.7%
10. Ragfish	43	43	100.0%	51.2%	34. Pacific Dogfish Shark	1	1	100.0%	0.0%
11. Eelpout Unid.	33	43	76.4%	0.1%	35. Duckbill Barracudina	1	1	100.0%	75.5%
12. Deepsea Sole	32	32	99.4%	2.5%	36. Cat Unid. Shark	1	1	100.0%	0.0%
13. California Slickhead	28	28	100.0%	0.0%	37. Salmon Shark	1	1	100.0%	0.0%
14. Sanddab Unid.	21	22	96.7%	84.0%	38. Longspine Combfish	0	1	20.5%	0.0%
15. Shovelnose Guitarfish	19	22	87.0%	80.0%	39. Starry Skate	0	1	46.8%	0.0%
16. Pacific Angel Shark	0	13	0.2%	78.7%	40. Tubeshoulder Unid.	1	1	99.9%	3.7%
17. Pacific Electric Ray	1	11	12.2%	0.0%	41. Deepsea Skate	1	1	100.0%	0.0%
18. Filetail Cat Shark	11	11	100.0%	0.0%	42. Slickhead Unid.	1	1	100.0%	0.0%
19. Pacific Sleeper Shark	8	8	100.0%	2.3%	43. Swell Shark	0	1	5.8%	0.0%
20. Brown Smoothhound Shark	2	7	26.5%	13.7%	44. Fantail Sole	0	1	0.0%	18.3%
21. King of the Salmon	6	6	100.0%	44.6%	45. Pacific Black Dogfish	1	1	100.0%	0.0%
22. Snailfish Unid.	5	5	99.2%	0.3%	46. Longnose Lancetfish	1	1	100.0%	64.8%
23. Walleye Pollock	4	4	100.0%	96.2%	47. Sixgill Shark	0	1	75.6%	0.0%
24. California Grenadier	4	4	100.0%	0.0%					

Source: Table 1 in Agenda Item G.8.b, GMT Report 2, September 2013.

Table 4-35. Average catch estimates for the FMP species flagged for initial consideration by the GMT.

	catch (mt)				catch (mt)				catch (mt)		
Species	**avg.**	**max**	**retain. %**	**Species**	**avg.**	**max**	**retain. %**	**Species**	**avg.**	**max**	**retain. %**
1. Spotted Ratfish	146	228	0.2%	*26.* Grass Rockfish	19	23	99.4%	*51.* Rosethorn Rockfish	4	5	23.4%
2. Pacific Ocean Perch Rockfish	135	179	68.9%	*27.* Starry Flounder	17	24	79.6%	*52.* Yellowmouth Rockfish	4	10	53.6%
3. Pacific Grenadier	131	212	0.0%	*28.* Greenstriped Rockfish	15	25	29.2%	*53.* Redstripe Rockfish	4	11	89.1%
4. Blackgill Rockfish	120	164	95.8%	*29.* Quillback Rockfish	15	20	96.6%	*54.* Squarespot Rockfish	3	6	94.0%
5. Blue Rockfish	120	192	91.8%	*30.* Greenspotted Rockfish	15	19	95.1%	*55.* Tiger Rockfish	1	1	96.3%
6. Cabezon	101	128	98.4%	*31.* California Skate	14	18	0.6%	*56.* Butter Sole	1	2	8.1%
7. Big Skate	95	170	1.7%	*32.* Finescale codling/Pacific Flatnose	13	19	0.0%	*57.* Nearshore Rockfish Unid.	1	3	100.0%
8. Brown Rockfish	90	116	97.8%	*33.* Stripetail Rockfish	12	15	0.7%	*58.* Halfbanded Rockfish	1	2	61.2%
9. Gopher Rockfish	85	120	96.7%	*34.* Slope Rockfish Unid.	12	21	100.0%	*59.* Greenblotched Rockfish	1	1	98.8%
10. California Scorpionfish	76	104	90.2%	*35.* Silvergray Rockfish	11	44	17.5%	*60.* Blackspotted Rockfish	1	1	100.0%
11. Bocaccio Rockfish	73	115	77.8%	*36.* Shortraker/Rougheye Unid.	10	34	0.3%	*61.* Cowcod Rockfish	1	1	17.3%
12. Copper Rockfish	69	80	94.4%	*37.* Yelloweye Rockfish	9	12	13.6%	*62.* Calico Rockfish	1	2	17.5%
13. Aurora Rockfish	50	68	51.0%	*38.* Treefish Rockfish	8	14	94.0%	*63.* Mexican Rockfish	0	0	100.0%
14. Sand Sole	49	85	94.5%	*39.* Kelp Rockfish	8	18	96.4%	*64.* Chameleon Rockfish	0	0	99.4%
15. Bank Rockfish	47	93	99.7%	*40.* Soupfin Shark*	8	18	91.9%	*65.* Pinkrose Rockfish	0	0	100.0%
16. Kelp Greenling	43	56	97.1%	*41.* Sharpchin Rockfish	8	12	15.0%	*66.* Pygmy Rockfish	0	0	0.3%
17. Canary Rockfish	42	52	36.4%	*42.* Shelf Rockfish Unid.	7	21	100.0%	*67.* Bronzespotted Rockfish	0	0	78.2%
18. Redbanded Rockfish	36	40	76.9%	*43.* Flag Rockfish	7	9	92.0%	*68.* Swordspine Rockfish	0	0	40.2%
19. Leopard Shark	35	38	81.4%	*44.* Rock Sole	6	8	80.8%	*69.* Freckled Rockfish	0	0	100.0%
20. Shortraker Rockfish	32	35	69.7%	*45.* Shortbelly Rockfish	6	11	2.9%	*70.* Spotted Rockfish Unid.	0	0	0.0%
21. China Rockfish	32	35	92.1%	*46.* Rosy Rockfish	6	7	83.3%	*71.* Dusky Rockfish	0	0	0.0%
22. Olive Rockfish	32	54	94.2%	*47.* Flathead Sole	6	11	36.2%	*72.* Harlequin Rockfish	0	0	43.0%
23. Rockfish Unid.	29	69	7.7%	*48.* Speckled Rockfish	5	8	94.7%	*73.* Pink Rockfish	0	0	100.0%
24. Starry Rockfish	24	30	91.1%	*49.* Honeycomb Rockfish	5	10	85.2%	*74.* Dwarf Red Rockfish	0	0	#N/A
25. Black And Yellow Rockfish	23	32	99.0%	*50.* Curlfin Sole/Turbot	5	10	17.9%				

Source: Table 2 in September's Agenda Item G.8.b, GMT Report 2, September 2013.
*Note: Only 15.6% of the catch of Soupfin Shark comes in the FMP's commercial and recreational sectors. The remainder is taken in the California Halibut and other non-FMP sectors.

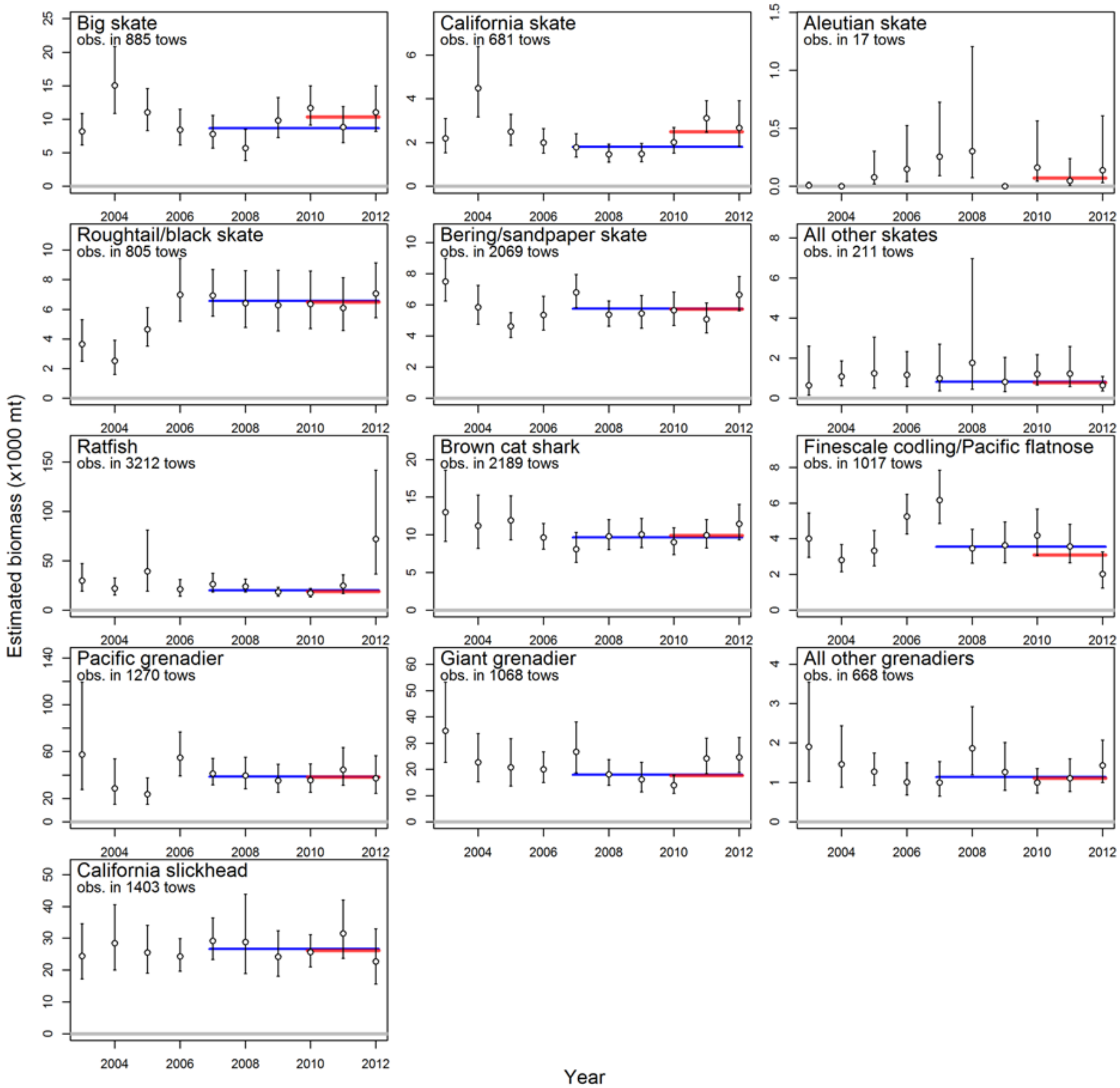


Figure 4-24. Time series of estimated survey biomass for species included in Agenda Item H.6.a, Supplemental Attachment 6, November 2013.

The time period covers 2003 to 2012, with estimated 95 percent confidence intervals. Horizontal lines indicate weighted average value over the most recent 6-year and 3-year periods. No 6-year average for Aleutian skate is reported because they were not encountered in the 2009 survey. Number of observations refers to total number of tows that included the species out of 6,453 tows for this 10-year period.

4.1.7 Summary of Biological Impacts by Alternative in Comparison to No Action

Relative to overfished species, the current harvest rates in rebuilding plans would be maintained. The best available information indicates that all overfished species are rebuilding consistent with trajectories from current rebuilding plans, with the exception of cowcod. The results of the 2013 assessment and rebuilding analysis for cowcod indicate that the stock is rebuilding ahead schedule. Therefore, the T_{TARGET} is proposed to be revised from 2068 to 2020. The 4 mt ACL under the No Action Alternative would have comparable impacts to the 10 mt ACL, with a 4 mt ACT under the Preferred Alternative. However, the Preferred Alternative would allow for much needed research to inform stock assessments. With only trawl observer data, there is little information to inform assessments. The cowcod rebuilding plan prohibits harvest in all fisheries and closes the primary habitats where adult cowcod are known to occur. Although CCAs seem to be effective at minimizing fishing mortality over offshore rocky habitat in the southern California bight, little fishery-dependent data are available to inform stock assessments.

Differences in harvest control rules used to establish ABCs and ACLs for seven stocks under the three action alternatives (Preferred Alternative, Alternative 1 and Alternative 2) for setting 2015-2016 harvest specifications would result in the following biological impacts relative to the No Action Alternative:

> The Dover sole constant catch ACL would increase from 25,000 mt to 50,000 mt. Adult Dover sole are found in depths from 10 to 500 fm, with the greatest densities occurring from 110 to 270 fm coastwide. The estimated depletion in 2011 was 83.7 percent of unfished biomass, and the stock has a vulnerability score of 1.54, showing a low concern for overfishing. Given the productivity of the stock and constraints on fishing, assuming a 25,000 mt constant annual catch (No Action Alternative, Alternative 1, and Alternative 2), the stock would be projected to remain above the target B_{MSY} level in the next 10 years, even under the more pessimistic and less likely low state of nature in the assessment decision table. The higher ACL of 50,000 mt is projected to be sustainable in that the stock would not drop below $B_{25\%}$ under the base case model. Assuming future mortalities of the full OFL from 2013 to 2022, the stock biomass would decline, but the stock would remain above the target level of $B_{25\%}$ under the most likely base case model from the 2011 assessment. Dover sole is a trawl-dominant species managed using IFQs and a high rate of observer monitoring. The 2011 Dover sole assessment is data-rich, and the species is readily tracked in the NMFS trawl survey.
>
> Flatfish species found in deeper waters include Dover sole, flathead sole, and petrale sole. Dover sole have historically been caught with shortspine and longspine thornyheads and sablefish, making up the DTS fishery. Sablefish quota is needed to target Dover sole with trawl gear. Therefore, the projected catch would be affected by the sablefish allocation, which would increase slightly under the Preferred Alternative relative to the No Action Alternative. Other 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, Pacific hagfish, and a diverse complex of eelpouts (PFMC 2014). Dover sole is also found in the same habitats as stripetail, splitnose rockfish, greenstriped rockfish and occurs in catches with aurora rockfish (PFMC 2014). It is possible that the increased Dover sole ACL, if successfully accessed, could result in increased catch of co-occurring stocks.
>
> The ACLs for shortspine thornyhead stocks north and south of 34º27' N. latitude would remain proportions of the coastwide ABC; the ABC would be determined by using a P* value of 0.4 rather than 0.45 (No Action Alternative, Alternative 1). The shortspine thornyhead spawning stock biomass was estimated to be at 62.9 percent of its initial, unfished biomass in 2005, and the stock has a vulnerability score of 1.8, showing a medium concern for overfishing. Under the No Action Alternative and Alternative 1, if a sigma value of 0.36 were combined with a P* value of 0.45, it would result in a reduction of 4.0 percent from the OFL to the ABC. Under the Preferred Alternative, the application of a P* of 0.40 would result in an ABC that is a 17 percent

reduction from the OFL. The reduction would buffer against model and management uncertainty. The added precaution, compared to the use of a P* of 0.45, would reduce both the risk of overfishing the true OFL and the risk of the stock falling into an overfished status. Implementing Alternative 2 would result in a 38 percent reduction from the OFL.

Management uncertainty is low for shortspine thornyhead in the north, since most of the catch is in the trawl fishery, where full observer coverage is required. Management uncertainty is higher in the south where shortspine thornyhead are mostly targeted in the limited entry fixed gear fishery, which is observed at a 20 to 25 percent rate.

Spiny dogfish would be removed from the Other Fish complex and managed with its own ACL, which would be set equal to the ABC using a P* value of 0.4, and a new $F_{50\%\ FMSY}$ harvest rate would be applied. 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. The vulnerability score for the stock is 2.13, indicating a high concern for overfishing.

Removing spiny dogfish from the Other Fish Complex and managing it with its own specifications under the Preferred Alternative, Alternative 1, and Alternative 2 would provide more direct catch accounting and control than managing the stock within the Other Fish complex (No Action Alternative). Managing the stock with its own harvest specifications would reduce the risk of overfishing. Using more conservative F_{MSY} harvest rates for elasmobranchs (SPR = 50 percent) would buffer against uncertainty, even with the higher P* value proposed under the action alternatives. Spiny dogfish is a category 2 stock. When a sigma value of 0.72 is combined with a P* value of 0.40, it would result in a reduction of 17 percent from the OFL to the ABC (Preferred Alternative). This is in contrast to a 9 percent reduction with a P* of 0.45 under Alternative 1 and a 39 percent reduction under Alternative 2.

The constant catch ACL for widow rockfish would be increased from 1,500 mt (No Action Alternative, Alternative 1, and Alternative 2) to 2,000 mt (Preferred Alternative). A 2011 stock assessment indicated the spawning stock biomass of widow rockfish was at 51 percent of its unfished biomass at the start of 2011. However, there was considerable uncertainty regarding the new stock assessment's findings. Productivity and status of this stock are highly uncertain because the available biomass indices are not informative. A vulnerability score of 2.05 indicates a high concern for overfishing.

Attainment of widow rockfish since implementation of IFQ has ranged between 36 and 46 percent of the ACL. The estimated mortality has been well below the ACLs under all of the alternatives. Widow rockfish are found in depths from 13 to 200 fm, with the highest density of adults found from 55 to 160 fm north of N 37º N latitude. The trawl RCAs restrict bottom trawl access to much of the area with the greatest widow rockfish density. However, north of 40°10' N latitude midwater trawl is occurring throughout the EEZ after the start of the primary whiting season for the shorebased IFQ program. At night, adults form large schools off bottom where they can be targeted with midwater trawl. Widow rockfish co-occur with Pacific whiting, yellowtail rockfish, chilipepper rockfish, shortbelly rockfish, bocaccio, vermilion rockfish, and speckled rockfish and have been associated with canary rockfish (PFMC 2014). Management uncertainty is low since widow rockfish is a trawl-dominant species, as there is mandatory 100 percent observer coverage on all trawl fisheries. Incidental catch and at-sea discards are well documented in the trawl sector. The risk of overfishing widow rockfish is low.

The constant catch ACL for shortbelly rockfish would increase from 50 mt (No Action Alternative, Alternative 1, and Alternative 2) to 500 mt (Preferred Alternative). Shortbelly rockfish is a healthy and valuable forage species that is not targeted in any commercial or recreational fisheries, but that is taken incidentally. The PSA vulnerability score for shortbelly is 1.13, indicating a low concern of overfishing.

The shortbelly rockfish is one of the most abundant rockfish species in the California Current, and it is a key forage species for many piscivorous fish, birds, and marine mammals. Shortbelly rockfish are also important prey of Chinook salmon along the central California coast in late spring and summer (PFMC 2014). Shortbelly rockfish are found in depths from 50 to 175 fm with the greatest density of adults found in 50 to 155 fm south of S. 46º N latitude. The trawl RCAs restrict bottom trawl access to much of the area with the highest shortbelly rockfish density. North of 40°10' N latitude, however, midwater trawl occurs throughout the EEZ after the start of the primary whiting season for the shorebased IFQ program. Shortbelly have been caught incidentally, at times in large numbers, by trawlers targeting other semi-pelagic rockfish (usually chilipepper and widow rockfish). An increase of the shortbelly rockfish ACL from 50 to 500 mt is not expected to have any effect on the abundance of the stock itself, nor is it expected to measurably affect the availability of shortbelly rockfish to its many non-human predators. The 500 mt ACL is less than 10 percent of the ABC and is anticipated to continue to allow access to co-occurring species without overfishing shortbelly rockfish or jeopardizing its role in the ecosystem.

<u>For the Minor Nearshore Rockfish North complex, the 40-10 precautionary adjustment would be applied to determine the China rockfish contribution to the stock complex ACL (Preferred Alternative , Alternative 1, and Alternative 2)</u>. In 2013, a data-moderate stock assessment was prepared for China rockfish north, and the estimate of depletion was 33 percent of the unfished biomass, indicating that the stock is in the precautionary zone. China rockfish has one of the highest PSA vulnerability scores at 2.23, indicating a major concern relative to the risk of overfishing. The China rockfish north assessment used a CPUE index of the Oregon and northern California recreational fisheries that was derived from dockside intercept surveys from 1980 to 2003 and an Oregon onboard charter boat index from 2001 to 2012 as indices of abundance and assumed the population off Washington followed the same trends. Concerns were raised about the assumptions made for Washington. Under all of the alternatives, China rockfish would be managed within the Minor Nearshore Rockfish complex north for 2015-2016 without an HG. The Council expressed interest in conducting a full assessment of China rockfish with greater focus on modeling state-specific indices of abundance. Keeping China rockfish within the Minor Nearshore Rockfish complex until a better understanding of the status of the stock and an appropriate species-specific ACL could be attained was considered prudent. Under the action alternatives, the 40-10 adjustment would be applied to the China rockfish contribution.

Under the Preferred Alternative and Alternative 1, the ACL for the complex would be a 22 percent reduction from the OFL, in contrast to No Action Alternative, where the ACL would be a 6 percent reduction from the OFL. Alternative 2 is the most precautionary with an OFL to ACL reduction of 55 percent in 2015 and 53 percent in 2016. The decrease in the ACL for the complex is due to new assessments for brown, China, and copper rockfish, as well as a blue rockfish ACL contribution that is trending downwards. China rockfish are found in depths from 0 to 70 fm with the greatest density of adults found from 2 to 50 fm north of N 35º N latitude. China rockfish are an important species in the nearshore recreational and nearshore commercial fisheries. They are particularly valuable in the commercial live-fish fishery. The bulk of the harvest has occurred in nearshore recreational fisheries in all three states and nearshore commercial fisheries in California and Oregon. The average annual total catch from 2004 to 2012 is estimated to be 13.8 mt, which is higher than the stocks contribution to the OFL in 2015 under all of the alternatives. Although the complex ACL/OY attainment has been high (Table 4-134), reaching 100 percent in 2011, management measures have prevented the ACL from being exceeded.

> There is little observer coverage or data on at-sea discards for catch taken in the recreational fisheries and nearshore commercial fisheries. Therefore, the error in total catch mortality estimates is higher than for trawl dominant species. Overfishing concern could arise if catch allocated within the nearshore complex were shifted to vulnerable species. Under the action alternatives, state nearshore management plans and policies would mitigate these risks. In addition, state HGs and a Federal California HG for the area between 40°10 and 42° N. latitude under the Preferred Alternative would reduce the risk of exceeding the complex ACL. Under state management, most, if not all, landed component species within the Minor Nearshore Rockfish complex must be sorted to species. For 2015-2016, the states will take an active, coordinated role in managing these stocks. Because the state may also take inseason action independent of NMFS, the Preferred Alternative would not be expected to result in overfishing of the complex OFL.
>
> <u>The Other Fish complex ACL would be equal to the complex ABC set equal 0.45 consistent with the removal of many species from the complex, including spiny dogfish</u>. The Preferred Alternative for a restructured Other Fish complex would be more consistent with National Standard 1 guidelines compared to the No Action Alternative structure because stocks with similar vulnerabilities to overfishing, distributions, and fishery interactions would be managed within one complex. The Other Fish complex under the Preferred Alternative would be composed of shallow-water species that are primarily caught within 3 miles of shore, in state waters.

The Preferred Alternative of removing the existing FMP species recommended for an EC designation from the Other Fish complex would also reduce the risks to the other species left in the complex. This is because some of the recommended EC species were effectively inflator stocks to the complex with relatively larger OFL contributions that increased the risk of overfishing more vulnerable stocks managed in the complex.

Relative to the remaining stocks, the risk of overfishing under the Preferred Alternative would be similar to the No Action Alternative. Alternative 1 would also be similar with a slightly higher risk for species such as sablefish, whereas the Preferred Alternative and the No Action Alternative would add precautions (P*=.40). Sablefish is a valuable stock with high rates of attainment. Alternative 2 would have the most conservative harvest rates and the most reduced risk of overfishing. However, for stocks and stock complexes where the attainment has been relatively low (Tables 4-135 and Table 4-136), the harvest rates under Alternative 2 would have a similar effect relative to the risk of overfishing as the other alternatives. Stocks and stock complexes that have exceeded 90 percent of the ACL in recent years include cabezon off Oregon, California scorpionfish, Pacific Whiting, Sablefish, Shortspine thornyhead north, and Minor Nearshore Rockfish North.

4.2 Impacts of 2015-2016 Management Measures on Groundfish Stocks

This section describes how management measures function so that groundfish catch may achieve, but not exceed, ACLs. This constitutes the impact mechanism linking harvest specifications to the direct and indirect biological impacts on groundfish stocks. The principal impact would be the level of fishing mortality and, secondarily, changes in stock structure due to age-specific mortality patterns. Harvest specifications are determined based on the Groundfish FMP framework to achieve optimum yield.

The section is organized by integrated alternative and by fishery sector within each alternative. The integrated alternatives incorporate the preferred options for stock complexes. The first management measure step is to determine set-asides deducted from ACLs to account for various fishing activities and allocate the resulting fishery HGs. Management measures are then developed based on catch projections so that fishing mortality does not exceed allocations and the overall ACLs. Subsequent sections evaluate how management measures applied to groundfish fishery sectors are projected to prevent allocations and the overall ACLs from being exceeded.

4.2.1 No Action

4.2.1.1 Deductions from the ACL and Allocations

Deductions from most groundfish ACLs, called off-the-top deductions, are made to account for groundfish mortality in the Pacific Coast treaty Indian tribal fisheries, scientific research, non-groundfish target fisheries (hereinafter incidental open access fisheries), and, as necessary, EFPs. Off-the-top deductions 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. Sufficient yield set-aside must be available to accommodate the anticipated groundfish mortality from the aforementioned activities. Deductions from the ACL to account for these activities are important accountability measures that increase the probability that catches will remain at or below the ACLs.

Amounts deducted from the ACL to accommodate groundfish mortality from scientific research, incidental open access fisheries, and EFPs can be modified based on the best available information. The amount estimated to go unharvested could be reapportioned back to the groundfish fishery according to sector needs. The process to reapportion is structured to be done through an inseason action published in the *Federal Register* following a Council meeting. At a Council meeting, the Council would review set-asides and recommend full reapportionment, partial reappointment, or no reapportionment, based on consideration of the allocation framework criteria outlined in the FMP, the FMP objectives, and managing the risk of exceeding an ACL. The specified amount of groundfish would be reapportioned in proportion to the original allocations for the calendar year, modified to account for Council recommendations with respect to sector needs. Reapportionment would be based on best available information, but would most likely occur later in the year after the September or November Council meetings.

Table 4-36 details the deductions from the ACLs for the No Action Alternative. The following paragraphs describe how off-the-top deductions were calculated under No Action. Table 4-37 details the allocations analyzed under the No Action Alternative. Table 4-38 also details the deductions from the ACLs for the No Action Alternative.

<u>Tribal Fishery</u>: Tribal fisheries consist of trawl (bottom, midwater, and whiting), fixed gear, and troll. The requested tribal amounts are based on those in the April 17, 2014, regulations.

<u>Research</u>: Research activities include the NMFS trawl survey, International Pacific Halibut Commission longline survey, and other Federal and state research. The Council approach is that off-the-top deductions should be equal to the maximum historical scientific research catch from 2005 to 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 catch 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 to 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). If data are available to determine that a set-aside has been exceeded during the fishing year, it would be evaluated by the Council and NMFS. Adjustments could be made to prevent an ACL, ABC, or OFL from being exceeded, as has been done in previous years.

Incidental Open Access: Deductions from ACLs are made to account for groundfish mortality in the incidental open access fisheries. The off-the-top deductions for all species, except longnose skate, were derived from the maximum historical values in the 2007 to 2011 WCGOP Groundfish Mortality reports (see http://tinyurl.com/nv3pddm). The recommended set-aside for longnose skate was based on data from the 2009 to 2011 WCGOP Groundfish Mortality reports, the years in which longnose skate were reported separately from the Other Fish category.

Exempted Fishing Permits: The Council recommended three EFPs and associated off-the-top deductions for 2013-2014 cycle, which would remain in place under the No Action Alternative. The first EFP seeks to test the effectiveness of trolled longline gear to harvest chilipepper rockfish selectively 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 harvest midwater species selectively 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 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 off-the-top deductions 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.

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 to 2011 (Table 4-37).

Table 4-36. No Action Alternative. Estimates of tribal, EFP, research (Res.), and incidental OA groundfish mortality in metric tons, used to calculate the fishery HG 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. lat.	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	2,418.0
POP	N of 40º10' N. lat.	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	2,041.0	0.0	16.4	30.0	3,670.6
Black rockfish	N of 46º16' N. lat.	409	14.0	0.0	0.0	0.0	395.0
Black rockfish	S of 46º16' N. lat.	1,000	0.0	0.0	0.0	0.0	1,000.0
Cabezon	46º16' to 42º N. lat.	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. lat.	117	0.0	0.0	0.0	2.0	115.0
Chilipepper	S of 40º10' N. lat.	1,647	0.0	210.0	9.0	5.0	1,423.0
Dover sole	Coastwide	25,000	1497.0	0.0	38.0	55.0	23,410.0
English sole	Coastwide	5,646	91.0	0.0	5.0	7.0	5,543.0
Lingcod	N of 40º10' N. lat.	2,878	250.0	0.0	11.7	16.0	2,600.3
Lingcod	S of 40º10' N. lat.	1,063	0.0	2.0	0.0	7.0	1,054.0
Longnose skate	Coastwide	2,000	56.0	0.0	13.2	3.0	1,927.8
Longspine thornyhead	N of 34º27' N. lat.	1,958	30.0	0.0	13.0	3.0	1,912.0
Longspine thornyhead	S of 34º27' N. lat.	347	0.0	0.0	1.0	2.0	344.0
Pacific cod	Coastwide	1,600	400.0	0.0	7.0	2.0	1,191.0
Pacific whiting [a/]	Coastwide	269,745	63,205	0.0	2,500		204,040
Sablefish	N of 36º N. lat.	4,349	See Table 4-37				
Sablefish	S of 36º N. lat.	1,560	0.0	0.0	3.0	2.0	1,555.0
Shortbelly	Coastwide	50	0.0	0.0	2.0	0.0	48.0
Shortspine thornyhead	N of 34º27' N. lat.	1,525	50.0	0.0	7.2	2.0	1,465.8
Shortspine thornyhead	S of 34º27' N. lat.	393	0.0	0.0	1.0	41.0	351.0
Splitnose	S of 40º10' N. lat.	1,670	0.0	3.0	9.0	0.0	1,658.0
Starry flounder	Coastwide	1,528	2.0	0.0	0.0	5.0	1,521.0
Widow	Coastwide	1,500	60.0	18.0	7.9	3.3	1,410.8
Yellowtail	N of 40º10' N. lat.	4,382	677.0	10.0	11.5	3.0	3,680.5
Nearshore Rockfish north	N of 40º10' N. lat.	94	0.0	0.0	0.0	0.0	94.0
Nearshore Rockfish south	S of 40º10' N. lat.	990	0.0	0.0	0.0	0.0	990.0
Shelf Rockfish north	N of 40º10' N. lat.	968	30.0	3.0	6.2	26.0	902.8
Shelf Rockfish south	S of 40º10' N. lat.	714	0.0	31.0	6.0	9.0	668.0
Slope Rockfish north	N of 40º10' N. lat.	1,160	36.0	1.0	6.0	19.0	1098.0
Slope Rockfish south	S of 40º10' N. lat.	622	0.0	2.0	2.0	17.0	601.0
Other Fish	Coastwide	4,697	111.8	3.0	12.5	49.5	4,520.2
Other Flatfish	Coastwide	4,884	60.0	0.0	17.0	125.0	4,682.0

[a/] The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-37. No Action Alternative. Stock specific fishery HGs or ACTs and allocations for 2015-2016 (in mt).

Stock	Area	Fishery HG	Allocation Type	Trawl %	Trawl Mt	Non-trawl %	Non-trawl 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 40º10' N. lat.	2,600.3	Amendment 21	45%	1,170.1	55%	1,430.2
Lingcod	S of 40º10' 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 [a/]	Coastwide	204,040	Amendment 21	100%	204,040	0%	
Sablefish	N of 36º N. lat.		See Table 4-37				
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
Minor Nearshore Rockfish north	N of 40º10' N. lat.	94.0	None				
Minor Nearshore Rockfish south	S of 40º10' N. lat.	990.0	None				
Minor Shelf Rockfish north	N of 40º10' N. lat.	902.8	Biennial	60.2%	543.5	39.8%	359.3
Minor Shelf Rockfish south	S of 40º10' N. lat.	668.0	Biennial	12.2%	81.5	87.8%	586.5
Minor Slope Rockfish north	N of 40º10' N. lat.	1,098.0	Amendment 21	81%	889.4	19%	208.6
Minor Slope Rockfish south	S of 40º10' N. lat.	601.0	Amendment 21	63%	378.6	37%	222.4
Other Fish	Coastwide	4,520.2	None				
Other Flatfish	Coastwide	4,682.0	Amendment 21	90%	4,213.8	10%	468.2

[a/] The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-38. No Action. Estimates of tribal, research, recreational (Rec) 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.

4.2.1.2 Harvest Guidelines

Accountability measures that increase the likelihood that total catch stays within the ACL include HGs, which are a specified numerical harvest objective that is not a quota. Attainment of an HG does not require closure of a fishery.

Black Rockfish (Oregon and California)

HGs are recommended for the southern component of the black rockfish stock with 58 percent to Oregon (579 mt) and 42 percent to California (420 mt) in 2014. This allocation scheme is based on recent year landings, consistent with allocations that have been in place since 2004. Both states further allocate black rockfish between commercial and recreational nearshore fisheries; however, those allocations are not implemented in Federal regulations.

Blackgill South of 40°10' N. Latitude

Blackgill rockfish a component stock that is managed within the Slope Rockfish complexes north and south of 40°10' N. latitude. In the south, blackgill rockfish is a precautionary zone stock that is subject to trawl/non-trawl allocations implemented under Amendment 21 (63 percent to trawl and 37 percent to non-trawl). To reduce the risk of blackgill rockfish becoming overfished, a sorting requirement to improve inseason tracking and an HG were implemented for the area south of 40°10' N. latitude. The 110-mt HG was derived by taking the stock's contribution to the complex ABC and applying the 40-10 harvest policy. For management of the fishery, the Council provided guidance that the commercial non-trawl apportionment of blackgill rockfish should be 60 percent to limited entry (27 mt) and 40 percent to open access fixed gears (18 mt). This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005 to 2010 (Table 3 in Agenda Item E.9.b, GMT Report 2, November 2011).

Blue Rockfish South of 42° N. Latitude

Since 2009, blue rockfish south of 42° N. latitude has been managed with an HG to prevent overfishing blue rockfish, which is in the precautionary zone (below B_{MSY}). Blue rockfish is part of the minor Nearshore Rockfish north and south complexes. The harvest guideline for the area south of 42° N. latitude is the stock's contribution of blue to the Minor Nearshore Rockfish complex south ABC adjusted by the 40-10 harvest policy combined with the contribution for the unassessed portion south of Point Conception added to the stock's contribution to the Minor Nearshore Rockfish complex north ABC adjusted by the 40-10 harvest policy for the area between 40°10' N. latitude 42° N. latitude. In 2014, there is a 236 mt HG for blue rockfish south of 42° N. latitude. The OFLs were derived from the 2007 assessment (Key et al. 2008), which was conducted for the portion of the stock in waters off California north of Point Conception at 34º27' N. latitude, plus the contribution for the unassessed area south of Point Conception. The ABCs were derived using a P* of 0.45 for category 2 stocks, which was then adjusted using the 40-10 default harvest policy, as specified in the FMP for species in the precautionary zone. The HG contribution for the unassessed portion of the stock south of Point Conception was calculated by first estimating an OFL using the depletion-corrected average catch (DCAC) methodology and then applying an ABC adjustment (using a P* of 0.45 for a category 3 stock). The HG contribution for the unassessed area was set equal to the ABC, since the stock is assumed to be above B_{MSY}. As described above, the 2014 blue rockfish HG contributions for the assessed and unassessed areas are then summed to determine the HG.

4.2.1.3 Shorebased IFQ – No Action Alternative

The shorebased IFQ fishery is described in Section 3.2.2.2. Principle management measures for the shorebased IFQ fishery include the following:

- Catch Controls: IFQ and 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 the No Action Alternative can be found in Table 4-39. 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.
- Carryover provision: The carryover 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 carryover 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 carryover provision may be modified during the biennial specifications and management measures process or based on a Council inseason recommendation, pending NMFS' approval.
- Monitoring and Reporting: All trips in the shorebased IFQ fishery are monitored at sea by the 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 non-trawl 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 non-trawl gears.

Table 4-39. No Action Alternative – Shorebased IFQ. Projected mortality for IFQ species and Pacific halibut compared to the allocations or set-asides under the No Action Alternative(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/]	
		Projected Mortality (mt)	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.	227	1,152	283	365
Lingcod	South of 40°10' N. lat.	84	474	7	16
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 multiyear 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)), there is 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.

- RCAs: Vessels harvesting IFQ must abide by RCA closures, which are specified by gear type (Tables 4-41 and 4-42). For example, vessels fishing with legal groundfish non-trawl 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.
- Bycatch Reduction Areas (BRAs): Bycatch on Pacific whiting trips can be mitigated by implementing BRAs. These area restrictions apply to vessels on Pacific whiting trips using midwater gear during the primary whiting season, and they 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 on Pacific whiting trips can be mitigated by implementing the ocean salmon conservation zones. These zones apply to vessels targeting on Pacific whiting trips using midwater gear during the primary whiting season and restrict fishing to depths seaward of 100 fm.
- Other GCAs: Several other GCAs exist and provide overfished species and habitat protection. Though limited bottom trawling occurs 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-Figure 4-25). 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 4-25). South Coast Area A is a voluntary "area to be avoided" for commercial groundfish fisheries.

Impact (Groundfish Mortality)

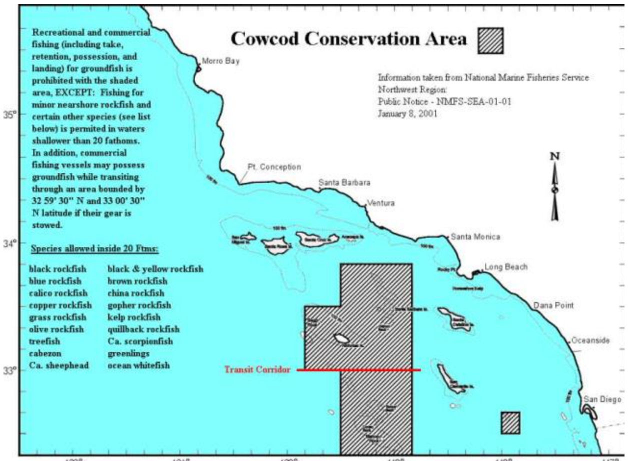
The projected groundfish mortality for IFQ species under the No Action Alternative, as a result of implementing the above mentioned management measures, can be found in Table 4-39. Additionally, Table 4-39 includes mortality estimates for 2011 and 2012 for comparison. Groundfish mortality of non-IFQ species is not projected using a model; however, historical data from 2011 and 2012 are provided for comparison (Table 4-40).

4.2.1.4 At-sea Whiting Co-ops – No Action Alternative

The at-sea sector is composed of CPs and motherships that target Pacific whiting with midwater trawl gear and process at sea. Management measures include allocations for Pacific whiting, canary rockfish, darkblotched rockfish, POP, and widow rockfish, as well as set-asides for bycatch species. Further, measures are established that restrict the Pacific whiting season dates and provide for BRAs and ocean salmon conservation zones (see Section 4.2.1.2 for more detail).

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 provides 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 CP 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, under the trawl rationalization program, a CP permit endorsement is required, which essentially closes this sector to new entrants; this move is intended to lend greater stability to the functioning of the current, voluntary co-op. The requirement for a co-op permit and a regulatory provision that would result in distribution of IFQ in the absence of a CP coop are also changes under trawl rationalization. Regulations at 660.160 outline the CP co-op provisions.

a.



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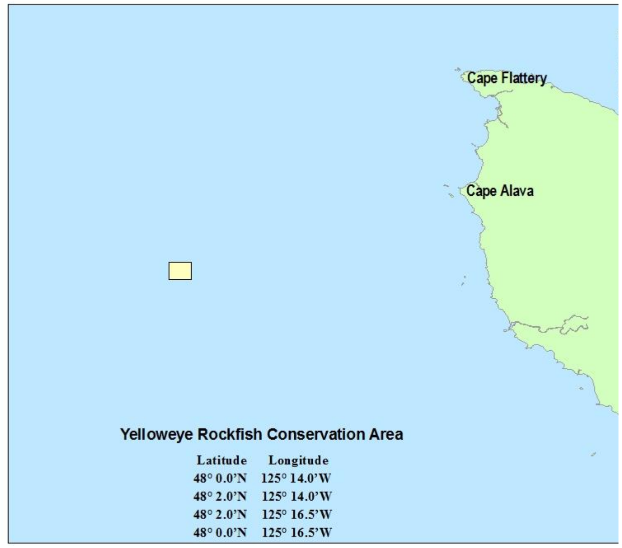

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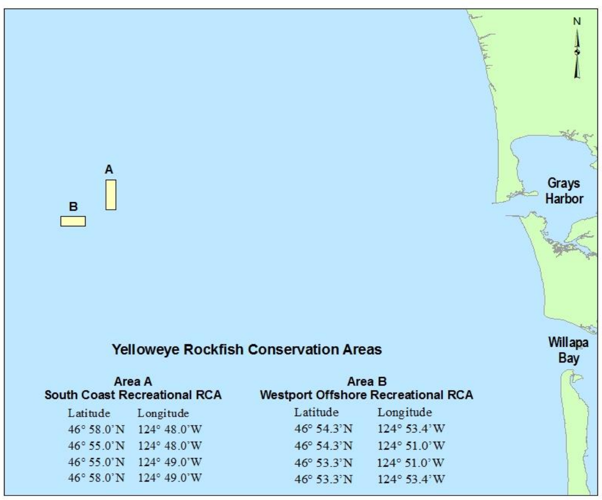


Figure 4-25. No Action Alternative – Selected GCAs.

a. The current Cowcod Conservation Areas located in the Southern California Bight; b. North Coast Area B, a Yelloweye Rockfish Conservation Area in northern Washington; c. South Coast Areas A and B, Yelloweye Rockfish Conservation Areas in southern Washington. South Coast Area A is an area to be avoided voluntarily.

Table 4-40. Groundfish mortality for non-IFQ Stock in the shorebased IFQ fishery (mt).

Stock	2011	2012
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

Table 4-41. Trawl RCA configuration in regulation as of April 17, 2014.

Area	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
North of 48°10' N. lat.	shore – modified/ 200 fm line	shore – 200 fm line	shore – 150 fm line		shore – 200 fm line	shore – modified 200 fm line
48°10' N. lat. – 45°46' N. lat.	100 fm line – 150 fm line					
45°46' N. lat. – 40°10' N. lat.	100 fm line – modified 200 fm line	100 fm line – 200 fm line				100 fm line – modified 200 fm line
South of 40°10' N. lat.	100 fm line – 150 fm line					

Table 4-42. Non-trawl RCA configuration in regulation as of April 17, 2014.

Area	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
North of 46°16' N. lat.	shoreline – 100 fm line					
46°16' N. lat. – 42°00' N. lat.	30 fm line – 100 fm line					
42°00' N. lat. – 40°10' N. lat.	20 fm depth contour – 100 fm line/					
40°10' N. lat. – 34°27' N. lat.	30 fm line – 150 fm line					
South of 34°27' N. lat.	60 fm line – 150 fm line					

Impact (Groundfish Mortality)

Under the No Action Alternative, 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 4-43 and Table 4-44). 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 allocations.

Table 4-43. No Action Alternative – At-sea. Allocations for the CP and mothership sectors under the No Action Alternative for 2015-2016 (values in regulation on April 17, 2014). Historical mortality for 2011 and 2012 by sector is provided (right panel) for reference.

No Action Alternative 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 4-44. No Action Alternative – At-sea. At-sea whiting set-asides and allocations under the No Action Alternative (values in regulation as of April 17, 2014). Historical mortality for the CP and mothership sectors 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
Yelloweye	Coastwide	0	0	0	0
Arrowtooth flounder	Coastwide	20	45	41	21
Dover sole	Coastwide	5	1	0.3	1
English sole	Coastwide	5	0	0	0
Lingcod	N of 40º10' N. lat.	15	0.2	0.2	2
Longnose skate	Coastwide	5	0.4	0.1	0.4
Longspine thornyhead	N of 34º27' N. lat.	5	0.4	0	0.3
Pacific cod	Coastwide	5	0	0	0
Pacific halibut [b/]	Coastwide	10	0.6	0.6	2
Sablefish	N of 36º N. lat.	50	5	5.1	8
Shortspine thornyhead	N of 34º27' N. lat.	20	13	1.7	8
Starry flounder	Coastwide	5	0	0	0
Yellowtail	N of 40º10' N. lat.	300	81	43	167
Shelf Rockfish north	N of 40º10' N. lat.	35	1	1	1
Slope Rockfish north	N of 40º10' N. lat.	100	91	75	63
Other Fish	Coastwide	520	726	178	322
Other Flatfish	Coastwide	20	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).

4.2.1.5 Limited Entry and Open Access Fixed Gear Management – No Action Alternative

Limited entry and open access fixed gear sectors are described in Section 3.2.2.3 and Section 3.2.2.4. Catch controls for both the incidental and directed open access fishery include trip limits and the non-trawl RCA. Table 4-45 and Table 4-46 summarize the principle management measures for the limited entry and open access fixed gear vessels. The sablefish stock is the primary target (in volume) for both the limited entry and open access fixed gear sectors. A variety of nearshore species (e.g., black rockfish, Minor Nearshore Rockfish complex, cabezon, lingcod, and kelp greenling) are targeted by a large number of vessels, but in relatively low volume.

Table 4-47 and Table 4-48 summarize the FMP allocations of sablefish for limited entry and open access north of 36° N. latitude under the No Action Alternative. 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. Trip limits intended to attain the allocations under the No Action Alternative can be found in Table 4-49 and Table 4-50.

Although blackgill rockfish south of 40°10 N. latitude was assessed in 2011, species-specific OFLs, ABCs, or ACLs have not been used to manage the stock. Blackgill rockfish continue to be managed within the Slope Rockfish complex south of 40°10' N. latitude, a complex subject to an Amendment 21 allocation (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 implemented a 110-mt HG in 2014. With an HG, landings and discards in the IFQ fishery count against slope rockfish quota pounds. The sorting requirement allows blackgill landings to be verified by catch monitors and port biologists. Discards at sea are recorded by the observer at the species level. If mortality appears to be tracking higher than the HG, the Council has the ability, through routine measures, to reduce blackgill impacts by moving the seaward boundary of the RCA to deeper than 150 fm. An HG for the limited entry and open access fixed gear fisheries provides an effective means to keep catch within harvest specifications, but does not require closure if the HG is reached. Since these fisheries are currently managed under trip limits, the blackgill component of the aggregate slope rockfish trip limit could be reduced without greatly affecting other slope rockfish species. Further, the Council provided guidance that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry (27 mt) and 40 percent to open access fixed gears (18 mt). This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005–2010 (Table 3 in Agenda Item E.9.b, GMT Report 2, November 2011).

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, Cascade Head at 43° N. latitude, 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, while providing access to target species. Changes can also be accommodated to provide greater access to target species when overfished species mortality is projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm).

The non-trawl RCA seaward boundary south of 40°10' N. latitude under the No Action Alternative would be defined by management lines specified with waypoints at roughly 150 fathoms (fm) to avoid areas where bocaccio, canary, and yelloweye rockfish are most abundant.

Table 4-45. No Action Alternative – Limited Entry Fixed Gear. Summary of limited entry fixed gear fishery management measures under the No Action Alternative based on regulations as of April 17, 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 4-49 and Table 4-50. • Primary sablefish fishery managed with tier limits in Table 4-47. • 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. latitude, minimum size limit is 22 inches total length. • South of 42° N. latitude, minimum size limit is 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.
Non-trawl 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 non-trawl 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 4-46. No Action Alternative – Open Access. Summary of open access fishery management measures under the No Action Alternative based on regulations as of April 17, 2014.

Cumulative limits	• Cumulative trip limits for most species, specific to trawl type and geographic area (see 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. latitude 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. latitude). 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. latitude. • 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 non-trawl 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 non-trawl 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 4-47. No Action Alternative: Limited entry sablefish FMP allocations north of 36 N. latitude, based on values in regulation on April 17, 2014.

Sablefish Com. HG	Limited Entry Share	LEFG Share (mt)				Estimated Tier Limits (lbs)[a]		
		LEFG 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 4-48. No Action Alternative: Open access FMP allocations north of 36 N. latitude, based on values in regulation on April 17, 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 4-49. No Action Alternative. Sablefish trip limits north of 36° N. latitude for limited entry and open access fixed gears based on regulations as of April 17, 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					

Table 4-50. No Action Alternative. Sablefish trip limits south of 36° N. latitude for limited entry and open access fixed gears based on regulations as of April 17, 2014.

Fishery	Jan-Feb	Mar-Apr	May-Jun	July-Aug	Sept-Oct	Nov-Dec
Limited Entry	2,000 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					

Other GCAs include the North Coast Area B Yelloweye Rockfish Conservation Area (YRCA) in Washington, which has been closed to limited entry and open access fixed gears since 2007 (Figure 4-26). Additionally, the South Coast Area A and Area B YRCAs and the "C-shaped" YRCA in waters off northern Washington are voluntary "areas to be avoided." Fishing would not be allowed in the CCAs 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 they inform management measures stratified by area of fishing shoreward (nearshore) or seaward (non-nearshore) of the non-trawl RCA (see Appendix A). Therefore, the estimates of groundfish mortality under the No Action Alternative and the action alternatives are presented using the same strata.

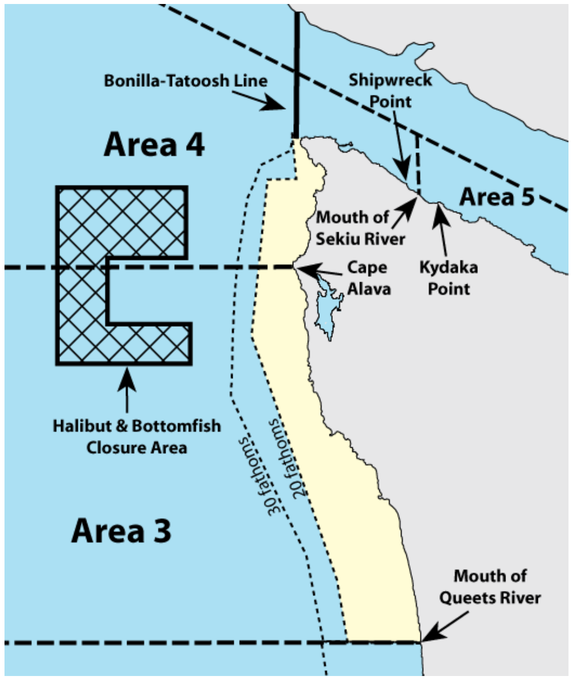


Figure 4-26. No Action Alternative. The current "C-shaped" Yelloweye Rockfish Conservation Area in waters off northern Washington where recreational groundfish and Pacific halibut fishing are prohibited.

Impact (Groundfish Mortality) – Non-nearshore North of 36° N. Latitude

The non-nearshore model projects the 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 non-trawl 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.

Interactions with overfished species, primarily yelloweye rockfish and canary rockfish, require adjustments to management measures in the non-nearshore fisheries. Seaward adjustments of the non-trawl RCA boundary are the main management measure for reducing catches of these two stocks. Changes to the shoreward boundary (e.g., changing from 150 to 100 fm) can also be accommodated to provide greater access to target species when overfished species mortality is projected to be within the non-nearshore share or non-trawl allocation.

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under the No Action Alternative are largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40, and the resulting sablefish allocations. Current trip limits would be routinely adjusted to achieve the limited entry and open access sablefish allocations. Trip limits for other species (e.g., slope rockfish, shelf rockfish, etc.) may also be adjusted to attain the ACL or achieve other conservation goals.

The overfished species mortality, as a result of harvesting the sablefish allocations, was evaluated using 2002 to 2011 WCGOP data in the non-nearshore model. Under the No Action Alternative, 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. Routine adjustments of the seaward non-trawl RCA would occur if the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation (Table 4-51). RCA changes could also be accommodated to provide greater access to target species when overfished species mortality is projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm). Table 4-52 contains the projected mortality of groundfish for the non-nearshore fishery.

Table 4-51. No Action Alternative – Non-nearshore fishery: Overfished species shares for the non-nearshore fixed gear fishery under the No Action Alternative (mt), based on the Preferred Alternative for 2014 in the 2013-2014 FEIS.

Stock	Area	Total Projected OFS Mortality 2015-2016 (mt)	Shares 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. lat.	0.2		6.8
Petrale	Coastwide	0.3		35.0
Yelloweye	Coastwide	0.4	1.1/1.1	11.2

Table 4-52. No Action Alternative. Projected groundfish mortality for the limited entry and open access fixed gear fisheries north of 36° N. latitude (in mt) compared to the non-trawl allocation.

Stock	Limited Entry (mt)	Open Access (mt)	Total (mt)	Non-trawl Allocation[a/] (mt)
Arrowtooth flounder	40	6	46	183.5
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	355.8
Dover sole	6	1	7	1,170.5
English sole	0	0	0	277.2
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	192.8
Longspine thornyhead (North Pt. Conception)	2	1	3	95.6
Mixed thornyheads	2	1	2	
Pacific cod	2	0	2	59.5
Pacific hake	0	0	1	
Redstripe rockfish (North of 40°10' N. lat.)	0	0	0	
Sharpchin rockfish	0	0	0	
Shortbelly rockfish	0	0	0	

Table 4-52 (continued). No Action Alternative. Projected groundfish mortality for the limited entry and open access fixed gear fisheries north of 36° N. latitude (in mt) compared to the non-trawl allocation.

Stock	Limited Entry (mt)	Open Access (mt)	Total (mt)	Non-trawl Allocation[a/] (mt)
Shortspine thornyhead (North Pt. Conception)	18	5	22	73.3
Silvergrey rockfish (North of 40°10' N. lat.)	0	0	0	
Spiny dogfish	135	22	157	
Splitnose rockfish	0	0	0	82.9
Starry flounder	0	0	0	760.5
Unspecified skate	15	3	17	
Widow rockfish	0	0	0	127.0
Yellowmouth (North of 40°10' N. lat.)	0	0	0	
Yellowtail rockfish	0	0	1	441.7
Other Flatfish	0	0	0	468.2
Other groundfish	3	1	4	
Other Nearshore Rockfish	0	0	0	
Other Shelf Rockfish	2	0	3	
Other Slope Rockfish	92	17	108	

[a/] The non-trawl allocation includes the non-nearshore, nearshore, and recreational fisheries.

Impact (Groundfish Mortality) – Non-nearshore South of 36° N. Latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under the No Action Alternative would be largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40. Anticipated catch of sablefish south of 36° N latitude under the No Action Alternative would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears. The current trip limits would be routinely adjusted to achieve the limited entry and open access sablefish allocations. Trip limits for other species (e.g., slope rockfish, shelf rockfish, etc.) may also be adjusted to attain the ACL or achieve other conservation goals.

Under the No Action Alternative, 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. Routine adjustments of the non-trawl RCA would occur if the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation. Changes could also be accommodated to provide greater access to target species when overfished species mortality was projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm).

Impact (Groundfish Mortality) – Nearshore – No Action Alternative

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 non-trawl RCA coastwide. Most of the 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 quotas than those specified in Federal regulations exist for most nearshore species, and state trip limits apply in these cases. State trip limits are designed to stay within nearshore species quotas, 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 and others stratified south of 34°27' N. latitude.

In Oregon, two types of state limited entry permits are issued – black and blue rockfish permits with a nearshore endorsement and black and blue rockfish permits without a nearshore endorsement. Limited entry permit holders without a nearshore endorsement may land commercial quantities of black and blue rockfish under state cumulative trip limits (currently 2-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 combined cumulative landing of black and blue rockfish 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-Figure 4-26) in depths shallower than 20 fm under the No Action Alternative. Only southern 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 limits and state quotas (or harvest guidelines) for nearshore species that limit target species landings in the commercial nearshore fishery (Table 4-50). There is a 236 mt Federal HG for blue rockfish south of 42° N. latitude within the Minor Nearshore Rockfish Complex for both commercial and recreational fisheries. State HGs between recreational and commercial fisheries may be adjusted by each state between or within years, so are not displayed herein. State HGs for each sector are established to ensure that the non-trawl allocation provided to each state is not exceeded while providing fishing opportunities for both sectors. The nearshore fishery is also managed to stay within the nearshore share for overfished species or the overall non-trawl overfished species allocations. Trawl, non-trawl, and within non-trawl allocations for overfished species, which were established in the 2013-2014 biennium, would be implemented under the No Action Alternative. Under the No Action Alternative, catch of canary rockfish in California would exceed the catch sharing agreement with Oregon (Table 4-53), 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 were expected to exceed the non-trawl allocation, routine adjustments of the shoreward non-trawl RCA or reduced trip limits for nearshore species could occur. RCA changes could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the nearshore share or non-trawl allocation (e.g., changing from 20 to 30 fm).

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 4-54 and 4-55), which is lower than most of the state quotas. Nearshore fishery landings are influenced by a variety of factors, including weather and market, and can vary annually. As such, there is substantial uncertainty surrounding the estimated landings under the No Action Alternative and the action alternatives, which in turn may influence the projected overfished species mortality and socioeconomic analysis. If fishery performance were better than the 5-year average, mortality of groundfish species would be higher; however, the fishery would still be managed to ensure that combined commercial and recreational catches stayed within the non-trawl allocation.

Table 4-53. No Action Alternative. Nearshore species quotas between state and sector under the No Action Alternative.

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 limit through state regulation.

[b/] The blue rockfish Federal HG was set equal to the 40:10 adjusted ABC for blue rockfish for the area between 42° N. latitude and 34°27' N. latitude area, plus the stock's contribution for the unassessed area. The trawl and non-trawl fisheries are managed to the HG; there is no allocation between the trawl and non-trawl sectors.

Table 4-54. No Action Alternative. Expected landings under the No Action Alternative, which are the average landings for the commercial nearshore fishery from 2008 to 2012. Target species landings by area are also shown in the far right panel. The 2013 quotas (or HGs) for Oregon and California 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 4-55. Annual landings and averages for nearshore species from 2008 to 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*		*98.4*	*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	23.5	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.	31.6	22.5	15.6	25.0	24.4	23.8
--*Blue rockfish (OR)*		*2.7*	*2.8*	*4.0*	*6.6*	*6.8*	*4.6*
--*Blue rockfish (CA)*		*7.8*	*5.5*	*3.4*	*5.1*	*2.8*	*4.9*
--*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. [a/]	S. 40°10 N. lat.	88.7	85.2	84.8	91.0	79.7	85.9
--*Blue rockfish*		*5.3*	*2.5*	*1.4*	*2.0*	*1.3*	*2.5*
--*Shallow nearshore rockfish b/*		*54.4*	*51.3*	*52.8*	*55.8*	*46.5*	*52.2*
--*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 4-56. No Action Alternative – Nearshore. Projected overfished species (OFS) mortality (mt) compared to the overfished species shares 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). Bold values indicate values greater than the shares.

Stock	Area	Total Projected OFS Mortality 2015-2016	Shares 2015/ 2016	Projected OFS Mortality by Area for 2015-2016			
				Oregon Total (Share)	CA Total (Share)	40°10' – 42° N. lat.	S. of 40°10' N. lat.
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. lat.	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

4.2.1.6 Tribal Fisheries – No Action Alternative

Tribal fisheries consist of trawl (bottom, midwater, 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 4-57, and they represent the values in the April 17, 2014, regulations. The Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) conducted their groundfish fisheries in 2014 with the trip limits shown in Table 4-57 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 1.6 percent for discard mortality, to produce landed catch allocations of 428 mt.
- Black rockfish was managed with an 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 (50 mt and 30 mt, respectively) 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 midwater trawl fisheries would be 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.

Table 4-57. The No Action Alternative: Tribal fishery based on regulations as of April 17, 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 midwater 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. Shelf Rockfish and Slope Rockfish. Redstripe rockfish are subject to an 800-lb (363 kg) trip limit. Shelf (excluding redstripe rockfish), and 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 nearshore, shelf, and Slope Rockfish, Other Rockfish are subject to a 300-lb per trip limit per species or species group, or to the non-tribal 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, and Other Flatfish, 110,000 lbs (49,895 kg) per 2 months; 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 2014 is 55,336 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.

- 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 the No Action Alternative. 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).

Impact (Groundfish Mortality)

All midwater 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.

4.2.1.7 Washington Recreational Fishery – No Action Alternative

Primary catch controls for the Washington recreational fishery are season dates, depth closures, bag limits, and GCAs, including YRCAs. Yelloweye rockfish and canary rockfish are the two overfished stocks primarily caught in the Washington recreational fishery, and seaward adjustments of the recreational RCAs 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 ACL, including an 18-mt yelloweye rockfish ACL and 119-mt canary rockfish ACL and the associated Washington recreational HGs of 2.9 mt for yelloweye rockfish and 3.1 for canary rockfish.

Table 4-58. No Action Alternative – Washington Recreational. Harvest guidelines (HG) for the Washington recreational fisheries under the No Action Alternative.

Species	HG (mt)
Canary	2.9
Yelloweye	3.1

Groundfish Seasons and Area Restrictions

Season Structure

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 the No Action Alternative.

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 they are, therefore, caught incidentally at a higher rate. Depth restrictions are fewer in the south coast where incidental catch of yelloweye and canary becomes progressively lower. Table 4-59 summarizes key features of the Washington recreational regulations under the No Action Alternative.

Table 4-59. No Action Alternative. 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>
</table>

[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 to 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 to 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.

North Coast (Marine Areas 3 and 4): The retention of bottomfish is prohibited seaward of a line approximating 20 fm from May 1 to September 30, except that 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 4-27).

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. Fishing for, retention, or possession of bottomfish or Pacific halibut is prohibited in the South Coast YRCA and Westport Offshore YRCA (Figure 4-27).

Columbia River (Marine Area 1): The 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 4-27).

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 and the South Coast and Westport YRCAs in the south coast (Figure 4-27).

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 4-27).

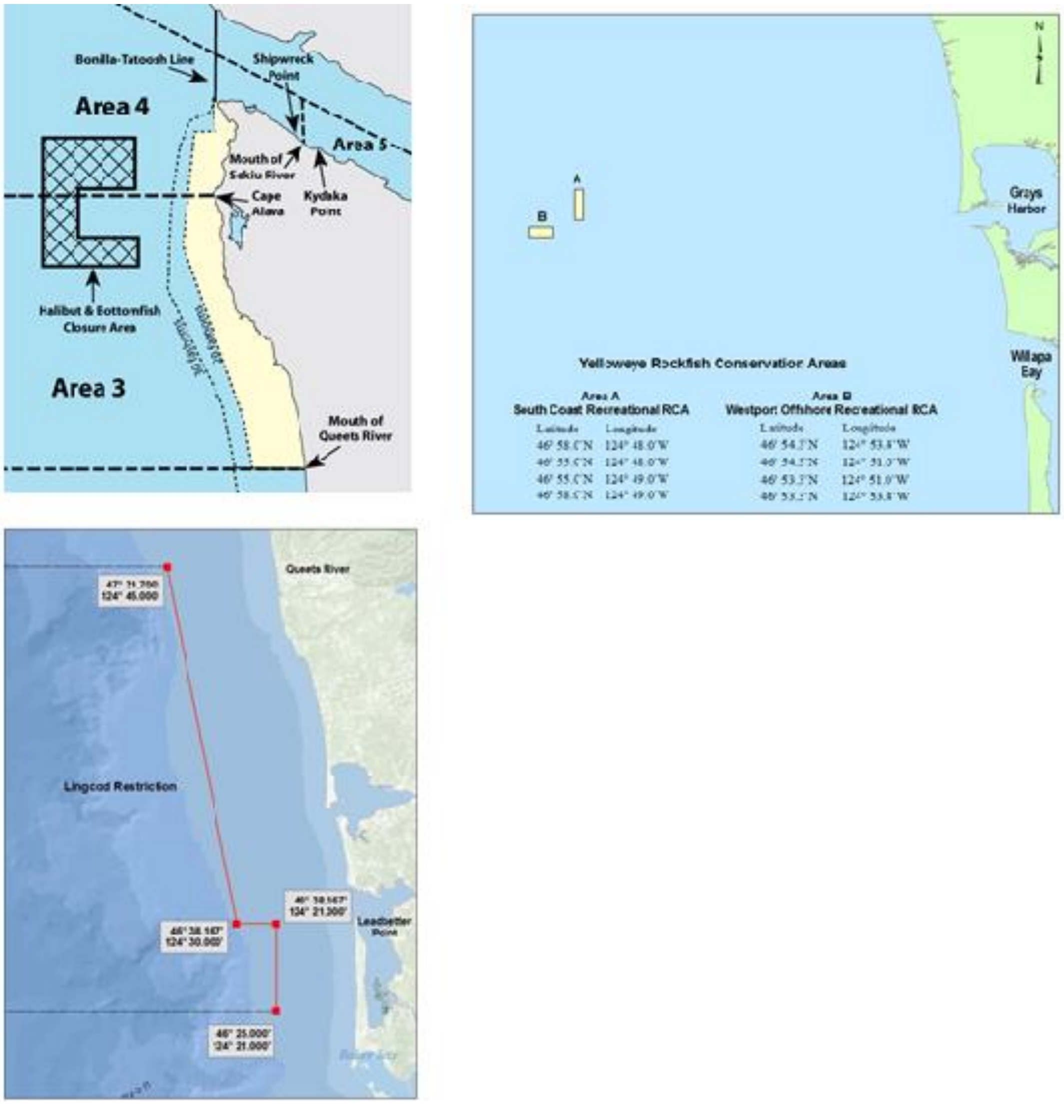


Figure 4-27. No Action Alternative Washington recreational area restrictions.

a. C-Shaped YRCA; b. Washington South Coast and Westport YRCAs; c. 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, 2 lingcod would 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.-Canada border) would be open from April 16 through October 15, or the Saturday closest to October 15, whichever is earlier; this 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 would be an 18-inch minimum size limit for cabezon in Marine Area 4 (Cape Alava to the U.S.-Canada 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 would be 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 the specified HGs.

Inseason Management Response

Projected mortality for Washington's recreational fishery is based upon the previous season's harvest estimated by the Washington Ocean Sampling Program and incorporated in RecFIN. 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 can produce estimates of groundfish catch with a 1-month lag time. Management measures such as more restrictive depth closures, area closures, groundfish retention restrictions, or changes to seasons would be considered and implemented through emergency changes to state regulations if inseason catch reports indicated that recreational harvests of overfished species or non-overfished species were exceeding pre-season projections to the point where HGs were at risk of being exceeded.

Impact (Groundfish Mortality)

Projected mortality for overfished and non-overfished species under the No Action Alternative is summarized in Table 4-60.

Table 4-60. No Action Alternative – Washington recreational projected mortality for overfished species under the No Action Alternative.

Stock	2015 and 2016	Non-trawl Allocation[a/]
Canary Rockfish	0.63	47.4
Yelloweye Rockfish	2.65	11.2
Black Rockfish	251.54	
Lingcod	125.61	1,430.2
Minor Nearshore Rockfish N.	10.54	
Blue Rockfish	*2.58*	
Quillback Rockfish	*2.23*	
Copper Rockfish	*2.24*	
China Rockfish	*3.49*	
Brown Rockfish	-	
Grass Rockfish	-	
Yellowtail Rockfish	28.32	441.7
Shelf Rockfish N.	0.60	586.5
Vermilion Rockfish	*0.60*	
Cabezon	5.56	
Kelp Greenling	1.90	

[a/] Includes non-nearshore, nearshore, and recreational fisheries.

4.2.1.8 Oregon Recreational Fishery – No Action Alternative

Primary catch controls for the Oregon recreational fishery are season dates, depth closures, bag limits, and GCAs, including YRCAs. For the No Action Alternative, the Oregon recreational fishery is analyzed under the 2014 ACLs and Oregon recreational HGs or state quotas (Table 4-61).

Table 4-61. No Action Alternative. Oregon recreational Federal harvest guidelines (HG) or state quotas under the No Action Alternative (mt).

Stock	HG[a/]
Canary Rockfish	11.1
Yelloweye Rockfish	2.6
Black Rockfish OR	440.8
Greenlings[b/]	5.2
Nearshore Rockfish North of 40°10’ N. Lat.[c/]	54.6
--*Blue Rockfish*	*41.0*
--*Other Nearshore Rockfish*	*13.6*

[a/] Federal HGs are established for canary and yelloweye rockfish only. The state process in Oregon establishes quotas for black rockfish, blue rockfish, other Nearshore Rockfish, and greenlings (all species). Black and blue rockfish are managed to a combined state quota; the estimated quotas by species are represented in this table. The state quotas are not intended to be implemented in Federal regulation, they are only provided as information.
[b/] Includes kelp and other greenlings.
[c/] Includes blue rockfish.

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 would be only allowed shoreward of 40 fathoms, as defined by waypoints (Figure 4-28). Closing the fishery outside of 40 fathoms from

April 1 to September 30, months when angler effort and yelloweye rockfish encounters are greatest, would mitigate mortality of yelloweye rockfish. Projected mortality of yelloweye and canary rockfish is within the Federal HGs; therefore, the shore-based fishery would be open year-round.

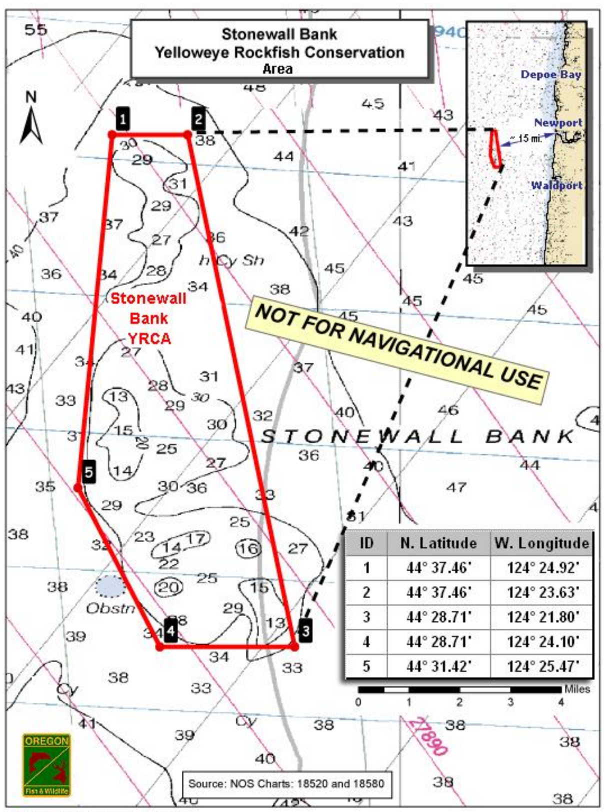
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bottomfish Season	Open all depths			Open < 40 fm						Open all depths		
Marine Bag Limit[1]	Ten (10)			1 Fish Cabezon Sub-Bag[2]						Ten (10)		
Lingcod Bag Limit	Three (3)											
Flatfish Bag Limit[3]	Twenty Five (25)											

[1]Marine bag limit would include 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 would be ten (10) fish per day, of which no more than one (1) may be cabezon.
[3]Would include flounders, soles, sanddabs, turbots and halibuts except Pacific halibut.

Figure 4-28. No Action Alternative. 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 4-29). 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 4-29.



ODFW, 05/22/06. Reprinted 12/12/06

Figure 4-29. No Action Alternative. 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 4-28). The marine bag limit would include 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 1 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. South of Humbug Mountain, groundfish may be retained in areas open to groundfish (e.g., less than 30 fm) when halibut are onboard the vessel. 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

Adjustments to routine and currently available management measures would be used to keep recreational harvests of overfished species within specified Federal HGs under the No Action Alternative.

Inseason Management Tools

Oregon has a responsive port-based monitoring program through the Ocean Recreational Boat Survey 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. The Oregon Department of Fish and Wildlife (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 Minor Nearshore Rockfish harvest. The lingcod daily bag limits may be adjusted to no more than three fish should the marine bag limit change or the halibut catch limit be reduced from 2013 levels. Season and/or area closures may also be considered, should harvest targets be 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 inseason tools used 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 Minor Nearshore Rockfish species.

Gear restrictions and/or release technique requirements may be implemented to reduce the impact of overfished rockfish, since a variety of descending devices are available. The SSC recommended and Council-approved mortality rates for canary and yelloweye rockfish when descending devices are used will be implemented in 2014 (see Appendix A for documentation).

Directed yellowtail rockfish and/or flatfish fisheries may be implemented inseason, as they were implemented in 2004[51], in the event of a closure of the recreational groundfish fishery due to attainment of Federal or state HGs or targets. Specific gear restrictions may be implemented if 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 when 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.

Impact (Projected Mortality)

The annual projected mortality presented in Table 4-62 is anticipated, given the season structure and bag limits detailed above. Table 4-63 shows the recent mortality of the ten most landed species in the Oregon recreational fishery, including black rockfish. Species in Table 4-63, 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.

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[51] On August 18, 2004, the Oregon cabezon harvest cap of 15.8 mt was projected to be reached, and retention of cabezon was prohibited. On September 3, 2004, the greenling and rockfish harvest caps (5.2 mt for greenling, 11.2 mt for nearshore rockfish, and 382.5 mt for black and blue rockfish) were projected to be reached, and retention of all rockfish, lingcod, and greenling were prohibited. In an effort to allow some recreational fisheries with minimal impact to canary rockfish, ODFW allowed retention of yellowtail rockfish taken seaward of a boundary line approximating the 40-fm (73-m) depth contour from October 1 through October 31, 2004. In addition, there was continued access off Oregon for sablefish, flatfish, and any groundfish not prohibited by state law in the area inside of a boundary line approximating the 40-fm (73-m) depth contour (October 6, 2004; 69 FR 59816).

Table 4-62. No Action Alternative – Oregon Recreational Projected mortality (mt) of species with Oregon recreational specific allocations under the No Action Alternative.

Stock	Projected Mortality	Non-trawl Allocation[c/]
Canary	3.2	47.4
Yelloweye	2.2	11.2
Black Rockfish	322.2	
Lingcod	132.0	1,430.2
Greenlings[a/]	6.4	
Nearshore Rockfish North of 40°10 N. lat.[b/]	30.5	
--Blue Rockfish	*17.5*	
--Other Nearshore	*13.0*	

[a/] Includes kelp and other greenlings.
[b/] Includes blue rockfish.
[c/] Includes non-nearshore, nearshore, and recreational fisheries.

Table 4-63. No Action Alternative – 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
Vermilion 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

4.2.1.9 California Recreational – No Action Alternative

Season structures and projected mortality under the No Action Alternative 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, and overfished species mortality is reported statewide. Under the No Action Alternative, trawl and non-trawl allocations for overfished species were established (Table 4-64). The California recreational fishery was allocated a share of the non-trawl allocation through use of an HG for bocaccio, canary, and yelloweye to ensure that total non-trawl catches remained within the non-trawl allocations for these overfished species. Further, there is a 236 mt HG for blue rockfish south of 42° N. latitude within the Nearshore Rockfish complex for both commercial and recreational fisheries. Under the No Action Alternative, depth restrictions and season length would remain unchanged statewide (PFMC and NMFS 2011).

Table 4-64. No Action Alternative – California Recreational: Overfished species allocations (mt) to the non-trawl sector and shares (mt) for the California recreational fisheries under the No Action Alternative, which is based on the Preferred Alternative for 2014 in the 2013-2014 FEIS.

Stock	Non-trawl Allocation	California Recreational HG
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

Groundfish Seasons and Area Restrictions

The following recreational season applied in 2014 would remain in place under the No Action Alternative (Figure 4-30). 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 4-30. No Action Alternative: California recreational groundfish season structure based on regulations as of April 17, 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 (state regulations only)
- Lingcod – 2 fish
- Soupfin shark – 1 fish (state regulations only)

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 (state regulations only)
- Lingcod – 22 inches

Based on the RecFISH 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 4-65). These values are pre-season projections, and actual mortality may differ.

Impact (Groundfish Mortality)

CDFW closely monitors yelloweye rockfish and cowcod, performing weekly tracking using preliminary CRFS field reports. These preliminary CRFS 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 5- to 8-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 HGs 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 4-65. In 2009, four YRCAs 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 4-65. No Action Alternative – California Recreational: Projected mortality (mt) under the No Action Alternative (using 2014 data) for the California Recreational fisheries.

Stock	Projected Mortality	California Recreational HG	Non-trawl Allocation[a/]
Bocaccio	100.1	172.5	249.6
Canary	16.3	23	47.4
Cowcod	1.0		1.9
Yelloweye	1.7	3.4	11.2
Black Rockfish	181.9		
Blue Rockfish	54.6		
Cabezon	35.1		
California Scorpionfish	78.3		
Greenlings	15.5		
Lingcod N. of 40°10' N. lat.	39.3		1,430.2
Lingcod S. of 40°10' N. lat.	205.4		579.7
Widow Rockfish	2.8		127.0
Nearshore Rockfish N. of 40°10' N. lat.	11.7		
Nearshore Rockfish S. of 40°10' N. lat.	332.5		

[a/]Includes non-nearshore, nearshore, and recreational fisheries.

4.2.2 Preferred Alternative

Table 4-66 through Table 4-71 contain the harvest specifications and allocations analyzed under the Preferred Alternative. A description of the HCR used to calculate the ACLs can be found in Chapter 2, Section 2.1.1.

4.2.2.1 Deductions from the ACL and Allocations

Under all of the action alternatives, off-the-top deductions from the ACL were updated based on the most recent information on fishery performance and need. Amounts are deducted from the ACL to accommodate groundfish mortality from scientific research and incidental open access fisheries, and EFPs can be modified based on inseason projections (Section 4.2.1.1). A description of the calculations is provided below.

Tribal Fishery: Tribal fisheries consist of trawl (bottom, midwater, and whiting), fixed gear, and troll. The tribal amounts in the April 17, 2014, regulations were updated with the final tribal requests provided in June 2014 (Agenda Item F.7.b, Supplemental Tribal Report and Agenda Item F.7.b, Supplemental Tribal Report 2).

Research: Research activities include the NMFS trawl survey, International Pacific Halibut Commission longline survey, and other Federal and state research. The Council approach is that off-the-top deductions from the ACL should be equal to the maximum historical scientific research catch from 2005 to 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 catch 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 to 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 (WDFW) (1 mt), ODFW (1 mt), and other projects (0.2 mt). If data were available to determine that a set-aside were exceeded during the fishing year, it would be evaluated by the Council and NMFS. Adjustments could be made to prevent an ACL, ABC, or OFL from being exceeded, as has been done in previous years.

Incidental Open Access: Deductions from ACLs are made to account for groundfish mortality in the incidental open access fisheries. The off-the-top deductions from the ACL for all species except longnose skate were derived from the maximum historical values in the 2007 to 2012 WCGOP Groundfish Mortality Reports (http://tinyurl.com/nv3pddm). The recommended set-aside for longnose skate was based on data from the 2009 to 2012 WCGOP Groundfish Mortality reports, the years in which longnose skate were reported separately from the Other Fish category.

Exempted Fishing Permits: The Council adopted one EFP and associated off-the-top deductions from the ACL for 2015-2016 for public review. The EFP seeks to test the effectiveness of vertical hook-and-line gear to harvest midwater species such as yellowtail rockfish selectively (Agenda Item H.2.a, Attachment 4, November 2013).[52]

Recreational (Sablefish north of 36° N. latitude only): The allocation framework for sablefish north of 36° N. latitude specifies that the 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 to 2012 (Table 4-70).

[52] The Council is considering EFPs for participants in the catch share program. See Section 4.15.4 for more details.

Table 4-66. Preferred Alternative. 2015 ACLs and estimates of tribal, EFP, research, and incidental open access (OA) mortality (in mt), used to calculate the fishery harvest guideline (HG).

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
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
Petrale Sole	Coastwide	2,816	220		14.2	2.4	2,579.4
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	WA	402	14				388.0
Black	OR and CA	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	154					154.0
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	50,000	1,497		41.9	55	48,406.1
English sole	Coastwide	9,853	200		5.8	7	9,640.2
Lingcod	N of 40º10' N. lat.	2,830	250	0.5	11.67	16	2,551.8
Lingcod	S of 40º10' 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	500		7.04	2	1,091.0
Pacific whiting [a/]	Coastwide	269,745	63,205	1	2,500 2,000		204,040
Sablefish	N of 36º N. lat.	4,793		See Table 4-70			
Sablefish	S of 36º N. lat.	1,719			3	2	1,714.0
Shortbelly	Coastwide	500			2		498.0
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	2,101	275	1	12.5	49.53	1763.0
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	2,000	100	9	7.9	3.3	1,879.8
Yellowtail	N of 40º10' N. lat.	6,590	1,000	10	16.6	3	5560.4
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.	1,693	36	1	8.1	19	1628.9
Slope Rockfish S.	S of 40º10' N. lat.	693		1	2	17	673.0
Other Flatfish	Coastwide	8,749	60		19	125	8,545.0
Other Fish	Coastwide	242					242.0

[a/] Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-67. Preferred Alternative. 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	49.4
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
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
Petrale Sole	Coastwide	2,579.4	Biennial	N/A	2,544.4	N/A	35.0
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	WA	388.0	None				
Black	OR and CA	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	154.0	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	48,406.1	Amendment 21	95%	45,985.8	5%	2,420.3
English sole	Coastwide	9,640.2	Amendment 21	95%	9,158.2	5%	482.0
Lingcod	N of 40º10' N. lat.	2,551.8	Amendment 21	45%	1,148.3	55%	1,403.5
Lingcod	S of 40º10' 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	1,091.0	Amendment 21	95%	1,036.4	5%	54.5
Pacific whiting [b/]	Coastwide	0.0	Amendment 21	100%	0.0	0%	0.0
Sablefish	N of 36º N. lat.		See Table 4-70				
Sablefish	S of 36º N. lat.	1,714.0	Amendment 21	42%	719.9	58%	994.1
Shortbelly	Coastwide	498.0	None				
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	1,763.0	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	1,879.8	Amendment 21	91%	1,710.6	9%	169.2
Yellowtail	N of 40º10' N. lat.	5,560.4	Amendment 21	88%	4,893.2	12%	667.2
Nearshore Rockfish N.	N of 40º10' N. lat.	69.0	None				
Nearshore Rockfish S.	S of 40º10' N. lat.	1,110.0	None				
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.	1,628.9	Amendment 21	81%	1,319.4	19%	309.5
Slope Rockfish S.	S of 40º10' N. lat.	673.0	Amendment 21	63%	424.2	37%	249
Other Flatfish	Coastwide	8,545.0	Amendment 21	90%	7,690.5	10%	854.5
Other Fish	Coastwide	242.0	None				

[a/]The cowcod fishery HG 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 4-68. Preferred Alternative. 2016 ACLs and estimates of tribal, EFP, research, and incidental open access (OA) mortality (in mt), used to calculate the fishery harvest guideline (HG).

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
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
Petrale Sole	Coastwide	2,910	220		14.2	2.4	2,673.4
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	WA	404	14				390.0
Black	OR and CA	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	151					151.0
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	50,000	1,497		41.9	55	48,406.1
English sole	Coastwide	7,204	200		5.8	7	6,991.2
Lingcod	N of 40º10' N. lat.	2,719	250	0.5	11.67	16	2,440.8
Lingcod	S of 40º10' 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	500		7.04	2	1,091.0
Pacific whiting [a/]	Coastwide	269,745	63,205		2,500		204,040
Sablefish	N of 36º N. lat.	5,241		See Table 4-70			
Sablefish	S of 36º N. lat.	1,880			3	2	1,875.0
Shortbelly	Coastwide	500			2		498.0
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	2,085	275	1	12.5	49.53	1,747.0
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	2,000	100	9	7.9	3.3	1,879.8
Yellowtail	N of 40º10' N. lat.	6,344	1,000	10	16.6	3	5,314.4
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.	1,706	36	1	8.1	19	1,641.9
Slope Rockfish S.	S of 40º10' N. lat.	695		1	2	17	675.0
Other Flatfish	Coastwide	7,243	60		19	125	7,039.0
Other Fish	Coastwide	243					243.0

[a/]Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-69. Preferred Alternative. 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	58.5	N/A	51.3
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
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
Petrale Sole	Coastwide	2,673.4	Biennial	N/A	2,638.4	N/A	35.0
Yelloweye	Coastwide	13.2	Biennial	N/A	1.1	N/A	12.1
Arrowtooth flounder	Coastwide	3,240.6	Amendment 21	95%	3,078.6	5%	162.0
Black	WA	390.0	None				
Black	OR and CA	999.0	None				
Cabezon	OR	47.0	None				
Cabezon	CA	151.0	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	48,406.1	Amendment 21	95%	45,985.8	5%	2,420.3
English sole	Coastwide	6,991.2	Amendment 21	95%	6,641.6	5%	349.6
Lingcod	N of 40º10' N. lat.	2,440.8	Amendment 21	45%	1,098.4	55%	1,342.5
Lingcod	S of 40º10' 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
Longspine thornyhead	S of 34º27' N. lat.	949.0	None				
Pacific cod	Coastwide	1,091.0	Amendment 21	95%	1,036.4	5%	54.5
Pacific whiting[b/]	Coastwide		Amendment 21	100%			
Sablefish	N of 36º N. lat.		See Table 4-70				
Sablefish	S of 36º N. lat.	1,875.0	Amendment 21	42%	787.5	58%	1,087.5
Shortbelly	Coastwide	498.0	None				
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	1,747.0	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	1,879.8	Amendment 21	91%	1,710.6	9%	169.2
Yellowtail	N of 40º10' N. lat.	5,314.4	Amendment 21	88%	4,676.7	12%	637.7
Nearshore Rockfish N.	N of 40º10' N. lat.	69.0	None				
Nearshore Rockfish S.	S of 40º10' N. lat.	1,002	None				
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.	1,576.4	Biennial	12.2%	192.3	87.8%	1,384.1
Slope Rockfish N.	N of 40º10' N. lat.	1,641.9	Amendment 21	81%	1,329.9	19%	312.0
Slope Rockfish S.	S of 40º10' N. lat.	675.0	Amendment 21	63%	425.3	37%	249.8
Other Flatfish	Coastwide	7,039.0	Amendment 21	90%	6,335.1	10%	703.9
Other Fish	Coastwide	243.0	None				

[a/]The cowcod fishery HG 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 4-70. Preferred Alternative. Sablefish north of 36° N. latitude ACLs, off-the-top deductions from the ACL used to calculate the commercial harvest guideline (mt) for 2015-2016 under the Preferred Alternative.

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 4-71. Preferred Alternative: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under the Preferred Alternative.

2015

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5-23-14**	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/
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	11.3	56.9	23.6	1.4	0.1	301.3	127.0	2,544.4	2,410.0	135.9	68.1	1.0	0.0
-SB Trawl	81.9	11.3	43.3	9.9	1.4	0.1	285.6	111.3	2,539.4	2,405.0	118.5	50.7	1.0	0.0
-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	117.6	49.9	30.0	2.6	1.2	15.9	4.9	35.0	0.3	7.2	0.3	11.2	8.9
Non-Nearshore	79.1	0.0	3.8	1.1				4.7		0.3		0.3	0.6	0.5
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.7	6.7				0.2		0.0		0.0	1.7	1.3
Recreational Groundfish														
WA			3.4	0.8				--		--		--	2.9	2.8
OR			11.7	3.2				--		--		--	2.6	2.2
CA	178.8	117.2	24.3	18.2		1.2		--		--		--	3.4	2.1
TOTAL	349.0	137.2	122.0	68.8	6.0	3.3	338.0	152.7	2,816.0	2,646.9	158.1	83.4	18.0	14.8
2015 Harvest Specification	349	359	122	122	10.0	10.0	338	338	2,816	2,816	158	158	18	18
Difference	0.0	221.8	0.0	53.3	4.0	6.7	0.0	185.3	0.0	169.1	-0.1	74.6	0.0	3.2
Percent of ACL	100.0%	38.2%	100.0%	56.4%	60.2%	33.2%	100.0%	45.2%	100.0%	94.0%	100.1%	52.8%	100.0%	82.0%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1mt
	(black)	= Fixed Values
	(light blue)	= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be specified in regulation in Tables 1a 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 during the biennial 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 requested set asides for 2015-2016.
[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).
[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.
[g/] Projected impacts are derived from GMT project models.

Table 4-71 (continued). Preferred Alternative: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under the Preferred Alternative.

2016

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5 April 2014**	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/
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	85.0	11.8	58.5	24.2	1.4	0.1	308.9	130.3	2,638.4	2,499.0	141.6	70.5	1.1	0.0
-SB Trawl	85.0	11.8	44.5	10.2	1.4	0.1	292.8	114.1	2,633.4	2,494.0	124.0	53.1	1.1	0.0
-At-Sea Trawl			14.0	14.0			16.2	16.2	5.0	5.0	17.4	17.4		
a) At-sea whiting MS			5.8	5.8			6.7	6.7			7.2	7.2		
b) At-sea whiting CP			8.2	8.2			9.5	9.5			10.2	10.2		
Non-Trawl Allocation	268.7	117.6	51.3	30.1	2.6	1.2	16.3	5.4	35.0		7.5	0.3	12.1	8.9
Non-Nearshore	82.1	0.0	3.9	1.2		0.0		5.2		0.3		0.3	0.7	0.5
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.9	6.7				0.2		0.0		0.0	1.8	1.3
Recreational Groundfish														
WA			3.5	0.8				--		--		--	3.1	2.8
OR			12.0	3.2				--		--		--	2.8	2.2
CA	185.6	117.2	25.0	18.2		1.2		--		--		--	3.7	2.1
TOTAL	362.0	137.7	125.0	69.5	6.0	3.3	346.0	156.5	2,910.0	2,735.6	164.1	85.8	19.0	14.8
2015 Harvest Specification	**362**	**362**	**125**	**125**	**10.0**	**10.0**	**346**	**346**	**2,910**	**2,910**	**164**	**164**	**19**	19
Difference	0.0	224.3	0.0	55.6	4.0	6.7	0.0	189.5	0.0	174.4	-0.1	78.2	0.0	4.2
Percent of ACL	100.0%	38.0%	100.0%	55.6%	60.2%	33.2%	100.0%	45.2%	100.0%	94.0%	100.1%	52.3%	100.0%	77.7%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1mt
	(black)	= Fixed Values
	(light blue)	= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be 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 during the biennial 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 requested set asides for 2015-2016.

[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).

[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.

[g/] Projected impacts are derived from GMT project models.

4.2.2.2 Harvest Guidelines

As described in Section 4.2.1.2, HGs are established for black rockfish (Oregon and California), blackgill rockfish south of 40°10’ N. latitude, and blue rockfish south of 42° N. latitude. Further, as described in Section 2.1.2.3, starting in 2015, the West Coast states will be monitoring and managing catches of Nearshore Rockfish north of 40°10' N. latitude using HGs. If harvest levels in a particular state approach 75 percent of the state-specific HGs (Table 2-6), which are based on status quo harvest levels, the states will consult via a conference call and determine whether inseason action is needed. The HGs for Washington and Oregon would be state HGs and not established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area 40°10' N. latitude to 42° N. latitude. If inseason action were needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings. The 2015-2016 HGs under the Preferred Alternative can be found in Table 4-72.

Table 4-72. Preferred Alternative Harvest Guidelines for 2015-2016.

Species	Description	2015 (mt)	2016 (mt)
Black Rockfish (OR and CA)	Allocation between OR and CA	579 (OR) 420 (CA)	579 (OR) 420 (CA)
Blackgill S. of 40°10' N. lat.	HG within the Slope Rockfish complex South	114	117 mt
Blue Rockfish S. of 42° N. lat.	HG within the Nearshore Rockfish complex South	194.4	198.3
Nearshore Rockfish 40°10' N. lat. to 42° N.		23	23

4.2.2.3 Overview of Management Measures

The following bullet points summarize management measure changes by sector under the Preferred Alternative. A more detailed discussion of management measures by sector follows. New measures, discussed under Chapter 2, Section 2.1.2, and in Chapter 4.2, would be implemented. A more detailed evaluation of management measure impacts can be found in Appendix B. New management measures that are specific to a sector are described below.

- The shorebased IFQ fishery would operate under the same management measures as the No Action Alternative, with a few modifications. The No Action Alternative trawl RCA configuration would be modified to 100 fm shoreward and 200 fm modified seaward in the area 40°10’ to 45°46' N. latitude, year-round. The IFQ would be issued based on the 2015-2016 ACLs and resulting trawl allocations under the Preferred Alternative. Legal-size 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 would be a 30,000-pound (14 mt) reduction from the No Action Alternative. A scientific sorting requirement for rougheye/blackspotted as an aggregate group and shortraker rockfish would be implemented, which would improve the data used in management. With full observer coverage in the trawl fisheries, discarded catch of IFQ species are already sorted to species, and some biological data are available for stock assessments (No Action Alternative). Adding a sorting requirement under the action alternatives would primarily improve data reported on landing receipts and electronic fish tickets.
- The at-sea whiting co-ops would operate under the same management measures described under the No Action Alternative, with a few modifications. Allocations would be issued based the 2015-

2016 ACLs and resulting at-sea trawl allocations under the Preferred Alternative. 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.

- The non-nearshore, fixed gear fishery would operate under the same management measures as the No Action Alternative, except trip limit increases for several species, including sablefish, bocaccio, and Shelf Rockfish south of 34°27' N. latitude, would be proposed to attain the ACLs under the Preferred Alternative. The prohibition on lingcod retention during some periods would be removed, and trip limits would be increased for both limited entry and open access. Trip limit decreases for Slope Rockfish north of 40°10' N. latitude may be implemented through inseason action to reduce mortality of rougheye/blackspotted rockfish. A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which could improve the data used in management.
- The nearshore fixed gear fishery would operate under the same management measures as the No Action Alternative, with a few modifications. The shoreward non-trawl RCA structure under the Preferred Alternative would be the same as under the No Action Alternative, except in the area from 40°10' N. latitude to 42° N. latitude, where the shoreward RCA boundary would be moved from 20 to 30 fm. The West Coast states will be tracking and managing catches of Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs, as described in Section 2.1.2.3. A 23.7 mt HG for Nearshore Rockfish north of 40°10' N. latitude is proposed for California (in the area 40°10' N. latitude to 42° N. latitude) and would apply to both the nearshore commercial and recreational fisheries. The prohibition on lingcod retention during some periods would be removed, and trip limits would be increased for both limited entry and open access.
- Tribal fisheries would operate under the HGs and allocations under the Preferred Alternative. Tribal fisheries would be managed using the same measures described under the No Action Alternative. Additionally, a scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which would improve the data used in management.
- Washington recreational fisheries would operate under the same management measures as under the No Action Alternative, except that the season dates for the depth closure in the North Coast (Marine Areas 3 and 4) would be shorter than under the No Action Alternative. 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. Last, in the Columbia River area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved 3 miles north. Changes to groundfish retention in Pacific halibut fisheries could also be proposed. The West Coast states will be tracking and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs, as described in Section 2.1.2.3. If harvest levels in Washington were to approach 75 percent of the state-specific HG, the state of Washington would consult with the other West Coast states via a conference call and would determine whether inseason action were needed. Changes to management measures would be implemented through state regulation.
- Oregon recreational fisheries would operate under the same management measures as under the No Action Alternative, except that the cabezon sub-bag limit would be removed, a one-fish canary sub-bag limit would be implemented, and changes to groundfish retention in Pacific halibut fisheries could be proposed in the Pacific Halibut Catch Sharing Plan. The West Coast states will be tracking and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs, as described in Section 2.1.2.3. If harvest levels in Oregon were to approach 75 percent of the state-specific HG, the state of Oregon would consult with the other West Coast states via a conference call and would determine whether inseason

action were needed. Changes to management measures would be implemented through state regulation.

- Season lengths and depth restrictions are being made for the California recreational fisheries. The lingcod bag limit would be increased from two to three fish. The West Coast states will be tracking and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs, as described in Section 2.1.2.3. A 23.7 mt HG for Minor Nearshore Rockfish north of 40°10' N. latitude is proposed for California (in the area 40°10' N. latitude to 42° N. latitude) and would apply to both the nearshore commercial and recreational fisheries. Bag limit decreases, season length reduction, or non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the state-specific Minor Nearshore Rockfish HG. All other management measures would be the same as under the No Action Alternative.

4.2.2.4 Impact (Groundfish Mortality) Shorebased IFQ – Preferred Alternative

The trawl RCA structure would be the same as the No Action Alternative with one exception. In the area from 45°46’ N. latitude to 40°10’ N. latitude, the seaward RCA boundary would be 200 fm modified year-round. The shorebased IFQ would be issued based on the preferred 2015-2016 ACLs and resulting trawl allocations (Table 4-73 and Table 4-74). Notable IFQ increases from the No Action Alternative would include Dover sole, petrale, longspine thornyheads north, sablefish, shortpine thornyhead, widow rockfish, 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-size conversion factor: multiply by the ratio of legal sized halibut to legal+sublegal-size 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. latitude, 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-size Pacific halibut IBQ would be limited to 15 percent of the Area 2A TCEY for legal-size halibut (net weight), not to exceed 100,000 pounds annually for legal-size halibut (net weight), which would be a 30,000-pound reduction from status quo.

A risk analysis was conducted to evaluate the risk of exceeding the spiny dogfish ACL (Section B.16, Appendix B). The effectiveness of GCAs to reduce spiny dogfish mortality in the shorebased IFQ sector was also explored in Appendix B, Section B.14.2. Given the low risk of exceeding the spiny dogfish ACL, the Council recommended continuing trip limit management of spiny dogfish in the shorebased IFQ sector, and it did not recommend spiny dogfish GCAs.

Management measures to reduce rougheye/blackspotted rockfish catch, including rougheye/blackspotted GCAs and/or rockfish excluders for the at-sea whiting vessels, were considered but were rejected (Chapter 2, Section 2.5, and Appendix B, Section B.14 and Section B.17). Instead, the Council recommended that a scientific sorting requirement for rougheye/blackspotted and shortraker rockfish could be implemented, which could improve the data used in management.

Table 4-73. Preferred Alternative – Shorebased IFQ. Projected mortality for IFQ species compared to the allocations or set-asides under the Preferred Alternative for 2015. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Preferred Alternative: 2015 Projected Mortality (mt)	Preferred Alternative: 2015 SB IFQ Allocation (mt) a/ b/	No Action: Projected Mortality (mt)	No Action: 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	0	1.0
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	15,935	45,981	7,713	22,235
English sole	Coastwide	152	9,153	137	5,261
Lingcod	North of 40°10' N. lat.	222	1,133	227	1,152
Lingcod	South of 40°10' N. lat.	79	448	84	474
Longspine thornyheads	North of 34°27' N. lat	1,531	2,962	936	1,811
Pacific cod	Coastwide	266	1,031	266	1,126
Pacific halibut[a/]	North of 40°10' N. lat.	N/A	45 max	N/A	45 max
Pacific halibut[b/]	South of 40°10' N. lat.	N/A	10	N/A	10
Pacific whiting[c/]	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	673	1,421	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,484	4,593	816	2,939
Shelf Rockfish	North of 40°10' N. lat.	60	1,092	28	508
Shelf Rockfish	South of 40°10' N. lat.	27	192	12	81
Slope Rockfish	North of 40°10' N. lat.	276	1,219	182	789
Slope Rockfish	South of 40°10' N. lat.	110	424	98	379
Other Flatfish	Coastwide	1,311	7,671	728	4,194

[a/]Pacific halibut is managed using IBQ; see regulations at §660.140. Starting in 2015, the maximum IBQ allocation will be 45 mt; see (§660.55 (m)). There is no projection model for Pacific halibut bycatch.
[b/]As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt will be applied 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).
[c/]The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-74. Preferred Alternative – Shorebased IFQ. Projected mortality for IFQ species compared to the allocations or set-asides under the Preferred Alternative for 2016. No action estimates of mortality are provided (right panel).

IFQ Species	Area	Preferred Alternative		No Action Alternative	
		2016 Projected Mortality (mt)	2016 SB IFQ Allocation (mt) [a/ b/]	Projected Mortality (mt)	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	1.1	0	1.0
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	15,935	45,981	7,713	22,235
English sole	Coastwide	137	6,637	137	5,261
Lingcod	North of 40°10' N. lat.	215	1,083	227	1,152
Lingcod	South of 40°10' N. lat.	75	422	84	743
Longspine thornyheads	North of 34°27' N. lat	1,455	2,815	936	1,811
Pacific cod	Coastwide	266	1,031	266	1,126
Pacific halibut[a/]	North of 40°10' N. lat.	N/A	45 max	N/A	45 max
Pacific halibut[b/]	South of 40°10' N. lat.	N/A	10	N/A	10
Pacific whiting[c/]	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	673	1,421	426	994
Yellowtail rockfish	North of 40°10' N. lat.	2,343	4,377	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	1,230	182	789
Slope Rockfish	South of 40°10' N. lat.	110	425	98	379
Other Flatfish	Coastwide	1,136	6,315	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)). There is no projection model for Pacific halibut bycatch.

[b/] As stated in regulations (§660.55 (m)), a Pacific halibut set-aside of 10 mt will be applied 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).

[c/] The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

4.2.2.5 Impact (Groundfish Mortality) At-sea Whiting Co-ops – Preferred Alternative

The at-sea whiting co-ops would operate under the same management measures described under the No Action Alternative, with a few modifications. The 2015-2016 allocations for the CP and mothership sectors under the Preferred Alternative for 2015-2016 are provided in Table 4-75 and Table 4-76 compared to the No Action Alternative.

At-sea whiting set-asides for some species would be increased compared to the No Action Alternative (Table 4-75 and Table 4-76), 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 (Chapter 2, Section 2.2.4). The proposed Other Fish complex contains nearshore species which are not typically encountered in the at-sea whiting sectors. As such, the Council determined it was not necessary to specify an Other Fish complex set-aside. A range of spiny dogfish set-asides from 163 mt to 725 mt was analyzed along with a risk analysis for all sectors of exceeding the spiny dogfish ACL (Section B.16, Appendix B). The effectiveness of GCAs to reduce spiny dogfish mortality was also explored in Appendix B. Given the low risk of exceeding the spiny dogfish ACL, the Council did not recommend spiny dogfish set-asides, nor did it recommend spiny dogfish GCAs for the at-sea sectors.

Management measures to reduce rougheye/blackspotted rockfish catch, including rougheye/blackspotted GCAs and/or rockfish excluders for the at-sea whiting vessels were considered but rejected (Chapter 2, Section 2.5, and Appendix B, Sections B.14 and B.17). Instead, the Council recommended implementing a scientific sorting requirement for rougheye/blackspotted rockfish, which could improve the data used in management.

Table 4-75. Preferred Alternative – At-sea. Allocations for the CP and mothership sectors under the Preferred Alternative for 2015-2016. The No Action Alternative allocations are provided (right panel) for reference.

		Preferred Alternative				No Action Alternative 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[a/]	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

[a/]The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-76. Preferred Alternative – At-sea. At-sea whiting set-asides under the Preferred Alternative. The No Action Alternative set-aside values are provided for reference.

Stock	Area	Preferred Alternative Total Set-asides (mt)	No Action Alternative Set-asides 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	N/A	520
Spiny Dogfish	Coastwide	N/A	N/A
Other Flatfish	Coastwide	20	20

[a/]Under the Preferred Alternative, as stated in §660.55 (m), the Pacific halibut set-aside would be 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).
[b/]In 2014, spiny dogfish was managed as part of the Other Fish complex. Starting in 2015-2016, spiny dogfish would be managed separately under the Preferred Alternative.

4.2.2.6 Limited Entry and Open Access Fixed Gear – Preferred Alternative

Impact (Groundfish Mortality) – Non-nearshore North of 36° N. Latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under the Preferred Alternative would be largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40, and the resulting sablefish allocations (Table 4-77 and Table 4-78). Trip limit increases for sablefish would be proposed (Table 4-79) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations. The prohibition on lingcod retention during certain periods would be removed, and trip limits would be increased for both limited entry and open access fixed gears (Section 2.1.2.2 and Appendix B, Section B.7 and Section B.8). Trip limits for other species may also be adjusted to attain the ACL or achieve other conservation goals.

Blackgill rockfish is part of the Slope Rockfish complex north and south of 40°10' N. latitude and is subject to an Amendment 21 allocation (63 percent to trawl and 37 percent to non-trawl). To improve inseason tracking and reduce the risk of blackgill rockfish becoming overfished, the Council recommended HGs for 2015 and 2016 of 114 mt and 117 mt for the area south of 40°10' N. latitude, respectively. Further, the Council provided guidance that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry (68 mt in 2015 and 70 mt in 2016) and 40 percent to open access fixed gears (46 mt in 2015 and 47 mt in 2016). This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005 to 2010 (Table 3 in Agenda Item E.9.b, GMT Report 2, November 2011).

Trip limit decreases for Slope Rockfish north of 40°10' N. latitude may be proposed through inseason action to reduce rougheye/blackspotted rockfish mortality (Appendix B, Section B.6). A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which could improve the data used in management (Table 4-80).

The overfished species mortality, as a result of harvesting the sablefish allocations, was evaluated using 2002 to 2012 WCGOP data in the non-nearshore model. Under the Preferred Alternative, 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 4-81). Routine adjustments of the non-trawl RCA (same as the No Action Alternative) would occur if the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation (e.g., changing from 100 to 125 fm). RCA changes could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm). Table 4-82 contains the projected mortality groundfish for the non-nearshore fishery.

Table 4-77. Preferred Alternative: Limited entry sablefish FMP allocations north of 36° N. latitude for 2015-2016.

				LEFG Share (mt)				Estimated Tier Limits (lbs)[a/]		
Year	ACL	Sablefish Com. HG	Limited Entry Share	Total Catch Share	Landed Catch Share [a/]	Primary Season Share	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 4-78. Preferred Alternative: Open access FMP allocations 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 4-79. Preferred Alternative. 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 4-80. Preferred Alternative – Non-nearshore. Limited entry and open access trip limit adjustments for lingcod north and south of 40°10' N. latitude.

Area	Sector	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
N. 40°10' N. lat.	LE	200 lb/ 2 mo		1,200 lb/2 mo			600 lb Nov, 200 lb Dec
	OA	100 lb/1 mo		600 lb/1 mo			600 lb Nov, 100 lb Dec
S. 40°10' N. lat	LE	200 lb/ 2 mo	CLOSED	800 lb/2 mo			400 lb Nov, 200 lb Dec
	OA	100 lb/1 mo	CLOSED	400 lb/1 mo			400 lb Nov, 100 lb Dec

Table 4-81. Preferred Alternative – Non-nearshore. Overfished species projected mortality (mt), compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations (mt), for 2015-2016.

	2015			2016		
Stock	**Projected Mortality**	**Non-nearshore Share**	**Non-trawl Allocation**	**Projected Mortality**	**Non-nearshore Share**	**Non-trawl Allocation**
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	0.6	11.2	0.5	0.7	12.1

Table 4-82. Preferred Alternative. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt) compared to the non-trawl allocation.

Stock	2015				2016			
	LE	OA	Total	Non-trawl Allocation[a/]	LE	OA	Total	Non-trawl Allocation[a/]
Arrowtooth flounder	44	7	51	170.5	48	7	55	162.0
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	
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	401.0	0	0	0	398.8
Dover sole	6	1	7	2,430.3	7	1	8	2,420.3
English sole	0	0	0	482.0	0	0	0	349.6
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	192.7	69	14	83	192.7
Longspine thornyhead (North Pt. Conception)	3	1	3	156.2	3	1	4	148.4
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	84.3	22	5	27	83.3
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	85.2	0	0	0	86.8
Starry flounder	0	0	0	761.9	0	0	0	764.4
Unspecified skate	16	3	19		18	3	21	
Widow rockfish	0	0	0	172.8	0	0	0	172.8
Yellowmouth (North of 40°10' N. lat.)	0	0	0		0	0	0	
Yellowtail rockfish	1	0	1	667.2	1	0	1	637.7
Other Flatfish	0	0	0	854.5	0	0	0	703.9
Other groundfish[b/]	3	1	4		4	1	4	
Other Nearshore Rockfish[b/]	0	0	0		0	0	0	
Other Shelf Rockfish[b/]	3	0	3		3	0	3	
Other Slope Rockfish[b/]	101	18	119	c/	110	20	130	d/

[a/] The non-trawl allocation includes the non-nearshore, nearshore, and recreational fisheries.
[b/] See PFMC 2014 for the composition of the aggregate groups.
[c/] Minor slope rockfish north non-trawl allocation in 2015 is 309.5 mt, and south is 246.8 mt.
[d/] Minor slope rockfish north non-trawl allocation in 2016 is 312 mt, and south is 249.8 mt.

Impact (Groundfish Mortality) Non-nearshore South of 36° N. Latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under the Preferred Alternative are largely influenced by the sablefish ACL, which would be calculated with a P* of 0.40. Anticipated catch of sablefish south of 36° N latitude under the Preferred Alternative would be approximately equal to the 2015-2016 sablefish allocations and resulting landed catch shares for limited entry and open access fixed gears. The No Action Alternative sablefish trip limits would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-3). Additionally, trip limit increases are proposed for bocaccio and Shelf Rockfish south of 34°27' N. latitude to increase attainment of the non-trawl allocations (Appendix B, Section B.9—historical attainment). Trip limits for other species may also be adjusted to attain the ACL or achieve other conservation goals.

Under the Preferred Alternative, 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 4-84). Routine adjustments of the non-trawl RCA (same as the No Action Alternative) would occur if the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation (Table 4-83). RCA changes could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm).

A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which could improve the data used in management.

Table 4-83 Preferred Alternative: 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 4-84. Preferred Alternative. Proposed trip limit increases for bocaccio and Shelf Rockfish south of 34°27' N. latitude.

<table>
<tr><th>Fishery Sector</th><th>Fleet</th><th>Alternative</th><th>Jan/Feb</th><th>Mar/Apr</th><th>May/Jun</th><th>Jul/Aug</th><th>Sep/Oct</th><th>Nov/Dec</th></tr>
<tr><td rowspan="4">Bocaccio south 34°27'</td><td rowspan="2">LE</td><td>No Action</td><td>300</td><td>closed</td><td>300</td><td colspan="3">500 lbs/2 months</td></tr>
<tr><td>Preferred</td><td>750</td><td>closed</td><td colspan="4">750 lbs/2 months</td></tr>
<tr><td rowspan="2">OA</td><td>No Action</td><td>100</td><td>closed</td><td>100</td><td colspan="3">200 lbs/2 months</td></tr>
<tr><td>Preferred</td><td>250</td><td>closed</td><td colspan="4">250 lbs/2 months</td></tr>
<tr><td rowspan="4">Shelf Rockfish Complex south 34°27'</td><td rowspan="2">LE</td><td>No Action</td><td>3,000</td><td>closed</td><td>3,000</td><td colspan="3">4,000 lbs/2 months</td></tr>
<tr><td>Preferred</td><td>4,000</td><td>closed</td><td colspan="4">4,000 lbs/2 months</td></tr>
<tr><td rowspan="2">OA</td><td>No Action</td><td>750</td><td>closed</td><td>750</td><td colspan="3">1,000 lbs/2 months</td></tr>
<tr><td>Preferred</td><td>1,500</td><td>closed</td><td colspan="4">1,500 lbs/2 months</td></tr>
</table>

Impact (Groundfish Mortality) Nearshore – Preferred Alternative

There are Federal limits and state quotas (or harvest guideline) for nearshore species that constrain target species landings in the commercial nearshore fishery. In 2015 and 2016, there would be a Federal HG for blue rockfish south of 40°10' N. latitude within the Minor Nearshore Rockfish complex of 194.4 mt and

198.3 mt, respectively, for both commercial and recreational fisheries. The West Coast states would be tracking and managing catches of Minor Nearshore Rockfish north of 40°10’ N. latitude, as described in Section 2.1.2.3. A 23.7 mt HG for Minor Nearshore Rockfish north of 40°10' N. latitude is proposed for California (in the area 40°10' N. latitude to 42° N. latitude) and would apply to both the nearshore commercial and recreational fisheries.

State HGs between recreational and commercial fisheries may be adjusted by each state between or within years, so they are not displayed herein. State HGs for each sector are established to ensure that the non-trawl allocation provided to each state is not exceeded, while providing fishing opportunities for both sectors. The Preferred Alternative would be based on the expectation that landings in the Oregon nearshore fishery (Table 4-85) would be equal to their allocations, except for lingcod where the historical average landings are estimated from WCGOP lingcod catch data(retained and discarded) by trip, and except for black rockfish, for which the state landing limit would have to be reduced from 137.9 mt to 120.0 mt to remain under the yelloweye rockfish catch share shown in Table 4-86. In California, nearshore fishery allocations cannot be achieved, given the current overfished species shares allocated to the nearshore fishery and state. As such, landings are reduced to stay within the nearshore fishery overfished species shares of the non-trawl allocation. Nearshore fishery landings are influenced by a variety of factors, including weather and market, and can vary annually. As such, there is substantial uncertainty surrounding the estimated landings under the action alternatives, which, in turn, influences the projected overfished species mortality and socioeconomic analysis. If fishery performance were lower than the allocations, mortality of groundfish species would be lower.

Trawl and non-trawl allocations for overfished species, would be implemented under the Preferred Alternative. 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. If the projected overfished species mortality were expected to exceed the nearshore share or non-trawl allocation, routine adjustments of the shoreward non-trawl RCA or reduced trip limits for nearshore species could occur. The shoreward non-trawl RCA structure under the Preferred Alternative would be the same as under the No Action Alternative with one exception. In the area from 40°10' N. latitude to 42° N. latitude, the shoreward RCA boundary would be moved from 20 to 30 fm. RCA changes could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the nearshore share or non-trawl allocation (e.g., changing from 20 to 30 fm).

The prohibition on lingcod retention during certain periods would be removed, and trip limits would be increased for both limited entry and open access fixed gears (Section 2.1.2.2 and Appendix B, Section B.7 and Section B.8).

Table 4-85. Preferred Alternative. Expected landings under the Preferred Alternative (mt) in 2015-2016. Target species landings by area are also shown (far right panel).

			Landings by Area			
Stock	Area	Total Landings	OR Total	CA Total	40°10' – 42° N. lat.	S. of 40°10' N. lat.
Black rockfish	S. 46°16' N. lat.	179	120	59	55	4
Cabezon	OR	30	30			
Cabezon	CA	57		57	3	54
Kelp greenling	OR	23	23			
Kelp greenling	CA	21.2		21.2	0.2	21
Lingcod	N. 40°10' N. lat.	57	49	8	8	
Lingcod	S. 40°10' N. lat.	17		17		17
Nearshore Rockfish N.[a/]	N. 40°10' N. lat.	25	18	7		
--Blue rockfish		*9*	*4*	*5*	*5*	
--Other Nearshore Rockfish		*16*	*14*	*2*	*2*	
Nearshore Rockfish S.	S. 40°10' N. lat.	79		79		
--Blue rockfish		*2*		*2*		*2*
--Shallow Nearshore Rockfish[b/] b/		*53*		*53*		*53*
--Deeper Nearshore Rockfish [c/]		*24*		*24*		*24*

[a/]Nearshore Rockfish north and south totals consists of black-and-yellow rockfish, blue rockfish, China rockfish, gopher rockfish, grass rockfish, kelp rockfish, brown rockfish, olive rockfish, copper rockfish, treefish, calico rockfish, and quillback rockfish.
[b/]Shallow Nearshore Rockfish south consists of black and yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish.
[c/]Deeper Nearshore Rockfish south consists of black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish.

Table 4-86. Preferred Alternative. Total projected overfished species (OFS) mortality compared to the nearshore fishery share of the non-trawl allocation 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.

				Projected OFS Mortality by Area for 2015-2016			
Stock	Area	Total Projected OFS Mortality 2015-2016	Nearshore Fishery Share 2015/2016	Oregon Total (Share 2015/2016)	CA Total (Share 2015/2016)	40°10' – 42° N. lat.	S. of 40°10' N. lat.
Bocaccio	S. 40°10' N. lat.	0.4	1.0/1.0	N/A	0.4	N/A	0.4
Cowcod	S. 40°10' N. lat.	0		N/A	0	N/A	0
Canary	Coastwide	6.7	6.7/6.9	1.1 (1.8/1.9)	5.6 (4.9/5.0)	0.5	5.1
Darkblotched	Coastwide	0.2		0.1	0.1	0	0.1
POP	N. 40°10' N. lat.	0		0	0	0	0
Petrale	Coastwide	0		0	0	0	0
Yelloweye	Coastwide	1.3	1.7/1.8	1.0	0.3 (0.3/0.35)	0.2	0.1

4.2.2.7 Impact (Groundfish Mortality) Tribal Fisheries – Preferred Alternative

Tribal fisheries would operate under the HGs and allocations displayed in Table 4-66, Table 4-68, and Table 4-70. Tribal fisheries would be managed using the same measures described under No Action.

4.2.2.8 Washington Recreational – Preferred Alternative

Primary catch controls for the Washington recreational fishery are season dates, depth closures, bag limits, and GCAs, including YRCAs. Under the Preferred Alternative, Washington recreational fisheries would operate under the 2015 and 2016 ACLs and Washington recreational HGs for overfished species (Table 4-87).

Table 4-87. Preferred Alternative: Washington recreational HGs for 2015 and 2016.

Stock	2015	2016
Canary Rockfish	3.4	3.5
Yelloweye Rockfish	2.9	3.1

Groundfish Season Structure

Under the Preferred Alternative, 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 the Preferred Alternative would differ only slightly from the No Action Alternative. Under the Preferred Alternative, the depth closure in the North Coast (Marine Areas 3 and 4) would be in place from May 9 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. In the Columbia River Area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved 3 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 2013-2014 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 they provided some leeway to refine and streamline management measures described under the No Action Alternative. Table 4-88 summarizes key features of the Washington recreational regulations under the Preferred Alternative.

Table 4-88. Preferred Alternative. 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 to 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 to June 15[b/ c/ d/ e/]</td><td colspan="6">Open all depths[e/]</td></tr>
<tr><td>1 (Columbia 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>
</table>

[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 to 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.

North Coast (Marine Areas 3 and 4)

The retention of bottomfish is prohibited seaward of a line approximating 20 fm from May 9 through the first Monday in September, except that lingcod, Pacific cod and sablefish can be retained seaward of 20 fm on days open to recreational fishing for Pacific halibut. Fishing for, retention of, or possession of groundfish and Pacific halibut is prohibited in the C-shaped YRCA (Figure 4-27).

South Coast (Marine Area 2)

The retention of bottomfish, except rockfish, is prohibited seaward of 30 fm from March 15 through June 15, except that 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 of, 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 4-31). Fishing for, retention of, or possession of bottomfish or Pacific halibut is prohibited in the South Coast YRCA and Westport Offshore YRCA (Figure 4-27).

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 of, 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 4-31).

Area Restrictions

Under the Preferred Alternative, fishing for, retention of, 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 and the South Coast, as well as in Westport YRCAs in the South Coast (Figure 4-27).

Fishing for, retention of, 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 4-31).

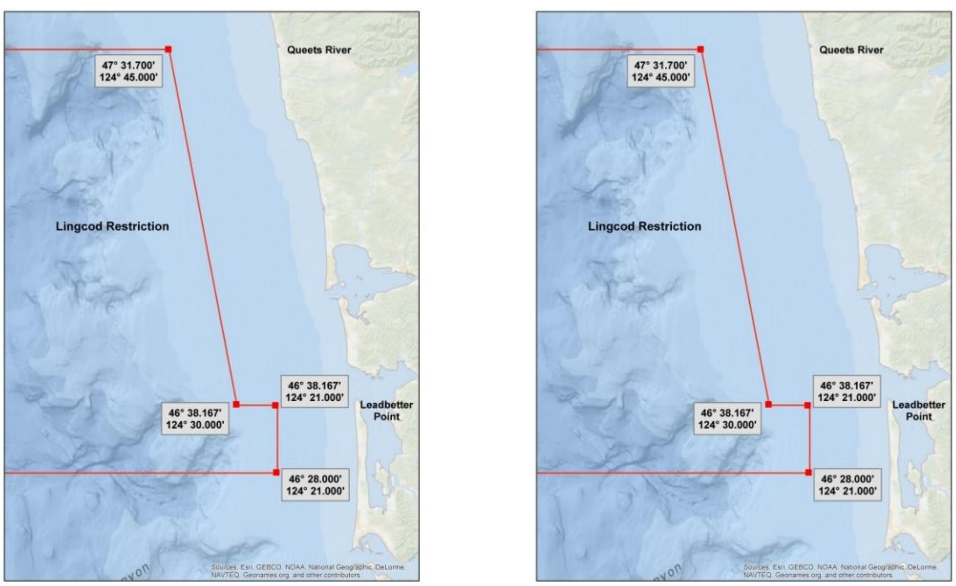

Figure 4-31. Preferred Alternative. Washington Lingcod Restricted Area.

Other Measures

Minor Nearshore Rockfish HGs: The West Coast states would be tracking and managing catches of Minor Nearshore Rockfish north of 40°10’ N. latitude, as described in Section 2.1.2.3. If harvest levels in Washington approached 75 percent of the state-specific HG (Table 2-6), the state of Washington would consult with the other West Coast states via a conference call and determine whether inseason action were needed. The HG for Washington would be a state HG and would not be established in Federal regulations. If inseason action were needed, the state of Washington would take action through state regulation. Inseason updates would be provided to the Council at the September and November meetings.

Groundfish Bag Limits: Groundfish bag limits would be the same under the Preferred Alternative 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, 2 lingcod would apply. The recreational bag limit would also include a sub-limit of two cabezon in Marine Areas 1 through 3 and one cabezon in Marine Area 4.

Lingcod Seasons and Size Limits: 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.-Canada border) the lingcod season would be open from April 16 through October 15, or the Saturday closest to October 15, should that Saturday precede October 15, whichever would be earlier. Lingcod seasons under the Preferred Alternative would be structured the same as they were under the No Action Alternative. Under the Preferred Alternative, the lingcod seasons and size limits by area would be as follows:

- Marine Areas 1 through 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.

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; in the Columbia River Area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved 3 miles north.

Cabezon Size Limit: Under the Preferred Alternative, there would be an 18-inch minimum size limit for cabezon in Marine Area 4 (Cape Alava to the U.S. Canadian border), the same as under the No Action Alternative.

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 would be no changes to the restrictions on groundfish retention during the Pacific halibut season proposed under the Preferred Alternative. However, modifications to the groundfish retention rules during the all-depth Pacific halibut openings may be proposed under the Pacific halibut Catch Sharing Plan process (Appendix B, Section B.13).

Additional Management Measures Analyzed: No additional management measures were analyzed for the Preferred Alternative. Currently available management measures would be used to keep recreational harvests of overfished species within specified HGs for 2015-2016.

Impact (Groundfish Mortality)

Projected mortality for Washington's recreational fishery is based upon the previous season's harvest estimated by the Ocean Sampling Program and incorporated in Recreational Fishery Information Network (RecFIN). Table 4-89 summarizes the projected mortality for overfished and non-overfished species under the Preferred Alternative.

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 4-89. Preferred Alternative: Washington recreational projected groundfish mortality in 2015 and 2016 (mt).

Stock	2015/2016
Canary Rockfish	0.75
Yelloweye Rockfish	2.83
Black Rockfish	251.54
Lingcod	125.61
Minor Nearshore Rockfish	10.54
Blue Rockfish	2.58
Quillback Rockfish	2.23
Copper Rockfish	2.24
China Rockfish	3.49
Brown Rockfish	-
Grass Rockfish	-
Yellowtail Rockfish	28.32
Vermilion Rockfish	0.60
Cabezon	5.56
Kelp Greenling	1.90

4.2.2.9 Oregon Recreational – Preferred Alternative

Primary catch controls for the Oregon recreational fishery are season dates, depth closures, bag limits, and GCAs, including YRCAs. The Preferred Alternative analyzes the Oregon recreational fishery with the 2015 and 2016 ACLs and Oregon recreational HGs for overfished species (Table 4-90), which directly influence the recommended management measures. Key target species with a state quota or Federal HG are also shown, such as black rockfish, which has an HG of 440.4 mt.[53] Projected mortality under the Preferred Alternative for the Oregon recreational fisheries is shown in Table 4-91.

[53] 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.

Table 4-90. Oregon recreational Federal HGs (in mt) and state quotas under the Preferred Alternative for 2015-2016.

Stock	HGs and State Quotas[a/]	
	2015	2016
Canary Rockfish	11.7	12.0
Yelloweye Rockfish	2.6	2.8
Black Rockfish	440.4	440.4
Greenlings [b/]	5.2	5.2
Nearshore Rockfish N. of 40°10' N. lat.	48.4	36
--*Blue Rockfish*		
--*Other Nearshore Rockfish*		

[a/] Federal HGs would be established for canary and yelloweye rockfish only. The state process in Oregon would establish quotas for black rockfish, blue rockfish, other Nearshore Rockfish, and greenlings (all species). Black and blue rockfish are managed to a combined state quota; the estimated quotas by species are represented in this table. The state quotas are not intended to be implemented in Federal regulation, they are only provided as information.
[b/] Would include kelp and other greenlings.
Should harvest levels in Oregon (both commercial and recreational) approach 75 percent of the state-specific HG (Table 2-6), the state of Oregon would consult with the other West Coast states via a conference call and determine whether inseason action were needed. The HG for Oregon would be a state HG and would not be established in Federal regulations.

Table 4-91. 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
Minor Nearshore Rockfish N. 40°10' N. lat.	30.5
--*Blue Rockfish*	*17.5*
--*Other Minor Nearshore Rockfish*	*13.0*

[a/]Would include kelp and other greenlings.

4.2.2.10 Groundfish Season Structure

Under the Preferred Alternative, the Oregon recreational groundfish fishery would be open offshore year-round, except from April 1 to September 30 when fishing would only be allowed shoreward of 40 fathoms, as defined by waypoints (Figure 4-32). Closing the fishery outside of 40 fathoms from April 1 to September 30, months when angler effort and yelloweye rockfish encounters are greatest, would mitigate 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)											
Lingcod Bag Limit	Three (3)											
Flatfish Bag Limit[2]	Twenty Five (25)											

[1]Under the Preferred Alternative, the marine bag limit would include 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]Under the Preferred Alternative the flatfish bag limit would include flounders, soles, sanddabs, turbots and halibuts except Pacific halibut.

Figure 4-32. Preferred Alternative. Oregon recreational groundfish season structure and bag limits under the Preferred Alternative.

Area Closures

The Stonewall Bank YRCA has been in place since 2006, and it would remain in place under the Preferred Alternative (Figure 4-33). 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 4-91.

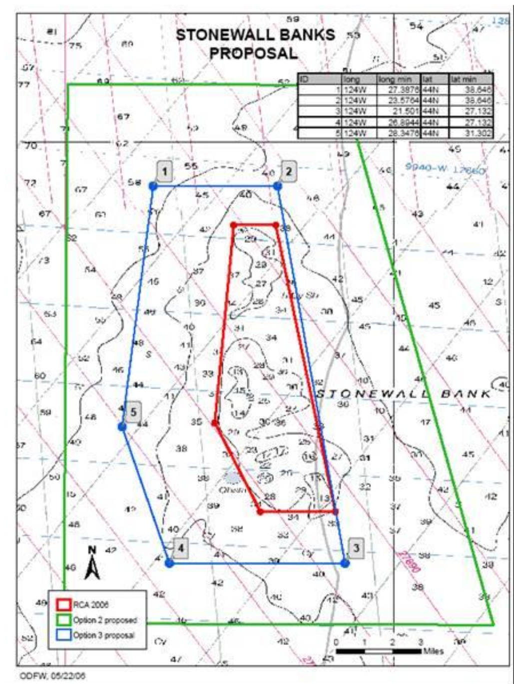

Figure 4-33. Preferred Alternative. The Stonewall Bank Yelloweye Rockfish Conservation Area where recreational fishing for groundfish and Pacific halibut is prohibited.

Two options for extending the status quo Stonewall Bank YRCA for 2015-2016 recreational fisheries, should they become necessary, are also shown in Figure 4-33. They are defined by the coordinates in Table 4-92.

Table 4-92. Preferred Alternative. Coordinates for the Stonewall Bank as specified currently in regulation, and Option 2 and Option 3 for expanding the Stonewall Bank area closure under the Preferred Alternative.

Current		Option 2		Option 3	
Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
44°37.458' N.	124°24.918' W.	44°41.7594' N.	124°30.018' W.	44°38.544' N	124°27.4122' W
44°37.458' N.	124°23.628' W.	44°41.7348' N.	124°21.603' W.	44°38.544' N	124°23.8554' W
44°28.710' N.	124°21.798' W.	44°25.2456' N.	124°16.944' W.	44°27.132' N	124°21.501' W
44°28.710' N.	124°24.102' W.	44°25.2942' N.	124°30.1404' W.	44°27.132' N	124°26.8944' W
44°31.422' N.	124°25.500' W.	44°41.7594' N.	124°30.018' W.	44°31.302' N	124°28.3476' W

Groundfish Bag Limits and Size Limits

Under the Preferred Alternative, a marine fish daily bag limit of 10 fish in aggregate would be implemented, the same as under the No Action Alternative, for 2015-2016. The marine bag limit would include 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 the No Action Alternative, would be removed under the Preferred Alternative. Cabezon mortality would be limited via state regulations. A one-fish canary sub-bag limit would be implemented. A flatfish daily bag limit of 25, which would include 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 yelloweye rockfish would continue to be prohibited under the Preferred Alternative.

The following minimum size limits applied to 2013–2014 Oregon recreational fisheries. They would be carried forward under the Preferred Alternative:

- Lingcod – 22 in.
- Cabezon – 16 in.
- Kelp greenling – 10 in.

Under the Preferred Alternative, the recreational Pacific halibut fisheries should be able to proceed as in 2013 and 2014, relative 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. South of Humbug Mountain, groundfish may be retained in areas open to groundfish (e.g., less than 30 fm) when halibut are onboard the vessel. There would be no changes to the restrictions on groundfish retention during the Pacific halibut season proposed under the Preferred Alternative. However, modifications to the groundfish retention rules during the Pacific halibut openings may be proposed under the Pacific halibut Catch Sharing Plan process (Appendix B, Section B.13).

The West Coast states would track and manage catches of Nearshore Rockfish north of 40°10’ N. latitude, as described in Section 2.1.2.3, under the Preferred Alternative. If harvest levels in Oregon (both commercial and recreational) were to approach 75 percent of the state-specific HG (Table 2-6), the state of Oregon would consult with the other West Coast states via a conference call and determine whether inseason action were needed. The HG for Oregon would be a state HG and would not be established in Federal regulations. If inseason action were needed, the state of Oregon would take action through state regulation. Inseason updates would be provided to the Council at the September and November meetings.

Additional Management Measures Analyzed

Under the Preferred Alternative, two additional management measures were analyzed for the Oregon recreational fisheries: allowing limited retention of canary rockfish (one-fish, sub-bag limit) and modifying the groundfish species allowed to be retained during all-depth Pacific halibut openings. Additionally, a variety of season structures (depths and months) were modeled to determine potential mortality to overfished species.

Inseason Management Tools

Oregon has a responsive port-based monitoring program through ORBS, as welelas regulatory processes in place to track mortality and take actions inseason, if necessary. The following are suggested management measures that could be implemented inseason should the fishery 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.

Should 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 Minor Nearshore Rockfish harvest. The lingcod daily bag limits may be adjusted to no more than 3 fish should marine bag limit change or the halibut catch limit be reduced from 2013 levels. Season and/or area closures may also be considered should harvest targets be 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 Minor 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 overfished rockfish, since a variety of descending devices are available. SSC recommended and Council-approved mortality rates for canary and yelloweye rockfish when descending devices are used will be implemented in 2014 (see Appendix A for documentation).

Directed yellowtail rockfish and/or flatfish fisheries may be implemented inseason, as occurred 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 they would be open shoreward of 40 fathoms during any period in which 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 remain within the harvest targets/guidelines.

If 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 would not exceed the HGs.

4.2.2.11 California Recreational – Preferred Alternative

The 2015-2016 California recreational groundfish projected mortality and season structure under the Preferred Alternative 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.

In 2015 and 2016, there would be a Federal HG for blue rockfish south of 42° N. latitude within the Minor Nearshore Rockfish complex of 194.4 mt and 198.3 mt, respectively, for both commercial and recreational fisheries. The West Coast states would be tracking and managing catches of Minor Nearshore

Rockfish north of 40°10' N. latitude, as described in Section 2.1.2.3. A 23.7 mt HG for Minor Nearshore Rockfish north of 40°10' N. latitude would be proposed for California (in the area 40°10' N. latitude to 42° N. latitude) and would apply to both the nearshore commercial and recreational fisheries. Bag limit decreases, season length reduction, or non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the state-specific Minor Nearshore Rockfish HG.

Table 4-93 depicts the Preferred Alternative overfished species HGs for the 2015-2016 California recreational groundfish seasons.

Table 4-93. Preferred Alternative: California recreational allocations/HGs 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.

Groundfish Seasons and Area Restrictions

The Preferred Alternative reflects tradeoffs between season lengths and depth restrictions affecting related overfished and target species mortality in each management area (Figure 4-34). The depth restrictions would be the same as the No Action Alternative, with the exception of the Southern California Management Area. The season lengths would be extended for most areas north of Point Conception, with the exception of the Northern California Management Area, where the status quo season length would remain in place to stay within the state HG for the Minor Nearshore Rockfish North complex. Due to lower yelloweye rockfish mortality in recent years, the season length in the Mendocino Management Area could be extended by two and a half months relative to status quo. The season length in the San Francisco Management Area would be extended by a month and a half, while the season length in the Central California Management Area would be extended by one month. Season length in the Southern California Management Area would remain the same as status quo, March 1 to December 31, but the depth restriction would be modified from 50 fm to 60 fm given the increase in the non-trawl allocation of cowcod. In addition, the lingcod bag limit would be increased from two to three fish in all management areas. All remaining management measures would remain the same as the No Action Alternative.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 15 – Oct 31 <20 fm						Closed	
Mendocino	Closed				May 15 – Oct 31 <20 fm						Closed	
San Francisco	Closed			April 15 – Dec 31 <30 fm								
Central	Closed			April 1 – Dec 31 <40 fm								
Southern	Closed		Mar 1 – Dec 31 <60 fm									

Figure 4-34. Preferred Alternative: California recreational groundfish season structure and depth restrictions for 2015-2016.

Groundfish Bag Limits and Size Limits: Under the Preferred Alternative, the groundfish bag limits or size limits would be the same as under the No Action Alternative, except for the following:

- Lingcod: The No Action Alternative bag limit for lingcod would be two fish. Under the Preferred Alternative, the lingcod bag limit would increase from two fish to three fish. The mortality (in metric tons) as a result of the increase in the bag limit is provided in Table 4-94. An increase in the lingcod bag limit from two to three fish could be accommodated statewide with the aforementioned season and depth restrictions. The Council is not proposing any changes to the lingcod minimum size restriction. Increases to overfished species mortality as a result of this increase would likely be minimal (if any) and would be expected to remain within allowable HGs/harvest limits.

Table 4-94. Preferred Alternative: California recreational projected mortality of non-overfished species for 2015-2016.

Species	Projected Mortality (mt)
Black Rockfish	187.3
Blue Rockfish	58.4
Cabezon	37.1
California scorpionfish	81.1
Greenlings	17.8
Lingcod	311.3
Minor Nearshore Rockfish North of 40°10’ N. lat.	11.8
Minor Nearshore Rockfish South of 40°10’ N. lat.	352.8
Widow Rockfish	3.6

Impact (Groundfish Mortality)

Projected mortality for bocaccio, canary rockfish, cowcod, and yelloweye rockfish options under the Preferred Alternative can be found in Table 4-95. The projected mortality of cowcod, bocaccio, canary and yelloweye rockfish would increase compared to the No Action Alternative due to the increased season lengths or deeper depth restrictions. The overfished and target species mortality projected under the Preferred Alternative management measures would be below their respect harvest limits. The number of angler trips would likely rise, allowing for increased opportunity for both private/rental boats (PR) and CPFVs. Projections for non-overfished species for the Preferred Alternative are provided in Table 4-93.

Similar to the No Action Alternative, weekly catch tracking of yelloweye and cowcod mortality using the relationship between encountered and estimated catch in years past would provide anticipated catch values reflecting expected catch accrual with as little as a 2-day lag. RecFIN catch estimates available on a one and a half month lag would be used to track canary and bocaccio mortality, while estimates for cowcod and yelloweye would be added to the anticipated catch vales to provide an approximation of mortality expected to have accrued. Similar to the No Action Alternative, if overfished species encounters were 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 should yelloweye rockfish catches be projected to exceed HGs.

Table 4-95. Preferred Alternative: California recreational projected mortality of overfished species for 2015-2016.

Species	Projected Mortality (mt)	2015 HG (mt)	2016 HG (mt)
Bocaccio	117.2	178.8	185.5
Canary Rockfish	18.2	24.3	25.0
Cowcod	1.2	[a/]	[a/]
Yelloweye Rockfish	2.1	3.4	3.7

[a/] The non-trawl allocation of cowcod would be 2.6 mt under the Preferred Alternative.

4.2.3 Alternative 1 – P* 0.45

Table 4-98, Table 4-99, and Table 4-100 contain the harvest specifications and allocations analyzed under Alternative 1. Projected mortality of overfished species under Alternative 1 would the same as under the Preferred Alternative (Table 4-101). A description of the HCR used to calculate the ACLs can be found in Section 2.1.1.3.

4.2.3.1 Deductions from the ACL and Allocations

Under all action alternatives, off-the-top deductions from the ACL were updated based on the most recent information on fishery performance and need. Amounts deducted that are from the ACL to accommodate groundfish mortality from scientific research, incidental open access fisheries, and EFPs can be modified based on inseason projections (Section 4.2.1.1). Under Alternative 1, the deductions from the ACL are made using the same process as described in Section 4.2.2.1, except for the tribal fishery, which is described below.

Tribal Fishery: Tribal fisheries consist of trawl (bottom, midwater, and whiting), fixed gear, and troll. The tribal amounts in the April 17, 2014, regulations were updated with the tribal requests from November 2013 (Agenda Item H.10.b, Supplemental Tribal Report, November 2013 and Agenda Item H.10.b, Supplemental Tribal Report 2, November 2013).

Table 4-96. Alternative 1. 2015 ACLs and estimates of tribal (Trib), EFP, research (Res), and incidental open access (OA) mortality (in mt), used to calculate the fishery harvest guideline (HG).

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
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
Petrale Sole	Coastwide	2,816	220		14.2	2.4	2,579.4
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	WA	402	14				388.0
Black	OR and CA	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	154					154.0
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	9,853	91		5.8	7	9,749.2
Lingcod	N of 40º10’ N. lat.	2,830	250	0.5	11.67	16	2,551.8
Lingcod	S of 40º10’ 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 4-100			
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.	6,590	677	10	16.6	3	5,883.4
Minor Nearshore Rockfish north	N of 40º10' N. lat.	69					69.0
Minor Nearshore Rockfish south	S of 40º10' N. lat.	1,114			2.6	1.4	1,110
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.	1,693	36	1	8.1	19	1628.9
Slope Rockfish south	S of 40º10' N. lat.	693		1	2	17	673.0
Other Flatfish	Coastwide	8,749	60		19	125	8,545.0
Other Fish	Coastwide	242					242.0

[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 1. Stock-specific fishery harvest guidelines (HGs) or annual catch targets (ACTs) and allocations for 2015 (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
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
Petrale Sole	Coastwide	2,579.4	Biennial	N/A	2,544.4	N/A	35.0
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				
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	9,749.2	Amendment 21	95%	9,261.7	5%	487.5
Lingcod	N of 40º10' N. lat.	2,551.8	Amendment 21	45%	1,148.3	55%	1,403.5
Lingcod	S of 40º10' 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 4-100				
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.	5,883.4	Amendment 21	88%	5,177.4	12%	706.0
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	69.0	None				
Minor Nearshore Rockfish S.	S of 40º10' N. lat.	1,110.0	None				
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.	1,628.9	Amendment 21	81%	1,319.4	19%	309.5
Slope Rockfish south	S of 40º10' N. lat.	673.0	Amendment 21	63%	424.0	37%	249.0
Other Flatfish	Coastwide	8,545.0	Amendment 21	90%	7,690.5	10%	854.5
Other Fish	Coastwide	242.0	None				

[a/]Under Alternative 1, the cowcod fishery HG would be 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 1. 2016 ACLs and estimates of tribal, EFP, research, and incidental open access (OA) mortality (in mt), used to calculate the fishery HG.

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
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
Petrale Sole	Coastwide	2,910	220		14.2	2.4	2,673.4
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	WA	404	14				390.0
Black	OR and CA	1,000		1			999.0
Cabezon	OR	47					47.0
Cabezon	CA	151					151.0
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	7,204	91		5.8	7	7,100.2
Lingcod	N of 40º10’ N. lat.	2,719	250	0.5	11.67	16	2,440.8
Lingcod	S of 40º10’ 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	See Table 4-100				
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.	6,344.0	677	10	16.6	3	5,637.4
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	69					69.0
Minor Nearshore Rockfish S.	S of 40º10' N. lat.	1,006			2.6	1.4	1,002.2
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.	1,706	36	1	8.1	19	1,641.9
Slope Rockfish S.	S of 40º10' N. lat.	695	0	1	2	17	675
Other Flatfish	Coastwide	7,243	60		19	125	7,039.0
Other Fish	Coastwide	243					243.0

[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 1. Stock-specific fishery harvest guidelines (HGs) or annual catch targets (ACTs) and allocations for 2016 (in mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl %	Trawl Mt	Non-trawl %	Non-trawl 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
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
Petrale Sole	Coastwide	2,673.4	Biennial	N/A	2,638.4	N/A	35.0
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				
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	7,100.2	Amendment 21	95%	6,745.2	5%	355.0
Lingcod	N of 40º10' N. lat.	2,440.8	Amendment 21	45%	1,098.4	55%	1,342.5
Lingcod	S of 40º10' 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 4-100				
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.	5,637.4	Amendment 21	88%	4,960.9	12%	676.5
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	69.0	None				
Minor Nearshore Rockfish S.	S of 40º10' N. lat.	1,002.2	None				
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.	1,641.9	Amendment 21	81%	1,329.9	19%	312.0
Slope Rockfish south	S of 40º10' N. lat.	675.0	Amendment 21	63%	425.3	37%	249.8
Other Flatfish	Coastwide	7,039.0	Amendment 21	90%	6,335.1	10%	703.9
Other Fish	Coastwide	243.0	None				

[a/] Under Alternative 1, the cowcod fishery HG would be 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 1. Sablefish north of 36° N. latitude ACLs, off-the-top deductions from the ACL used to calculate the commercial HG (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/] Under Alternative 1, the sablefish allocation to Pacific Coast treaty Indian tribes would be 10 percent of the sablefish ACL for the area north of 36° N. latitude This allocation represents the total amount available to the treaty Indian fisheries before deductions for discard mortality.

Table 4-101. Alternative 1: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under Alternative 1.

2015

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5-23-14**	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/
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	11.3	56.9	23.6	1.4	0.1	301.3	127.0	2,544.4	2,410.0	135.9	68.1	1.0	0.0
-SB Trawl	81.9	11.3	43.3	9.9	1.4	0.1	285.6	111.3	2,539.4	2,405.0	118.5	50.7	1.0	0.0
-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	117.6	49.9	30.0	2.6	1.2	15.9	5.1	35.0	0.3	7.2	0.3	11.2	8.9
Non-Nearshore	79.1	0.0	3.8	1.1				4.9		0.3		0.3	1.1	0.5
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.7	6.7				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	178.8	117.2	24.3	18.2		1.2		--		--		--	3.4	2.1
TOTAL	349.0	137.2	122.0	68.8	6.0	3.3	338.0	152.9	2,816.0	2,646.9	158.1	83.4	18.0	14.8
2015 Harvest Specification	**349**	**349**	**122**	**122**	**10.0**	**10.0**	**338**	**338**	**2,816**	**2,816**	**158**	**158**	**18**	18
Difference	0.0	211.8	0.0	53.3	4.0	6.7	0.0	185.1	0.0	169.1	-0.1	74.6	0.0	3.2
Percent of ACL	100.0%	39.3%	100.0%	56.4%	60.2%	33.2%	100.0%	45.2%	100.0%	94.0%	100.1%	52.8%	100.0%	82.0%

Key		
		= not applicable
	--	= trace, less than 0.1mt
		= Fixed Values
		= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be 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 during the biennial 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 requested set asides for 2015-2016.
[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).
[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.
[g/] Projected impacts are derived from GMT project models.

Table 4-101 (continued). Alternative 1: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under Alternative 1.

2016

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5 April 2014**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**	**Allocation a/**	**Projected**
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	85.0	11.8	58.5	24.2	1.4	0.1	308.9	130.3	2,638.4	2,499.0	141.6	70.5	1.1	1.1
-SB Trawl	85.0	11.8	44.5	10.2	1.4	0.1	292.8	114.1	2,633.4	2,494.0	124.0	53.1	1.1	0.0
-At-Sea Trawl			14.0	14.0			16.2	16.2	5.0	5.0	17.4	17.4		
a) At-sea whiting MS			5.8	5.8			6.7	6.7			7.2	7.2		
b) At-sea whiting CP			8.2	8.2			9.5	9.5			10.2	10.2		
Non-Trawl Allocation	268.7	117.6	51.3	30.2	2.6	1.2	16.3	5.6	35.0		7.5	0.3	12.1	8.9
Non-Nearshore	82.1	0.0	3.9	1.2		0.0		5.4		0.3		0.3	1.2	0.6
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.9	6.8				0.2		0.0		0.0	1.3	1.2
Recreational Groundfish														
WA			3.5	0.8				--		--		--	3.1	2.8
OR			12.0	3.2				--		--		--	2.8	2.2
CA	185.6	117.2	25.0	18.2		1.2		--		--		--	3.7	2.1
TOTAL	362.0	137.7	125.0	69.6	6.0	3.3	346.0	156.7	2,910.0	2,735.6	164.1	85.8	19.0	15.9
2015 Harvest Specificatio	**362**	**362**	**125**	**125**	**10.0**	**10.0**	**346**	**346**	**2,910**	**2,910**	**164**	**164**	**19**	19
Difference	0.0	224.3	0.0	55.5	4.0	6.7	0.0	189.3	0.0	174.4	-0.1	78.2	0.0	3.1
Percent of ACL	100.0%	38.0%	100.0%	55.6%	60.2%	33.2%	100.0%	45.3%	100.0%	94.0%	100.1%	52.3%	100.0%	83.5%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1 mt
	(black)	= Fixed Values
	(blue)	= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be 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 during the biennial 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 requested set asides for 2015-2016.
[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).
[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.
[g/] Projected impacts are derived from GMT project models.

4.2.3.2 Harvest Guidelines

Harvest guidelines under Alternative 1 would be the same as those under the Preferred Alternative (Section 4.2.2.2).

4.2.3.3 Overview of Management Measure Changes

The following bullet points summarize management measure changes by sector under Alternative 1 compared to the Preferred Alternative. A more detailed discussion of management measures by sector follows. New measures discussed under Chapter 2, Section 2.1.2, and analyzed in Appendix B would be implemented. New management measures that are specific to a sector are described below.

Starting in 2015, the West Coast states would monitor and manage catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs. If harvest levels in a particular state approached 75 percent of the state-specific HGs, which are based on status quo harvest levels, the states would consult via a conference call and determine whether inseason action would be needed. The HGs for Washington and Oregon would be state HGs and would not be established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area 40°10' N. latitude to 42° N. latitude. If inseason action were needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

- The shorebased IFQ fishery would operate under the same management measures as described under the Preferred Alternative, except that the shorebased IFQ would be issued based the 2015-2016 ACLs and resulting trawl allocations under Alternative 1.
- The at-sea whiting co-ops would operate under the same management measures described under the Preferred Alternative.
- The non-nearshore fixed gear fishery would operate under the same management measures as under the Preferred Alternative, except that additional trip limit increases would be proposed to attain the higher sablefish ACLs under Alternative 1.
- The nearshore fixed gear fishery would operate under the same management measures as the Preferred Alternative.
- Tribal fisheries would operate under the HGs and allocations under Alternative 1. Tribal management measures would be the same as those described under the No Action Alternative.
- Washington recreational fisheries would operate under the same management measures as the Preferred Alternative.
- Oregon recreational fisheries would operate under the same management measures as the Preferred Alternative.
- Oregon recreational fisheries would operate under the same management measures as the Preferred Alternative.
- California recreational fisheries would operate under the same management as the Preferred Alternative.

4.2.3.4 Impact (Groundfish Mortality) – Shorebased IFQ – Alternative 1

The shorebased IFQ fishery would operate under the same management measures as described under the Preferred Alternative, except that the shorebased IFQ would be issued based on the 2015-2016 ACLs and resulting trawl allocations under Alternative 1 (Table 4-102 and Table 4-105). Notable IFQ increases from the No Action Alternative would include petrale, longspine thornyheads north, sablefish, shortpine thornyhead, yellowtail, and Other Flatfish.

Table 4-102. Alternative 1 – Shorebased IFQ. Projected mortality for IFQ species 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 Alternative	
		2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt) [a/ b/]	Projected Mortality (mt)	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	0	1.0
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	9,257	137	5,261
Lingcod	North of 40°10' N. lat.	223	1,133	227	1,152
Lingcod	South of 40°10' N. lat.	87	491	84	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[c/]	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	4,877	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	1,219	182	789
Slope Rockfish	South of 40°10' N. lat.	110	424	98	379
Other Flatfish	Coastwide	1,506	7,691	728	4,194

[a/]Under Alternative 1, Pacific halibut would be managed using IBQ; see regulations at §660.140. Starting in 2015, the maximum IBQ allocation would be 45 mt; see (§660.55 (m)). There is no projection model for Pacific halibut bycatch.

[b/]As stated in regulations (§660.55 (m)), there would be 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). There is no projection model for Pacific halibut bycatch.

[c/]The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-103. Alternative 1 – Shorebased IFQ. Projected mortality for IFQ species compared to the allocations or set-asides under Alternative 1 for 2016. No action estimates of mortality are provided (right panel).

		Alternative 1		No Action	
IFQ Species	**Area**	**2016 Projected Mortality (mt)**	**2016 SB IFQ Allocation (mt) a/ b/**	**Projected Mortality (mt)**	**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	1.1	0	1.0
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	6,740	137	5,261
Lingcod	North of 40°10' N. lat.	213	1,083	227	1,152
Lingcod	South of 40°10' N. lat.	81	463	84	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 c/	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	4,661	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	1,2309	182	789
Slope Rockfish	South of 40°10' N. lat.	110	425	98	379
Other Flatfish	Coastwide	1,313	6,315	728	4,194

a/ Under Alternative 1, Pacific halibut would be managed using IBQ; see regulations at §660.140. Starting in 2015, the maximum IBQ allocation would be 45 mt, see (§660.55 (m)). There is no projection model for Pacific halibut bycatch.

b/ As stated in regulations (§660.55 (m)), under Alternative 1, there would be 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). There is no projection model for Pacific halibut bycatch.

c/ The 2014 Pacific whiting TAC was unavailable during the preparation of the EIS; therefore, the 2013 values were used.

4.2.3.5 Impact (Groundfish Mortality) – At-sea Whiting Co-ops – Alternative 1

The at-sea whiting co-ops would operate under the same management measures described under the Preferred Alternative with an equivalent level of projected groundfish mortality.

4.2.3.6 Limited Entry and Open Access Fixed Gear – Alternative 1

Impact (Groundfish Mortality) – Non-nearshore North of 36° N. Latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under Alternative 1 would be largely influenced by the sablefish ACL, which would be calculated with a P* of 0.45 and the resulting sablefish allocations (Table 4-104). Trip limit increases for sablefish would be proposed (Table 4-106) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations. The prohibition on lingcod retention in Periods 1, 2, and 6 would be removed, and trip limits would be increased for both limited entry and open access fixed gears to better attain the non-trawl allocation (Appendix B, Section B.7 and Section B.8). Trip limits for other species may also be adjusted to attain the ACL or achieve other conservation goals.

Blackgill rockfish is part of the Slope Rockfish complex south of 40°10' N. latitude, and the complex is subject to an Amendment 21 allocation (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 for 2015 and 2016 of 114 mt and 117 mt, respectively. Further, the Council provided guidance that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry (68 mt in 2015 and 70 mt in 2016) and 40 percent to open access fixed gears (46 mt in 2015 and 47 mt in 2016). This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005–2010 (Table 3 in **Agenda Item E.9.b, GMT Report 2, November 2011**). Trip limit decreases for Slope Rockfish north of 40°10' N. latitude may be considered inseason to reduce mortality of rougheye/blackspotted rockfish (Appendix B, Section B.6). A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which could improve the data used in management.

The overfished species mortality, as a result of harvesting the sablefish allocations, was evaluated using 2002 to 2012 WCGOP data in the non-nearshore model. Under Alternative 1, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would also be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye (Table 4-107). In the event the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation, routine adjustments of the seaward non-trawl RCA boundary could occur. Changes to RCA boundaries could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm). Table 4-108 contains the projected mortality groundfish for the non-nearshore fishery under Alternative 1.

Table 4-104. Alternative 1. Limited entry sablefish FMP allocations north of 36° N. latitude for 2015-2016.

			LEFG Share (mt)				Estimated Tier Limits (lbs)[a/]		
Year	Sablefish Com. HG	Limited Entry Share	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/]Under Alternative 1, the limited entry fixed gear total catch share would be 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 would be anticipated to be discarded; 20 percent would be expected to die.

Table 4-105. Alternative 1. Open access FMP allocations (mt) north of 36° N. latitude for 2015-2016.

Year	Open Access Total Catch Share	Open Access Landed Catch Share[a/]
2015	421	406
2016	459	443

[a/]Under Alternative 1, the open access total catch share would be 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 would be anticipated to be discarded;
20 percent would be expected to die.

Table 4-106. 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 4-107. Alternative 1 – Non-nearshore. Overfished species projected mortality (mt), compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations (mt), for 2015-2016.

	2015			2016		
Stock	Projected Mortality	Non-nearshore Share	Non-trawl Allocation	Projected Mortality	Non-nearshore Share	Non-trawl Allocation
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 4-108. Alternative 1. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (in mt), compared to the non-trawl allocation.

Stock	2015 [a]				2016 [a]			
	LE	OA	Total	Non-trawl Allocation[b]	LE	OA	Total	Non-trawl Allocation[b]
Arrowtooth flounder	46	7	53	196.6	50	8	58	187.6
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	401.0	0	0	0	398.8
Dover sole	7	1	8	1,170.3	7	1	9	1,170.3
English sole	0	0	0	487.5	0	0	0	355.0
Greenspotted rockfish	0	0	0		0	0	0	
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	192.7	72	14	86	
Longspine thornyhead (North Pt. Conception)	3	1	4	171.4	3	1	4	162.9
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	92.7	22	6	28	91.6
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	85.2	0	0	0	86.8
Starry flounder	0	0	0	835.4	0	0	0	837.9
Unspecified skate	17	3	20		19	3	22	
Widow rockfish	0	0	0	127.8	0	0	0	127.8
Yellowmouth (North of 40°10' N. lat.)	0	0	0		0	0	0	
Yellowtail rockfish	1	0	1	706.0	1	0	1	676.5
Other Flatfish	0	0	0	854.5	0	0	0	703.9
Other groundfish	3	1	4		4	1	5	
Other Minor Nearshore Rockfish	0	0	0		0	0	0	
Other Shelf Rockfish	3	0	3		3	0	4	
Other Slope Rockfish	105	19	125	c/	115	21	136	d/

[a] Zero values resulting from model projections may not accurately project mortality for all species. WCGOP total mortality report may be referred to at http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/species_management.cfm
[b] Under Alternative 1, the non-trawl allocation would include the non-nearshore, nearshore, and recreational fisheries.
[c] Minor slope rockfish north non-trawl allocation in 2015 is 309.5 mt, and south is 249.0 mt.
[d] Minor slope rockfish north non-trawl allocation in 2016 is 312 mt, and south is 249.8 mt.

Impact (Groundfish Mortality) Non-nearshore South of 36° N. Latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under Alternative 1 would be largely influenced by the sablefish ACL, which would be calculated with a P* of 0.45. 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. Increases in the sablefish trip limits would be proposed (Table 4-110) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations (Table 4-109). Additionally, trip limit increases would be proposed for bocaccio and Shelf Rockfish south of 34°27' N. latitude to attain the non-trawl allocations. Trip limits for other species may also be adjusted to attain the ACL or achieve other conservation goals.

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 4-109). Routine adjustments of the non-trawl RCA would occur if the overfished species mortality were projected to exceed the non-nearshore share or non-trawl allocation. Changes to RCA boundaries could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm).

Table 4-109. 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
2015	1,798	1,793	1,040	572	468	555	451
2016	1,961	1,956	1,134	624	511	606	492

[a/]Under Alternative 1, the limited entry and open access fixed gear total catch shares would be 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 would be anticipated to be discarded, and 20 percent would be expected to die.

Table 4-110. 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					

Impact (Groundfish Mortality) Nearshore

The commercial nearshore fishery would operate under the same management measures as under the Preferred Alternative. The fishery would also be projected to have the same groundfish impacts as those described under the Preferred Alternative.

4.2.3.7 Impact (Groundfish Mortality) Tribal Fisheries – Alternative 1

Tribal fisheries would operate under the HGs and allocations displayed in Table 4-66, Table 4-68, and Table 4-70. Tribal fisheries would be managed using the same measures as those described under the Preferred Alternative.

4.2.3.8 Washington Recreational – Alternative 1

The Washington recreational fisheries would operate under the same management measures as those described under the Preferred Alternative. They would also be projected to have the same groundfish impacts as those described under the Preferred Alternative.

4.2.3.9 Oregon Recreational – Alternative 1

The Oregon recreational fisheries would operate under the same management measures as those described under the Preferred Alternative. They would also be projected to have the same groundfish impacts as those described under the Preferred Alternative.

4.2.3.10 California Recreational – Alternative 1

The California recreational fisheries would operate under the same management measures as those described under the Preferred Alternative. They would also be projected to have the same groundfish impacts as those described under the Preferred Alternative.

4.2.4 Alternative 2 – P* 0.25

4.2.4.1 Deductions from the ACL and Allocations

Under all action alternatives, off-the-top deductions from the ACL would be updated based on the most recent information on fishery performance and need. Amounts deducted that are from the ACL to accommodate groundfish mortality from scientific research, incidental open access fisheries, and EFPs could be modified based on inseason projections (Section 4.2.1.1). Under Alternative 2, the deductions from the ACL would be made using the same process as described in Section 4.2.2.1, except for the tribal fishery, which is described below.

Tribal Fishery: Tribal fisheries consist of trawl (bottom, midwater, and whiting), fixed gear, and troll. The tribal amounts in the April 17, 2014, regulations were updated with the tribal requests from November 2013 (Agenda Item H.10.b, Supplemental Tribal Report, November 2013 and Agenda Item H.10.b, Supplemental Tribal Report 2, November 2013).

Table 4-111, Table 4-112, Table 4-113, Table 4-114, and Table 4-115 contain the harvest specifications and allocations under Alternative 2. A description of the HCR used to calculate the ACLs can be found in Section 2.1.1.4. Table 4-116 shows projected mortality.

Table 4-111. Alternative 2. 2015 ACLs and estimates of tribal (Trib), EFP, research (Res), and incidental open access (OA) groundfish mortality in metric tons (MTs), 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
POP	N of 40º10' N. lat.	158	9.2		5.2	0.6	143.0
Petrale	Coastwide	2,310	220		14.2	2.4	2,073.4
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
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	6,637	91		5.8	7	6,533.2
Lingcod	N of 40º10’ N. lat.	2,172	250	0.5	11.67	16	1,893.8
Lingcod	S of 40º10’ 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 4-115			
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	1,551	111.8	1	12.5	49.53	1,376.2
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.	4,439	677	10	16.6	3	3,732.4
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	40					40
Minor Nearshore Rockfish S.	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.	1,232	36	1	8.1	19	1,167.9
Slope Rockfish south	S of 40º10' N. lat.	389		1	2	17	369.0
Other Flatfish	Coastwide	5,701	60		19	125	5,497.0
Other Fish	Coastwide	110					110.0

[a/]Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore, the 2013 values were used.

Table 4-112. Alternative 2. Stock specific fishery harvest guidelines (HGs) or annual catch targets (ACTs) and allocations for 2015 (mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl %	Trawl Mt	Non-trawl %	Non-trawl 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
POP	N of 40º10' N. lat.	143.0	Amendment 21	95%	135.9	5%	7.2
Petrale	Coastwide	2,073.4	Biennial	N/A	2,038.4	N/A	35.0
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				
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	6,533.2	Amendment 21	95%	6,206.5	5%	326.7
Lingcod	N of 40º10' N. lat.	1,893.8	Amendment 21	45%	852.2	55%	1,041.6
Lingcod	S of 40º10' 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 4-115				
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	1,376.2	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.	3,732.4	Amendment 21	88%	3,284.5	12%	447.9
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	40.0	None				
Minor Nearshore Rockfish S.	S of 40º10' N. lat.	689.0	None				
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.	1,167.9	Amendment 21	81%	946.0	19%	221.9
Slope Rockfish S.	S of 40º10' N. lat.	369	Amendment 21	63%	232.5	37%	136.5
Other Flatfish	Coastwide	5,497.0	Amendment 21	90%	4,947.3	10%	549.7
Other Fish	Coastwide	110	None				

[a/] Under Alternative 2, the cowcod fishery HG would be 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 4-113. Alternative 2. 2016 ACLs and estimates of tribal, EFP, research, 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
POP	N of 40º10' N. lat.	164	9.2		5.2	0.6	149.0
Petrale	Coastwide	2,386	220		14.2	2.4	2,149.4
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	WA	332	14		0	0	318.0
Black	OR and CA	927	0	1	0	0	926.0
Cabezon	OR	38	0		0	0	38.0
Cabezon	CA	124	0		0	0	124.0
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	4,852	91		5.8	7	4,748.2
Lingcod	N of 40º10’ N. lat.	2,089	250	0.5	11.67	16	1,810.8
Lingcod	S of 40º10’ 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 2,000		204,040
Sablefish	N of 36º N. lat.	4,540		See Table 4-115			
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.	4,274	677	10	16.6	3	3,567.4
Minor Nearshore Rockfish N.	N of 40º10' N. lat.	41					41
Minor 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.	1,243	36	1	8.1	19	1,178.9
Slope Rockfish S.	S of 40º10' N. lat.	390	0	1	2	17	370.0
Other Flatfish	Coastwide	4,589	60		19	125	4,385.0
Other Fish	Coastwide	110					

[a/]Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore ,the 2013 values were used.

Table 4-114. Alternative 2. Stock specific fishery harvest guidelines (HGs) or annual catch targets (ACTs) and allocations for 2016 (mt).

Stock	Area	Fishery HG or ACT	Allocation Type	Trawl %	Trawl Mt	Non-trawl %	Non-trawl 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
POP	N of 40º10' N. lat.	149.0	Amendment 21	95%	141.6	5%	7.5
Petrale	Coastwide	2,149.4	Biennial	N/A	2,114.4	N/A	35.0
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	WA	318.0	None				
Black	OR and CA	926.0	None				
Cabezon	46º16' to 42º N. lat.	38.0	None				
Cabezon	S of 42º N. lat.	124.0	None				
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	4,748.2	Amendment 21	95%	4,510.8	5%	237.4
Lingcod	N of 40º10' N. lat.	1,810.8	Amendment 21	45%	814.9	55%	996.0
Lingcod	S of 40º10' 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.	3,567.4	Amendment 21	88%	3,139.3	12%	428.1
Minor Nearshore Rockfish N	N of 40º10' N. lat.	41.0	None				
Minor Nearshore Rockfish S	S of 40º10' N. lat.	690.0	None				
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.	1,178.9	Amendment 21	81%	954.9	19%	224.0
Slope Rockfish S	S of 40º10' N. lat.	370.0	Amendment 21	63%	233.1	37%	136.9
Other Flatfish	Coastwide	4,385.0	Amendment 21	90%	3,946.5	10%	438.5
Other Fish	Coastwide	110	None				

[a/]Under Alternative 2, the cowcod fishery HG would be 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 4-115. Alternative 2. Sablefish north of 36° N. latitude ACLs, off-the-top deductions from the ACL used to calculate the commercial HG (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/]Under Alternative 2, the sablefish allocation to Pacific coast treaty Indian Tribes would be 10 percent of the sablefish ACL for the area north of 36° N. lat. This allocation would represent the total amount available to the treaty Indian fisheries before deductions for discard mortality.

Table 4-116. Alternative 2: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under Alternative 2.

2015

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5-23-14**	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/
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	11.3	56.9	23.6	1.4	0.1	301.3	127.0	2,544.4	1,930.8	135.9	68.1	1.0	0.0
-SB Trawl	81.9	11.3	43.3	9.9	1.4	0.1	285.6	111.3	2,539.4	1,925.8	118.5	50.7	1.0	0.0
-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	117.2	49.9	29.7	2.6	1.2	15.9	4.3	35.0	0.2	7.2	0.2	11.2	9.3
Non-Nearshore	79.1	0.0	3.8	0.9				4.1		0.2		0.2	1.1	0.4
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.7	6.8				0.2		0.0		0.0	1.2	1.2
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	116.8	24.3	18.0		1.2		--		--		--	3.4	2.7
TOTAL	349.0	136.8	122.0	68.5	6.0	3.3	338.0	152.1	2,816.0	2,167.6	158.1	83.3	18.0	15.2
2015 Harvest Specification	**349**	**359**	**122**	**122**	**10.0**	**10.0**	**338**	**338**	**2,816**	**2,816**	**158**	**158**	**18**	18
Difference	0.0	222.2	0.0	53.6	4.0	6.7	0.0	185.9	0.0	648.4	-0.1	74.7	0.0	2.8
Percent of ACL	100.0%	38.1%	100.0%	56.1%	60.2%	33.2%	100.0%	45.0%	100.0%	77.0%	100.1%	52.7%	100.0%	84.2%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1mt
	(black)	= Fixed Values
	(light blue)	= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be 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 during the biennial 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 requested set asides for 2015-2016.

[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).

[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.

[g/] Projected impacts are derived from GMT project models.

Table 4-116 (continued). Alternative 2: Allocations and projected mortality impacts (mt) of overfished groundfish species for 2015 and 2016 under Alternative 2.

2016

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Yelloweye	
***Date*: 5 April 2014**	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/	Allocation a/	Projected Impacts g/
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	85.0	11.8	58.5	24.2	1.4	0.1	308.9	130.3	2,638.4	2,002.7	141.6	70.5	1.1	0.0
-SB Trawl	85.0	11.8	44.5	10.2	1.4	0.1	292.8	114.1	2,633.4	1,997.7	124.0	53.1	1.1	0.0
-At-Sea Trawl			14.0	14.0			16.2	16.2	5.0	5.0	17.4	17.4		
a) At-sea whiting MS			5.8	5.8			6.7	6.7			7.2	7.2		
b) At-sea whiting CP			8.2	8.2			9.5	9.5			10.2	10.2		
Non-Trawl Allocation	268.7	117.2	51.3	29.8	2.6	1.2	16.3	4.7	35.0		7.5	0.3	12.1	9.4
Non-Nearshore	82.1	0.0	3.9	1.0		0.0		4.5		0.2		0.3	1.2	0.5
LE FG														
OA FG														
Directed OA: Nearshore	1.0	0.4	6.9	6.8				0.2		0.0		0.0	1.3	1.2
Recreational Groundfish														
WA			3.5	0.8				--		--		--	3.1	2.8
OR			12.0	3.2				--		--		--	2.8	2.2
CA (based on Option 2)	185.6	116.8	25.0	18.0		1.2		--		--		--	3.7	2.7
TOTAL	362.0	137.3	125.0	69.2	6.0	3.3	346.0	155.8	2,910.0	2,239.3	164.1	85.8	19.0	15.3
2015 Harvest Specification	**362**	**362**	**125**	**125**	**10.0**	**10.0**	**346**	**346**	**2,910**	**2,910**	**164**	**164**	**19**	19
Difference	0.0	224.7	0.0	55.9	4.0	6.7	0.0	190.2	0.0	670.7	-0.1	78.2	0.0	3.7
Percent of ACL	100.0%	37.9%	100.0%	55.3%	60.2%	33.2%	100.0%	45.0%	100.0%	77.0%	100.1%	52.3%	100.0%	80.3%

Key		
	(hatched)	= not applicable
	--	= trace, less than 0.1mt
	(black)	= Fixed Values
	(light blue)	= off the top deductions

[a/] Formal allocations are represented in the black shaded cells and would be 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 during the biennial 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 requested set asides for 2015-2016.

[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 documented in the 2013-2014 Environmental Impact Statement (Appendix B).

[f/] Tribal values in the allocation column represent the values in regulation. Projected impacts are the tribes best estimate of catch.

[g/] Projected impacts are derived from GMT project models.

4.2.4.2 Harvest Guidelines

As described in Section 4.2.1.2 HGs are established for black rockfish (OR and CA), blackgill rockfish south of 40°10' N. latitude, and blue rockfish south of 42° N. latitude. Further, as described in Section 2.1.2.3, there would likely be a Minor Nearshore Rockfish HG for the area 40°10' N. latitude to 42° N. latitude. The value for the Minor Nearshore Rockfish HG under Alternative 2 would be developed if Alternative 2 was implemented. Table 4-117 contains the 2015-2016 HGs under Alternative 2.

Table 4-117. Alternative 2 Harvest Guidelines for 2015-2016.

Species	Description	2015 (mt)	2016 (mt)
Black Rockfish (Oregon and California)	Allocation between Oregon and California	579 (OR) 420 (CA)	579 (OR) 420 (CA)
Blackgill S. of 40°10' N. latitude	HG within the Slope Rockfish complex South	83	86
Blue Rockfish S. of 42° N. latitude	HG within the Minor Nearshore Rockfish complex South	115	119

4.2.4.3 Overview of Management Measure Changes

The following bullet points summarize management measure by sector under Alternative 2. If adopted by the Council, new management measures discussed under Section 2.1.2 and Appendix B would be implemented.

Starting in 2015, the West Coast states would be monitoring and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude, according to newly established HGs. If harvest levels in a particular state were to approach 75 percent of the state-specific HGs, which would be based on status quo harvest levels, the states would consult via a conference call and determine whether inseason action would be needed. The HGs for Washington and Oregon would be state HGs, and they would not be established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area 40°10' N. latitude to 42° N. latitude. If inseason action were needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

- The shorebased IFQ fishery would receive IFQ based on the 2015-2016 ACLs and resulting trawl allocations under Alternative 2, which would generally be lower than under the No Action Alternative and the Preferred Alternative. The IFQ fishery would operate under the same management measures as those described under the Preferred Alternative.
- The at-sea whiting co-ops would operate under the same allocations and management measures as those described under the Preferred Alternative.
- Allocations and HGs 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 as those described under the Preferred Alternative.
- The non-nearshore fixed gear fishery would operate under the same management measures as those described under the Preferred Alternative, except that trip limit decreases for several species, including sablefish, would be necessary to stay within the lower ACLs under Alternative 2.

- The nearshore fixed gear fishery would operate under the same management measures as those described for the Preferred Alternative, except that trip limit decreases for several species would be necessary to stay within the lower ACLs under Alternative 2.
- Tribal fisheries would operate under the HGs and allocations under Alternative 2. Tribal fisheries would be managed using the same measures as those described under the Preferred Alternative.
- Washington recreational fisheries would operate under the same management measures as those described under the Preferred Alternative.
- Oregon recreational fisheries would operate under the same management measures as the those descried under the Preferred Alternative.
- 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) would be proposed under Alternative 2. Greater reductions in bag limits or longer periods of non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the complex ACL or the state-specific Minor Nearshore Rockfish HGs under Alternative 2, compared to those described under the Preferred Alternative.

4.2.4.4 Impact (Groundfish Mortality) – Shorebased IFQ – Alternative 2

The shorebased IFQ fishery would operate under the same management measures as those described under the Preferred Alternative, except that the shorebased IFQ would be issued based the 2015-2016 ACLs and resulting trawl allocations under Alternative 2 (Tables 4-118 and 4-119). Notable IFQ decreases from the No Action Alternative would include petrale and arrowtooth flounder. Notable increases from the No Action Alternative would include longspine thornyhead and yellowtail.

Table 4-118. 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 Alternative estimates of mortality are provided (right panel).

IFQ Stock	Area	Alternative 2		No Action Alternative	
		2015 Projected Mortality (mt)	2015 SB IFQ Allocation (mt) [a/ b/]	Projected Mortality (mt)	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	0	1.0
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	6,202	137	5,261
Lingcod	North of 40°10' N. lat.	216	837	227	1,152
Lingcod	South of 40°10' N. lat.	74	329	84	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	2,985	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	846	182	789
Slope Rockfish	South of 40°10' N. lat.	60	232	98	379
Other Flatfish	Coastwide	840	4,927	728	379

[a/]Under Alternative 2, Pacific halibut would be managed using IBQ; see regulations at §660.140. Starting in 2015, the maximum IBQ allocation would be 45 mt; see regulations at§660.55 (m).

[b/] Under Alternative 2, as stated in regulations (§660.55 (m)), there would be 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).

Table 4-119. 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 Alternative estimates of mortality are provided (right panel).

IFQ Species	Area	Alternative 2		No Action Alternative	
		2016 Projected Mortality (mt)	2016 SB IFQ Allocation (mt) [a/ b/]	Projected Mortality (mt)	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	1.1	0	1.0
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	4,506	137	5,261
Lingcod	North of 40°10' N. lat.	217	800	227	1,152
Lingcod	South of 40°10' N. lat.	73	310	84	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	2,839	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	855	182	789
Slope Rockfish	South of 40°10' N. lat.	60	233	98	379
Other Flatfish	Coastwide	711	3,927	728	379

[a/]Under Alternative 2, Pacific halibut would be managed using IBQ; see regulations at §660.140. Starting in 2015, the maximum IBQ allocation would be 45 mt, see regulations at §660.55 (m).

[b/]As stated in regulations (§660.55 (m)), there would be 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).

4.2.4.5 Impact (Groundfish Mortality) – At-sea Whiting Co-ops – Alternative 2

The at-sea whiting co-ops would operate under the same management measures as those described under the Preferred Alternative, with equivalent levels of groundfish mortality.

4.2.4.6 Limited Entry and Open Access Fixed Gear – Alternative 2

Impact (Groundfish Mortality) Non-nearshore North of 36° N. Latitude

Management measures and projected mortality for the non-nearshore fishery north of 36° N. latitude under Alternative 2 would be influenced largely by the sablefish ACL, which would be calculated with a P* of 0.25 and the resulting sablefish allocations (Table 4-120 and Table 4-121). Trip limit decreases for sablefish would be proposed (Table 4-122) and would routinely be adjusted to achieve the limited entry and open access sablefish allocations. The prohibition on lingcod retention in Periods 1, 2, and 6 would be removed, and trip limits would be increased for both limited entry and open access fixed gears (Appendix B, Section B.7 and Section B.8).

Trip limit decreases for Slope Rockfish north of 40°10' N. latitude may be proposed inseason to reduce rougheye/blackspotted rockfish mortality (Appendix B, Section B.6). A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which could improve the data used in management.

Blackgill rockfish is part of the Slope Rockfish complex south of 40°10' N. latitude, and the complex is subject to an Amendment 21 allocation (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 for 2015 and 2016 of 83 mt and 86 mt, respectively. Further, the Council provided guidance that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry and 40 percent to open access fixed gears. This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005 to 2010 (Table 3 in Agenda Item E.9.b, GMT Report 2, November 2011).

The overfished species mortality, as a result of harvesting the sablefish allocations, was evaluated using 2002 to 2012 WCGOP data in the non-nearshore model. Under Alternative 2, trawl and non-trawl allocations would be established for overfished species. Further, the non-nearshore fishery would also be allocated a share of the non-trawl allocation for bocaccio, canary, and yelloweye (Table 4-123). Routine adjustments of the non-trawl RCA (the same as for the No Action Alternative) would occur if the projected overfished species mortality were expected to exceed the non-nearshore share or non-trawl allocation. Changes to RCA boundaries could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm). Table 4-123 and Table 4-124 contain the projected mortality groundfish for the non-nearshore fishery under Alternative 2.

Table 4-120. Alternative 2: Limited entry sablefish FMP allocations north of 36° N. latitude for 2015-2016.

				LEFG Share (mt)				Estimated Tier Limits (lbs)[a/]		
Year	ACL	Com. HG	Limited Entry Share	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/] For Alternative 2, the limited entry fixed gear total catch share would be 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 would be anticipated to be discarded, and 20 percent would be expected to die.

Table 4-121. Alternative 2: Open access FMP allocations 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/]For Alternative 2, the open access total catch share would be 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 would be anticipated to be discarded, and 20 percent would be expected to die.

Table 4-122. 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 4-123. Alternative 2 – Non-nearshore. Overfished species projected mortality (mt), compared to the shares for the non-nearshore fixed gear fishery and the non-trawl allocations (mt), for 2015-2016.

	2015			2016		
Stock	Projected Mortality	Non-nearshore Share	Non-trawl Allocation	Projected Mortality	Non-nearshore Share	Non-trawl Allocation
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 4-124. Alternative 2. Projected groundfish mortality for the limited entry (LE) and open access (OA) fixed gear fisheries (mt), compared to the non-trawl allocation.

Stocks	2015				2016			
	LE	OA	Total	Non-trawl Allocation[a/]	LE	OA	Total	Non-trawl Allocation[a/]
Arrowtooth flounder	38	6	43	98.5	42	6	48	92.3
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	327.8	0	0	0	326.0
Dover sole	5	1	6	1,170.3	6	1	7	1,170.3
English sole	0	0	0	326.7	0	0	0	237.4
Greenspotted rockfish	0	0	0		0	0	0	
Greenstriped rockfish	1	0	1		1	0	1	
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	184.7	60	12	72	181.2
Longspine thornyhead (North Pt. Conception)	2	1	3	114.7	3	1	3	109.0
Mixed thornyheads	1	0	2		2	1	2	
Pacific cod	2	0	2	40.2	2	0	2	40.2
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	61.4	19	5	23	60.8
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	69.8	0	0	0	71.1
Starry flounder	0	0	0	560.9	0	0	0	562.9
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	447.9	0	0	1	428.1
Other Flatfish	0	0	0	549.7	0	0	0	438.5
Other groundfish	3	1	3		3	1	4	
Other Minor Nearshore Rockfish	0	0	0		0	0	0	
Other Shelf Rockfish	2	0	3		3	0	3	
Other Slope Rockfish	86	16	102	c/	95	17	113	d/

[a/] For Alternative 2, the non-trawl allocation would include the non-nearshore, nearshore, and recreational fisheries.
[c/] Minor slope rockfish north non-trawl allocation in 2015 is 221.9 mt, and south is 136.5 mt.
[d/] Minor slope rockfish north non-trawl allocation in 2016 is 224 mt, and south is 136.9 mt.

Impact (Groundfish Mortality) Non-nearshore South of 36° N. Latitude

Management measures and projected groundfish mortality for the non-nearshore fishery south of 36° N. latitude under Alternative 2 are largely influenced by the sablefish ACL, which would be calculated with a P* of 0.25. 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 4-125). Decreases to the sablefish trip limits would be proposed (Table 4-126) and would be routinely adjusted to achieve the limited entry and open access sablefish allocations. Additionally, trip limit increases are proposed for bocaccio and Shelf Rockfish south of 34°27' N. latitude to attain the non-trawl allocations.

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. Routine adjustments of the non-trawl RCA (same as No Action) would occur in the event the projected overfished species mortality is expected to exceed the non-nearshore share or non-trawl allocation. Changes can also be accommodated to provide greater access to target species when overfished species mortality is projected to be within the non-nearshore share or non-trawl allocation (e.g., changing from 125 to 100 fm).

Table 4-125 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 4-126. Alternative 2. 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	1,975 lb/week					
	Open Access	300 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 3,000 lb/ 2 months					
2016	Limited Entry	2,050 lb/week					
	Open Access	310 lb/ day, or 1 landing per week of up to 1,550 lb, not to exceed 3,100 lb/ 2 months					

Impact (Groundfish Mortality) Nearshore – Alternative 2

There are Federal limits and state quotas for nearshore species that limit target species landings in the commercial nearshore fishery. Under Alternative 2, in 2015 and 2016, there would be a Federal HG for blue rockfish south of 42° N. latitude within the Minor Nearshore Rockfish complex of 115 mt and 119 mt, respectively, for both commercial and recreational fisheries. The West Coast states would be responsible for tracking and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude, as described in Section 2.1.2.3.

Alternative 2 is based on the expectation that landings in the Oregon nearshore fishery would be equal to their allocations (Table 4-127), except for lingcod, where estimates of historical average landings are derived from WCGOP catch data (retained plus landed catch). In California, nearshore fishery allocations could not be achieved, given the current overfished species allocations. As such, landings would be 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 4-127). As such, there is substantial uncertainty surrounding the estimated landings under the action alternatives, which in turn would influence the projected overfished species mortality and socioeconomic analysis. If fishery performance were lower than the allocations, mortality of groundfish species would be lower.

The Council removed the prohibition on lingcod retention in Periods 1, 2, and 6. Council also increased trip limits for both limited entry and open access fixed gears (Appendix B, Section B.7 and Section B.8).

Trawl and non-trawl allocations for overfished species would be implemented under Alternative 2 (Table 4-128). Specifically, the nearshore fishery would be managed to stay within its share of the non-trawl allocation for bocaccio, canary, and yelloweye. Under Alternative 2, catch of canary and yelloweye rockfish in California would exceed the catch-sharing agreements with Oregon (Table 4-128); however, total catch of canary and yelloweye by both states would be within the non-trawl allocation. If the projected overfished species mortality were expected to exceed the nearshore fishery share or the non-trawl allocation, routine adjustments of the non-trawl RCA or reductions to trip limits would occur. Changes could also be accommodated to provide greater access to target species should overfished species mortality be projected to be within the nearshore share or non-trawl allocation (e.g., changing from 20 to 30 fm).

Table 4-127. Alternative 2. Expected landings under Alternative 2, compared to the Federal and state limits. 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
Minor Nearshore Rockfish N.[a/]	N. 40°10' N. lat.	12				
--Blue rockfish		*6.6*	*1.9*	*4.7*	*4.7*	
--Other Minor Nearshore Rockfish		*5.4*	*3.2*	*2.2*	*2.2*	
Minor 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/]Minor Nearshore Rockfish totals consist of black-and-yellow rockfish, blue rockfish, China rockfish, gopher rockfish, grass rockfish, kelp rockfish, brown rockfish, olive rockfish, copper rockfish, treefish, calico rockfish, and quillback rockfish. These species are part of the Minor 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 Minor 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 Minor Nearshore Rockfish complex south of 40°10' N. latitude.

Table 4-128. Alternative 2. Total projected overfished species (OFS) mortality compared to the nearshore fishery share of the non-trawl allocation 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 parentheses).

Stock	Area	Total Projected OFS Mortality 2015/2016 (mt)	Nearshore Fishery Share 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. lat.	0.4	1.0/1.0	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	6.7/6.9	0.9 (1.8/1.9)	5.9 (4.9/5.0)	0.7	5.2
Darkblotched	Coastwide	0.2		0.1	0.1	0	0.1
POP	N. 40°10' N. lat.	0		0	0	0	0
Petrale	Coastwide	0		0	0	0	0
Yelloweye	Coastwide	1.2	1.2/1.3	0.8 (0.9/0.95)	0.4 (0.3/0.35)	0.3	0.1

4.2.4.7 Impact (Groundfish Mortality) Tribal Fisheries – Alternative 2

Tribal fisheries would operate under the HGs and allocations displayed in Table 4-66, Table 4-68, and Table 4-70. Tribal fisheries would be managed using the same measures as those described under the Preferred Alternative.

4.2.4.8 Washington Recreational – Alternative 2

Washington recreational fisheries would operate under the same management measures as those under the Preferred Alternative. They would be projected to have the same groundfish mortality under Alternative 2 as under the Preferred Alternative.

Impact (Groundfish Mortality)

Projected mortality to overfished and non-overfished species and angler effort in 2015 and 2016 under Alternative 2 would likely be similar to previous seasons; however, if angler effort and fishing success were to result in catch estimates higher than those projected, inseason action through state regulations such as modifications to seasons, groundfish retention, and closed areas may be considered to ensure that catches would not exceed HG.

4.2.4.9 Oregon Recreational – Alternative 2

Under Alternative 2, the Oregon recreational Federal HGs for yelloweye and canary rockfish would remain the same as under all other action alternatives. The black rockfish ACL would decrease, which would reduce the Oregon recreational state quota from 440.8 mt to 406.0 mt in 2015 and 408.2 mt in 2016.

The Council is considering a range of state-specific nearshore HGs to keep mortality of Minor Nearshore Rockfish north of 40°10' N. latitude at or within the ACL. Under this alternative, yelloweye rockfish allocations would directly relate to the recommended management measures and would prevent the full utilization of the black rockfish state harvest cap. Therefore, even though there would be a reduction in the black rockfish state harvest cap, the fisheries would operate under the same management measures as those under the Preferred Alternative.

Table 2-6 shows a range of state-specific nearshore HGs that would be implemented to keep mortality of Minor Nearshore Rockfish north of 40°10’ N. latitude at or within the ACL. Appendix B, Section B.20, contains the management measures for the Oregon recreational fisheries that would be necessary to stay within the range of state-specific HGs.

Table 4-129. Alternative 2. Oregon recreational Federal HGs or state quotas under the No Action Alternative and Alternative 2, with a P* of 0.25.

Stock	HG or State Quotas[a/]		
	No Action Alternative	Alternative 2	
		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[b/]	N/A	TBD	TBD
Minor Nearshore Rockfish N. 40°10’ N. lat. [a/]	N/A	TBD	TBD
--Blue Rockfish			
--Other Minor Nearshore Rockfish			

a/ Under Alternative 2, Federal HGs would established for canary and yelloweye rockfish only. The state process in Oregon would establish quotas for black rockfish, blue rockfish, other Minor Nearshore Rockfish, and greenlings (all species). Black and blue rockfish would be managed to a combined state quota; the estimated quotas by species are represented in this table. The state quotas are not intended to be implemented in Federal regulation, they are only provided as information.
b/ Includes kelp and other greenlings

4.2.4.10 California Recreational – Alternative 2

While harvest limits on overfished species would not change under Alternative 2, the ABC values from a P* of 0.25 applied to all target species would reduce the harvest limits relative to Alternative 1 and Alternative 3, requiring additional recreational management measures under all options. Under Alternative 2, in 2015 and 2016, there would be a Federal HG for blue rockfish south of 42° N. latitude within the Minor Nearshore Rockfish complex of 115 mt and 119 mt, respectively, for both commercial and recreational fisheries. The three-fish, lingcod bag limit could be accommodated under all the options of this alternative.

Groundfish Seasons and Area Restrictions

<u>Option 1</u>

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 4-35). To maintain this season, while remaining below state harvest limits for kelp greenling and ACLs for California scorpionfish, bag limits would have to be reduced. This would require a reduction from ten fish to two fish for kelp greenling and from five fish to three fish for California scorpionfish. The season length in the Southern California Management Area would remain March 1 through December 31, 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 <60 fm									

Figure 4-35. 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 California Management Area would remain March 1 to December 31 (Figure 4-36). The split-depth season in the Northern California and Mendocino Management Areas starting in 20 fm from May 1 to Sept 30 to 30 fm from October 1 through Dec 31 could be accommodated. As in Option 1, the kelp greenling bag limit would have to be reduced from ten fish to two fish and from five fish to three fish for California scorpionfish 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 <60 fm									

Figure 4-36. 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 would be the same as those described for Option 3 for Alternative 1, analyzing mortality from a depth restriction 10 fm deeper than for the No Action Alternative. In order to keep catches within allowable limits, season lengths north of Point Conception would be reduced to May 15 through August 15 to prevent yelloweye rockfish mortality from exceeding the HGs (Figure 4-37). The reduced season length north of Point Conception would reduce the kelp greenling mortality to below the harvest limit, even with the current ten-fish bag limit.

Season length in the Southern California 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 types of inseason management measures that may be taken relative to season length to reduce mortality This represents the low end of the season adjustment that may be implemented 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 would be necessary to keep mortality below the lower harvest limit under Alternative 2, in order to maintain year-round fishing opportunity.

Similar to Option 3 under 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. Should inseason monitoring project that mortality would be 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 4-37. Alternative 2 (Option 3): California recreational groundfish season structure and depth restrictions for 2015-2016.

Groundfish Bag Limits and Size Limits

Under Alternative 2, groundfish bag limits and size limits would the same as those under the No Action Alternative, except for the following:

Lingcod – The No Action Alternative bag limit for lingcod would be two fish. The Council is proposing to increase the bag limit from two fish to three fish. The increase in the bag limit would likely increase total lingcod mortality by 17 percent south of Point Conception and 21 percent north of Point Conception (the mortality in metric tons is provided for Option 1, Option 2, and Option 3 in Table 4-131. An increase in the lingcod bag limit from two to three fish could 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 Option 1 and Option 2 (the mortality in metric tons is provided in Table 4-130 and Table 4-131).

California Scorpionfish – The bag limit management measure analysis 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 No Action Alternative fishing season (the mortality in metric tons is provided for Option 1, Option 2, and Option 3 (Tables 4-130 and 4-131).

Impact (Groundfish Mortality)

With all options under Alternative 2, the projected mortality of, bocaccio, canary rockfish, cowcod and yelloweye rockfish would likely increase compared to the No Action Alternative due to the increased season lengths or deeper depth restrictions, with the exception of bocaccio and cowcod under Option 3. The number of angler trips would likely increase under the options allowing increased opportunity for both PRs and CPFVs. Projections for non-overfished species under Alternative 2 for each option are provided in Table 4-129.

The same inseason management actions as the No Action Alternative and Alternative 1 would be available should allowable limits be projected to be exceeded. The YRCAs described under the No Action Alternative would also be available under this Alternative.

Table 4-130. 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 Rockfish	3.4	3.7	2.6	2.7	2.7

[a/]Under Alternative 2, the non-trawl allocation of cowcod would be 2.6 mt.

Table 4-131. 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
Cabezon	38.1	38.0	16.9
California scorpionfish	63.3	63.3	13.3
Greenlings	16.2	16.1	8.7
Lingcod N. of 40°10’	45.1 (54.6)	45.2 (54.7)	24.3 (29.4)
Lingcod S. of 40°10’	220.5 (265.1)	220.3 (264.9)	80.0 (96.4)
Minor Nearshore Rockfish North	14.1	14.6	6.7
--Blue Rockfish	2.9	2.9	1.3
--Other Minor Nearshore Rockfish	11.2	11.7	5.4
Minor Nearshore Rockfish South	354.0	354.2	118.6
--Blue Rockfish	56.4	56.4	21.0
-Other Nearshore	297.6	297.8	97.6
Widow Rockfish	3.4	3.4	1.5

4.2.5 Impacts of 2015-2016 Management Measures on Groundfish Stocks

4.2.5.1 Groundfish Mortality

Detailed descriptions of the fishery management measures and the modeled estimates of groundfish mortality are reported by alternative and sector in Sections **Error! Reference source not found.**, 0, 4.2.3, and 4.2.4. Table 4-132 and Table 4-133 display the estimated groundfish species mortality by alternative in 2015-2016 for those species where model estimates are available. The overfished species mortality estimates represent the best available estimates for 2015-2016. However, for non-overfished species, the projections may not represent the best available estimates of mortality, since not all species and sectors are modeled. As such, Table 4-132 and Table 4-133 provide only a partial understanding of the anticipated non-overfished species mortality under the alternatives. The total mortality presented in Table 4-134, Table 4-135, and Table 4-136, and based on WCGOP reports, should also be considered.

Given that management measures are designed to achieve but not exceed ACL, the maximum non-overfished species groundfish mortality under the action alternatives would be equal to the ACLs under each alternative. Historically, however, given a variety of factors like overfished species interactions, market conditions, and weather, etc., there are very few stocks and complexes where the ACL is achieved (Table 4-134, Table 4-135, and Table 4-136). Each biennium, management measures are adjusted to improve ACL attainment; however, there is little interannual variation on ACL attainment for most species. As such, the anticipated groundfish mortality and ACL attainment for 2015-2016 might be best estimated by calculating the average attainment rate from the last biennium and applying the average attainment rate to the 2015-2016 ACLs. Generally groundfish mortality would be highest under Alternative 1, and the Preferred Alternative would be slightly lower. Alternative 2 would have the lowest mortality.

Table 4-132. Summary of the Modeled Estimates of Groundfish Mortality under the Action Alternatives for 2015, Compared to the No Action Alternative.

Stocks and Complexes	No Action Alternative	Preferred Alternative	Alternative 1	Alternative 2
Bocaccio South of 40°10’	119.8	137.2	137.2	136.8
Canary	67.8	68.8	68.8	68.5
Cowcod South of 40°10’	1.2	3.3	3.3	3.3
Darkblotched	149.1	152.7	152.9	152.1
Petrale	2,491.4	2,646.9	2,646.9	2,167.6
POP	82.1	83.4	83.4	83.3
Yelloweye	13.9	14.8	14.8	15.2
Arrowtooth flounder	2,482	2,487	2,489	1,870
Black Rockfish OR/CA	675	731	731	752
Black Rockfish WA	252	252	252	252
Cabezon CA	59	97	97	87
Cabezon OR	63	66	66	61
California Scorpionfish S. 34°27’	78.3	81.1	81.1	63.3
Chilipepper Rockfish S. 40°10’	291	308	308	291
Dover Sole	7,720	15,942	7,720	7,718
English Sole	137	152	152	137
Lingcod Unspecified (coastwide)	244			
Lingcod N 40°10’	522	566	568	564
Lingcod S 40°10’	114	449	457	368
Longnose Skate	69	76	79	65
Longspine Thornyheads N 34°27’	939	1,534	1,684	1,126
Unspecified Thornyheads (coastwide)	2	2	2	2
Pacific Cod	268	268	268	181
Pacific Whiting[a/]	83,929	83,929	83,929	83,929
Sablefish N. 36°	1,887	2,088	2,186	1,860
Sablefish S. 36°	307	339	354	291
Shortspine Thornyheads N. 34°27’	755	870	956	734
Shortspine Thornyheads S. 34°27’	4	4	4	4
Spiny Dogfish	157	173	181	148
Splitnose Rockfish S. 40°10’	53	54	54	44
Starry Flounder	9	9	9	6
Widow Rockfish	429	677	434	433
Yellowtail Rockfish	845	2,513	2,513	1,619
Minor Nearshore Rockfish N. 40°10’[b/]	80	81	81	68
Minor Nearshore Rockfish S. 40°10’	472	444	444	433
Other Fish	52	80	80	55
Other Flatfish	728	1,311	1,506	840
Groundfish Unspecified	4	4	4	3
Unspecified Shelf Rockfish	3	3	3	3
Unspecified Slope Rockfish	108	119	125	102
Shelf Rockfish N. 40°10’	30	62	62	35
Shelf Rockfish S. 40°10’	12	27	27	13
Slope Rockfish N. 40°10’	182	276	276	191
Slope Rockfish S. 40°10’	114	127	128	75

[a/] Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore, the 2013 values were used.
[b/] As described in Section 2.1.2.3, the West Coast states would be responsible for monitoring and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude. Should harvest levels in a particular state approach 75 percent of the state-specific HGs (Table 2-6), which are based on status quo harvest levels, the states would consult via a conference call and determine whether inseason action would be needed.

Table 4-133. Summary of the Modeled Estimates of Groundfish Mortality for 2016 under the Action Alternatives, compared to the No Action Alternative.

Stocks and Complexes	No Action	Preferred	Alt 1	Alt 2
Bocaccio South of 40°10’	119.8	137.7	137.7	136.8
Canary	67.8	69.5	69.6	68.5
Cowcod South of 40°10’	1.2	3.3	3.3	3.3
Darkblotched	149.1	156.6	156.7	152.1
Petrale	2,491.4	2,735.6	2,735.6	2,167.6
POP	82.1	85.8	85.8	83.3
Yelloweye	13.9	14.8	15.9	15.2
Arrowtooth flounder	2,482	2,491	2,494	1,757
Black rockfish OR/CA	675	731	730.9	751.7
Black Rockfish WA	252	252	252	252
Cabezon CA	59	97	97	87
Cabezon OR	63	66	66	61
California scorpionfish S. 34°27’	78	81	81	63
Chilipepper Rockfish S. 40°10’	291	306	306	291
Dover Sole	7,720	15,943	7,721	7,719
English Sole	137	137	137	137
Lingcod Unspecified	244			
Lingcod N. 40°10’	522	560	558	565
Lingcod S. 40°10’	114	446	453	368
Longnose Skate	69	83	86	72
Longspine Thornyheads N. 34°27’	939	1.459	1,601	1,070
Unspecified Thornyheads	2	2	3	2
Pacific Cod	268	268	268	181
Pacific Whiting[a/]	83,929	83,929	83,929	83,929
Sablefish N. 36°	1,887	2,289	2,390	1,973
Sablefish S. 36°	307	371	387	321
Shortspine Thornyheads N. 34°27’	755	862	947	736
Shortspine Thornyheads S. 34°27’	4	4	4	4
Spiny Dogfish	157	189	198	164
Splitnose Rockfish S. 40°10’	53	55	55	45
Starry Flounder	9	9	9	6
Widow Rockfish	429	677	434	433
Yellowtail Rockfish	845	2,372	2,372	1,523
Minor Nearshore Rockfish N. 40°10’[b/]	80	81	81	68
Minor Nearshore Rockfish S. 40°10’	472	444	444	444
Shelf Rockfish N. 40°10’	30	63	63	36
Shelf Rockfish S. 40°10’	12	27	27	13
Slope Rockfish N. 40°10’	182	279	279	194
Slope Rockfish S. 40°10’	114	129	130	76
Other Flatfish	728	1,136	1,313	711
Other Fish	52	81	81	55
Groundfish Unspecified	4	4	5	4
Shelf Rockfish Unspecified	3	3	4	3
Slope Rockfish Unspecified	108	130	136	113

[a/]Pacific whiting TAC forecasts for 2015-2016 were unavailable during the preparation of the EIS; therefore, the 2013 values were used.

[b/]As described in Section 2.1.2.3, the West Coast states would be monitoring and managing catches of Minor Nearshore Rockfish north of 40°10' N. latitude according to newly established HGs. Should harvest levels in a particular state approach 75 percent of the state-specific HGs (Table 2-6), which are based on status quo harvest levels, the states would consult via a conference call and determine whether inseason action would be needed.

Table 4-134. Specified annual OYs (mts), estimated annual total mortality (mts), and percent of OY attainment of non-overfished West Coast groundfish species managed with stock-specific harvest specifications, 2005 to 2012 (from the WCGOP Reports, http://tinyurl.com/nv3pddm).

	2005	2006	2007	2008	2009	2010	2011	2012
Arrowtooth Flounder								
OY (mt)	5,800	5,800	5,800	5,800	11,267	10,112	15,174	12,049
Est. Mort. (mt)	3,706	3,105	3,099	3,409	5,443	4,090	2,666	2,508
% OY	63.90%	53.50%	53.40%	58.80%	48.30%	40.40%	17.57%	20.82%
Black RF (coastwide)[a/]								
OY (mt)	1,293	1,276	NA	NA	NA	NA	NA	NA
Est. Mort. (mt)	937	896	NA	NA	NA	NA	NA	NA
% OY	72.50%	70.20%	NA	NA	NA	NA	NA	NA
Black RF (CA & OR)								
OY (mt)	753	736	722	722	1,000	1,000	1,000	1,000
Est. Mort. (mt)	NA	NA	577	593	784	650	523	563
% OY	NA	NA	79.90%	82.10%	78.40%	65.00%	52.30%	56.30%
Black RF (WA)								
OY (mt)	540	540	540	540	490	464	426	415
Est. Mort. (mt)	NA	NA	260	156	207	199	208	249
% OY	NA	NA	48.10%	28.90%	42.20%	43.00%	48.83%	60.00%
Cabezon (CA)								
OY (mt)	69	69	69	69	69	79	179	168
Est. Mort. (mt)	80	106	42	39	51	47	50	74
% OY	116.40%	153.40%	61.40%	56.20%	73.90%	59.60%	27.93%	44.05%
Cabezon (OR)								
OY (mt)							50	48
Est. Mort. (mt)							48	47
% OY							96.00%	97.92%
CA scorpionfish[b/]								
OY (mt)	NA	NA	175	175	175	155	135	126
Est. Mort. (mt)	NA	NA	68	65	70	67	104	120
% OY	NA	NA	38.70%	37.00%	40.00%	43.00%	77.04%	95.24%
Chilipepper S								
OY (mt)	2,000	2,000	2,000	2,000	2,885	2,447	1,981	1,789
Est. Mort. (mt)	97	126	128	151	311	376	329	302
% OY	4.90%	6.30%	6.40%	7.60%	10.80%	15.30%	16.61%	16.8%
Dover sole								
OY (mt)	7,476	7,564	16,500	16,500	16,500	16,500	25,000	25,000
Est. Mort. (mt)	7,507	7,730	10,227	11,820	12,546	10,952	7,927	7,175
% OY	100.40%	102.20%	62.00%	71.60%	76.00%	66.40%	31.71%	28.70%
English sole								
OY (mt)	3,100	3,100	6,237	6,237	14,326	9,745	19,761	10,150
Est. Mort. (mt)	1,222	1,336	914	436	501	311	205	224
% OY	39.40%	43.10%	14.70%	7.00%	3.50%	3.20%	1.04%	2.21%
Lingcod Coastwide								
OY (mt)	2,414	2,414	6,170	6,170	5,278	4,829	NA	NA
Est. Mort. (mt)	890	952	706	574	581	450	NA	NA
% OY	36.90%	39.50%	11.40%	9.30%	11.00%	9.30%	NA	NA
Lingcod N. 42°								
OY (mt)							2,330	2151
Est. Mort. (mt)							588	731
% OY							25.24%	33.98%

Table 4-134 (continued). Specified annual OYs (mts), estimated annual total mortality (mts), and percent of OY attainment of non-overfished West Coast groundfish species managed with stock-specific harvest specifications, 2005 to 2012 (from the WCGOP Reports, http://tinyurl.com/nv3pddm).

	2005	2006	2007	2008	2009	2010	2011	2012
Lingcod S. 42°								
OY (mt)							2,102	2,164
Est. Mort. (mt)							264	337
% OY							12.56%	15.57%
Longnose skate[c/]								
OY (mt)	NA	NA	NA	NA	1,349	1,349	1,349	1,349
Est. Mort. (mt)	NA	NA	NA	NA	1,455	1,387	1,133	991
% OY	NA	NA	NA	NA	107.90%	102.80%	83.99%	73.46%
Longspine thornyhead (coastwide)[d/]								
OY (mt)	2,461	2,461	2,696	NA	NA	NA	NA	NA
Est. Mort. (mt)	750	854	928	NA	NA	NA	NA	NA
% OY	30.50%	34.70%	NA	NA	NA	NA	NA	NA
Longspine thornyhead N								
OY (mt)	NA	NA	2,220	2,220	2,231	2,175	2,119	2,064
Est. Mort. (mt)	NA	NA	NA	1,445	1,582	1,719	961	912
% OY	NA	NA	NA	65.10%	70.90%	79.00%	45.35%	44.19%
Longspine thornyhead S								
OY (mt)	NA	NA	476	476	395	385	376	366
Est. Mort. (mt)	NA	NA	NA	18	20	26	23	18
% OY	NA	NA	NA	3.70%	5.10%	6.70%	6.12%	4.92%
Pacific cod								
OY (mt)	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Est. Mort. (mt)	864	385	101	39	248	346	607	634
% OY	54.00%	24.10%	6.30%	2.40%	15.50%	21.70%	37.94%	39.63%
Pacific whiting								
OY (mt)	269,069	269,545	242,591	269,545	135,939	193,935	290,903	186,037
Est. Mort. (mt)	261,212	267,707	215,340	250,205	122,165	165,717	231,996	160,706
% OY	97.10%	99.30%	88.80%	92.80%	89.90%	85.40%	79.75%	86.38%
Sablefish (coastwide)[e/]								
OY (mt)	7,761	7,634	5,933	5,933	*NA*	*NA*	NA	NA
Est. Mort. (mt)	6,543	6,470	5,545	6,078	*NA*	*NA*	NA	NA
% OY	84.30%	84.70%	93.50%	102.40%	*NA*	*NA*	NA	NA
Sablefish N								
OY (mt)	7,486	7,363	5,723	5,723	7,052	6,471	5,515	5347
Est. Mort. (mt)	NA	NA	NA	NA	6,625	6,167	5,362	4701
% OY	NA	NA	NA	NA	93.90%	95.30%	97.23%	87.92%
Sablefish S								
OY (mt)	275	271	210	210	1,371	1,258	1,298	1258
Est. Mort. (mt)	NA	NA	NA	NA	776	1,039	1,220	705
% OY	NA	NA	NA	NA	56.60%	82.60%	93.99%	56.04%
Shortbelly RF								
OY (mt)	13,900	13,900	13,900	13,900	6,950	6,950	50	50
Est. Mort. (mt)	NA	NA	1	9	9	7	12	7
% OY	NA	NA	0.00%	0.10%	0.10%	0.10%	24.00%	14.00%
Shortspine thornyhead (coastwide) [d/]								
OY (mt)	999	1,018	2,055	NA	NA	NA	NA	NA
Est. Mort. (mt)	796	853	1,194	NA	NA	NA	NA	NA
% OY	79.70%	83.80%	58.10%	NA	NA	NA	NA	NA

Table 4-134 (continued). Specified annual OYs (mts), estimated annual total mortality (mts), and percent of OY attainment of non-overfished West Coast groundfish species managed with stock-specific harvest specifications, 2005 to 2012 (from the WCGOP Reports, http://tinyurl.com/nv3pddm).

	2005	2006	2007	2008	2009	2010	2011	2012
Shortspine thornyhead N								
OY (mt)	NA	NA	1,634	1,634	1,608	1,591	1,573	1,556
Est. Mort. (mt)	NA	NA	NA	1,313	1,557	1,308	827	801
% OY	NA	NA	NA	80.40%	96.80%	82.20%	52.57%	51.48%
Shortspine thornyhead S								
OY (mt)	NA	NA	421	421	414	410	405	401
Est. Mort. (mt)	NA	NA	NA	172	167	173	184	128
% OY	NA	NA	NA	40.90%	40.30%	42.10%	45.43%	31.92%
Splitnose S								
OY (mt)	461	461	461	461	461	461	1,461	1,538
Est. Mort. (mt)	237	162	143	177	203	140	42	62
% OY	51.50%	35.10%	31.10%	38.40%	44.00%	30.30%	2.87%	4.03%
Starry Flounder[f/]								
OY (mt)	NA	NA	890	890	1,004	1,077	1,352	1,360
Est. Mort. (mt)	NA	NA	30	21	28	38	24	17
% OY	NA	NA	3.30%	2.30%	2.80%	3.60%	1.78%	1.25%
Widow								
OY (mt)	285	289	368	368	522	509	600	600
Est. Mort. (mt)	199	214	259	238	195	173	216	276
% OY	69.80%	74.00%	70.40%	64.70%	37.40%	34.00%	36.00%	46.00%
Yellowtail N								
OY (mt)	3,896	3,681	4,548	4,548	4,562	4,562	4,364	4,371
Est. Mort. (mt)	935	493	389	476	751	955	1,352	1,570
% OY	24.00%	13.40%	8.60%	10.50%	16.50%	20.90%	30.98%	35.92%

[a/] Black rockfish have been managed with stock-specific harvest specifications north and south of the Columbia River through this period; however, only coastwide catches were reported in 2005 and 2006 NWFSC total mortality reports. Therefore, the OYs depicted in this table are the sum of north and south OYs specified in regulations.

[b/] California scorpionfish was first managed with stock-specific harvest specifications in 2007. Prior to 2007, California scorpionfish was managed under the Minor Nearshore Rockfish South complex.

[c/] Longnose skate was first managed with stock-specific harvest specifications in 2009. Prior to 2009, longnose skate was managed under the Other Fish complex.

[d/] Shortspine and longspine thornyheads were managed with stock-specific harvest specifications north and south of 34º27' N. latitude beginning in 2007 and coastwide prior to 2007. The 2007 NWFSC total mortality report only reported coastwide catches of thornyheads; the OYs in the table are the sum of the north and south OYs for both species in 2007.

[e/] Sablefish have been managed with stock-specific harvest specifications north and south of 34º27' N. latitude through this time period; however, only coastwide catches were reported in NWFSC total mortality reports through 2008. Thereafter, area-specific catches of sablefish have been reported. The 2005 to 2008 sablefish OYs depicted in this table are the sum of north and south OYs specified in regulations.

[f/] Starry flounder was first managed with stock-specific harvest specifications in 2007. Prior to 2007, starry flounder was managed under the Other Flatfish complex.

Table 4-135. Specified annual OYs (mts), estimated annual total mortality (mt), and percent of OY attainment of West Coast groundfish stock complexes, 2005 to 2012.

	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore RF (coastwide) [a/]								
OY (mt)	737	NA	NA	NA	NA	NA	NA	NA
Est. Mort. (mt)	590	NA	NA	NA	NA	NA	NA	NA
% OY	80.10%	NA	NA	NA	NA	NA	NA	NA
Nearshore RF N								
OY (mt)	122	122	142	142	155	155	99	99
Est. Mort. (mt)	NA	96	133	97	63	75	99	96
% OY	NA	78.50%	93.60%	68.50%	40.60%	48.50%	100.00%	96.97%
Shelf RF (coastwide)[a/]								
OY (mt)	1,682	NA	NA	NA	NA	NA	NA	NA
Est. Mort. (mt)	501	NA	NA	NA	NA	NA	NA	NA
% OY	29.80%	NA	NA	NA	NA	NA	NA	NA
Shelf RF N								
OY (mt)	968	968	968	968	968	968	968	968
Est. Mort. (mt)	NA	104	153	75	70	77	85	90
% OY	NA	10.80%	15.80%	7.70%	7.20%	7.90%	8.78%	9.30%
Slope RF (coastwide) [a/]								
OY (mt)	1,799	NA	NA	NA	NA	NA	NA	NA
Est. Mort. (mt)	435	NA	NA	NA	NA	NA	NA	NA
% OY	24.20%	NA	NA	NA	NA	NA	NA	NA
Slope RF N								
OY (mt)	1,160	1,160	1,160	1,160	1,160	1,160	1160	1160
Est. Mort. (mt)	NA	283	522	484	517	562	341	453
% OY	NA	24.40%	45.00%	41.70%	44.60%	48.40%	29.40%	39.05%
Nearshore RF S								
OY (mt)	615	615	564	564	650	650	1001	990
Est. Mort. (mt)	NA	711	466	394	388	384	436	445
% OY	NA	115.60%	82.70%	69.90%	59.70%	59.00%	43.56%	44.95%
Shelf RF S								
OY (mt)	714	714	714	714	714	714	714	714
Est. Mort. (mt)	NA	334	365	212	273	251	336	402
% OY	NA	46.80%	51.20%	29.70%	38.20%	35.20%	47.06%	56.30%
Slope RF S								
OY (mt)	639	639	626	626	626	626	626	626
Blackgill RF Est. Mort.	*90*	*123*	*51*	*72*	*136*	*152*	*150*	*195*
Est. Mort. (mt)	NA	256	149	189	231	183	191	257
% OY	NA	40.10%	23.80%	30.10%	36.90%	29.20%	30.51%	41.05%
Other Flatfish								
OY (mt)	4,090	4,090	4,884	4,884	4,884	4,884	4884	4884
Est. Mort. (mt)	1,965	1,962	1,649	1,040	1,565	1,144	921	897
% OY	48.10%	48.00%	33.80%	21.30%	32.00%	23.40%	18.86%	18.37%
Other Fish								
OY (mt)	7,300	7,300	7,300	7,300	5,600	5,600	5,575	5,575
Spiny dogfish Est. Mort.	*2,044*	*1,407*	*1,504*	*2,497*	*1,207*	*1,215*	*1,662*	*831*
Est. Mort. (mt)	6,424	4,242	4,516	5,339	2,514	2,231	2,521	1,655
% OY	88.00%	58.10%	61.90%	73.10%	44.90%	39.80%	45.22%	29.69%

[a/]Area-specific OYs north and south of 40º10' N. latitude were specified for the nearshore, shelf, and slope complexes through this period. However, only coastwide catches of species in the nearshore, shelf, and Slope Rockfish complexes were reported in the 2005 NWFSC total mortality report. Therefore, the coastwide OYs for each assemblage are the sum of the north and south OYs specified in regulations.

Table 4-136. Estimated Groundfish Mortality under the Action Alternatives, Compared to the No Action Alternative (mt). Estimated mortality is based on the assumption that the average ACL was attained in 2011-2012.

		No Action	Preferred Alternative		Alternative 1		Alternative 2	
		Alternative	2015	2016	2015	2016	2015	2016
Arrowtooth flounder								
ACL (mt)		5,758	5,497	5,328	6,025	5,840	4,058	3,934
Proj. Mort.		1,105	1,055	1,023	1,156	1,121	779	755
Avg. %	19.19%							
Black RF (CA & OR)								
ACL (mt)		1,000	1,000	1,000	1,000	1,000	922	927
Proj. Mort.		543	543	543	543	543	501	503
Avg. %	54.30%							
Black RF (WA)								
ACL (mt)		409	402	404	402	404	330	332
Proj. Mort.		223	219	220	219	220	180	181
Avg. %	54.41%							
Cabezon (CA)								
ACL (mt)		158	154	151	154	151	126	124
Proj. Mort.		57	55	54	55	54	45	45
Avg. %	35.99%							
Cabezon (OR)								
ACL (mt)		47	47	47	47	47	38	38
Proj. Mort.		46	46	46	46	46	37	37
Avg. %	96.96%							
CA scorpionfish								
ACL (mt)		117	114	111	114	111	93	91
Proj. Mort.		101	98	96	98	96	80	78
Avg. %	86.14%							
Chilipepper S								
ACL (mt)		1,647	1,628	1,619	1,628	1,619	1,335	1,328
Proj. Mort.		137	135	134	135	134	111	110
Avg. %	8.30%							
Dover sole								
ACL (mt)		25,000	25,000	25,000	25,000	25,000	25,000	25,000
Proj. Mort.		7,551	7,551	7,551	7,551	7,551	7,551	7,551
Avg. %	30.20%							
English sole								
ACL (mt)		5,646	9.853	7.204	9.853	7.204	6.637	4,852
Proj. Mort.		92	179	126	179	126	121	85
Avg. %	1.79%							
Lingcod N. 42°								
ACL (mt)		2,878	2,830	2,719	2,830	2,719	2,172	2,089
Proj. Mort.		852	838	805	838	805	643	619
Avg. %	29.61%							
Lingcod S. 42°								
ACL (mt)		1,063	1,004	946	1,100	1,037	741	699
Proj. Mort.		150	141	133	155	146	104	98
Avg. %	14.07%							
Longnose skate								
ACL (mt)		2,000	2,000	2,000	2,000	2,000	1,920	1,885
Proj. Mort.		1,574	1,574	1,574	1,574	1,574	1,512	1,484
Avg. %	78.72%							

Table 4-136 (continued). Estimated Groundfish Mortality under the Action Alternatives, Compared to the No Action Alternative (mt). Estimated mortality is based on the assumption that the average ACL was attained in 2011-2012.

		No Action Alternative	Preferred Alternative		Alternative 1		Alternative 2	
			2015	2016	2015	2016	2015	2016
Longspine thornyhead N								
ACL (mt)		1,958	3,170	3,015	3,474	3,305	2,340	2,226
Proj. Mort.		877	1,419	1,350	1,555	1,480	1,048	997
Avg. %	44.77%							
Longspine thornyhead S								
ACL (mt)		347	1,001	952	1,097	1,044	739	703
Proj. Mort.		19	55	53	61	58	41	39
Avg. %	5.52%							
Pacific cod								
ACL (mt)		1,600	1,600	1,600	1,600	1,600	1,213	1,213
Proj. Mort.		621	621	621	621	621	470	470
Avg. %	38.78%							
Pacific whiting								
ACL (mt)								
Proj. Mort.								
Avg. %	83.07%							
Sablefish N								
ACL (mt)		4,349	4,793	5,241	5,012	5,467	4,114	4,540
Proj. Mort.		4,026	4,437	4,852	4,640	5,061	3,808	4,203
Avg. %	92.57%							
Sablefish S								
ACL (mt)		1,560	1,719	1,880	1,798	1,961	1,475	1,629
Proj. Mort.		1,170	1,290	1,410	1,349	1,471	1,106	1,222
Avg. %	75.02%							
Shortbelly RF								
ACL (mt)		50	50	50	50	50	50	50
Proj. Mort.		10	10	10	10	10	10	10
Avg. %	19.00%							
Shortspine thornyhead N								
ACL (mt)		1,525	1,745	1,726	1,913	1,892	1,288	1,275
Proj. Mort.		793	908	898	995	984	670	663
Avg. %	52.03%							
Shortspine thornyhead S								
ACL (mt)		393	923	913	1,012	1,001	682	674
Proj. Mort.		152	357	353	391	387	264	261
Avg. %	38.68%							
Splitnose S								
ACL (mt)		1,670	1,715	1,746	1,715	1,746	1,406	1,432
Proj. Mort.		58	59	60	59	60	49	49
Avg. %	3.45%							
Starry Flounder								
ACL (mt)		1,528	1,534	1,539	1,681	1,686	1,132	1,136
Proj. Mort.		23	23	23	25	26	17	17
Avg. %	1.51%							
Widow								
ACL (mt)		1,500	2,000	2,000	1,500	1,500	1,500	1,500
Proj. Mort.		615	820	820	615	615	615	615
Avg. %	41.00%							

Table 4-136 (continued). Estimated Groundfish Mortality under the Action Alternatives, Compared to the No Action Alternative (mt). Estimated mortality is based on the assumption that the average ACL was attained in 2011-2012.

		No Action Alternative	Preferred Alternative 2015	Preferred Alternative 2016	Alternative 1 2015	Alternative 1 2016	Alternative 2 2015	Alternative 2 2016
Yellowtail N								
ACL (mt)		4,382	6,590	6.344	6,590	6.344	4.439	4,274
Proj. Mort.		1,466	3,751	3,557	3,751	3,557	2,526	2,396
Avg. %	56.49%							

4.2.5.2 Impacts of Management Measures Summary by Sector

Shorebased IFQ

Under the Preferred Alternative, the shorebased IFQ fishery would operate under the same similar management measures as the No Action Alternative. Management measure changes from the No Action Alternative include RCA modifications to the seaward boundary between 40°10 to 45° 46 N. latitude, adjustments to the 200-fm modified depth contours off Oregon, and sorting requirements for rougheye/blackspotted and shortraker rockfish. Alternative 1 would have the same management measures with slightly higher IFQ allocations, compared to the Preferred Alternative and the No Action Alternative. Alternative 2 would have the same management measures as the Preferred Alternative, with lower IFQ allocations.

The RCAs are used to keep total catch mortality of certain species within the ACLs. RCAs affect the collective behavior of harvesters by preventing fishing in areas where bycatch of specific species, generally overfished stocks, is particularly high. The trawl RCA structure is the same as under the No Action Alternative (Table 4-137), except in the area from 40°10' to 45°46' N. latitude. Under the action alternatives (Preferred Alternative, Alternative 1, and Alternative 2), the trawl RCA seaward boundary would be modified from the 200-fm depth contour during the November to February period to year-round use of the 200-fm modified depth contour. The RCA change may provide access to more areas and species. Access to other species could aid in reducing effort on rougheye/blackspotted rockfish.

Dover sole occur coastwide with highest densities found in depths between 110 to 270 fm. Trawl RCA modifications may allow greater access to the Dover sole stock, as well as petrale sole. The projected catch would likely be affected by the sablefish allocation, which would be increased under the Preferred Alternative. In addition to sablefish, species historically caught with Dover sole include IFQ species (shortspine and longspine thornyheads, other flatfish, minor slope rockfish), trip limit species (longnose skate), species proposed to be designated as EC species (Pacific grenadier, Pacific flatnose), and non-FMP species (roughtail skate, giant grenadier, hagfish, and a diverse complex of eelpouts) (PFMC 2014). Roughtail skate and giant grenadier would be designated as EC species under the action alternatives.

Under all three action alternatives, adjustments to coordinates for the 200-fm modified depth contour off Oregon would provide access to shallower waters where petrale sole concentrations are greater (Appendix B, Section B.1.1). To the degree that there is a precise correlation between depth and catch rates, there could be a marginal increase in the catch of overfished species, other fish species, and the potential take of protected species occurring in the newly opened areas under the action alternatives. However, for the 200-fm modified line adjustments, the assumption is that catch rates in the newly opened area would be comparable to rates seen when the 200-fm line is in place, since the action would simply align the 200-fm modified line with the 200-fm line by more closely aligning the depth contour with the actual bathymetry in the area.

Table 4-137. Trawl RCA configuration.

	Area	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
No Action Alt. (4/17/14)	North of 48°10' N. lat.	shore – modified/ 200-fm line	shore – 200-fm line	shore – 150-fm line		shore – 200-fm line	shore – modified 200-fm line
	48°10' N. lat. – 45°46' N. lat.	100-fm line – 150 fm line					
	45°46' N. lat. – 40°10' N. lat.	100-fm line – modified 200 fm-line	100-fm line – 200-fm line				100-fm line – modified 200-fm line
	South of 40°10' N. lat.	100-fm line – 150-fm line					
	Area	**JAN-FEB**	**MAR-APR**	**MAY-JUN**	**JUL-AUG**	**SEP-OCT**	**NOV-DEC**
Action Alternatives, Alternatives 1 & 2	North of 48°10' N. lat.	shore – modified/ 200-fm line	shore – 200-fm line	shore – 150-fm line		shore – 200-fm line	shore – modified 200-fm line
	48°10' N. lat. – 45°46' N. lat.	100-fm line – modified 150-fm line					
	45°46' N. lat. – 40°10' N. lat.	100-fm line – modified 200-fm line					
	South of 40°10' N. lat.	100-fm line – 150-fm line					

The shorebased IFQ program quota pounds would be issued based the 2015-2016 ACLs and resulting trawl allocations under the Preferred Alternative. Projected total catch mortality of overfished species under the Preferred Alternative, Alternative 1, and Alternative 2 are the same between the alternatives for 2015 and 2016 (Table 4-138), with the exception of petrale sole where the rebuilding HCR is the ABC with the 25-5 adjustment. With a lower P* under Alternative 2, the total mortality projections would be lower and would be least likely to result in the true OFL being exceeded. Petrale sole total catch mortality would be similar under the No Action Alternative, the preferred Alternative, and Alternative 1 where the ABC would be based on a P* of 0.45. Except for Petrale sole, the projected attainment of all overfished species would be well below the trawl allocation. Estimates of non-overfished groundfish species projected mortality relative to allocations are presented in Table 4-132 and Table 4-133. Under the No Action Alternative, the attainment of the trawl allocation for the dominant non-target species has been relatively low, with the exception of sablefish, Pacific whiting, and petrale sole, where the attainment has exceeded 90 percent of the trawl allocation annually. Similar rates of attainment could be expected in 2015-2016 under all of the action alternatives.

A key aspect of the Shorebased IFQ program is the level of observer coverage and individual accountability. Each vessel is required to carry one observer on every IFQ trip. Observers collect data on retained and discarded catch that are used to estimate total catch by species. In the case of Pacific halibut, the observers collect data used to tabulate the total catch mortality. Vessels are required to land catch at IFQ first receivers, where the landed catch is sorted and weighed. Catch monitors are individuals who collect data to verify that the catch is correctly sorted, weighed, and reported. The level of monitoring and catch accounting in the IFQ fishery reduces the risk of exceeding a trawl allocation or ACL for non-IFQ species.

Legal-size Pacific halibut IBQ would be limited to 15 percent of the Area 2A TCEY for legal size halibut (net weight), not to exceed 100,000 pounds (45 mt) annually for legal size halibut (net weight), which would be a 30,000-pound (14-mt) reduction from status quo. A scientific sorting requirement for rougheye/blackspotted and shortraker rockfish would be implemented, which would improve the data used in management. Alternative 1 would have similar management measures with slightly higher IFQ allocations, compared to the Preferred Alternative and No Action. Alternative 2 would have the same management measures as the Preferred Alternative, with lower IFQ allocations.

Table 4-138. Comparison of Shorebased Trawl IFQ Program Allocation and Projected Mortality by Alternative (mt).

IFQ Species	No Action Alternative		Council Preferred		Alternative 1		Alternative 2	
	Trawl IFQ Allocation	Projected Mortality	Trawl IFQ Allocation	Projected Mortality	Trawl IFQ Allocation	Projected Mortality	Trawl IFQ Allocation	Projected Mortality
2015								
Bocaccio	79.0	10.9	81.9	11.3	Same as Council Preferred		Same as Council Preferred	
Canary	41.1	9.4	43.3	9.9				
Cowcod	1.0	0.1	1.4	0.1				
Darkblotched	278.4	108.5	285.6	111.3				
Petrale	2,378.0	2,252.1	2,539.4	2,405.0	2,539.4	2,405.0	2,633.4	1.925.8
POP	112.3	48.0	118.5	50.7	Same as Council Preferred		Same as Council Preferred	
Yelloweye	1	--	1.0	--				
2016								
Bocaccio	79.0	10.9	85.0	11.8	Same as Council Preferred		Same as Council Preferred	
Canary	41.1	9.4	44.5	10.2				
Cowcod	1.0	0.1	1.4	0.1				
Darkblotched	278.4	108.5	292.8	114.1				
Petrale	2378.0	2,252.1	2,633.4	2,494.0	2,633.4	2,494.0	2.539.4	1,997.7
POP	112.3	48.0	124.0	53.1	Same as Council Preferred		Same as Council Preferred	

At-sea Sectors

Under the Preferred Alternative, the at-sea whiting co-ops would operate under management measures similar to the No Action Alternative. Management measure modifications under all of the action alternatives would include sorting requirements for rougheye/blackspotted rockfish and shortraker rockfish and adjustments to set-asides for arrowtooth flounder and other fish. Under Alternatives 1 and 2, the at-sea whiting co-ops would operate under the same management measures described under the Preferred Alternative.

Projected total catch mortality of overfished species that occur in the whiting fishery under the Preferred Alternative, Alternative 1, and Alternative 2 for 2015 and 2016 are shown in Table 4-139. The mortality projections assume that 100 percent of the allocation is taken, although that generally does not occur. Reaching an allocation for canary, darkblotched petrale sole, or POP would result in closure of the at-sea fishery and would be an incentive take efforts to keep the total catch below the at-sea allocation. The catch of non-whiting groundfish is very low (generally less than 2 percent). To prevent exceeding the trawl allocations for non-whiting groundfish, set-asides are established for species commonly caught in the fishery. To accommodate the restructuring of the Other Fish complex, including the removal of spiny dogfish from the complex, adjustments to the at-sea whiting set-asides for species in the Other Fish complex would be necessary under all of the action alternatives.

Table 4-139. Comparison of At-sea Sectors Combined Allocation and Projected Mortality by Alternative (mt).

IFQ Species	No Action		Council Preferred		Alternative 1		Alternative 2	
	At-sea Allocation	Projected Mortality[a/]	At-sea Allocation	Projected Mortality[a/]	At-sea Allocation	Projected Mortality[a/]	At-sea Allocation	Projected Mortality[a/]
2015								
Canary	13		13.7	13.7	Same as Council Preferred		Same as Council Preferred	
Darkblotched	15.3		15.7	15.7				
Petrale	5.0		5.0	5.0				
POP	17.4		17.4	17.4				
2016								
Canary	13		14.0	14.0	Same as Council Preferred		Same as Council Preferred	
Darkblotched	15.3		16.2	16.2				
Petrale	5.0		5.0	5.0				
POP	17.4		17.4	17.4				

[a/]Projected mortality assumes 100 percent of the at-sea sector set-aside is taken.

Each processing vessel over 125 feet in length is required to carry two observers, and mothership catcher vessels carry one observer. Observers collect data on retained and discarded catch that are used to estimate total catch by species. In the case of Pacific halibut, they collect data used to estimate total catch mortality. The level of monitoring and catch accounting in the fishery greatly reduces the likelihood of overfishing or even of exceeding the at-sea allocations, set-asides, trawl allocations, or ACL for either Pacific whiting or non-whiting groundfish species.

Non-nearshore

Under the Preferred Alternative, the non-nearshore fixed gear fishery would operate under similar management measures as under the No Action Alternative. The No Action Alternative non-trawl RCA boundaries from 2014 would remain in place for 2015 and 2016 (Table B-68). Under the action alternatives, however, the shoreward boundary would change from 20 to 30 fm in the area 40°10’ to 42° N. latitude (would allow some sablefish catch shoreward of RCAs). Management measure modifications under all of the action alternatives would include modifications to the 60-fm depth contour in areas off the southern California bight (Appendix B, Section B.1.2.1) and the 50-fm depth contour off the northern Channel Islands (Appendix B, Section B.1.2.2); trip limits increases for several species, including sablefish, bocaccio, Shelf Rockfish south of 34°27’ N. latitude, and lingcod; and removal of the prohibition on lingcod retention in Periods 1, 2, and 6 (except period 2 would remain closed in the south); trip limit decreases for Slope Rockfish north of 40°10’ N. latitude that may be proposed inseason to reduce mortality of rougheye/blackspotted rockfish; and a scientific sorting requirement for shortraker and, rougheye/blackspotted rockfish. Under Alternative 1, the non-nearshore fixed gear fishery would operate under the same management measures as under the Preferred Alternative, except that additional trip limit increases would be proposed to attain the higher sablefish ACLs. Under Alternative 2, the non-nearshore fixed gear fishery would operate under the same management measures as under the Preferred Alternative, except that trip limits decreases for several species, including sablefish, would be necessary to stay within the lower ACLs.

The adjustments off California would allow non-trawl vessels increased access to fishing areas, while maintaining the intent of the depth contours. To the degree that there is a precise correlation between depth and catch rates, under the action alternatives, there could be a marginal increase in the catch of overfished species such as bocaccio, canary, cowcod, and yelloweye rockfishes, other fish species, and potential take of protected species occurring in the newly opened areas.

North of 36° north latitude, the limited entry and open access sablefish DTL fisheries would account for approximately 13.5 percent of the northern sablefish ACL, while the fishery south of 36° north latitude would account for approximately 58 percent of the southern ACL (during 2015 under the Preferred Alternative). Trip limit changes for sablefish would include increased limits under the Preferred Alternative and Alternative 1 and decreased limits under Alternative 2. The proposed trip limits are intended to attain, but not to exceed, the HGs under each alternative. The aim throughout all the alternatives was to enable harvest of the HGs, while accommodating 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.

The sablefish No Action Alternative trip limit structures for 2014 in each fixed gear fishery are presented in Table B-99. The No Action Alternative would result in projected attainments of the landed catch shares for the limited entry fishery of 95 percent in the north and 91 percent in the south and open access attainments of 99 percent in the north and 71 percent in the south. Trip limits would generally be higher under the Preferred Alternative than under the No Action Alternative. Higher limits would be needed to influence similar attainment under the higher shares (Table B-63). Both limited entry and open access attainment rates south of 40°10’ N. latitude would be lower under the Preferred Alternative than under the No Action Alternative. In the north, the attainment rates for limited entry would be similar to the No Action Alternative for limited entry and open access (Table B-100). Similarly, high attainment rates would be expected under Alternative 1 and Alternative 2.

The Minor Shelf Rockfish complex south of 40°10´ N. latitude has been managed to sector-specific allocations (i.e., trawl, 12.2 percent and non-trawl, 87.8 percent). Although the Minor Shelf Rockfish complex is managed as a single stock south of 40°10´ N. latitude, trip limit increases are specific to the management area south of 34°27' N. latitude. Stocks within the Minor Shelf Rockfish complex south are primarily 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). Shelf rockfish are particularly well protected by the RCAs. Attainment rates for minor shelf rockfish south in recent years have been 31 to 67 percent of the non-trawl allocation (Table B-59).

The intent of the trip limit increases for minor shelf rockfish under the action alternatives would be to reduce discarding (i.e., turn discards into landed catch and thereby improve catch accounting) and to increase attainment of the non-trawl HG. The non-trawl allocation (all sectors other than trawl) south of 40°10´ N. latitude would likely increase substantially from 615 mt in 2014 (No Action Alternative) to 1,383.2 mt in 2015 and 1,384.0 mt in 2016 at a P* = 0.45 under the Preferred Alternative and Alternative 1 (Table B-59). Under Alternative 2 with a P* = 0.25, the 2015 and 2016 allocations would be 659.7 mt for both years. Differences in the projected landings under the alternatives are presented in Table B-66. Under the action alternatives, landings would likely increase approximately 10 percent (0.4 mt) and 68 percent (9.7 mt) in the limited entry and open access sectors, respectively, compared to the No Action Alternative (Option 1). Under the No Action Alternative, there would be no anticipated increase in the mortality of overfished species. There may be a small increase in the bycatch of overfished species under the action alternatives, but, at present, no quantifiable method has been explored to determine how much this may be.

Any increase in trip limit would likely increase fishing effort for shelf rockfish species. The amount of the increase is uncertain and cannot be estimated at this time. Because the open access fishery is open-ended compared to the limited sector, it is difficult to estimate how many new participants could enter the fishery as a result of increased trip limits and, thus, the extent of increased overfished species mortality. Overfishing of stocks within the shelf complex would not be expected under any of the alternatives.

The bocaccio HG for non-trawl fixed gear would likely increase in 2015 and 2016 to 80.1 mt and 83.1 mt, respectively (Table B-53). The 2011 update assessment (Field 2013) 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. This, combined with the information that recent mortality of this stock is far below the non-trawl harvest guideline (Table B-53), prompted the Council to request an analysis of higher trip limits for the limited entry and open access sectors south of 34°27' N. latitude. The intent of the trip limit increases is to reduce discarding (i.e., turn discards into landed catch and thereby improve catch), while discouraging targeting since the stock is under a rebuilding plan. Under the action alternatives, (Option 2a, Table B-62), the projected landings would likely increase by 70 percent (0.7 mt) in the limited entry sector and 63 percent (3.4 mt) in the open access sector as compared to the No Action Alternative (Option 1, Table B-62). Mortality for bocaccio south of 40°10' N. latitude would likely be well below the non-trawl fixed gear HGs (Table B-57) and would be consistent with rebuilding measures for the stock.

Overfished species (OFS) are encountered by non-nearshore fixed gear fisheries. For example in 2013 (No Action Alternative), non-nearshore fixed gear fishery mortality was as follows for bocaccio rockfish south of 40°10' N. latitude (2.62 mt), canary rockfish (0.12 mt), darkblotched rockfish (9.04 mt), Pacific ocean perch (0.41 mt), yelloweye rockfish (0.34 mt), and petrale sole (0.83 mt). It is expected that similar catches may be observed under the No Action Alternative during 2015 and 2016.

Other species are encountered by non-nearshore fixed gear fisheries. For example, rougheye rockfish was taken by the non-nearshore fixed gear fisheries (when shortspine thornyheads were also landed) as follows: 29.7 mt in 2011, 26.2 mt in 2012, and 19.4 mt in 2013 (No Action Alternative). Shortraker rockfish was also taken as follows: 2.5 mt in 2011, 4.53 mt in 2012, and 0.16 mt in 2013 (No Action Alternative). Last, rougheye/blackspotted rockfish was taken as follows: 0.25 mt in 2011, 4.53 mt in 2012, and 0.16 mt in 2013 (No Action). Mortality of these species of rockfish would not be likely to change under the action alternatives.

Under the No Action Alternative, lingcod would be managed by cumulative bi-monthly trip limits. Under the action alternatives, trip limit increases would be proposed. Lingcod catch is mostly incidental to the targeting of sablefish. Increases in lingcod mortality (landings) affect overfished rockfish mortality in the Oregon and California nearshore fisheries (Washington has not had a commercial nearshore fishery since 1995). Increasing the lingcod trip limit during the open season showed some increased overfished species rockfish species. Increased catch of canary rockfish was significant when lingcod mortality was increased by 100 percent. It is expected that other Minor Nearshore Rockfish mortality also increases. Current RCA closures prevent access to much of the lingcod stock.

Trip limits that are appreciably higher than those needed to accommodate bycatch may lead to increased 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, primarily shelf and nearshore species, and lingcod co-occur on rocky reef habitat, and lingcod are currently discarded by participants in the fishery who encounter them while fishing for rockfish during the closed period for lingcod. While mortality on discarded lingcod is relatively low (approximately 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 to 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 would result in increased mortality for overfished rockfish species, primarily yelloweye and canary rockfish, and the potential for the sector allocations to be exceeded if inseason management, including trip limit reductions, were slow to respond (Appendix B).

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 into 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 designed to reduce catch of the males while concentrated during the nest-guarding season to facilitate rebuilding of the stock when it was overfished. Under the action alternatives, the prohibition on lingcod retention in Periods 1, 2, and 6 would be removed, except that period 2 would remain closed in the south, and trip limits would increase for both limited entry and open access fixed gears (Appendix B, Section B.7 and Section B.8). Opening the closed season for lingcod retention would not likely result in increased catch of any rockfish species (overfished species or China rockfish), because the proposed increases would be equal to or lower than average encounter rates of lingcod during the closed season (based on WCGOP bycatch rates during December to April). An 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. Therefore, the period 2 closure south of 40°10′ N. latitude would remain in effect under the action alternatives.

A scientific sorting requirement for shortraker and rougheye/blackspotted would be implemented, which could improve the data used in management. To improve inseason tracking of blackgill rockfish south of 40°10' N. latitude, the Council implemented an HG of 110 mt in 2014 (No Action Alternative). Further, the Council provided guidance that the commercial non-trawl apportionment of blackgill should be 60 percent to limited entry (27 mt) and 40 percent to open access fixed gears (18 mt). This apportionment reflects the historical distribution of catch between the limited entry and open access fixed gear sectors from 2005 to 2010.

Catch allocations and projection for overfished species for the non-nearshore fixed gear fisheries are shown in Table 4-140 below. The projected catches for each the action alternatives are similar. Yelloweye rockfish has a higher rate of attainment in the fixed-gear fisheries than the other overfished species. For highly discarded species like yelloweye, catch is not known with certainty, because not all catch is observed. Annual mortality estimates are produced with statistical sampling and estimation methods that are inherently uncertain. Yelloweye catch estimates and model projections are subject to considerable uncertainty (Table 4-140). The analysis presented in Appendix B.4 considered the relative level of uncertainty surrounding yelloweye catches. Given the uncertainty in catch estimates, the management strategy under the action alternatives would be to allow for buffer between the projected catch and the non-nearshore and nearshore sector shares. The ultimate goal is to ensure that yelloweye rockfish total catch mortality remains below the ACL. Even though most of the fixed-gear allocation would be projected to be harvested, in reality, all fisheries combined have not caught more than 70 percent of the ACL during recent years. Reasons include the following: (a) set-asides are based on high or highest catches attained; (b) even though some sectors may exceed their allocation, it is unlikely that all sectors will exceed each of their allocations at the same time. The result has been annual catches much lower than the ACL or OY.

Table 4-140. Annual yelloweye rockfish mortality relative to the ACL (or OY) for 2008 to 2012. Data are from the West Coast Groundfish Observer Program Reports on Estimated Discard and Catch.

Year	Mortality (mt)	ACL or OY (mt)	Percent of ACL or OY
2012	12	17	68%
2011	9	17	52%
2010	8	14	54%
2009	11	17	63%

Observer coverage in the non-nearshore fisheries in 2012 was 24 percent of the landings for the primary sablefish fishery, 5 percent of the landings for the non-tier limited entry vessels, and 6 percent of the open access landings (http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/sector_products.cfm#ob). For highly discarded species like yelloweye in the non-nearshore fisheries, catch is not known with certainty because not all catch is observed. Annual mortality estimates are produced with statistical sampling and estimation methods that are inherently uncertain. Yelloweye allocations, catch estimates, and model projections are subject to considerable uncertainty. Given the uncertainty in catch estimates, the management strategy under the action alternatives would be to allow for a buffer between the projected catch and the non-nearshore and nearshore sector shares.

Nearshore

Under the Preferred Alternative, the nearshore fixed gear fishery would operate under similar management measures as under the No Action Alternative. Management measure modifications would include a 23-mt HG for Minor Nearshore Rockfish north of 40°10’ N. latitude for California (in the area 40°10' N. latitude to 42° N. latitude) and would apply to both the nearshore commercial and recreational fisheries. In California, trip limit decreases or non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the Minor Nearshore Rockfish complex ACL or the state Minor Nearshore Rockfish HGs. Should inseason action be needed to reduce catches of Minor Nearshore Rockfish in Washington and Oregon, the states would take action through state regulation. The prohibition on lingcod retention in Periods 1, 2, and 6; would be removed (except for period 2 south), and trip limits would be increased for both limited entry and open access lingcod. To the extent that the nearshore fisheries also catch minor shelf rockfish and bocaccio south of 34°27' N. latitude, the biological impacts discussed under non-nearshore would also apply to nearshore fixed gear fisheries.

Under Alterative 1, the nearshore fixed gear fishery would operate under the same management measures as the Preferred Alternative. Under Alternative 2, the nearshore fixed gear fishery would operate under the same management measures as the Preferred Alternative, except that trip limits decreases for several species would be necessary to stay within the lower ACLs, given the reduction from the No Action Alternative ACL. Greater trip limit decreases or longer periods of non-retention would be required for Minor Nearshore Rockfish north to keep mortality at or within the complex ACL under Alternative 2.

The Minor Nearshore Rockfish north and south complex OFLs and ABCs are derived from the contributions of component stocks to the entire complex. Under the No Action Alternative, there would be an HG only for blue rockfish within the complex for the area south of 42° N. latitude. The specifications would be at the complex level with the ACL specified for each region north and south of 40°10′ N. latitude. Under the preferred Alternative, Alternative 1, and Alternative 2, an HG would be established for the Minor Nearshore Rockfish complex north between 42° N latitude (Oregon/California border) and 40°10’ N latitude (Cape Mendocino) (Appendix B.5). The HG would be specified at 23.7 mt, a number that represents the No Action Alternative in the EIS (i.e., expected commercial landings combined with projected recreational mortality.) Should harvest levels in a particular state approach 75 percent of the state-specific HGs (Table 2-6), the states would consult via a conference call and determine whether inseason action would be needed. The HGs for Washington and Oregon would be state

HGs and would not be established in Federal regulations. In California, the HG would be specified in Federal regulation and would apply only in the area 40°10' N. latitude to 42° N. latitude. Should inseason action be needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

Under the No Action Alternative, lingcod would be managed by cumulative bi-monthly trip limits. Under the action alternatives, trip limit increases would be proposed. Lingcod catch is mostly incidental to the targeting of sablefish. Increases in lingcod mortality (landings) affect overfished rockfish mortality in the Oregon and California nearshore fisheries (Washington has not had a commercial nearshore fishery since 1995). Increasing the lingcod trip limit during the open season would likely result in increased catch of overfished rockfish species in the nearshore fisheries. Increased catch of canary rockfish was significant when lingcod mortality was increased by 100 percent. Other Minor Nearshore Rockfish mortality would also likely increase.

Current RCA closures prevent access to much of the lingcod stock. Trip limits that are appreciably higher than needed to accommodate bycatch may lead to increased 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, primarily shelf and nearshore species, and lingcod co-occur on rocky reef habitat, and lingcod are currently discarded by participants in the fishery who encounter them while fishing for rockfish during the closed period for lingcod. While mortality on discarded lingcod is relatively low (approximately 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 to 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 would result in increased mortality for overfished rockfish species, primarily yelloweye and canary rockfish, and the potential for the sector allocations to be exceeded if inseason management responses, including trip limit reductions, were slow (Appendix B).

As noted under non-nearshore, 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. Under the action alternatives, the prohibition on lingcod retention in periods 1, 2, and 6 would be removed, except for period 2 south of 40°10′ N. latitude, and trip limits would be increased for both limited entry and open access fixed gears (Appendix B, Section B.7 and Section B.8). Opening the closed season for lingcod retention would not be expected to result in increased catch of any rockfish species (overfished species or China rockfish), because the proposed increases would be equal to or less than average encounter rates of lingcod during the closed season (based on WCGOP bycatch rates during December to April). An 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. Therefore, the closure would remain in effect in period 2 south of 40°10′ N. latitude.

Catch allocations and projections for overfished species for the nearshore fixed gear fisheries are shown in Table 4-141 below. The projected catches for each the action alternatives are similar to each other. Yelloweye rockfish would have a higher rate of attainment than the other overfished species. For highly discarded species like canary and yelloweye rockfish, catch is not known with certainty because not all catch is observed. Annual mortality estimates are produced with statistical sampling and estimation methods that are inherently uncertain. Yelloweye allocations, catch estimates, and model projections are subject to considerable uncertainty. The analysis presented in Appendix B.4 considered the relative level of uncertainty surrounding yelloweye catches. Given the uncertainty in catch estimates, the management strategy under the action alternatives would be to allow for a buffer between the projected catch and the non-nearshore and nearshore sector shares. At-sea observer coverage in the nearshore fisheries in 2012 was 8 percent of the landings (see http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/sector_products.cfm#ob).

Table 4-141. Comparison of Combined Non-nearshore and Directed Nearshore Catch Allocations and Projected Mortality by Alternative (mt).

IFQ Species	No Action Alternative		Council Preferred Alternative		Alternative 1		Alternative 2	
	Non-nearshore Allocation	Projected Mortality	Non-nearshore Allocation	Projected Mortality	Non-nearshore Allocation	Projected Mortality	Non-nearshore Allocation	Projected Mortality
2015								
Bocaccio	249.6	0.0	79.0	0.0	79.1	0	79.1	0.0
Canary	47.4	1.0	3.8	1.1	3.8	1.1	3.8	0.9
Yelloweye	11.2	0.4	1.1	0.5	1.1	0.5	1.1	0.4
2016								
Bocaccio	249.6	0.0	82.1	0.0	82.1	0.0	82.1	0
Canary	47.4	1.0	3.9	1.2	3.9	1.2	3.9	1.0
Yelloweye	11.2	0.4	1.2	0.5	1.2	0.6	1.2	0.5
IFQ Species	**No Action Alternative**		**Council Preferred Alternative**		**Alternative 1**		**Alternative 2**	
	Nearshore Allocation	**Projected Mortality**	**Nearshore Allocation**	**Projected Mortality**	**Nearshore Allocation**	**Projected Mortality**	**Nearshore Allocation**	**Projected Mortality**
2015								
Bocaccio	0.9	0.4	1.0	0.4	1.0	0.4	1.0	0.4
Canary	6.2	0.0	6.7	6.0	6.7	6.8	6.7	6.8
Yelloweye	1.2	1.1	1.2	1.3	1.2	1.3	1.1	0.4
2016								
Bocaccio	0.9	0.4	1.0	0.4	1.0	0.4	1.0	0.4
Canary	6.2	0.0	6.9	6.9	6.9	6.8	6.9	6.8
Yelloweye	1.2	1.1	1.3	1.2	1.3	1.2	1.3	1.2
IFQ Species	**No Action Alternative**		**Council Preferred Alternative**		**Alternative 1**		**Alternative 2**	
	Combined Allocation	**Projected Mortality**	**Combined Allocation**	**Projected Mortality**	**Combined Allocation**	**Projected Mortality**	**Combined Allocation**	**Projected Mortality**
2015								
Cowcod	1.9	0.0	2.6	1.2	2.6	1.2	2.6	1.2
Darkblotched	15.5	4.3	15.9	4.9	15.9	5.1	15.9	4.3
POP	6.8	0.2	7.2	0.3	7.2	0.3	7.2	0.2
Petrale	35.0	0.3	35.0	0.3	35.0	0.3	35.0	0.2
2016								
Cowcod	1.9	0.0	2.6	1.2	2.6	1.2	2.6	1.2
Darkblotched	15.5	4.3	16.3	5.4	16.3	5.6	16.3	4.7
POP	6.8	0.2	7.5	0.3	7.5	0.3	7.5	0.3
Petrale	35.0	0.3	35.0	0.3	35.0	0.3	35.0	0.2

Tribal

Tribal fisheries would be managed using the same measures described under the No Action Alternative. Additionally, a scientific sorting requirement for shortraker and rougheye/blackspotted rockfish would be implemented, which would improve the data used in management. Under Alternatives 1 and 2, tribal fisheries would operate under the same HGs, allocations, and management measures as those under the

Preferred Alternative. The tribal set-asides for overfished species would be similar to the No Action Alternative. Minor Nearshore Rockfish complex mortality from the tribal fishery is negligible, and the tribes would notify the Council should this be expected to change in the future.

The Makah Tribe has had an observer program in place since 2003 to monitor maximum retention in the trawl fleet. Maximum retention is defined as retention of all marketable species and all overfished species. The program has a target observation rate of approximately 15 percent of all trawl trips in a given year.

Washington Recreational

Under the Preferred Alternative, Washington recreational fisheries would operate under management measures that are similar to the No Action Alternative. Management measure modifications under the action alternatives would include season dates for the depth closure in the North Coast (Marine Areas 3 and 4) and removal of the South Coast (Marine Area 2) 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 3. In the Columbia River area (Marine Area 1), the southern boundary for the year-round lingcod closure would be moved 3 miles north, and changes to groundfish retention in Pacific halibut fisheries could also be proposed. Under Alternative 1, the Washington recreational fisheries would operate under the same management measures as those for the Preferred Alternative. Under Alternative 2, Washington recreational fisheries would operate under the same management measures as those described under the Preferred Alternative. Should inseason action be needed to reduce catches of Minor Nearshore Rockfish in Washington, the state would take action through state regulation.

In 2012, deepwater lingcod closures were implemented in Washington to reduce encounters with yelloweye rockfish. Under the action alternatives, modifications of the boundary lines would be proposed to more effectively reduce encounters with yelloweye and canary rockfish and to streamline regulations, making them easier for anglers to understand. All catch is projected to be within the proposed HGs.

Retention of all groundfish, lingcod only, or flatfish only during the Pacific halibut fishery is currently allowed. Under the action alternatives, changes in the retention allowances by area would reduce discards and discard mortality of incidentally caught groundfish during the Pacific halibut fishery and would keep yelloweye rockfish mortality within the HGs. The primary tools used to keep yelloweye rockfish mortality within the HGs would be regulations that limit recreational opportunity over deepwater reefs (more than 40 fm; 240 feet).

Anglers fishing deep reefs more commonly encounter yelloweye rockfish than those fishing shallower reefs, and a higher percentage of the yelloweye rockfish released die due to barotrauma inflicted injuries. Allowing retention of groundfish by Pacific halibut anglers on “all-depth” days, could create an opportunity where anglers would target groundfish on these days, reducing the effectiveness of the groundfish depth restrictions. If allowed to retain groundfish, some halibut anglers would be expected to target deep-water reefs near Pacific halibut fishing grounds. Encounters with yelloweye and canary rockfish on recreational halibut trips is lower in the Columbia River management area than in other areas.

Expanding the groundfish species allowed on halibut trips might be a viable alternative for the recreational halibut fishery that occurs in the Columbia River management area, resulting in less of a risk to yelloweye rockfish. Management of the Columbia River management area extends to Cape Falcon, Oregon. 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 are higher if retention were allowed on recreational halibut trips.

Oregon Recreational

Under the Preferred Alternative, Oregon recreational fisheries would operate under management measures similar to the No Action Alternative. Management measure modifications would include the removal of the cabezon sub-bag limit, an allowance for a one-fish canary sub-bag limit, and changes to groundfish retention in Pacific halibut fisheries. Bag limit decreases or non-retention may also be required for Minor Nearshore Rockfish to keep mortality at or within the complex ACL or state-specific Minor Nearshore Rockfish HGs. Under Alternative 1, Oregon recreational fisheries would operate under the same management measures as the Preferred Alternative. Under Alternative 2, Oregon recreational fisheries would operate under the same management measures as the Preferred Alternative. Should inseason action be needed to reduce catches of Minor Nearshore Rockfish in Oregon, the state would take action through state regulation.

For the recreational fisheries, canary retention would be prohibited under the No Action Alternative. In 2002, concerns were raised relative to the impacts on overfished species, particularly canary and yelloweye rockfish in the north, resulting from the one-fish bag limit of yelloweye in Oregon. The thinking was that it was inconsistent with the spirit of rebuilding as quickly as possible. The 2002 canary rockfish assessment documented that recreational removals (both landed and bycatch mortality) had a disproportionately negative effect on rebuilding trajectories compared to commercial removals due to recreational fishing effort occurring in shallower areas and, therefore, removing smaller (younger) fish. Although the prohibition created potential discard, the thought that even a one-fish bag limit would encourage a limited amount of targeting on canary rockfish and result in increased bycatch mortality of both yelloweye rockfish and canary rockfish was a particular concern that led to the prohibition under the No Action Alternative. The zero retention of both canary and yelloweye was intended to discourage any targeting by recreational fisheries to reduce the potential of additional targeted catch of those species beyond true unavoidable catch (Exhibit C.3.v., Supplemental GMT Report, September 2002).

Under the action alternatives, a sub-bag limit for canary rockfish of 1 fish would be allowed (Appendix B, Section B.11). Allowing incidental catch to be retained would likely minimize discards of canary rockfish, improve the accuracy of total catch mortality estimates, and provide data to better inform the stock assessment. Allowing a one-fish sub-bag limit would likely result in total catch mortality levels within the Oregon State canary rockfish HG. In addition, the discarded mortality impacts from released fish would have been greatly reduced (3.0 mt versus 0.8 mt, respectively), since the discarded dead catch would have been converted to harvested dead catch. Total catch mortality projections would be based on the assumption that no targeting would occur. While it is unrealistic to assume that no targeting would occur, targeting would likely be minimal because canary rockfish catches are greater in deep depths. For fishermen 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 would be greatest. No delays in the projected rebuilding time would likely result from the retention allowance under the action alternatives.

Similar to recreational measure modifications under the action alternatives for Washington State, changes in groundfish retention in the Pacific halibut fisheries would also be considered for Oregon. The state recreational HGs of yelloweye rockfish could not accommodate any additional yelloweye rockfish mortality without requiring more restrictive management measures (e.g., shorter seasons, lower bag limits, more restrictive depths), to keep from exceeding the state HG. Allowing halibut anglers to retain incidental groundfish catches would not provide much benefit because these catches are infrequent (based on angler reports to ORBS to be 0.3 fish per halibut trip), and they primarily consist of species that are overfished or non-desired (e.g., sharks, skates, and arrowtooth flounder; Figure B 31). A modification to allow halibut anglers to harvest groundfish species that are not associated with reef habitat (i.e., other flatfish species), thereby extending the current rule that 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 of exceeding an HG.

California Recreational

Under the action alternatives, season lengths and depth restrictions were explored for the California recreational fisheries. Under the Preferred Alternative and Alternative 1, the lingcod bag limit would be increased from two to three fish. Bag limit decreases, season length reduction, or non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the complex ACL or state-specific Minor Nearshore Rockfish HGs under the Preferred Alternative and Alternative 1. All other management measures under the Preferred Alternative and Alternative 1 would be the same as under the No Action Alternative. 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) would be proposed. Greater reductions in bag limits or longer periods of non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the complex ACL or the state-specific Minor Nearshore Rockfish HGs under Alternative 2, compared to the Preferred Alternative and Alternative 1.

In recent years, mortality of lingcod south of 42° N. latitude has been far below the non-trawl allocation. In 2012, approximately 27 percent (314 mt) of the allocation was attained. Within the non-trawl sector, the recreational fishery comprised approximately 24 percent of the total mortality in 2012. Under the No Action Alternative, lingcod would be subject to a two-fish bag limit; other recreational management measures would include the same season and depth restrictions as many other groundfish, as well as a minimum size limit of 22 inches. Lingcod south of 42° N. latitude is a healthy stock, and the most recent assessment indicates the stock remains above target biomass, with increasing abundance (Hamel et. al. 2009). Utilization of the stock has been limited somewhat by restrictive depth constraints and season structures implemented to protect overfished stocks.

Under the Preferred Alternative and Alternative 1, the lingcod bag limit would be increased from two to three fish. The projected mortality to lingcod in the recreational fishery under a two-fish bag limit would be 244.4 mt. With a three-fish bag limit, the projected mortality to lingcod would likely increase by approximately 20 percent (399.7 mt) when combined with season structure changes. The increase in projected mortality could be accommodated within the non-trawl allocation, given historically low attainment. Should anglers spend more time on the water fishing for an additional lingcod, the number of encounters with overfished species may increase, although any increase is difficult to quantify. While some increase in overfished species mortality could be expected over the No Action Alternative, sufficient buffer would be available to accommodate the increased impacts (if realized) without exceeding the respective recreational HGs or the non-trawl allocation for cowcod.

Bag limit decreases, season length reduction, or non-retention may be required for Minor Nearshore Rockfish to keep mortality at or within the complex ACL or state-specific Minor Nearshore Rockfish HGs under the Preferred Alternative and Alternative 1. 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) would be proposed.

4.2.6 Summary of Biological Impacts of 2015-2016 Harvest Specifications and Management Measures to Groundfish Stocks

Management measures are structured so that the ACLs are not exceeded. Commercial fishery management measures subject to modification consist of catch control tools such as, IFQ annual quota pound issuance, establishing tier limits for the limited entry sablefish primary season, modifying cumulative landing limits for other fisheries and species, and changes to the boundaries of time/area closures to control bycatch of overfished species and other species where there is a conservation concern. Recreational management measures subject to modification include bag limits and time/area closures (seasons).

The best available scientific information indicates that all overfished species are rebuilding consistent with trajectories from current rebuilding plans; therefore, current rebuilding plans would be maintained under all of the alternatives, with the exception of cowcod. The results of the 2013 assessment and rebuilding plan for cowcod indicate that the stock is rebuilding ahead of schedule. Therefore, the T_{TARGET} would be revised from 2068 to 2020 under the action alternatives. Except for Petrale sole, the projected attainment of all overfished species has been well below ACLs.

Non-trawl RCA adjustments to align RCA contours with the true depths off California would allow non-trawl vessels increased access to fishing areas while maintaining the intent of the depth contours. To the degree that there is a precise correlation between depth and catch rates, there could be a marginal increase in the catch of overfished species such as bocaccio, canary, cowcod, and yelloweye rockfishes under the action alternatives. Trip limit increases for minor shelf rockfish intended to reduce discarding (i.e., turn discards into landed catch and, thereby, improve catch accounting) and to increase attainment of the non-trawl HG may result in a small increase in the catch of overfished species, particularly in the south. However, mortality for bocaccio south of 40°10' N. latitude would be projected to be consistent with the rebuilding measures for the stock. Removing the non-trawl prohibition on retention of lingcod during the winter months (except in period 2 in the south) would increase the non-trawl lingcod season length, while maintaining moderate trip limits. This was seen as the most viable means of increasing attainment of the lingcod ACL without increasing interactions with overfished species.

Canary rockfish retention in the recreational fisheries would be prohibited under the No Action Alternative. A retention allowance for canary rockfish in the Oregon recreational fishery would likely improve data available for future stock assessments without increasing total catch mortality (incidentally caught fish that would otherwise be discarded could be landed). Raising lingcod bag limits from two to three fish in the California recreational fishery could result in increased overfished species catch if anglers spent more time on the water fishing for an additional lingcod. All total catch mortality would be projected to be managed within the ACLs.

Relative to non-overfished species, the risk of overfishing under the Preferred Alternative would be similar to that under the No Action Alternative. The risks under Alternative 1 would be highest for species where there would be no added precaution to address management and scientific uncertainty; species would include sablefish, shortspine thornyhead, or minor nearshore rockfish. Alternative 2 would have the most conservative harvest rates and the lowest overall risk of overfishing. For stocks and stock complexes where the attainment of the ACL would be relatively low, however, the harvest rates under Alternative 2 would have a risk of overfishing similar to the other alternatives. For stocks and stock complexes that have exceeded 90 percent of the ACL, including cabezon off Oregon, California scorpionfish, Pacific whiting, sablefish, shortspine thornyhead north, and Minor Nearshore Rockfish north, Alternative 2 would have the lowest risk of overfishing, but the greatest impact on fisheries.

Constant-catch ACLs used for three trawl-dominant species, Dover sole, widow rockfish, and shortbelly would continue, but would be increased under the Preferred Alternative. As trawl-dominant species, fishery-dependent observer data are available for monitoring catch season. An increase in the Dover sole ACL from 25,000 mt to 50,000 mt under the Preferred Alternative would not be projected to result in overfishing or the stock dropping below B_{MSY} in the next 10 years. Dover sole occur coastwide, with the highest densities found between 110 and 270 fm. RCA modifications (change in seaward boundary between 40°10’ and 45°46’ N. latitude and coordinate changes to the 200-fm modified contour off Oregon) may allow greater access to petrale sole, as well as to Dover sole. The projected catch would likely be affected by the sablefish allocation, which would increase under the Preferred Alternative. In addition to sablefish, species historically caught with Dover sole include IFQ species (shortspine and longspine thornyheads, other flatfish—rex sole and minor slope rockfish—and aurora rockfish), trip limit species (longnose skate), species proposed to be designated as EC species (Pacific grenadier and Pacific flatnose), and non-FMP species (roughtail skate, giant grenadier, hagfish, and a diverse complex of eelpouts) (PFMC 2014). Roughtail skate and giant grenadier would be designated as EC species under the action alternatives.

The Preferred Alternative would increase the constant catch ACL for widow rockfish, a healthy stock, from 1,500 mt to 2,000 mt. Widow rockfish would be projected to remain above B_{MSY} under all of the alternatives. However, the productivity and status of the stock are highly uncertain, as the available biomass indices are not informative. The highest densities of widow rockfish occur north of 37º N. latitude at depths of 55 to 160 fm. The trawl RCAs restrict bottom trawling in much of the area with the highest densities. North of 40°10' N. latitude, however, midwater trawl occurs within the RCAs after the start of the primary whiting season for the shorebased IFQ program. At night, adults form large schools off bottom where they can be targeted with midwater trawl. Widow rockfish co-occur with Pacific whiting, yellowtail rockfish, chilipepper rockfish, shortbelly rockfish, bocaccio, and minor shelf rockfish (vermilion rockfish and speckled rockfish) and have been associated with canary rockfish (PFMC 2014).

The constant-catch ACL for shortbelly rockfish would increase from 50 to 500 mt under the Preferred Alternative. Shortbelly rockfish is a healthy and valuable forage species that is taken incidentally. Shortbelly rockfish are found south of 46º N. latitude with the highest density found between 50 and 155 fm. The trawl RCAs would restrict bottom trawl access to much of the area with the highest shortbelly rockfish density. North of 40°10' N. latitude, however, midwater trawl occurs throughout the EEZ after the start of the primary whiting season for the shorebased IFQ program. At times, shortbelly rockfish have been caught in large numbers by trawlers targeting other semi-pelagic rockfish (usually chilipepper and widow rockfish). An ACL of 500 mt is less than 10 percent of the ABC and would allow access to co-occurring groundfish without overfishing shortbelly rockfish or jeopardizing its role in the ecosystem.

Removing spiny dogfish from the Other Fish Complex and managing it with its own specifications under the action alternatives would reduce the risk of overfishing over the No Action Alternative (managing the stock within the Other Fish complex). The ABC would be based on a P* value of 0.4 and a new $F_{50\%\ FMSY}$ harvest rate for elasmobranchs. Spiny dogfish is a healthy stock with a high PSA vulnerability score, indicating a high concern for overfishing. Using a more conservative F_{MSY} harvest rate for elasmobranchs would buffer against uncertainty, even with the higher P* value.

The ABC for shortspine thornyhead stocks north and south of 34º27' N. latitude would be based on a P* value of 0.4 under the Preferred Alternative (0.45 under the No Action Alternative and Alternative 1). Shortspine thornyhead is a healthy stock with a medium concern for overfishing. Under the No Action Alternative and Alternative 1, the ACL would be a reduction of 4.0 percent from the OFL. Under the Preferred Alternative, the application of a P* of 0.4 would result in an ACL that is a 17-percent reduction from the OFL. Alternative 2 would result in a 38 percent reduction from the OFL. The reductions from OFL would buffer against model and management uncertainty. The added precaution would reduce the risk of overfishing the true OFL. In the north, management uncertainty is low since most of the catch occurs in the trawl fishery, where full observer coverage is required. Management uncertainty is higher in the south, where shortspine thornyhead are mostly targeted in the limited entry fixed gear fishery, which is observed at a 20 to 25 percent rate. Limited entry non-trawl trip limit increases for shortspine thornyhead north would be intended to reduce discarding to increase attainment of the non-trawl HG and would, thereby, improve catch accounting.

For the Minor Nearshore Rockfish complex north, the 40-10 precautionary adjustment was applied to determine the China rockfish contribution to the stock complex ACL. China rockfish north is a precautionary zone stock with one of the highest PSA vulnerability scores, indicating a major concern relative to the risk of overfishing. China rockfish are an important species in the nearshore recreational and nearshore commercial fisheries, particularly the commercial live-fish fishery. Under the Preferred Alternative and Alternative 1, the Minor Nearshore Rockfish North ACL would be a 22 percent reduction from the OFL, in contrast to the No Action Alternative where the ACL would be a 6 percent reduction from the OFL. Alternative 2 would be the most precautionary alternative relative to Minor Nearshore Rockfish with an OFL to ACL reduction of 55 percent in 2015 and 53 percent in 2016. Under all of the alternatives, however, China rockfish would continue to be managed within the Minor Nearshore Rockfish complex.

Although the Minor Nearshore Rockfish North ACL attainment has been high, reaching 100 percent in 2011, management measures have prevented the ACL from being exceeded. State nearshore management plans and policies mitigate the risks of overfishing. State HGs and a Federal HG for Minor Nearshore Rockfish in the area between 40°10 and 42° N. latitude under the Preferred Alternative would reduce the risk of overfishing the complex. Under state management, most, if not all, landed component species within the minor nearshore complex must be sorted to species. For 2015-2016, the states would take an active, coordinated role in managing these stocks. Because a state may also take inseason action independent of NMFS, the Preferred Alternative would not be expected to result in overfishing of the complex OFL.

Little observer coverage or data exist on at-sea discards for catch that is taken in the recreational fisheries and nearshore commercial fisheries. Therefore, the error in total catch mortality estimates is higher than for trawl-dominant species. Overfishing concern could arise if catch allocated within the nearshore complex were shifted to vulnerable species such that the catch of component stocks would exceed the OFL contributions.

The Other Fish complex ACL is equal to the complex ABC using a P* value of 0.45 consistent with the removal of many species from the complex, including spiny dogfish. The Other Fish complex under the Preferred Alternative, Alternative 1, and Alternative 2 would consist of shallow-water species that are primarily caught within 3 miles of shore, in state waters. Removing the other existing species for an EC designation would reduce the risks to the species left in the complex (Cabezon off Washington, kelp greenling, and leopard shark). The risk of overfishing would be reduced because some of the recommended EC species were effectively inflator stocks to the complex with relatively larger OFL contributions that increased the risk of overfishing more vulnerable stocks managed in the complex.

A scientific sorting requirement for shortraker rockfish and rougheye/blackspotted would be implemented under the action alternatives. Trawl observers already identify discarded catch to species. Therefore, the requirement would primarily be expected to improve the data reported on state landing receipts and electronic fish tickets.

4.3 Socioeconomic Impacts of 2015-2016 Harvest Specifications and Management Measures

This section evaluates the effects of the alternatives on fishery participants and fishing communities. Section 3.2 describes the economic status of these affected groups during the baseline period from 2003 to 2012 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 Alternative) 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 by each directed shoreside groundfish vessel sector. Results are presented for vessels engaged in shoreside whiting, non-whiting trawl, limited entry fixed gear, and directed open access sectors.

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.[54] 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 some 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 among the alternatives (including the No Action Alternative) 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 relationship between ex-vessel revenue, accounting net revenue, and commercial fisheries income (and employment) impacts can seem confusing. However, the starting point for all three measures is the same. Ex-vessel revenues represent the total amounts paid by first receivers to harvesters for deliveries or

[54] Commercial fishing sectors in IOPAC are based on vessel costs and earnings estimates gathered using systematic data collection efforts. Since cost and earnings for tribal vessels have not been formally surveyed, estimates of community income, employment, and net revenue impacts attributable to activities by the tribal groundfish fleet are not calculated. Landings from tribal groundfish fisheries are concentrated in communities along the Washington Coast.

“landings” of raw fish. Ex-vessel revenues, therefore, represent gross income received by harvesters (and a corresponding cost to first receivers). Accounting net revenues are a rough estimate of the “profit” or return to investment earned by harvesting vessels. Net revenues are calculated by subtracting estimated operating costs and prorated fixed cost components from total ex-vessel revenues received by a vessel. Vessel cost components are estimated for each groundfish sector based on data collected through annual economic data reports for the IFQ fisheries sectors and periodic cost-earnings surveys for the non-IFQ fleets.[55]

Commercial fisheries income impacts measure the combined effects of fish harvesting and processing activities in a given port. These are calculated by treating a portion of the costs paid by harvesting vessels as expenditures in local economies. These expenditures, in turn, drive additional spending by the businesses and individuals supplying inputs and services, as well as by local restaurants and retail outlets patronized by people involved in the fishing industry and other affected businesses. Similarly, expenditures for inputs and labor used to process fish and distribute seafood products will drive additional economic activity. The sum of all economic activity triggered by the landing of fish and subsequent processing and distribution of seafood products is termed the multiplier effect, and it is calculated using impact models such as IOPAC. Income impacts are the portion of the total multiplier effect that is paid as wages and salaries to workers and proprietors residing in the local economy.

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. Estimates of numbers of recreational angler trips are made for each state by management region. Recreational fisheries income impacts are calculated by applying estimated average per-trip expenditures to the number of recreational angler trips, and then modeling the additional spending those expenditures generate as the funds flow through the local economy. Estimated average trip expenditures are derived from periodic angler economic surveys.[56] The sum of all economic activity triggered by expenditures made by recreational anglers is termed the multiplier effect, and it is calculated using impact models such as IOPAC. Income impacts are the portion of the total multiplier effect that is paid as wages and salaries to workers and proprietors residing in the local economies.

Employment impacts generated by commercial and recreational fisheries activities are calculated from the income impacts by applying estimated average income per job in the affected industries in the local economy. Most of the total income and employment impacts are the effects of the direct expenditures by the originating industry sectors, e.g., fish harvesters, seafood processors and the guides, tackle shops, hotels, and restaurants that service recreational anglers. The additional income and employment impacts generated from respending by support businesses, input suppliers, and their employees are termed indirect and induced effects. Total impacts are the sum of all direct, indirect, and induced effects.

Change in unemployment rates are calculated by adding or subtracting the estimated change in local employment impact to the estimated number of unemployed workers in the local labor force.[57]

The models used to project harvest by fisheries sector, and the socioeconomic impacts associated with those activities are detailed in Appendices A and B and summarized in the sections below. The socioeconomic impacts of the alternatives are evaluated using the following comparisons.

[55] Net revenue is an upward-biased indicator of profitability, since the underlying fisheries data collection efforts do not capture all of the costs associated with operating commercial fishing vessels.
[56] For example: Gentner, Brad and Scott Steinback. 2008. The Economic Contribution of Marine Angler Expenditures in the United States, 2006. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-94, 301 p.
[57] Estimated unemployment by county is based on 2012 county labor force and employment statistics from the U.S. Bureau of Labor Statistics http://www.bls.gov/data/

4.3.1.1 Commercial and Tribal Groundfish Fisheries: Change in Total Ex-vessel Revenue (and accounting net revenue) from the No Action Alternative from the 2003 to 2012 Baseline by Fishery Sector

In Section 4.3.2.1, the alternatives are compared based on data summarized in Table 4-142 and Table 4-143 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 4-142. 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 3.2.2. It should be noted that shoreside whiting trawl is presented separate from non-whiting trawl, although both sectors, along with a nontrawl fixed gear component, have comprised the shorebased IFQ fishery beginning in 2011. As explained in Section 3.2.2.2, 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 cannot 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 relatively fine distinctions between the alternatives if those differences lie within the models' margins of error. Economic impact models like IOPAC are calibrated to represent a baseline or "snapshot" of the economy at a particular point in time. Consequently these models are best able to address impacts of scenarios that are not too far removed from the realm of what has occurred in the recent past (i.e., five to ten years), during which time the local economy has developed its characteristic structure. Analysis of scenarios that represent particularly large departures from baseline conditions that are well beyond experience of the recent past may, therefore, result in somewhat biased estimates of total economic impacts.

Catch projection in the shorebased IFQ fishery (which has historically accounted for almost 45 percent of groundfish ex-vessel revenue [Section 3.2.2.2]) 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 when 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 QPs, 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.[58] Consequently a higher allocation of, for example, canary rockfish to the shorebased IFQ fishery may generate more actual revenue than is forecast using the current catch projection models.

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[58] 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.

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 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 the No Action Alternative and all of the action alternatives. There would be some variation in estimated ex-vessel revenues earned by the shoreside whiting IFQ sector under the action alternatives, however, chiefly due to variations 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, Tables 4-143 to 4-Table 4-148 show the change in groundfish ex-vessel revenue by fishery sector from the baseline period described in Section 3.2.2 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 to 2012 annual average baseline is expressed in terms of inflation-adjusted 2013 dollars.

In addition, Table 4-147 reports projected aggregate accounting net revenues (an indicator of profitability) for the non-tribal, directed, shoreside groundfish sectors in terms of dollar and percentage change from the No Action Alternative. Accounting net revenues are calculated as the difference between the ex-vessel value of landings and the estimated 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 economic data reports (for IFQ sectors) and on cost-earnings surveys of samples of vessels in the remaining groundfish sectors. Values reported are "total cost net revenues," which include pro-rations of certain estimated fixed cost components in addition to the variable costs directly associated with each groundfish fishery sector.

4.3.1.2 Recreational Fisheries: Change in Marine Angler Trips from the No Action Alternative to that under the Action Alternatives

In Section 4.3.2.2, impacts of the alternatives on recreational fisheries are compared using the data summarized in Tables 4-149 and 4-150, which show 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 cannot 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.

Table 4-142. Projected combined commercial and tribal fisheries landings (mt) of non-overfished West Coast groundfish species and species complexes under the No Action Alternative and the 2015-2016 Action Alternatives.

Stock or Stock Complex	No Action	2015 Pref Alt	2015 Prelim Pref Alt	2015 Alt 1	2015 Alt 2	2016 Pref Alt	2016 Prelim Pref Alt	2016 Alt 1	2016 Alt 2
Non-Overfished Stocks									
Arrowtooth Flounder	2,146	2,154	2,154	2,146	1,611	2,154	2,154	2,146	1,508
Black Rockfish OR and CA	165	183	183	227	216	183	183	227	216
Black Rockfish WA	0	0	0	0	0	0	0	0	0
Cabezon CA	25	58	58	61	50	58	58	61	50
Cabezon OR	29	32	32	33	27	32	32	33	27
California Scorpionfish	2	2	2	2	2	2	2	2	2
Chilipepper S. of 40-10	248	261	261	261	248	260	260	260	248
Dover Sole	7,704	15,935	15,935	7,703	7,703	15,935	15,935	7,703	7,703
English Sole	267	279	279	279	267	267	267	267	267
Kelp greenling	23	46	46	46	33	46	46	46	33
Lingcod WA	129	127	127	129	125	125	125	126	125
Lingcod OR	246	240	240	245	233	233	233	236	233
Lingcod N. of 40-10 CA	5	4	4	4	4	4	4	4	4
Lingcod S. of 40-10	40	38	38	39	38	38	38	38	38
Longnose Skate	750	750	750	750	750	750	750	750	750
Longspine Thornyheads N. of 34-27	900	1,514	1,514	1,612	1,079	1,442	1,442	1,533	1,025
Longspine Thornyheads S. of 34-27	10	10	10	10	10	10	10	10	10
Pacific Cod	556	556	556	556	469	556	556	556	469
Pacific Whiting	112,504	112,504	112,504	112,504	112,504	112,504	112,504	112,504	112,504
Petrale sole	2,402	2,555	2,555	2,553	2,080	2,643	2,643	2,641	2,151
Sablefish N. of 36	4,297	4,881	4,881	4,945	4,215	5,324	5,324	5,398	4,565
Sablefish S. of 36	1,009	1,111	1,111	1,161	953	1,215	1,215	1,267	1,053
Shortspine Thornyheads N. of 34-27	789	916	916	984	770	907	907	974	770
Shortspine Thornyheads S. of 34-27	62	62	62	62	62	62	62	62	62
Spiny dogfish	128	128	128	128	128	128	128	128	128
Splitnose Rockfish S. of 40-10	16	16	16	16	13	16	16	16	13
Starry flounder	11	11	11	12	9	11	11	12	9
Widow Rockfish	478	672	672	481	481	672	672	481	481
Yellowtail Rockfish N. of 40-10	1,497	3,165	3,165	3,165	2,271	3,023	3,023	3,023	2,175
Stock Complexes									
Minor Nearshore Rockfish N. of 40-10	29	27	27	17	15	27	27	17	15
Minor Shelf Rockfish N. of 40-10	33	59	59	59	38	59	59	59	38
Minor Slope Rockfish N. of 40-10	241	329	329	325	249	332	332	327	251
Minor Nearshore Rockfish S. of 40-10	87	82	82	81	81	82	82	81	81
Minor Shelf Rockfish S. of 40-10	19	22	22	21	20	22	22	21	20
Minor Slope Rockfish S. of 40-10	118	130	130	130	81	130	130	130	81
Other flatfish	687	1,185	1,185	1,348	783	1,036	1,036	1,185	672
Other Groundfish	104	104	104	104	104	104	104	104	104
TOTALS	**137,756**	**150,150**	**150,150**	**142,199**	**137,719**	**150,390**	**150,390**	**142,428**	**137,880**

Table 4-143. Change in groundfish ex-vessel revenues from the No Action Alternative by groundfish harvest sector under the commercial fishery alternatives ($million).

	No Action	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Shoreside Sectors:									
Whiting	*22.5*	+0.6	+0.6	+0.5	+0.2	+0.6	+0.6	+0.5	+0.2
Non-whiting Trawl+Non-trawl IFQ	*28.9*	+12.8	+12.8	+4.9	-0.564	+13.6	+13.6	+5.6	-0.1
Limited Entry Fixed Gear	*11.8*	+1.1	+1.1	+1.6	-0.578	+2.1	+2.1	+2.7	+0.5
Nearshore Open Access	*3.5*	+0.7	+0.7	+0.8	+0.5	+0.7	+0.7	+0.8	+0.5
Non-nearshore Open Access	*4.9*	+0.5	+0.5	+0.7	-0.3	+0.9	+0.9	+1.2	+0.2
Incidental Open Access	*0.1*	-	-	-	-	-	-	-	-
Tribal (incl. whiting)	*10.7*	+0.3	+0.3	+0.3	+0.3	+0.5	+0.5	+0.5	+0.5
Shoreside sectors' Totals	***82.3***	**+16.0**	**+16.0**	**+8/8**	**-0.4**	**+18.5**	**+18.5**	**+11.3**	**+1.8**
At-sea Sectors:-									
Non Tribal Whiting	*31.5*	-	-	-	-	-	-	-	-
Tribal Whiting	*9.1*	-	-	-	-	-	-	-	-
At-sea sectors' Totals	***40.5***	-	-	-	-	-	-	-	-
TOTAL Groundfish Revenue	*122.9*	+16.0	+16.0	+8.8	-0.4	+18.5	+18.5	+11.3	+1.8

Table 4-144. Change in groundfish ex-vessel revenues from the No Action Alternative by shoreside harvest sector under the commercial fishery alternatives (percent).

	No Action	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Shoreside Sectors:									
Whiting	*22.5*	2.9%	2.9%	2.4%	1.1%	2.7%	2.7%	2.2%	0.9%
Non-whiting Trawl+Non-trawl IFQ	*28.9*	44.5%	44.5%	16.9%	-2.0%	47.1%	47.1%	19.5%	-0.2%
Limited Entry Fixed Gear	*11.8*	9.0%	9.0%	13.4%	-4.9%	18.1%	18.1%	22.7%	3.8%
Nearshore Open Access	*3.5*	21.0%	21.0%	24.1%	13.3%	21.0%	21.0%	24.1%	13.3%
Non-nearshore Open Access	*4.9*	9.6%	9.6%	14.2%	-5.3%	19.3%	19.3%	24.2%	4.0%
Incidental Open Access	*0.1*	-	-	-	-	-	-	-	-
Tribal (incl. whiting)	*10.7*	2.5%	2.5%	2.5%	2.5%	4.6%	4.6%	4.6%	4.6%
Shoreside sectors' Totals	***82.3***	**19.5%**	**19.5%**	**10.7%**	**-0.5%**	**22.5%**	**22.5%**	**13.8%**	**2.1%**
At-sea Sectors:									
Non Tribal Whiting	*31.5*	-	-	-	-	-	-	-	-
Tribal Whiting	*9.1*	-	-	-	-	-	-	-	-
At-sea sectors' Totals	***40.5***	-	-	-	-	-	-	-	-
TOTAL Groundfish Revenue	*122.9*	13.0%	13.0%	7.2%	-0.4%	15.1%	15.1%	9.2%	1.4%

Table 4-145. Change in groundfish ex-vessel revenues from the Baseline (10-year 2003 to 2012 inflation-adjusted average annual ex-vessel revenue) by aggregated non-tribal shoreside commercial harvest sector under the commercial fishery alternatives (2013 $million).

$ million	*Baseline*	No Action	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Whiting	*12.8*	*+9.6*	+10.3	+10.3	+10.2	+9.9	+10.3	+10.3	+10.1	+9.9
Non-whiting Trawl+Non-trawl IFQ	*33.7*	*-4.9*	+8.0	+8.0	+0.0	-5.4	+8.7	+8.7	+0.8	-4.9
Nearshore Fixed Gear	*3.5*	*-0.0*	+0.7	+0.7	+0.8	+0.4	+0.7	+0.7	+0.8	+0.4
Non-nearshore Fixed Gear	*17.8*	*-1.1*	+0.4	+0.4	+1.1	-2.0	+1.9	+1.9	+2.7	-0.5
Totals	***0.1***	***-0.0***	**-0.0**	**-0.0**	**-0.0**	**-0.0**	**-0.0**	**-0.0**	**-0.0**	**-0.0**
	68.0	*+3.6*	+19.3	+19.3	+12.1	+2.9	+21.6	+21.6	+14.4	+4.9

Table 4-146. 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 commercial fishery alternatives (percent).

	Baseline	No Action	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Whiting	*12.8*	+75.1%	+80.2%	+80.2%	+79.3%	+76.9%	+79.9%	+79.9%	+79.0%	+76.8%
Non-whiting Trawl+Non-trawl IFQ	*33.7*	*-14.4%*	+23.7%	+23.7%	+0.1%	-16.1%	+25.9%	+25.9%	+2.3%	-14.6%
Nearshore Fixed Gear	*3.5*	*-0.7%*	+20.1%	+20.1%	+23.2%	+12.5%	+20.1%	+20.1%	+23.2%	+12.5%
Non-nearshore Fixed Gear	*17.8*	*-6.4%*	+2.2%	+2.2%	+6.4%	-11.1%	+10.9%	+10.9%	+15.3%	-2.7%
Totals	***0.1***	***-21.5%***	**-21.5%**	**-21.5%**	**-21.5%**	**-21.5%**	**-21.5%**	**-21.5%**	**-21.5%**	**-21.5%**
	68.0	*+5.3%*	+28.4%	+28.4%	+17.8%	+4.2%	+31.8%	+31.8%	+21.2%	+7.1%

Table 4-147. Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from No Action under the commercial fishery alternatives ($1,000).

Alternatives:	*No Action*	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Whiting	*9,979*	+642	+642	+522	+237	+599	+599	+479	+209
Non-whiting trawl IFQ	*6,685*	+6,662	+6,662	+1,962	-272	+6,577	+6,577	+1,861	-251
Non-whiting non-trawl IFQ	*415*	+372	+372	+209	-40	+491	+491	+338	+51
Limited entry fixed gear	*1,761*	+401	+401	+598	-218	+808	+808	+1,013	+171
Open access nearshore	*406*	+534	+534	+534	+284	+534	+534	+534	+284
Open access non-nearshore	*488*	+202	+202	+300	-112	+406	+406	+511	+85
TOTAL SHORESIDE SECTOR CHANGE ($,000)	*19,733*	+8,813	+8,813	+4,124	-120	+9,416	+9,416	+4,736	+549

Table 4-148. Change in groundfish accounting net revenue impacts by shoreside commercial fishery sector from the No Action Alternative under the commercial fishery alternatives (percent).

Alternatives:	*No Action ($,000)*	2015 PA	2015 PPA	2015 A1	2015 A2	2016 PA	2016 PPA	2016 A1	2016 A2
Whiting	*9,979*	+6.4%	+6.4%	+5.2%	+2.4%	+6.0%	+6.0%	+4.8%	+2.1%
Non-whiting trawl IFQ	*6,685*	+99.7%	+99.7%	+29.3%	-4.1%	+98.4%	+98.4%	+27.8%	-3.7%
Non-whiting non-trawl IFQ	*415*	+89.7%	+89.7%	+50.4%	-9.5%	+118.5%	+118.5%	+81.6%	+12.4%
Limited entry fixed gear	*1,761*	+22.8%	+22.8%	+34.0%	-12.4%	+45.9%	+45.9%	+57.6%	+9.7%
Open access nearshore	*406*	+131.5%	+131.5%	+131.5%	+70.0%	+131.5%	+131.5%	+131.5%	+70.0%
Open access non-nearshore	*488*	+41.5%	+41.5%	+61.4%	-22.9%	+83.2%	+83.2%	+104.7%	+17.5%
TOTAL SHORESIDE SECTOR CHANGE (%)	*19,733*	+44.7%	+44.7%	+20.9%	-0.6%	+47.7%	+47.7%	+24.0%	+2.8%

Table 4-149. Average bottomfish angler trips per month by port and boat type for months without depth restrictions (all-depth), 2010 to 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 4-150. Average bottomfish angler trips per month by port and boat type for months with 40-fm depth restrictions, 2010 to 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

Impacts projected for most management areas would 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, 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 the No Action Alternative to that under the Action Alternatives and Change from the 2003 to 2012 Baseline in Ex-vessel Revenue

Change in personal income (income impacts) and employment-related measures for communities under the alternatives are compared. 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 they 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 to provide an index to facilitate comparison of effects under the alternatives.

Economic impact models like IOPAC are calibrated to represent a baseline or "snapshot" of the economy at a particular point in time. Consequently these models are best able to address impacts of scenarios that are within the realm of what may have occurred over the past five to ten years. Analysis of scenarios that represent particularly large departures from baseline conditions may, therefore, result in biased impact estimates.

As indicated above, it is assumed that commercial and recreational fishing effort displaced or discouraged under a particular alternative cannot 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 indicated 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 4-156 displays the dollar change in commercial fishery income impacts from the No Action Alternative. Table 4-157 displays the same information in terms of percentage change. Table 4-158 and 4-159 display the projected change in commercial fishery employment impacts from the No Action Alternative in terms of number of total jobs (combined full-time and part-time) and percentage change, respectively. Table 4-160 displays the projected change in regional unemployment rates from the No Action Alternative in each community resulting from the commercial fishery employment impacts.

Table 4-161 and Table 4-162 display recreational fishery income impacts in terms of change in dollars and percentage change, respectively. While these tables show impact projections for both 2015 and 2016, and although commercial fisheries impacts may vary between the two years, the underlying patterns are generally identical. For simplicity, therefore, only impacts occurring in 2015 are discussed in the accompanying descriptive text, below.

Table 4-165 and Table 4-166 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 4-173 and Table 4-175 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 ($2,013) ex-vessel revenue during 2003 to 2012.

4.3.1.4 Processors

Section 4.3.2.4 describes impacts to processors under the proposed management alternatives using the comparison in Table 4-176 and Table 4-177; the tables show the change in projected processor purchases of groundfish landings from the No Action Alternative in dollar and percentage terms, respectively. These are actually estimates of ex-vessel revenues paid to harvesters, but they 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 non-whiting 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. 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 the No Action Alternative) 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 wellbeing 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

No Action

Under the No Action Alternative, total shoreside ex-vessel revenues from groundfish landings of $82.3 million are projected in 2014. This total includes the following projections for shoreside groundfish sectors: whiting trawl $22.5 million; non-whiting trawl and non-trawl IFQ $28.9 million; limited entry fixed gear $11.8 million; nearshore open access $3.5 million; non-nearshore open access $4.9 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[59] from at-sea non-tribal whiting (combined motherships and CPs), and $9.1 million ex-vessel revenue equivalent from at-sea tribal whiting (mothership) fisheries are projected under the No Action Alternative. These same amounts for the tribal and non-tribal at-sea whiting fisheries are also projected under all the action alternatives.

There would be no projected change from the No Action Alternative 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. In addition, 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.

When comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation-adjusted) revenue during the 2003 to 2012 baseline, revenue increases by $3.6 million (5 percent) for all shoreside groundfish fisheries combined. Projected shoreside whiting ex-vessel revenue accounts for most of this change, increasing by $9.6 million (75 percent) from the baseline under the No Action Alternative due to relatively high Pacific whiting ACL in 2013 and recently observed high ex-vessel

[59] 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 CPs.

prices. Changes from the baseline for non-whiting fishery sectors are all negative. The combined non-nearshore limited entry and open access fixed gear sector shows a decline of $1.1 million (-6 percent), and revenue in the non-whiting IFQ sector would decline under the No Action Alternative by $4.9 million (-14 percent).

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors are estimated to be $19.7 million under the No Action Alternative. Sectors with the greatest estimated net revenues under the No Action Alternative would be whiting ($10 million), non-whiting trawl ($6.7 million), and limited entry fixed gear ($1.8 million).

The Preferred Alternative

The Preferred Alternative for commercial fisheries is a combination of the Preliminary Preferred Alternative, plus additional items resulting from actions taken at the June 2014 council meeting. Items include (1) increases in tribal set asides for English sole, Pacific cod, widow rockfish, and yellowtail rockfish; (2) change in yelloweye allocation between non-nearshore and nearshore addressed through RCA adjustments; (3) elimination of the winter spawning closure for lingcod north of 40°10´ N. latitude (reduction in length of closure time in California); (4) change in slope rockfish trip limits for the non-nearshore sector; (5) the adopted HG and management scheme for minor nearshore rockfish north of 40°10´ N. latitude; and (6) some adjustments and changes to RCA lines.

Implementation of items 1 through 6, above, would not likely have measurable effects on impacts projected for commercial fisheries under the Preliminary Preferred Alternative, described below. Projected impacts of the harvest guideline options for minor nearshore rockfish north of 40°10´ North latitude on commercial and recreational groundfish fisheries are described in June 2014 Agenda Item F.7.a Supplemental Attachment 9 (See: http://www.pcouncil.org/wp-content/uploads/F7a_SUP_Att9_HGEcon_JUNE2014BB.pdf). While there may be some geographic redistribution of fishing effort in the commercial nearshore open access fisheries sector as a result of the adopted HG option (Option 4), as described in that document, the aggregate effects would likely be less than $100,000 in ex-vessel revenue and personal income impacts. Impacts in this dollar range lie well within the margins of error of projections described in this section, so the sector landings revenue and community income impact projections reported for the Preliminary Preferred Alternative would be assumed to still apply under the Preferred Alternative. Effects of the adopted HG option on recreational fishing effort in California, which may require restructuring seasons in some areas, are described in Section 4.3.2.2., below.

Projections were made for both years of the management cycle (2015 and 2016). For simplicity, unless the general pattern would change between the two years, only results for 2015 are discussed below.

Total shoreside sectors' ex-vessel revenue under the Preferred Alternative would be projected to be the highest among the action alternatives. Compared with the No Action Alternative, total shoreside ex-vessel revenue under the Preferred Alternative would be projected to increase by $16 million (20 percent) in 2015.

Projected revenues would be higher than under the No Action Alternative for every shorebased groundfish sector. The greatest absolute and percentage increase in revenue would be projected for the IFQ sector: $12.8 million (45 percent) in 2015.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003 to 2012 baseline, revenue would increase by $19.3 million (28 percent) in 2015 for all shoreside groundfish sectors combined. Projected shoreside whiting ex-vessel revenue would account for most of this, increasing from the baseline by 80 percent due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for non-whiting fishery sectors would all be positive, but smaller in dollar terms. The non-whiting IFQ sector would show the second largest absolute and percentage increase among non-whiting fishery sectors, increasing from the baseline by $8 million (24 percent) in 2015.

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors would be projected to be $8.8 million higher under the Preferred Alternative than under the No Action Alternative. The sector with the greatest estimated absolute change in net revenues over the No Action Alternative would be non-whiting trawl, which would increase by $6.7 million (100 percent). The largest increase in percentage terms would be open access nearshore, which would increase by $0.5 million (132 percent).

The Preliminary Preferred Alternative

The Preliminary Preferred Alternative is a combination of selected components from Alternative 1 and Alternative 2, plus increased ACLs for Dover sole and widow rockfish. Projections were made for both years of the management cycle (2015 and 2016). For simplicity, unless the general pattern would change between the two years, only results for 2015 are discussed below.

Total shoreside sectors' ex-vessel revenue under the Preliminary Preferred Alternative would be projected to be the highest among the action alternatives. Compared with the No Action Alternative, the total shoreside ex-vessel revenue under the Preferred Alternative would be projected to increase by $16 million (20 percent) in 2015.

Projected revenues would be higher than under the No Action Alternative for every shorebased groundfish sector. The greatest absolute and percentage increase in revenue would be projected for the IFQ sector: $12.8 million (45 percent) in 2015.

The estimated average annual ex-vessel revenue of Pacific whiting in the shoreside fishery (inflation adjusted) during the 2003 to 2012 baseline would increase by $19.3 million (28 percent) in 2015 for all shoreside groundfish sectors combined. Projected shoreside whiting ex-vessel revenue would account for most of this, increasing from the baseline by 80 percent due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for Non-whiting fishery sectors would all be positive, but smaller in dollar terms. The non-whiting IFQ sector would show the second largest absolute and percentage increase among non-whiting fishery sectors, increasing from the baseline by $8 million (24 percent) in 2015.

Total shoreside directed groundfish net accounting revenues ("profits") for participating groundfish sectors would be projected to be $8.8 million higher under the Preliminary Preferred Alternative than under the No Action Alternative. The sector with the greatest estimated absolute change in net revenues over the No Action Alternative would be non-whiting trawl, which would increase by $6.7 million (100 percent). The largest increase in percentage terms would be open access nearshore, which would increase by $0.5 million (132 percent).

Alternative 1

Under this alternative, projected revenues would be higher than under the No Action Alternative for every shorebased groundfish sector. The greatest absolute increase in revenue would be projected for the IFQ sector: $4.9 million (17 percent) in 2015. The greatest percentage increase in revenue would be projected for the nearshore open access sector: $0.8 million (24 percent) in 2015.

Comparing estimated commercial shoreside ex-vessel revenue to average annual (inflation adjusted) revenue during the 2003 to 2012 baseline, revenues would increase by $19.3 million (28 percent) in 2015 for all shoreside groundfish fisheries combined. Again, most of the projected increase would be shoreside whiting ex-vessel revenues, which would increase from the baseline by 79 percent in 2015 due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for non-whiting fishery sectors would all be positive, but relatively small in dollar terms. The non-nearshore fixed gear sector would show the largest dollar increase among the non-whiting fishery sectors, increasing from the baseline by $1.1 million (6 percent) in 2015. The nearshore open access fixed gear sector would show the largest percentage increase among the non-whiting fishery sectors, increasing from the baseline by 23 percent in 2015.

Total shoreside directed groundfish net accounting revenues (“profits”) for participating groundfish sectors would be projected to be $4.1 million higher under Alternative 1 than under the No Action Alternative. The sector with the greatest estimated absolute change in net revenues over the No Action Alternative would be non-whiting trawl, which would increase by $2 million (29 percent). The largest increase in percentage terms would be open access nearshore, which would increase by $0.5 million (132 percent).

Alternative 2

Total aggregated shoreside sectors’ ex-vessel revenue under Alternative 2 would be projected to be the lowest among the action alternatives. Compared with the No Action Alternative, under Alternative 2, the total shoreside ex-vessel revenue would be projected to decrease by $0.4 million (-1 percent) in 2015, and increase by $1.8 million (2 percent) in 2016.

Projected revenue changes from the No Action Alternative under Alternative 2 across groundfish sectors would be mixed. The greatest absolute increase in revenue for 2015 would be projected for the nearshore open access sector at $0.5 million (13 percent). In 2016, the largest increases would be projected for the nearshore open access sector at $0.5 million (13 percent) and for the limited entry fixed gear sector at $0.5 million (4 percent). The greatest absolute decrease in revenue for 2015 would be projected for the limited entry fixed gear sector at -$0.6 million (-5 percent) in 2015, and the non-whiting IFQ sector at -$0.1 million (-0.2 percent) in 2016. The largest percentage increase in both 2015 and 2016 would be projected for the nearshore open access sector at 13 percent ($0.5 million). The largest percentage decreases are for the non-nearshore open access sector in 2015 at -5 percent (-$0.3 million), and the non-whiting 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 to 2012 baseline, revenue would increase by $2.9 million (4 percent) for all shoreside groundfish sectors combined in 2015 and by $4.9 million (7 percent) in 2016. Again, most of the projected increase would be shoreside whiting ex-vessel revenues, increasing from the baseline by 77 percent in both 2015 and 2016 due to the relatively high assumed Pacific whiting ACL and ex-vessel prices. Changes from the baseline for non-whiting fishery sectors would be mixed. The non-whiting IFQ sector would show the largest dollar and percentage decrease among the fishery sectors, decreasing from the baseline by $5.4 million (-16 percent) in 2015 and $4.9 million (-15 percent) in 2016. The non-nearshore fixed gear sector would also be negatively affected relative to the baseline under Alternative 2. The nearshore open access sector would show the largest dollar and percentage increase among the non-whiting fishery sectors, increasing from the baseline by 13 percent ($0.4 million) in both 2015 and 2016.

Total shoreside directed groundfish net accounting revenues (“profits”) for participating groundfish sectors would be projected to be $0.1 million lower under Alternative 2 in 2015 than under the No Action Alternative. The sector with greatest estimated absolute decline in net revenues over the No Action Alternative would be non-whiting trawl, which would decrease by $0.3 million (-4 percent). The sector with greatest estimated increase in net revenues over the No Action Alternative, in both absolute and percentage terms, would be open access nearshore, which would increase by $0.3 million (70 percent). The sector with the largest decrease in percentage terms would be open access non-nearshore, which would decrease by $0.1 million (-23 percent).

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 for California (Appendix B, Section B.11). Options 1 and 2 apply to the Preferred Alternative, Alternative 1, and Alternative 2 (although Option 1 and Option 2 would have identical impacts under Alternative 2). Projected impacts under Option 3 are identical under all three action alternatives and would have the most highly negative effects on projected angler effort.

No Action Alternative

Projected angler effort levels under the No Action Alternative are derived from estimates developed independently by each state. The No Action Alternative 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 the No Action Alternative. California's angler effort level under the No Action Alternative would be based on average annual bottomfish boat trips recorded during 2011-2012.

Under the No Action Alternative, 835,500 groundfish and Pacific halibut trips would be projected coastwide. Sixty two percent of these would be charter boat trips, with the remainder taken on private boats. The breakdown by state would be 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).

Washington Recreational – No Action Alternative

Under the No Action Alternative, management measures necessary to keep recreational harvest of yelloweye rockfish within harvest guidelines would require closure or severe 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 would continue to limit recreational fishing opportunity.

Projected impacts on overfished and non-overfished species and angler effort in 2015 and 2016 under status quo management measures would be expected to be similar to previous seasons; however, should angler effort and fishing success result in catch estimates higher than what is projected, additional fishing restrictions would be considered and could be implemented through state regulations to ensure that harvest of overfished species would 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.

Oregon Recreational – No Action Alternative

Depth restrictions for the recreational groundfish fishery would be the primary management method used to keep overfished yelloweye and canary rockfish mortality within their respective HGs in the Oregon recreational fisheries under the No Action Alternative. Depth restrictions reduce mortality of overfished species because catch rates and discard mortality rates for those species are lower in shallower depths. The depth restrictions under the No Action Alternative would be all depths from January to February, inside 40 fathoms from April to September, and all depths from October to December (Figure 4-38).

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-fm depth restriction because the majority (98 percent) of bottomfish grounds are shallower than 20 fathoms (Figure 4-38). 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 most bottomfish grounds are between 20 to 40 fathoms, are relatively unaffected by 40-fm depth restrictions, but are greatly affected by 20-fm depth restrictions.

Under the No Action Alternative, mortality of canary and yelloweye rockfish in the groundfish fishery and the Pacific halibut fishery would be projected to be within allocations, and expected angler trips would likely be similar to what has been seen in recent years. 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.

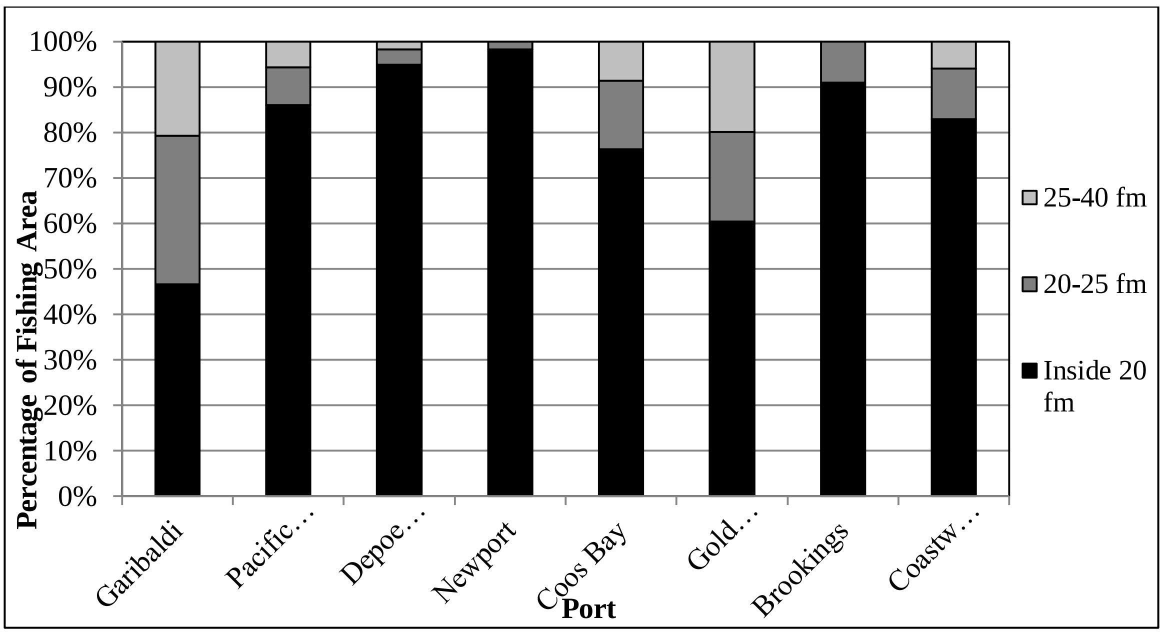

Figure 4-38. Percentage of Marine Area by Depth Bin for Ports on the Oregon Coast.

California Recreational – No Action Alternative

Under the No Action Alternative, California communities would 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 management areas coastwide 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).

The Preferred Alternative

Impacts under the Preferred Alternative for recreational fisheries would be derived from the Preliminary Preferred Alternative, plus any additive effects of implementing the adopted HG and management scheme for minor nearshore rockfish north of 40°10´ N. latitude, which would be expected to require some restructuring of recreational seasons in certain areas. Compared with the Preliminary Preferred Alternative and season option 1, these changes would be expected to somewhat reduce angler effort in the Northern, Mendocino, San Francisco and Central California Management Areas. In all areas, however, the resulting angler effort levels would be estimated to equal or exceed levels projected under the No Action Alternative.

Under the Preferred Alternative, an increase of 11,600 angler trips would be projected from the No Action Alternative coastwide. All of the increase would occur in California. Trips would increase by 1,600 (20 percent) in the Mendocino region, 5,600 (11 percent) in the San Francisco region, and 4,400 (4 percent) in the central California region. No change from the No Action Alternative would be projected for California's Northern and Southern California Management Areas or for recreational fisheries in Washington and Oregon.

The Preliminary Preferred Alternative and Alternative 1

Impacts under recreational fisheries for Alternative 1 and the Preliminary Preferred Alternative would be identical in all cases. Under the Preliminary Preferred Alternative, Option 1 (Appendix B, Section B.11), an increase of 25,800 angler trips would be projected over the No Action Alternative coastwide. All of the increase would occur in California. Trips would increase by 4,400 (22 percent) in the Northern California Management Area, 3,700 (47 percent) in the Mendocino Management Area, 8,900 (18 percent) in the San Francisco region and 8,800 (8 percent) in the Central California Management Area. No change from the No Action Alternative would be projected for the Southern California Management Area or for recreational fisheries in Washington and Oregon.

Under the Preliminary Preferred Alternative, Option 2 (Appendix B, Section B.11), an increase of 16,700 angler trips would be projected over the No Action Alternative, all in California. Trips would increase by 2,700 (13 percent) in the Northern California Management Area, 2,900 (37 percent) in the Mendocino region, 6,700 (13 percent) in the San Francisco Management Area, and 4,400 (4 percent) in the Central California Management Area. No change from the No Action Alternative would be projected for the Southern California Management Area or for recreational fisheries in Washington and Oregon.

Under the Preliminary Preferred Alternative, Option 3 (Appendix B, Section B.11), a decrease of 394,700 angler trips would be projected to differ from the No Action Alternative, all in California. This would represent more than half of the total California angler trips under the No Action Alternative. Trips would decrease by 6,100 (-30 percent) in the Northern California Management Region, by 1,300 (-16 percent) in the Mendocino Management Region, by 31,300 (-63 percent) in the San Francisco region, by 62,900 (-58 percent) in the Central California Management Region, and by 293,100 (-56 percent) in the Southern California Management Region. No change from the No Action Alternative would be projected for recreational fisheries in Washington and Oregon.

<u>Washington Recreational – Alternative 1</u>

Management measures under Alternative 1 would modify the time period that the 20-fm depth restriction would be in place off the north coast (Marine Areas 3 and 4). The measures would provide 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 of 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 when effort is 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 by 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 fms, south of 46°58' on Fridays and Saturday from July 1 through August 31, a regulation that is 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 in Marine Area 1 and discussions with recreational anglers in this area indicate that moving the southern boundary 3 miles north would cover the area where increased yelloweye encounters are a concern.

Projected impacts on overfished species and angler effort in 2015 and 2016 under Alternative 1 management measures would be expected to be similar to previous seasons; however, should angler 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 would not exceed harvest guidelines.

Washington State specific harvest guidelines for the Minor Nearshore Rockfish complex, which includes china rockfish and cabezon under Alternative 1, could be reached before the end of 2014. As such, inseason action through state regulations may be considered to ensure that catches do not exceed harvest guidelines. If necessary, additional restrictions to groundfish management measures could result in fewer anglers participating in recreational fisheries. This would put an additional burden on coastal communities that are economically dependent on recreational fishing.

Oregon Recreational – Alternative 1

Table 4-151 shows the allocations, or model targets, for overfished species and key target species for the Oregon recreational fisheries under Alternative 1, the same as under the No Action Alternative.

Oregon recreational management measures and community impacts under the Preferred Alternative would be expected to be the same as under the No Action Alternative, except that the seasonal cabezon sub-bag limit would be removed. Cabezon impacts would be limited via state processes. Any management measures necessary to reduce impacts on Minor Nearshore Rockfish complex or greenlings would be done through the state process.

Table 4-151. Oregon recreational harvest guidelines (in mt) under 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
Minor 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

Table 4-152 shows the season lengths under Alternative 1, Options 1, 2, and 3, compared with the No Action Alternative. Implications for 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. This would provide for increased fishing opportunity, thereby affording greater economic benefit to ports in the region. This would be particularly true for 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 Areas through December 31 would increase fishing opportunity 4.5 months and 6.5 months, respectively.

While the season length in the Southern California Management Area would not be extended, a deeper depth restriction of 60 fm depth would 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 would provide major improvements in fishing opportunities 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 would 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 1 to December 31 in the Northern and Mendocino Management Areas would 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 would likely be relatively minor.

Option 3

A 10-fm increase in depth restriction for each of the management areas north of Point Conception (relative to the No Action Alternative) would require substantial reductions in season lengths to keep overfished species impacts within harvest guidelines, given the high uncertainty in projected impacts. The season under Option 3 would be reduced relative to the No Action Alternative by 2.5 months in the Northern California Management Area, by 16 days in the Mendocino Management Area, by 4 months in the San Francisco Management Area, and by 5 months in the Central California Management Area. Compared to Option 2, the season in the Northern Management Area would be reduced by 6 months, the Mendocino Management Area by 5.5 months, and the San Francisco and Central California Management Areas by 6 months.

In the Southern California Management Area, the loss of 7 months of season relative to the No Action Alternative would result in a severe reduction in trips. The limited opportunity for California scorpionfish during the closed months of fishing for the RCG complex would not be expected to draw as much effort as the foregone opportunities. In addition, any increase in effort as a result of the deeper depth restriction relative to status quo is not quantified and would not be 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 that are distributed further to the south or offshore at 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. 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 4-152. Preferred Alternative: Summary of season structures under the No Action Alternative, 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)

Alternative 2

Under Alternative 2 Option 1, a decrease of a total of 19,300 angler trips (-3 percent) would be projected from the No Action Alternative in California, although impacts would vary considerably by region. Trips would increase by 1,000 (5 percent) in the Northern California region, by 2,100 (26 percent) in the Mendocino region, and by 4,500 (9 percent) in the San Francisco region, but they would decrease by 26,800 (-25 percent) in the Central California Management Area. No change from the No Action Alternative would be projected for California's southern region or for recreational fisheries in Washington and Oregon.

Impacts under Alternative 2, Option 2, would be the same as under Alternative 2 Option 1. Impacts under Alternative 2, Option 3, would be the same as under Alternative 1, the Preliminary Preferred Alternative, Option 3.

California Recreational – Alternative 2

Table 4-153 shows the season lengths under Alternative 2 Options 1, 2, and 3, compared with the No Action Alternative. Implications for 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 relatively higher ACL would allow increased fishing opportunity north of Point Conception where yelloweye rockfish are more commonly encountered. This would 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 Alternative 1 and Alternative 3, the season north of Point Conception would be 1 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 Areas through December 31 would increase fishing opportunity, especially in November and December when effort is low, and other fisheries such as Pacific halibut and salmon are closed.

The reduced bag limit for kelp greenling would mainly affect anglers fishing north of Point Conception where the majority of these encounters occur. This would 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 would adversely affect anglers south of Point Conception where the vast majority of encounters occur. This would have a disproportionate effect during January and February when the season is closed for many groundfish species, and pelagic species move south into Mexican waters and are unavailable. During this time of year, California scorpionfish are targeted more frequently, and the reduced bag limit of three fish would diminish fishing opportunity for this species. However, the effects of bag limit changes on effort have not been quantified.

Option 2

The season length could 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. The season would be 1 month shorter than under Alternative 1 or Alternative 3, opening May 1 instead of April 1. The current depth restrictions in the Northern and Mendocino Management Areas are the shallowest in the state, with anglers confined to fishing within 20 fm year-round under status quo regulations, thereby greatly reducing OFS impacts. A deeper depth restriction of 30 fm from October to December in the Northern and Mendocino Management Areas would allow access to more fishing grounds at a time when fishing effort is relatively low compared to summer months. Although this increased fishing opportunity may attract some anglers, changes in effort would be expected to be relatively minor and are not 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 of this reduction are not quantified.

While the season length in the Southern California Management Area would not be extended, a deeper depth restriction of 60 fm would 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 substantial 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. Qualitatively, the greatest impact would be in January and February when California scorpionfish is one of a few fishing opportunities available in the Southern California Management Area. At this time of the year, most other groundfish fisheries are closed, and pelagic species are unavailable.

Option 3

A ten-fm deeper depth restriction in each of the management areas north of Point Conception would require substantial reductions in season lengths to keep overfished species impacts within harvest guidelines. Under Option 3, the season would be reduced in the Northern Management Area relative to the No Action Alternative by 2.5 months, by 16 days in the Mendocino Management Area, by 4 months in the San Francisco Management Area, and by 5 months in the Central California Management Area. Compared to Option 1, the season in the Northern Management Area would be reduced by 5 months, the Mendocino Management Area would be reduced by 4.5 months, the San Francisco Management Area would be reduced by 5 months, and the Central California Management Area would be reduced by 5 months.

In the Southern California Management Area, the loss of 7 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, but would not be expected to compensate for the loss of fishing season at a time when the RCG complex is one of few opportunities available. The limited opportunity for California scorpionfish during the closed months of fishing for the RCG complex would not likely draw as much effort as the foregone opportunities.

Furthermore, a reduced bag limit for California scorpionfish would still be necessary under this alternative to maintain the status quo year-round season length south of Point Conception, given the ACLs in Alternative 2. This would diminish fishing opportunity for anglers in the Southern California Management Area where California scorpionfish are predominantly encountered, with greater effects during January and February when few other opportunities would be available as discussed in Option 1 and Option 2.

While a deeper depth restriction would increase fishing opportunity, the effect in terms of increased effort is not quantified, but the reduction in season length would translate into a greatly reduced number of fishing trips during the season. Mortality estimates do not account for the use of descending devices in the release of overfished species, which began in 2013.

Table 4-153. Alternative 2: Summary of season structures under the No Action Alternative, in addition to Option 1, Option 2, and Option 3. Season length (in months) is included in parentheses.

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)

Table 4-154. Estimated bottomfish + Pacific halibut marine angler boat trips under the No Action Alternative and changes from the No Action Alternative under the 2015-2016 recreational fisheries action alternatives (thousands of trips).

State / District or Management Area	*No Action*			Preferred Alternative			Prelim Pref Alt Option 1			Alt 1 Option 1			Alt 2 Option 1		
	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															
Northern: 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
Mendocino: Mendocino and Sonoma	*1.5*	*6.5*	*8.0*	+0.3	+1.3	+1.6	+0.7	+3.0	+3.7	+0.7	+3.0	+3.7	+0.4	+1.7	+2.1
San Francisco: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+3.1	+2.5	+5.6	+4.9	+4.0	+8.9	+4.9	+4.0	+8.9	+2.5	+2.0	+4.5
Central: Santa Cruz through San Luis Obispo	*31.1*	*77.4*	*108.5*	+1.3	+3.1	+4.4	+2.5	+6.3	+8.8	+2.5	+6.3	+8.8	-7.7	-19.1	-26.8
Southern: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-	-	-	-
California Total	***465.1***	***246.6***	***711.8***	**+4.6**	**+6.9**	**+11.6**	**+8.7**	**+17.1**	**+25.8**	**+8.7**	**+17.1**	**+25.8**	**-4.7**	**-14.6**	**-19.3**
Washington-Oregon Error! Bookmark not defined.-- **California Total**	***521.8***	***313.7***	***835.5***	**+4.6**	**+6.9**	**+11.6**	**+8.7**	**+17.1**	**+25.8**	**+8.7**	**+17.1**	**+25.8**	**-4.7**	**-14.6**	**-19.3**

Table 4-154 (continued). Estimated bottomfish + Pacific halibut marine angler boat trips under the No Action Alternative and changes from the No Action Alternative under the 2015-2016 recreational fisheries action alternatives (thousands of trips).

State / District or Management Area	*No Action*			Prelim Pref Alt 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															
Northern: 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
Mendocino: 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
San Francisco: 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
Central: 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
Southern: 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 4-155. Estimated change in bottomfish plus Pacific halibut marine angler boat trips under the No Action Alternative and change from the No Action Alternative under the 2015-2016 action alternatives (percent).

State / District or Management Area	*No Action*			Preferred Alternative			Prelim Pref Alt Option 1			Alt 1 Option 1			Alt 2 Option 1		
	Charter	Charter	Private	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															
Northern: 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%
Mendocino: Mendocino and Sonoma	*1.5*	*6.5*	*8.0*	+19.8%	+19.8%	+19.8%	+46.9%	+46.9%	+46.9%	+46.9%	+46.9%	+46.9%	+26.4%	+26.4%	+26.4%
San Francisco: Marin through San Mateo	*27.5*	*22.4*	*49.9*	+11.1%	+11.1%	+11.1%	+17.8%	+17.8%	+17.8%	+17.8%	+17.8%	+17.8%	+8.9%	+8.9%	+8.9%
Central: Santa Cruz through San Luis Obispo	*31.1*	*77.4*	*108.5*	+4.1%	+4.1%	+4.1%	+8.1%	+8.1%	+8.1%	+8.1%	+8.1%	+8.1%	-24.7%	-24.7%	-24.7%
Southern: Santa Barbara through San Diego	*402.5*	*122.8*	*525.3*	-	-	-	-	-	-	-	-	-	-	-	-
California Total	*465.1*	*246.6*	*711.8*	+1.0%	+2.8%	+1.6%	+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*	+0.9%	+2.2%	+1.4%	+1.7%	+5.5%	+3.1%	+1.7%	+5.5%	+3.1%	-0.9%	-4.6%	-2.3%

Table 4-155 (continued). Estimated change in bottomfish plus Pacific halibut marine angler boat trips under the No Action Alternative and change from the No Action Alternative under the 2015-2016 action alternatives (percent).

State / District or Management Area	*No Action*			Prelim Pref Alt 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	*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															
Northern: 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%
Mendocino: Mendocino and Sonoma	*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%
San Francisco: 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%
Central: Santa Cruz through San Luis Obispo	*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%
Southern: 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%

Table 4-156. Change in commercial fishery income impacts (from No Action Alternative) under the action alternatives by community group ($1,000).

Community Groups	*No Action Alt ($,000)*	2015 Pref Alt	2015 Prelim Pref Alt	2015 A1	2015 A2	2016 Pref Alt	2016 Prelim Pref Alt	2016 A1	2016 A2
Puget Sound	*2,987*	+850	+850	+559	-64	+1,013	+1,013	+725	+92
Washington Coast	*16,084*	+1,507	+1,507	+1,149	-79	+1,807	+1,807	+1,482	+211
Astoria-Tillamook	*29,943*	+7,850	+7,850	+3,644	+99	+8,104	+8,104	+3,890	+273
Newport	*22,331*	+1,571	+1,571	+820	-167	+1,909	+1,909	+1,163	+110
Coos Bay-Brookings	*11,964*	+4,168	+4,168	+1,648	-455	+4,703	+4,703	+2,183	-33
Crescent City-Eureka	*5,772*	+3,275	+3,275	+806	-40	+3,438	+3,438	+968	+77
Fort Bragg – Bodega Bay	*6,226*	+1,691	+1,691	+1,000	-161	+2,042	+2,042	+1,355	+134
San Francisco Area	*2,250*	+1,431	+1,431	+345	-58	+1,496	+1,496	+413	-3
SC – Mo – MB	*7,705*	+1,485	+1,485	+1,302	+19	+1,971	+1,971	+1,797	+481
SB – LA – SD	*5,987*	+524	+524	+737	-197	+975	+975	+1,204	+239
Coastwide Total	*111,249*	+24,351	+24,351	+12,010	-1,104	+27,458	+27,458	+15,179	+1,581

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-157. Change in commercial fishery income impacts (from No Action Alternative) under the action alternatives by community group (percent).

Community Groups	*No Action Alt ($,000)*	2015 Pref Alt	2015 Prelim Pref Alt	2015 A1	2015 A2	2016 Pref Alt	2016 Prelim Pref Alt	2016 A1	2016 A2
Puget Sound	*2,987*	+ 28.5%	+ 28.5%	+ 18.7%	- 2.1%	+ 33.9%	+ 33.9%	+ 24.3%	+ 3.1%
Washington Coast	*16,084*	+ 9.4%	+ 9.4%	+ 7.1%	- 0.5%	+ 11.2%	+ 11.2%	+ 9.2%	+ 1.3%
Astoria-Tillamook	*29,943*	+ 26.2%	+ 26.2%	+ 12.2%	+ 0.3%	+ 27.1%	+ 27.1%	+ 13.0%	+ 0.9%
Newport	*22,331*	+ 7.0%	+ 7.0%	+ 3.7%	- 0.7%	+ 8.5%	+ 8.5%	+ 5.2%	+ 0.5%
Coos Bay-Brookings	*11,964*	+ 34.8%	+ 34.8%	+ 13.8%	- 3.8%	+ 39.3%	+ 39.3%	+ 18.2%	- 0.3%
Crescent City-Eureka	*5,772*	+ 56.7%	+ 56.7%	+ 14.0%	- 0.7%	+ 59.6%	+ 59.6%	+ 16.8%	+ 1.3%
Fort Bragg – Bodega Bay	*6,226*	+ 27.2%	+ 27.2%	+ 16.1%	- 2.6%	+ 32.8%	+ 32.8%	+ 21.8%	+ 2.1%
San Francisco Area	*2,250*	+ 63.6%	+ 63.6%	+ 15.3%	- 2.6%	+ 66.5%	+ 66.5%	+ 18.3%	- 0.1%
SC – Mo – MB	*7,705*	+ 19.3%	+ 19.3%	+ 16.9%	+ 0.2%	+ 25.6%	+ 25.6%	+ 23.3%	+ 6.2%
SB – LA – SD	*5,987*	+ 8.8%	+ 8.8%	+ 12.3%	- 3.3%	+ 16.3%	+ 16.3%	+ 20.1%	+ 4.0%
Coastwide Total	*111,249*	+ 21.9%	+ 21.9%	+ 10.8%	- 1.0%	+ 24.7%	+ 24.7%	+ 13.6%	+ 1.4%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-158. Change in commercial fishery employment impacts (from No Action Alternative) under the action alternatives by community group

(number of jobs).

Community Groups	*No Action Alt*	2015 Pref Alt	2015 Prelim Pref Alt	2015 A1	2015 A2	2016 Pref Alt	2016 Prelim Pref Alt	2016 A1	2016 A2
Puget Sound	*44*	+11	+11	+8	-1	+14	+14	+11	+1
Washington Coast	*308*	+26	+26	+21	-2	+33	+33	+28	+4
Astoria-Tillamook	*478*	+114	+114	+55	+3	+118	+118	+60	+7
Newport	*394*	+27	+27	+16	-3	+33	+33	+22	+3
Coos Bay-Brookings	*299*	+84	+84	+39	-15	+94	+94	+50	-6
Crescent City-Eureka	*131*	+61	+61	+19	+2	+65	+65	+22	+4
Fort Bragg – Bodega Bay	*190*	+45	+45	+35	-1	+58	+58	+48	+10
San Francisco Area	*55*	+29	+29	+8	+0	+30	+30	+9	+1
SC – Mo – MB	*274*	+58	+58	+58	+23	+70	+70	+70	+34
SB – LA – SD	*169*	+16	+16	+20	-1	+25	+25	+30	+8
Coastwide Total	*2,341*	+472	+472	+278	+5	+542	+542	+350	+67

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-159. Change in commercial fishery employment impacts (from No Action Alternative) under the action alternatives by community group (percent).

Community Groups	*No Action Alt*	2015 Pref Alt	2015 Prelim Pref Alt	2015 A1	2015 A2	2016 Pref Alt	2016 Prelim Pref Alt	2016 A1	2016 A2
Puget Sound	*44*	+ 25.7%	+ 25.7%	+ 17.7%	- 2.7%	+ 31.9%	+ 31.9%	+ 24.0%	+ 3.2%
Washington Coast	*308*	+ 8.6%	+ 8.6%	+ 6.9%	- 0.7%	+ 10.7%	+ 10.7%	+ 9.2%	+ 1.4%
Astoria-Tillamook	*478*	+ 23.8%	+ 23.8%	+ 11.5%	+ 0.7%	+ 24.8%	+ 24.8%	+ 12.5%	+ 1.4%
Newport	*394*	+ 6.9%	+ 6.9%	+ 4.0%	- 0.7%	+ 8.5%	+ 8.5%	+ 5.6%	+ 0.7%
Coos Bay-Brookings	*299*	+ 28.1%	+ 28.1%	+ 13.2%	- 5.0%	+ 31.6%	+ 31.6%	+ 16.7%	- 2.1%
Crescent City-Eureka	*131*	+ 47.1%	+ 47.1%	+ 14.4%	+ 1.2%	+ 49.7%	+ 49.7%	+ 17.0%	+ 3.2%
Fort Bragg – Bodega Bay	*190*	+ 23.5%	+ 23.5%	+ 18.3%	- 0.4%	+ 30.4%	+ 30.4%	+ 25.3%	+ 5.5%
San Francisco Area	*55*	+ 52.7%	+ 52.7%	+ 14.1%	+ 0.4%	+ 55.2%	+ 55.2%	+ 16.8%	+ 2.5%
SC – Mo – MB	*274*	+ 21.3%	+ 21.3%	+ 21.1%	+ 8.3%	+ 25.6%	+ 25.6%	+ 25.5%	+ 12.4%
SB – LA – SD	*169*	+ 9.6%	+ 9.6%	+ 12.1%	- 0.5%	+ 15.1%	+ 15.1%	+ 17.8%	+ 4.9%
Coastwide Total	*2,341*	+ 20.1%	+ 20.1%	+ 11.9%	+ 0.2%	+ 23.1%	+ 23.1%	+ 15.0%	+ 2.8%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-160. Change in regional unemployment rates[t] for all industries (from No Action Alternative) resulting from commercial fishery employment impacts under the action alternatives by community group.

Community Groups	*No Action Alt*[t]	2015 Pref Alt	2015 Prelim Pref Alt	2015 A1	2015 A2	2016 Pref Alt	2016 Prelim Pref Alt	2016 A1	2016 A2
Puget Sound	*7.553%*	-0.001%	-0.001%	-0.000%	+0.000%	-0.001%	-0.001%	-0.000%	-0.000%
Washington Coast	*10.553%*	-0.009%	-0.009%	-0.007%	+0.001%	-0.011%	-0.011%	-0.010%	-0.001%
Astoria-Tillamook	*7.772%*	-0.026%	-0.026%	-0.013%	-0.001%	-0.027%	-0.027%	-0.014%	-0.001%
Newport	*9.295%*	-0.119%	-0.119%	-0.069%	+0.012%	-0.148%	-0.148%	-0.097%	-0.011%
Coos Bay-Brookings	*9.551%*	-0.032%	-0.032%	-0.015%	+0.006%	-0.036%	-0.036%	-0.019%	+0.002%
Crescent City-Eureka	*10.916%*	-0.086%	-0.086%	-0.026%	-0.002%	-0.091%	-0.091%	-0.031%	-0.006%
Fort Bragg – Bodega Bay	*7.960%*	-0.010%	-0.010%	-0.008%	+0.000%	-0.013%	-0.013%	-0.011%	-0.002%
San Francisco Area	*8.221%*	-0.001%	-0.001%	-0.000%	-0.000%	-0.001%	-0.001%	-0.000%	-0.000%
SC – Mo – MB	*10.394%*	-0.011%	-0.011%	-0.011%	-0.004%	-0.013%	-0.013%	-0.013%	-0.007%
SB – LA – SD	*10.015%*	-0.000%	-0.000%	-0.000%	+0.000%	-0.000%	-0.000%	-0.000%	-0.000%
Coastwide Total	*9.333%*	-0.003%	-0.003%	-0.002%	-0.000%	-0.003%	-0.003%	-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/

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-161. Change in income impacts from No Action under the recreational fishery alternatives and season options, by community group ($1,000).

Community Groups	*No Action Alt ($,000)*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt 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*	+141	+335	+262	+335	+262	+189	+189	-112
San Francisco Area	*8,034*	+895	+1,428	+1,073	+1,428	+1,073	+718	+718	-5,045
SC – Mo – MB*	*10,711*	+435	+870	+435	+870	+435	-2,645	-2,645	-6,212
SB – LA – SD*	*110,778*	-	-	-	-	-	-	-	-61,813
Coastwide Total	*145,552*	+1,471	+2,960	+1,969	+2,960	+1,969	-1,666	-1,666	-73,635

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-162. Change in income impacts from No Action Alternative under the recreational fishery alternatives and season options, by community group (percent).

Community Groups	*No Action Alt ($,000)*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt 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*	+19.8%	+46.9%	+36.6%	+46.9%	+36.6%	+26.4%	+26.4%	-15.7%
San Francisco Area	*8,034*	+11.1%	+17.8%	+13.4%	+17.8%	+13.4%	+8.9%	+8.9%	-62.8%
SC – Mo – MB*	*10,711*	+4.1%	+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*	+1.0%	+2.0%	+1.4%	+2.0%	+1.4%	-1.1%	-1.1%	-50.6%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-163. Change in employment impacts from No Action Alternative under the recreational fishery alternatives and season options, by community group (number of jobs).

Community Groups	*No Action Alt*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt 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*	+3	+6	+5	+6	+5	+4	+4	-2
San Francisco Area	*148*	+17	+26	+20	+26	+20	+13	+13	-93
SC – Mo – MB*	*216*	+9	+18	+9	+18	+9	-53	-53	-125
SB – LA – SD*	*2,146*	-	-	-	-	-	-	-	-1,198
Coastwide Total	*2,952*	+28	+57	+38	+57	+38	-35	-35	-1,428

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-164. Change in employment impacts from No Action Alternative under the recreational fishery alternatives and season options, by community group (percent).

Community Groups	*No Action Alt (jobs)*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt 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*	+19.8%	+46.9%	+36.6%	+46.9%	+36.6%	+26.4%	+26.4%	-15.7%
San Francisco Area	*148*	+11.1%	+17.8%	+13.4%	+17.8%	+13.4%	+8.9%	+8.9%	-62.8%
SC – Mo – MB*	*216*	+4.1%	+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*	+0.9%	+1.9%	+1.3%	+1.9%	+1.3%	-1.2%	-1.2%	-48.4%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-165. Change in income impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2015 ($1,000).[t]

Community Groups	*No Action Alt*	Preferred Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*2,987*	+850	+850	+850	+850	+559	+559	+559	-64	-64	-64
Washington Coast	*21,690*	+1,507	+1,507	+1,507	+1,507	+1,149	+1,149	+1,149	-79	-79	-79
Astoria-Tillamook	*30,966*	+7,850	+7,850	+7,850	+7,850	+3,644	+3,644	+3,644	+99	+99	+99
Newport	*27,053*	+1,571	+1,571	+1,571	+1,571	+820	+820	+820	-167	-167	-167
Coos Bay-Brookings	*14,429*	+4,168	+4,168	+4,168	+4,168	+1,648	+1,648	+1,648	-455	-455	-455
Crescent City-Eureka	*7,270*	+3,275	+3,601	+3,474	+2,823	+1,132	+1,005	+354	+32	+32	-492
Fort Bragg – Bodega Bay	*6,940*	+1,832	+2,025	+1,952	+1,578	+1,335	+1,262	+888	+27	+27	-274
San Francisco Area	*10,285*	+2,326	+2,859	+2,504	-3,615	+1,773	+1,418	-4,701	+660	+660	-5,103
SC – Mo – MB	*18,416*	+1,920	+2,355	+1,920	-4,727	+2,172	+1,737	-4,910	-2,626	-2,626	-6,193
SB – LA – SD	*116,764*	+524	+524	+524	-61,289	+737	+737	-61,076	-197	-197	-62,010
Coastwide Total	*256,801*	+25,823	+27,311	+26,320	-49,284	+14,970	+13,979	-61,625	-2,770	-2,770	-74,739

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-166. Change in income impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2015 (percent)[t].

Community Groups	*No Action Alt ($,000)*	Preferred Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*2,987*	+28.5%	+28.5%	+28.5%	+28.5%	+18.7%	+18.7%	+18.7%	-2.1%	-2.1%	-2.1%
Washington Coast	*21,690*	+6.9%	+6.9%	+6.9%	+6.9%	+5.3%	+5.3%	+5.3%	-0.4%	-0.4%	-0.4%
Astoria-Tillamook	*30,966*	+25.4%	+25.4%	+25.4%	+25.4%	+11.8%	+11.8%	+11.8%	+0.3%	+0.3%	+0.3%
Newport	*27,053*	+5.8%	+5.8%	+5.8%	+5.8%	+3.0%	+3.0%	+3.0%	-0.6%	-0.6%	-0.6%
Coos Bay-Brookings	*14,429*	+28.9%	+28.9%	+28.9%	+28.9%	+11.4%	+11.4%	+11.4%	-3.2%	-3.2%	-3.2%
Crescent City-Eureka	*7,270*	+45.0%	+49.5%	+47.8%	+38.8%	+15.6%	+13.8%	+4.9%	+0.4%	+0.4%	-6.8%
Fort Bragg – Bodega Bay	*6,940*	+26.4%	+29.2%	+28.1%	+22.7%	+19.2%	+18.2%	+12.8%	+0.4%	+0.4%	-3.9%
San Francisco Area	*10,285*	+22.6%	+27.8%	+24.3%	-35.1%	+17.2%	+13.8%	-45.7%	+6.4%	+6.4%	-49.6%
SC – Mo – MB	*18,416*	+10.4%	+12.8%	+10.4%	-25.7%	+11.8%	+9.4%	-26.7%	-14.3%	-14.3%	-33.6%
SB – LA – SD	*116,764*	+0.4%	+0.4%	+0.4%	-52.5%	+0.6%	+0.6%	-52.3%	-0.2%	-0.2%	-53.1%
Coastwide Total	*256,801*	+10.1%	+10.6%	+10.2%	-19.2%	+5.8%	+5.4%	-24.0%	-1.1%	-1.1%	-29.1%

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 displayed here and in the following tables are provided to facilitate comparison of the alternatives.

Table 4-167. Change in income impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2016 ($1,000)[t].

Community Groups	*No Action Alt ($,000)*	Preferred Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*2,987*	+1,013	+1,013	+1,013	+1,013	+725	+725	+725	+92	+92	+92
Washington Coast	*21,690*	+1,807	+1,807	+1,807	+1,807	+1,482	+1,482	+1,482	+211	+211	+211
Astoria-Tillamook	*30,966*	+8,104	+8,104	+8,104	+8,104	+3,890	+3,890	+3,890	+273	+273	+273
Newport	*27,053*	+1,909	+1,909	+1,909	+1,909	+1,163	+1,163	+1,163	+110	+110	+110
Coos Bay-Brookings	*14,429*	+4,703	+4,703	+4,703	+4,703	+2,183	+2,183	+2,183	-33	-33	-33
Crescent City-Eureka	*7,270*	+3,438	+3,764	+3,637	+2,986	+1,295	+1,168	+516	+150	+150	-375
Fort Bragg – Bodega Bay	*6,940*	+2,183	+2,376	+2,303	+1,929	+1,690	+1,617	+1,243	+323	+323	+21
San Francisco Area	*10,285*	+2,391	+2,925	+2,569	-3,549	+1,841	+1,486	-4,633	+714	+714	-5,049
SC – Mo – MB	*18,416*	+2,406	+2,841	+2,406	-4,241	+2,667	+2,232	-4,415	-2,164	-2,164	-5,731
SB – LA – SD	*116,764*	+975	+975	+975	-60,839	+1,204	+1,204	-60,609	+239	+239	-61,575
Coastwide Total	*256,801*	+28,930	+30,418	+29,428	-46,177	+18,139	+17,148	-58,456	-85	-85	-72,055

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-168. Change in income impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2016 (percent)[t].

Community Groups	*No Action Alt ($,000)*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*2,987*	+33.9%	+33.9%	+33.9%	+33.9%	+24.3%	+24.3%	+24.3%	+3.1%	+3.1%	+3.1%
Washington Coast	*21,690*	+8.3%	+8.3%	+8.3%	+8.3%	+6.8%	+6.8%	+6.8%	+1.0%	+1.0%	+1.0%
Astoria-Tillamook	*30,966*	+26.2%	+26.2%	+26.2%	+26.2%	+12.6%	+12.6%	+12.6%	+0.9%	+0.9%	+0.9%
Newport	*27,053*	+7.1%	+7.1%	+7.1%	+7.1%	+4.3%	+4.3%	+4.3%	+0.4%	+0.4%	+0.4%
Coos Bay-Brookings	*14,429*	+32.6%	+32.6%	+32.6%	+32.6%	+15.1%	+15.1%	+15.1%	-0.2%	-0.2%	-0.2%
Crescent City-Eureka	*7,270*	+47.3%	+51.8%	+50.0%	+41.1%	+17.8%	+16.1%	+7.1%	+2.1%	+2.1%	-5.2%
Fort Bragg – Bodega Bay	*6,940*	+31.5%	+34.2%	+33.2%	+27.8%	+24.3%	+23.3%	+17.9%	+4.6%	+4.6%	+0.3%
San Francisco Area	*10,285*	+23.3%	+28.4%	+25.0%	-34.5%	+17.9%	+14.4%	-45.0%	+6.9%	+6.9%	-49.1%
SC – Mo – MB	*18,416*	+13.1%	+15.4%	+13.1%	-23.0%	+14.5%	+12.1%	-24.0%	-11.7%	-11.7%	-31.1%
SB – LA – SD	*116,764*	+0.8%	+0.8%	+0.8%	-52.1%	+1.0%	+1.0%	-51.9%	+0.2%	+0.2%	-52.7%
Coastwide Total	*256,801*	+11.3%	+11.8%	+11.5%	-18.0%	+7.1%	+6.7%	-22.8%	-0.0%	-0.0%	-28.1%

-.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 employment impacts generated by commercial and recreational fishing activities displayed here and in the following tables are provided to facilitate comparison of the alternatives.

Table 4-169. Change in employment impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2015 (jobs)[t].

Community Groups	*No Action Alt*	Preferred Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*44*	+11	+11	+11	+11	+8	+8	+8	-1	-1	-1
Washington Coast	*464*	+26	+26	+26	+26	+21	+21	+21	-2	-2	-2
Astoria-Tillamook	*510*	+114	+114	+114	+114	+55	+55	+55	+3	+3	+3
Newport	*532*	+27	+27	+27	+27	+16	+16	+16	-3	-3	-3
Coos Bay-Brookings	*367*	+84	+84	+84	+84	+39	+39	+39	-15	-15	-15
Crescent City-Eureka	*163*	+61	+69	+66	+52	+26	+23	+9	+3	+3	-8
Fort Bragg – Bodega Bay	*204*	+47	+51	+50	+42	+41	+40	+33	+3	+3	-3
San Francisco Area	*203*	+45	+55	+49	-64	+34	+28	-85	+13	+13	-93
SC – Mo – MB	*491*	+67	+76	+67	-67	+75	+67	-68	-31	-31	-103
SB – LA – SD	*2,315*	+16	+16	+16	-1,182	+20	+20	-1,177	-1	-1	-1,198
Coastwide Total	*5,293*	+500	+529	+510	-957	+336	+316	-1,150	-30	-30	-1,423

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-170. Change in employment impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2015 (percent)[t].

Community Groups	*No Action Alt (jobs)*	Pref Alt Op1	Pref Alt Op2	Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 _Op2	Alt2 _Op3
Puget Sound	*44*	+31.9%	+31.9%	+31.9%	+24.0%	+24.0%	+24.0%	+3.2%	+3.2%	+3.2%
Washington Coast	*464*	+7.1%	+7.1%	+7.1%	+6.1%	+6.1%	+6.1%	+0.9%	+0.9%	+0.9%
Astoria-Tillamook	*510*	+23.2%	+23.2%	+23.2%	+11.7%	+11.7%	+11.7%	+1.3%	+1.3%	+1.3%
Newport	*532*	+6.3%	+6.3%	+6.3%	+4.1%	+4.1%	+4.1%	+0.5%	+0.5%	+0.5%
Coos Bay-Brookings	*367*	+25.7%	+25.7%	+25.7%	+13.6%	+13.6%	+13.6%	-1.7%	-1.7%	-1.7%
Crescent City-Eureka	*163*	+44.1%	+42.5%	+33.8%	+18.0%	+16.3%	+7.6%	+3.6%	+3.6%	-3.4%
Fort Bragg – Bodega Bay	*204*	+31.5%	+30.8%	+27.3%	+26.7%	+26.0%	+22.5%	+6.9%	+6.9%	+4.1%
San Francisco Area	*203*	+27.8%	+24.6%	-31.0%	+17.5%	+14.3%	-41.4%	+7.2%	+7.2%	-45.2%
SC – Mo – MB	*491*	+17.9%	+16.1%	-11.3%	+17.8%	+16.1%	-11.3%	-4.0%	-4.0%	-18.6%
SB – LA – SD	*2,315*	+1.1%	+1.1%	-50.6%	+1.3%	+1.3%	-50.4%	+0.4%	+0.4%	-51.4%
Coastwide Total	*5,293*	+11.3%	+11.0%	-16.7%	+7.7%	+7.3%	-20.4%	+0.6%	+0.6%	-25.7%

Community Groups	*No Action Alt (jobs)*	Pref Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*44*	+25.7%	+25.7%	+25.7%	+25.7%	+17.7%	+17.7%	+17.7%	-2.7%	-2.7%	-2.7%
Washington Coast	*464*	+5.7%	+5.7%	+5.7%	+5.7%	+4.6%	+4.6%	+4.6%	-0.5%	-0.5%	-0.5%
Astoria-Tillamook	*510*	+22.3%	+22.3%	+22.3%	+22.3%	+10.8%	+10.8%	+10.8%	+0.6%	+0.6%	+0.6%
Newport	*532*	+5.1%	+5.1%	+5.1%	+5.1%	+2.9%	+2.9%	+2.9%	-0.5%	-0.5%	-0.5%
Coos Bay-Brookings	*367*	+22.8%	+22.8%	+22.8%	+22.8%	+10.7%	+10.7%	+10.7%	-4.1%	-4.1%	-4.1%
Crescent City-Eureka	*163*	+37.7%	+42.0%	+40.3%	+31.6%	+15.9%	+14.2%	+5.5%	+1.9%	+1.9%	-5.1%
Fort Bragg – Bodega Bay	*204*	+23.2%	+25.0%	+24.4%	+20.9%	+20.2%	+19.5%	+16.0%	+1.4%	+1.4%	-1.5%
San Francisco Area	*203*	+22.3%	+27.2%	+23.9%	-31.7%	+16.8%	+13.6%	-42.1%	+6.6%	+6.6%	-45.8%
SC – Mo – MB	*491*	+13.7%	+15.5%	+13.7%	-13.7%	+15.4%	+13.6%	-13.8%	-6.2%	-6.2%	-20.9%
SB – LA – SD	*2,315*	+0.7%	+0.7%	+0.7%	-51.0%	+0.9%	+0.9%	-50.8%	-0.0%	-0.0%	-51.8%
Coastwide Total	*5,293*	+9.4%	+10.0%	+9.6%	-18.1%	+6.3%	+6.0%	-21.7%	-0.6%	-0.6%	-26.9%

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 employment impacts generated by commercial and recreational fishing activities displayed here and in the following tables are provided to facilitate comparison of the alternatives.

Table 4-171. Change in employment impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2016 (jobs)[t].

Community Groups	***No Action Alt (jobs)***	**Preferred Alt**	**Prelim Pref Alt Op1**	**Prelim Pref Alt Op2**	**Prelim Pref Alt Op3**	**Alt1 Op1**	**Alt1 Op2**	**Alt1 Op3**	**Alt2 Op1**	**Alt2 Op2**	**Alt2 Op3**
Puget Sound	*44*	+14	+14	+14	+14	+11	+11	+11	+1	+1	+1
Washington Coast	*464*	+33	+33	+33	+33	+28	+28	+28	+4	+4	+4
Astoria-Tillamook	*510*	+118	+118	+118	+118	+60	+60	+60	+7	+7	+7
Newport	*532*	+33	+33	+33	+33	+22	+22	+22	+3	+3	+3
Coos Bay-Brookings	*367*	+94	+94	+94	+94	+50	+50	+50	-6	-6	-6
Crescent City-Eureka	*163*	+65	+72	+69	+55	+29	+27	+12	+6	+6	-6
Fort Bragg – Bodega Bay	*204*	+60	+64	+63	+56	+54	+53	+46	+14	+14	+8
San Francisco Area	*203*	+47	+57	+50	-63	+36	+29	-84	+15	+15	-92
SC – Mo – MB	*491*	+79	+88	+79	-55	+88	+79	-55	-19	-19	-91
SB – LA – SD	*2,315*	+25	+25	+25	-1,172	+30	+30	-1,168	+8	+8	-1,189
Coastwide Total	*5,293*	+570	+599	+580	-887	+408	+388	-1,078	+32	+32	-1,362

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 employment impacts generated by commercial and recreational fishing activities displayed here and in the following tables are provided to facilitate comparison of the alternatives.

Table 4-172. Change in employment impacts from No Action Alternative under the combined commercial plus recreational fishery alternatives and season options, by community group in 2016 (percent)[t].

Community Groups	*Baseline*	No Action Alt	2015 Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Alt1	2016 Alt2
Puget Sound	*3.4*	*-1.5*	-1.0	-1.2	-1.6	-0.9	-1.1	-1.5
Washington Coast	*14.4*	+4.6	+5.8	+5.6	+4.8	+6.2	+6.1	+5.3
Astoria-Tillamook	*12.8*	+5.7	+10.9	+8.2	+5.8	+11.1	+8.4	+5.9
Newport	*10.5*	+3.7	+4.9	+4.4	+3.6	+5.1	+4.6	+3.8
Coos Bay-Brookings	*9.6*	-0.9	+1.9	+0.3	-1.3	+2.3	+0.7	-1.0
Crescent City-Eureka	*5.9*	-2.4	-0.6	-1.9	-2.4	-0.5	-1.8	-2.3
Fort Bragg – Bodega Bay	*3.9*	+0.2	+1.2	+0.9	+0.1	+1.5	+1.1	+0.3
San Francisco Area	*1.8*	-0.6	+0.1	-0.4	-0.6	+0.1	-0.4	-0.6
Santa Cruz – Monterey – Morro Bay	*5.0*	+1.9	+3.2	+3.1	+1.9	+3.6	+3.5	+2.3
Santa Barbara – Los Angeles – San Diego	*2.7*	+1.7	+2.1	+2.2	+1.5	+2.4	+2.6	+1.9
Shoreside Total	*70.1*	+12.4	+28.4	+21.2	+12.0	+30.9	+23.7	+14.1

Community Groups	*No Action Alt (jobs)*	Preferred Alt	Prelim Pref Alt Op1	Prelim Pref Alt Op2	Prelim Pref Alt Op3	Alt1 Op1	Alt1 Op2	Alt1 Op3	Alt2 Op1	Alt2 Op2	Alt2 Op3
Puget Sound	*44*	+31.9%	+31.9%	+31.9%	+31.9%	+24.0%	+24.0%	+24.0%	+3.2%	+3.2%	+3.2%
Washington Coast	*464*	+7.1%	+7.1%	+7.1%	+7.1%	+6.1%	+6.1%	+6.1%	+0.9%	+0.9%	+0.9%
Astoria-Tillamook	*510*	+23.2%	+23.2%	+23.2%	+23.2%	+11.7%	+11.7%	+11.7%	+1.3%	+1.3%	+1.3%
Newport	*532*	+6.3%	+6.3%	+6.3%	+6.3%	+4.1%	+4.1%	+4.1%	+0.5%	+0.5%	+0.5%
Coos Bay-Brookings	*367*	+25.7%	+25.7%	+25.7%	+25.7%	+13.6%	+13.6%	+13.6%	-1.7%	-1.7%	-1.7%
Crescent City-Eureka	*163*	+39.8%	+44.1%	+42.5%	+33.8%	+18.0%	+16.3%	+7.6%	+3.6%	+3.6%	-3.4%
Fort Bragg – Bodega Bay	*204*	+29.7%	+31.5%	+30.8%	+27.3%	+26.7%	+26.0%	+22.5%	+6.9%	+6.9%	+4.1%
San Francisco Area	*203*	+23.0%	+27.8%	+24.6%	-31.0%	+17.5%	+14.3%	-41.4%	+7.2%	+7.2%	-45.2%
SC – Mo – MB	*491*	+16.1%	+17.9%	+16.1%	-11.3%	+17.8%	+16.1%	-11.3%	-4.0%	-4.0%	-18.6%
SB – LA – SD	*2,315*	+1.1%	+1.1%	+1.1%	-50.6%	+1.3%	+1.3%	-50.4%	+0.4%	+0.4%	-51.4%
Coastwide Total	*5,293*	+10.8%	+11.3%	+11.0%	-16.7%	+7.7%	+7.3%	-20.4%	+0.6%	+0.6%	-25.7%

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 employment impacts generated by commercial and recreational fishing activities displayed here and in the following tables are provided to facilitate comparison of the alternatives.

Table 4-173. Change in groundfish ex-vessel revenue under the commercial fishery alternatives from baseline 2003 to 2012 average annual revenue (inflation-adjusted $2013) ($ million).

Community Groups	*Baseline*	No Action Alt	2015 Pref Alt	2015 Prelim Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Prelim Pref Alt	2016 Alt1	2016 Alt2
Puget Sound	*3.4*	*-1.5*	-1.0	-1.0	-1.2	-1.6	-0.9	-0.9	-1.1	-1.5
Washington Coast	*14.4*	+4.6	+5.8	+5.8	+5.6	+4.8	+6.2	+6.2	+6.1	+5.3
Astoria-Tillamook	*12.8*	+5.7	+10.9	+10.9	+8.2	+5.8	+11.1	+11.1	+8.4	+5.9
Newport	*10.5*	+3.7	+4.9	+4.9	+4.4	+3.6	+5.1	+5.1	+4.6	+3.8
Coos Bay-Brookings	*9.6*	-0.9	+1.9	+1.9	+0.3	-1.3	+2.3	+2.3	+0.7	-1.0
Crescent City-Eureka	*5.9*	-2.4	-0.6	-0.6	-1.9	-2.4	-0.5	-0.5	-1.8	-2.3
Fort Bragg – Bodega Bay	*3.9*	+0.2	+1.2	+1.2	+0.9	+0.1	+1.5	+1.5	+1.1	+0.3
San Francisco Area	*1.8*	-0.6	+0.1	+0.1	-0.4	-0.6	+0.1	+0.1	-0.4	-0.6
Santa Cruz – Monterey – Morro Bay	*5.0*	+1.9	+3.2	+3.2	+3.1	+1.9	+3.6	+3.6	+3.5	+2.3
Santa Barbara – Los Angeles – San Diego	*2.7*	+1.7	+2.1	+2.1	+2.2	+1.5	+2.4	+2.4	+2.6	+1.9
Shoreside Total	*70.1*	+12.4	+28.4	+28.4	+21.2	+12.0	+30.9	+30.9	+23.7	+14.1

Table 4-174. Change in groundfish ex-vessel revenue under the commercial fishery alternatives from baseline 2003 to 2012 average annual revenue (inflation-adjusted $2013) ($ million).

Community Groups	*Baseline ($ million)*	No Action Alt	2015 Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Alt1	2016 Alt2
Puget Sound	*3.4*	-45.5%	-30.7%	-35.4%	-46.6%	-27.8%	-32.5%	-43.9%
Washington Coast	*14.4*	+32.1%	+40.3%	+39.1%	+33.5%	+43.3%	+42.3%	+36.5%
Astoria-Tillamook	*12.8*	+44.6%	+85.0%	+64.3%	+45.2%	+86.3%	+65.6%	+46.1%
Newport	*10.5*	+35.4%	+46.4%	+41.3%	+34.2%	+48.8%	+43.8%	+36.2%
Coos Bay-Brookings	*9.6*	-9.5%	+19.7%	+2.9%	-13.2%	+23.7%	+6.9%	-10.1%
Crescent City-Eureka	*5.9*	-40.3%	-10.4%	-31.4%	-40.1%	-8.6%	-29.6%	-38.8%
Fort Bragg – Bodega Bay	*3.9*	+5.6%	+31.7%	+22.5%	+2.8%	+38.1%	+29.0%	+8.1%
San Francisco Area	*1.8*	-34.6%	+4.7%	-24.9%	-36.3%	+6.6%	-22.9%	-34.7%
Santa Cruz – Monterey – Morro Bay	*5.0*	+37.1%	+63.1%	+60.6%	+38.3%	+71.5%	+69.2%	+46.3%
Santa Barbara – Los Angeles – San Diego	*2.7*	+61.4%	+75.8%	+81.5%	+56.4%	+87.8%	+93.9%	+68.0%
Shoreside Total	*70.1*	+17.7%	+40.5%	+30.2%	+17.0%	+44.1%	+33.8%	+20.2%

Table 4-175. Change in groundfish ex-vessel revenue under the commercial fishery alternatives from baseline 2003 to 2012 average annual revenue (inflation-adjusted $2013) (percent).

Community Groups	*Baseline ($ million)*	No Action Alt	2015 Pref Alt	2015 Prelim Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Prelim Pref Alt	2016 Alt1	2016 Alt2
Puget Sound	*3.4*	-45.5%	-30.7%	-30.7%	-35.4%	-46.6%	-27.8%	-27.8%	-32.5%	-43.9%
Washington Coast	*14.4*	+32.1%	+40.3%	+40.3%	+39.1%	+33.5%	+43.3%	+43.3%	+42.3%	+36.5%
Astoria-Tillamook	*12.8*	+44.6%	+85.0%	+85.0%	+64.3%	+45.2%	+86.3%	+86.3%	+65.6%	+46.1%
Newport	*10.5*	+35.4%	+46.4%	+46.4%	+41.3%	+34.2%	+48.8%	+48.8%	+43.8%	+36.2%
Coos Bay-Brookings	*9.6*	-9.5%	+19.7%	+19.7%	+2.9%	-13.2%	+23.7%	+23.7%	+6.9%	-10.1%
Crescent City-Eureka	*5.9*	-40.3%	-10.4%	-10.4%	-31.4%	-40.1%	-8.6%	-8.6%	-29.6%	-38.8%
Fort Bragg – Bodega Bay	*3.9*	+5.6%	+31.7%	+31.7%	+22.5%	+2.8%	+38.1%	+38.1%	+29.0%	+8.1%
San Francisco Area	*1.8*	-34.6%	+4.7%	+4.7%	-24.9%	-36.3%	+6.6%	+6.6%	-22.9%	-34.7%
Santa Cruz – Monterey – Morro Bay	*5.0*	+37.1%	+63.1%	+63.1%	+60.6%	+38.3%	+71.5%	+71.5%	+69.2%	+46.3%
Santa Barbara – Los Angeles – San Diego	*2.7*	+61.4%	+75.8%	+75.8%	+81.5%	+56.4%	+87.8%	+87.8%	+93.9%	+68.0%
Shoreside Total	*70.1*	+17.7%	+40.5%	+40.5%	+30.2%	+17.0%	+44.1%	+44.1%	+33.8%	+20.2%

Table 4-176. Change from the No Action Alternative in shoreside processors' groundfish purchases by species group under the commercial fishery alternatives ($ million).

Alternative:	No Action Alt	2015 Pref Alt	2015 Prelim Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Prelim Pref Alt	2016 Alt1	2016 Alt2
Whiting	*28.6*	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Non-whiting	*54.0*	+16.0	+16.0	+8.8	-0.4	+18.5	+18.5	+11.3	+1.8
Total Change	*82.6*	+16.0	+16.0	+8.8	-0.4	+18.5	+18.5	+11.3	+1.8

Table 4-177. Change from the No Action Alternative in shoreside processors' groundfish purchases by species group under the commercial fishery alternatives (percent).

Alternative:	No Action Alt	2015 Pref Alt	2015 Prelim Pref Alt	2015 Alt1	2015 Alt2	2016 Pref Alt	2016 Prelim Pref Alt	2016 Alt1	2016 Alt2
Whiting	*28.6*	+0.00%	+0.00%	+0.00%	+0.00%	+0.00%	+0.00%	+0.00%	+0.00%
Non-whiting	*54.0*	+29.64%	+29.64%	+16.27%	-0.80%	+34.25%	+34.25%	+20.96%	+3.25%
Total Change	*82.6*	+19.38%	+19.38%	+10.64%	-0.53%	+22.39%	+22.39%	+13.70%	+2.12%

Slope Rockfish Restructuring

Public and GAP testimony on this issue indicated that removing these stocks from the status quo complexes would be disruptive to industry. Measures requiring new sector allocations for these stocks would likely not be done in time for 2015-2016. Therefore, as part of the Preferred Alternative, the Council and NMFS expect industry to take voluntary measures to avoid these stocks. A sorting requirement would enable better catch monitoring and estimation, which should help industry more quickly realize when catches are approaching a level of concern. Further, lower slope rockfish cumulative landing limits are being considered for the non-trawl sectors to remove any incentive to target these stocks.

Industry awareness of this problem, coupled with the sorting requirement, should facilitate avoidance of rougheye. Realizing this issue was emerging, the CP fleet started to pay attention to rougheye catches by their fleet and move from areas where higher rougheye bycatch was occurring in 2013. Using the services of a private contractor, Sea State, Inc., the fleet was apprised in real time of areas where rougheye bycatch was relatively high so vessels could move to other areas to target whiting. Total catch of rougheye in 2013 by the CP fleet was 11.2 metric tons (mt), down substantially from the high 2011 catch of 74.4 mt. The whiting vessels in the mothership fleet and the shorebased IFQ trawl fleet also use Sea State and could enact a similar strategy to reduce their impacts. If the non-whiting vessels in the shorebased IFQ trawl fleet could use Sea State or other strategies to avoid rougheye areas, this would greatly ameliorate the risk of potential overfishing of rougheye.

Neither the Preferred Alternative nor the RBS complex alternative, where all sectors would be managed under a shared fishery harvest guideline, would include contemplating modifications to the current formal sector allocations. However, the Council stated it might consider removing these stocks from the status quo complexes in the future and modifying formal sector allocations for slope rockfish should voluntary measures not decrease total catch impacts to prevent potential overfishing of rougheye in the next 2 years. Other potential accountability measures that could be considered in the future include rockfish excluders in trawl nets and implementation of Groundfish Conservation Areas (i.e., trawl/non-trawl RCAs, closing discrete areas where rougheye are more prevalent).

4.3.2.3 Communities

No Action

Coastwide

Compared to the 2003 to 2012 baseline period, total groundfish ex-vessel revenue would increase by $12.4 million coastwide, or 18 percent under the No Action Alternative. Relative to the baseline period, the No Action Alternative would produce the second smallest increase in ex-vessel revenue among the alternatives. Estimated coastwide commercial fishery income impacts under the No Action Alternative would be $111.2 million. Estimated coastwide recreational fishery income impacts under the No Action Alternative would be $145.6 million.

The average estimated coastwide unemployment rate under the No Action Alternative would be 9.3 percent (based on 2012 county statistics). Estimated coastwide commercial fishery employment impacts under the No Action Alternative would be 2,300 jobs. Estimated coastwide recreational fishery income impacts under the No Action Alternative would be 3,000 jobs.

Puget Sound

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1.5 million in Puget Sound. This would be a -46 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $3 million.

The average estimated unemployment rate in the region under the No Action Alternative would be the lowest among the coastal communities. It would be 7.6 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 44 jobs.

Washington Coast

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $4.6 million on the Washington Coast, or 32 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $21.7 million. Revenues from landings in tribal groundfish fisheries are included in these totals, but not in the income impact results since cost and earnings data for tribal vessels have not been formally surveyed.

The average estimated unemployment rate in the region under the No Action Alternative would be 10.6 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 464 jobs.

Astoria – Tillamook

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $5.7 million in Astoria-Tillamook, or 45 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $31 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 7.8 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 510 jobs.

Newport

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $3.7 million in Newport, or 35 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $27 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 9.3 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 532 jobs.

Coos Bay – Brookings

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.9 million in Coos Bay – Brookings, or -10 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $14.4 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 9.6 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 367 jobs.

Crescent City – Eureka

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $2.4 million in Crescent City – Eureka, or -40 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $7.3 million.

The average estimated unemployment rate in the region under the No Action Alternative would be the highest among the coastal communities at 10.9 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 163 jobs.

Fort Bragg – Bodega Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $0.2 million in Fort Bragg – Bodega Bay, or 6 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $6.9 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 8 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 204 jobs.

San Francisco Area

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.6 million in the San Francisco Area, or -35 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $10.3 million

The average estimated unemployment rate in the region under the No Action Alternative would be 8.2 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 203 jobs.

Santa Cruz – Monterey – Morro Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.9 million in the Santa Cruz – Monterey – Morro Bay region, or 37 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $18.4 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 10.4 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 491 jobs.

Santa Barbara – Los Angeles – San Diego

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.7 million in the Santa Barbara – Los Angeles – San Diego region, or 61 percent under the No Action Alternative. Combined commercial plus recreational fisheries income impacts in the port area under the No Action Alternative would be $116.7 million.

The average estimated unemployment rate in the region under the No Action Alternative would be 10 percent (based on 2012 county statistics). Combined commercial plus recreational fisheries employment impacts in the port area under the No Action Alternative would be 2,300 jobs.

The Preferred Alternative

Coastwide

Compared to the 2003 to 2012 baseline period, total groundfish ex-vessel revenue would increase by $28.4 million coastwide in 2015 (41 percent). Relative to the baseline period, this alternative would produce the largest increase in ex-vessel revenue among the alternatives. Coastwide combined commercial plus recreational fishery income impacts under the Preferred Alternative would be projected to increase over the No Action Alternative by $25.8 million (10 percent).

The change in commercial fisheries-related employment would be projected to decrease the average coastwide unemployment rate under the Preferred Alternative (compared to the No Action Alternative) by 0.003 percent (based on 2012 county statistics). Coastwide combined commercial plus recreational fishery employment impacts under the Preferred Alternative would be projected to increase over the No Action Alternative by 500 jobs (9 percent).

Puget Sound

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1 million (-31 percent) in the port area in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $0.9 million (29 percent) under all three recreational options.

The change in commercial fisheries–related employment is projected to decrease the average regional unemployment rate under the Preferred Alternative (compared to the No Action Alternative) by 0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 11 jobs (26 percent) under all three recreational options.

Washington Coast

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $5.8 million on the Washington Coast in 2015 (40 percent). Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $1.5 million (7 percent) under all three recreational options. Revenues from landings in tribal groundfish fisheries are included in these totals, but not in the income impact results since cost and earnings data for tribal vessels have not been formally surveyed.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with No Action)) by 0.001 percent (based on 2012 county statistics).

Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative are projected to increase over No Action by 26 jobs (6 percent) under all three recreational options.

Astoria – Tillamook

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $10.9 million (85 percent) in Astoria-Tillamook in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative are projected to increase over the No Action Alternative by $7.9 million (25 percent).

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared to the No Action Alternative) by 0.026 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 114 jobs (22 percent).

Newport

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $4.9 million (46 percent) in Newport in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $3.6 million (50 percent) under Recreational Option 1, $3.5 million (48 percent) under Recreational Option 2, and $2.8 million (39 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.119 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative are projected to increase over No Action by 69 jobs (42 percent) under Recreational Option 1, 66 jobs (40 percent) under Recreational Option 2, and 52 jobs (32 percent) under Recreational Option 3.

Coos Bay – Brookings

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.9 million (20 percent) in Coos Bay – Brookings in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $2 million (29 percent) under Recreational Option 1, $2 million (28 percent) under Recreational Option 2, and $1.6 million (23 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.032 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 51 jobs (25 percent) under recreational Option 1, 50 jobs (24 percent) under recreational Option 2, and 42 jobs (21 percent) under recreational Option 3.

Crescent City – Eureka

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.6 million (-10 percent) in Crescent City – Eureka in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over No Action by $2.9 million (28 percent) under Recreational Option 1 and by $2.5 million (24 percent) under Recreational Option 2, but would decrease by $3.6 million (-35 percent) under Recreational Option 3.

The change in commercial fisheries–related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.086 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative are projected to increase over the No Action Alternative by 55 jobs (27 percent) under Recreational Option 1 and by 49 jobs (24 percent) under Recreational Option 2, but would decrease by 64 jobs (-32 percent) under Recreational Option 3.

Fort Bragg – Bodega Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.2 million (32 percent) in Fort Bragg – Bodega Bay in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $2.4 million (13 percent) under Recreational Option 1 and by $1.9 million (10 percent) under Recreational Option 2, but would decrease by $4.7 million (-26 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.010 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 76 jobs (16 percent) under recreational Option 1 and by 67 jobs (14 percent) under Recreational Option 2, but would decrease by 67 jobs (-14 percent) under Recreational Option 3.

San Francisco Area

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $0.1 million (5 percent) in the San Francisco Area in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $2.3 million (23 percent).

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with No Action) by 0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 45 jobs (22 percent).

Santa Cruz – Monterey – Morro Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $3.2 million (63 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $1.9 million (10 percent).

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.011 percent (based on 2012 county statistics).Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 67 jobs (14 percent).

Santa Barbara – Los Angeles – San Diego

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $2.1 million (76 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by $0.5 million (0.4 percent).

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under the Preferred Alternative (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preferred Alternative would be projected to increase over the No Action Alternative by 16 jobs (0.7 percent).

The Preliminary Preferred Alternative

Coastwide

Compared to the 2003 to 2012 baseline period, total groundfish ex-vessel revenue would increase by $28.4 million coastwide in 2015 (41 percent). Relative to the baseline period, this alternative would produce the largest increase in ex-vessel revenue among the alternatives. Coastwide combined commercial plus recreational fishery income impacts under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $27.3 million (11 percent) under Recreational Option 1 and by $26.3 million (10 percent) under Recreational Option 2, but would decrease by $49.2 million (-19 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average coastwide unemployment rate under the Preferred Alternative (compared with the No Action Alternative) by 0.003 percent (based on 2012 county statistics). Coastwide combined commercial plus recreational fishery employment impacts under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 529 jobs (10 percent) under Recreational Option 1 and by 510 jobs (10 percent) under Recreational Option 2, but would decrease by 957 jobs (-18 percent) under Recreational Option 3.

Puget Sound

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1 million (-31 percent) in the port area in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $0.9 million (29 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 11 jobs (26 percent) under all three recreational options.

Washington Coast

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $5.8 million on the Washington Coast in 2015 (40 percent). Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $1.5 million (7 percent) under all three recreational options. Revenues from landings in tribal groundfish fisheries are included in these totals, but not in the income impact results since cost and earnings data for tribal vessels have not been formally surveyed.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.009 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 26 jobs (6 percent) under all three recreational options.

Astoria – Tillamook

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $10.9 million (85 percent) in Astoria-Tillamook in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $7.9 million (25 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.026 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 114 jobs (22 percent) under all three recreational options.

Newport

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $4.9 million (46 percent) in Newport in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $1.6 million (6 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.119 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over No Action by 27 jobs (5 percent) under all three recreational options.

Coos Bay – Brookings

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.9 million (20 percent) in Coos Bay – Brookings in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $4.2 million (29 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.032 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 84 jobs (23 percent) under all three recreational options.

Crescent City – Eureka

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.6 million (-10 percent) in Crescent City – Eureka in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $3.6 million (50 percent) under Recreational Option 1, $3.5 million (48 percent) under Recreational Option 2, and $2.8 million (39 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.086 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 69 jobs (42 percent) under Recreational Option 1, 66 jobs (40 percent) under Recreational Option 2, and 52 jobs (32 percent) under Recreational Option 3.

Fort Bragg – Bodega Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.2 million (32 percent) in Fort Bragg – Bodega Bay in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $2 million (29 percent) under Recreational Option 1, $2 million (28 percent) under Recreational Option 2, and $1.6 million (23 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.010 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over No Action by 51 jobs (25 percent) under Recreational Option 1, 50 jobs (24 percent) under Recreational Option 2, and 42 jobs (21 percent) under Recreational Option 3.

San Francisco Area

Compared to the 2003 to 2012 baseline period groundfish ex-vessel revenue would increase by $0.1 million (5 percent) in the San Francisco Area in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $2.9 million (28 percent) under Recreational Option 1 and $2.5 million (24 percent) under Recreational Option 2, but would decrease by $3.6 million (-35 percent) under Recreational Option 3.

The change in commercial fisheries–related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 55 jobs (27 percent) under Recreational Option 1 and by 49 jobs (24 percent) under Recreational Option 2, but would decrease by 64 jobs (-32 percent) under Recreational Option 3.

Santa Cruz – Monterey – Morro Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $3.2 million (63 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $2.4 million (13 percent) under Recreational Option 1 and by $1.9 million (10 percent) under Recreational Option 2, but would decrease by $4.7 million (-26 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Preliminary Preferred Alternative (compared with the No Action Alternative) by 0.011 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 76 jobs (16 percent) under Recreational Option 1 and by 67 jobs (14 percent) under Recreational option 2, but would decrease by 67 jobs (-14 percent) under Recreational Option 3.

Santa Barbara – Los Angeles – San Diego

Compared to the 2003 to 2012 baseline period groundfish ex-vessel revenue would increase by $2.1 million (76 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by $0.5 million (0.4 percent) under Recreational Option 1 and Option 2, but would decrease by $61.2 million (-53 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under the Preliminary Preferred Alternative (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Preliminary Preferred Alternative would be projected to increase over the No Action Alternative by 16 jobs (0.7 percent) under Recreational Option 1 and Option 2, but would decrease by 1,182 jobs (-51 percent) under Recreational Option 3.

Alternative 1

Coastwide

Compared to the 2003 to 2012 baseline period, total groundfish ex-vessel revenue would increase by $21.2 million on the Washington Coast in 2015 (30 percent). Relative to the baseline period, this alternative would produce the second largest increase in ex-vessel revenue among the alternatives. Coastwide combined commercial plus recreational fishery income impacts under Alternative 1 would be projected to increase over the No Action Alternative by $15 million (6 percent) under Recreational option

1 and by $14 million (5 percent) under Recreational Option 2, but would decrease by $61.6 million (-24 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Alternative (compared with the No Action Alternative) by 0.002 percent (based on 2012 county statistics). Coastwide combined commercial plus recreational fishery employment impacts under Alternative 1 would be projected to increase over the No Action Alternative by 336 jobs (10 percent) under Recreational Option 1 and by 316 jobs (10 percent) under Recreational Option 2, but would decrease by 1,150 jobs (-22 percent) under Recreational Option 3.

Puget Sound

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1.2 million (-35 percent) in Puget Sound in 2015. Combined commercial plus recreational fishery income impacts in the port area under the Alternative would be projected to increase over the No Action Alternative by $0.6 million (19 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under the Alternative (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Alternative would be projected to increase over the No Action Alternative by 8 jobs (18 percent) under all three recreational options.

Washington Coast

In 2015, the Washington Coast ex-vessel value from groundfish would increase by $5.6 million (39 percent) over the average annual revenue from the baseline period (2003 to 2012). Ex-vessel value revenue from tribal groundfish fishery landings are included in the overall revenue value, but are not included in the income impact values. Combined commercial plus recreational fishery income impacts would be projected to increase over the No Action Alternative by $3.6 million (12 percent) under all three recreational options.

Under this alternative, commercial fisheries-related employment increases would be projected to result in a 0.013 percent decrease in the average regional unemployment over the No Action Alternative (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts under all three recreational options would be projected to increase by 55 jobs (11 percent) in the port area over the No Action Alternative.

Astoria – Tillamook

Compared to the 2003 to 2013 baseline period, groundfish ex-vessel revenue would increase by $8.2 million (64 percent) in Astoria-Tillamook in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $3.6 million (12 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by 0.013 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Alternative would be projected to increase over the No Action Alternative by 55 jobs (11 percent) under all three recreational options.

Newport

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $4.4 million (41 percent) in Newport in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $0.8 million (3 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by 0.069 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 16 jobs (3 percent) under all three recreational options.

Coos Bay – Brookings

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $0.3 million (3 percent) in Coos Bay – Brookings in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $1.6 million (11 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by 0.015 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 39 jobs (11 percent) under all three recreational options.

Crescent City – Eureka

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1.9 million (-31 percent) in Crescent City – Eureka in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $1.1 million (16 percent) under Recreational Option 1, $1 million (14 percent) under Recreational Option 2, and $0.4 million (5 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by 0.026 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 26 jobs (16 percent) under Recreational Option 1, 23 jobs (14 percent) under Recreational Option 2, and 9 jobs (6 percent) under Recreational Option 3.

Fort Bragg – Bodega Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $0.9 million (23 percent) in Fort Bragg – Bodega Bay in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $1.3 million (19 percent) under Recreational Option 1, $1.3 million (18 percent) under Recreational Option 2, and $0.9 million (13 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by

0.008 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 41 jobs (20 percent) under Recreational Option 1, 40 jobs (20 percent) under Recreational Option 2, and 33 jobs (16 percent) under Recreational Option 3.

San Francisco Area

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.4 million (-25 percent) in the San Francisco Area in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $1.8 million (17 percent) under Recreational Option 1 and by $1.4 million (14 percent) under Recreational Option 2, bout would decrease by $4.7 million (-46 percent) under Recreational option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under Alternative 1 (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 34 jobs (17 percent) under Recreational Option 1 and by 28 jobs (14 percent) under Recreational Option 2, but would decrease by 85 jobs (-42 percent) under Recreational Option 3.

Santa Cruz – Monterey – Morro Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $3.1 million (61 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $2.2 million (12 percent) under Recreational Option 1 and by $1.7 million (9 percent) under Recreational Option 2, but would decrease by $5 million (-27 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 1 (compared with the No Action Alternative) by 0.011 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 75 jobs (15 percent) under Recreational Option 1 and by 67 jobs (14 percent) under Recreational Option 2, but would decrease by 68 jobs (-14 percent) under Recreational Option 3.

Santa Barbara – Los Angeles – San Diego

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $2.2 million (82 percent) in the Santa Barbara – Los Angeles – San Diego region. Combined commercial plus recreational fishery income impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by $0.7 million (0.6 percent) under Recreational Option 1 and Option 2, but would decrease by $61 million (-52 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under Alternative 1 (compared with the No Action Alternative) (based on 2012 county statistics). The average estimated unemployment rate in the region under Alternative 1 would be projected to decrease slightly compared with the No Action Alternative (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 1 would be projected to increase over the No Action Alternative by 20 jobs (0.9

percent) under Recreational Option 1and Option 2, but would decrease by 1,177 jobs (-51 percent) under Recreational Option 3.

Alternative 2

Coastwide

Compared to the 2003-12 baseline period, total groundfish ex-vessel revenue would increase by $12 million coastwide in 2015 (17 percent). Relative to the baseline period, this alternative would produce the lowest total coastwide increase in ex-vessel revenue among the alternatives. Coastwide combined commercial plus recreational fishery income impacts under Alternative 2 would be projected to decrease over the No Action Alternative by $2.8 million (-1 percent) under Recreational Option 1 and Option 2, but would decrease by $74.7 million (-29 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under Alternative 2 (compared with the No Action Alternative) (based on 2012 county statistics). Coastwide combined commercial plus recreational fishery employment impacts under Alternative 2 would be projected to decrease over the No Action Alternative by 30 jobs (-0.6 percent) under Recreational Option 1 and Option 2, but would decrease by 1,423 jobs (-27 percent) under Recreational Option 3.

Puget Sound

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1.6 million (-47 percent) in Puget Sound in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $0.06 million (-2 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to increase the average regional unemployment rate slightly under Alternative 2 (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 1 job (-3 percent) under all three recreational options.

Washington Coast

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $4.8 million on the Washington Coast in 2015 (34 percent). Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $0.08 million (-0.4 percent) under all three recreational options. Revenues from landings in tribal groundfish fisheries are included in these totals, but not in the income impact results since cost and earnings data for tribal vessels have not been formally surveyed.

The change in commercial fisheries–related employment would be projected to increase the average regional unemployment rate under Alternative 2 (compared with the No Action Alternative) by 0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 2 jobs (-0.5 percent) under all three recreational options.

Astoria – Tillamook

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $5.8 million (45 percent) in Astoria-Tillamook in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by $0.1 million (0.3 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 2 (compared with the No Action Alternative) by0.001 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by 3 jobs (0.6 percent) under all three recreational options.

Newport

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $3.6 million (34 percent) in Newport in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $0.2 million (-0.6 percent) under all three recreational options.

The change in commercial fisheries–related employment would be projected to increase the average regional unemployment rate under Alternative 2 (compared with the No Action Alternative) by 0.012 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 3 jobs (-0.5 percent) under all three recreational options.

Coos Bay – Brookings

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $1.3 million (-13 percent) in Coos Bay – Brookings in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $0.5 million (-3 percent) under all three recreational options.

The change in commercial fisheries-related employment would be projected to increase the average regional unemployment rate under Alternative 2 (compared with the No Action Alternative) by 0.006 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 15 jobs (-4 percent) under all three recreational options.

Crescent City – Eureka

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $2.4 million (-40 percent) in Crescent City – Eureka in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by $0.03 million (0.4 percent) under Recreational Option 1 and Option 2, but would decrease by $0.5 million (-7 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under Alternative 2 (compared with the No Action Alternative) by 0.002 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under the Alternative would be projected to increase compared with the No Action Alternative by 3 jobs (2 percent) under Recreational Option 1 and Option 2, but would decrease by 8 jobs (-5 percent) under Recreational Option 3.

Fort Bragg – Bodega Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $0.1 million (3 percent) in Fort Bragg – Bodega Bay in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by $0.03 million (0.4 percent) under Recreational Option 1 and Option 2, but would decrease by $0.3 million (-4 percent) under Recreational Option 3.

The change in commercial fisheries-related employment is projected to increase the average regional unemployment rate slightly under Alternative 2 (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by 3 jobs (1 percent) under Recreational Option 1 and Option 2, but would decrease by 3 jobs (-1.5 percent) under Recreational Option 3.

San Francisco Area

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would decrease by $0.6 million (-36 percent) in the San Francisco Area in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by $0.7 million (6 percent) under Recreational Option 1 and Option 2, but would decrease by $5.1 million (-50 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate slightly under Alternative 2 (compared with the No Action Alternative) (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to increase compared with the No Action Alternative by 13 jobs (7 percent) under Recreational Option 1 and Option 2, but would decrease by 93 jobs (-46 percent) under Recreational Option 3.

Santa Cruz – Monterey – Morro Bay

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.9 million (38 percent) in the Santa Cruz – Monterey – Morro Bay region in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $2.6 million (-14 percent) under Recreational Option 1 and Option 2, but would decrease by $6.2 million (-34 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to decrease the average regional unemployment rate under the Alternative 2 (compared with the No Action Alternative) by 0.004 percent (based on 2012 county statistics). Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 31 jobs (-6 percent) under Recreational Option 1 and Option 2, but would decrease by 103 jobs (-21 percent) under Recreational Option 3.

Santa Barbara – Los Angeles – San Diego

Compared to the 2003 to 2012 baseline period, groundfish ex-vessel revenue would increase by $1.5 million (56 percent) in the Santa Barbara – Los Angeles – San Diego region in 2015. Combined commercial plus recreational fishery income impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by $0.2 million (-0.2 percent) under Recreational Option 1 and Option 2, but would decrease by $62 million (-53 percent) under Recreational Option 3.

The change in commercial fisheries-related employment would be projected to increase the average regional unemployment rate slightly under Alternative 2 (compared with the No Action Alternative) (based on 2012 county statistics).Combined commercial plus recreational fishery employment impacts in the port area under Alternative 2 would be projected to decrease compared with the No Action Alternative by 1 job (-0 percent) under Recreational Option 1 and Option 2, but would decrease by 1,198 jobs (-52 percent) under Recreational Option 3.

4.3.2.4 Processors

No Action Alternative

Under the No Action Alternative, total purchases of groundfish landings by shoreside processors of $82.6 million would be projected. This total would include projected purchases of $28.6 million of whiting and $54 million in deliveries of combined non-whiting groundfish species (Average ex-vessel values observed for groundfish deliveries in 2013 are assumed).

The Preferred Alternative

Projected impacts under the Preferred Alternative would be the same as under the Preliminary Preferred Alternative. Compared with the No Action Alternative, total groundfish purchases by processors under the Preferred Alternative would be projected to increase by $16 million (19 percent) in 2015 and by $18.5 million (22 percent) in 2016. Purchases of whiting would be the same as under the No Action Alternative, while deliveries of combined non-whiting groundfish species would increase by 30 percent in 2015 and 34 percent in 2016. These values describe the highest level of non-whiting groundfish and total groundfish purchases among the action alternatives.

The Preliminary Preferred Alternative

Compared with the No Action Alternative, under the Preliminary Preferred Alternative total groundfish purchases by processors are projected to increase by $16 million (19 percent) in 2015 and $18.5 million (22 percent) in 2016. Purchases of whiting are the same as under the No Action Alternative, while deliveries of combined non-whiting groundfish species increase by 30 percent in 2015 and 34 percent in 2016. These values describe the highest level of non-whiting groundfish and total groundfish purchases among the action alternatives.

Alternative 1

Compared with the No Action Alternative, total groundfish purchases by processors under Alternative 1 would be projected to increase by $8.8 million (11 percent) in 2015 and $11.3 million (14 percent) in 2016. Purchases of whiting would be the same as under the No Action Alternative, while deliveries of combined non-whiting groundfish species increase by 16 percent in 2015 and 21 percent in 2016. These values describe the second highest overall level of non-whiting groundfish and total groundfish purchases among the action alternatives.

Alternative 2

Compared with the No Action Alternative, total groundfish purchases by processors under Alternative 2 would be projected to decrease by $0.4 million (-1 percent) in 2015 and would increase by $1.8 million (2 percent) in 2016. Purchases of whiting would be the same as under the No Action Alternative, while deliveries of combined non-whiting groundfish species would decrease by 1 percent in 2015 and increase by 3 percent in 2016. These values describe the lowest overall level of non-whiting groundfish and total groundfish purchases among the action alternatives.

4.3.2.5 Effects of Alternative ACLs for Widow Rockfish and Pacific Whiting on the IFQ Fishery

In addition to the No Action Alternative and Preferred ACL alternatives of 1,500 mt for widow rockfish, the Council also considered 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 they have also historically been a midwater trawl target species along with yellowtail rockfish. Consequently, in conjunction with the TAC decision that will ultimately be 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 CP and mothership sectors, will be able to harvest their Pacific whiting allocations, and (2) the potential to expand opportunities in the non-whiting midwater trawl fishery for widow and yellowtail rockfish.

Effects of Alternative Pacific Whiting TACs on the Trawl Fishery

Table 4-178 shows a range of possible whiting sector allocations derived from an historical analysis of Pacific whiting harvest limits (OY, U.S. TAC) during 2005 to 2013. During most of this period, widow rockfish was managed under a rebuilding plan. In addition to the 2013 whiting allocation levels assumed in alternatives, four scenarios are shown: the lowest and highest values observed for each whiting sector during the 2005 to 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 scenarios are based on examination of "final" sector allocations during the 2005 to 2013 period (i.e., after all in-season reallocations). Consequently, the potential sector allocations shown do not necessarily adhere to the initial intersector allocation shares of the Pacific whiting commercial harvest guideline specified in the FMP (i.e., at-sea CPs 34 percent, at-sea motherships 24 percent and shorebased IFQ sector 42 percent [PFMC 2011]). The hypothetical whiting sector allocations shown are used to (1) 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 processors), and (2) estimate potential ex-vessel revenue impacts generated by the shoreside midwater trawl fishery for widow and yellowtail rockfish.

Shoreside sector Pacific whiting allocations shown in Table 4-178 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, which occurred in 2009. By comparison, the allocation assumed for the shoreside sector under the alternatives for 2015-2016 would be 85,697 mt, the original shoreside sector allocation in 2013.

Allocations under the alternative TACs for the whiting mothership sector would 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. The allocation assumed for the mothership sector under the alternatives for 2015-2016 would be 48,969 mt, the original mothership sector allocation in 2013.

Allocations under the alternative TACs for the CP 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 recorded in 2009. By comparison, the allocation for the CP sector assumed under the alternatives for 2015-2016 would be 69,373 mt, the original CP sector allocation in 2013.

Table 4-179 shows the potential whiting sector ex-vessel revenues associated with the range of Pacific whiting TAC alternatives shown in Table 4-178. Estimated potential revenues under the alternatives are also shown for comparison. Revenues would be projected by assuming all sectors take their entire allocation delivered at average 2013 shoreside ex-vessel prices. Values for the CP sector would be imputed to represent the equivalent ex-vessel revenue represented by the volume of whiting harvested by the sector.

Table 4-179 shows potential ex-vessel revenues for the three combined, non-Tribal, commercial whiting sectors, which would range 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 would range from $3.2 million to $23.2 million compared with a projected level of $12.8 million under the alternatives for 2015-2016. CP sector (equivalent) revenues under the whiting TAC scenarios would range from $4.7 million to $46.2 million, compared with $18.5 million projected under the alternatives for 2015-2016.

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 for 2015-2016. Based on patterns observed in the 2013 fishery, about 44 percent of shoreside whiting ex-vessel revenues would 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 would partially determine to what extent the shoreside IFQ trawl sector could conduct a midwater trawl fishery targeting on widow and yellowtail rockfish. Each commercial whiting sector would leverage its available widow rockfish (and the other bycatch species) to maximize Pacific whiting catch up to the sector's allocation. Having ensured that the bycatch requirements of the Pacific whiting harvest would be satisfied, additional widow rockfish quota available to the shoreside trawl sector would likely be used in the midwater fishery for widow rockfish and yellowtail rockfish.

Table 4-180 shows potential Pacific whiting catch by the three non-Tribal commercial whiting sectors under the different widow rockfish ACLs and intersector allocation options and two sets of assumed widow rockfish bycatch rates: (1) the average widow rockfish bycatch rate over 2005 to 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 4-180 indicate scenarios where the widow rockfish ACL would not be likely to constrain Pacific whiting harvest even under the "Highest plus 50 percent" Pacific whiting TAC option for that sector shown in Table 4-178. Conversely, the shaded cells indicate scenarios where the sector may be unable to harvest up to its "Highest plus 50 percent" Pacific whiting TAC option under the assumed widow rockfish ACL and bycatch rate.[60]

Under the higher assumed widow rockfish bycatch rate, the mothership and CP sectors may become limited by widow rockfish bycatch under both of the widow rockfish ACL alternatives. However, under the average assumed 2005 to 2011 widow rockfish bycatch rates, no sector appears to be potentially limited by widow rockfish bycatch under either of the widow rockfish ACL alternatives. 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 4-180 indicates the shoreside whiting sector appears not to be limited by widow rockfish bycatch under either widow rockfish ACL alternative. Assuming adequate widow bycatch has been allotted to take the shoreside sector's "Highest plus 50 percent" whiting allocation, Table 4-181 calculates potential maximum harvest and ex-vessel revenue available in a directed widow rockfish-yellowtail rockfish fishery under the widow rockfish ACL alternatives. Table 4-181 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 comparison, PacFIN landings data show that the 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 mt, 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.

Landings data from the midwater IFQ fishery in more recent years may indicate a much lower widow rockfish encounter rate than was evident in 2001 (Table 3-6). In 2001, the ratio of yellowtail rockfish landings to widow rockfish landings was approximately 0.85:1 (1,471 mt yellowtail to 1,729 mt widow). In 2013, the same ratio in an admittedly much smaller fishery was 1.8:1 (391 mt yellowtail to 214 mt widow). Using the 2013 landings ratio in place of the 2001 statistic implies that potential yellowtail rockfish landings and associated ex-vessel revenue in the midwater fishery may be more than double the amounts shown in Table 4-181.

[60] In recent years, largely due to the effectiveness of avoidance measures, widow rockfish bycatch has not imposed a constraint on the ability of the Tribal or non-tribal whiting fisheries to harvest their sector allocations of Pacific whiting.

Table 4-178. Range of potential Pacific whiting allocations by sector based on actual annual 2005 to 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). The potential sector allocations shown do not necessarily adhere to intersector allocation shares in the FMP.

Table 4-179. 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

* Assumes average 2013 shoreside ex-vessel prices and that all sectors take their entire allocations. Ex-vessel revenues for the CP sector represent the equivalent value of raw whiting harvested.

Table 4-180. Projected potential whiting catch at the average and maximum widow bycatch rates for whiting sectors during 2005 to 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 4-181. 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 to 2011 Whiting-Per Widow Bycatch Rate			Using Maximum 2005 to 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 to 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 one of the primary targets of the shorebased trawl fleet. In testimony to the Council, industry representatives stated that raising the ACL for Dover sole above the No Action Alternative level of 25,000 mt would increase vessel QP use caps for the stock and could help attract larger volume retail and food service outlets. The 50,000 mt ACL for Dover sole under the Preferred Alternative would result in a commercial fishery harvest guideline of 48,406 mt and an assumed allocation of approximately 45,981 mt to the shorebased IFQ sector.

To the extent that markets can absorb more Dover sole, a higher ACL may result in greater harvest levels and revenue. At some point, however, participants may not have sufficient QP for co-occurring target species (thornyheads, sablefish, etc.) and constraining overfished species that are caught with Dover sole, thus limiting harvesters' ability to target Dover sole freely.

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 4-39).

Figure 4-40 compares trends over the 2003 to 2012 period in ex-vessel 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. 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 ex-vessel 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 ex-vessel prices have been fairly flat and were slightly lower in 2012 than at the beginning of the time series in 2002.

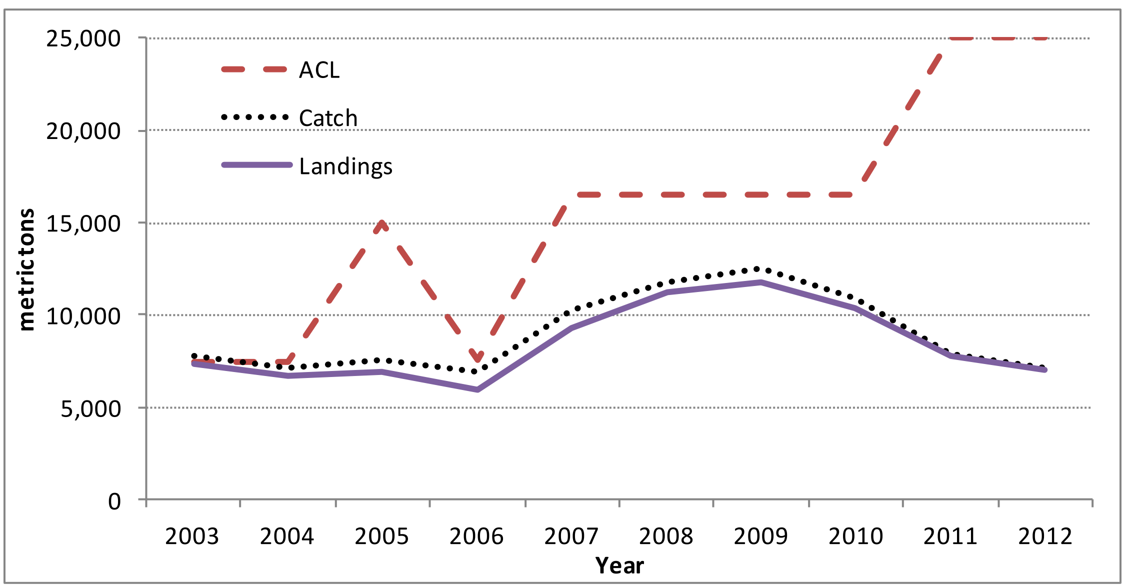

Figure 4-39. ACLs, catch and landings for Dover sole: 2003 to 2012.

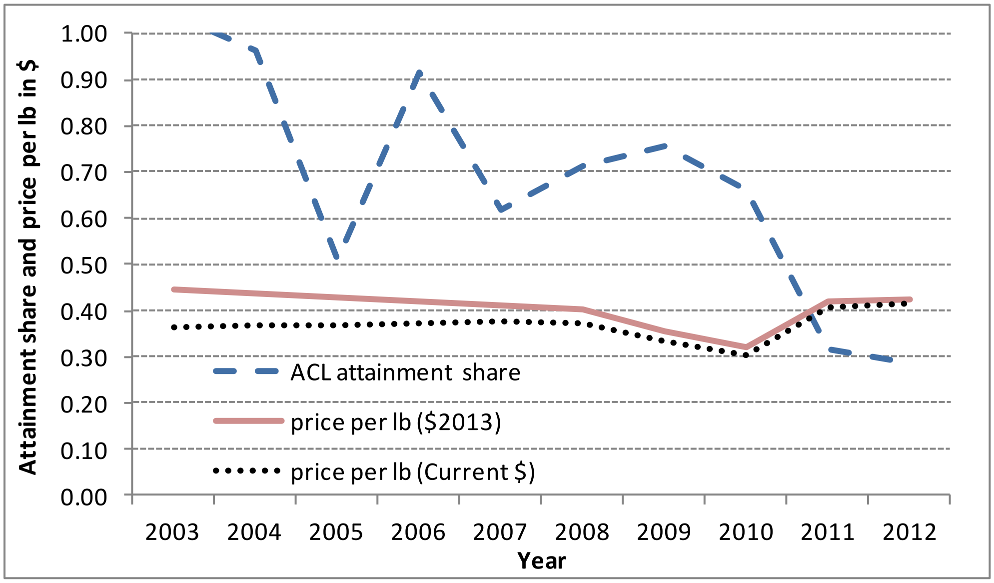

Figure 4-40. Attainment share (catch/ACL) and price per pound in current and inflation-adjusted $2013 for Dover sole: 2003 to 2012

4.3.2.7 Implications of Attainment Assumptions for Dover Sole and Widow Rockfish on IFQ Sector Revenues and Community Impacts

Revenue and income impacts for IFQ sector fisheries were generally modeled assuming that historic average 2011 to 2013 attainment rates (total QPs debited/sector allocation) would apply under the 2015-2016 alternatives. On average during 2011 to 2013, approximately 35 percent of the IFQ sector allocation of Dover sole and approximately 43 percent of the IFQ sector allocation of widow rockfish were debited as quota pounds caught. Applying these percentages to the IFQ sector allocations under the Preferred Alternative (Dover sole 45,981 mt, and widow rockfish 1,457 mt) would result in estimated catch of about 15,700 mt of Dover sole and about 600 mt of widow rockfish. In addition, approximately 2,450 mt of yellowtail rockfish would be projected to be landed under the Preferred Alternative by the IFQ sector. Assuming average 2013 ex-vessel prices of $970 per mt for Dover sole, $1,050 for widow rockfish, and $1,110 for yellowtail rockfish, these landings would generate ex-vessel values of approximately $15 million for Dover sole, $0.6 million for widow rockfish, and $2.7 million for yellowtail rockfish.

If larger shares of the IFQ sector allocations for these species could be caught and landed at the same ex-vessel price levels, however, then ex-vessel values would be correspondingly higher. As a polar case, if virtually the entire IFQ sector allocations of 45,981 mt for Dover sole and 1,457 mt for widow rockfish could be landed at the average 2013 ex-vessel prices, then ex-vessel revenues of approximately $44 million for Dover sole and $1.5 million for widow rockfish would be realized. Increased landings of widow rockfish in the midwater fishery would also leverage increased landings of yellowtail rockfish. Applying the 2013 landings ratio of 1.8 mt of yellowtail rockfish per mt of widow rockfish implies that the additional 857 mt of widow landings would be accompanied by up to 1,500 mt of additional yellowtail rockfish landings. Valued at the average 2013 ex-vessel price for yellowtail rockfish,

These calculations ignore the possible effects of decreased ex-vessel prices with increasing harvests and difficulties associated with catch of other co-occurring species. The likely increases in catch of overfished species and co-occurring target species (other than yellowtail rockfish) are not accounted for in these simple calculations. It is uncertain whether existing allocations of constraining overfished species or target species such as sablefish would be sufficient to allow attainment of the entire IFQ sector allocation of Dover sole, or to what degree harvesters would prioritize using relatively scarce and valuable sablefish quota to leverage increased harvests of Dover sole.

Most of the potential increases in ex-vessel revenue and associated income and employment impacts resulting from increased landings of Dover sole, widow rockfish, and yellowtail rockfish would accrue to port areas with involvement in trawl IFQ fisheries. Based on 2013 landing patterns, the three port areas with the highest involvement in the shorebased whiting fishery are Newport (45 percent), Astoria (34 percent) and Washington Coast (Westport: 21 percent). The seven port areas with greatest involvement in non-whiting trawl IFQ fisheries are Astoria (37 percent), Coos Bay (16 percent), Eureka (10 percent), Newport (9 percent), Fort Bragg (8 percent), Brookings (6 percent) and Washington Coast (Westport: 6 percent).

4.3.3 Summary of the Socioeconomic Impacts of New Management Measures

As part of the 2015-2016 biennial process, the Council adopted several new management measures. As discussed elsewhere, new management measures are those that are not designated as routine. Once designated routine, management measures may usually be adjusted through an abbreviated rulemaking process. Appendix B contains detailed descriptions and analysis of management measures that would be used with the Preferred Alternative, including new measures. These measures are also summarized in Section 2.1.2. Only the measures adopted as part of the Preferred Alternative are evaluated below.

4.3.3.1 Changes to Rockfish Conservation Area Coordinates (Appendix B, Section B.1)

The change proposed under the action option may have a marginal socioeconomic benefit for the shoreside trawl fishery because harvesters could access higher concentrations of petrale sole compared to the No Action Alternative. The change in management costs, primarily those associated with enforcement of the RCA boundaries, would be minimal under the proposal. The compliance with the depth contours would be monitored with VMSs that are currently required on all groundfish vessels.

4.3.3.2 Within Non-trawl: Two-year Yelloweye Sharing – Evaluating Uncertainty of Yelloweye Catches in the Nearshore and Non-nearshore Commercial Fixed Gear Sectors (Appendix B, Section B.4)

The Council Final Preferred Alternative recommendation may provide increased opportunities for the commercial nearshore sector. These Final Preferred Alternative recommendations include the following: (a) move the shoreward non-trawl RCA in northern California from 20 fm to 30 fm (projected to increase yelloweye mortality by +0.3 mt), (b) allow Oregon landings of black rockfish to reach their current landing limit of 138.7 mt (projected to increase yelloweye mortality by +0.1 mt relative to PPA), and (c) adopt increased commercial lingcod trip limits for commercial non-trawl sectors (projected to increase yelloweye mortality by +0.1 mt). The net result is a projected yelloweye buffer for the nearshore sector of 0.1 to 0.2 mt for 2015 and 2016, respectively.

4.3.3.3 Within Non-trawl: Consideration of State-specific Minor Nearshore Rockfish Harvest Guidelines North of 40°10' N. Latitude (Appendix B, Section B.5)

Four options for allocating the Minor Nearshore Rockfish complex north of 40°10' N. latitude among the three states were initially considered: 1) the No Action Alternative, 2) by miles of coastline in each state north of 40°10' N. latitude, 3) recreational and commercial historical catch in each state from 2004 to 2012, and 4) a hybrid allocation method which uses miles of coastline for copper, China, and quillback rockfishes and historical catch from 2004 to 2012 for the remaining species. At the Council's June 2014 meeting the Preferred Option was selected. The Minor Nearshore Rockfish state HGs under the Preferred Option are 10.5 mt for the state of Washington, 48.4 mt for the state of Oregon and 23.7 mt for the state of California. The overarching purpose of this measure is to facilitate state-level fishery management while keeping mortality at or within the complex's ACL.

The Council chose a preferred option after the June 2014 meeting, which was incorporated into the Preferred Alternative, detailed in Appendix B.5 and is shown in Table 2-6. The GMT modeled various management measures for commercial and recreational fisheries for each option to estimate total mortality of target species in the complex.

For nearshore commercial fisheries, these estimates were then converted to landings and ex-vessel revenue using average ex-vessel value per landed round weight pound observed in 2013. Ex-vessel revenue impacts were distributed to likely landings ports (port areas) using the 2013 distribution of minor nearshore rockfish landings in port areas north of $40^0 10'$ North latitude. The projected ex-vessel revenue impacts were translated into income impacts by applying IO-PAC commercial fishery income impact coefficients for West Coast port areas. Where available, the GMT's projections for recreational angler effort (number of angler-trips) under the relevant HG options were translated into income impacts using IO-PAC recreational fishery income impact multipliers for angler-trips originating from West Coast port areas.

Descriptions and analysis of the HG options are reported in Appendix B, Section B.5.2. Projected economic impacts on commercial and recreational groundfish fisheries are described in June 2014 Agenda Item F.7.a Supplemental Attachment 9 (See: http://www.pcouncil.org/wp-content/uploads/F7a_SUP_Att9_HGEcon_JUNE2014BB.pdf).

4.3.3.4 Non-trawl: Lingcod Trip Limit Increases (Appendix B, Section B.7)

Lingcod catch has been managed, in part, by cumulative bimonthly trip limits designed to keep catches within the respective ACLs. Trip limits may be adjusted inseason as a result of inseason tracking patterns (higher/lower than projected). This applies to lingcod taken in both the non-nearshore (all three states) and nearshore fisheries (Oregon and California only). Attainment of the lingcod ACL has been low in previous biennial periods; increasing the trip limits for these fisheries increases fishing opportunity, potentially increasing ACL attainment.

The intent of the Council-preferred Option 2a (Appendix B, Section B.7.) is to allow retention and landings of lingcod that would otherwise be discarded during the closed season, in addition to increasing trip limits during the currently open season to increase attainment of the non-trawl allocation. Under this option north of 40°10' N. latitude, the LE sector would have a 200-pound (lb) trip limit per two months for periods 1 and 2 and a 200-lb trip limit for December. This sector would also have a 1,200-lb trip limit for periods 3 through 5 and a 600-lb trip limit in November. South of 40°10' N. latitude, the LE sector would have a 200-lb per two-month limit for periods 1 and a 200-lb limit for December. The sector would continue to have an 800-lb per two-month limit for periods 3 through 5 and a 400-lb limit for November. Period 2 would remain closed.

For the OA sector north of 40°10' N. latitude, the monthly trip limit would be 100 lb during periods 1 and 2 and 100 lb in December. Additionally, this sector would have a 600-lb monthly trip limit for periods 3 through 5 and November. For the OA sector south of 40°10' N. latitude, a 100-lb per month trip limit would apply for period 1 and for December. Period 2 would remain closed, and all the other months would continue to have a 400-lb per month trip limit.

The action alternatives would have a positive socioeconomic benefit through increases in ex-vessel revenue. Allowing fishery participants to retain incidentally encountered lingcod that were previously discarded would increase revenue from current operations targeting other species with incidental lingcod encounters. In 2013, the average price per pound coastwide averaged $2.50 per pound. This amount, applied to the projected increase (approximately 102,000 lb) would result in a coastwide gross estimated ex-vessel increase of approximately $255,000. While 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 trip limits cannot be attained, if fuel or other variable costs make it unprofitable, or if, alternatively, opportunity costs are too high to justify changing targets, directed effort may not be economically viable, and trips targeting lingcod may be unlikely. However, some vessels do target lingcod on some trips, so any increase would benefit these participants. Economic effects of catch projections under trip limit increases for lingcod are incorporated in the overall estimated impacts described for the Preferred Alternative, Alternative 1, and Alternative 2.

4.3.3.5 Non-trawl: Allow Lingcod Retention in Periods 1, 2, and 6 (Appendix B, Section B.8)

Under the No Action Alternative, lingcod retention would be prohibited from November to April (periods 1, 2, and part of 6) for both limited entry and open access fixed gear fisheries. This prohibition was implemented in the 1990s to minimize catch of lingcod during their spawning season to help rebuild the stock, which was overfished at that time. The stock was declared rebuilt in 2009, and catch has been well below the ACL. Therefore, the Council decided that this conservation measure was no longer needed.

Under the No Action Alternative, lingcod caught as bycatch during the closed months of the fishing season would be discarded, and revenues from landing them would be forgone by participants in the fishery. In addition, no targeted fishery for lingcod would be permitted during the closed months, preventing effort from being exerted to increase attainment of the ACL, resulting in foregone revenue from directed effort. Thus, fishery participants and coastal communities will continue to forego potential revenue from converting lingcod discards to landings. Allowing retention during the currently closed period under the Preferred Alternative, Alternative 1, and Alternative 2 could potentially increase ex-vessel revenue over the No Action Alternative if it would result in greater attainment of the fixed gear allocations.

Under the action alternatives, the prohibition on lingcod retention in periods 1, 2, and 6 would be removed, and trip limits would be increased for both limited entry and open access fixed gears (Appendix B, Section B.7 and Section B.8). Allowing fishery participants to retain incidentally encountered lingcod that were previously discarded would increase revenue from current limited entry and open access operations, primarily the nearshore fishery, 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 could be attained. While the low trip limits (200 lb/mo for limited entry and 100 lb/mo for open access) make it unlikely that fishery participants would choose to target lingcod, such targeting may become worthwhile should the price per pound make the trip profitable, despite the relatively low trip limits. If the trip limit cannot be attained, if fuel or other variable costs make it unprofitable, or ,alternatively, if opportunity costs are too high to justify changing targets, directed effort may not be economically viable, and trips targeting lingcod may be unlikely. Economic effects of catch projections of lingcod under the different closure periods are incorporated in the overall estimated impacts described for the Preferred Alternative, Alternative 1, and Alternative 2.

4.3.3.6 Non-trawl: Trip Limit Adjustments for Shortspine Thornyhead N., Bocaccio S., and Shelf Rockfish S. (Appendix B, Section B.9.)

The preferred option would be to maintain the 2014 shortspine thornyhead trip limits for the limited entry sector north of 34°27' N. latitude. The OA sector would remain closed. Inseason adjustments could be recommended to attain the non-trawl HG. Higher trip limits for shortspine thornyhead could increase access to healthy stocks, resulting in increased ex-vessel value over the No Action Alternative, 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 would represent a bycatch amount of the sablefish fishery. The latest anecdotal information received from the industry regarding the 2014 sablefish fishery indicates that demand may experience an upswing, which could result in increased mortality of thornyheads.

For bocaccio and Minor Shelf Rockfish, moderate increases were explored south of 34°27' N. latitude to accommodate increased encounters and minimize discarding as the stock continues to rebuild. Higher trip limits for bocaccio may convert discards into retained fish, thus increasing landings, resulting in increased ex-vessel value, although the amount is difficult to quantify over the No Action Alternative. Changes as a result of this action may not have a large effect on the sectors as a whole, but could be important to some individuals in each sector. Higher trip limits for Minor Shelf Rockfish 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 important to some individuals in each sector.

The combined effect of the Preferred Alternative, which would incorporate the Preferred Option described in Appendix B, would be an expectation that fishery participants would attain higher revenues than under the No Action Alternative.

4.3.3.7 Non-trawl: Coastwide Sablefish Trip Limits (Appendix B, Section B.10.)

Under the Preferred Alternative, the non-trawl RCA structure would be the same as under the No Action Alternative and DTL trip limits in the north are generally higher under Preferred Alternative than for The No Action Alternative. The amount of landed catch projected is consistently higher under the Preferred Alternative than The No Action Alternative; higher, due to the higher trip limits. Higher trip limits for sablefish result in increased ex-vessel value over The No Action Alternative.

4.3.3.8 Recreational: Canary Rockfish Sub-Bag Limit in Oregon Fisheries (Appendix B, Section B.11)

Canary rockfish stock abundance is relatively uncertain, but abundance estimates could be improved if recreational groundfish fishery data were available. For recreational catch data to be able to contribute to future canary rockfish stock assessments, some retention of canary rockfish would have to be permitted. The analysis (Appendix B, Section B.11) demonstrates that allowing retention of canary rockfish in the recreational fishery would be impact neutral (i.e., would not change the projected stock rebuilding time) since canary rockfish currently caught are discarded with a relatively high mortality rate. A sub-bag limit would be created under the miscellaneous groundfish daily bag limit, which includes rockfish, cabezon, greenlings, and elasmobranchs.

Relative to the No Action Alternative, this management measure that is included under Preferred Alternative, Alternative 1, and Alternative 2 may have positive socioeconomic benefits if the degree of opportunity to retain canary rockfish would improve the recreational fishing experience. Economic effects of the option to retain a small amount of canary rockfish in recreational fisheries have been incorporated in the estimated impacts of the Preferred Alternative, Alternative 1, and Alternative 2.

4.4 Impacts of 2015-2016 Harvest Specifications and Management Measures on Essential Fish Habitat

4.4.1 Impact Mechanism

Setting harvest specifications does not directly affect groundfish EFH or EFH for species managed under other West Coast FMPs (CPS, HMS, or salmon). An analysis of groundfish trawl logbook data does not reveal any clear relationship between catch limits and fishing effort (Appendix A). As discussed in Section 3.3.3.3, fishing effort in the shoreside trawl fishery has declined substantially since 2010 while catch has generally increased. This change in fishing effort is likely a function of the introduction of trawl rationalization and related changes in fishery operations. Under the trawl fishery's Shorebased IFQ Program, trawl vessels are permitted to use fixed gear to harvest IFQ (gear switching). Shifts from trawl gear to fixed gear have occurred. Non-nearshore fixed gear fishery participation has remained relatively stable, while nearshore fixed gear fishery participation has declined (Section 3.2.3). The analysis of trawl logbook data presented in Section 3.3.3.3 suggests that there are fewer vessels participating in the trawl fishery. Alternative harvest specifications proposed for the 2015-2016 biennial period are indistinguishable with respect to the effect on EFH. To the degree that the amount and spatiotemporal distribution of gear-specific fishing effort does not change from historical patterns, adverse impacts on EFH from the groundfish fishery are likely to be equivalent to the historical impacts described in Section 3.3, which serves as a proxy for describing the impacts of the No Action Alternative (summarized in Section 4.4.2.1).

Under the No Action Alternative, a combination of gear restrictions, effort reduction, and closed areas would be implemented to protect a broad range of habitat types and species, as well as providing protection. The actions include the following: (1) footprint closure in which bottom trawling would be prohibited seaward of 700 fathoms, (2) a ban of dredge gear, (3) a ban of beam trawl gear, and (4) a ban of trawl roller gear greater than 19 inches. These measures remain in place under all of the alternatives. Under the No Action Alternative, approximately 4.51 percent of the EEZ would be designated as HAPC, which would equate to 3,711,978 hectares (ha) (10,822 square miles). Reducing fishing effort would mitigate the effects of fishing on EFH should the aerial or temporal extent of gear contact with EFH be reduced. Although the rationale for measures that result in capacity reduction may be to prevent overfishing, reduce bycatch, or increase economic efficiency, they may have a corollary mitigating effect for EFH impacts.

The proposed action would indirectly mitigate adverse impacts on EFH from fishing by using time/area closures. As discussed in Section 3.3, GCAs, established as top-down measures to reduce bycatch of overfish species, would have an ancillary mitigating impact on the adverse impacts of groundfish fisheries on EFH by prohibiting fishing within these areas.[61] If an area were closed for an extended period, the EFH within it might recover from these adverse impacts. Estimates of recovery times for EFH are shown in Table 3-30 by habitat and gear type causing the impact. These range from less than a year to decades. Although the maximum recovery time shown in the table is 56 years (the upper end of the range of recovery times for offshore biogenic habitat impacted by trawl gear), estimates range into centuries for some deepwater coral species.

[61] Other closed areas, principally EFH Conservation Areas, were established with the objective of mitigating such impacts or (in the case of MPAs) addressing a variety of objectives closely related to habitat protection. However, establishing or modifying these areas is not part of the proposed action.

4.4.2 Summary of the Impact of the Alternatives on Essential Fish Habitat

4.4.2.1 The No Action Alternative

Under the No Action Alternative, the harvest specifications and management measures in place in 2014 would continue in effect, although inseason action could be taken to adjust routine management measures. This would include the change to the trawl RCA implemented in April 2014 (79 FR 21639), described in Section 3.3.3.2. The characterization of the environmental baseline in Section 3.3 is the best available summary of the impact in the future because there are no models or methodology available to estimate the amount and spatial distribution of fishing effort and, thus, effects on EFH resulting from the proposed action. Using information about the environmental baseline, the following possible effects are noted:

- Based on historical trends, fishing effort in the bottom trawl portion of the shoreside IFQ fishery is not likely to increase. Bottom trawl effort fell substantially with the implementation of IFQ management (Figure 3-22). Bottom trawl gear has greater adverse impacts to groundfish EFH compared to other gear types.
- A portion of the shoreside IFQ fishery is using fixed gear to catch its IFQ. Fixed gear has less adverse impact on groundfish EFH compared to bottom trawl. Hard substrate (rocky habitat) is more accessible to fixed gear, but recovery times are shorter for fixed gear even in comparison to bottom trawl gear for soft substrate, which is generally rated to recover faster from the adverse impacts of fishing.
- In 2014, NMFS partially implemented a Council recommendation to modify the size of the trawl RCA between 40°10’ N. latitude and 48°10’ N. latitude. The environmental baseline now includes the trawl activity in these open areas for the remainder of 2014. Under the No Action Alternative, trawl fishing would continue to be permitted in these areas.

The Preferred Alternative

Mitigating measures adopted under Amendment 19 and in place under the No Action Alternative would remain in place under the Preferred Alternative. As discussed in Section 4.4.1, a correlation between the size of target species ACLs and bottom-trawl fishing effort estimated from logbook data could not be identified. Under an IFQ program, however, it is reasonable to assume that the most efficient vessels remain in the fishery. With the added flexibility and reduction in the competitive nature of the fishery, it is reasonable to assume that the amount of fishing effort would be reduced since the start of the IFQ program in 2011 under all of the alternatives. At some level of magnitude, it is reasonable to conclude that fishing opportunity, dictated overall by ACLs and mediated by sector allocations and related management measures, would affect fishing effort.

A crude way of representing the difference between Alternative 1 and the No Action Alternative is looking at the difference between the sum of all the ACLs under each alternative. The sum of Alternative 1 ACLs for 2015 (not including Pacific whiting) would be 44,736 mt greater than the No Action Alternative, a 53 percent increase. Put another way, out of the 38 stocks for which ACLs are established and a comparison can be made with the No Action Alternative, 25 would show an increase from the No Action Alternative.[62] However, 25,000 mt of this difference in the ACL is represented by the increase in the Dover sole ACL; as discussed in Section 4.3.2.6, there is not enough historical evidence to demonstrate that this increase would be accompanied by a comparable increase in catch. The sum of the non-whiting ACLs for 2015, 129,060 mt, would be larger than summed values for any year during the baseline period, during which the largest value was 119,371 mt. The stock definitions for which individual ACLs are set have changed over time. Thus, while these sums are not exactly comparable, at

[62] Because spiny dogfish is removed from the Other Fish complex, which has further changes through the designation of EC species, only 38 out of 40 ACLs for the 2015-2016 biennium can be compared.

this gross scale, the changes in the recent past have probably not substantially affected fishery behavior by themselves. While no conclusion can be made about how ACLs and resulting fishing opportunity may affect the distribution of fishing effort, it is reasonable to conclude that fishing effort would be more likely to increase over the No Action Alternative than to decrease. Even with increases to the Dover sole ACL, measurable impacts on EFH would likely be lower than those considered in the 2005 EFH designation for the fishery, as bottom trawl effort has fallen substantially since 2005 due to implementation of the IFQ program (Figure 3-22). The difference between the magnitude of adverse effects on EFH caused by various gear types and the estimated recovery times would be the same as those under the No Action Alternative.

Under the Preferred Alternative, the trawl RCA boundary as implemented in April 2014 would continue in place for the 2015-2016 biennium, with the exception of a change in the seaward RCA line between 40°10' N. latitude and 45°46' N. latitude, where the modified 200-fm line would be in place year round. The trawl RCA configuration in the area north of 40°10'. N. latitude varies somewhat during the year with a maximum extent of 75 to 200 fm (Table 3-28). Because of the long-term RCA closures, it was determined substantial recovery of EFH within the long-term closed areas has likely occurred in the absence groundfish bottom trawling (Table 3-30). Until the Council's current EFH review analysis is completed, the importance of the habitat within the area to the diverse array of groundfish stocks is unclear. The impacts on EFH relative to RCA configurations would likely be similar to the No Action Alternative. An environmental assessment titled "Trawl Rockfish Conservation Area (RCA) Boundary Modifications," was prepared for the April 2014 trawl RCA changes (http://www.westcoast.fisheries.noaa.gov/publications/nepa/groundfish/misc_ea/rca_ea_3_4_14.pdf).

4.4.2.2 Alternative 1

Under the No Action Alternative, there are 10 stocks where the ACL would be set equal to the ABC and a P* value less than 0.45 would be used. Under Alternative 1, the P* value used would be 0.45 in all cases, indicating a policy change from the No Action Alternative (however, six of these stocks have ACLs set for geographic subdivisions of a coastwide value, so effectively the P* policy choice would only come into play in seven cases). Otherwise, ACLs would be expected to increase in cases where spawning stock abundance is increasing. The sum of the 2015 ACLs under Alternative 1 would be 106,733 mt; the main difference from the Preferred Alternative is that the No Action Alternative ACL of 25,000 mt would apply under Alternative 1, rather than the Preferred Alternative ACL of 50,000 mt. A Dover sole ACL that would be 25,000 mt lower than the Preferred Alternative may not result in substantial differences in bottom-trawl effort in 2015-2016. Increases would largely depend on marketability. As with the Preferred Alternative, measurable impacts to EFH would likely be lower than those considered in 2005 under Amendment 19, the EFH designation for the fishery, as bottom-trawl effort has fallen substantially since 2005 due to implementation of the IFQ program (Figure 3-22). In addition, measures to minimize adverse impacts were implemented. As with the No Action Alternative, the trawl RCA boundary implemented in April 2014 would continue in place for the 2015-2016 biennium under Alternative 1, with mitigating effects equivalent to the No Action Alternative.

4.4.2.3 Alternative 2

Under the No Action Alternative, there would be 25 stocks where the ACL would be set equal to the ABC based on a P* value. Under Alternative 2, the P* value used would be 0.25 in all cases, indicating a policy change from the No Action Alternative (however, six of these stocks would have ACLs set for geographic subdivisions of a coastwide value, so, effectively, the P* policy choice would come into play in 22 cases). The sum of the 2015 ACLs under Alternative 2 would be 82,512 mt, which would be 1,814 mt lower than the sum of the No Action Alternative ACLs. At a gross level, this suggests that fishing opportunity, fishing effort, and resulting adverse impacts on EFH would not likely increase compared to the No Action Alternative.

As with the Preferred Alternative and Alternative 1, the trawl RCA boundary as implemented in April 2014 would continue in place for the 2015-2016 biennium under Alternative 3, with mitigating effects equivalent to the No Action Alternative.

4.5 Impacts of 2015-2016 Harvest Specifications and Management Measures on the California Current Ecosystem

As discussed in Section 4.12, Kaplan (2014, reproduced in Appendix A) used the Atlantis California Current Ecosystem Model to evaluate the harvest policies proposed in the Amendment 24 alternatives to simulate and evaluate food web impacts of groundfish fisheries. As discussed by Kaplan, direct and indirect impacts only begin to manifest themselves over the long term (i.e., a simulation period of 30 years). The extent to which climate change impacts may affect Atlantis model simulations, or the resulting inferences in the model results on various management alternatives, is not yet fully understood. Ongoing changes to the model to improve evaluation of these impacts continue to be developed. While the 2015-2016 alternatives are broadly similar to the Amendment 24 Alternatives used to evaluate long-term impacts, they would only be relevant with respect to ecosystem impacts if they were kept in place for a longer time than 2 years. However, the whole purpose of the biennial process is to adjust harvest specifications and management measures adaptively in light of new information about the status of stocks. The Council may also study broader effects, such as indirect and cumulative ecosystem effects, when it considers biennial adjustments to harvest specifications and management measures. Since 2012, the Council has been receiving annual reports from NOAA's California Current Integrated Ecosystem Assessment Program to support such considerations.

The Atlantis simulation compared groundfish removals to a recent average catch benchmark to evaluate a broad range of potential harvest policies encompassing the alternatives considered in this EIS. Only at very high catch levels, higher than would be allowed under any of the alternatives for this action, would the food web be substantially affected by this action.[63]

Under the 2015-2016 harvest specifications and management measures component of this action, Alternative 1 would be expected to result in the greatest fishery removals of target and bycatch species from the CCE, which means that it would have the greatest negative impact on the health and function of the CCE. Alternative 2 is the most conservative action alternative for this component, and it would result in both lower overall fishery removals and lower impacts on the health and function of the CCE compared to the No Action Alternative. The Preferred Alternative would allow the Council to adjust fishery management measures as necessary and would be expected to have higher fishery removals than Alternative 2 and lower fishery removals than Alternative 1. Given the current limitations of the Atlantis ecosystem model, it is uncertain, but it is inferred, that all three of the action alternatives and the No Action Alternative would be expected to result in fishery removal levels lower than the levels at which food web function would be affected by this action.

Under the stock complex reorganization and designation of EC Species component of this action, the Preferred Alternative for restructuring the other fish complex and bringing new species into the FMP as EC species would be expected to result in more information becoming available about harvest levels of previously mixed or unidentified stocks. All of the stocks considered in the reorganization are stocks for which NMFS has relatively little information about life histories, historic abundance levels, and roles within the ecosystem. Bringing new species into the FMP as EC species may provide scientists and managers more data about these species than under the No Action Alternative. Better and more abundant data on individual species within the ecosystem can help NMFS to better assess the ecosystem condition as a whole and to better manage human activities within the ecosystem.

The Amendment 24 (default HCRs and management measure process) component of this action features alternatives for setting the harvest rates detailed in the action alternatives for the 2015-2016 harvest specifications as the default rates for 2017 and beyond. The effects of the alternatives under this component would be the same as those under the 2015-2016 harvest specifications, although they would

[63] Theevaluation is relative to baseline conditions. Section 3.4.3 reviews another Atlantis simulation (Kaplan et al. 2012) that evaluated food web effects of fisheries relative to an unfished state.

be more likely to have measurable effects on the roles of groundfish within the CCE over the long term. Although Alternative 2 would be least likely to have a notable effect on CCE health and function, the differences between the other action alternatives (Alternative 1 and the Preferred Alternative) and Alterative 2 over the long term would depend largely on whether the groundfish fisheries would actually attain allowable harvest levels. If groundfish fisheries were to continue to under-attain allowable harvest levels, the actual effects of fisheries removals on the CCE would be less notable than the expected effects of fully harvesting any of the allowable harvest levels under any of the action alternatives. For additional information on the impacts of setting harvest specifications on the CCE, see Section 4.12.

4.6 Impacts of 2015-2016 Harvest Specifications and Management Measures on Protected Species

Setting harvest specifications does not directly affect protected species. Furthermore, an analysis of groundfish trawl logbook data does not reveal any clear relationship between catch limits and fishing effort (Appendix A). As discussed in Section 3.3.3.3, fishing effort in the shoreside trawl fishery has declined substantially since 2010, while catch has generally increased. Equivalent information is unavailable for fixed gear fisheries. Section 3.2.3 reports participation trends in groundfish fixed gear and trawl fisheries during the baseline period. Non-nearshore fixed gear fishery participation has remained relatively stable, while nearshore fixed gear fishery participation has declined. The trend in effective fishing effort is not directly related to participation, but it is unlikely that fishing effort increased during the baseline period (2003 to 2012). Alternative harvest specifications proposed for the 2015-2016 biennial period are indistinguishable with respect to effects on protected species. To the degree that the amount and spatiotemporal distribution of gear-specific fishing effort does not change from historical patterns, adverse impacts on protected species from the groundfish fishery are likely to be equivalent to the historical impacts described in Section 3.5, which serves as a proxy for describing the impacts of the No Action Alternative.

NMFS has prepared ITSs for species listed under the ESA and taken in groundfish fisheries. A biological opinion for salmonids was prepared in 1999 (NMFS 1999) and supplemented in 2006 (NMFS 2006). Based on these biological opinions, the expected level of take the Pacific whiting fishery is 11,000 Chinook salmon per year and 9,000 Chinook salmon in the bottom trawl fishery (NMFS 2006). Bycatch of other salmonid species is modest, so no specified threshold was established for any other salmonid. On January 22, 2013, NMFS requested the reinitiation of the biological opinion for listed salmonids to address changes in the fishery occurring since implementation of the trawl rationalization program, including the emerging midwater trawl fishery. More recently, the best available information also indicates that the 2014 Pacific whiting fishery exceeded the 11,000 Chinook and 0.05 Chinook salmon/mt whiting reinitiation triggers. Accordingly, the reinitiated consultation will also address that exceedance.

Increases in widow rockfish and shortbelly rockfish ACLs under the Preferred Alternative may allow increased fishing with midwater gear, which would have the potential to increase catch of salmonids species over the No Action Alternative. The amount of increase, if any, would depend on a variety of factors. These include, but are not limited to, the effort shift from bottom trawl to the midwater gear and the availability of salmonids to intercept (time and area overlap with target species). Because trawl vessels have full observer coverage (all vessels currently carry observers on all trips), incidental catch would be monitored to determine whether reinitiation thresholds identified in the current ESA Section 7 biological opinion for the groundfish fishery would be exceeded. Alternative 1 and Alternative 2 impacts would likely be similar to the No Action Alternative.

A biological opinion for take of other listed species by the groundfish fishery was prepared in 2012 (NMFS 2012a). NMFS's PRD initially found that, of the listed species occurring in the ESA action area, the continued operation of the groundfish fishery could adversely impact the eulachon southern DPS, southern DPS of green sturgeon, humpback whales, Stellar sea lions, and leatherback sea turtles. The eastern Stellar sea lion DPS was subsequently delisted. Section 3.5.2.2 describes the ITS from this biological opinion. At this time, there is no information to indicate the fishery has changed in a way such that these ITS levels are likely to be exceeded during the next biennial period. Under the terms and conditions in the biological opinion, NMFS established a PCGW in cooperation with USFWS and the Council. The PCGW held its second meeting in February 2014. If new information shows that the levels specified in the ITS have been exceeded, NMFS will reinitiate consultation and develop any necessary mitigation measures through that process.

Increases in widow rockfish and shortbelly rockfish ACLs under the Preferred Alternative may allow increased fishing with midwater gear, which would have the potential to increase catch of eulachon over the No Action Alternative. The amount of increase, if any, would depend on a variety of factors. These include, but would not be limited to the effort shift from bottom trawl to midwater gear and the availability of eulachon to intercept (time and area overlap with target species). Because trawl vessels have full observer coverage (all vessels currently carry observers on all trips), incidental catch would be monitored to determine whether reinitiation thresholds identified in the current ESA Section 7 biological opinion for the groundfish fishery would be exceeded. Alternative 1 and Alternative 2 impacts would likely be similar to the No Action Alternative.

NMFS initiated a Section 7 consultation with the USFWS for species in its area of responsibility. USFWS concurred with NMFS's conclusion (NMFS 2012b) 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, as part of 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 2012). The final rule implementing these requirements is pending.

Section 3.5.3 summarizes available information on marine mammals protected by the MMPA, but not listed under the ESA. Estimates of total human-caused serious injury/mortality are below the PBR for all these stocks (Carretta et al. 2013). The WCGOP reports observed interactions with marine mammals (Jannot et al. 2011). 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 would not prevent these stocks from reaching their optimum sustainable population level. There is no information to indicate that continued operation of the fishery in the 2015-2016 biennial period would lead to an increase in serious injury/mortality of non-ESA-listed marine mammals. The sablefish ACL (Preferred Alternative and Alternative 1) increase over the No Action Alternative may result in increased fixed gear effort (longline and pot). Because the fishery primarily occurs in deep water, it would not be expected to result in measureable increases in cetacean interactions compared to the No Action Alternative.

Section 4.13 reviews information on the impacts of the groundfish fishery on seabirds not listed under the ESA. Of the species observed taken in the groundfish fishery (Jannot et al. 2011) the black-footed albatross is listed as Vulnerable on the International Union for the Conservation of Nature (IUCN) Red List, the sooty shearwater is listed as Vulnerable, and the northern fulmar is listed as Near Threatened (these are global assessments, and regional population status may differ). As shown in Table 3-42, groundfish fisheries are estimated to take a maximum of 93.5 black-footed albatrosses annually and 1.7 northern fulmars. There is no information to indicate that continued operation of the fishery in the 2015-2016 biennial period would lead to an increase in the take of non-ESA-listed seabirds.

4.6.1 Summary of the Impacts of the Alternatives

<u>No Action Alternative</u>: There is no information to conclude that protected species take would differ substantially from the average level of takes during the baseline period. A substantial increase in the level of take would trigger action under applicable law to mitigate any increased take, if necessary.

Based on the current biological opinion, the expected level of take the Pacific whiting fishery would be 11,000 Chinook salmon per year and 9,000 Chinook salmon in the bottom-trawl fishery (NMFS 2006). Bycatch of other salmonid species would be modest, so no specified threshold was established. A biological opinion for take of listed non-salmonid species by the groundfish fishery was prepared in 2012 (NMFS 2012a). NMFS's PRD initially found that, of the listed species occurring in the ESA action area, the continued operation of the groundfish fishery could adversely impact the eulachon southern DPS, southern DPS of green sturgeon, humpback whales, Stellar sea lions, and leatherback sea turtles. The eastern Stellar sea lion DPS was subsequently delisted. Under the terms and conditions in the biological opinion, NMFS established a PCGW in cooperation with USFWS and the Council. If new information shows that the levels specified in the ITS have been exceeded, NMFS will reinitiate consultation and develop any necessary mitigation measures through that process.

Preferred Alternative: There is no information to conclude that protected species takes would differ substantially from the No Action Alternative. While no conclusion can be made about how ACLs and resulting fishing opportunity may affect the distribution of fishing effort, it is reasonable to conclude that fishing effort would be more likely to increase than to decrease. Increase in midwater trawl effort as a result of higher widow and shortbelly rockfish ACLs may result in increased encounters with eulachon, salmonids, and some marine mammal species. Observer data would be used to evaluate the impacts relative to the incidental take limits. Increased sablefish allocations may result in modest increases in fixed gear fishing effort. Because the fishery occurs in deep water, it would not be expected to result in measureable increases in cetacean interactions compared to the No Action Alternative. Reorganization of the Other Fish complex, including the removal of spiny dogfish from the complex, and designating EC species would not be expected to result in substantial changes from the No Action Alternative. A substantial increase in the level of take would trigger action under applicable law to mitigate any increased take, if necessary.

Alternative 1: There is no information to conclude that protected species takes would differ substantially from the No Action Alternative. A substantial increase in the level of take would trigger action under applicable law to mitigate any increased take, if necessary.

Alternative 2: There is no information to conclude that protected species takes would differ substantially from the No Action Alternative. A substantial increase in the level of take would trigger action under applicable law to mitigate any increased take, if necessary.

4.7 Impacts of 2015-2016 Harvest Specifications and Management Measures on Non-groundfish

Section 3.6 describes non-groundfish species caught in groundfish fisheries based on WCGOP estimates (Bellman et al. 2013). Non-groundfish catch in groundfish sectors varied between 1.2 percent and 5.0 percent during the baseline period (2003 to 2011). There is no correlation between total catch and non-groundfish catch for these years. Therefore, it is not possible to predict how non-groundfish catch would vary among the alternatives. It is reasonable to conclude that non-groundfish catch would be in the historical range across all the alternatives. Tribal shoreside and at-sea whiting sectors accounted for 38 percent of non-groundfish catch. Management measures for these sectors are not directly established as part of the proposed action. Instead, the level of catch that will occur in the tribes' usual and accustomed fishing grounds is accommodated in the harvest specifications to ensure that total mortality from all sectors remains within the appropriate limits. Non-groundfish catch declined in the shorebased IFQ/trawl sector, which accounts for the largest proportion of non-groundfish catch in commercial sectors at 28 percent. Over the baseline period, non-groundfish catch varied from 7.7 percent (2,240 mt) of total catch in 2003 to 3.4 percent (809 mt) in 2011. The drop in 2011 could be an ancillary effect of trawl rationalization if changes in fishing strategies have an indirect effect on non-groundfish catch. Gear switching could be a factor, because fixed gear fisheries have lower bycatch of non-groundfish. The shorebased IFQ sector is subject to IBQ for Pacific halibut, which is effective in controlling bycatch mortality of this commercially important species.

4.7.1 Summary of the Impacts of the Alternatives

No Action Alternative: Some 334 non-groundfish species or groups (including partially or unidentified species) were observed caught from 2002 to 2012. Non-groundfish catch, by weight, accounts for about 2 percent of total catch. Most commonly caught species (90+ percent) include Dungeness crab, squids, pollock, Pacific halibut, tanner crab, grenadiers, sharks, American shad, and Pacific sardines. There is no information to conclude that non-groundfish catch will differ substantially from the average level during the 2002 to 2012 period. Fishery monitoring allows any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

Preferred Alternative: There is no information to conclude that non-groundfish catch would differ substantially from the No Action Alternative. While no conclusion can be made about how ACLs and resulting fishing opportunity may affect the distribution of fishing effort, it is reasonable to conclude that fishing effort would be more likely to increase than to decrease. Increase in midwater trawl effort as a result of higher widow and shortbelly rockfish ACLs may result in increased encounters with species such as squid, pollock, American shad Pacific sardine, sharks, jack mackerel, chub mackerel, herring, and smelts. Increased sablefish and Dover sole ACLs could result in an increased catch of grenadiers. Reorganization of the Other Fish complex, including the removal of spiny dogfish from the complex, and designating EC species would not be expected to result in substantial changes from the No Action Alternative. Managing grenadiers currently not in the FMP as EC species could aid in the detection of conservation issues.

Annual harvest specifications of CPS species include an estimate of the incidental catch in non-CPS fisheries. Because CPS species harvest guidelines include an incidental catch portion, the risk of overfishing as a result of catch in the groundfish midwater trawl fisheries is reduced since the catch is accommodated in the CPS harvest guidelines. Relative to other non-groundfish species, each vessel in the shorebased trawl IFQ program is currently required to carry one observer to monitor catch and estimate at-sea discards. Incidental catch levels of non-groundfish will continue to be monitored, allowing identification of biological concerns regarding incidental catch levels. Over the long-term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

Alternative 1: There is no information to conclude that non-groundfish catch would differ substantially from the No Action Alternative. Fishery monitoring allows any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP. The impacts would likely be similar to the No Action Alternative.

Alternative 2: There is no information to conclude that non-groundfish catch would differ substantially from the No Action Alternative. Fishery monitoring allows any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP. The impacts would likely be similar to the No Action Alternative.

4.8 Biological Impacts of Alternative Long-term Biennial Harvest Specifications on Groundfish Stocks

This section evaluates the predicted biological impacts of alternative long-term harvest specifications on a select list of groundfish stocks. The focus of this section is on those overfished stocks currently managed under rebuilding plans, the economically most important target stocks that are the backbone of the current fishery, and those stocks and stock complexes that were historically important targets of the West Coast groundfish fishery. This evaluation addresses the projected depletion trends under the range of scenarios modeled. The results of this analysis are presented by taxon and, for rockfish, are further stratified by depth strata (i.e., nearshore, shelf, and slope). Changes to the CCE resulting from climate change may affect projected depletion for various species assessed in this section, but the extent of these effects is currently unknown.

The long-term analysis in this EIS used projections of spawning stock depletion, spawning stock biomass, and total biomass of key assessed groundfish stocks through 2024 under a wide range of catch streams or harvest control rules, as well as across the states of nature that captured the key axes of uncertainty in stock assessments. An important caveat in the analysis is that the base case state of nature in these projections is the most probable state of nature.

The terms of reference for stock assessments direct that the states of nature modeled in assessment decision tables be developed as stochastically as possible with the base case state of nature being the median or most probable case (i.e., 50 percent likelihood). The low and high states of nature bracket the base case having half the probability (i.e., 25 percent likelihood) as the base case. In all cases, the highest catch stream modeled is the harvest control rule of ACL = ABC under a P* of 0.45; the highest catch streams are from the high state of nature models under this harvest control rule. The lowest catch streams, depending on the stock, are modeled using either the harvest control rule ACL = ABC under a P* of 0.25, the 2014 ACL scenario, or under the "recent year average catch" scenario. The lowest catch streams are from the low state of nature models under one of these harvest control rule scenarios.

The states of nature developed in groundfish stock assessments can best be thought of as bracketing the key axes of uncertainty that affect stock productivity. Stock assessments vary by how many of the key population dynamics parameters are estimated. The more parameters that are estimated, the more the true uncertainty in the assessment is characterized. However, no assessments attempt to estimate all parameters that describe stock dynamics. For example, those assessments that are done in Stock Synthesis (the assessment platform used for the majority of current groundfish stock assessments) will often try to estimate steepness of the stock-recruitment function (h) or the instantaneous rate of natural mortality (M), but seldom both parameters. Both h and M are measures of relative stock productivity (high h and high M are indicators of strong stock productivity), and their estimates are confounded (that is, assumptions or priors used to estimate one of these parameters will affect the estimate of the other). Therefore, when one of these parameters is freely estimated, the other is usually assumed and fixed in the assessment. In this case, the fixed parameter is usually what is varied to determine the states of nature in the assessment. The high state of nature is, therefore, indicative of an "optimistic" assumption that affects high stock productivity, and the low state of nature indicates a more "pessimistic" lower productivity assumption.

All biomass projections are deterministic in that future recruitment and total removals (i.e., total catch), as well as the fixed parameters in the assessment, are assumed. Decision tables in assessments that show variable future catch streams by state of nature also explore the implications of using a catch stream that is projected to be sustainable for the base case model (i.e., future biomass is projected to remain above B_{MSY}) for the other states of nature. This application enables addressing the question, "what is predicted to happen if the alternative state of nature is the actual one for the stock"? However, the purpose of this analysis is to probe a broader range of biomasses and catches for select groundfish stocks to better posit how these outcomes affect the stocks and the fishery. The highest and lowest biomasses and catches in this analysis are highly unlikely, and any case where all these stocks are in equilibrium at these high or low biomasses is implausible.

Ongoing work is being done to develop and improve the Atlantis ecosystem model output estimates further to ascertain climate change impacts on the CCE. Stock assessment model methods and results that are used in the Atlantis model may also need further development to improve estimates of climate change and the impacts on CCE productivity. Currently, stock assessment models are limited in their ability to forecast potential climate change impacts; therefore, the Atlantis model's ability to predict these changes is also limited.

Since the main objective of this long-term impact analysis is to discuss impacts at the extremes of plausibility (i.e., analyzing the highest and lowest catch streams using the high and low states of nature models), this analysis does not map directly to the 2015-2016 alternatives analyzed in this EIS. However, when linking this long-term impact analysis with the 2015-2016 alternatives analyzed in this EIS, the base case model is always assumed since that is the most probable assessment model. In all cases, Alternative 1 would be the ACL = ABC using a P* of 0.45, and Alternative 2 would be the ACL = ABC using a P* of 0.25 (in both cases the appropriate precautionary reduction to the ACL, either the 40-10 or the 25-5 rule, is made when the stock is projected to be below the B_{MSY} target). The No Action Alternative would be the 2014 ACL, and the Preferred Alternative would vary by stock.

4.8.1 Long-term Impacts of Assessed Flatfish Species

Of all the assessed flatfish species, only the projections for rex sole were not available in time for this analysis. The proxy biomass reference points that direct management of assessed flatfish species are a target biomass (B_{MSY}) depletion ratio of 0.25 (depletions at or above this threshold indicate a healthy stock) and an MSST of 0.125 (depletions below this threshold indicate an overfished stock). Depletion levels between the B_{MSY} threshold and the MSST indicate stocks in the precautionary zone. The default ACL harvest control rule for flatfish in the precautionary zone is to implement the "25-5" rule, which is a reduction in the ACL from the ABC (PFMC 2014).

Most of the flatfish species are not caught at levels commensurate with high attainment of ACLs, with the exception of petrale sole, which is an important trawl target. Therefore, the high catch streams for these species under even the base case models are unlikely. Flatfish species managed in the FMP are mostly trawl-dominant (i.e., on average, 90 percent or more of the catch occurs in the trawl fishery), with the exception of Pacific sanddabs and starry flounder, which are important species in trawl and recreational fisheries. Given the dominance of flatfish as a trawl species, catch-monitoring uncertainty is low. Therefore, there is very low risk of depleting flatfish stocks through overfishing.

4.8.1.1 Arrowtooth Flounder

The modeled catch scenarios for arrowtooth flounder range from 3,088 mt per year based on the recent year average catches to an annual average catch from 2015 to 2024 of 37,915 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-182). Projected arrowtooth depletions under all states of nature are sustainable, assuming the respective states of nature, except maintaining the 2014 ACL under the low state of nature is projected to drive depletion just below B_{MSY} by the end of the projection period (Figure 4-41, Figure 4-42, and Figure 4-43). All the 2015-2016 alternatives are sustainable under the base case model (Figure 4-41).

Table 4-182. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for arrowtooth flounder.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	5,758
	ABC Removals (P* = 0.25; Alt. 2)	6,364
	ABC Removals (P* = 0.4; Pref. Alt.)	7,125
	ABC Removals (P* = 0.45; Alt. 1)	7,307
	Recent Year Average Total Catch Removals	3,088
High	2014 ACL	5,758
	ABC Removals (P* = 0.25)	33,968
	ABC Removals (P* = 0.4)	37,184
	ABC Removals (P* = 0.45)	37,915
	Recent Year Average Total Catch Removals	3,088
Low	2014 ACL	5,758
	ABC Removals (P* = 0.25)	4,001
	ABC Removals (P* = 0.4)	4,624
	ABC Removals (P* = 0.45)	4,789
	Recent Year Average Total Catch Removals	3,088

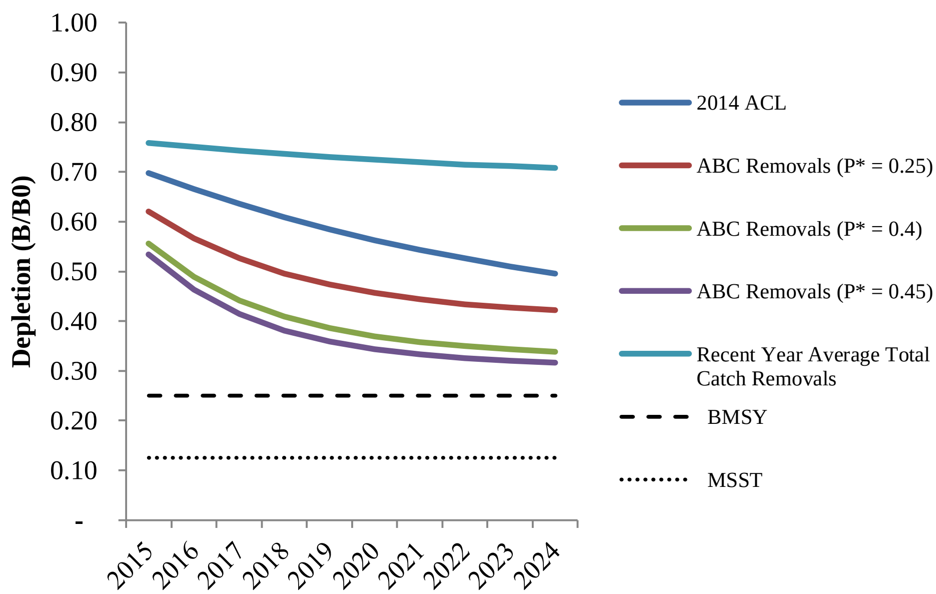

Figure 4-41. Projected depletion under alternative catch streams under the base case state of nature model for arrowtooth flounder.

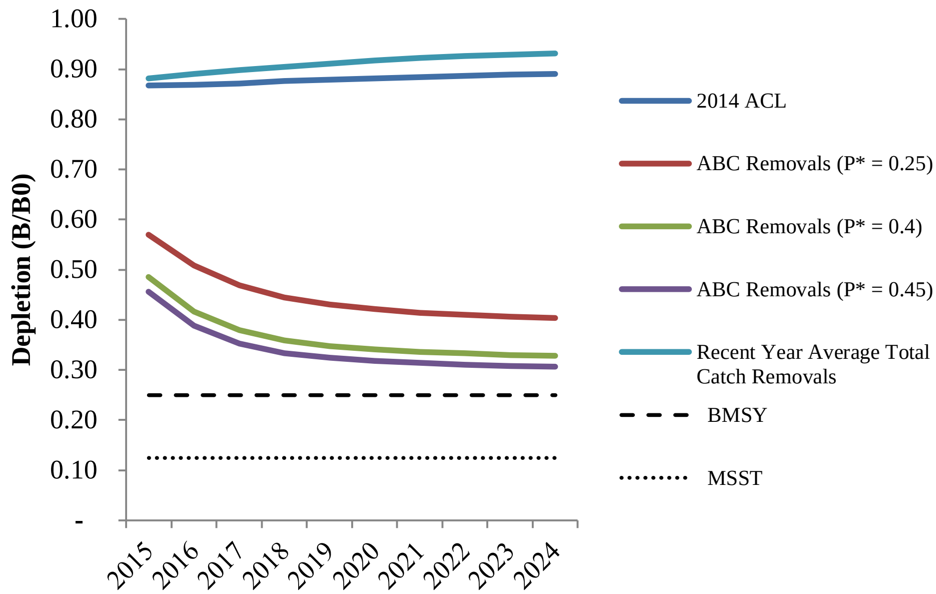

Figure 4-42. Projected depletion under alternative catch streams under the high state of nature model for arrowtooth flounder.

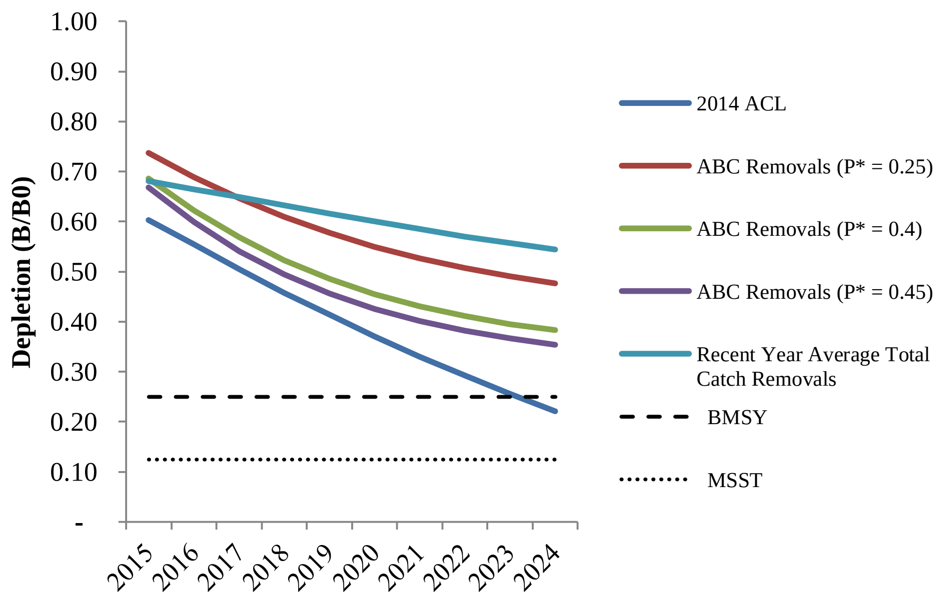

Figure 4-43. Projected depletion under alternative catch streams under the low state of nature model for arrowtooth flounder.

4.8.1.2 Dover Sole

The modeled catch scenarios for Dover sole range from 7,551 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 91,249 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-183). Projected Dover sole depletions under all states of nature are sustainable, assuming the respective states of nature (considered for these species). For instance, single species stock assessment projections predict depletion of Dover sole to approximately B40 (Figure 4-44, Figure 4-45, and Figure 4-46). While the preferred Dover sole alternative of a 50,000-mt constant catch has not been projected or modeled in this long-term analysis, the total removals and biomass trajectory, assuming full attainment of the ACL in the next ten years, are very similar to the Alternative 2 scenario (ABC removals using a P* of 0.25) under the base case model.

Table 4-183. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for Dover sole.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	25,000
	ABC Removals (P* = 0.25; Alt. 2)	50,630
	ABC Removals (P* = 0.45; Alt. 1)	56,611
	Recent Year Average Total Catch Removals	7,551
High	2014 ACL	25,000
	ABC Removals (P* = 0.25)	81,641
	ABC Removals (P* = 0.45)	91,249
	Recent Year Average Total Catch Removals	7,551
Low	2014 ACL	25,000
	ABC Removals (P* = 0.25)	34,880
	ABC Removals (P* = 0.45)	39,069
	Recent Year Average Total Catch Removals	7,551

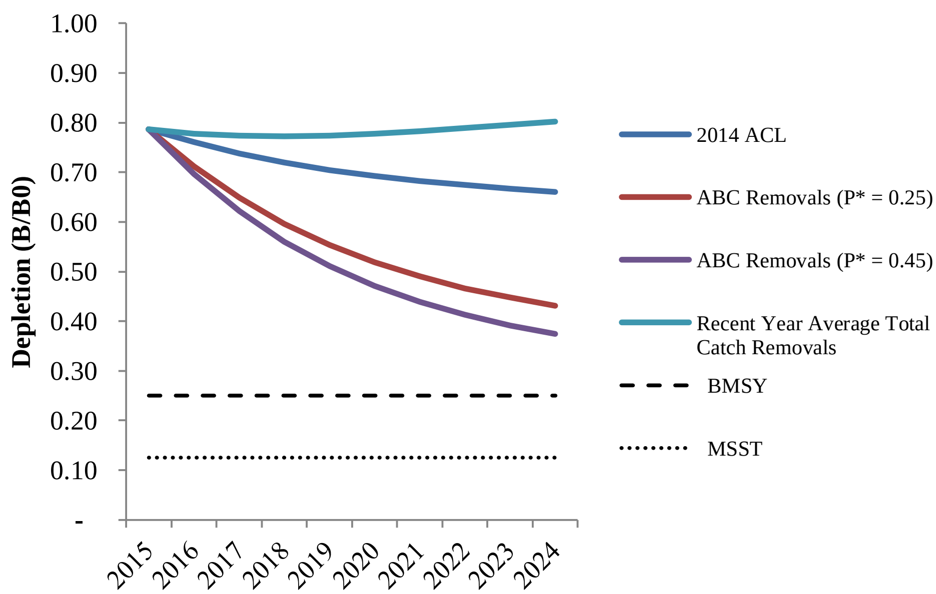

Figure 4-44. Projected depletion under alternative catch streams under the base case state of nature model for Dover sole.

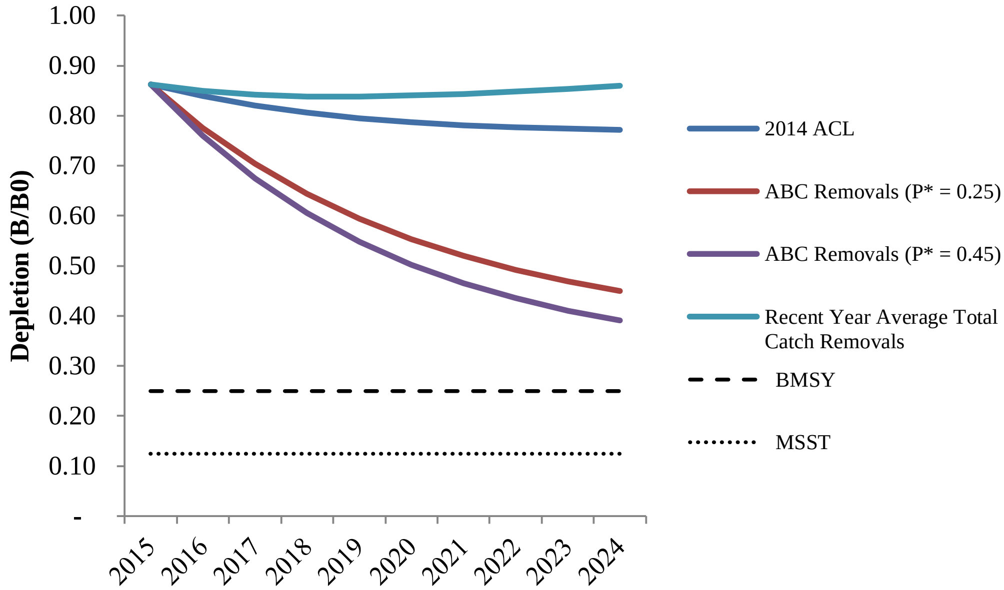

Figure 4-45. Projected depletion under alternative catch streams under the high state of nature model for Dover sole.

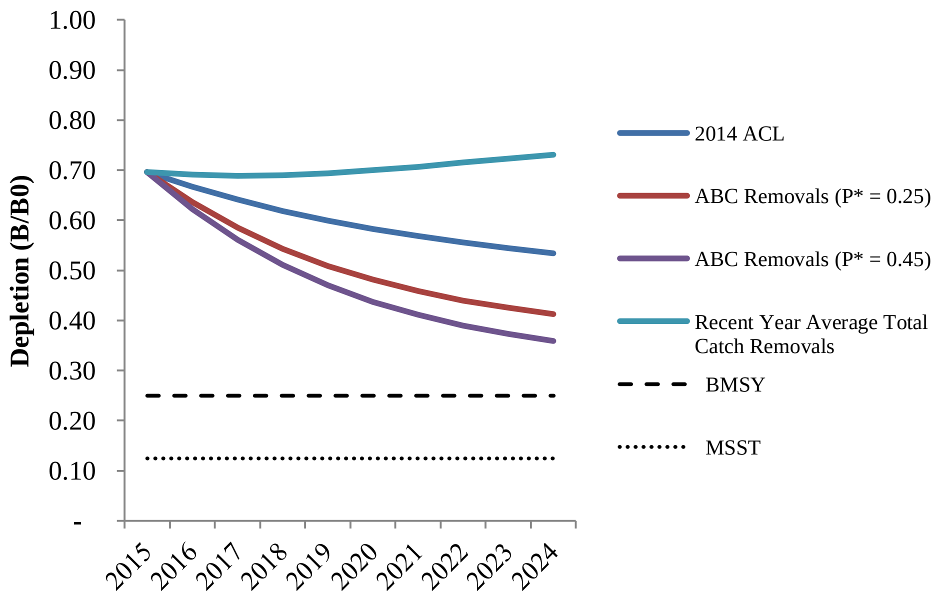

Figure 4-46. Projected depletion under alternative catch streams under the low state of nature model for Dover sole.

4.8.1.3 English Sole

The modeled catch scenarios for English sole range from 207 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 7,461 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-184). Projected English sole depletions under all catch scenarios and states of nature are predicted to be sustainable, except that maintaining the 2014 ACL is predicted to drive the stock down below the B_{MSY} target into the precautionary zone under the base case and low state of nature models (Figure 4-47, Figure 4-48, and Figure 4-49).

Table 4-184. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for English sole.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	5,645
	ABC Removals (P* = 0.25; Alt. 2)	4,423
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	5,479
	Recent Year Average Total Catch Removals	207
High	2014 ACL	5,645
	ABC Removals (P* = 0.25)	6,011
	ABC Removals (P* = 0.45)	7,461
	Recent Year Average Total Catch Removals	207
Low	2014 ACL	5,645
	ABC Removals (P* = 0.25)	3,585
	ABC Removals (P* = 0.45)	4,447
	Recent Year Average Total Catch Removals	207

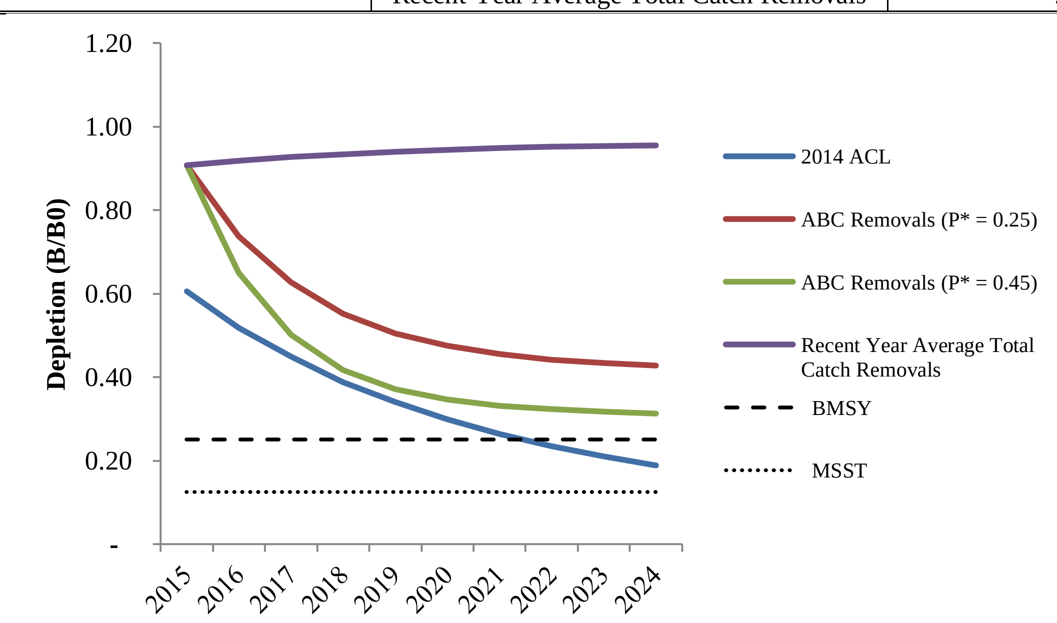

Figure 4-47. Projected depletion under alternative catch streams under the base case state of nature model for English sole.

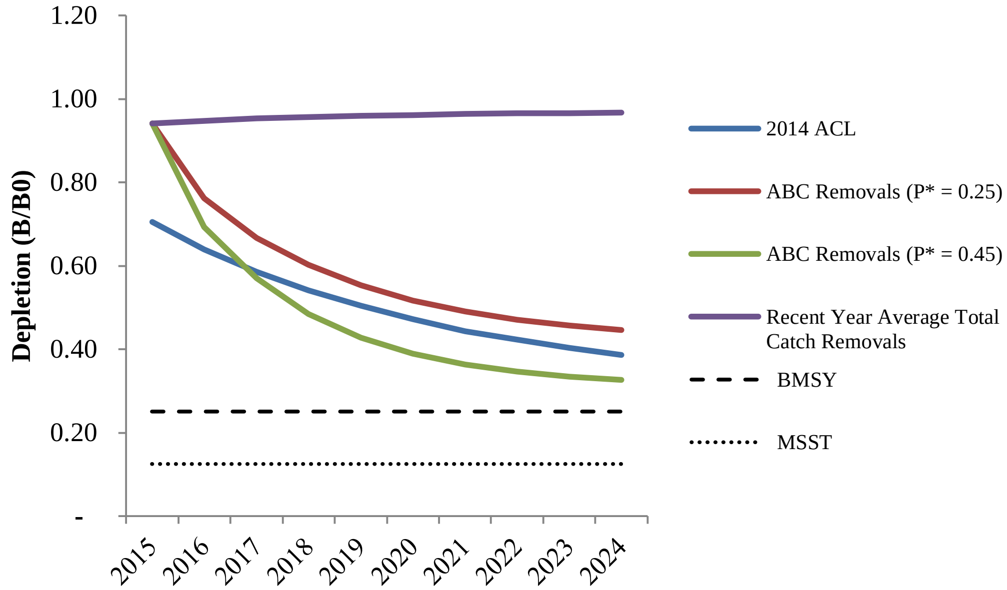

Figure 4-48. Projected depletion under alternative catch streams under the high state of nature model for English sole.

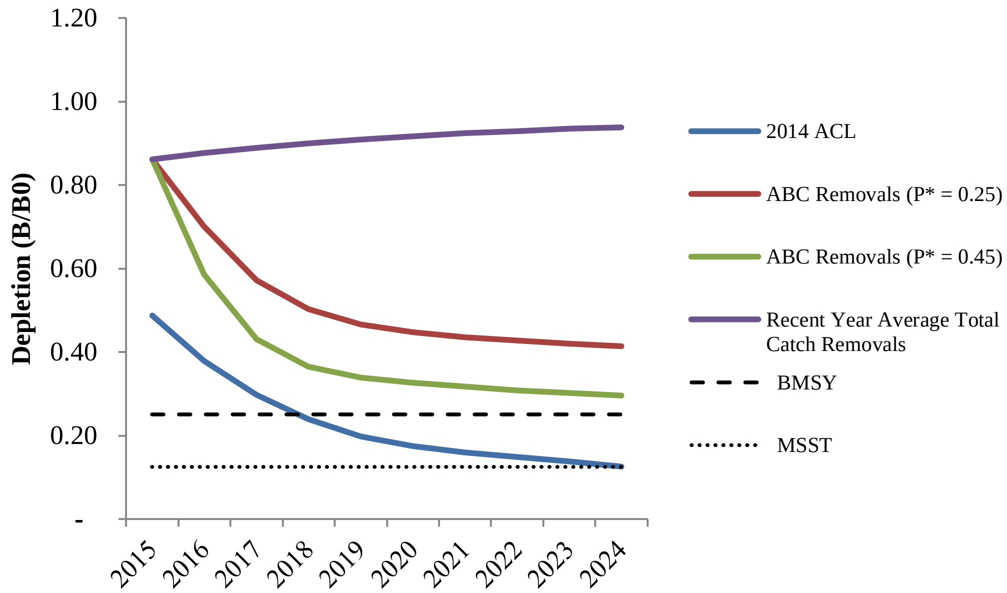

Figure 4-49. Projected depletion under alternative catch streams under the low state of nature model for English sole.

4.8.1.4 Petrale Sole

The modeled catch scenarios for petrale sole range from 939 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 3,170 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-185). Projected petrale sole depletions under all states of nature are sustainable assuming the respective states of nature, except that the stock is estimated to be less than the target B_{MSY} depletion level in the beginning of the projection period under the base case and low state of nature models (Figure 4-50, Figure 4-51, and Figure 4-52).

Table 4-185. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for petrale sole.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	2,652
	ABC Removals (P* = 0.25; Alt. 2)	2,522
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	2,771
	Recent Year Average Total Catch Removals	939
High	2014 ACL	2,652
	ABC Removals (P* = 0.25)	2,919
	ABC Removals (P* = 0.45)	3,170
	Recent Year Average Total Catch Removals	939
Low	2014 ACL	2,652
	ABC Removals (P* = 0.25)	2,191
	ABC Removals (P* = 0.45)	2,439
	Recent Year Average Total Catch Removals	939

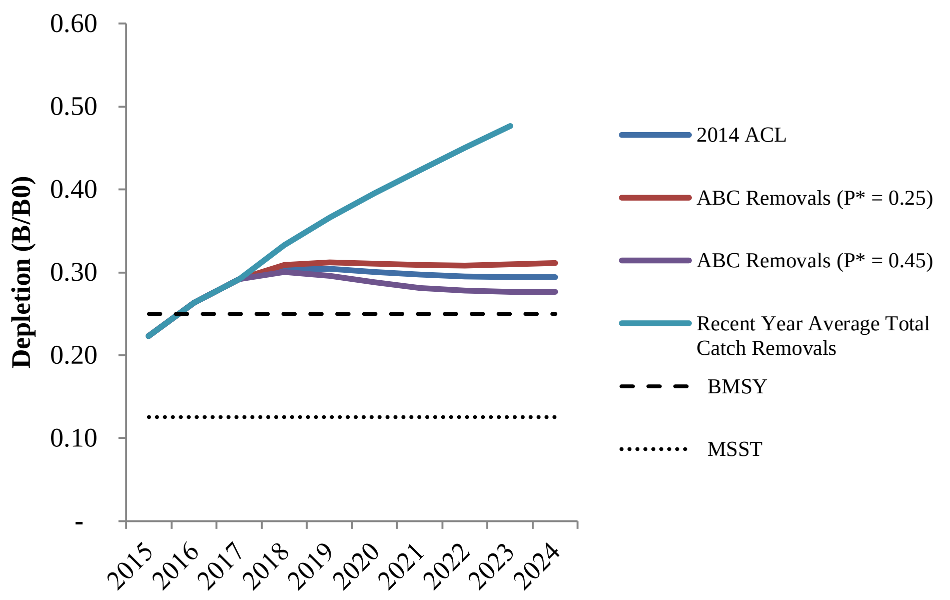

Figure 4-50. Projected depletion under alternative catch streams under the base case state of nature model for petrale sole.

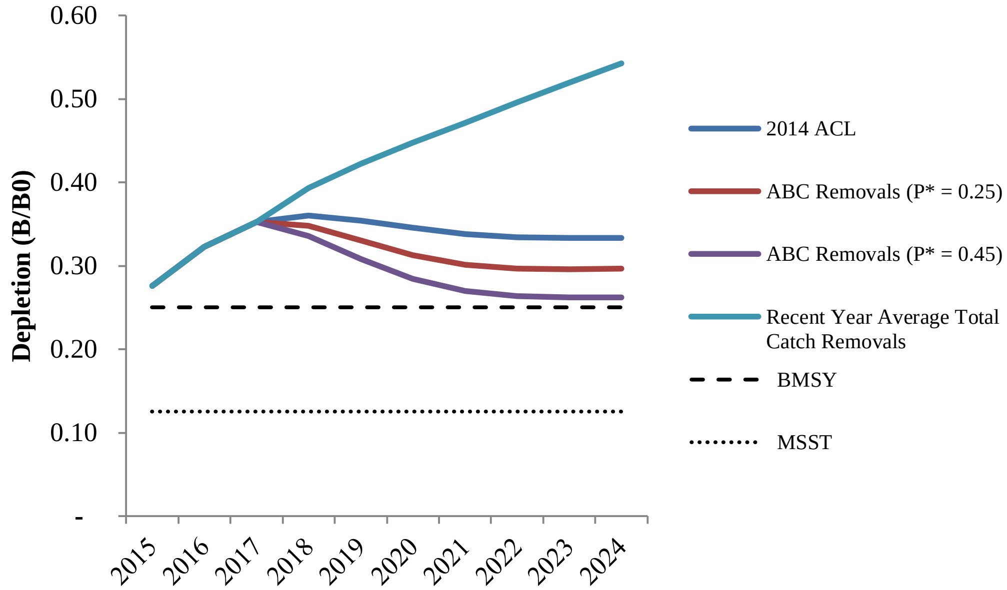

Figure 4-51. Projected depletion under alternative catch streams under the high state of nature model for petrale sole.

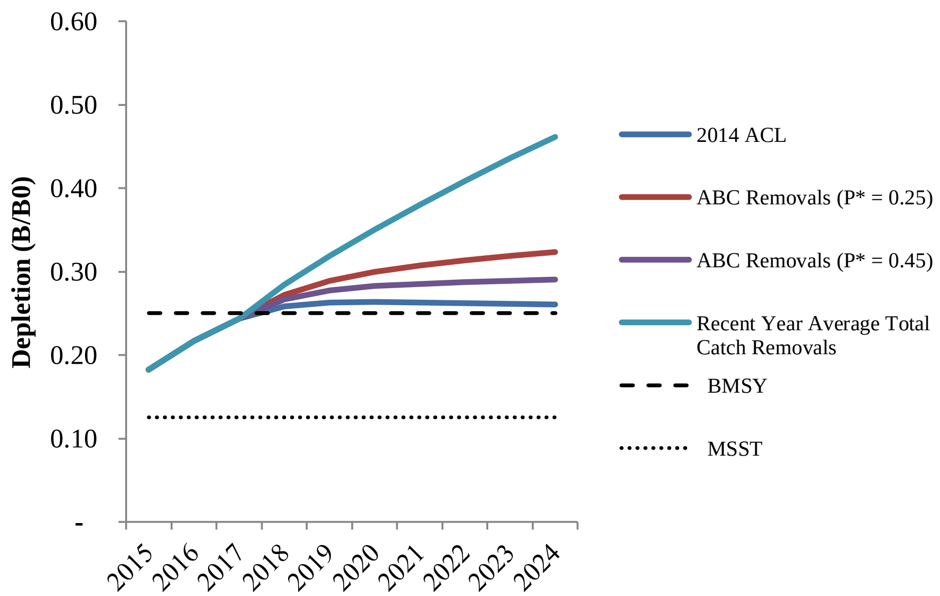

Figure 4-52. Projected depletion under alternative catch streams under the low state of nature model for petrale sole.

4.8.2 Long-term Impacts of Assessed Minor Nearshore Rockfish Species

Of the assessed Minor Nearshore Rockfish species, long-term projections were not provided in time for brown, China, and copper rockfish or for California scorpionfish. Minor Nearshore Rockfish are dominant in the non-trawl fisheries (both commercial and recreational) and, therefore, have a higher catch monitoring uncertainty than trawl-dominant species. The assessments are also generally more uncertain, since there are no fishery-independent indices of abundance (i.e., no nearshore surveys) informing abundance trends. Most Minor Nearshore Rockfish assessments rely on fishery CPUE indices and the fisheries compositional data (i.e., age and length data from sampled fisheries) to inform stock status and dynamics. Therefore, there is considerably more uncertainty in the long-term projections for Minor Nearshore Rockfish than for the other species analyzed in this EIS.

4.8.2.1 Black Rockfish in California and Oregon

The modeled catch scenarios for southern black rockfish off California and Oregon range from 554 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 2,032 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-186). Projected southern black rockfish depletions under all states of nature are sustainable, assuming the respective states of nature (Figure 4-53, Figure 4-54, and Figure 4-55). The default harvest control rule of 1,000 mt/year cannot be accommodated under the low state of nature due to a lack of exploitable biomass at that level of harvest.

Table 4-186. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for black rockfish in California and Oregon.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	1,044
	ABC Removals (P* = 0.45; Alt. 1)	1,220
	ACL Removals (1,000 mt constant catch; No Action Alt.; Pref. Alt.)	1,000
	Recent Year Average Total Catch Removals	554
High	ABC Removals (P* = 0.25)	1,739
	ABC Removals (P* = 0.45)	2,032
	ACL Removals (1,000 mt constant catch)	1,000
	Recent Year Average Total Catch Removals	554
Low	ABC Removals (P* = 0.25)	715
	ABC Removals (P* = 0.45)	836
	Recent Year Average Total Catch Removals	554

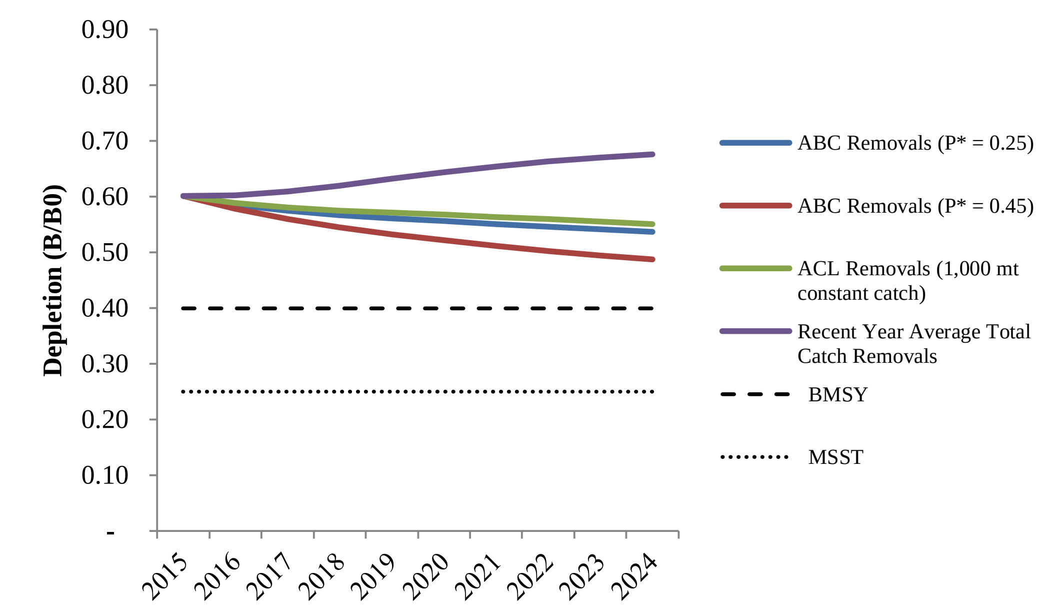

Figure 4-53. Projected depletion under alternative catch streams under the base case state of nature model for black rockfish in California and Oregon.

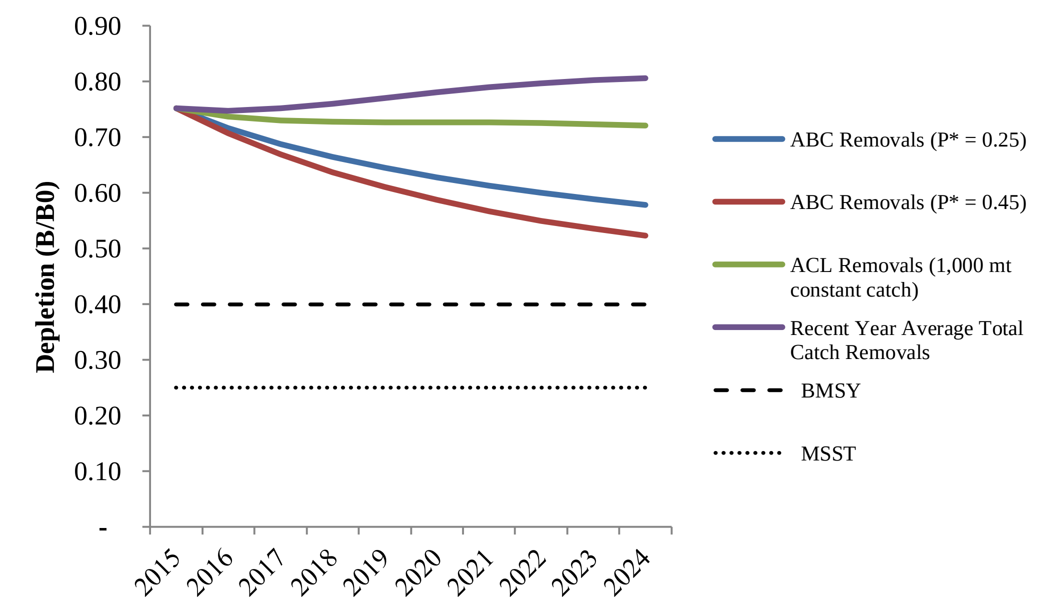

Figure 4-54. Projected depletion under alternative catch streams under the high state of nature model for black rockfish in California and Oregon.

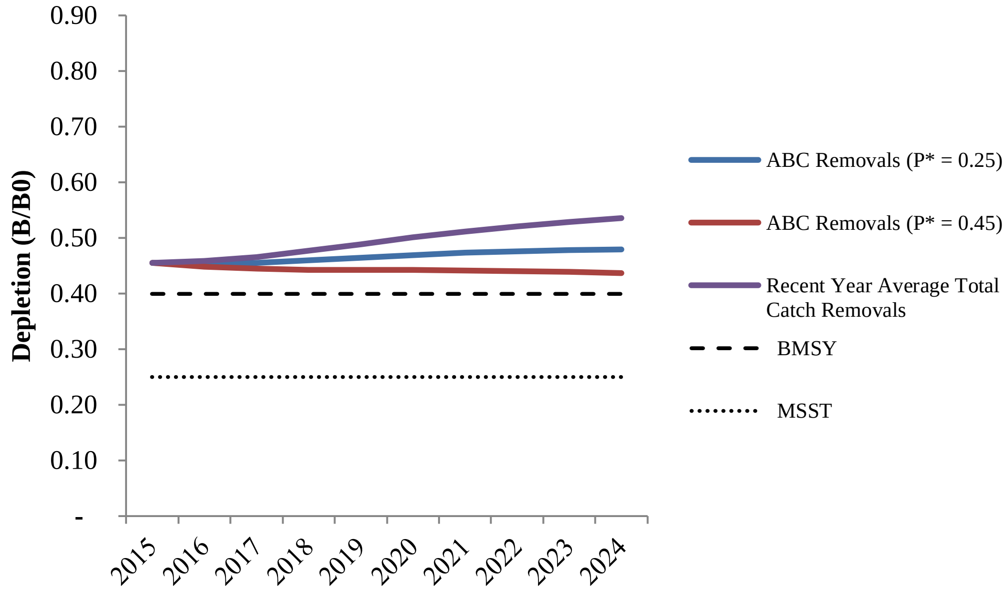

Figure 4-55. Projected depletion under alternative catch streams under the low state of nature model for black rockfish in California and Oregon.

4.8.2.2 Black Rockfish in Washington

The modeled catch scenarios for northern black rockfish off Washington range from 134 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature, to an annual average catch from 2015 to 2024 of 592 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-187). Projected northern black rockfish depletions under the base case and high states of nature are sustainable, assuming the respective states of nature (Figure 4-56 and Figure 4-57). All of these catch scenarios are under the B_{MSY} target under the low state of nature (Figure 4-58). The stock is estimated to be currently overfished under the low state of nature, but it is projected to increase in abundance under all the catch scenarios, except the constant catch of the 2014 ACL, which drives the stock to a lower abundance during the projection period.

Table 4-187. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for black rockfish in Washington.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	409
	ABC Removals (P* = 0.25; Alt. 2)	325
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	381
	ACL Removals (40-10 rule)	395
	Recent Year Average Total Catch Removals	219
High	2014 ACL	409
	ABC Removals (P* = 0.25)	488
	ABC Removals (P* = 0.45)	572
	ACL Removals (40-10 rule)	592
	Recent Year Average Total Catch Removals	219
Low	2014 ACL	409
	ABC Removals (P* = 0.25)	134
	ABC Removals (P* = 0.45)	155
	ACL Removals (40-10 rule)	160
	Recent Year Average Total Catch Removals	219

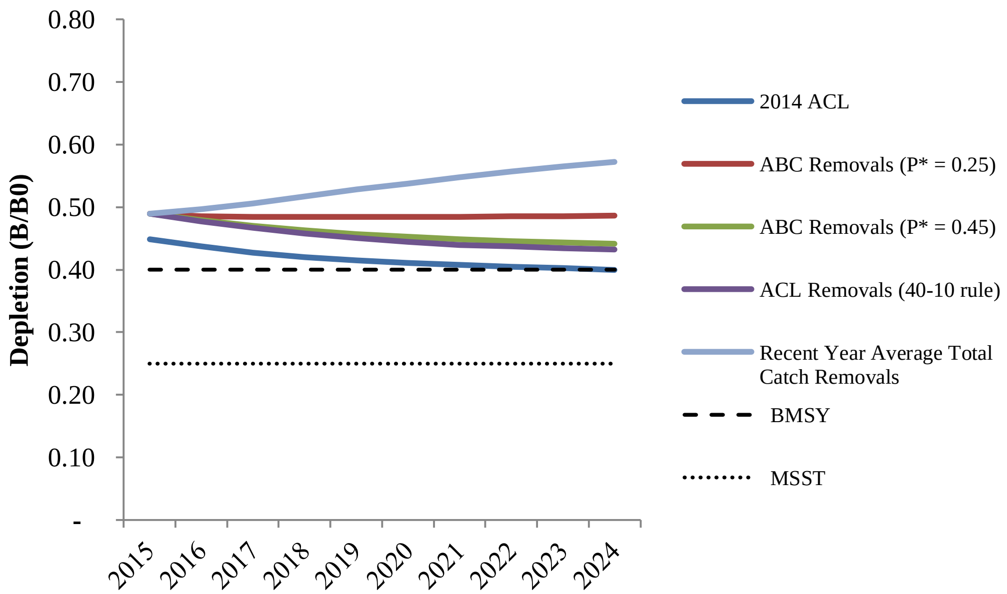

Figure 4-56. Projected depletion under alternative catch streams under the base case state of nature model for black rockfish in Washington.

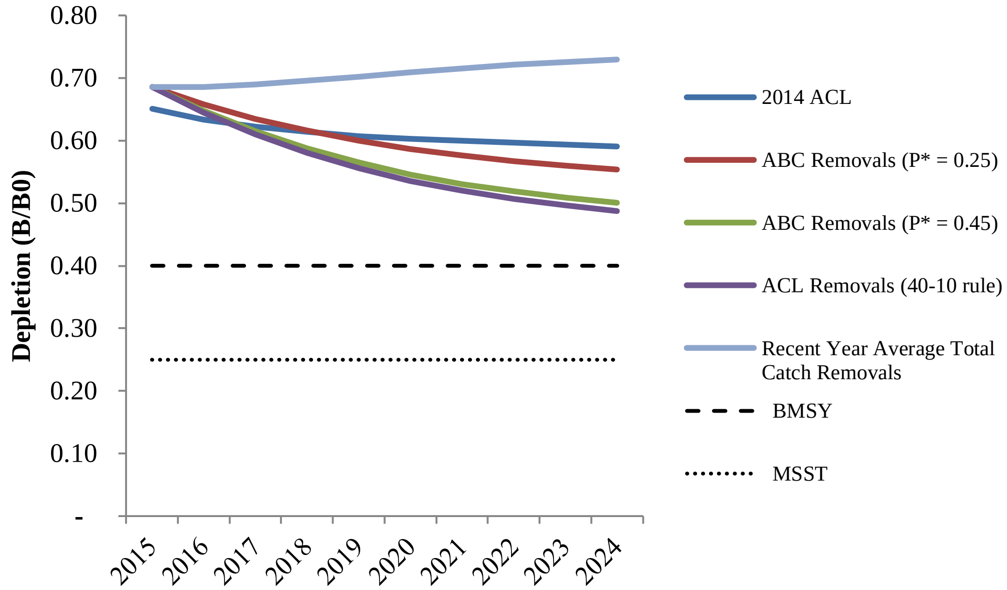

Figure 4-57. Projected depletion under alternative catch streams under the high state of nature model for black rockfish in Washington.

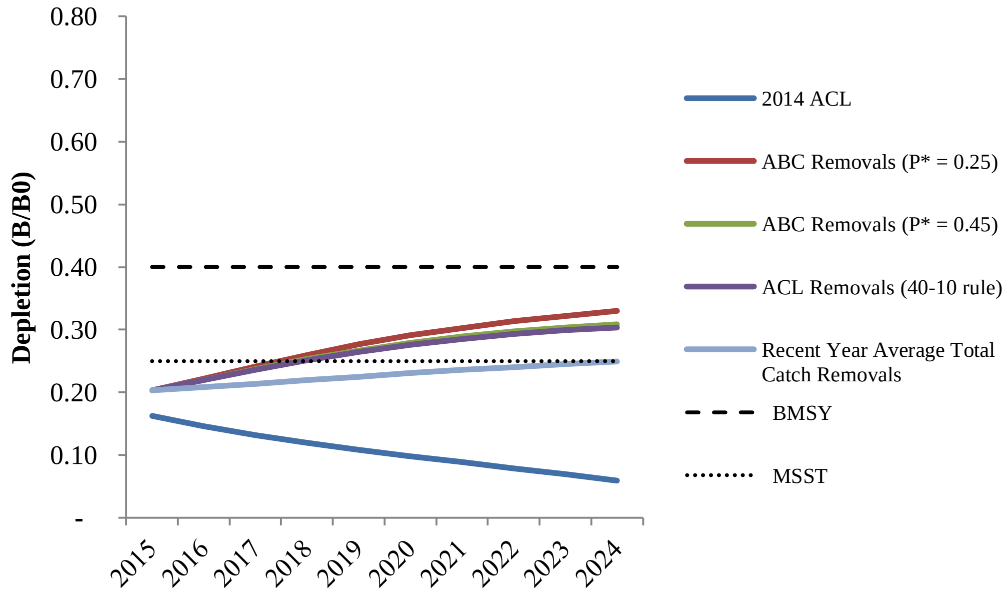

Figure 4-58. Projected depletion under alternative catch streams under the low state of nature model for black rockfish in Washington.

4.8.2.3 Gopher Rockfish South of 40º10' N. Latitude

The average annual catch of gopher rockfish from 2015 to 2024 varies between 77 mt (the ABC removals using a P* of 0.25 for the low state of nature) and 229 mt (the 2014 ACL) (Table 4-188). The 2014 gopher ACL contribution projected forward is not predicted to be sustainable under any of the states of nature and is predicted to drive the stock to an overfished condition under the base case and low state of nature models (Figure 4-59, Figure 4-60, and Figure 4-61). However, all the other catch scenarios are predicted to be sustainable under all the states of nature. The most likely projection is the recent year average total catch removals under the base case, since access to gopher rockfish will likely be constrained by limits imposed on the entire Southern Minor Nearshore Rockfish complex.

Table 4-188. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for gopher rockfish south of 40º10' N. latitude

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	229
	ABC Removals (P* = 0.25; Alt. 2)	139
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	156
	Recent Year Average Total Catch Removals	81
High	2014 ACL	229
	ABC Removals (P* = 0.25)	170
	ABC Removals (P* = 0.45)	191
	Recent Year Average Total Catch Removals	81
Low	2014 ACL	229
	ABC Removals (P* = 0.25)	77
	ABC Removals (P* = 0.45)	86
	Recent Year Average Total Catch Removals	81

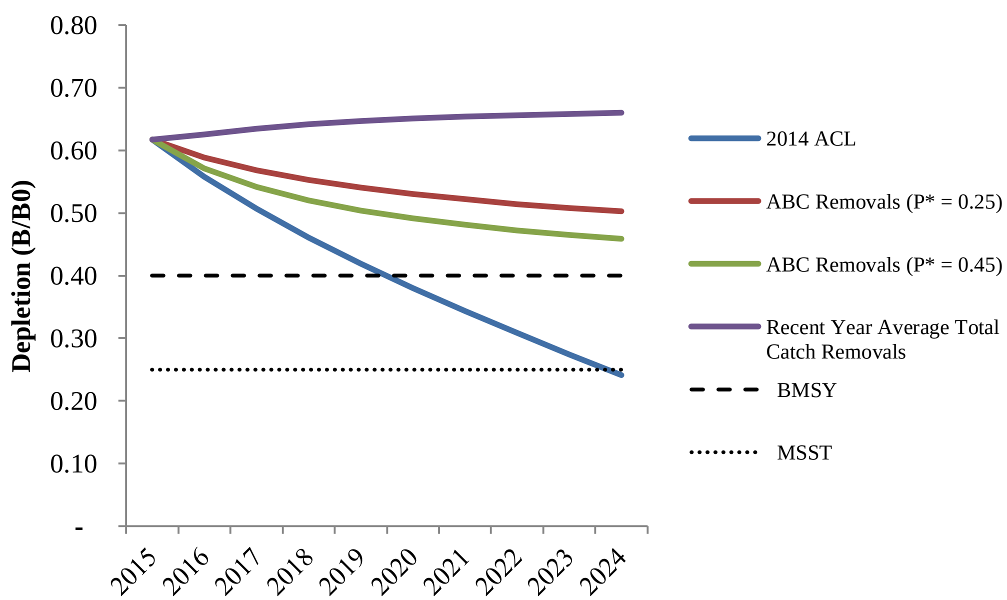

Figure 4-59. Projected depletion under alternative catch streams under the base case state of nature model for gopher rockfish south of 40º10' N. latitude.

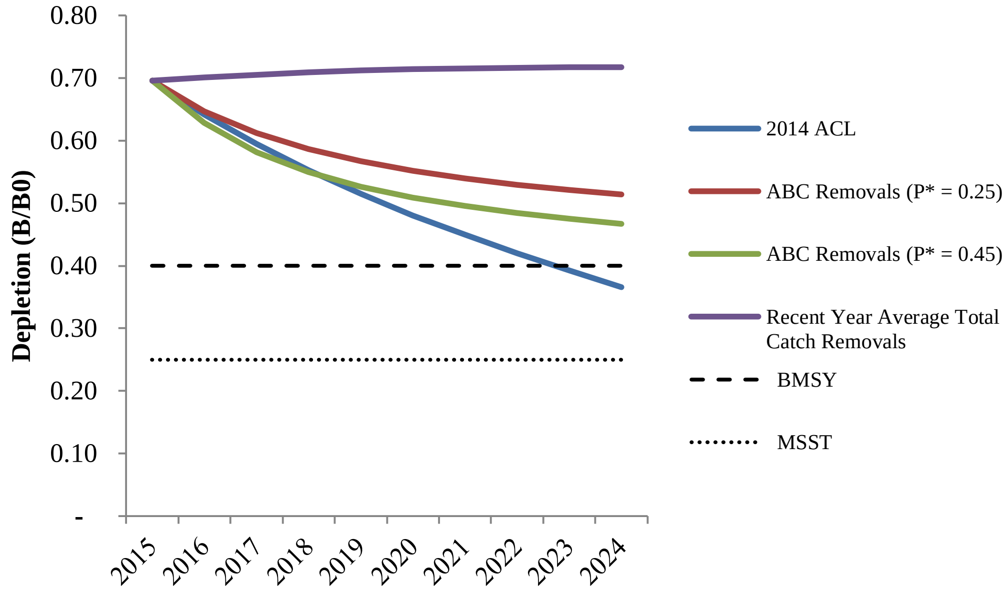

Figure 4-60. Projected depletion under alternative catch streams under the high state of nature model for gopher rockfish south of 40º10' N. latitude.

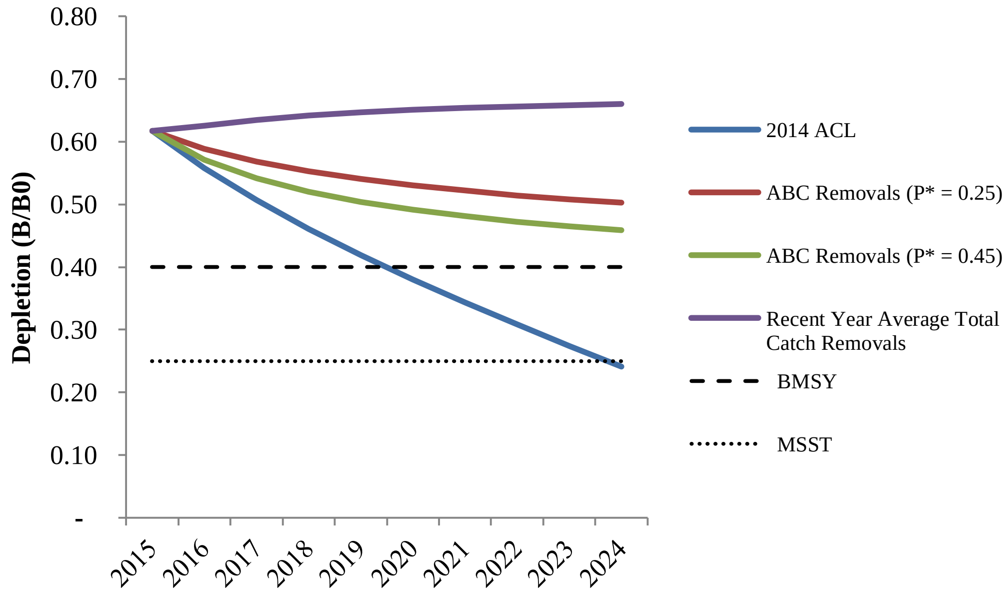

Figure 4-61. Projected depletion under alternative catch streams under the low state of nature model for gopher rockfish south of 40º10' N. latitude.

4.8.3 Long-term Impacts of Assessed Shelf Rockfish Species

Of the assessed shelf rockfish species, only the greenspotted rockfish projections were not provided in time for this analysis. Shelf rockfish are caught by both the trawl and fixed gear sectors, although there is some variation between species on their relative selectivity to different gears. For instance, greenstriped rockfish, while not targeted in any fishery, tend to be more readily caught in trawl gears than fixed gears. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity. There is more certain catch estimation for those species dominant to the trawl fishery, given the 100 percent observer coverage for those fleets. Current overfishing risks are low for shelf rockfish in general and have been since implementation of RCAs over ten years ago.

4.8.3.1 Bocaccio South of 40º10' N. Latitude

The modeled catch scenarios for bocaccio south of 40º10' N. latitude range from 150 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 1,431 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-189). Projected bocaccio depletions under the base case and high states of nature are sustainable, assuming the respective states of nature (Figure 4-62 and Figure 4-63). All of these catch scenarios are in the precautionary zone under the B_{MSY} target at the beginning of the projection period under the low state of nature (Figure 4-64). The stock is estimated to undergo rebuilding under the low state of nature with all catch scenarios. All catch scenarios under the low state of nature, except that the ABC removals (under both P*s of 0.45 and 0.25) are predicted to be over the B_{MSY} target by the end of the projection period.

Table 4-189. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for bocaccio south of 40º10' N. latitude.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	338
	ABC Removals (P* = 0.25; Alt. 2)	1,127
	ABC Removals (P* = 0.45; Alt. 1)	1,314
	Recent Year Average Total Catch Removals	150
	ACL Removals (SPR = 77.7%; Pref. Alt.)	563
High	2014 ACL	338
	ABC Removals (P* = 0.25)	1,225
	ABC Removals (P* = 0.45)	1,431
	Recent Year Average Total Catch Removals	150
	ACL Removals (SPR = 77.7%)	609
Low	2014 ACL	338
	ABC Removals (P* = 0.25)	729
	ABC Removals (P* = 0.45)	839
	Recent Year Average Total Catch Removals	150
	ACL Removals (SPR = 77.7%)	383

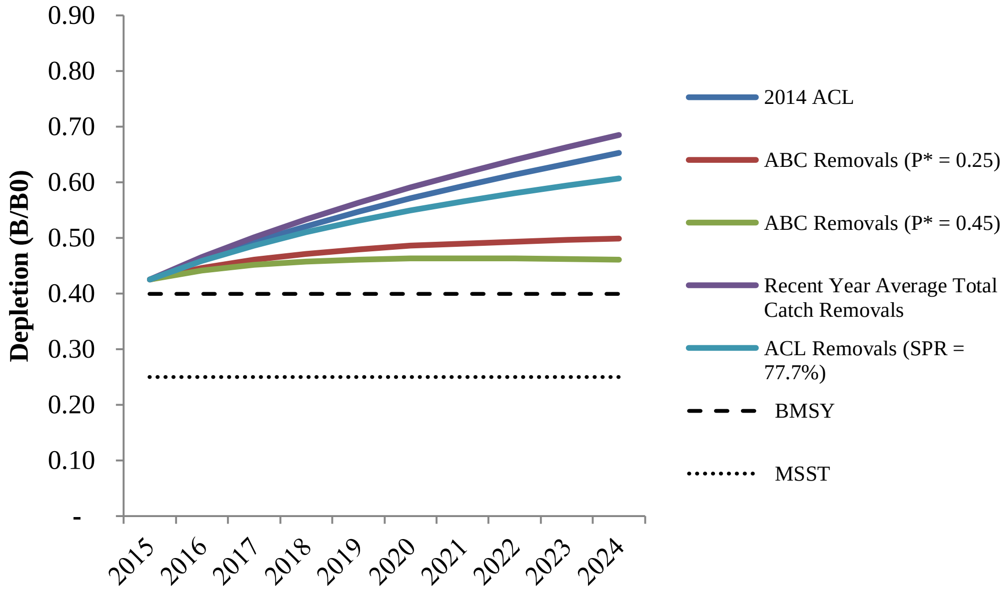

Figure 4-62. Projected depletion under alternative catch streams under the base case state of nature model for bocaccio south of 40º10' N. latitude.

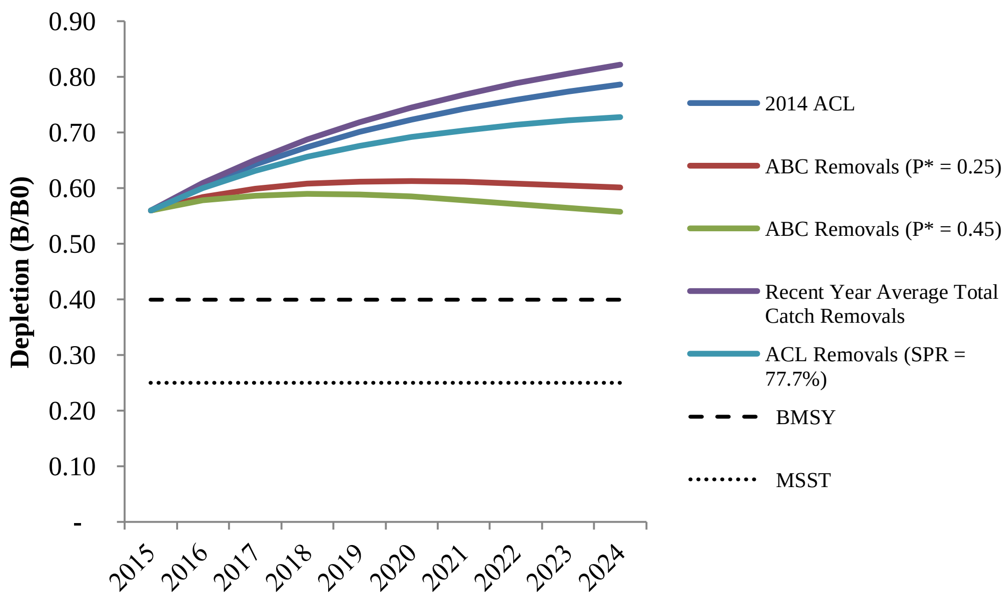

Figure 4-63. Projected depletion under alternative catch streams under the high state of nature model for bocaccio south of 40º10' N. latitude.

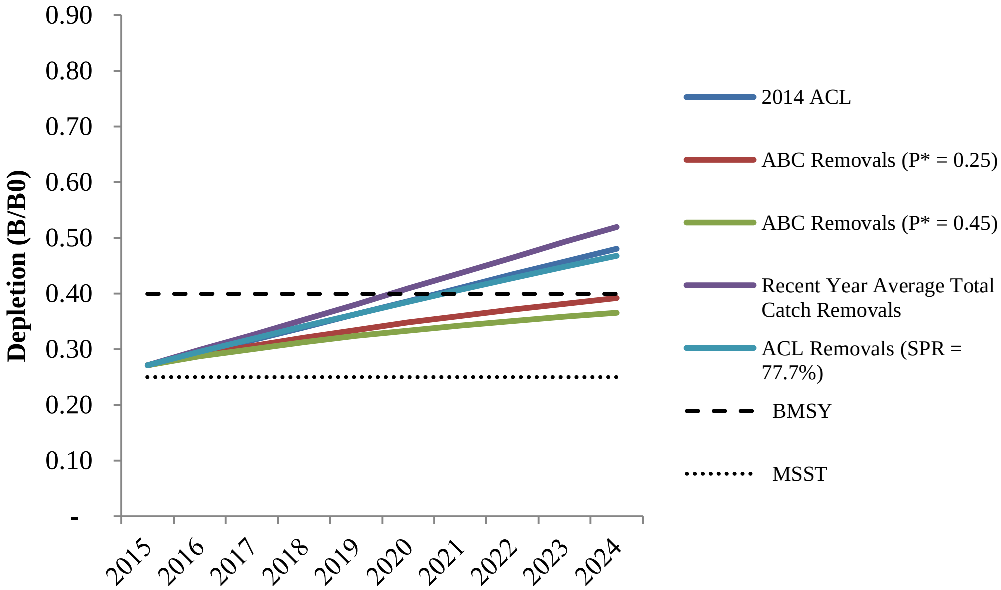

Figure 4-64. Projected depletion under alternative catch streams under the low state of nature model for bocaccio south of 40º10' N. latitude.

4.8.3.2 Canary Rockfish

The modeled catch scenarios for canary rockfish range from 47 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 1,337 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-190). Projected canary rockfish depletions for all catch scenarios under the base case state of nature are shown to be in the precautionary zone and are predicted to rebuild, but not by the end of the projection period (Figure 4-65). Projected canary depletions for all catch scenarios under the high state of nature are sustainable (Figure 4-Figure 4-66). Projected canary depletions for all catch scenarios under the low state of nature are predicted to keep the stock at very low levels of depletion under the MSST with very little or no rebuilding (Figure 4-67).

Table 4-190. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for canary rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	119
	ABC Removals (P* = 0.25; Alt. 2)	556
	ABC Removals (P* = 0.45; Alt. 1)	652
	ACL Removals (SPR = 88.7%; Pref. Alt.)	145
	Recent Year Average Total Catch Removals	47
High	2014 ACL	119
	ABC Removals (P* = 0.25)	1,130
	ABC Removals (P* = 0.45)	1,337
	ACL Removals (SPR = 88.7%)	248
	Recent Year Average Total Catch Removals	47
Low	2014 ACL	119
	ACL Removals (SPR = 88.7%)	38
	Recent Year Average Total Catch Removals	47

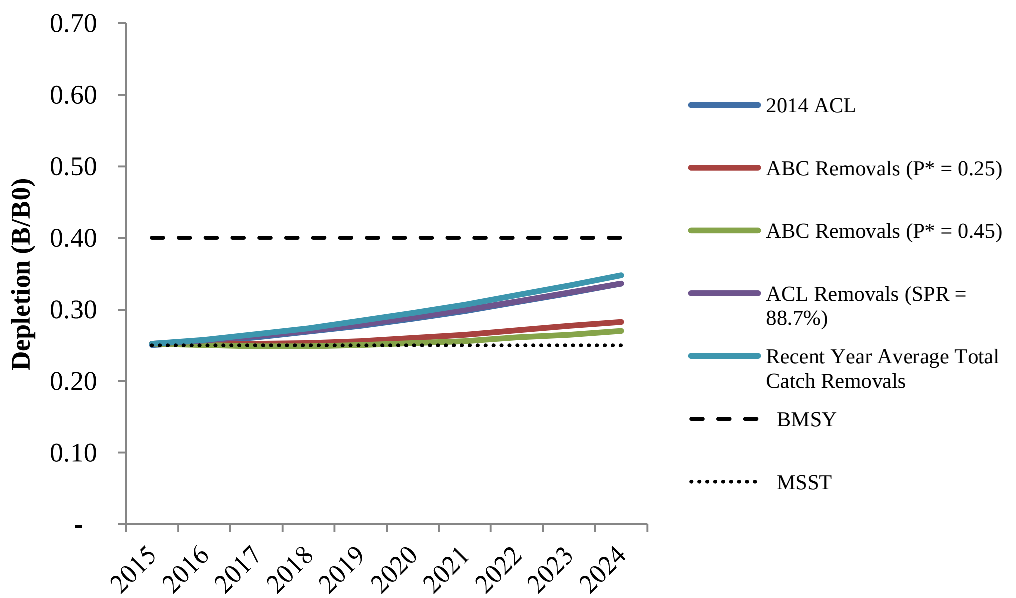

Figure 4-65. Projected depletion under alternative catch streams under the base case state of nature model for canary rockfish.

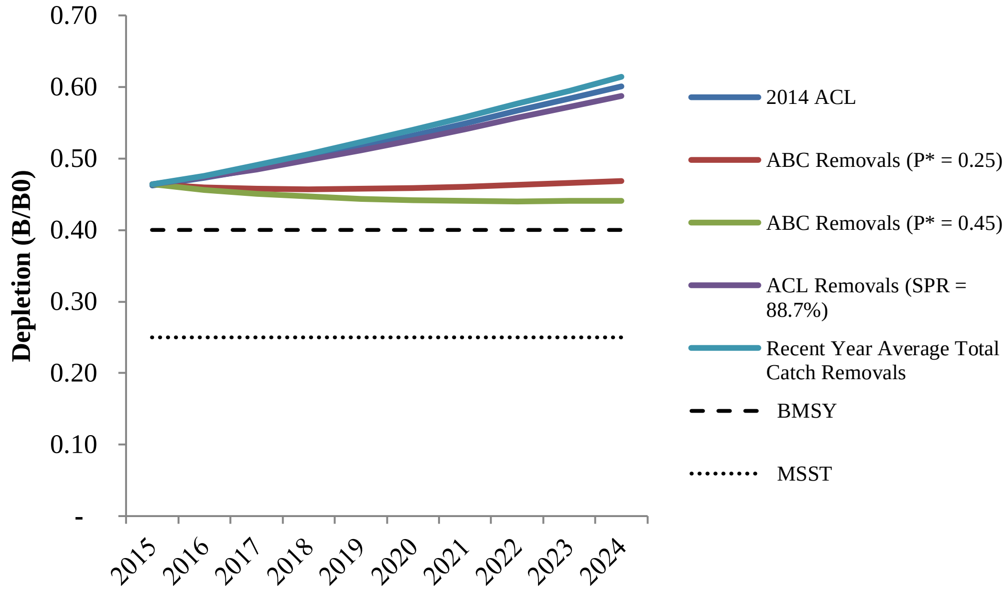

Figure 4-66. Projected depletion under alternative catch streams under the high state of nature model for canary rockfish.

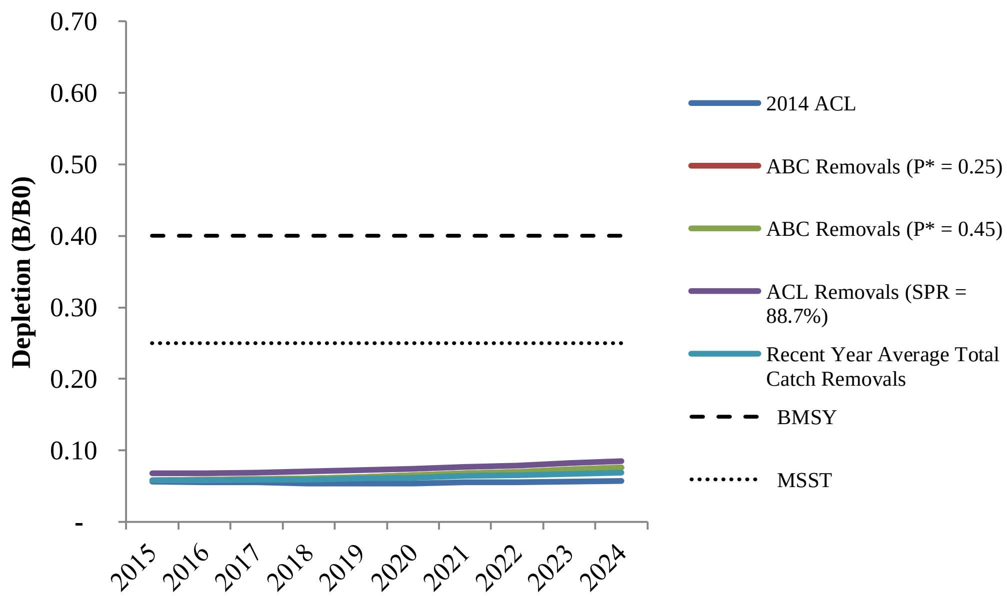

Figure 4-67. Projected depletion under alternative catch streams under the low state of nature model for canary rockfish.

4.8.3.3 Chilipepper Rockfish

The modeled catch scenarios for chilipepper range from 330 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 2,252 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-191). Projected chilipepper depletions under all states of nature are sustainable during the projection period, assuming the respective states of nature, except for the ABC removals at a P* of 0.45 under the low state of nature, which causes the stock to drop below the B_{MSY} threshold into the precautionary zone (Figure 4-68, Figure 4-69, and Figure 4-70).

Table 4-191. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for chilipepper rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	1,618
	ABC Removals (P* = 0.25; Alt. 2)	1,922
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	2,216
	Recent Year Average Total Catch Removals	330
High	2014 ACL	1,618
	ABC Removals (P* = 0.25)	1,950
	ABC Removals (P* = 0.45)	2,252
	Recent Year Average Total Catch Removals	330
Low	2014 ACL	1,618
	ABC Removals (P* = 0.25)	1,532
	ABC Removals (P* = 0.45)	1,747
	Recent Year Average Total Catch Removals	330

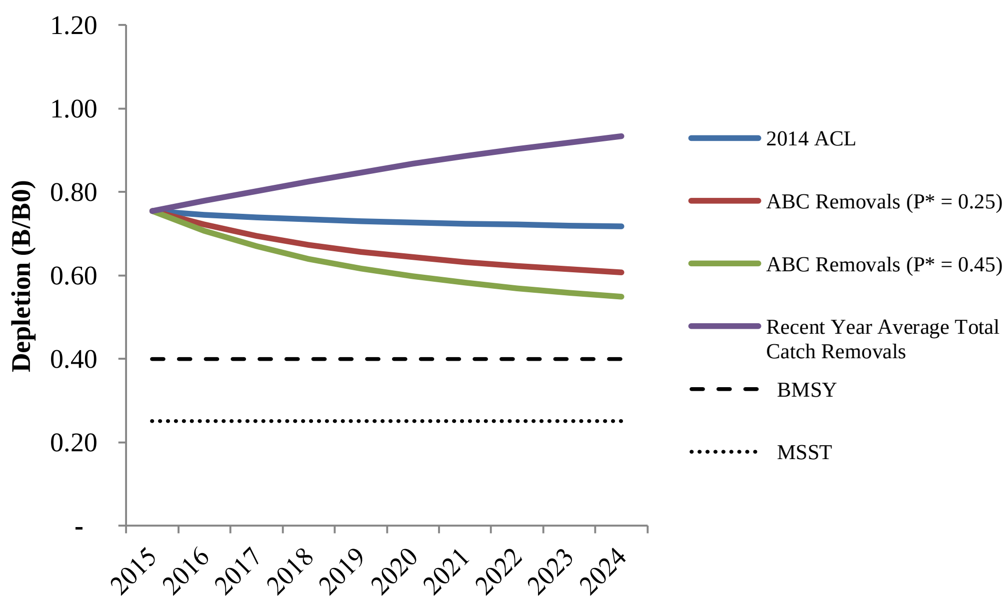

Figure 4-68. Projected depletion under alternative catch streams under the base case state of nature model for chilipepper rockfish.

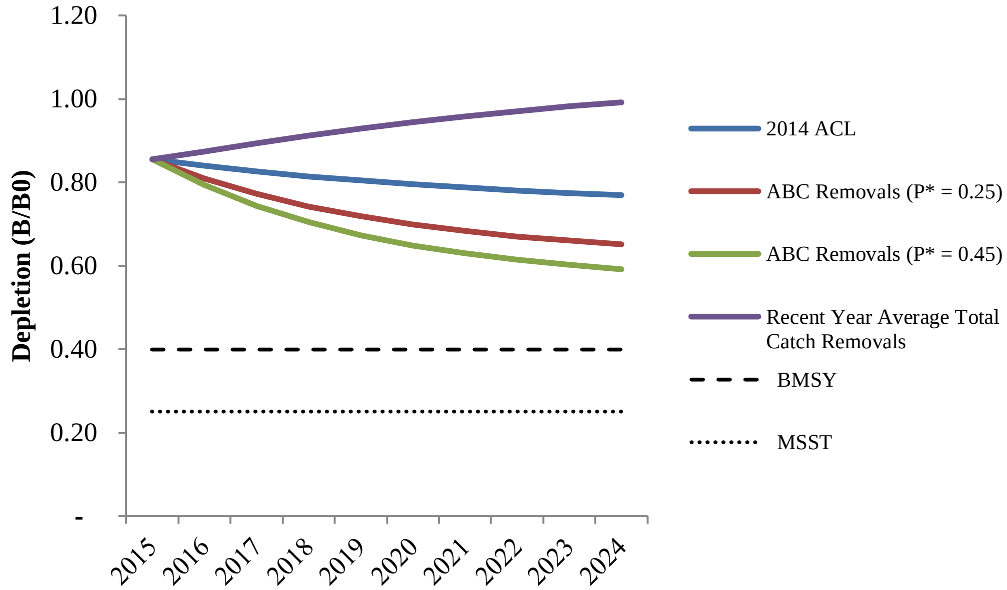

Figure 4-69. Projected depletion under alternative catch streams under the high state of nature model for chilipepper rockfish.

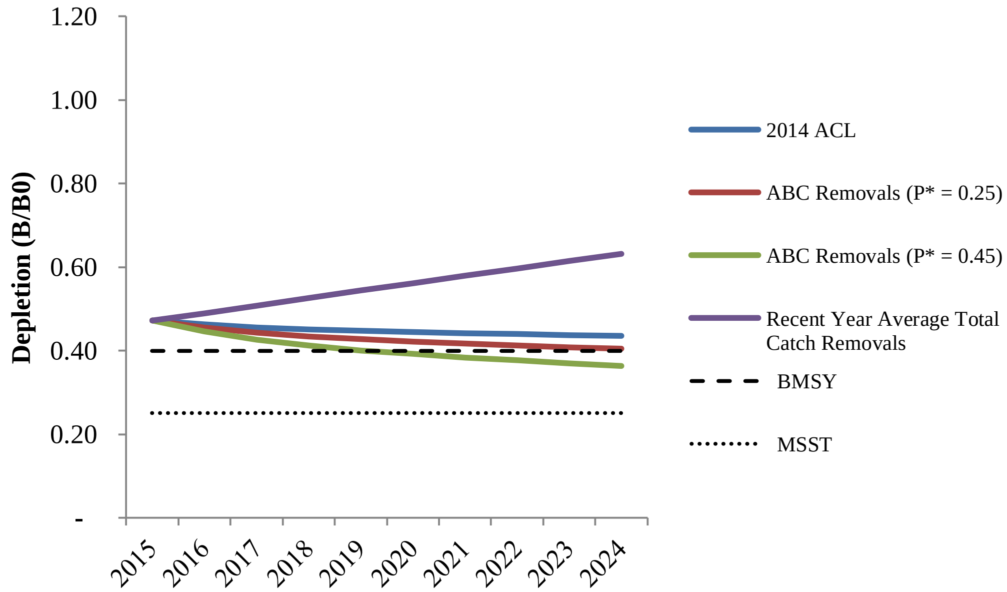

Figure 4-70. Projected depletion under alternative catch streams under the low state of nature model for chilipepper rockfish.

4.8.3.4 Cowcod

While the management unit for the cowcod stock managed under the rebuilding plan is for the population south of 40º10’ N. latitude, the long-term projections analyzed in this section are only for the assessed population south of Pt. Conception at 34º27’ N. latitude. The range of average annual cowcod catch contributions from 2015 to 2024 from the Southern California Bight across the catch scenarios analyzed and states of nature modeled in the 2013 assessment is 1 to 93 mt (Table 4-192). The stock is projected to rebuild under the base case scenario for all catch scenarios except the highest one (ACL = ABC using a P* of 0.45), where the biomass trends to a slightly lower depletion (Figure 4-71). All the ABC removal scenarios are predicted to keep the stock in the precautionary zone, while the lower catch scenarios (i.e., 2014 ACL, ACL removal using an SPR rate of 82.7 percent (or equivalent exploitation fraction[64]), and recent year average total catch removals) are predicted to rebuild the stock within the next ten years. The stock is estimated to be healthy, with all catch scenarios being sustainable under the high state of nature (Figure 4-72). In contrast, the estimated depletion under the low state of nature is below the MSST, with a slightly increasing trend under all catch scenarios (Figure 4-73). None of the catch scenarios under the low state of nature is predicted to rebuild the stock within ten years, although the lower catch streams up to the ABC removals using a P* of 0.25 are predicted to increase biomass above the MSST within 10 years.

Table 4-192. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for cowcod south of 34º27’ N. latitude.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	2
	ABC Removals (P* = 0.25; Alt. 2)	35
	ABC Removals (P* = 0.4)	46
	ABC Removals (P* = 0.45; Alt. 1)	49
	ACL Removals (SPR = 82.7% in Conception area; Pref. Alt.)	9
	Recent Year Average Total Catch Removals	1
High	2014 ACL	2
	ABC Removals (P* = 0.25)	68
	ABC Removals (P* = 0.4)	86
	ABC Removals (P* = 0.45)	93
	ACL Removals (SPR = 82.7% in Conception area)	12
	Recent Year Average Total Catch Removals	1
Low	2014 ACL	2
	ABC Removals (P* = 0.25)	15
	ABC Removals (P* = 0.4)	21
	ABC Removals (P* = 0.45)	22
	ACL Removals (SPR = 82.7% in Conception area)	6
	Recent Year Average Total Catch Removals	1

[64] The 2013 cowcod assessment was conducted in an XDB-SRA platform, which does not accommodate SPR harvest rates. Therefore, the 2013 cowcod rebuilding analysis calculated an equivalent exploitation fraction of allowable harvest/age 11+ biomass to the status quo SPR harvest rate of 82.7% (E = 0.007) to project impacts.

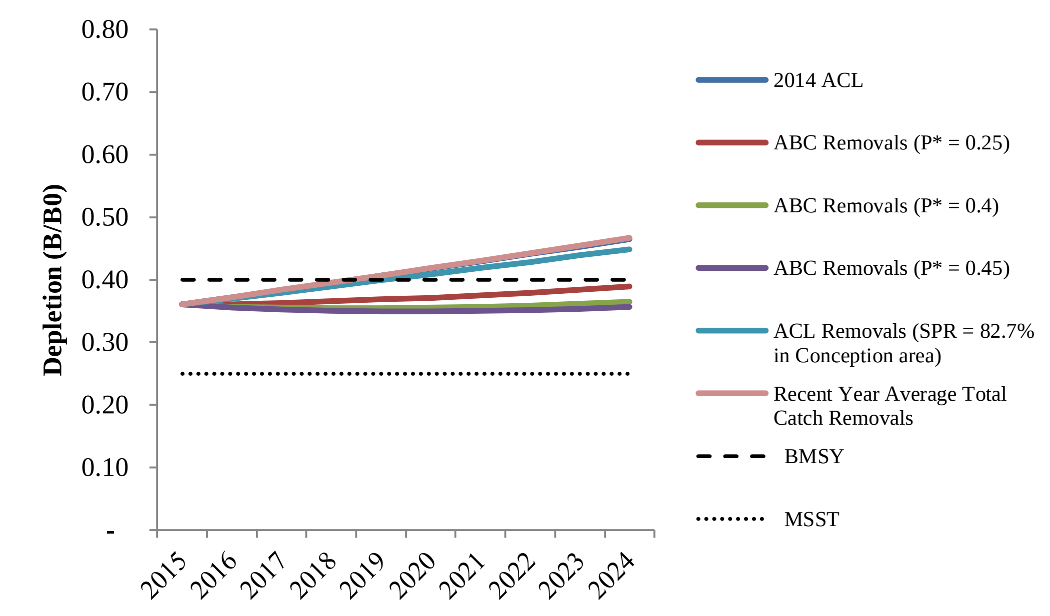

Figure 4-71. Projected depletion under alternative catch streams under the base case state of nature model for cowcod south of 34º27' N. latitude.

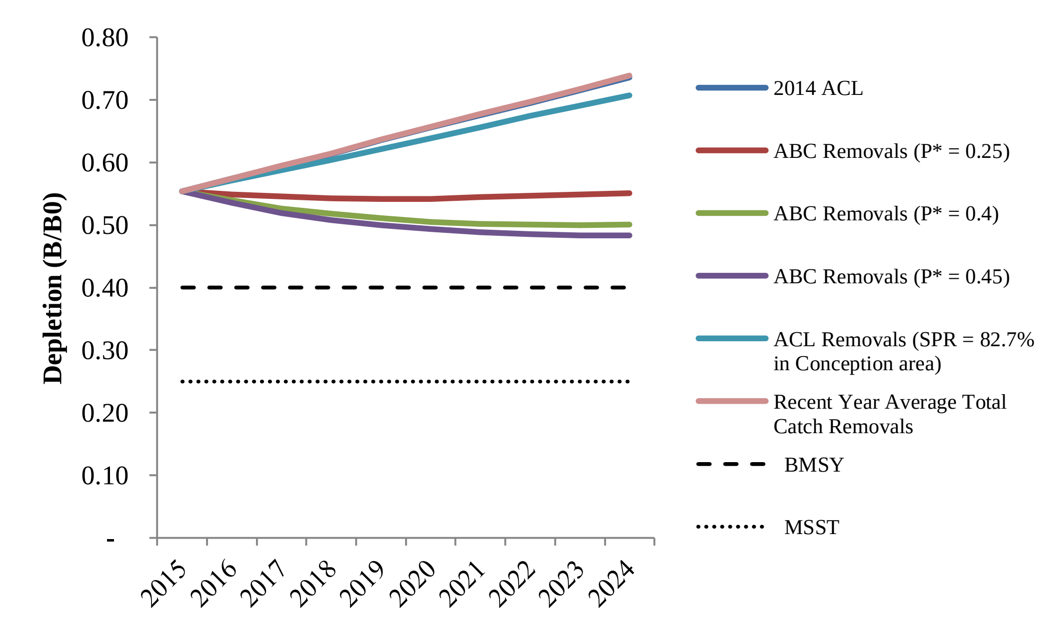

Figure 4-72. Projected depletion under alternative catch streams under the high state of nature model for cowcod south of 34º27' N. latitude.

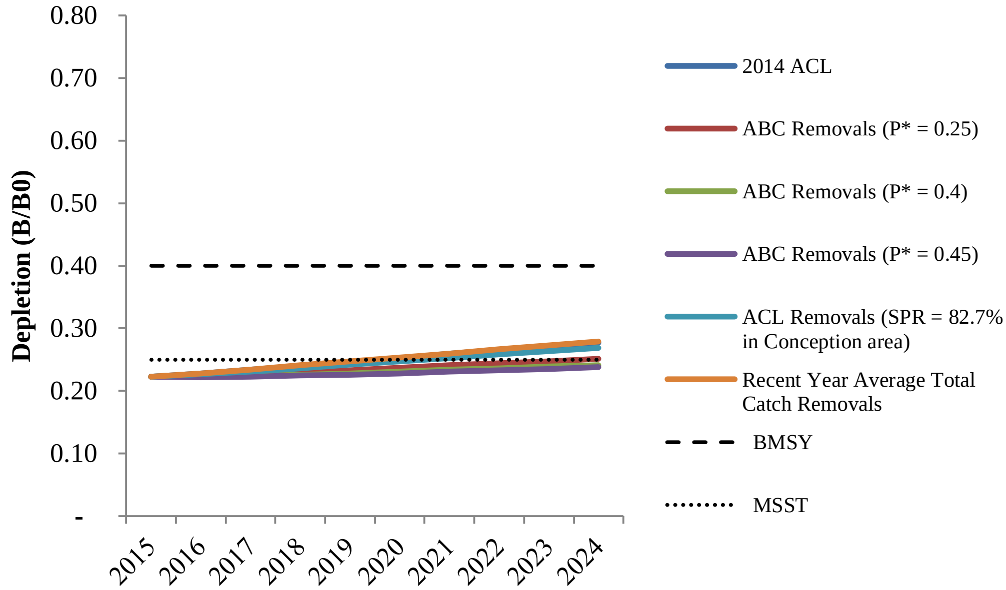

Figure 4-73. Projected depletion under alternative catch streams under the low state of nature model for cowcod south of 34º27' N. latitude.

4.8.3.5 Greenstriped Rockfish

The modeled catch scenarios for greenstriped rockfish range from 21 mt per year, based on the recent year average catches to an annual average catch from 2015 to 2024 of 10,211 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-193). Projected greenstriped depletions under all catch scenarios and states of nature are predicted to be sustainable (Figure 4-74, Figure 4-75, and Figure 4-76). The most likely trajectory for greenstriped is the recent year average total catch scenario under the base case model since greenstriped are not targeted and do not tend to aggregate, which might otherwise cause sporadically high catches.

Table 4-193. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for greenstriped rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	857
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	1,201
	Recent Year Average Total Catch Removals	21
High	ABC Removals (P* = 0.25)	7,365
	ABC Removals (P* = 0.45)	10,211
	Recent Year Average Total Catch Removals	21
Low	ABC Removals (P* = 0.25)	156
	ABC Removals (P* = 0.45)	221
	Recent Year Average Total Catch Removals	21

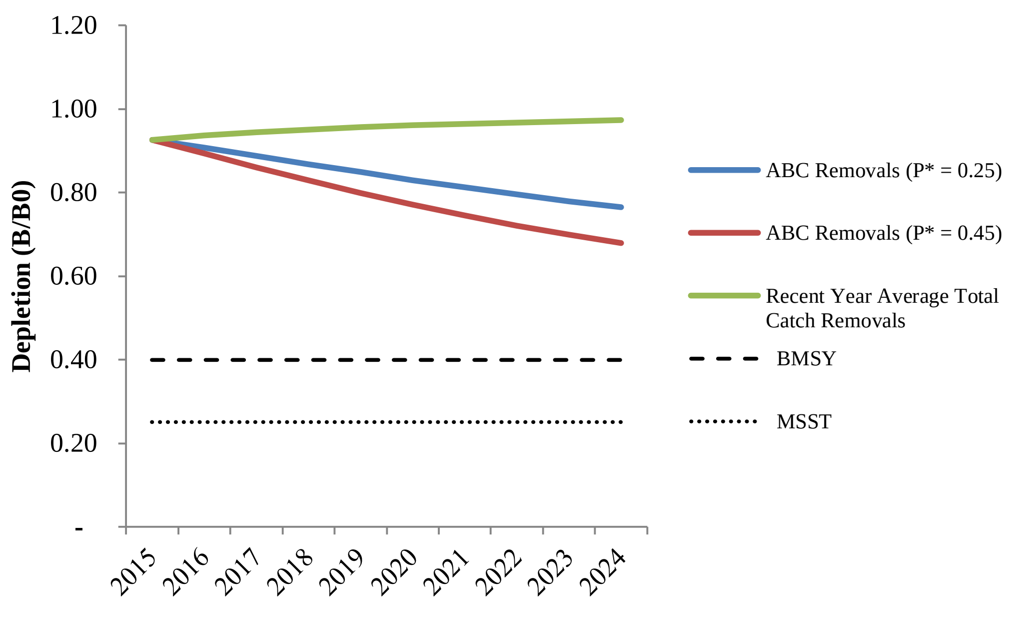

Figure 4-74. Projected depletion under alternative catch streams under the base case state of nature model for greenstriped rockfish.

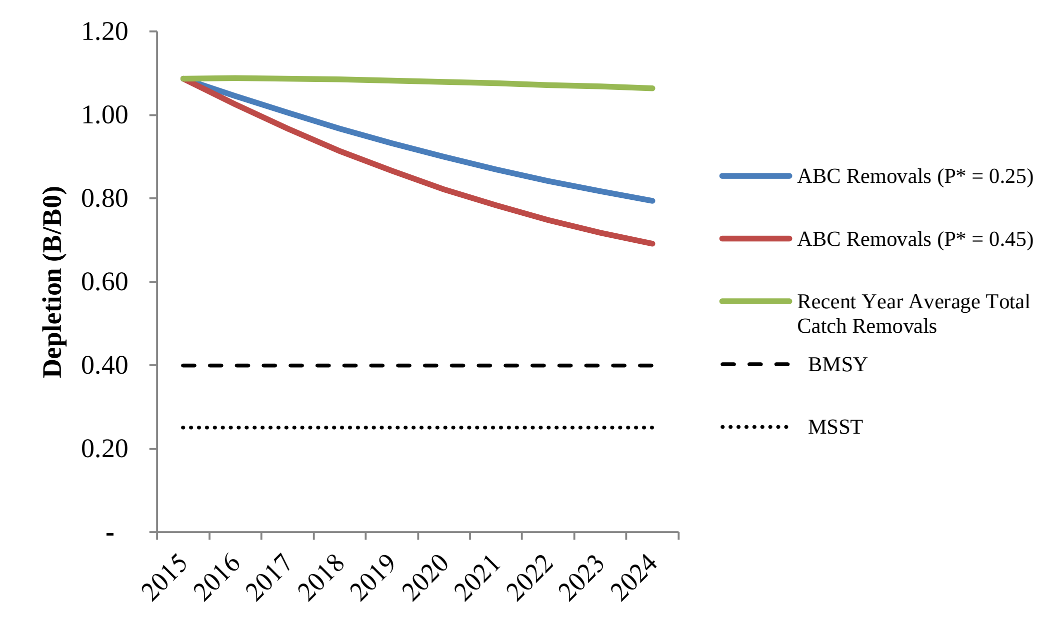

Figure 4-75. Projected depletion under alternative catch streams under the high state of nature model for greenstriped rockfish.

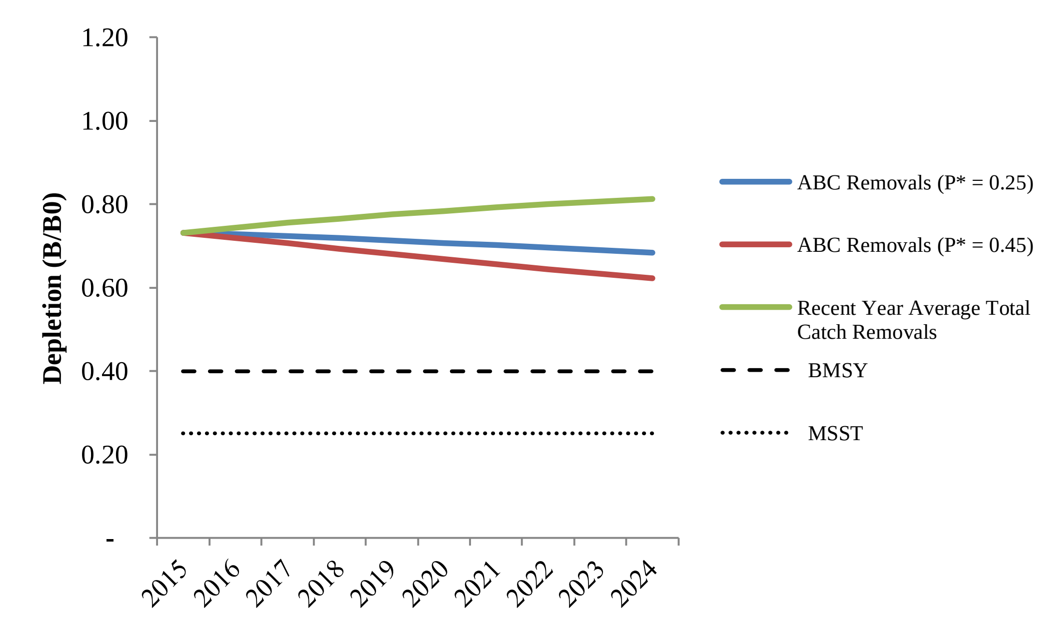

Figure 4-76. Projected depletion under alternative catch streams under the low state of nature model for greenstriped rockfish.

4.8.3.6 Widow Rockfish

The modeled catch scenarios for widow rockfish range from 247 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 4,648 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-194). Projected widow depletions under the base case and high states of nature are sustainable during the projection period, assuming the respective states of nature (Figure 4-77, Figure 4-78, and Figure 4-79). Projected widow depletions under the low state of nature keeps the stock in the precautionary zone during the projection period (Figure 7-79). All the catch scenarios, except the 3,000-mt constant catch scenario under the low state of nature, predict some stock rebuilding. The 3,000-mt constant catch scenario under the low state of nature is predicted to reach an asymptote at the MSST during the projection period.

Table 4-194. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for widow rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	3,709
	ABC Removals (P* = 0.45; Alt. 1)	4,402
	Recent Year Average Total Catch Removals	247
	ACL Removals (1,500 mt constant catch; No Action Alt.)	1,500
	ACL Removals (3,000 mt constant catch)	3,000
High	ABC Removals (P* = 0.25)	3,915
	ABC Removals (P* = 0.45)	4,648
	Recent Year Average Total Catch Removals	247
	ACL Removals (1,500 mt constant catch)	1,500
	ACL Removals (3,000 mt constant catch)	3,000
Low	ABC Removals (P* = 0.25)	2,131
	ABC Removals (P* = 0.45)	2,493
	Recent Year Average Total Catch Removals	247
	ACL Removals (1,500 mt constant catch)	1,500
	ACL Removals (3,000 mt constant catch)	3,000

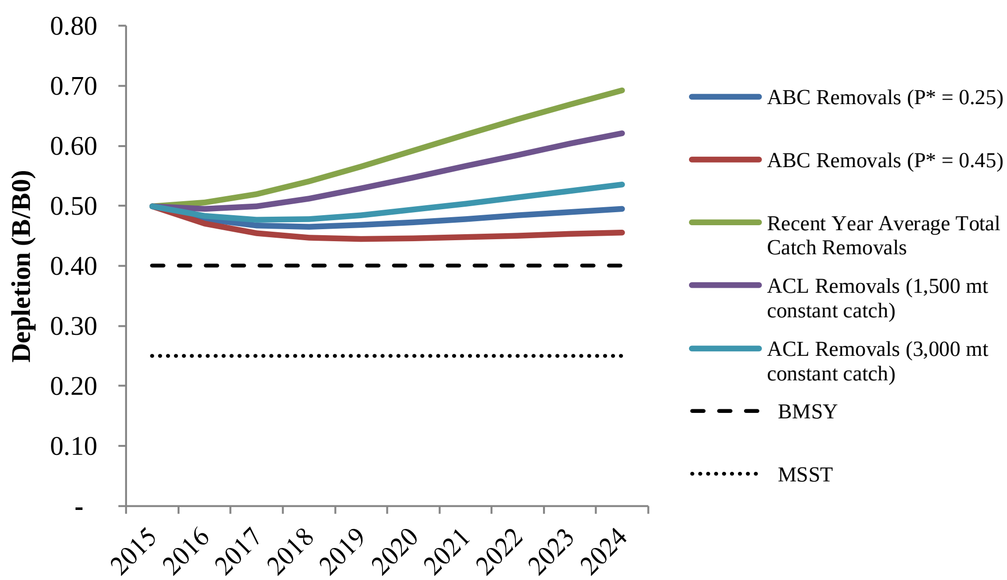

Figure 4-77. Projected depletion under alternative catch streams under the base case state of nature model for widow rockfish.

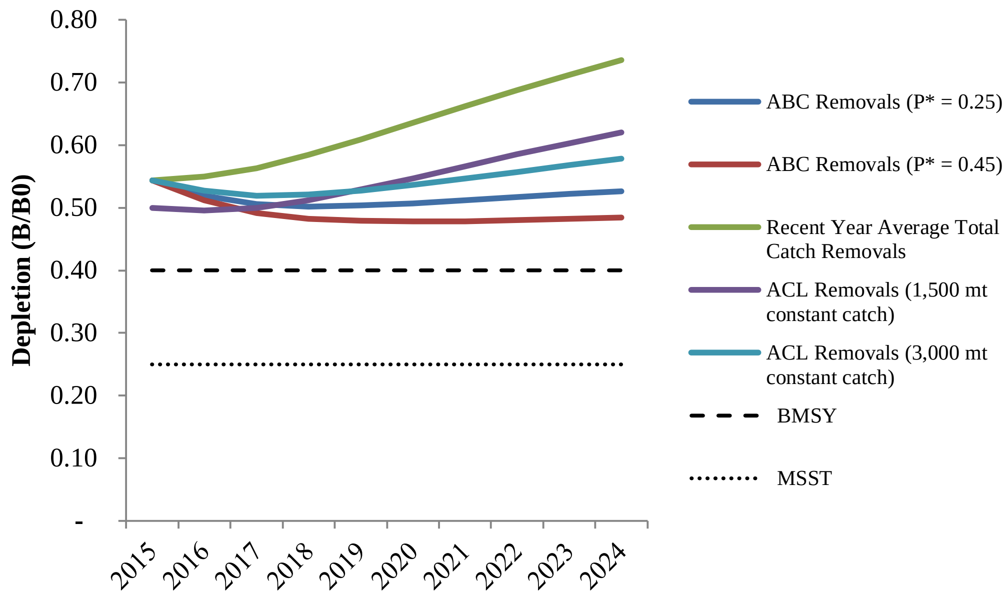

Figure 4-78. Projected depletion under alternative catch streams under the high state of nature model for widow rockfish.

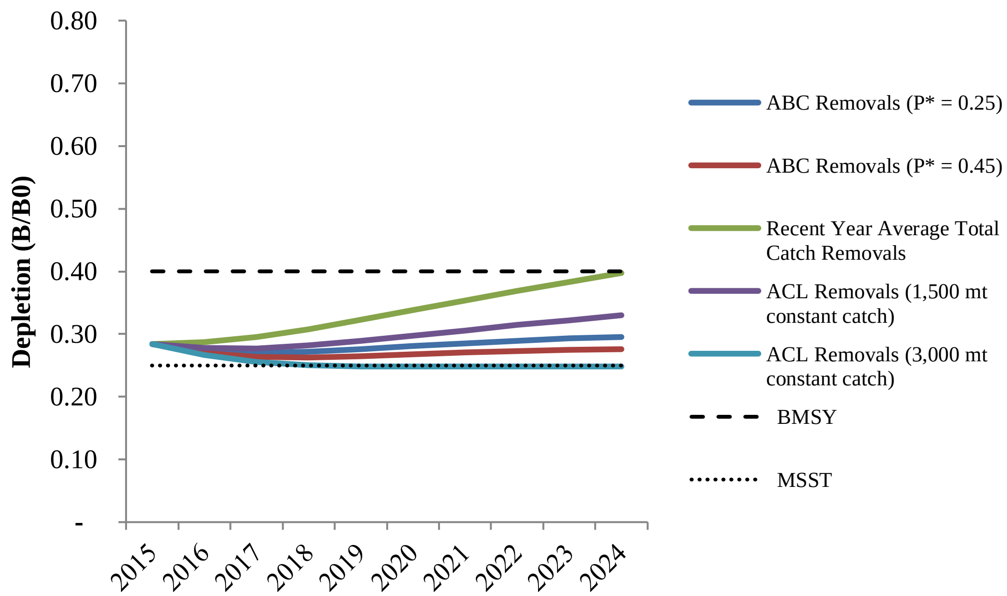

Figure 4-79. Projected depletion under alternative catch streams under the low state of nature model for widow rockfish.

4.8.3.7 Yelloweye Rockfish

The modeled catch scenarios for yelloweye rockfish range from 10 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 76 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-195). Projected yelloweye rockfish depletions for all catch scenarios under the base case state of nature are predicted to undergo rebuilding and increase in abundance from below the MSST into the precautionary zone during the projection period (Figure 4-80). Projected yelloweye depletions for all catch scenarios under the high state of nature are predicted to keep the stock in the precautionary zone during the projection period (Figure 4-81). Projected yelloweye depletions for all catch scenarios under the low state of nature are predicted to keep the stock at very low levels of depletion under the MSST, with very little or no rebuilding (Figure 4-82).

Table 4-195. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for yelloweye rockfish.

State of Nature	Catch Scenario	201 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	18
	ABC Removals (P* = 0.25; Alt. 2)	29
	ABC Removals (P* = 0.45; Alt. 1)	41
	ACL Removals (SPR = 76%; Pref. Alt.)	19
	Recent Year Average Total Catch Removals	10
High	2014 ACL	18
	ABC Removals (P* = 0.25)	54
	ABC Removals (P* = 0.45)	76
	ACL Removals (SPR = 76%)	33
	Recent Year Average Total Catch Removals	10
Low	2014 ACL	18
	ABC Removals (P* = 0.25)	17
	ABC Removals (P* = 0.45)	24
	ACL Removals (SPR = 76%)	12
	Recent Year Average Total Catch Removals	10

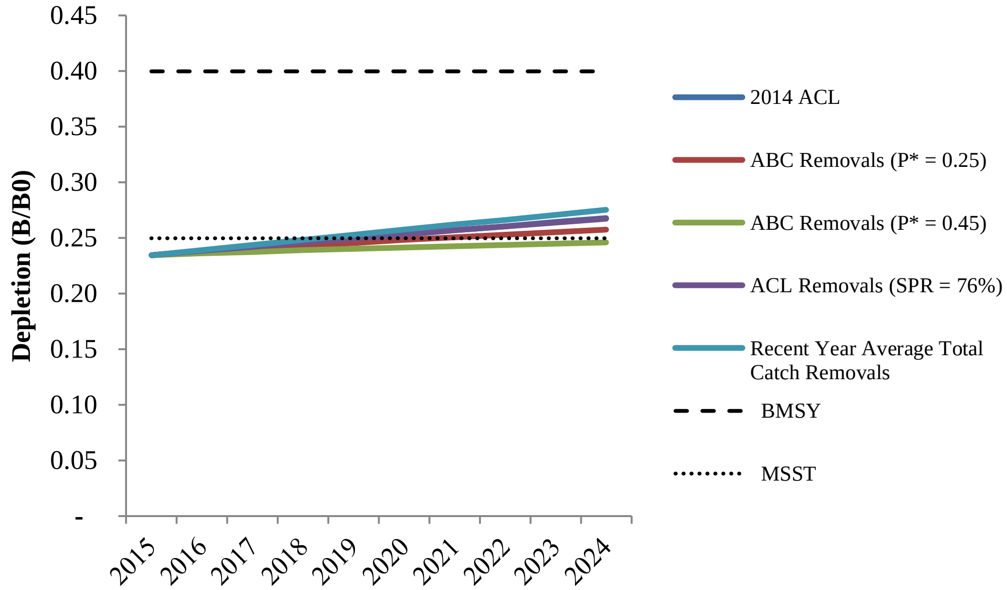

Figure 4-80. Projected depletion under alternative catch streams under the base case state of nature model for yelloweye rockfish.

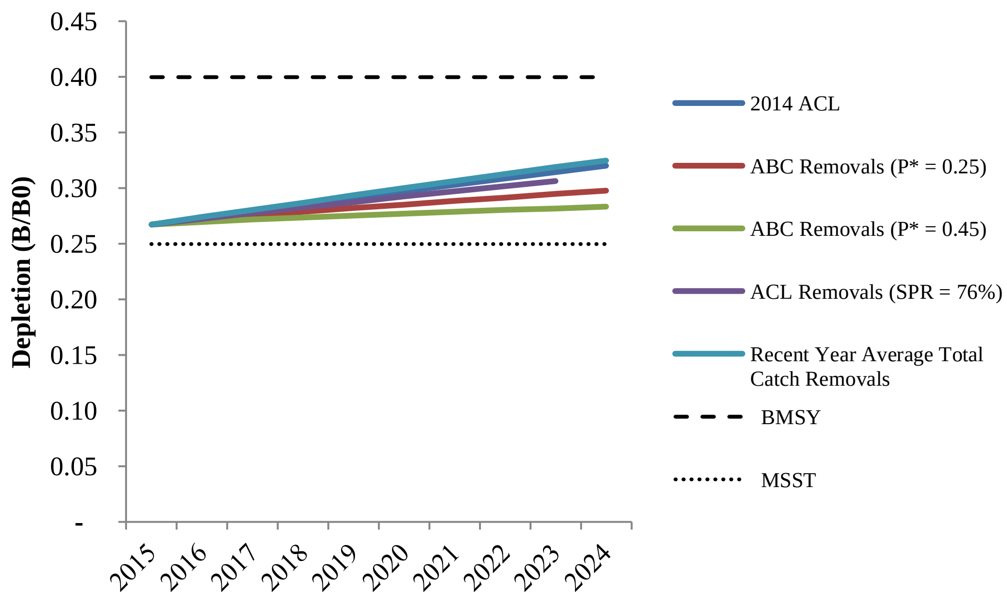

Figure 4-81. Projected depletion under alternative catch streams under the high state of nature model for yelloweye rockfish.

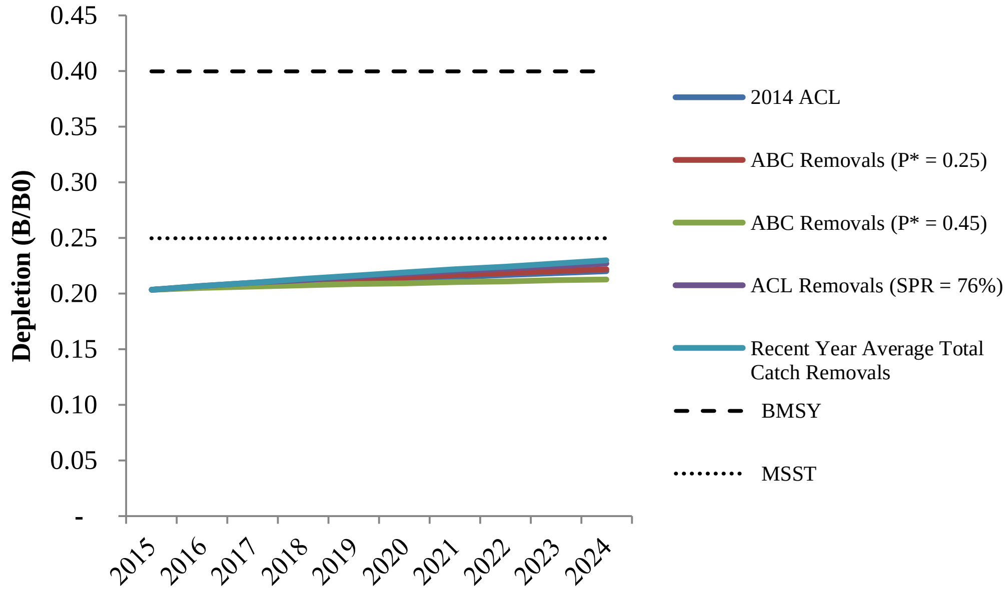

Figure 4-82. Projected depletion under alternative catch streams under the low state of nature model for yelloweye rockfish.

4.8.3.8 Yellowtail Rockfish North of 40º10' N. Latitude

The modeled catch scenarios for yellowtail rockfish north of 40º10' N. latitude range from 1,551 mt per year, based on the recent year average catches, to an annual average catch from 2015 to 2024 of 9,805 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-196). Projected yellowtail rockfish depletions under all states of nature are sustainable, assuming the respective states of nature (Figure 4-83, Figure 4-84, and Figure 4-85).

Table 4-196. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for yellowtail rockfish north of 40º10' N. latitude.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	4,382
	ABC Removals (P* = 0.25; Alt. 2)	3,251
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	5,603
	Recent Year Average Total Catch Removals	1,551
High	2014 ACL	4,382
	ABC Removals (P* = 0.25)	5,745
	ABC Removals (P* = 0.45)	9,805
	Recent Year Average Total Catch Removals	1,551
Low	2014 ACL	4,382
	ABC Removals (P* = 0.25)	2,050
	ABC Removals (P* = 0.45)	3,571
	Recent Year Average Total Catch Removals	1,551

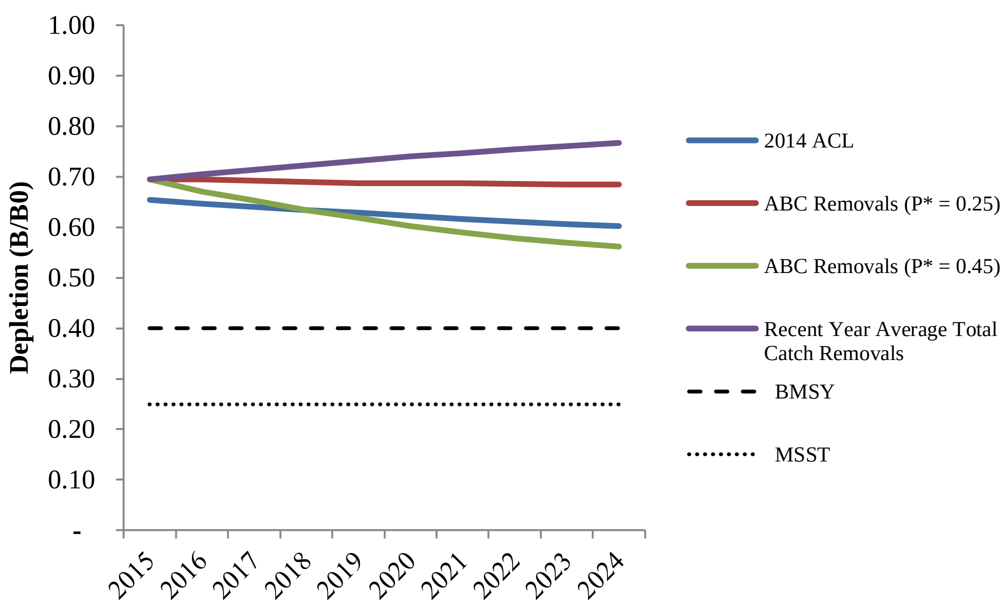

Figure 4-83. Projected depletion under alternative catch streams under the base case state of nature model for yellowtail rockfish north of 40º10' N. latitude.

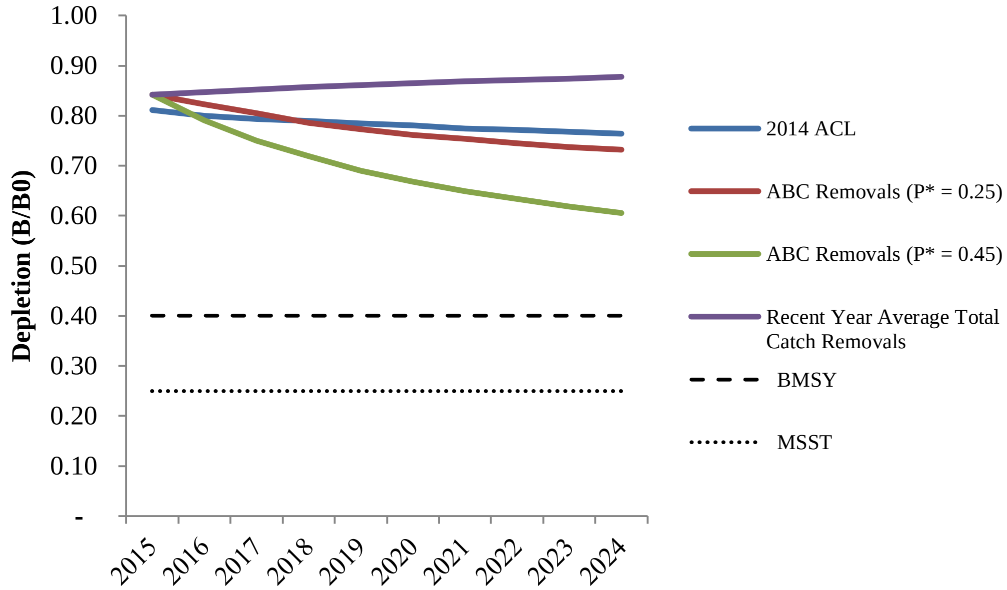

Figure 4-84. Projected depletion under alternative catch streams under the high state of nature model for yellowtail rockfish north of 40º10' N. latitude.

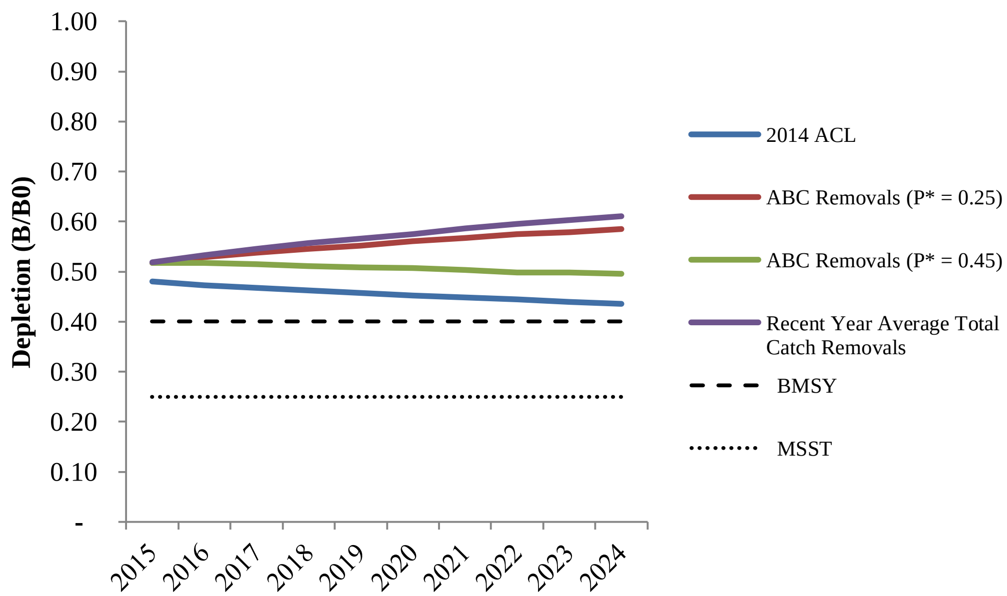

Figure 4-85. Projected depletion under alternative catch streams under the low state of nature model for yellowtail rockfish north of 40º10' N. latitude.

4.8.4 Long-term Impacts of Assessed Slope Rockfish Species

4.8.4.1 Aurora Rockfish

The modeled catch scenarios for aurora rockfish range from 34 mt per year, based on the 2014 ACL contribution (based on a data-poor OFL that preceded the OFL estimated from the 2013 assessment and a

16.6 percent ABC deduction from the OFL, based on the stock then being categorized as a cat. 3 stock under a P* of 0.45), to an annual average catch from 2015 to 2024 of 144 mt based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-197). Projected aurora rockfish depletions under all states of nature are sustainable, assuming the respective states of nature (Figure 4-86, Figure 4-87, and Figure 4-88).

Table 4-197. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for aurora rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL contribution (No Action Alt.)	34
	ABC Removals (P* = 0.25; Alt. 2)	72
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	87
	Recent Year Average Total Catch Removals	46
High	2014 ACL contribution	34
	ABC Removals (P* = 0.25)	118
	ABC Removals (P* = 0.45)	144
	Recent Year Average Total Catch Removals	46
Low	2014 ACL contribution	34
	ABC Removals (P* = 0.25)	46
	ABC Removals (P* = 0.45)	55
	Recent Year Average Total Catch Removals	46

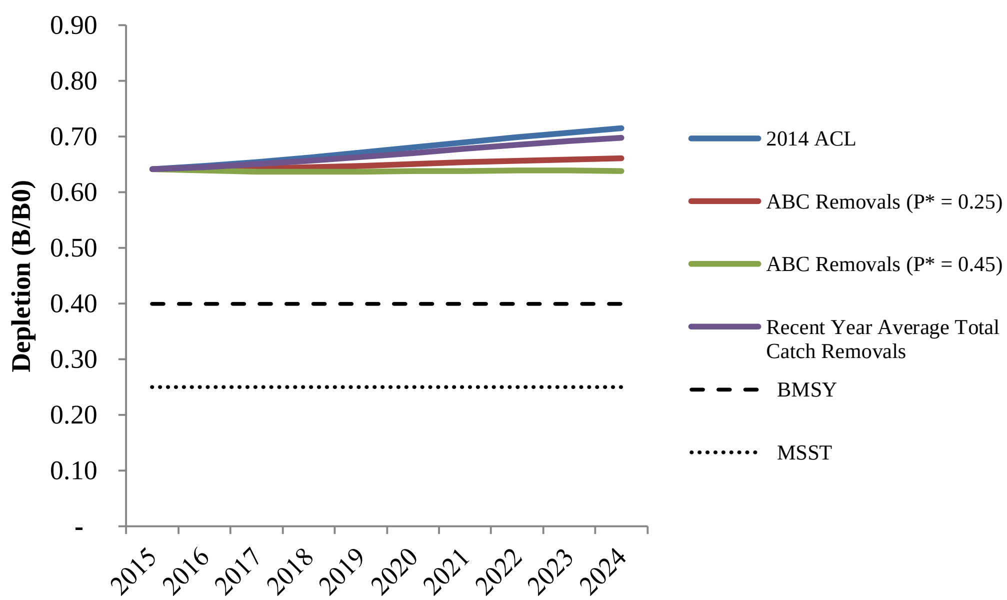

Figure 4-86. Projected depletion under alternative catch streams under the base case state of nature model for aurora rockfish.

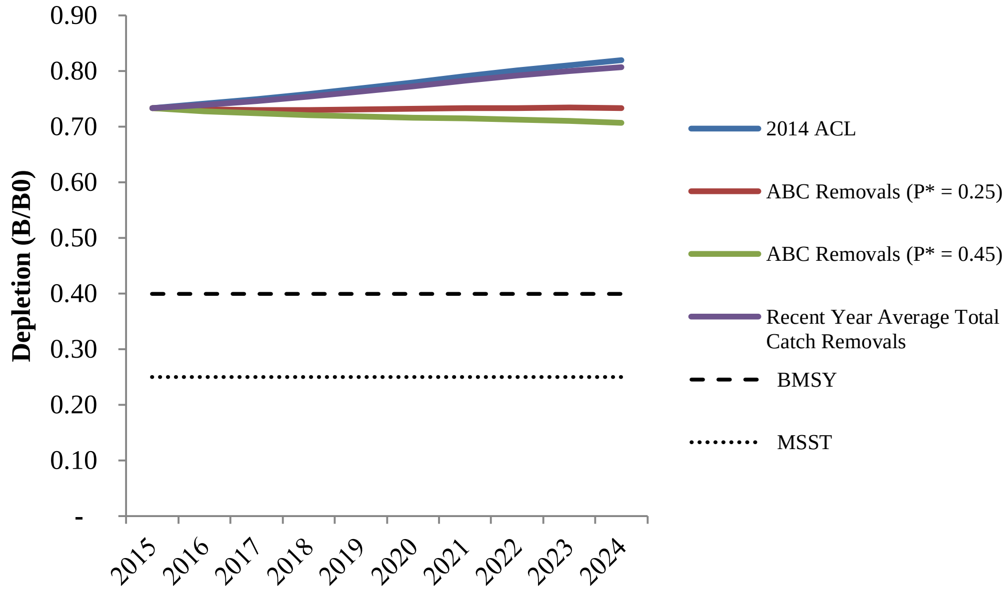

Figure 4-87. Projected depletion under alternative catch streams under the high state of nature model for aurora rockfish.

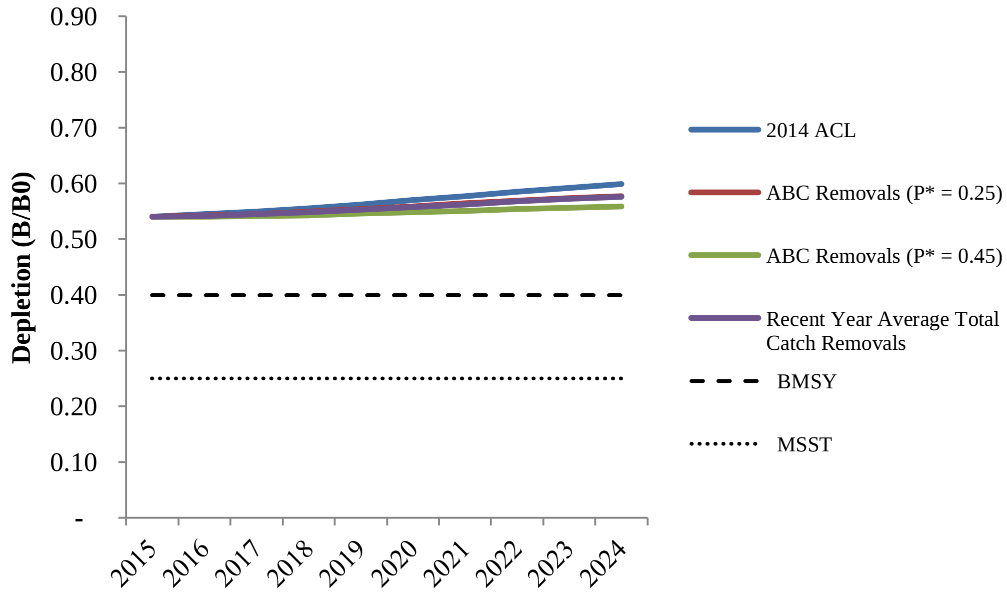

Figure 4-88. Projected depletion under alternative catch streams under the low state of nature model for aurora rockfish.

4.8.4.2 Blackgill Rockfish South of 40º10' N. Latitude

The modeled catch scenarios for blackgill rockfish south of 40º10' N. latitude range from an annual average catch of 55 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature, to an annual average catch from 2015 to 2024 of 224 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-198). Projected blackgill rockfish depletions under the base case state of nature for all catch scenarios keep the stock within the precautionary zone during the projection period, except for the ABC removals under a P* of 0.25, where the depletion is projected to rebuild to the B_{MSY} threshold by the end of the projection period (Figure 4-89). Projected blackgill rockfish depletions under the high state of nature are sustainable for all catch scenarios (Figure 4-90). Projected blackgill rockfish depletions under the low state of nature for all catch scenarios are predicted to rebuild from below the MSST into the precautionary zone during the projection period (Figure 4-91).

Table 4-198. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for blackgill rockfish south of 40º10' N. latitude.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL contribution (No Action Alt.	110
	ABC Removals (P* = 0.25; Alt. 2)	93
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	131
	Recent Year Average Total Catch Removals	173
High	2014 ACL contribution	110
	ABC Removals (P* = 0.25)	159
	ABC Removals (P* = 0.45)	224
	Recent Year Average Total Catch Removals	173
Low	2014 ACL contribution	110
	ABC Removals (P* = 0.25)	55
	ABC Removals (P* = 0.45)	78
	Recent Year Average Total Catch Removals	173

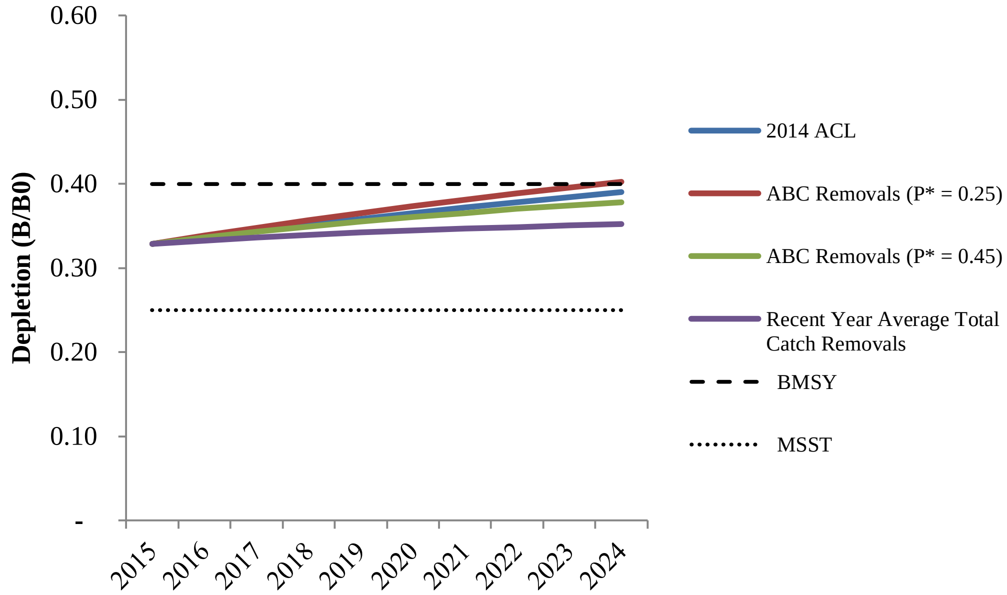

Figure 4-89. Projected depletion under alternative catch streams under the base case state of nature model for blackgill rockfish south of 40º10’ N. latitude.

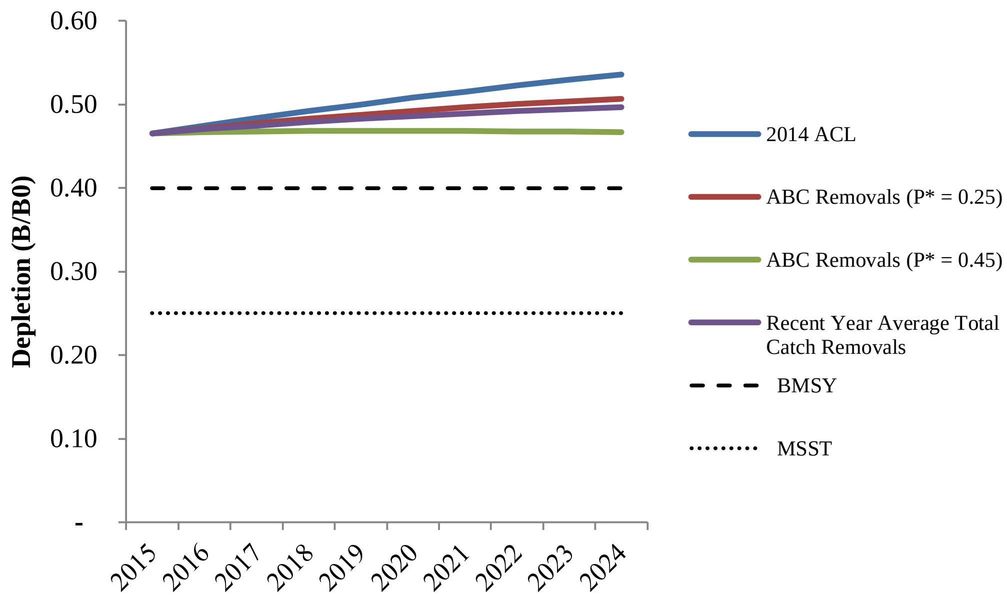

Figure 4-90. Projected depletion under alternative catch streams under the high state of nature model for blackgill rockfish south of 40º10’ N. latitude.

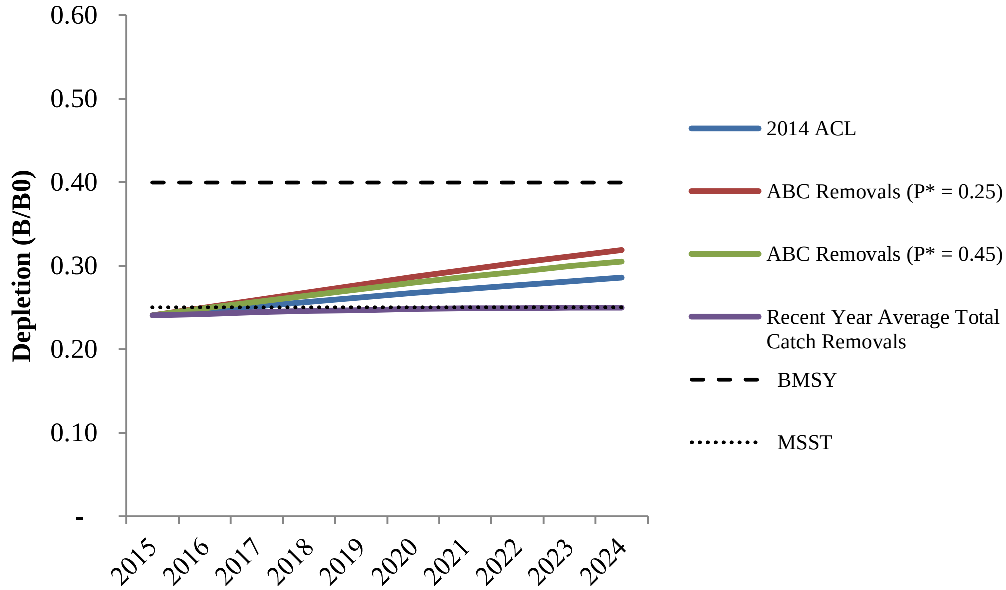

Figure 4-91. Projected depletion under alternative catch streams under the low state of nature model for blackgill rockfish south of 40º10’ N. latitude.

4.8.4.3 Darkblotched Rockfish

The modeled catch scenarios for darkblotched rockfish range from an annual average catch of 108 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 2,003 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-199). Projected darkblotched rockfish depletions under the base case and high states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-92 and Figure 4-93). Projected darkblotched rockfish depletions under the low state of nature for all catch scenarios are predicted to rebuild from below the MSST into the precautionary zone during the projection period (Figure 4-94).

Table 4-199. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for darkblotched rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	330
	ABC Removals (P* = 0.25; Alt. 2)	484
	ABC Removals (P* = 0.45; Alt. 1)	575
	ACL Removals (SPR = 64.9%; Pref. Alt.)	349
	Recent Year Average Total Catch Removals	108
High	2014 ACL	330
	ABC Removals (P* = 0.25)	1,702
	ABC Removals (P* = 0.45)	2,003
	ACL Removals (SPR = 64.9%)	1,253
	Recent Year Average Total Catch Removals	108
Low	2014 ACL	330
	ABC Removals (P* = 0.25)	168
	ABC Removals (P* = 0.45)	200
	ACL Removals (SPR = 64.9%)	121
	Recent Year Average Total Catch Removals	108

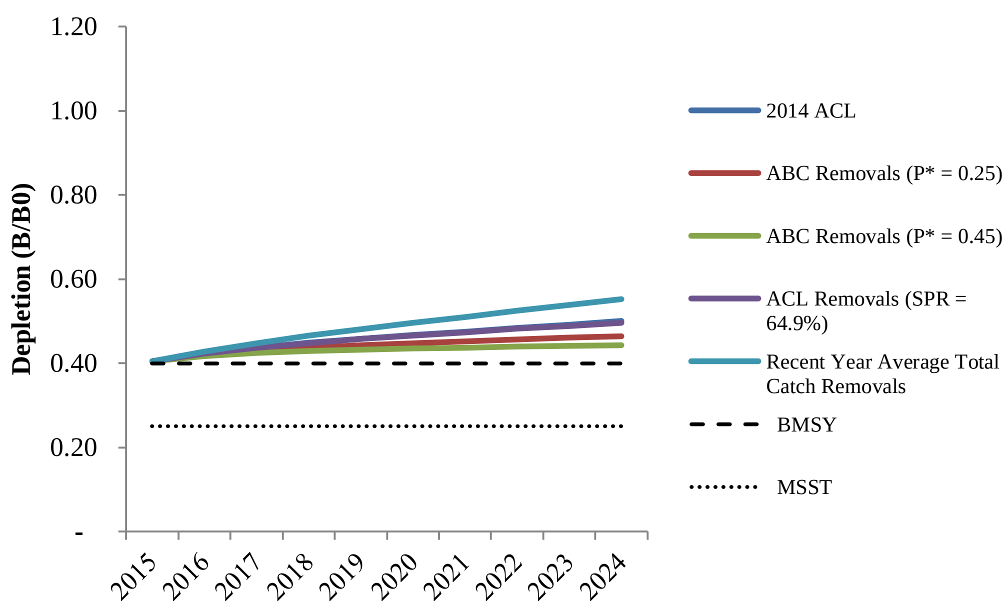

Figure 4-92. Projected depletion under alternative catch streams under the base case state of nature model for darkblotched rockfish.

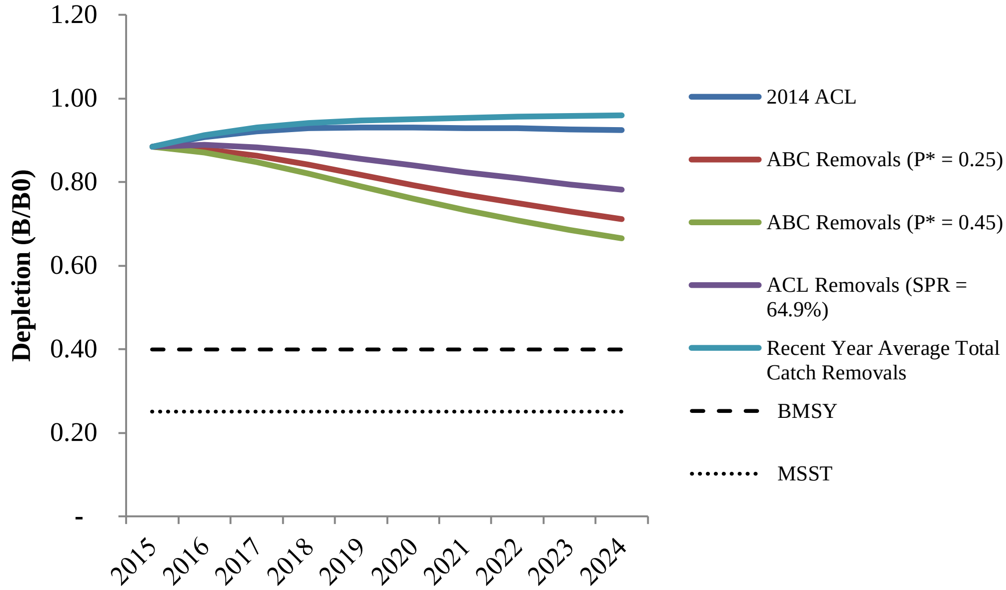

Figure 4-93. Projected depletion under alternative catch streams under the high state of nature model for darkblotched rockfish.

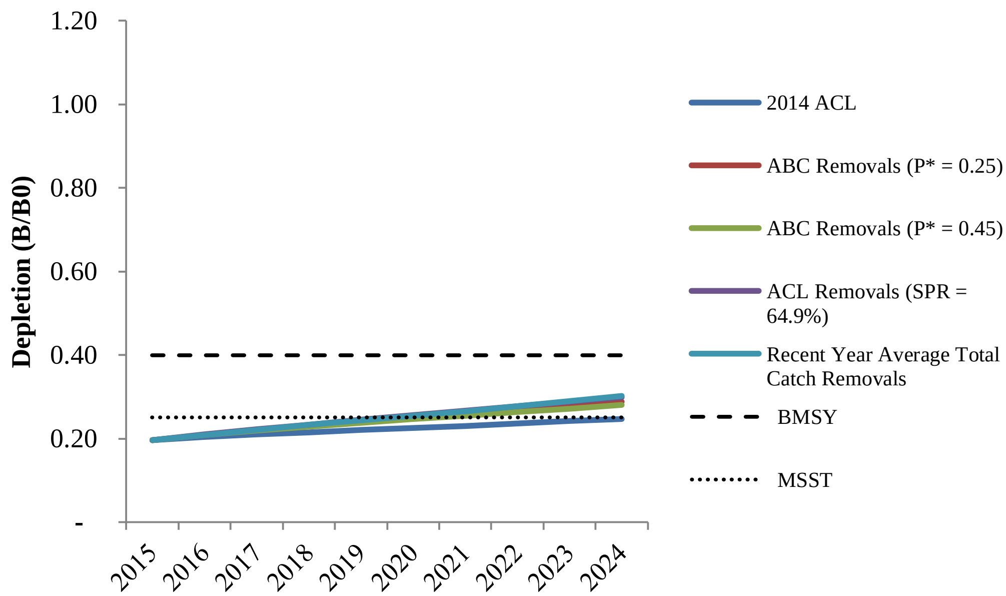

Figure 4-94. Projected depletion under alternative catch streams under the low state of nature model for darkblotched rockfish.

4.8.4.4 Longspine Thornyheads

The modeled catch scenarios for longspine thornyheads range from an annual average catch of 942 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 6,620 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-200). Projected longspine thornyhead depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-95, Figure 4-96, and Figure 4-97).

Table 4-200. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for longspine thornyheads.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	2,305
	ABC Removals (P* = 0.25; Alt. 2)	2,683
	ABC Removals (P* = 0.4; Pref. Alt.)	3,395
	ABC Removals (P* = 0.45; Alt. 1)	3,631
	Recent Year Average Total Catch Removals	942
High	2014 ACL	2,305
	ABC Removals (P* = 0.25)	4,904
	ABC Removals (P* = 0.4)	6,192
	ABC Removals (P* = 0.45)	6,620
	Recent Year Average Total Catch Removals	942
Low	2014 ACL	2,305
	ABC Removals (P* = 0.25)	1,732
	ABC Removals (P* = 0.4)	2,195
	ABC Removals (P* = 0.45)	2,349
	Recent Year Average Total Catch Removals	942

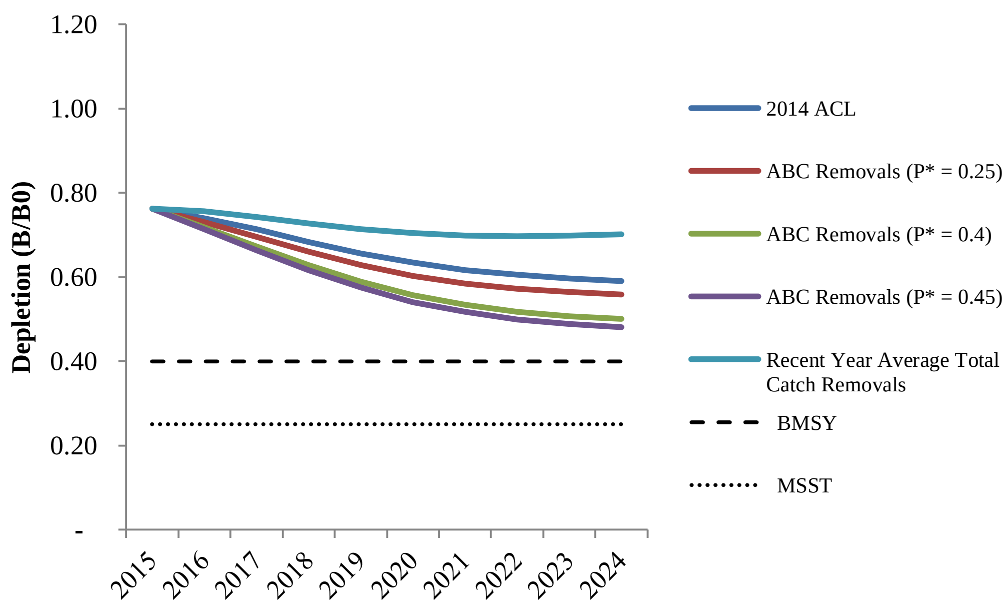

Figure 4-95. Projected depletion under alternative catch streams under the base case state of nature model for longspine thornyheads.

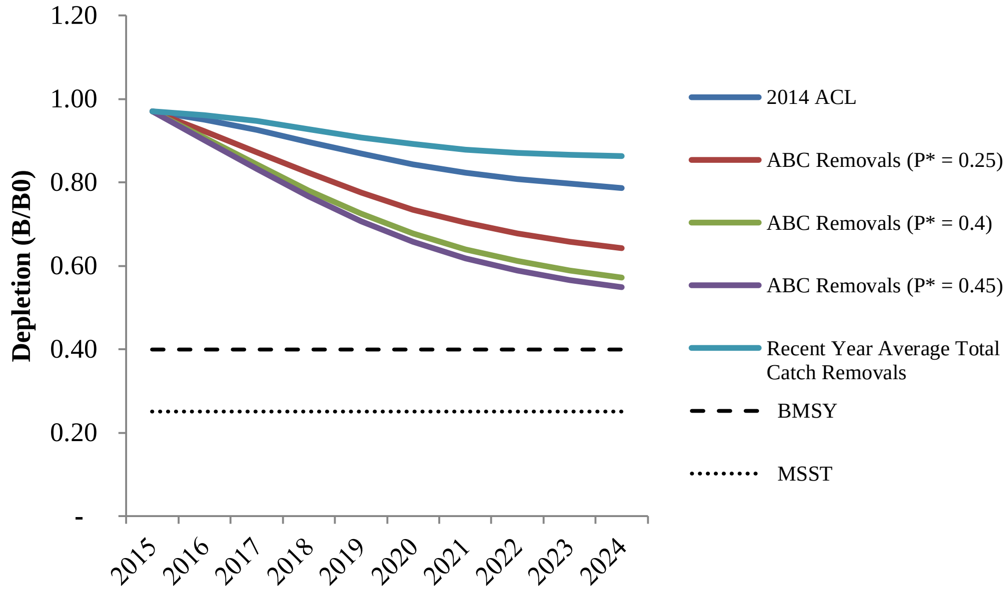

Figure 4-96. Projected depletion under alternative catch streams under the high state of nature model for longspine thornyheads.

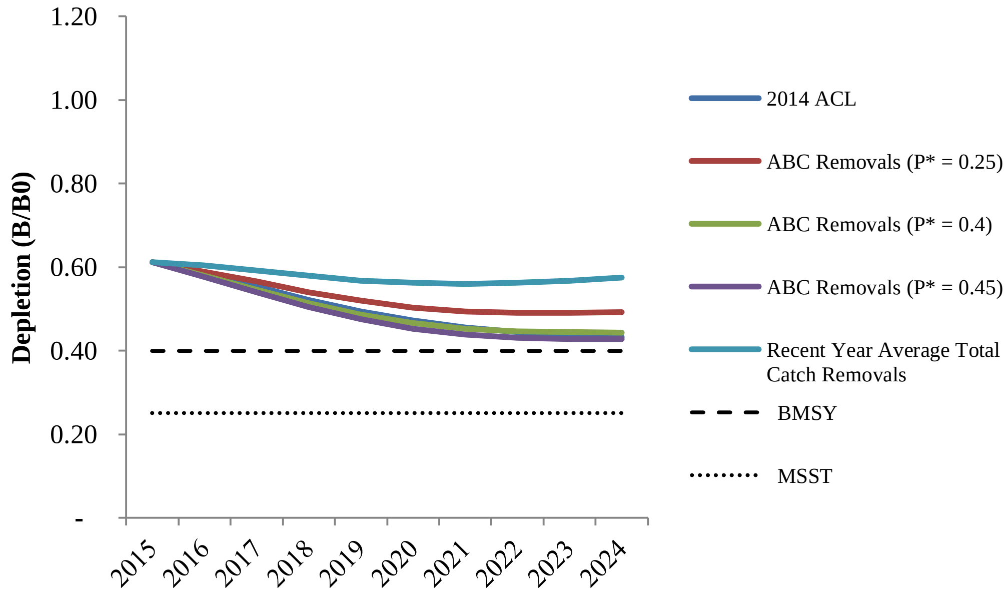

Figure 4-97. Projected depletion under alternative catch streams under the low state of nature model for longspine thornyheads.

4.8.4.5 Pacific Ocean Perch

The modeled catch scenarios for POP range from 59 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 1,805 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-201). Projected POP depletions for all catch scenarios, except the ABC removals (both the P* of 0.25 and 0.45 scenarios) under the base case state of nature, are predicted to undergo rebuilding and increase in abundance from below the MSST into the precautionary zone during the projection period. The ABC removal scenarios keep the stock below the MSST during the projection period (Figure 4-98). Projected POP depletions for all catch scenarios under the high state of nature are predicted to be sustainable during the projection period (Figure 4-99). Projected POP depletions for all catch scenarios under the low state of nature are predicted to keep the stock at very low levels of depletion under the MSST, with very little or no rebuilding (Figure 4-100).

Table 4-201. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for Pacific ocean perch.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	153
	ABC Removals (P* = 0.25; Alt. 2)	560
	ABC Removals (P* = 0.45; Alt. 1)	662
	ACL Removals (SPR = 86.4%; Pref. Alt.)	180
	Recent Year Average Total Catch Removals	59
High	2014 ACL	153
	ABC Removals (P* = 0.25)	1,517
	ABC Removals (P* = 0.45)	1,805
	ACL Removals (SPR = 86.4%)	371
	Recent Year Average Total Catch Removals	59
Low	2014 ACL	153
	ABC Removals (P* = 0.25)	189
	ABC Removals (P* = 0.45)	224
	ACL Removals (SPR = 86.4%)	110
	Recent Year Average Total Catch Removals	59

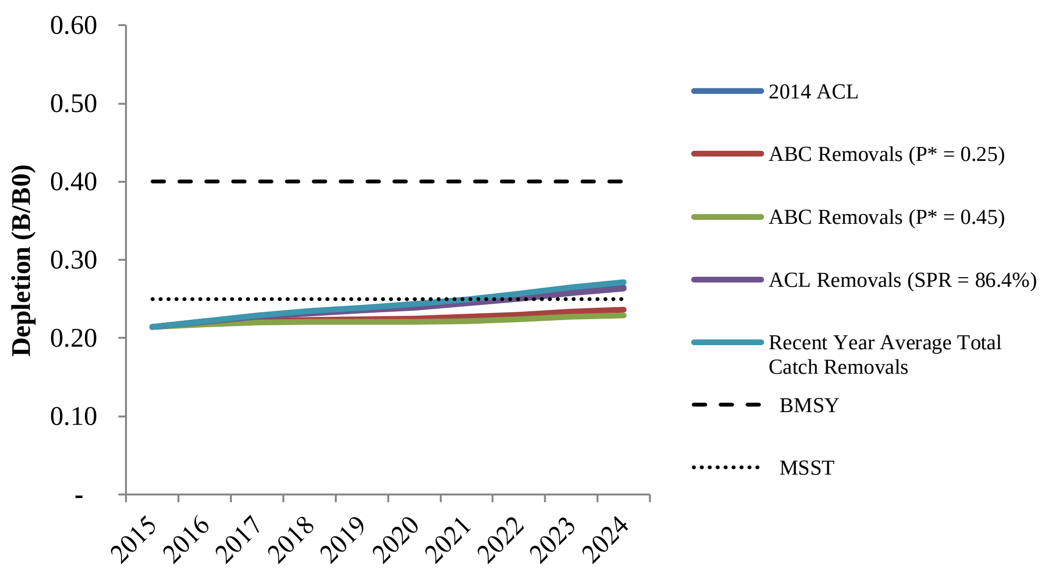

Figure 4-98. Projected depletion under alternative catch streams under the base case state of nature model for POP.

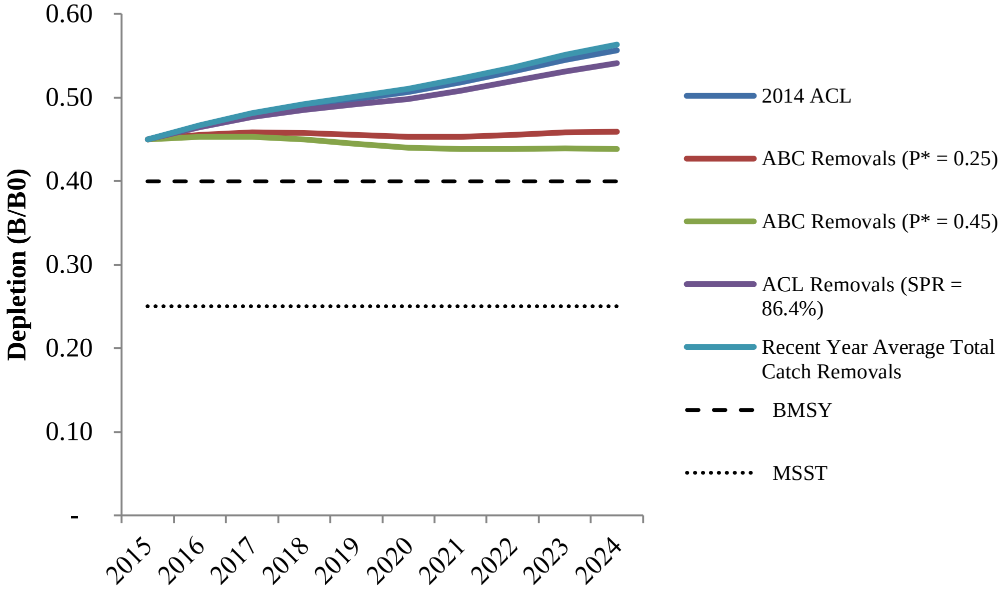

Figure 4-99. Projected depletion under alternative catch streams under the high state of nature model for POP.

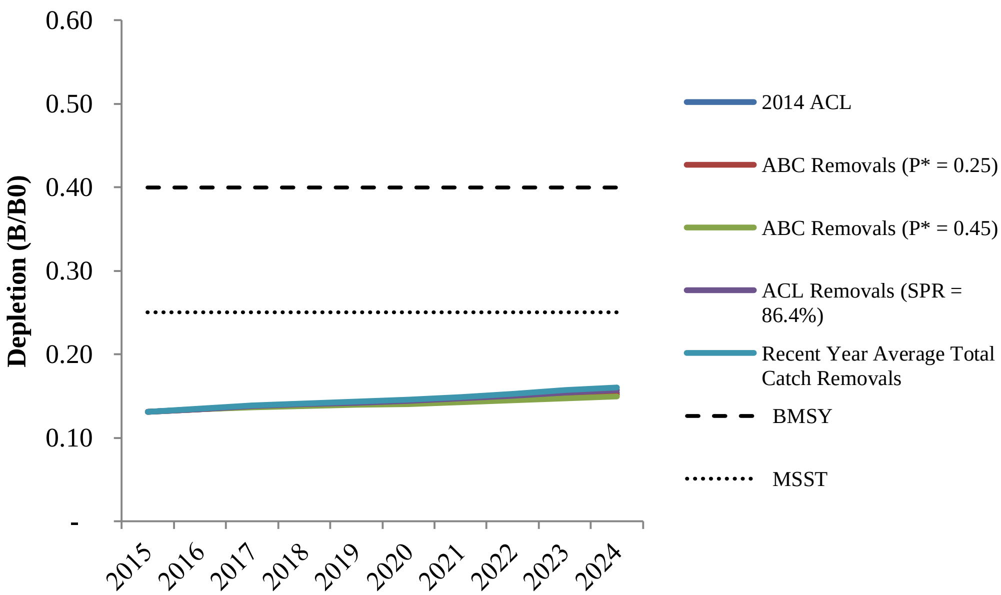

Figure 4-100. Projected depletion under alternative catch streams under the low state of nature model for POP.

4.8.4.6 Rougheye/Blackspotted Rockfish

The modeled catch scenarios for rougheye/blackspotted rockfish range from an annual average catch of 60 mt per year, based on the 2014 ACL contribution (based on a data-poor OFL that preceded the OFL estimated from the 2013 assessment and a 16.6 percent ABC deduction from the OFL based on the stock then being categorized as a cat. 3 stock under a P* of 0.45), to an annual average catch from 2015 to 2024 of 319 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-202). Projected rougheye/blackspotted rockfish depletions under the base case and high states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-101 and Figure 4-102). Projected rougheye/blackspotted rockfish depletions under the low state of nature for all catch scenarios are predicted to rebuild from the precautionary zone to above the B_{MSY} threshold during the projection period (Figure 4-103).

Table 4-202. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for rougheye/blackspotted rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL Contribution (No Action Alt.)	60
	ABC Removals (P* = 0.25; Alt. 2)	141
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	202
	Recent Year Average Total Catch Removals	189
High	2014 ACL Contribution	60
	ABC Removals (P* = 0.25)	224
	ABC Removals (P* = 0.45)	319
	Recent Year Average Total Catch Removals	189
Low	2014 ACL Contribution	60
	ABC Removals (P* = 0.25)	91
	ABC Removals (P* = 0.45)	130
	Recent Year Average Total Catch Removals	189

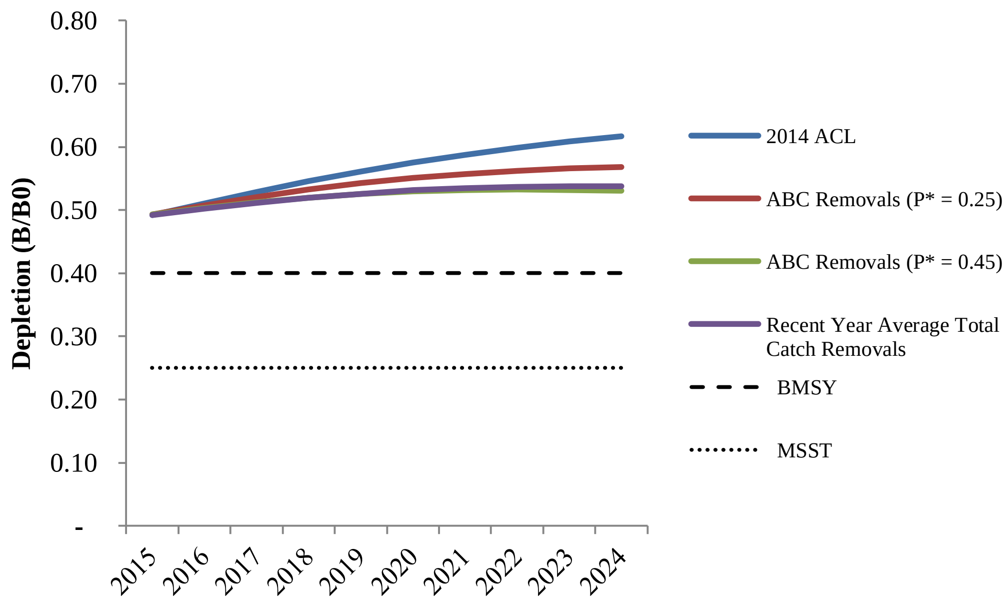

Figure 4-101. Projected depletion under alternative catch streams under the base case state of nature model for rougheye/blackspotted rockfish.

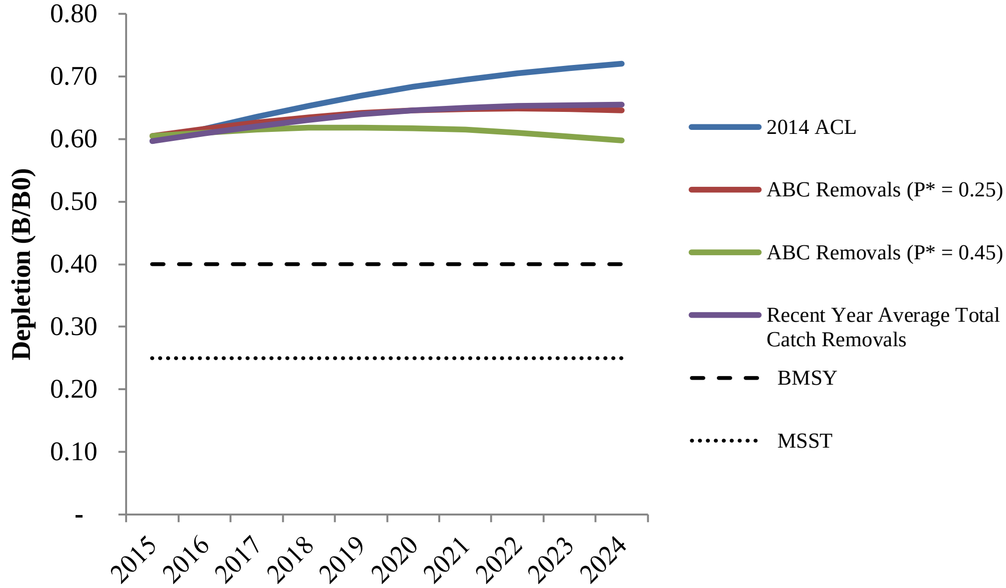

Figure 4-102. Projected depletion under alternative catch streams under the high state of nature model for rougheye/blackspotted rockfish.

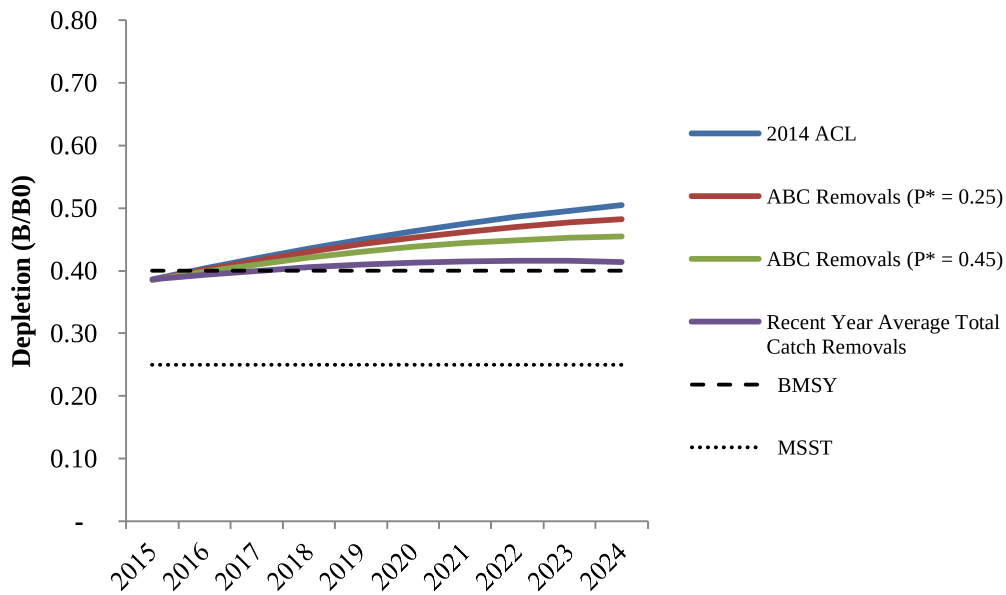

Figure 4-103. Projected depletion under alternative catch streams under the low state of nature model for rougheye/blackspotted rockfish.

4.8.4.7 Shortspine Thornyheads

The modeled catch scenarios for shortspine thornyheads range from an annual average catch of 754 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature, to an annual average catch from 2015 to 2024 of 8,011 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-203). Projected shortspine thornyhead depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-104, Figure 4-105, and Figure 4-106).

Table 4-203. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for shortspine thornyheads.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	1,918
	ABC Removals (P* = 0.25; Alt. 2)	1,928
	ABC Removals (P* = 0.4; Pref. Alt.)	2,566
	ABC Removals (P* = 0.45; Alt. 1)	2,794
	Recent Year Average Total Catch Removals	953
High	2014 ACL	1,918
	ABC Removals (P* = 0.25)	5,527
	ABC Removals (P* = 0.4)	7,356
	ABC Removals (P* = 0.45)	8,011
	Recent Year Average Total Catch Removals	953
Low	2014 ACL	1,918
	ABC Removals (P* = 0.25)	754
	ABC Removals (P* = 0.4)	1,003
	ABC Removals (P* = 0.45)	1,093
	Recent Year Average Total Catch Removals	953

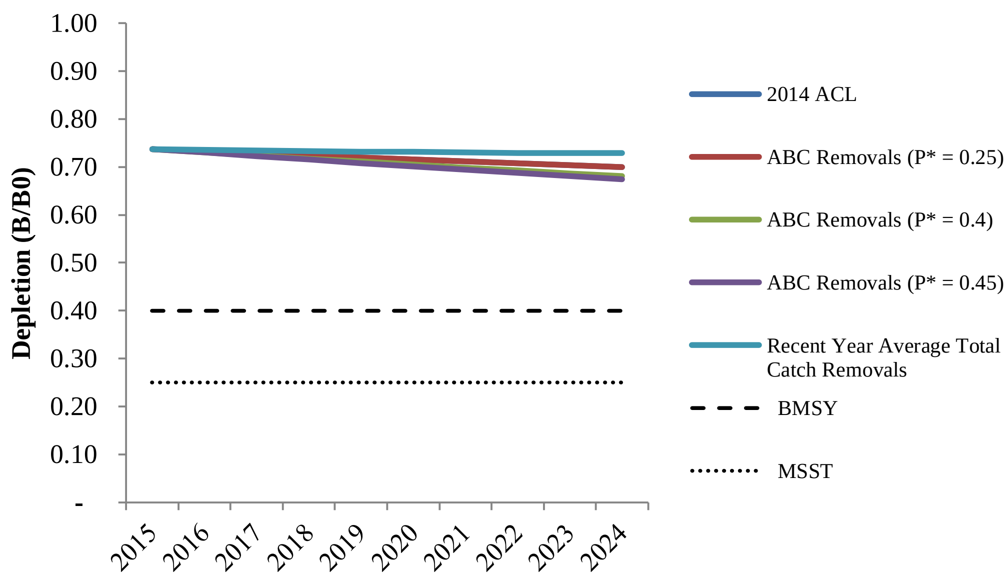

Figure 4-104. Projected depletion under alternative catch streams under the base case state of nature model for shortspine thornyheads.

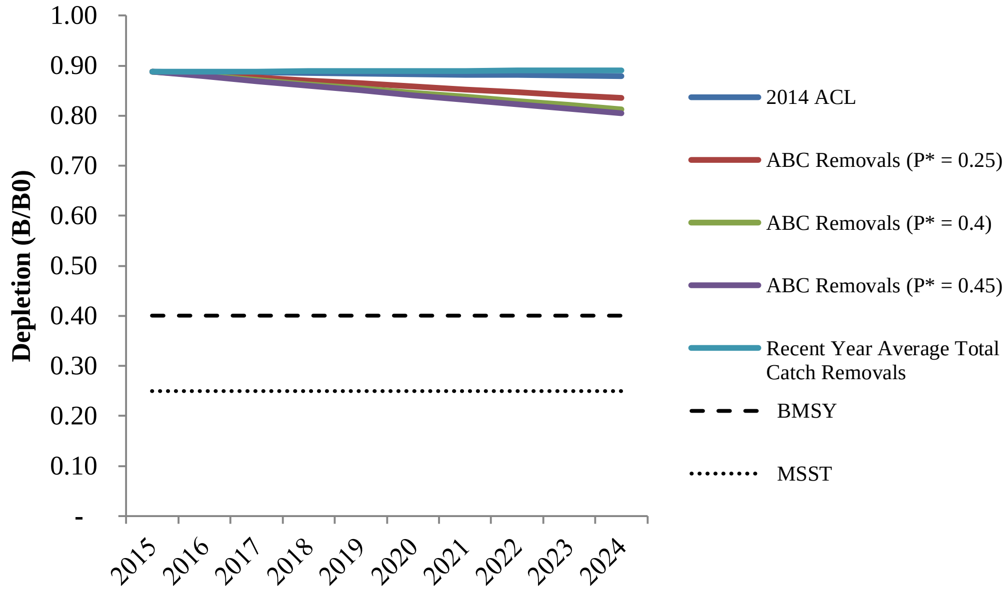

Figure 4-105. Projected depletion under alternative catch streams under the high state of nature model for shortspine thornyheads.

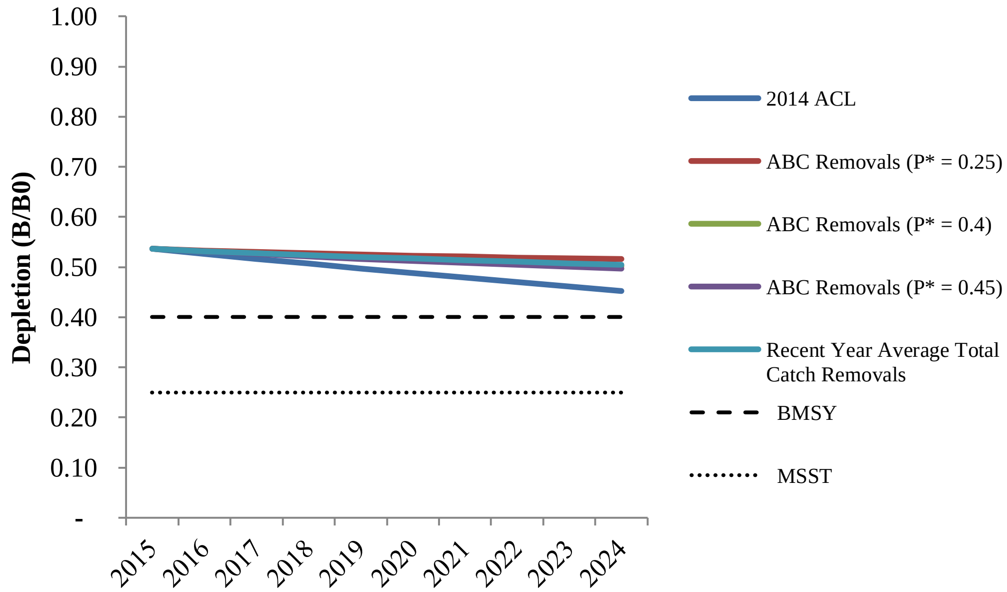

Figure 4-106. Projected depletion under alternative catch streams under the low state of nature model for shortspine thornyheads.

4.8.4.8 Splitnose Rockfish

The modeled catch scenarios for splitnose rockfish range from an annual average catch of 70 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 3,036 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-204). Projected splitnose rockfish depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-107, Figure 4-108, and Figure 4-109).

Table 4-204. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for splitnose rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	2,440
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	2,908
	Recent Year Average Total Catch Removals	70
High	ABC Removals (P* = 0.25)	2,549
	ABC Removals (P* = 0.45)	3,036
	Recent Year Average Total Catch Removals	70
Low	ABC Removals (P* = 0.25)	2,028
	ABC Removals (P* = 0.45)	2,417
	Recent Year Average Total Catch Removals	70

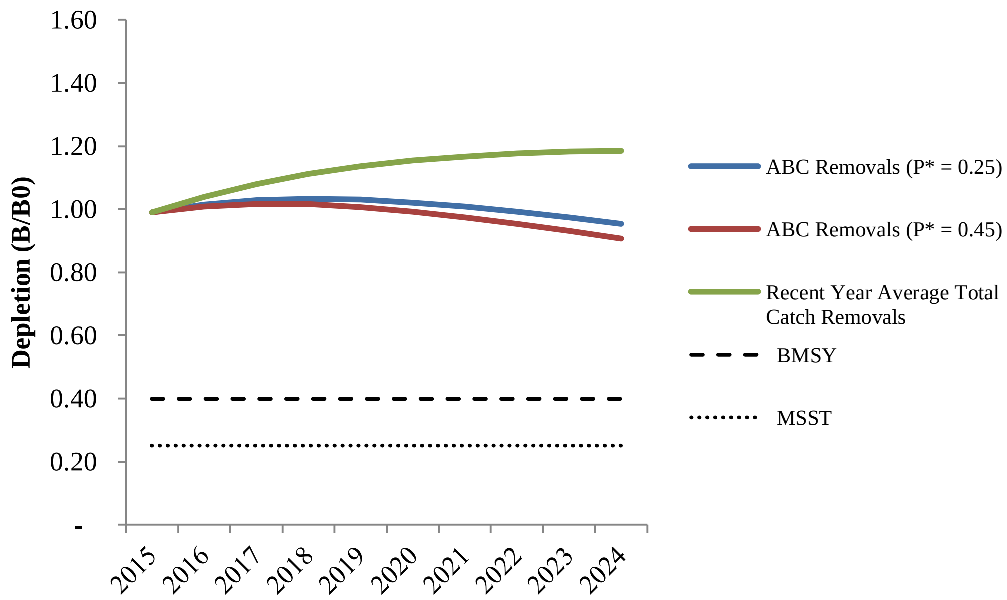

Figure 4-107. Projected depletion under alternative catch streams under the base case state of nature model for splitnose rockfish.

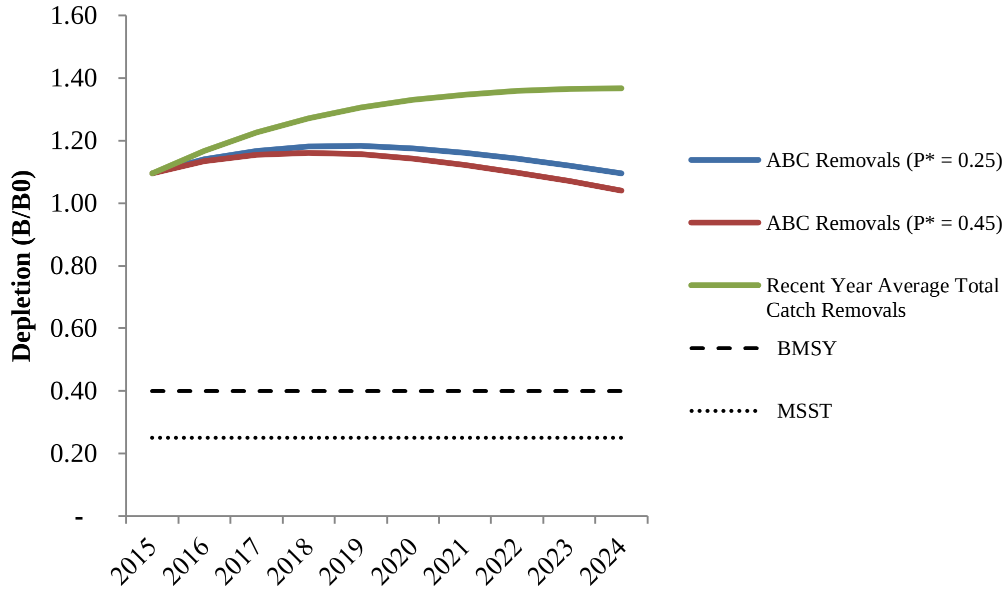

Figure 4-108. Projected depletion under alternative catch streams under the high state of nature model for splitnose rockfish.

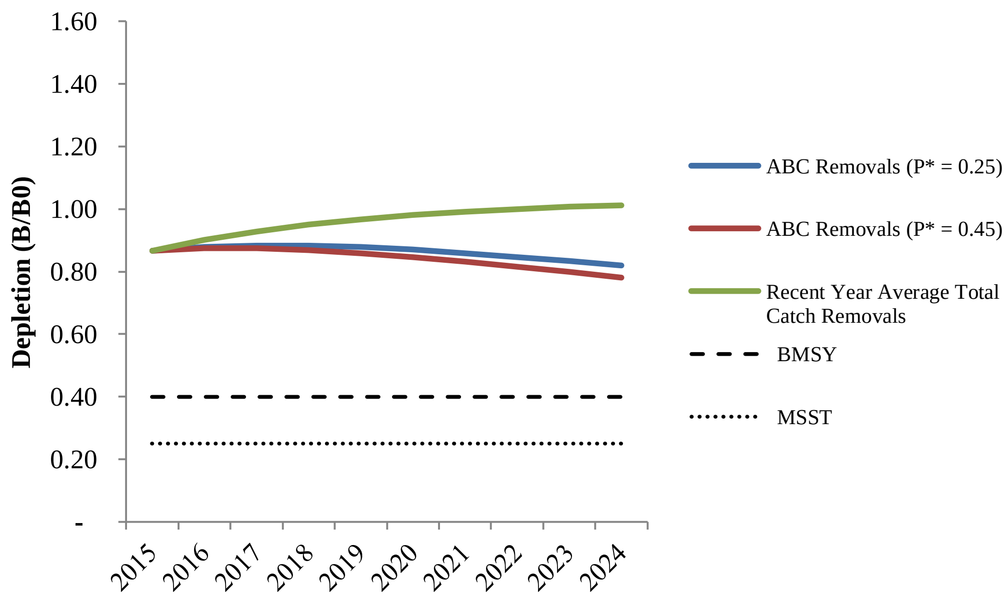

Figure 4-109. Projected depletion under alternative catch streams under the low state of nature model for splitnose rockfish.

4.8.4.9 Sharpchin Rockfish

The modeled catch scenarios for sharpchin rockfish range from an annual average catch of 7 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 636 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-205). Projected sharpchin rockfish depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-110, Figure 4-111, and Figure 4-112).

Table 4-205. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for sharpchin rockfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL Contribution (No Action Alt.)	179
	ABC Removals (P* = 0.25; Alt. 2)	223
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	340
	Recent Year Average Total Catch Removals	7
High	2014 ACL Contribution	179
	ABC Removals (P* = 0.25)	422
	ABC Removals (P* = 0.45)	636
	Recent Year Average Total Catch Removals	7
Low	2014 ACL Contribution	179
	ABC Removals (P* = 0.25)	121
	ABC Removals (P* = 0.45)	187
	Recent Year Average Total Catch Removals	7

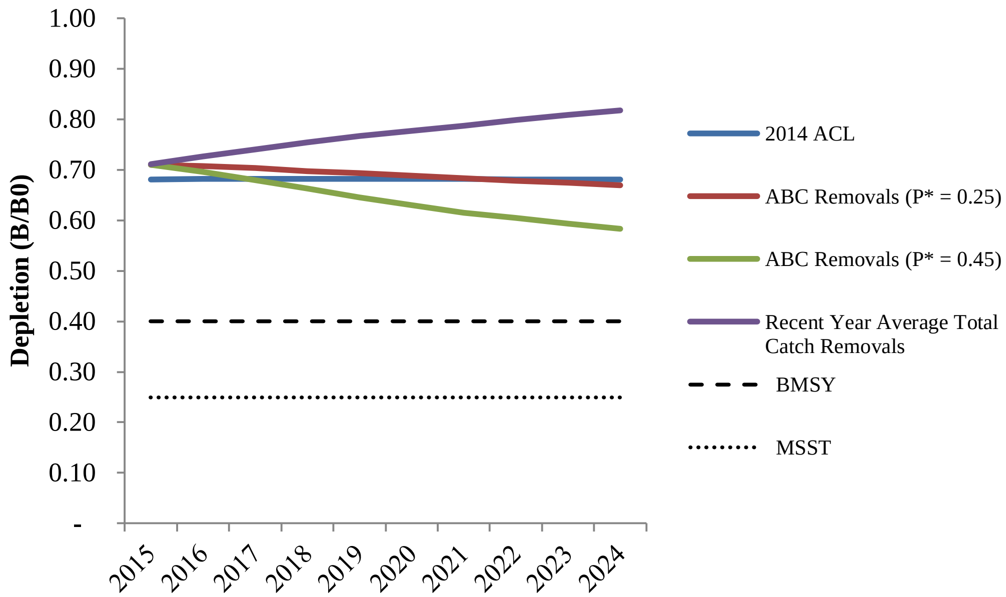

Figure 4-110. Projected depletion under alternative catch streams under the base case state of nature model for sharpchin rockfish.

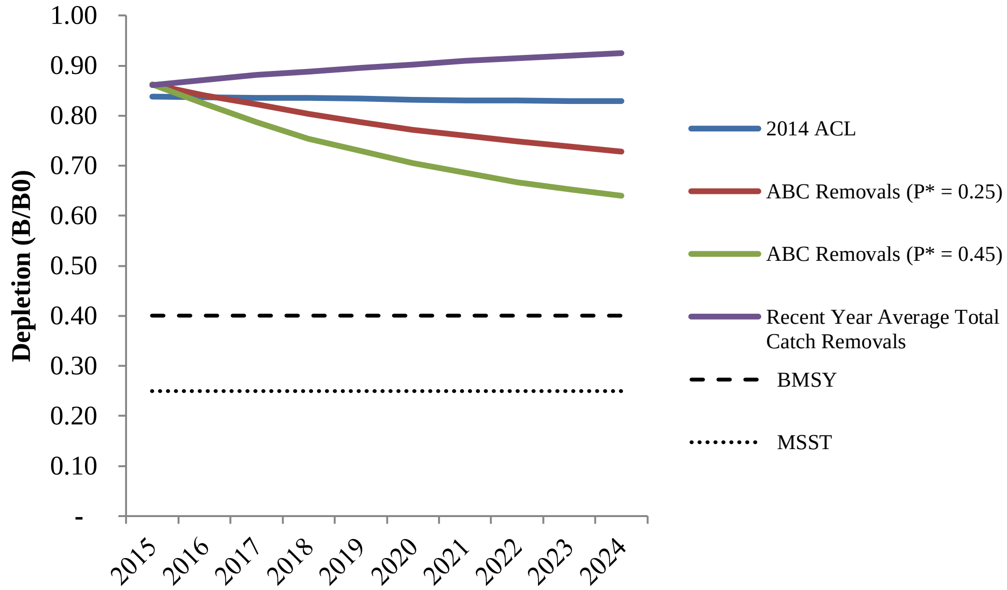

Figure 4-111. Projected depletion under alternative catch streams under the high state of nature model for sharpchin rockfish.

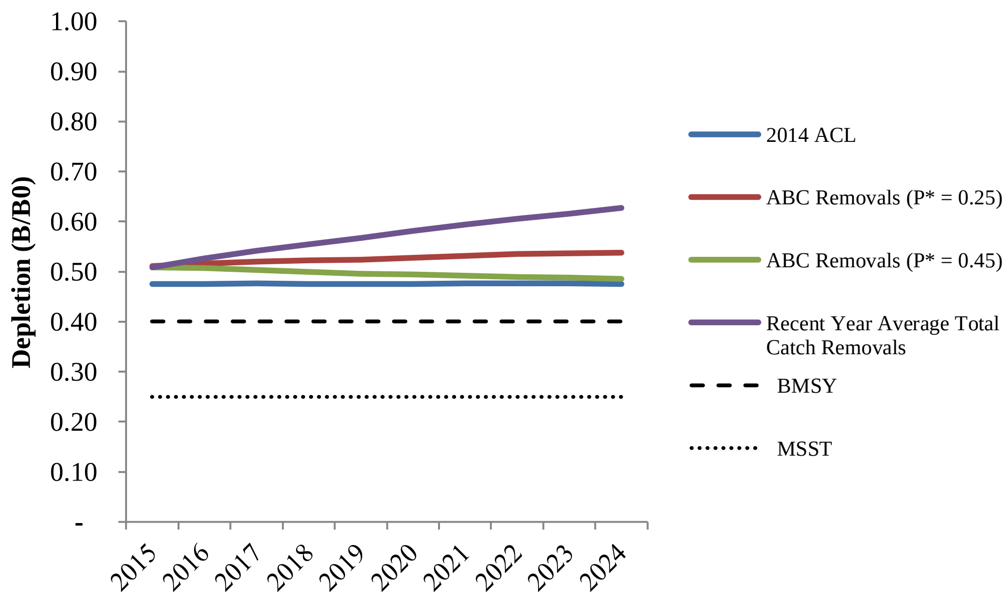

Figure 4-112. Projected depletion under alternative catch streams under the low state of nature model for sharpchin rockfish.

4.8.5 Long-term Impacts of Assessed Roundfish Species

Of the assessed roundfish species, only cabezon in California was not available in time for this analysis.

4.8.5.1 Cabezon in Oregon

The modeled catch scenarios for cabezon in Oregon range from 24 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature, to an annual average catch from 2015 to 2024 of 88 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-206). Projected Oregon cabezon depletions under the base case and high states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-113 and Figure 4-114). Projected Oregon cabezon depletions under the low state of nature for the ABC removals with a P* of 0.25 catch scenario are predicted to rebuild from below the MSST to above the B_{MSY} threshold during the projection period (Figure 4-115). The ABC removals with a P* of 0.45 under the low state of nature are predicted to rebuild the stock from below the MSST, but to keep the stock in the precautionary zone during the projection period. The 2014 ACL and recent year average catch scenarios are predicted to drive the stock to lower levels of depletion below the MSST under the low state of nature.

Table 4-206. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for cabezon in Oregon.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	47
	ABC Removals (P* = 0.25; Alt. 2)	43
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	49
	Recent Year Average Total Catch Removals	45
High	2014 ACL	47
	ABC Removals (P* = 0.25)	77
	ABC Removals (P* = 0.45)	88
	Recent Year Average Total Catch Removals	45
Low	2014 ACL	47
	ABC Removals (P* = 0.25)	24
	ABC Removals (P* = 0.45)	27
	Recent Year Average Total Catch Removals	45

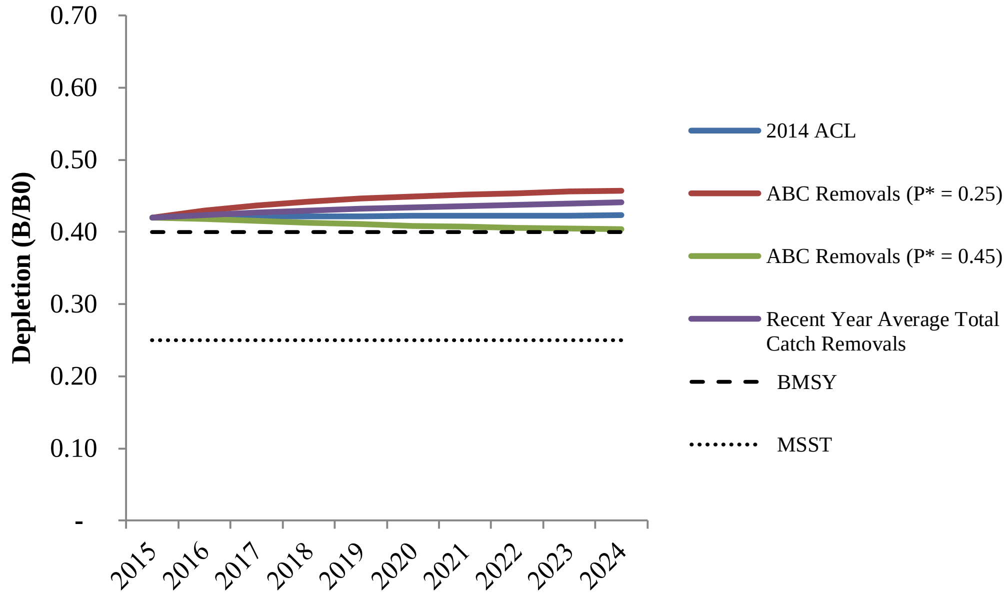

Figure 4-113. Projected depletion under alternative catch streams under the base case state of nature model for cabezon in Oregon.

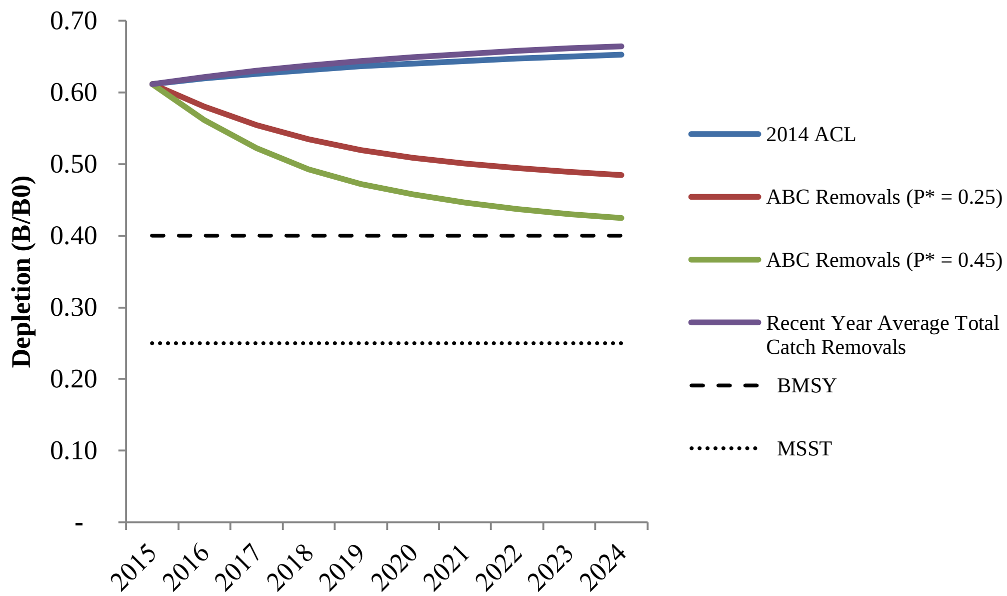

Figure 4-114. Projected depletion under alternative catch streams under the high state of nature model for cabezon in Oregon.

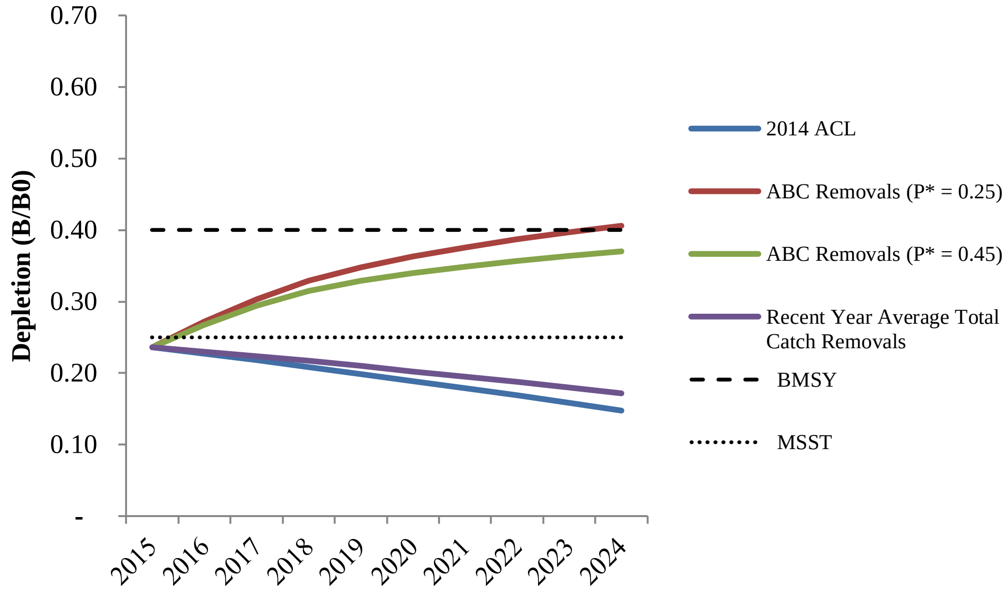

Figure 4-115. Projected depletion under alternative catch streams under the low state of nature model for cabezon in Oregon.

4.8.5.2 Lingcod North of 40º10' N. Latitude

The modeled catch scenarios for lingcod north of 40º10' N. latitude range from an annual average catch of 893 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 3,696 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-207). Projected northern lingcod depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-116, Figure 4-117, and Figure 4-118).

Table 4-207. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for lingcod north of 40º10' N. latitude

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	2,878
	ABC Removals (P* = 0.25; Alt. 2)	2,499
	ABC Removals (P* = 0.45; Alt. 1; Pref. Alt.)	3,060
	Recent Year Average Total Catch Removals	893
High	2014 ACL	2,878
	ABC Removals (P* = 0.25)	3,002
	ABC Removals (P* = 0.45)	3,696
	Recent Year Average Total Catch Removals	893
Low	2014 ACL	2,878
	ABC Removals (P* = 0.25)	2,115
	ABC Removals (P* = 0.45)	2,570
	Recent Year Average Total Catch Removals	893

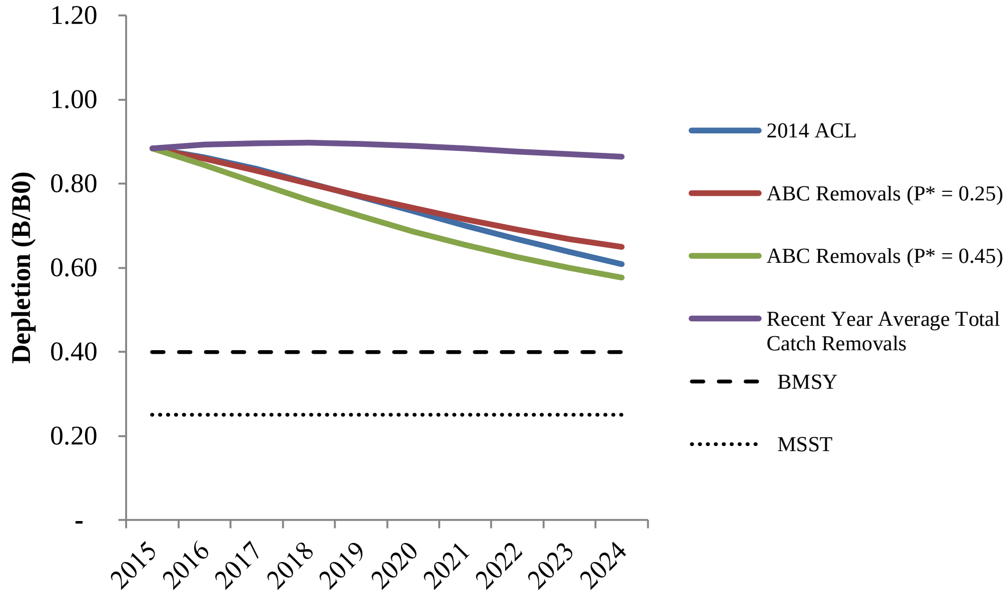

Figure 4-116. Projected depletion under alternative catch streams under the base case state of nature model for lingcod north of 40º10' N. latitude.

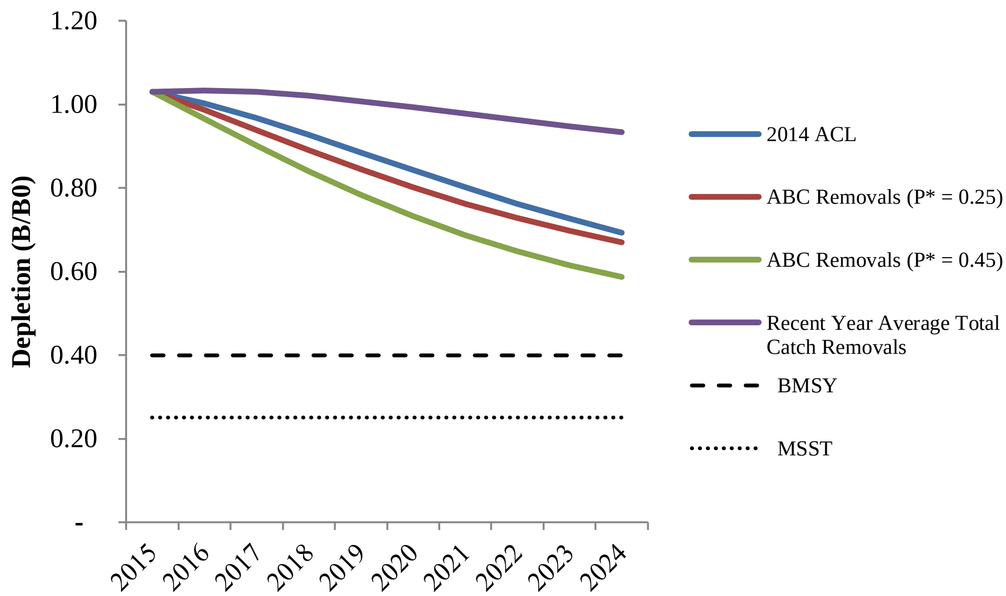

Figure 4-117. Projected depletion under alternative catch streams under the high state of nature model for lingcod north of 40º10' N. latitude.

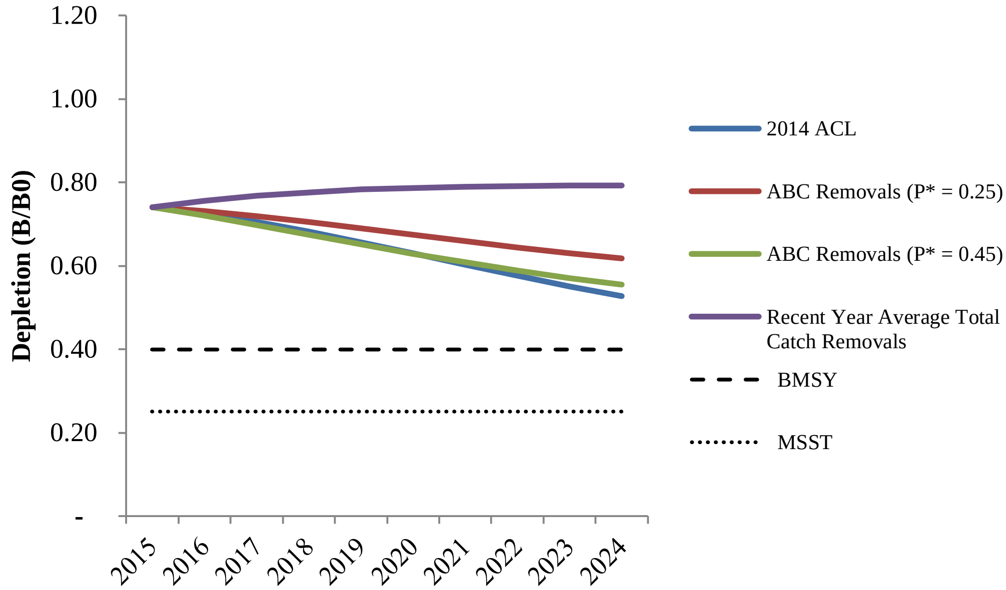

Figure 4-118. Projected depletion under alternative catch streams under the low state of nature model for lingcod north of 40º10' N. latitude.

4.8.5.3 Lingcod South of 40º10' N. Latitude

The modeled catch scenarios for lingcod south of 40º10' N. latitude range from an annual average catch of 175 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 1,624 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-208). Projected southern lingcod depletions under all states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-119, Figure 4-120, and Figure 4-121).

Table 4-208. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for lingcod south of 40º10' N. latitude

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	1,063
	ABC Removals (P* = 0.25; Alt. 2)	859
	ABC Removals (P* = 0.4; Pref. Alt.)	1,092
	ABC Removals (P* = 0.45; Alt. 1)	1,170
	Recent Year Average Total Catch Removals	175
High	2014 ACL	1,063
	ABC Removals (P* = 0.25)	1,201
	ABC Removals (P* = 0.4)	1,519
	ABC Removals (P* = 0.45)	1,624
	Recent Year Average Total Catch Removals	175
Low	2014 ACL	1,063
	ABC Removals (P* = 0.25)	640
	ABC Removals (P* = 0.4)	810
	ABC Removals (P* = 0.45)	866
	Recent Year Average Total Catch Removals	175

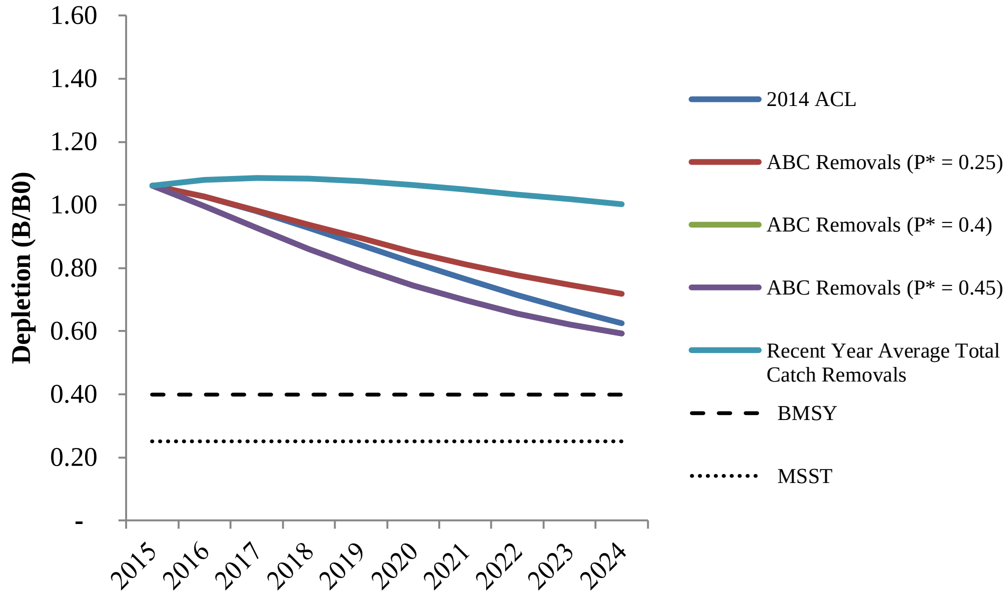

Figure 4-119. Projected depletion under alternative catch streams under the base case state of nature model for lingcod south of 40°10' N. latitude.

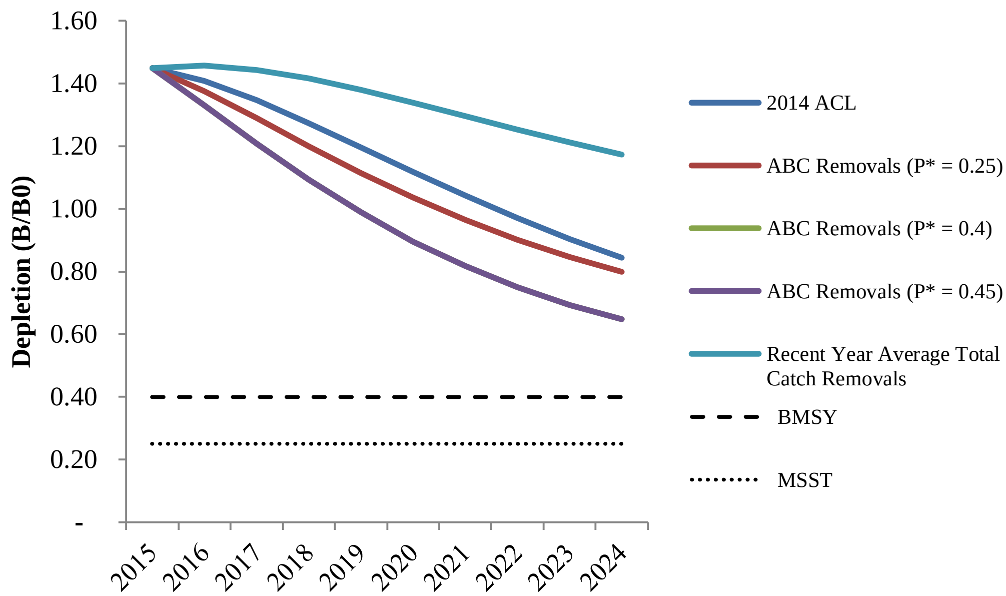

Figure 4-120. Projected depletion under alternative catch streams under the high state of nature model for lingcod south of 40°10' N. latitude.

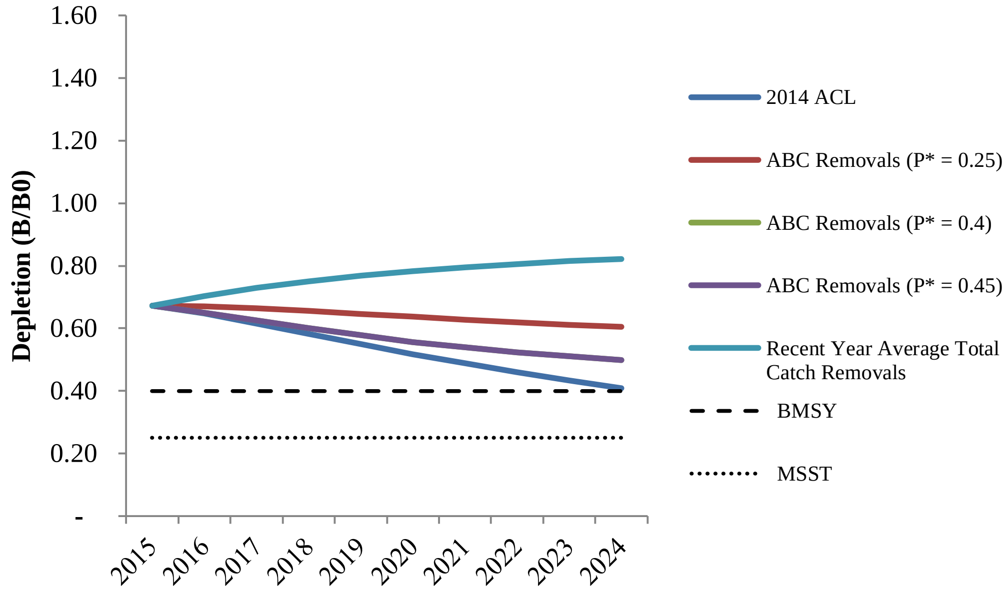

Figure 4-121. Projected depletion under alternative catch streams under the low state of nature model for lingcod south of 40°10' N. latitude.

4.8.5.4 Sablefish

The modeled catch scenarios for sablefish range from 4,086 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature to an annual average catch from 2015 to 2024 of 12,335 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-209). Projected sablefish depletions for all catch scenarios under the base case state of nature are predicted to increase in abundance, but remain in the precautionary zone during the projection period (Figure 4-122). Projected sablefish depletions for all catch scenarios under the high state of nature are predicted to be sustainable during the projection period (Figure 4-123). Projected sablefish depletions for all catch scenarios under the low state of nature are predicted to keep the stock at very low levels of depletion under the MSST, with very little or no rebuilding (Figure 4-124).

Table 4-209. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for sablefish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	2014 ACL (No Action Alt.)	5,909
	ABC Removals (P* = 0.25; Alt. 2)	7,358
	ABC Removals (P* = 0.45; Alt. 1)	8,542
	ABC Removals (P*= 0.4; Pref. Alt.)	8,258
High	2014 ACL	5,909
	ABC Removals (P* = 0.25)	10,630
	ABC Removals (P* = 0.45)	12,335
	ABC Removals (P*= 0.4)	11,926
Low	2014 ACL	5,909
	ABC Removals (P* = 0.25)	4,086
	ABC Removals (P* = 0.45)	4,749
	ABC Removals (P*= 0.4)	4,590

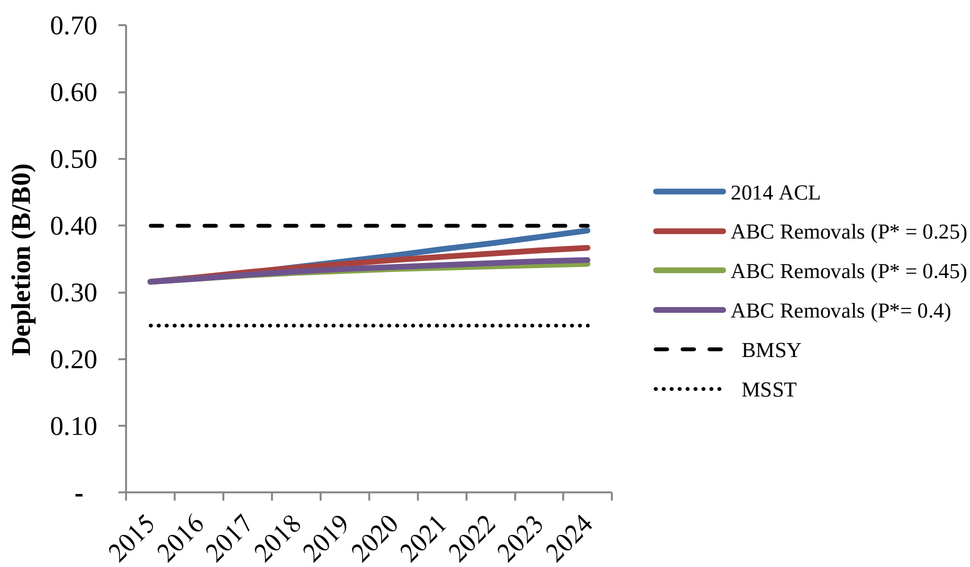

Figure 4-122. Projected depletion under alternative catch streams under the base case state of nature model for sablefish.

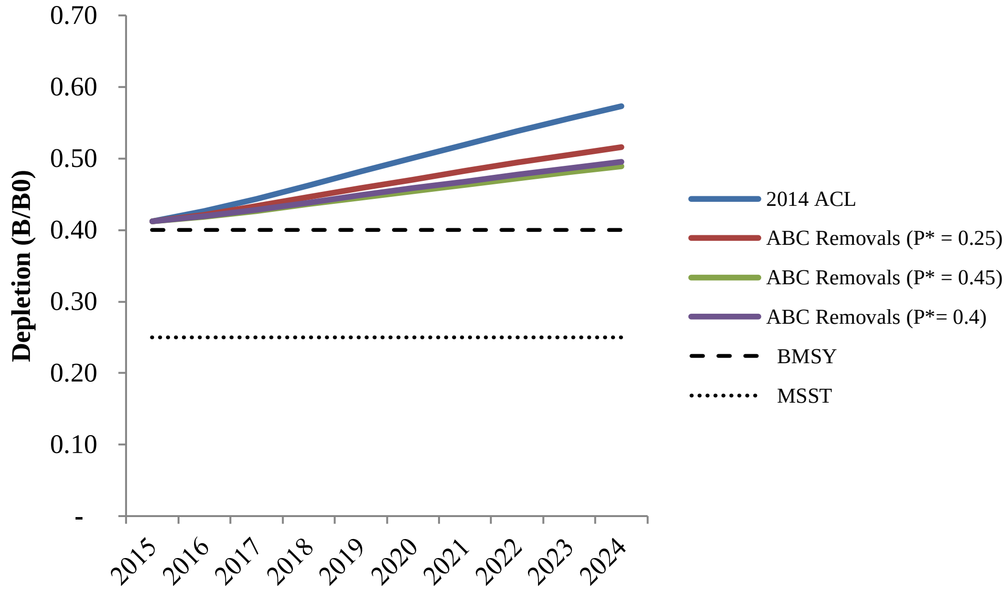

Figure 4-123. Projected depletion under alternative catch streams under the high state of nature model for sablefish.

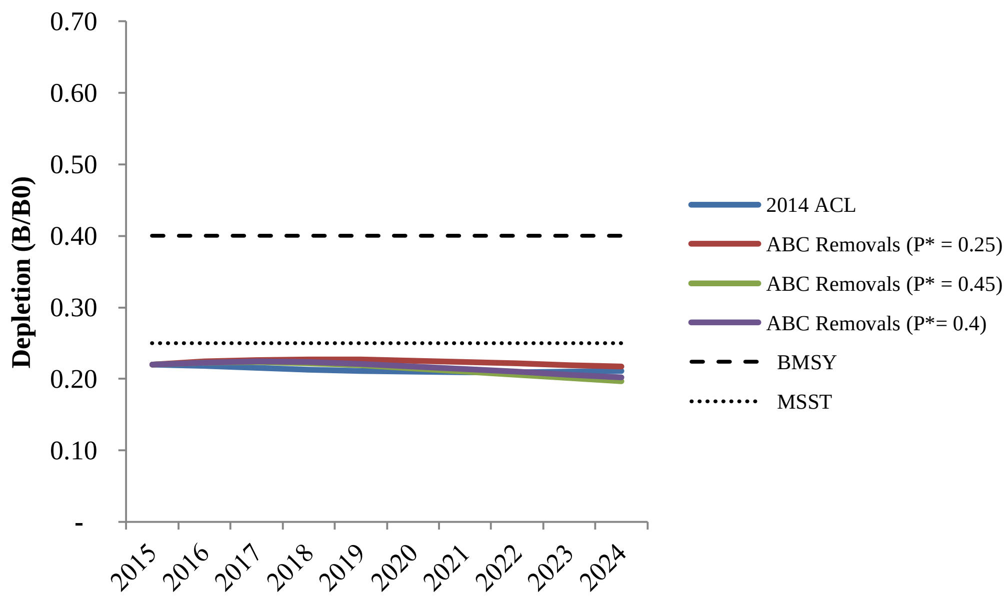

Figure 4-124. Projected depletion under alternative catch streams under the low state of nature model for sablefish.

4.8.6 Long-term Impacts of Assessed Elasmobranch Species

4.8.6.1 Longnose Skate

The modeled catch scenarios for longnose skate range from an annual average catch of 999 mt per year, based on the recent year average catch scenario, to an annual average catch from 2015 to 2024 of 2,892 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-210). Projected longnose skate depletions under the base case and high states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-125 and Figure 4-126). Projected longnose skate depletions under the low state of nature for the recent year average catch scenario is predicted to be sustainable, but the other catch scenarios are predicted to drive the stock below the B_{MSY} threshold and into the precautionary zone during the projection period (Figure 4-127).

Table 4-210. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for longnose skate.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	2,014
	ABC Removals (P* = 0.45; Alt. 1)	2,382
	ACL Removals (2,000 mt constant catch; No Action Alt.; Pref. Alt.)	2,000
	Recent Year Average Total Catch Removals	999
High	ABC Removals (P* = 0.25)	2,446
	ABC Removals (P* = 0.45)	2,892
	ACL Removals (2,000 mt constant catch)	2,000
	Recent Year Average Total Catch Removals	999
Low	ABC Removals (P* = 0.25)	1,939
	ABC Removals (P* = 0.45)	2,264
	ACL Removals (2,000 mt constant catch)	2,000
	Recent Year Average Total Catch Removals	999

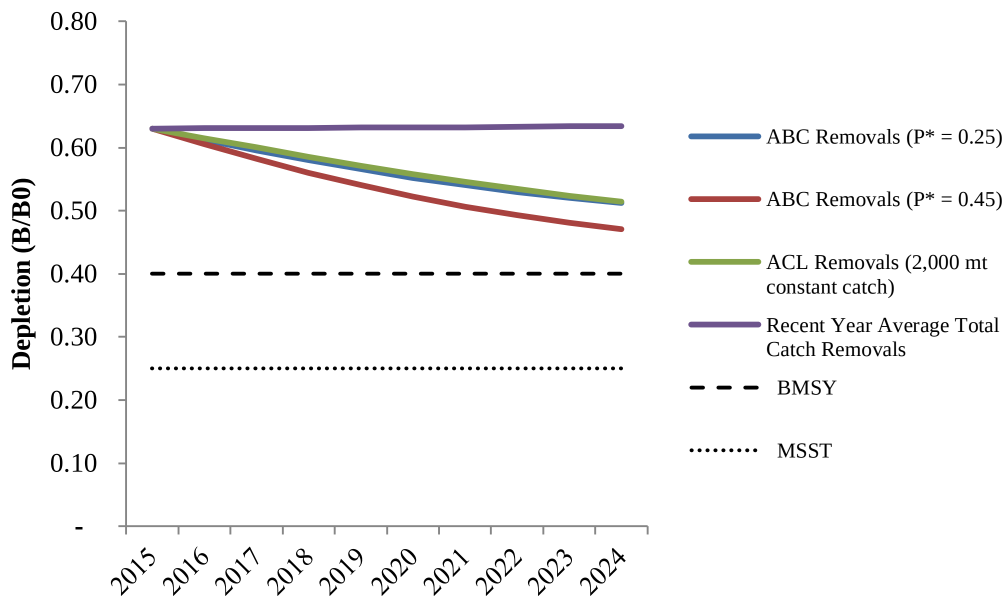

Figure 4-125. Projected depletion under alternative catch streams under the base case state of nature model for longnose skate.

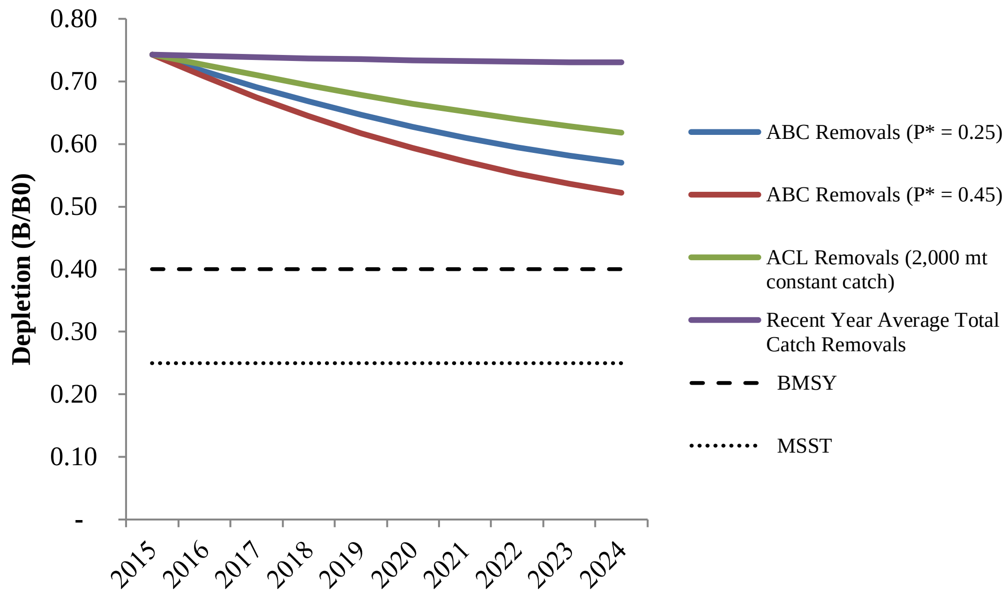

Figure 4-126. Projected depletion under alternative catch streams under the high state of nature model for longnose skate.

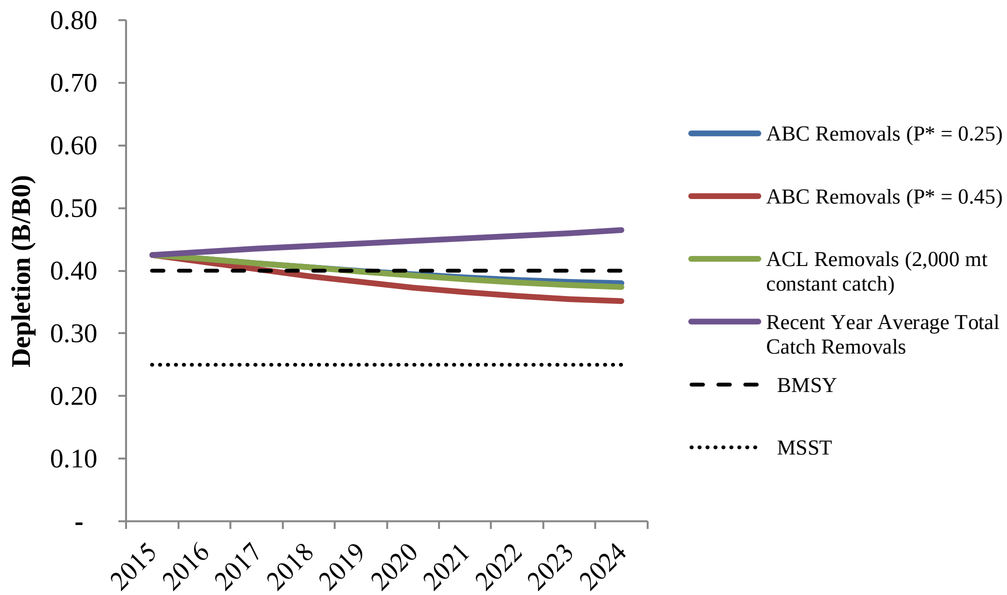

Figure 4-127. Projected depletion under alternative catch streams under the low state of nature model for longnose skate.

4.8.6.2 Spiny Dogfish

The modeled catch scenarios for spiny dogfish range from an annual average catch of 482 mt per year, based on the ACL = ABC with a P* of 0.25 catch scenario under the low state of nature, to an annual average catch from 2015 to 2024 of 5,503 mt, based on the ACL = ABC with a P* of 0.45 catch scenario under the high state of nature (Table 4-211). Projected spiny dogfish depletions under the base case and high states of nature for all catch scenarios are predicted to be sustainable during the projection period (Figure 4-128 and Figure 4-129). Projected spiny dogfish depletions for all catch scenarios under the low state of nature are predicted to keep the stock in the precautionary zone during the projection period (Figure 4-130).

Table 4-211. Predicted average annual catches (mt) from 2015 to 2024 by state of nature and catch scenario for spiny dogfish.

State of Nature	Catch Scenario	2015 to 2024 Average Annual Catch
Base	ABC Removals (P* = 0.25; Alt. 2)	1,560
	ABC Removals (P* = 0.35; No Action Alt.)	1,907
	ABC Removals (P* = 0.45; Alt. 1)	2,275
	Recent Year Average Total Catch Removals	1,619
High	ABC Removals (P* = 0.25)	3,775
	ABC Removals (P* = 0.35)	4,612
	ABC Removals (P* = 0.45)	5,503
	Recent Year Average Total Catch Removals	1,619
Low	ABC Removals (P* = 0.25)	482
	ABC Removals (P* = 0.35)	588
	ABC Removals (P* = 0.45)	700
	Recent Year Average Total Catch Removals	1,619

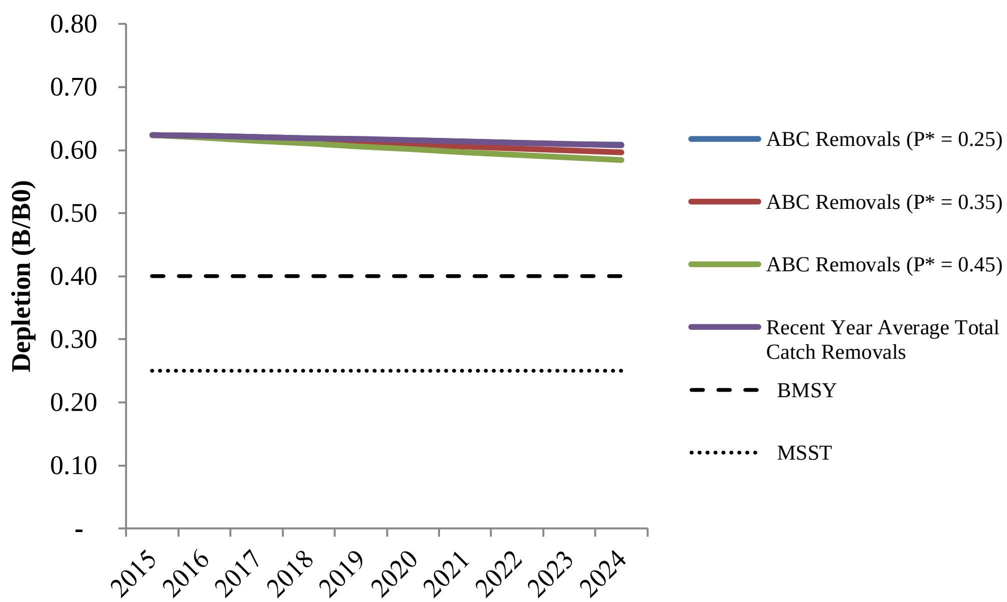

Figure 4-128. Projected depletion under alternative catch streams under the base case state of nature model for spiny dogfish.

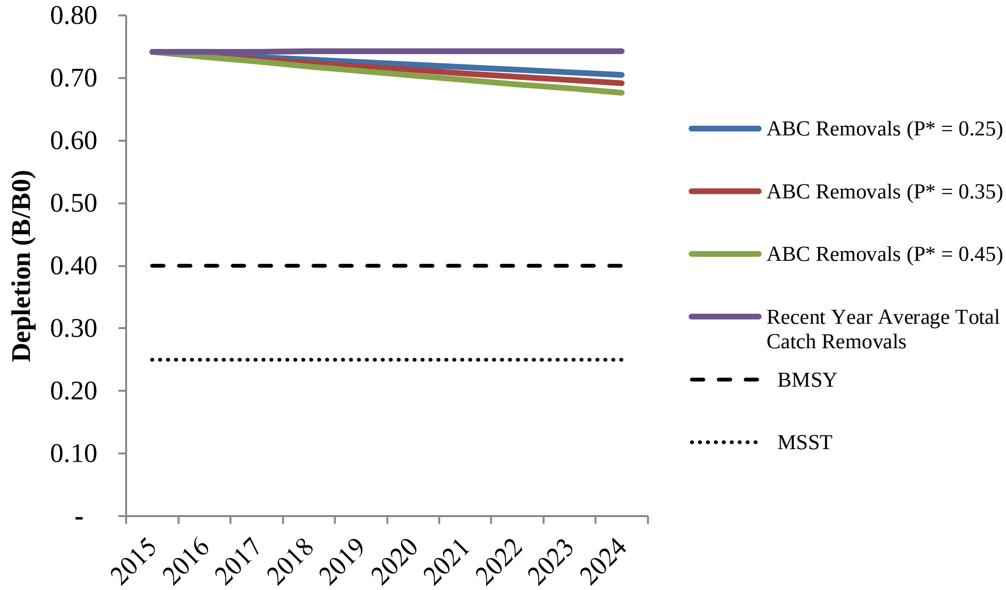

Figure 4-129. Projected depletion under alternative catch streams under the high state of nature model for spiny dogfish.

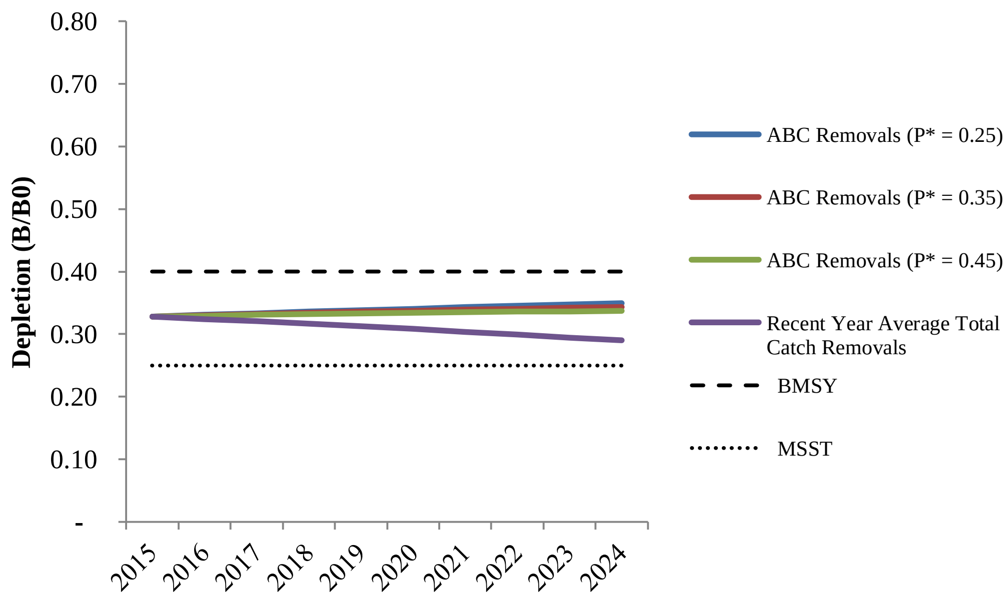

Figure 4-130. Projected depletion under alternative catch streams under the low state of nature model for spiny dogfish.

4.8.7 Summary of Long-term Biological Impacts

The long-term analysis of setting harvest specifications uses recent stock assessments to project changes in stock depletion from 2014 to 2024 under the following four alternatives:

- The No Action Alternative would be the 2014 ACL.
- Alternative 1 would be the ACL = ABC using a P* of 0.45 with the appropriate precautionary reduction to the ACL, either the 40-10 or the 25-5 rule.
- Alternative 2 would be the ACL = ABC using a P* of 0.25 with the appropriate precautionary reduction to the ACL, either the 40-10 or the 25-5 rule.
- Preferred Alternative would vary by stock (Table 2-3; see HCRs).

Flatfish

Most of the flatfish species are not caught at levels commensurate with high attainment of ACLs, with the exception of petrale sole, which is an important trawl target. Flatfish species managed in the FMP are mostly trawl-dominant (i.e., on average, 90 percent or more of the catch occurs in the trawl fishery), with the exception of Pacific sanddabs and starry flounder, which are important species in trawl and recreational fisheries. Given the dominance of flatfish as a trawl species, catch-monitoring uncertainty is low. Therefore, there is very low risk of depleting flatfish stocks through overfishing under any of the alternatives. Recent catch trends (the No Action Alternative) tend to result in the stocks remaining well above B_{MSY}, while ABC removals with a P* of 0.45 (Alternative 1 and Preferred Alternative) result in greater depletion of each stocks biomass. The projected depletion trends using the base case state of nature indicate that the arrowtooth flounder, petrale sole, English sole, and Dover sole would remain above B_{MSY} under all of the alternatives. Only English sole would dip below B_{MSY} under the No Action Alternative, but it would not be projected to become overfished. Rex sole projections were not available.

Minor Nearshore Rockfish Species

Black rockfish (California and Oregon), black rockfish (Washington), and gopher rockfish would remain above B_{MSY} under the Preferred Alternative, Alternative 1, and Alternative 2. The No Action Alternative would result in black rockfish off Washington dipping to just below B_{MSY} by 2024. Gopher rockfish would become overfished by 2024 under the No Action Alternative (2014 ACL). Projections were not available in time for brown, China, and copper rockfish, or for California scorpionfish. Minor Nearshore Rockfish are dominant in the non-trawl fisheries (both commercial and recreational) and, therefore, have a higher catch monitoring uncertainty than trawl-dominant species. State HGs and a federal HG for minor Nearshore Rockfish in the area between 40°10 and 42° N. latitude under the Preferred Alternative would reduce the risk of overfishing the complex.

The assessments are also generally more uncertain since there are no fishery-independent indices of abundance (i.e., no nearshore surveys) informing abundance trends. Most Minor Nearshore Rockfish assessments rely on fishery CPUE indices and the fisheries compositional data (i.e., age and length data from sampled fisheries) to inform stock status and dynamics. Therefore, there is considerably more uncertainty in the long-term projections for Minor Nearshore Rockfish than for the other species analyzed in this EIS.

Shelf Rockfish Species – including Minor Shelf Rockfish Complex

Under all of the alternatives, bocaccio, chilipepper, greenstriped rockfish, widow rockfish, and yellowtail rockfish would remain above B_{MSY}. Canary rockfish continues to rebuild slowly, but it would not reach B_{MSY}. Under the 2014 ACL and with an SPR of 88.7 percent (No Action Alternative and Preferred Alternative), the stock would slowly approach BMSY. While cowcod continues to rebuild slowly, it would not reach B_{MSY} under Alternative 1 or Alternative 2. It would rebuild by 2020 with an SPR harvest rate of 82.7 percent (No Action Alternative and Preferred Alternative). Yelloweye rockfish would rebuild under all of the alternatives except Alternative 1. Greenspotted rockfish projections were not available in time for this analysis.

Shelf rockfish are caught by both the trawl and fixed gear sectors, although there is some variation between species on their relative selectivity to different gears. For instance, greenstriped rockfish, while not targeted in any fishery, tend to be more readily caught in trawl gears than fixed gears. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity with more certain catch estimation for those species dominant to the trawl fishery, given the 100 percent observer coverage for those fleets. Current overfishing risks are low for shelf rockfish in general and have been since implementation of RCAs over ten years ago.

Slope Rockfish Species – including Minor Slope Rockfish Complex

Under all of the alternatives, aurora rockfish, longspine thornyhead, shortspine thornyhead, rougheye/blackspotted, and splitnose, sharpshin would remain above B_{MSY} throughout the time series. Blackgill would remain above the overfished level, but would only reach B_{MSY} with a P* of 0.25 (Alternative 2) by 2020. Darkblotched rockfish would rebuild by 2015 (based on the results on 2013 assessment, not the projections from the 2011 rebuilding analysis) and would remain above B_{MSY} under all of the alternatives. Under the 2014 ACL and with an SPR of 88.7 percent (No Action Alternative and Preferred Alternative) the stock would slowly approach B_{MSY}. POP would continue to rebuild slowly, but would not reach B_{MSY} under Alternative 1 or 2. POP would rebuild with an SPR harvest rate of 84.6 percent under the No Action Alternative and the Preferred Alternative.

Slope rockfish are caught by both the trawl and fixed gear sectors, although there is some variation between species on their relative selectivity to different gears. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity, with more certain catch estimation for those species dominant to the trawl fishery, given the 100 percent observer coverage for those fleets.

Assessed Roundfish Species and Assessed Elasmobranch Species

Under all of the alternatives, lingcod north and south, longnose skate, and spiny dogfish would remain above B_{MSY} throughout the time series. Cabezon off Oregon would remain above $B_{MSY,}$ but would approach B_{MSY} under Alternative 1 (P*=0.45). Sablefish shows an upward trend, but it would remain below B_{MSY} under all of the alternatives.

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 encompass measures that may be considered "routine" or new.

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 for 2014 and for the 2015-2016 biennium can be found in Section **Error! Reference source not found.**. Section 0 provides a more detailed look at the measures proposed for implementation in regulations for the 2015-2016 biennial period.

This section does not evaluate every possible adjustment in routine management measures (e.g., changes to RCA configurations, trip-limit adjustments, bag and sub-bag limits) as that is not possible, given the range of ACL projections under the various states of nature. The range of bag limits and trip limits expected in the future could be as low as zero (i.e., non-retention to keep mortality within the ACL), or, for some species, as high as unlimited. Many or most changes in routine measures provide for flexibility during the season in response to catch data, but generally result in catch staying within the ACLs.

4.9.1 Routine Management Measures

Routine management measures are those that the Council determines are likely to be adjusted on an annual or more frequent basis. The Council classifies measures as routine through the specifications and management measures or full rulemaking processes. For a measure to be classified as routine, the Council determines that the measure is appropriate to address an issue at hand and may require further adjustment to achieve its purpose.

Prior to initial implementation as routine measures, the Council analyzes the need for the measures, their impacts, and the rationale for their use. Once a management measure has been classified as routine, it may be modified thereafter through a single Council meeting if the modification is proposed for the same purpose as the original measure, and the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine. The Council may also recommend removing a routine classification.

In cases where protection of an overfished or depleted stock is required in the commercial fishery, the Council may impose limits that differ by gear type, or establish closed areas or seasons. These latter two measures were not historically imposed through the annual management cycle (now biennial) because of their allocative implications. However, this additional flexibility has become necessary to allow the harvest of healthy stocks as much as possible, while protecting and rebuilding overfished and depleted stocks and equitably distributing the burdens of rebuilding among sectors. The first time a differential trip limit or closed season is to be imposed in a fishery, it must be imposed during the biennial management cycle (with the required analysis and opportunity for public comment). It may subsequently be modified inseason through the routine adjustment process.

Any measure designated as routine for a particular species, species group, or gear type may not be treated as routine for a different species, species group, or gear type without first having been classified as routine. Each biennium, the SAFE document or the appropriate NEPA document analyzing management measures will list all measures that have been designated as routine. Table 4-212, Table 4-213, Table 4-214, Table 4-215, and Table 4-216 below provide more detailed information on the routine measures used in the past 10 years.

Routine Management Measures 2005 to 2013

Under the action alternatives, routine management measure adjustments are expected to continue, similar to adjustments made between 2005 and 2013 (Table 4-212, Table 4-213, and Table 4-214). In 2005, the limited entry fixed gear fishing opportunity was constrained by measures needed to reduce catch of canary rockfish coastwide, yelloweye rockfish north of 40°10′ N, latitude, and bocaccio and cowcod south of 40°10' N. latitude. Landing limits for the limited entry fixed gear fleet north of 40°10' N. latitude provided vessels with access to continental slope and nearshore species, and less access to continental shelf species. Retention of canary rockfish, yelloweye rockfish, and cowcod was prohibited throughout the year, and only minimal levels of bocaccio retention were permitted. Landing lingcod was prohibited from January through April and from November through December to protect lingcod during their spawning and nest-guarding season. Minimum size limits for lingcod were in place to reduce the catch of young fish. In 2005 and 2006, a minimum size limit for lingcod was 24 inches coastwide. For waters south of 40°10′ N. latitude, the landings limits were intended to draw vessels away from continental shelf species. Non-trawl RCA boundaries were intended to move effort away from areas with higher yelloweye and canary abundance. Trawl RCA boundaries for the trawl fleets moved effort off the shelf and allowed fishing for shallow flatfish and off the slope where canary rockfish and bocaccio were less abundant. The CCAs off the Southern California Bight were closed to commercial groundfish fishing to prevent vessels from fishing in areas of higher cowcod abundance.

Although the open access non-trawl fishery is managed separate from the limited entry fixed gear fishery, overfished species protection measures were similar for both sectors. The non-trawl RCA boundaries that apply to the limited entry fixed gear fleet also apply to the open access non-trawl fleet, as do the CCAs. Also similar to the limited entry fleet, greater landings limits are provided for continental slope and nearshore species, with closed seasons and lower limits for continental shelf species, including the same closed periods for lingcod as in the limited entry fixed gear fisheries. Non-groundfish target fisheries for pink shrimp, salmon troll, California halibut, sea cucumber, and ridgeback prawn have incidental landing allowances.

In 2013, management measures for the limited entry fixed gear and open access non-trawl fisheries were similar to 2005. Changes in 2013 from 2005 were primarily driven by the lower sablefish ACL for the area north of 36° N. latitude and species-specific limits for blackgill rockfish south of 40°10′ N. latitude. From 2009 to 2011, the shoreward boundary of the non-trawl RCA in the north was adjusted to reduce yelloweye rockfish mortality in areas that have higher yelloweye rockfish bycatch. Non-trawl RCAs north of 46°16' N. latitude remained the most restrictive. Since 2009, incidental lingcod landing allowances have been permitted in the salmon troll fishery. Minimum size limits continued to be used for lingcod. From 2007 to 2013, north of 42° N. latitude, the limit was reduced to 22 inches, but it remained at 24 inches south of 42 N. latitude.

The trawl fishery management changed substantially in 2011 from a trip limit structure to an IFQ program. Therefore, limits prior to 2011 on species that are currently managed under IFQs are not considered here. Trip limits between 2011 and 2013 are unchanged. The trawl RCA structure has been adjusted over time, including in 2013 (Table 4-215 and Table 4-216). Between 2006 and 2007, the number of sub-areas used for refining the trawl RCAs north of 40°10' N. latitude increased from one to seven. The trawl RCA north of 48°10' N. latitude has remained the most restrictive since 2007, given canary rockfish abundance in the area.

Table 4-212. Limited entry (LE) and Open Access (OA) fixed gear fishery trip limits, 2005 to 2013 [1/2/]

Species	Sector		Lowest	Highest
Roundfish				
Cabezon North & South	LEFG/OA		Unlimited (managed within "Other Fish" limit)	
Lingcod North & South	LEFG		Closed 5 months per year	800 lb/mo May-Oct with 400 lb/mo in Nov
	OA [1/]			400 lb/mo May-Nov
Pacific cod	LEFG		1,000 lb/2 mo	Not limited year-round (managed within "Other Fish" limit)
	OA			
Pacific whiting	LEFG		10,000 lb/trip	
	OA		300 lb/trip	
Sablefish (DTL) North of 36° [3/]	LEFG		2,800 lb/2 mo	500 lb/day, 1 landing/wk up to 1,500 lb (2,000 lb/wk), 9,000 lb/2 mo
	OA		Closed 3 months between 40°10' and 36°	500 lb/day, 1 landing/wk up to 1,500 lb, NTE 9,000 lb/2 mo
Sablefish (DTL) South of 36°	LEFG		300 lb/ day, 1 landing/wk up to 700 lb	3,000 lb/wk, (no monthly or 2-month limit)
	OA		Closed 1 month	400lb/ day, 1 landing/ wk up to 2,500lb (no monthly or 2-month limit)
Flatfish				
Arrowtooth flounder, Dover sole, English sole, PETRALE sole, starry flounder, "Other Flatfish" North & South	LEFG		5,000 lb/mo with Dover. English, PETRALE sole, starry flounder, and "Other Flatfish"	
	OA		3,000 lb/mo with Dover. English, PETRALE sole, starry flounder, and Other Flatfish, no more than 300 lb of which may be Pacific sanddab	
Rockfish				
Bronzespotted	LEFG/OA		Closed year-round	
Canary Rockfish	LEFG/OA		Closed year-round	
Cowcod South	LEFG/OA		Closed year-round	
Yelloweye Rockfish	LEFG/OA		Closed year-round	
Nearshore & Black rockfish North	LEFG/OA	North of 42°	5,000 lb/2 mo, no more than 1,200 lb of which may be species other than black or blue rockfish	
		40°10' to 42°	5,000 lb/2 mo, no more than 1,200 lb of which may be species other than black or blue rockfish	8,500 lb/2 mo, no more than 1,200 lb of which may be species other than black or blue rockfish
Nearshore & Black rockfish South	LEFG/OA	Shallow Nearshore	Closed 2 months	1,000 lb/2 mo
		Deeper Nearshore – 40°10' to 34°27	Closed 2 months	900 lb/2 mo
		Deeper Nearshore South of 34°27'	Closed 2 months	900 lb/2 mo
California Scorpionfish	LEFG		Closed 2 months	1,200 lb/2 mo
Shelf Rockfish & Widow rockfish, shortbelly, & yellowtail rockfish North	LEFG/OA		200 lb/mo	
Shelf Rockfish, & Widow rockfish, shortbelly rockfish, chilipepper rockfish, & Bocaccio (after Aug. 31, 2007)	LEFG	40°10' to 34°27	Closed 2 months	2,500 lb/2 mo no more than 500 lb/2 mo may be a species other than chilipepper
		South of 34°27'	Closed 2 months	3,000 lb/ 2 mo (excluding chilipepper)
	OA	40°10' to 34°27'	Closed 2 months	500 lb/2 mo
		South of 34°27'	Closed 2 months	1,000 lb/2 mo (excluding chilipepper)

Table 4-212 (continued). Limited entry (LE) and Open Access (OA) fixed gear fishery trip limits, 2005 to 2013 [1/2/]

Species	Sector	Lowest		Highest
Chilipepper rockfish South	OA	South of 34°27’	Closed 2 months	2,000 lb/ 2 mo (seaward of RCA only)
Bocaccio South	LEFG	40°10’ to 34°27’ (2005 – Aug 2007) [4/]	Closed 2 months	300 lb/ 2 mo
		South of 34°27’	Closed 2 months	300 lb/ 2 mo
	OA	40°10’ to 34°27’	Closed 2 months	200 lb/mo
		South of 34°27’	Closed 2 months	200 lb/mo
Longspine thornyheads North & South	LEFG	10,000 lb /2 mo		
Shortspine Thornyhead North	LEFG	2,000 lb/2 mo		
Shortspine Thornyhead South	LEGF	South of 40°10’ (2005–2010)	2,000 lb/2 mo	
		40°10’ to 34°27’ (2011-2013)	2,000 lb/2 mo	2,500 lb/2 mo
		South of 34°27’ (2011-2013)	2,000 lb/2 mo	3,000 lb/2 mo
Thornyhead North	OA	North of 40°10’	Closed year-round	
Thornyhead South		40°10’ to 34°27’	Closed year-round	
		South of 34°27’	50lb/ day NTE 1,000lb/2 mo	
Pacific ocean perch North	LEFG	1,800 lb/2 mo		
	OA	100 lb/mo		
Slope Rockfish & Darkblotched rockfish North	LEFG	4,000 lb/2 mo		
	OA	Per trip, no more than 25% of the sablefish landed		
Slope Rockfish & Darkblotched rockfish South	LEFG	40,000 lb/2 mo		
	OA	40°10’ to 38°	Per trip, no more than 25% of the sablefish landed	
		South of 38	10,000 lb/2 mo [6/]	
Longnose skate [5/]	LEFG/OA	Unlimited		
Spiny dogfish [5/]	LEFG/OA	100,000 lb/2 mo		200,000 lb/2 mo
“Other Fish [5/] North	LEFG/OA	Unlimited		
“Other Fish [5/] & Cabezon South	LEFG/OA	Unlimited		

[1/]Does not include limits for sea cucumber, ridgeback prawn, pink shrimp or salmon troll
[2] Unless otherwise specified, north and south are relative to 40°10’ N. latitude.
[3/]For trip limits, north of 36° has been further divided into two areas, 36°-40°10’ and north of 40°10’.
[4/]After August 31, 2007, bocaccio limits foe LEFG included in shelf limit.
[5/] Includes all groundfish species listed in the FMP and not otherwise listed as a distinct species or species group. Included spiny dogfish until 2006 and longnose skate until 2013.
[6/]In 2013, sublimits were added to Slope Rockfish south for blackgill rockfish: for LEFG, 1,375 lb per two months; for OA south of 40°10′ N. latitude, 475 lb per two months.

Table 4-213. Open Access (OA) exempted trawl and salmon troll fishery trip limits, 2005 to 2013 [1/]

Species		Lowest	Highest
Pink Shrimp – April to October			
All groundfish (Not to exceed wt. of pink shrimp)	North	500 lb /day not to exceed 1,500 lb/trip	
Lingcod Sublimit	North	300 lb/mo	
Sablefish sublimit	North	2,000 lb/mo	
Canary Rockfish Sublimit	North	Prohibited year-round	
Thornyheads	North	Prohibited year-round	
Yelloweye Rockfish Sublimit	North	Prohibited year-round	
All groundfish (Not to exceed wt. of pink shrimp)	South	500 lb /day not to exceed 1,500 lb/trip	
Lingcod Sublimit	South	300 lb/mo	
Sablefish sublimit	South	2,000 lb/mo	
Canary Rockfish Sublimit	South	Prohibited year-round	
Thornyheads	South	Prohibited year-round	
Yelloweye Rockfish Sublimit	South	Prohibited year-round	
Salmon Troll – North			
Shelf Rockfish & widow & yellowtail rockfish		200 lb/mo	
Yellowtail sublimit		1lb for every 2 lb of salmon	
Lingcod sublimit (2009 to 2013)		1 lingcod/15 Chinook, plus 1 lingcod per trip up to 10 lingcod (must be within OA lingcod limit)	
Remaining exempted trawl Fisheries			
All groundfish (not to exceed the weight of target species) [1/]		300 lb/trip	
Spiny dogfish sublimit		300 lb/trip (may exceed weight of target species)	

[1/]South of 38°57'30", California halibut vessels are allowed to land up to 100 lb/day of groundfish and 3,000 lb/mo of flatfish, no more than 300 lb of which may be species other than Pacific sanddabs, sand sole, starry flounder, rock sole, curlfin sole, or California scorpionfish, without the ratio requirement, provided that at least one California halibut is landed.

Table 4-214. Trawl trip limits since implementation of IFQ, 2011 to 2013.

Species	Trip Limits		
Pacific whiting	Midwater trawl	Prohibited outside the primary season	
	Lg & Sm footrope Bottom trawl	10,000 lb/trip	20,000 lb/trip (prior to primary season)
Nearshore & Black rockfish North & South	300 lb/mo		
Longspine Thornyhead South of 34°27'	24,000 lb/2 mo		
Shortbelly rockfish	Unlimited year-round		
Cabezon (CA & OR)	50 lb/ mo		
Spiny dogfish	60,000 lb/mo		
Longnose skate	Unlimited year-round		
California scorpionfish	Unlimited year-round		
"Other Fish" [1/]	Unlimited year-round		

[1/]Sublimits have not been used to date , but may be established under routing measures for big skate, California skate, California scorpionfish, leopard shark, soupfish shark, finescale codling, Pacific rattail (grenadier), ratfish, kelp greenling, cabezon off Washington.

Table 4-215. Limited entry trawl RCA depth boundaries by year and month, 2002 to 2012, including inseason changes.

<table>
<tr><th>Year</th><th>Area</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="6">2012[a]</td><td>North of 48°10'</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="4">0 - 150</td><td colspan="2">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48°10' - 45°46'</td><td rowspan="2" colspan="2">75 - [m]200</td><td colspan="2">75 - 150</td><td colspan="6">100 - 150</td><td colspan="2">75 - 150</td></tr>
<tr><td>45°46' - 40°10'</td><td colspan="2">75 - 200</td><td colspan="6">100 - 200</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40°10' - 34°27'</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34°27' (mainland)</td></tr>
<tr><td>South 34°27' (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="6">2011[a]</td><td>North of 48°10'</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="4">0 - 150</td><td colspan="2">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48°10' - 45°46'</td><td rowspan="2" colspan="2">75 - [m]200</td><td rowspan="2" colspan="2">75 - 200</td><td colspan="2">75 - 150</td><td colspan="2">100 - 150</td><td colspan="4">75 - 150</td></tr>
<tr><td>45°46' - 40°10'</td><td colspan="2">75 - 200</td><td colspan="2">100 - 200</td><td colspan="2">75 - 200</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40°10' - 34°27'</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34°27' (mainland)</td></tr>
<tr><td>South 34°27' (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="6">2010[a]</td><td>North of 48°10'</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="4">0 - 150</td><td colspan="2">0 - 200</td><td>0 - [m]200</td><td>0 - 250</td></tr>
<tr><td>48°10' - 45°46'</td><td rowspan="2" colspan="2">75 - [m]200</td><td rowspan="2" colspan="2">75 - 200</td><td colspan="2">75 - 150</td><td colspan="2">100 - 150</td><td rowspan="2" colspan="2">75 - 200</td><td rowspan="2">75 - [m]200</td><td rowspan="2">75 - 250</td></tr>
<tr><td>45°46' - 40°10'</td><td colspan="2">75 - 200</td><td colspan="2">100 - 200</td></tr>
<tr><td>40°10' - 34°27'</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34°27' (mainland)</td></tr>
<tr><td>South 34°27' (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="6">2009[a]</td><td>North of 48°10'</td><td colspan="3">0 - [m]200</td><td>0 - 200</td><td colspan="4">0 - 150</td><td colspan="2">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48°10' - 45°46'</td><td rowspan="2" colspan="3">75 - [m]200</td><td rowspan="2">75 - 200</td><td colspan="2">75 - 150</td><td colspan="2">100 - 150</td><td rowspan="2" colspan="2">75 - 200</td><td rowspan="2" colspan="2">75 - [m]200</td></tr>
<tr><td>45°46' - 40°10'</td><td colspan="2">75 - 200</td><td colspan="2">100 - 200</td></tr>
<tr><td>40°10' - 34°27'</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34°27' (mainland)</td></tr>
<tr><td>South 34°27' (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="10">2008[a]</td><td>North of 48°10'</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="6">0 - 150</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48 10 - 46 38.17</td><td rowspan="4" colspan="2">75 - [m]200</td><td colspan="2">60 - 200</td><td colspan="5">60 - 150</td><td rowspan="2">75 - 150</td><td rowspan="4" colspan="2">75 - [m]200</td></tr>
<tr><td>46 38.17 - 46 16</td><td colspan="4">60 - 200</td><td colspan="3">60 - 150</td></tr>
<tr><td>46 16 - 45 46</td><td colspan="2">75 - 200</td><td colspan="4">75 - 150</td><td colspan="2">75 - 200</td></tr>
<tr><td>45 46 - 43 20.83</td><td colspan="8">75 - 200</td></tr>
<tr><td>43 20.83 - 42 40.50</td><td colspan="2">0 - [m]200</td><td colspan="8">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>42 40.5 - 40 10</td><td colspan="2">75 - [m]200</td><td colspan="2">75 - 200</td><td colspan="5">60 - 200</td><td>75 - 200</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40 10 - 34 27</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="11">2007[a]</td><td>North of 48°10'</td><td rowspan="7" colspan="2">75 - [m]250</td><td rowspan="7">75 - 250</td><td colspan="5">0 - 150</td><td>0 - 200</td><td>75 - 200</td><td rowspan="7" colspan="2">75 - [m]200</td></tr>
<tr><td>48°10' - 46°38'</td><td colspan="5">75 - 150</td><td colspan="2">75 - 200</td></tr>
<tr><td>46°38' - 46°16'</td><td colspan="5">60 -150</td><td colspan="2">60 -200</td></tr>
<tr><td>46°16' - 45°03'</td><td colspan="4">75 - 150</td><td colspan="3">75 - 200</td></tr>
<tr><td>45°03' - 43°20'</td><td colspan="7">75 - 200</td></tr>
<tr><td>43°20' - 42°40'</td><td colspan="6">0 - 200</td><td>75 - 200</td></tr>
<tr><td>42°40' -40°10'</td><td colspan="7">75 - 200</td></tr>
<tr><td>40°10' - 38'</td><td colspan="2">100 - [m]200</td><td colspan="8">100 - 150</td><td colspan="2">100 - [m]200</td></tr>
<tr><td>38° - 34°27'</td><td rowspan="2" colspan="12">100 - 150</td></tr>
<tr><td>South 34°27' (mainland)</td></tr>
<tr><td>South 34°27' (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="5">2006[a]</td><td>North 40 10</td><td colspan="2">75 - [m]200</td><td colspan="4">75 - 200</td><td colspan="2">100 - 250</td><td colspan="2">75 - 250</td><td rowspan="2" colspan="2">75 - [m]250</td></tr>
<tr><td>40 10 - 38</td><td rowspan="3" colspan="2">75 - 150</td><td rowspan="3" colspan="4">100 - 150</td><td colspan="2">100 - 200</td><td colspan="2">100 - 250</td></tr>
<tr><td>38 - 34 27</td><td rowspan="2" colspan="4">100 - 150</td><td rowspan="2" colspan="2">75 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="6">2005[a]</td><td>North 40 10</td><td colspan="2">75 - [m]200</td><td colspan="7">100 - 200</td><td rowspan="2" colspan="3">0 - 250</td></tr>
<tr><td>40 10 - 38</td><td rowspan="4" colspan="2">75 - 150</td><td colspan="2">100 - 200</td><td colspan="5">100 - 150</td></tr>
<tr><td>38 - 36</td><td rowspan="3" colspan="7">100 - 150</td><td colspan="3">0 - 200</td></tr>
<tr><td>36 - 34 27</td><td rowspan="2" colspan="3">50 - 200</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="9">0 - 150</td><td colspan="3">0 - 200</td></tr>
<tr><td rowspan="6">2004</td><td>North 40 10</td><td colspan="2">75 - [m]200</td><td colspan="2">60 - 200</td><td colspan="2">60 - 150</td><td colspan="3">75 - 150</td><td rowspan="2" colspan="3">0 - 250</td></tr>
<tr><td>40 10 - 38</td><td rowspan="4" colspan="4">75 - 150[z]</td><td rowspan="4" colspan="4">100 - 150[z]</td><td rowspan="4">75 - 150[z]</td></tr>
<tr><td>38 - 36</td><td colspan="3">0 - 200[z]</td></tr>
<tr><td>36 - 34 27</td><td rowspan="2" colspan="3">0 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="5">2003</td><td>North 40 10</td><td colspan="2">100 - [m]250</td><td colspan="2">100 - 250</td><td colspan="2">50 - 200</td><td colspan="2">75 - 200</td><td colspan="2">50 - 200</td><td rowspan="5" colspan="2">0 - [m]200</td></tr>
<tr><td>40 10 - 38</td><td colspan="2">50 - [m]250</td><td colspan="2">60 - 250</td><td rowspan="2" colspan="6">60 - 200</td></tr>
<tr><td>38 - 34 27</td><td colspan="2">50 - 150</td><td colspan="2">60 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td><td colspan="4">100 - 150</td><td colspan="6">100 - 200</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="4">0 - 150</td><td colspan="6">0 - 200</td></tr>
<tr><td>2002</td><td>North 40 10</td><td colspan="12">Within DBCA - CLOSED TO TRAWLING, September - December, special footrope requirements outside DBCA</td></tr>
</table>

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

[a] Selective flatfish trawl required shoreward of the RCRA north of 40 10.

[z] Additional closure 0-10fm around Farallon Islands.

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Table 4-216. Fixed gear RCA depth boundaries by year and month, 2002 to 2013, including inseason changes.

<table>
<tr><th>Year</th><th>Location</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="6">2013</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>43 00 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>42 00 - 43 00</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>40 10 - 42 00</td><td colspan="12">20 fm depth contour - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 fm - 150 fm line</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm line (also applies around islands)</td></tr>
<tr><td rowspan="6">2012</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>43 00 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>42 00 - 43 00</td><td colspan="12">20 - 100 fm</td></tr>
<tr><td>40 10 - 42 00</td><td colspan="12">20 fm depth contour - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 fm - 150 fm line</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm line (also applies around islands)</td></tr>
<tr><td rowspan="7">2011</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>45 03 83 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>43 00 - 45 03 83</td><td colspan="12">30 - 125 fm (125 line reduced to 100 fm during directed halibut days)</td></tr>
<tr><td>42 00 - 43 00</td><td colspan="12">20 - 100 fm</td></tr>
<tr><td>40 10 - 42 00</td><td colspan="12">20 fm depth contour - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 fm - 150 fm line</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm line</td></tr>
<tr><td rowspan="7">2010</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>45 03 83 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>43 00 - 45 03 83</td><td colspan="12">30 - 125 fm (125 line reduced to 100 fm during directed halibut days)</td></tr>
<tr><td>42 00 - 43 00</td><td colspan="12">20 - 100 fm</td></tr>
<tr><td>40 10 - 42 00</td><td colspan="12">20 fm depth contour - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 fm - 150 fm line</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm line</td></tr>
<tr><td rowspan="7">2009</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>45 03 83 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>43 00 - 45 03 83</td><td colspan="12">30 - 125 fm (125 line reduced to 100 fm during directed halibut days)</td></tr>
<tr><td>42 00 - 43 00</td><td colspan="12">20 - 100 fm</td></tr>
<tr><td>40 10 - 42 00</td><td colspan="12">20 fm depth contour - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2008</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2007</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="12">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2006</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="4">30 - 150 fm</td><td colspan="4">20 - 150 fm</td><td colspan="4">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2005</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="4">30 - 150 fm</td><td colspan="4">20 - 150 fm</td><td colspan="4">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2004</td><td>North 46 16</td><td colspan="12">shore - 100 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="12">30 - 100 fm</td></tr>
<tr><td>34 27 - 40 10 (+ islands)</td><td colspan="4">30 - 150 fm</td><td colspan="4">20 - 150 fm</td><td colspan="4">30 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)</td><td colspan="12">60 fm - 150 fm</td></tr>
<tr><td rowspan="4">2003</td><td>North 46 16</td><td colspan="10">shore - 100 fm</td><td colspan="2">shore - 200 fm</td></tr>
<tr><td>40 10 - 46 16</td><td colspan="10">27 - 100 fm</td><td colspan="2" rowspan="3">shore - 150 fm</td></tr>
<tr><td>34 27 - 40 10</td><td colspan="10">20 - 150 fm</td></tr>
<tr><td>South 34 27 (+ islands)20</td><td colspan="8">20 - 150 fm</td><td colspan="2">30 - 150 fm</td></tr>
<tr><td>2002</td><td>South 40 10</td><td colspan="6"></td><td colspan="6">CLOSED > 20fm (exceptions: sablefish, S Thorny and slope RF)</td></tr>
</table>

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Washington Recreational

Table 4-217 and Table 4-218 summarize the historical management measures used in the Washington recreational fishery.

Table 4-217. History of the Washington recreational groundfish bag limits from 1991 to present.

Management Period	Aggregate Daily Limit [1/]	Rockfish	Lingcod [2/]	Cabezon [3/]	Canary and Yelloweye Rockfish
1991		15		n/a	n/a
1992-1995		12		n/a	n/a
1995-1999		10		n/a	n/a
2000-2001		10		n/a	2 canary, 2 yelloweye
2001-2002		10		n/a	No more than 2 canary and yelloweye
2002-2003		10		n/a	2 canary, 0 yelloweye
2003–2004		10		n/a	1 canary, 0 yelloweye
2004–2005		10		n/a	No retention
2005–2006	15	10	2	n/a	No retention
2007–2008	15	10	2	n/a	No retention
2009–2010	15	10	2	n/a	No retention
2011–2012	12	10	2	2	No retention
2013–2014	12	10	2	2	No retention

[1/]Groundfish included in the aggregate daily limit: all species of rockfish, Pacific cod, Pacific tomcod, Pacific hake, walleye Pollock, all species of dabs, sole and flounders (except Pacific halibut), lingcod, ratfish, sablefish, cabezon, greenling, buffalo sculpin, great sculpin, red Irish lord, brown Irish lord, Pacific staghorn sculpin, wolf eel, giant wrymouth, plainfin midshipman, all species of shark, skate, rattail, and surf perches excluding shiner perch.
[2/]Beginning in 2013, the lingcod size limit for Marine Area 4 was reduced from 24 inches to 22 inches. The lingcod size limit in all other Marine Areas has historically been 22 inches.
[3/]Beginning in 2014, the daily sub bag limit for cabezon was reduced to one, and a minimum size limit of 18 inches was implemented for Marine Area 4. In all other marine areas, there is no minimum size limit for cabezon.

Table 4-218. History of depth restrictions for the recreational fisheries in Washington.

	North Coast (MCA 3 & 4)	South Coast (MCA 2)	Columbia River (MCA 1)
2006	No retention of rockfish or lingcod seaward of 20 fm May 21-Sep 30.	No retention of rockfish or lingcod seaward of 30 fm March 18 through June 15.	No retention of groundfish, except Pacific cod and sablefish when halibut are onboard.
2007-2008	No retention of groundfish seaward of 20 fm May 21-Sep 30.	No retention of groundfish seaward of 30 fm March 18 through June 15. Allow the retention of sablefish and Pacific cod from May 1-June 15.	No retention of groundfish, except sablefish and Pacific cod when halibut are onboard.
2009-2010	No retention of groundfish seaward of 20 fm May 21-Sep 30, except on days open to halibut fishing.	No retention of groundfish seaward of 30 fm March 15 through June 15. Allow the retention of sablefish and Pacific cod from May 1-June 15.	No retention of groundfish, except sablefish and Pacific cod when halibut are onboard.
2011-2012	No retention of groundfish seaward of 20 fm June 1-Sep 30, except on days open to halibut fishing.	No retention of groundfish except rockfish seaward of 30 fm March 15-June 15. Allow the retention of sablefish and P. cod from May 1-June 15. Lingcod retention allowed >30 fm on days open to halibut fishing. Lingcod closed seaward of 30 fm south of 46°58 on Fridays and Saturdays from July 1-Aug 30. Year-round deepwater lingcod closure implemented in 2012.	No retention of groundfish, except sablefish and Pacific cod when halibut are onboard. Year-round deepwater lingcod closure implemented in 2012.
2013–2014	No retention of groundfish seaward of 20 fm May 1-Sep 30, except, on days open to halibut fishing, lingcod, Pacific cod and sablefish can be retained.	No retention of groundfish except rockfish seaward of 30 fm March 15-June 15. Allow the retention of sablefish and P. cod >30 fm from May 1-June 15. Lingcod retention allowed >30 fm on days open to halibut fishing. Lingcod closed seaward of 30 fm south of 46°58’ on Fridays and Saturdays from July 1-Aug 30. Year-round deepwater lingcod closure.	No retention of groundfish, except sablefish and Pacific cod when halibut are onboard. Year-round deepwater lingcod closure.

Oregon Recreational

Table 4-219 summarizes the historical management measures used in the Washington recreational fishery.

Table 4-219. History of management measures implemented in the Oregon recreational fishery.

	Bag Limits				Size Limits (in Inches)			Depth Restrictions	Inseason changes
Year	Marine Fish	Lingcod	Flatfish/ Sanddab	"other fish"	Cabezon	Lingcod	Greenlings		
2000	10 [d]	1	--	25	--	24 (34 max)	--		
2001	10 [d]	1	--	25	--	24	--		
2002	10 [c]	1	--	25	--	24	--		
2003	10 [c]	2	--	25	15	24	--	all depth year round	11/21 lingcod & canary closed, < 27 fm until 31 Dec
2004	10	2	25	--	16	24	10	< 40 fm Jun-Sep	08/18 cabezon closed, 09/03 marine fish & lingcod closed, 10/1 yellowtail RF > 40 fm allowed
2005	8, 5 [b]	2	25	--	16	24	10	< 40 fm Jun-Sep	08/11 cabezon closed, 10/18 black RF closed
2006	6	2	25	--	16	24	10	< 40 fm Jun-Sep	07/24 vermilion closed, 09/23 cabezon closed
2007	6	2	25	--	16	22	10	< 40 fm Apr-Sep	08/11 cabezon closed
2008	6, 5 [b]	2	25	--	16	22	10	< 40 fm Apr-Sep	07/07 < 20 fm until 1 Oct, 8/21 cabezon closed
2009	6, 7 [b]	2	25	--	16	22	10	< 40 fm Apr-Sep	09/14 cabezon closed
2010	7	2	25	--	16	22	10	< 40 fm Apr-Sep	07/24 cabezon closed and < 20 fm until 31 Dec
2011	7 [a]	2	25	--	16	22	10	< 40 fm Apr-Sep	07/21 cabezon closed and < 20 fm until 1 Oct
2012	7 [a]	2	25	--	16	22	10	< 30 fm Apr-Sep	07/21 cabezon closed
2013	7 [a]	2	25	--	16	22	10	< 30 fm Apr-Sep	
2014	7 [a]	2	25	--	16	22	10	< 30 fm Apr-Sep	

[a] includes a seasonal 1 fish cabezon sub-bag limit
[b] changed inseason through state temp rule
[c] includes no more than 1 canary RF, 1 yelloweye RF, and 1 P. halibut
[d] includes a 1-3 canary sub-bag limit

Considerations Relative to Future Adjustments to Routine Measures

Under all of the alternatives, future adjustments in routine management measures are expected to be adaptive to new information and anticipated to be similar to those that have occurred since 2005. As noted above, routine measures may be modified only if the modification is proposed for the same purpose as the original measure, and the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine. Regulations at 50 CFR 660.60(c) list the purpose that specific routine measure adjustments may be made. Table 4-220 and Table 4-221 show the purpose a measure can be used as routine under the No Action Alternative.

Table 4-220. Routine measures defined for the Commercial fisheries 50 CFR 660.60(c).

Routine Measure	Purpose for Which the Measure Can be used as Routine Under No Action Alternative
Trip and frequency limits	To keep landings within the harvest specifications/ to extend the fishing season; to minimize disruption of traditional fishing and marketing patterns; to reduce discards; to discourage target fishing while allowing small incidental catches to be landed; to protect overfished species; to allow small fisheries to operate outside the normal season; and, for the OA fishery only, to maintain landings at the historical proportions during the 1984 to 1988 window period.
Size limits	To protect juvenile fish; to extend the fishing season; to keeping landings within the harvest specifications.
Depth-based management measures, including Groundfish Conservation Areas	Groundfish Conservation Areas may be implemented in any fishery that takes groundfish directly or incidentally. Area management may be used to keep landings within the harvest specifications; to protect and rebuild overfished stocks; to extend the fishing season; to minimize disruption of traditional fishing and marketing patterns; to reduce discards for the recreational fisheries; to discourage target fishing while allowing small incidental catches to be landed; and to allow small fisheries to operate outside the normal season.
Non-tribal set-asides deducted from the TAC, ACLs, or ACT	To provide additional harvest opportunities in groundfish fisheries when set-aside catch (scientific research activities, non-groundfish fisheries, and EFPs) is lower than the amounts that were initially deducted off the TAC, ACL, or ACT when specified, during the biennial specifications.

Table 4-221. Purpose for using routing management measures under the No Action Alternative (50 CFR 660.60 (c)).

Routine Measure	Purpose the Measure Can be used as Routine Under the No Action Alternative
Bag limits	To keep landings within the harvest specifications; to spread the available catch over a large number of anglers; to protect and rebuild overfished species; and to avoid waste.
Size limits	To protect juvenile fish; to protect and rebuild overfished species; to enhance the quality of the recreational fishing experience; and to keep landings within the harvest specifications.
Season duration restrictions	To keep landings within the harvest specifications; to spread the available catch over a large number of anglers; to protect and rebuild overfished species; to avoid waste; and to enhance the quality of the recreational fishing experience.
Depth-based closures	To keep landings within the harvest specifications; to protect and rebuild overfished stocks; to prevent the overfishing of any groundfish species by minimizing the direct or incidental catch of that species; to minimize the incidental harvest of any protected or prohibited species taken in the groundfish fishery; for the recreational fisheries, to spread the available catch over a large number of anglers; to discourage target fishing while allowing small incidental catches to be landed; and to allow small fisheries to operate outside the normal season.
Time/area closures Boat limits, Hook limits Dressing requirements	To keep landings within the harvest specifications; to rebuild and protect overfished or depleted species; and to maintain consistency with State regulations
Non-tribal deductions from the TAC, ACL, ACT	To make fish that would otherwise go unharvested available to other fisheries during the fishing year. Adjustments may be made to provide additional harvest opportunities in groundfish fisheries when catch in scientific research activities, non-groundfish fisheries, and EFPs is lower than the amounts that were initially deducted off the TAC, ACL, or ACT when specified, during the biennial specifications.

The Council manages total catch of groundfish species by monitoring landings and incidental catch inseason, and then making inseason adjustments to catch and other restrictions to ensure that annual total catch does not exceed allowable harvest amounts. As part of the process, the GMT monitors the fishery throughout the year, using the most current catch, effort, and other relevant data from the fishery and taking into account any new information that may identify resource issues requiring a management response. Into the future, it is expected that routine management measures will generally be used to address the following issues:

- Catch for the calendar year is projected to exceed the current ACL, OY, HG or quota.
- Estimated bycatch of a species or species group increases substantially above previous estimates, or there is information that abundance of a bycatch species has declined substantially.
- It becomes necessary to increase attainment of ACLs, HGs or quotas, particularly for targeted stocks.

From 2005 to 2013, issues for which routine management measures have been used include the following:

- Changes in trip limits and RCAs to reduce catch of target and co-occurring species
- Changes in trip limits to balance the catch of target (groundfish and non-groundfish) and co-occurring species to reduce bycatch
- Increased limits to provide economic benefits to fishermen and communities from increased attainment of ACLs, particularly for healthy stocks
- Changes in economic incentives that resulted in increased participation, particularly in the OA fisheries (i.e., increased DTL opportunity south of 36° resulted in fishing effort shifting from the north)
- In response to changes in non-groundfish fishing opportunity that increased participations in groundfish fisheries (i.e., salmon fishery restrictions resulted in increased DTL sablefish effort).
- In response to changes in non-groundfish fishery that resulted in increased incidental catch
- For consistency between fishery sectors
- For conforming with state and Federal restrictions
- Reductions to HGs when off-the-top, set-asides for research catch were exceeded
- Reduced trip limits to address concerns about biological status of a transboundary stock (i.e., Pacific cod trip-limit reductions to incidental levels due to the Canadian fishery low harvest levels and closed areas during the spawning season to allow for the stock to rebuild)

From time to time, non-biological issues may arise that require the Council to recommend management actions to address certain social or economic issues in the fishery and attain optimum yield while preventing overfishing. The Council may evaluate current information and issues to determine if social or economic factors warrant adjustments to routine management measures to achieve the Council's established management objectives. If the Council concludes that a management action is necessary to address a social or economic issue, it will prepare a report containing the rationale in support of its conclusion.

The Council and its advisory bodies evaluate fishery performance throughout the year and may recommend inseason adjustments at appropriate Council meetings. The GMT, GAP, and other advisory bodies typically generate analysis and supporting statements describing the rationale for the requested change to routine management measures and assessing the likely impacts that could result. For example, analysis could include how the change to a routine management measure may affect catch of overfished stocks, the likelihood that the change would result in achieving but not exceeding ACLs, or HGs, and other relevant considerations related to the Council's management objectives.

4.9.2 Impact Mechanisms by the Type of Management Measure

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 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 seasonably available due to their migratory pattern.

Recreational Rockfish Conservation Areas: These are 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 mechanisms 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), and 3) 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: These mechanisms discourage 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: This mechanism 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 efficiency (CPUE) and other gear-specific adverse impacts. If prohibited gear would enhance the angler experience, restrictions would reduce the value of recreational activity.

4.9.3 Impacts

Figure 4-131 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), and 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 be 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.

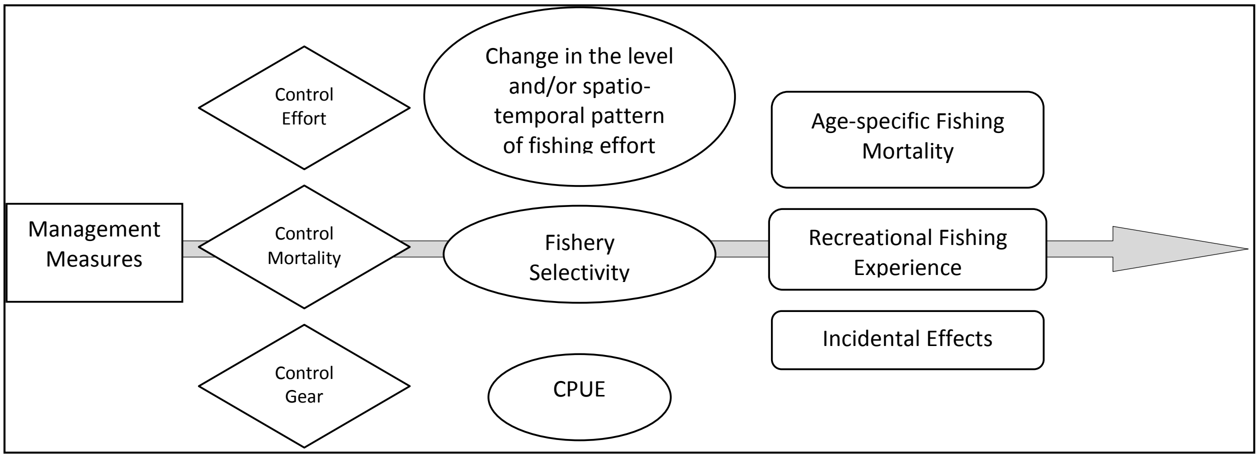

Figure 4-131. Summary of impact mechanisms for recreational management measures.

4.9.3.1 Groundfish Stocks

- Limiting fishing effort through time/area restrictions (fishing seasons, RCAs) reduces groundfish mortality, which is usually the primary objective of such management measures. Time/area restrictions are particularly effective in reducing mortality on stocks or portions of stocks based on the availability in time and space. 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.

4.9.3.2 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 the 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 restrictions are relaxed.

4.9.3.3 California Current Ecosystem

Changes in age-specific fishing mortality affect stock structure and relative abundance. Section 3.3 further 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 it 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.

4.9.3.4 Essential Fish Habitat

Adverse impacts on 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.

4.9.3.5 Protected Species

Measures that control fishing effort and its spatiotemporal 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 or 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.

4.9.3.6 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 generally accounted for in the management of those stocks.

4.9.4 Summary

Table 4-222 summarizes the effects of the commercial and recreational groundfish management measures described above on the environmental components evaluated in this EIS. As noted above, under all of the alternatives, future adjustments in routine management measures are expected to be adaptive to new information and are anticipated to be similar to those that have occurred since 2005. Routine measures may be modified only if the modification is proposed for the same purpose as the original measure and if the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine.

The Council and its advisory bodies evaluate fishery performance throughout the year and may recommend inseason adjustments at appropriate Council meetings. The Council manages total catch of groundfish species by monitoring landings and incidental catch inseason, and then making inseason adjustments to ensure that total catch does not exceed the ACLs. The fishery is monitored throughout the year by using the most current catch, effort, and other relevant data from the fishery and taking into account any new information that may identify resource issues requiring a management response. From time to time, non-biological issues may arise that require the Council to recommend management actions to address certain social or economic issues in the fishery and attain optimum yield while preventing overfishing. The Council may evaluate current information and issues to determine if social or economic factors warrant adjustments to achieve the Council's established management objectives. This adaptive and effective approach to management would continue under all of the alternatives.

Table 4-222. Summary of commercial and recreational management measures and impacts on environmental components. (- adverse effect, 0 negligible/no effect, + positive effect)

Measure	Environmental Component					
	Groundfish Stocks	California Current Ecosystem	Essential Fish Habitat	Non-Groundfish Species	Protected Species	Anglers and Fishing Communities
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	-/+
Prohib sale	+	0	0	0	0	-/+

4.10 Long-term Impacts of Setting Harvest Specifications on the Socioeconomic Environment

4.10.1 Impact Evaluation Methods

4.10.1.1 Revenue Volatility

As a preface to considering socioeconomic impacts, future fishery performance should be considered with respect to historical interannual 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 to 2012 long-term mean of total annual inflation-adjusted groundfish revenue (including at-sea Pacific whiting sectors). Figure 4-132 is similar, except that it is based on data from 1998 to 2012, and it shows non-whiting and whiting revenue separately. As discussed below, groundfish revenues dropped precipitously and remained below the long-term average starting in 1998. 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 non-whiting revenue in 2011. 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.

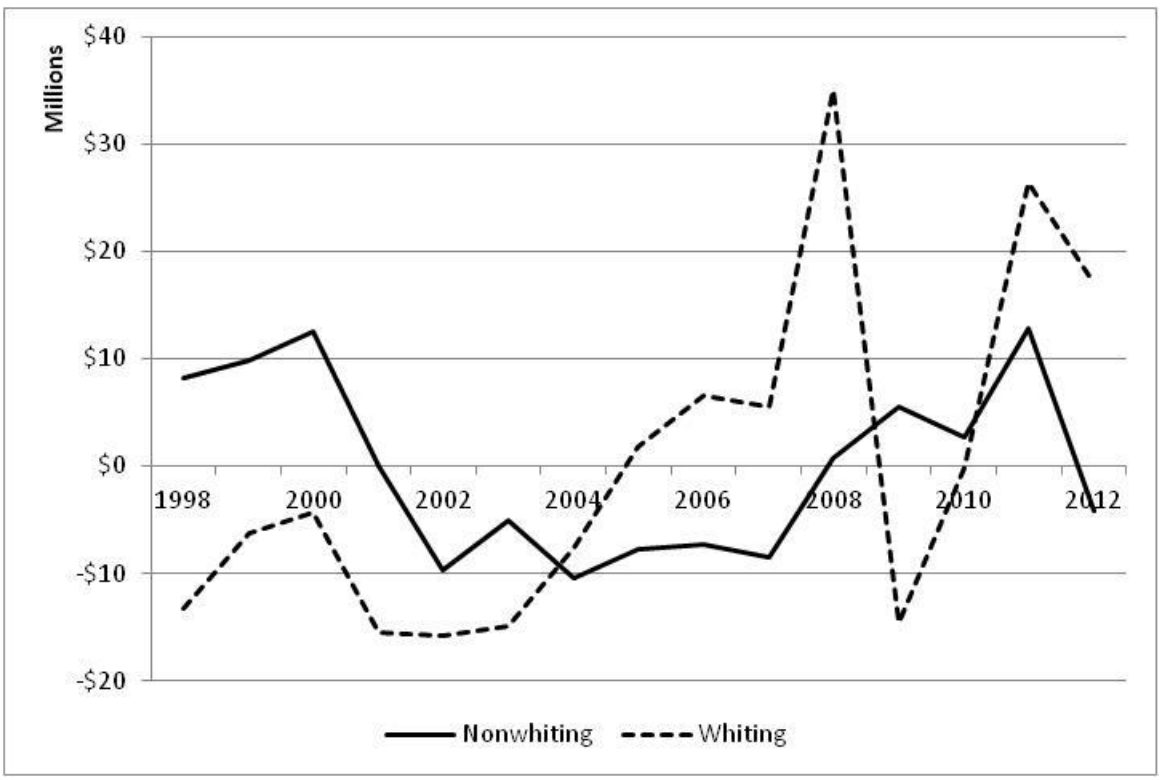

Figure 4-132. Deviation from the mean for inflation adjusted ex-vessel revenue from non-whiting and whiting fisheries, 1998 to 2012.

By way of comparison, Table 4-223 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 to 2011 period where the Other Species group (generally, various state-managed species) has a lower CV.

Table 4-223. Absolute variation in ex-vessel revenue (range between maximum and minimum value) in inflation-adjusted $1,000s during 1981 to 2011, and coefficient of variation for three periods, by species group.

	CPS	Crab	Groundfish	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 4-224 presents information on the maximum year-on-year revenue decline by species group. In addition to revenue for all species, 1997 to 1998 also showed the maximum decline for the CPS (-78 percent), Groundfish (-35 percent), Other (-35 percent), and Shellfish (-94 percent) 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 groundfish revenues are not unusually volatile compared to other West Coast fisheries. Expressed as percent, the maximum year-on-year change for groundfish, -35 percent, is close to the value for all species, -37 percent.

Table 4-224. Maximum year-on-year decline in inflation-adjusted revenue, 1982 to 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%

These data represent a longer time series than the 2003 to 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 percent. However, this statistic is somewhat misleading, because 2011 recorded the largest year-on-year gain of $23.9 million or 34 percent. 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 the No Action Alternative, 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 4-224 suggests that management of the groundfish fishery at that time was not a primary factor in the decline in revenue.

4.10.1.2 Stock Assessment Projections

Historical catch is compared to potential catch to evaluate the impact of the alternatives. The analysis focuses on a subset of species that generate most of the ex-vessel revenue in commercial fisheries and/or are important targets in recreational groundfish fisheries. For the No Action Alternative, it is assumed that the 2014 ACLs would be carried forward for some indefinite period.[65] For the No Action Alternative,

[65] 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.

historical catch is compared to those ACLs; cases where historical average catch is greater than a 2014 ACL could represent an adverse socioeconomic impact. Projected aggregate catch (the sum of catch over the 2015 to 2024 projection period) is used to evaluate the potential effect of the action alternatives. Catch under both the base case and high state of nature would be used for Alternative 1, the base case and the low state of nature for Alternative 2, and just the base case for the Preferred Alternative. 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 is either the recent average catch stream or the P*=0.25 ACL catch stream for the stocks considered here. Favoring the base case state of nature 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 fishing mortality is equal to the ACL. In order to make these scenarios more comparable to historical information, they have been adjusted by applying the historical ACL catch attainment rates based on WCGOP data (Bellman et al. 2013). 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. Adjusting the ACLs in this way as a proxy for catch would under-represent potential future catch should attainment rates increase.

The projections assume 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 towards the B_{MSY} level, while stocks below B_{MSY} increase towards that level. Changes in stock productivity and recruitment that cannot be predicted add to uncertainty about the level of future yields. Resulting misspecification of catch limits would result in foregone fishing opportunity (if specifications were low compared to actual stock status) or stock depletion (if specifications were too high).

4.10.2 Commercial Fisheries: Shorebased IFQ and Non-nearshore Fixed Gear

4.10.2.1 No Action Alternative

During the baseline period, shoreside groundfish limited entry fisheries have accounted for 70 percent of inflation-adjusted, ex-vessel revenue from non-tribal groundfish fisheries; with at-sea whiting included, the fraction rises to 94 percent. Inflation adjusted (2012 prices) ex-vessel revenue during the 2003 to 2012 baseline period ranged from $23.1 to $36.8 million for the limited entry groundfish bottom trawl fishery (including vessels fishing with fixed gear since 2011 under the IFQ program) and averaged $29.8 million. Comparable figures for the non-nearshore fixed fishery are $11.8 to $29.2 million and an average of $18.2 million. Under the No Action Alternative, it would be expected that revenues would range similarly.

The evaluation below considers the No Action Alternative ACLs more broadly with respect to 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 shorebased 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--225 shows average annual catch of these commercially important species compared to the 2014 ACLs.[66] Commercial catch attainment (the fraction of the ACL caught in commercial fisheries) for the

[66] See Figure 3-1 for a breakdown of total shoreside ex-vessel revenue by species.

2003 to 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 shorebased 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 above, that the magnitude of the ACL affects performance at a gross level. 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. During the baseline period, most of each ACL was caught (an attainment rate of 95 percent), and average catch during the baseline period exceeds the 2014 ACL. This suggests that coastwide revenue under the No Action Alternative would likely 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) is greater than the baseline period, catch attainment (the third column from the left in Table 4-225) 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 percent of coastwide inflation-adjusted revenue during the baseline period). For overfished species shown in Table 4-223, this relationship holds true only for POP.

Table 4-225. Comparison of 2003 to 2012 catch to ACLs for commercially important stocks. Historical catch from Bellman (2013).

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.

4.10.2.2 Action Alternatives

Table 4-224 compares baseline catch to potential catch, using adjusted ACLs as a proxy, based on stock assessment projections for major target species in the groundfish trawl and non-nearshore fixed fisheries. As shown in the table, these species account for almost four-fifth of landings by weight and value of groundfish by the trawl and non-nearshore sectors. As discussed above, ACL catch is adjusted based on historical attainment rates. These attainment rates are based on total catch for all sectors, but trawl and non-nearshore fixed gear account for most of the catch of these species. For each alternative and state of nature scenario, the ratio is shown between projected aggregate catch and aggregate catch during the 2003 to 2012 baseline period. These ratios make it easier to compare the difference between the alternatives in terms of potential revenues. Because potential ex-vessel revenue is likely to be influenced by many other factors aside from fishing opportunity, these results are not presented in terms of potential revenue; the ratios are meant to give a general indication of possible revenue differences from baseline conditions.

The ratios for Alternative 1 (P*=0.45) and the high state of nature would range from 1.4 for Petrale sole to 6.3 for Dover sole; the ratio for these stocks combined would be 4.1. Sablefish accounts for the largest fraction of groundfish revenues in this sector (almost two-fifths of nominal revenue during the baseline period) and has a ratio of 1.7. Nominal revenue from sablefish averaged $23.5 million per year for these fishery sectors during the baseline period. Under the base case state of nature, the difference between the adjusted ACLs and be 1.0 when Dover sole is excluded. Coincidentally, the ratios for sablefish would also be 0.6 and 1.0 under these two state of nature scenarios. Depending on how effective harvesters could be in catching Dover sole, while avoiding species with relatively low ACLs, revenue may not be much different under Alternative 2 than it was during the baseline period.

The Preferred Alternative (default P* values), shown for the base case state of nature, could result in slightly higher catches compared to the baseline level of catch; the ratio of adjusted ACLs to baseline catch would be 1.4. Under this scenario, the Dover sole ACL is a constant value of 25,000 mt, which is lower than the ABC harvest level, even with a P* of 0.25. Given that the Council proposes an increase in the ACL to 50,000 mt for the 2015-2016 biennial period, under-represent fishing opportunity and potential catch of this species under the Preferred Alternative. Excluding Dover sole, recognizing some of the anomalies resulting from the projections across all scenarios, Alternatives 1 and 2 would have adjusted ACL catch proxies equal to baseline catch. Excluding Dover sole, nominal ex-vessel revenue for these species from the trawl and non-nearshore fixed gear would average $35 million per year during the baseline period for these sectors.

The minimum catch streams from the projections for the low state of nature are also shown. These are not adjusted based on historical attainment, because, in most cases, they represent historical average catch rather than a fully attained ACL. The ratio for these stocks combined would be 0.8, which suggests adverse socioeconomic impacts, because catches would likely be below those during the baseline period.

Table 4-226. Catch proxies for major target species in the trawl and non-nearshore fixed gear fisheries.

	Percent of Groundfish Total					Alt 1 (P*=0.45)					
						High			Base		
Stock	By weight	By value	2003-2012 Catch	2003-2012 Cum. ACLs (OYs)	ACL Attainment	Cum. ACLs	Adjusted Cum. ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio
Arrowtooth Flounder	9%	1%	33,985	83,402	41%	379,146	154,496	4.5	73,075	29,777	0.9
Dover Sole	35%	16%	89,812	145,920	62%	912,486	561,625	6.3	566,111	348,435	3.9
Thornyheads	8%	8%	22,951	41,760	55%	146,311	80,413	3.5	64,256	35,315	1.5
Petrale Sole	7%	9%	18,874	23,008	82%	31,700	26,004	1.4	27,711	22,732	1.2
Sablefish	22%	56%	63,245	71,411	89%	123,354	109,249	1.7	85,424	75,656	1.2
Stocks Combined	82%	91%	228,867	365,501	63%	1,592,997	931,787	4.1	816,577	511,915	2.2

	Alt. 2 (P* =0.25)						Pref. Alt. (Default P*)			Minimum Catch Stream	
	Low			Base			Base			Low	
Stock	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. Catch	Ratio
Arrowtooth Flounder	40,011	16,304	0.5	63,641	25,933	0.8	71,249	29,033	0.9	30,880	0.9
Dover Sole	348,799	214,682	2.4	506,304	311,625	3.5	250,000	153,872	1.7	75,509	0.8
Thornyheads	24,857	13,661	0.6	46,114	25,344	1.1	59,605	32,759	1.4	16,961	0.7
Petrale Sole	21,912	17,975	1.0	25,217	20,686	1.1	27,711	22,732	1.2	9,390	0.5
Sablefish	40,862	36,190	0.6	73,583	65,169	1.0	82,581	73,138	1.2	40,862	0.6
Stocks Combined	476,441	298,811	1.3	714,860	448,757	2.0	491,146	311,534	1.4	173,602	0.8

Note: The columns on the left side of the upper panel show the following information about the 2003 to 2012 baseline period: percent of total groundfish landings in these sectors by weight and nominal value, baseline catch, cumulative ACLs, and resulting ACL attainment (catch divided by ACL). For each alternative, the cumulative ACLs, adjusted cumulative ACLs (ACLs multiplied by baseline attainment rate), and ratio of adjusted ACLs are shown for alternative state of nature catch streams. The lower right section of the table shows the minimum catch stream, which is not adjusted for attainment. Historical catch from Bellman (2013). Stocks combined for thornyheads (longspine and shortspine) and sablefish (north and south of 36° N. latitude).

4.10.3 Commercial Fisheries: Pacific Whiting

Pacific whiting fisheries show greater revenue volatility compared to non-whiting fisheries, as indicated in Figure 3-5. For the shoreside whiting fishery, inflation-adjusted ex-vessel revenue ranged from $7.7 to $25.8 million and averaged $13.6 million during the 2003 to 2012 baseline period. For the two at-sea sectors, the range was $8.1 to $46.6 million, with an average of $21.4 million.

Potential future variability in revenue can be characterized in terms of the CVs for whiting sectors' inflation-adjusted, ex-vessel revenue during the baseline period. Table 4-227 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 is 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 4-227. CVs for inflation-adjusted, ex-vessel revenue and catch limits for whiting and non-whiting trawl fisheries, 2003 to 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

Non-tribal Pacific whiting sectors ex-vessel revenue under the No Action Alternative used to evaluate 2015-2016 ACLs and management measures would be $54 million. During the baseline period, whiting fisheries (including tribal sectors) landed between 79 percent and 99 percent 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 4-228), it is likely that exogenous factors play an important role in both attainment and revenues.

In coming years, a value similar to this range of revenues during the baseline period may be expected under any of the alternatives, including the No Action Alternative. However, given the high variability in Pacific whiting abundance, values outside this range could also occur. For example, the 2014 U.S. share of the TAC for Pacific whiting is 316,206 mt. Using the 2013 shoreside average price per pound for whiting and assuming the entire non-tribal allocation were caught, this would translate into about $27 million for the non-tribal shoreside sector and $37 million for the combined two non-tribal at-sea sectors. While $37 million would lie within the 2003 to 2012 historical range of revenues for the combined at-sea sectors, $27 million would lie slightly above the 2003 to 2012 historical range for the shoreside sector.

Ten-year projections were not made for Pacific whiting, because yield is highly variable, and long-term projections were deemed unrealistic. 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.

During the baseline period, total ex-vessel revenue from Pacific whiting (including the at-sea sectors) ranged from $16.9 to $66.8 million. This range holds going back to 1997, the first year that at-sea data are available.

4.10.4 Commercial Nearshore Fixed Gear and Recreational Fisheries

4.10.4.1 No Action Alternative

The commercial nearshore fishery is prohibited in Washington, but occurs in Oregon and California waters. Recreational fisheries occur primarily in state waters off all three states. Generally, the nearshore commercial fishery and recreational fishery target the same species: black rockfish, blue rockfish, cabezon, lingcod, greenlings, principally kelp greenling, and other rockfish grouped in the nearshore complexes (geographically subdivided north and south of 40°10' N. latitude).

The nearshore fixed gear sector accounted for 5 percent of inflation-adjusted revenue from shoreside fisheries during the baseline period. Although this fishery sector is not very important from a coastwide perspective, as discussed in Section 3.2.2.4 and Section 3.2.8, it makes up an important component of groundfish revenue in some coastal communities, particularly in southern Oregon and northern California. This revenue (from groundfish) ranged from $2.9 million to $4.2 million and averaged $3.6 million. Under the No Action Alternative, comparable levels of revenue would likely be generated.

Recreational groundfish fisheries are managed with time/area closures and bag limits to limit angler effort and catch. Generally, recreational fisheries are managed to limit catch of overfished species, yelloweye, and canary rockfish in Washington and Oregon and also cowcod and bocaccio in California, as well. Comparable management measures would be implemented under the No Action Alternative as those described in Section 4.2. As in the 2015-2016 biennial period, under the No Action Alternative, and over the long term, these measures would be regularly adjusted in response to new information about catch.

Table 4-226 compares 2005 to 2012 catch, ACL attainment, and 2014 ACLs for stocks that are targets in nearshore commercial and recreational fisheries. Historical catch is divided by the 2014 ACL to give an indication of whether more restrictive management measures may be needed to control catch in the future. Average annual catch in previous years is close to or exceeds the 2014 ACL for black rockfish and Cabezon in Oregon and California, and Minor Nearshore Rockfish north. Black rockfish and Minor Nearshore Rockfish north are mostly caught in recreational fisheries. Thus, under the No Action Alternative over the long term, it is likely that recreational management measures would have to take these stocks into account.

Table 4-228. Comparison of commercial nearshore fixed gear and recreational catch (mt), 2005 to 2012 to ACLs for commercially important nearshore stocks and stock complexes.

Stock	Average Annual Catch 2005-2012	Attainment	2014 ACL	Catch / 2014 ACL	Comm.-Rec. Split	
Black Rockfish (OR-CA)	608	84%	409	149%	27%	73%
Black Rockfish (WA)	224	35%	1,000	22%	0%	100%
Cabezon (California)	59	61%	158	37%	46%	54%
Cabezon (OR-WA) [a/]	48	109%	47	103%	54%	46%
Lingcod Coastwide [b/]	441	19%	3,941	11%	12%	88%
Nearshore RF North	85	65%	94	90%	39%	61%
Nearshore RF South	485	69%	990	49%	19%	81%

Source: commercial catch estimates from WCGOP multi-year data product (Bellman et al. 2013). Recreational catch estimates from RecFIN Recent Estimate Tabulation, http://www.recfin.org/data/estimates/tabulate-recent-estimates-2004-current.
[a/] Attainment based on ACLs in 2011-2012 only.
[b/] Lingcod has been managed under different geographic units; for comparison, catch limits and catch is presented coastwide.

Recreational fisheries can also be evaluated with respect to angler fishing effort. For the 2015-2016 biennial period, bottomfish plus Pacific halibut marine angler boat trips under the No Action Alternative are estimated at 835,000 generating personal income of $145.6 million. During the baseline period (2004 to 2012) bottomfish plus Pacific halibut marine angler boat trips averaged 648,000 annually. California accounted for 82 percent of marine angler boat trips during the baseline period, and the Los Angeles-Orange County-San Diego region alone accounted for 48 percent of these trips. The change in the number of boat trips over time has varied more, but also been greater in California, compared to the other two states. The number of these trips averaged 586,203 from 2006 to 2010, but jumped to an average of 836,837 in 2011-2012. Over the long term, recreational effort and resulting personal income would likely be within the range of the baseline period.

4.10.4.2 Action Alternatives

Table 4-229 presents data similar to Table 4-226, but for nearshore species important in commercial fixed gear and recreational fisheries. For the Minor Nearshore Rockfish complexes, blue rockfish is used as a proxy, because it is the only stock in these complexes for which a projection could be produced. In this case, ACLs were only available for the 2005 to 2012 period, so the projected ACLs were adjusted for both the time series difference (by multiplying by 0.8) and historical ACL attainment. Since blue rockfish is managed as part of a complex, no historical ACL attainment rate was applied as part of the adjustment. As result, the ratios shown for this species are higher than would otherwise be the case. Species in the Minor Nearshore Rockfish complexes accounted for 22 percent of landings and 43 percent of revenue from the commercial fixed gear sector during the baseline period.

Table 4-229. Catch proxies for major target species in nearshore fixed gear and recreational fisheries.

				Alt 1 (P*=0.45)					
				High			Base		
Stock	2005-2012 Catch	2005-2012 Cum. ACLs (OYs)	ACL Attainment	Cum. ACLs	Adjusted Cum. ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio
Black Rockfish	6,658	10,888	61%	26,042	12,739	1.9	16,008	7,831	1.2
Cabezon	855	869	98%	2,523	1,987	2.3	1,798	1,416	1.7
Lingcod	3,526	36,022	10%	53,205	4,166	1.2	42,294	3,312	0.9
Blue Rockfish [a/]	5,940			3,960	*3,168*	0.7	2,230	1,784	0.4
Stocks Combined [b/]	11,039	47,779	23%	81,770	18,893	1.7	60,100	12,559	1.1

	Alt. 2 (P* =0.25)						Pref. Alt. (Default P*)			Minimum Catch Stream	
	Low			Base			Base			Low	
Stock	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. ACLs	Adjusted Cum ACLs	Ratio	Cum. ACLs	Ratio
Black Rockfish	8,483	4,150	0.6	13,685	6,694	1.0	13,946	6,822	1.0	5,540	0.7
Cabezon	980	772	0.9	1,541	1,213	1.4	1,798	1,416	1.7	553	0.5
Lingcod	27,557	2,158	0.6	33,580	2,630	0.7	41,517	3,251	0.9	242	0.1
Blue Rockfish [a/]	487	*390*	0.3	1,609	1,287	1.2	2,230	*1,784*	1.6	1,335	0.8
Stocks Combined [b/]	37,020	7,080	0.6	48,805	10,537	1.0	57,261	11,489	1.0	6,336	0.5

Note: The panels in this table are arrayed . The upper left panel shows information for the baseline period: cumulative catch, cumulative ACLs, and ACL attainment (catch divided by ACL).
Source: historical catch from Bellman (2013). For each alternative, cumulative ACLs, adjusted cumulative ACLs (ACL multiplied by historical attainment), and the ratio of adjusted cumulative ACL to baseline catch are shown for alternative state of nature catch streams. The minimum catch stream cumulative ACLs (not attainment adjusted) and ratio to historical catch are also shown. Geographic stocks are combined for black rockfish, cabezon, and lingcod.
[a/] Blue rockfish adjusted for time period only (see text for explanation).
[b/] Excluding blue rockfish.

For Alternative 1 under the high state of nature, the overall ratio (excluding blue rockfish) would be 1.7, which may be biased downward somewhat by the very low attainment rate for lingcod. Across all fishery sectors (including recreational), the attainment rate for lingcod would be only 15 percent. However, this bias may be counteracted by the high value for blue rockfish, which, as discussed above, does not take into account attainment rates. Under the base case state of nature scenarios, the catch proxies across all the action alternatives would differ little from baseline catch, with ratios of 1.0 for Alternative 2 and 3 and 1.1 for Alternative 1. For Alternative 2 under the low state of nature scenario, the ratio would be 0.6, suggesting adverse impacts. Note that the ratio for blue rockfish would be 0.3; if blue rockfish status and stock dynamics were actually representative of the species in the Minor Nearshore Rockfish complexes, the adverse impacts could be greater than indicated by combined species ratio (which excludes blue rockfish and by extension the Minor Nearshore Rockfish complexes). As noted above, the Minor Nearshore Rockfish complexes comprise a large proportion of ex-vessel revenue from the commercial nearshore fishery. The minimum catch stream scenario represents a substantial reduction in potential catch compared to the baseline, which would result in severe adverse impacts. The minimum catch stream would result in a catch proxy ratio of 0.5 overall; this would be outside of the range of default HCR policies of the alternatives, but would represent the low end of projected catches.

4.10.5 Buyers and Processors

Data are not available to estimate processor revenues so ex-vessel revenue is used in groundfish harvest specifications impact analyses as a measure of the flow of raw fish into the production process. Although prices for processed fish may not correlate directly with this input cost, the discussion of revenue impacts discussed above for fishery sectors may indicate the relative impact of the alternatives on processors.

Processors would also likely play a role in stimulating demand for particular fish products, by developing new products for example. This is relevant to productive, currently under-utilized species such as flatfish.

4.10.6 Fishing Communities

Section 3.2.8 summarizes the economic characteristics of West Coast fishing communities during the 2003 to 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, the No Action Alternative for 2015-2016 harvest specifications would use a 2014 commercial ex-vessel revenue estimate of $123 million, which is the basis for estimating the regional distribution of personal income impacts, shown in Table 4-142. These distributions are based on landing patterns in 2013, and they should be broadly similar to the information on landings distributions during the baseline period, as described in Section 3.2.8. All other factors being equal, one would expect the amount and distribution of income to fishing communities would be comparable over the long term if harvest specifications remained at their 2014 values. As discussed in the previous sections, evaluating fishery sector impacts, under the action alternatives catch could increase or decrease relative to baseline catches.

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 the following:

- 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 the No Action Alternative ACLs (the “rebuilding paradox”)
- Changes in the distribution of landings due to agglomeration (geographic concentration of related firms)
- Public and private initiatives intended to support the continued viability of fishing communities

As discussed in Section 3.2.8, geographic trends in landings during the baseline period suggest increasing agglomeration at fewer ports. This is likely driven by the shorebased IFQ fishery, which accounts for the largest proportion of coastwide groundfish revenue. Harvest specifications are, however, unlikely to be a substantial contributor to this trend, because exogenous factors are likely to have a greater influence on 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 the No Action Alternative, ACLs would remain constant over time, so one might expect the trends shown in Figure 3-19 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”), and harvesters are unable to avoid catching stocks with low ACLs, their ability to attain target species’ ACLs could be impeded. This could affect fishing communities differently, depending on the operational characteristics of their fleets. While techniques and technologies to target species more selectively and avoid those with low catch limits might be expected to spread to all fishery participants eventually, local fishing grounds vary with respect to the occurrence of low ACL species (such as overfished/rebuilding species). The FEIS for Groundfish FMP Amendment 20 (PFMC 2010) identified ports “adjacent to fishing grounds with high constraining overfished species abundance” (p. 530). While that analysis focused on overfished species, if ACLs remain constant while species abundance increases, various other species could become limiting factors for local fisheries. Interventions outside the biennial process, such as the trawl rationalization adaptive management program, are likely to have a much greater effect on the distribution of landings.

As discussed above, potential catch under the action alternatives would likely be close to baseline period catch, based on the adjusted cumulative ACLs ratios. The influence of exogenous factors, discussed with respect to the No Action Alternative, would be equally influential if ACLs and resulting management measures were established under any of the three ACL policies. Alternative 2 would implement a larger precautionary reduction from the OFL compared to Alternative 1 and the Preferred Alternative (although, under proposed Amendment 24 procedures, the Council could modify the default ACLs). The lower ACLs under Alternative 2 would be more limiting in cases where the proportion of the ACL caught (the attainment rate) increases towards 100 percent. Differential socioeconomic impacts on fishing communities under any set of ACLs would more likely result from differences between catch limits for stocks under any of the alternatives, rather than the broader policy differences represented by the action alternatives.

4.10.7 Summary of the Impacts of the Alternatives

All other factors being equal, ex-vessel revenue, personal income, and employment would likely remain within the range exhibited during the recent past. Table 4-230 shows the maximum and minimum total annual revenue for whiting and non-whiting fisheries and all groundfish fisheries from 1998 to 2012. This period was chosen because 1997-1998 represents a breakpoint where there was sudden precipitous decline in groundfish ex-vessel revenue. For groundfish fisheries as a whole, revenue ranged from $63.5 million to $128.2 million. This is the best estimate of the likely range in future real revenues, recognizing the many factors that could affect actual landings beyond the biological yield from stocks. The most important of these uncertainties is the true future yield from stocks. The fraction of this yield that is actually landed is almost as important. Changing ACL attainment is a function of technical innovation and market demand. Technical innovation (including institutional arrangements such as risk pools) allows harvesters to better match actual catch in a multi-species fisheries to harvest limits.

Table 4-230. Maximum and minimum annual inflation adjusted (2012) revenue for non-whiting and whiting fishery sectors, and all groundfish.

	Revenue	Year
	Nonwhiting	
Min	$46,774,698	2004
Max	$70,008,542	2011
	Whiting	
Min	$16,013,680	2002
Max	$66,819,804	2008
	Total	
Min	$63,484,665	2002
Max	$128,212,249	2011

The No Action Alternative would establish 2014 ACLs for the indefinite future. The No Action Alternative in Section 4.3 (socioeconomic impacts of 2015-2016 harvest specifications and management measures) provides a first approximation of ex-vessel revenue and personal income impacts under the long-term No Action Alternative. In that section, annual coastwide commercial and tribal ex-vessel revenue for the No Action Alternative is estimated to be $123 million, near the maximum for the 1998 to 2012 period. The annual average for the 2003 to 2012 baseline period is $91 million. This difference is mainly explained by the increasing Pacific whiting TAC since 2009, because the 2015-2016 No Action Alternative uses 2013 revenues.

Since the No Action Alternative would implement static ("constant catch") ACLs over the long term, the discrepancy between these ACLs and actual abundance could lead to adverse socioeconomic impacts since additional yield that might otherwise be available for harvest would not be accommodated under these ACLs. A prime example is Dover sole, where the 2014 policy is a 25,000 mt constant catch limit. Furthermore, the so-called rebuilding paradox, where increasing abundance of a stock makes it more difficult for them to be avoided in a multi-species fishery, could result in the imposition of restrictive management measures affecting fishing opportunity for other species. Even in catch share fisheries, where there is greater scope for innovation, technical limitations could prevent harvesters from attaining their target species quotas.

The action alternatives policies would allow higher harvests than the No Action Alternative. Table 4-231 compares the No Action Alternative ACLs to the annual average of the 10-year catch streams for action alternatives under different state of nature scenarios for the commercially and recreational species presented above. The ratio of the 2014 ACL to the annual average catch stream also presented. For the trawl and non-nearshore target species combined, the ratios for the base case state of nature range from 1.9 times the 2014 ACLs under Alternative 1 to 1.1 times the 2014 ACLs under the Preferred Alternative. For Alternative 2, the ratio would be 1.6 for the base case. Alternative 3 would have a smaller ratio than the more risk averse policy (P*=0.25) under Alternative 2 because of the default constant catch ACL of 25,000 mt for Dover sole. As discussed elsewhere, the Council proposes doubling this ACL to 50,000 mt for 2015-2016, so the combined species ratio for the Preferred Alternative would be unrealistically biased downward. For the nearshore commercial and recreational fishery target species, these ratios would be small, ranging from 1.1 under Alternative 1 to 0.9 for Alternative 2.

Table 4-231. Comparison of ACLs for the alternatives for selected stocks

Stock	2014 ACL	Annual Average ACLs				
		Alt 1 High	**Alt 1 Base**	**Alt 2 Low**	**Alt 2 Base**	**Pr Alt Base**
Arrowtooth Flounder	5,758	37,915	7,307	4,001	6,364	7,125
Dover Sole	25,000	91,249	56,611	34,880	50,630	25,000
Thornyheads	4,223	14,631	6,426	2,486	4,611	5,960
Petrale Sole	2,652	3,170	2,771	2,191	2,522	2,771
Sablefish	5,909	12,335	8,542	4,086	7,358	8,258
Stocks Combined	43,542	159,300	81,658	47,644	71,486	49,115
		Ratios				
Arrowtooth Flounder		6.6	1.3	0.7	1.1	1.2
Dover Sole		3.6	2.3	1.4	2.0	1.0
Thornyheads		3.5	1.5	0.6	1.1	1.4
Petrale Sole		1.2	1.0	0.8	1.0	1.0
Sablefish		2.1	1.4	0.7	1.2	1.4
Stocks Combined		3.7	1.9	1.1	1.6	1.1
	2014 ACL	**Annual Average ACLs**				
		Alt 1 High	**Alt 1 Base**	**Alt 2 Low**	**Alt 2 Base**	**Pr Alt Base**
Black Rockfish (OR-CA)	409	2,032.0	1,219.8	714.8	1,043.7	1,000.0
Black Rockfish (WA)	1,000	572.2	380.9	133.5	324.8	394.6
Cabezon (off CA only)	158	164.3	130.9	73.8	111.3	130.9
Cabezon (OR-WA)	47	88.0	48.9	24.2	42.8	48.9
Lingcod N. of 42° (OR & WA)	2,878	3,696.2	3,059.8	2,115.4	2,499.0	3,059.8
Lingcod S. of 42° (CA)	1,063	1,624.4	1,169.7	640.3	859.0	1,092.0
Stocks Combined	5,555	8,177.0	6,010.0	3,702.0	4,881.0	5,726.0
		Ratios				
Black Rockfish (OR-CA)		5.0	3.0	1.7	2.6	2.4
Black Rockfish (WA)		0.6	0.4	0.1	0.3	0.4
Cabezon (off CA only)		1.0	0.8	0.5	0.7	0.8
Cabezon (OR-WA)		1.9	1.0	0.5	0.9	1.0
Lingcod N. of 42° (OR & WA)		1.3	1.1	0.7	0.9	1.1
Lingcod S. of 42° (CA)		1.5	1.1	0.6	0.8	1.0
Stocks Combined		1.5	1.1	0.7	0.9	1.0

As noted above, the deterministic projections used to evaluate long-term impacts of the action alternatives assume perfect information so that stock biomasses tend to converge on the policy target (B_{MSY} or proxy thereof). In a decision table, the state of nature scenarios are intended to bracket uncertainty around key model parameters; here, they are presented to bracket potential catch if lower probability parameter values are the "true" values. In a multispecies fishery involving a variety of different targeting strategies, however, 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 likely that future ex-vessel revenue from the groundfish fishery across the action alternatives would be within the range of annual values recorded for the baseline period.

Benefits to harvesters are a function of net revenue or "profits," a function of costs, including opportunity costs. Figure 3- shows the estimated breakdown of costs by category for the shorebased IFQ and at-sea co-op fisheries. Wages are the largest component of costs for the trawl component; for the fixed gear segment, quota is the largest share, and wages are a smaller fraction of total costs. Changes in net revenue would result from changes in the price of these costs components relative to ex-vessel prices for fish.

4.11 Long-term Impacts of Setting Harvest Specifications and Management Measures on Essential Fish Habitat

Setting harvest specifications does not directly affect EFH. Furthermore, an analysis of groundfish trawl logbook data does not reveal any clear relationship between catch limits and fishing effort (Appendix A). As discussed in Section 3.3.3.3, fishing effort in the shoreside trawl fishery has declined substantially since 2010, while catch generally increased. Section 3.2.3 reports participation trends in groundfish fixed gear and trawl fisheries during the baseline period (2003 to 2012). Non-nearshore fixed gear fishery participation has remained relatively stable while nearshore fixed gear fishery participation has declined. The trend in effective fishing effort is not directly related to participation, but it is unlikely that fishing effort increased during the baseline period (2003–2012). Considering the lack of a clear relationship between the harvest specifications and fishing effort, it is not possible to distinguish the effect on EFH among the long-term Amendment 24 alternatives. To the degree that the amount and spatio-temporal distribution of gear-specific fishing effort does not change from historical patterns, adverse impacts to EFH from the groundfish fishery are likely to be equivalent to the historical impacts described in Section 3.3, which serves as a proxy for describing the impacts of the No Action Alternative (Section 3.3.1).

Groundfish fisheries have negligible impact on the water column itself, parts of which are designated EFH under other FMPs. Benthic habitats are disturbed by gear types that contact the bottom. These effects are summarized in Section 3.3 and described in more detail elsewhere (NMFS 2005; NMFS 2013b; NMFS 2014b).

The proposed action would indirectly mitigate adverse impacts on EFH from fishing through the use of time/area closures. As discussed in Sections 3.3 and 4.4, GCAs, established as top-down measures to reduce bycatch of overfish species, have an ancillary mitigating impact on the adverse impacts of groundfish fisheries on EFH by prohibiting fishing within these areas.[67] If an area is closed for an extended period of time, the EFH within it may recover from these adverse impacts. Estimates of recovery times for EFH are shown in Table 3-30 by habitat and gear type causing the impact. These range from less than a year to decades. Although the maximum recovery time shown in the table is 56 years (the upper end of the range of recovery times for offshore biogenic habitat impacted by trawl gear), estimates range into centuries for some deepwater coral species. However, Table A.3a.2 in NMFS (2013a) shows a maximum recovery time across gear types and habitat categories of 3.2 years.

While some GCA configurations, such as the CCAs, have remained static since implementation, in the case of the trawl RCA, boundaries change seasonally and year to year to optimize fishing opportunity versus bycatch avoidance. Inseason changes of this kind involve moving seaward and shoreward boundaries of the RCA, using sets of waypoints published in Federal regulations that approximate different depth contours. The depths closed to trawl gear by RCAs also vary by latitude. Over time, waypoints comprising a particular depth boundary have been changed so that they better approximate the actual depth contours. These improvements in accuracy are generally minor with respect to the area affected and, thus, have negligible potential impacts on EFH related to permitting fishing in areas that were previously inside the trawl RCA. As an example, Appendix C to the 2013–2014 Groundfish Harvest Specifications FEIS (PFMC and NMFS 2012) includes an analysis of proposed changes to RCA waypoints to improve their accuracy.

It is likely that, as overfished species stocks rebuild and other measures are implemented that more effectively and efficiently control catch of species with low ACLs, the rationale for maintaining GCAs, at least in their present configurations, will diminish. However, the need to control catch because of the changed status of other species could lead to the implementation of new GCAs. It is also possible that,

[67] Other closed areas, principally EFH Conservation Areas, were established with the objective of mitigating such impacts or (in the case of MPAs) addressing a variety of objectives closely related to habitat protection. However, establishing or modifying these areas is not part of the proposed action.

over the long term, time/area closures could be developed with the dual objectives of controlling catch and mitigating adverse impacts of fishing on EFH. This might be the case if one or more stocks with intrinsically low yield are found to associate with benthic habitat types that have long recovery times.

In the past, RCA boundaries were changed frequently as a routine matter based on the premise that the effects of such changes had been previously analyzed when a particular RCA configuration was initially implemented. However, as discussed in Section 3.3, as part of a 2014 rulemaking to modify the trawl RCA boundary, NMFS considered several factors when assessing the potential for adverse impacts on EFH from such changes, including the history of fishing that may have caused adverse impacts, the estimated recovery time of the EFH in the area where fishing will be permitted, and related habitat conservation considerations (such as proposals to close the area to fishing specifically to protect EFH). As with the bycatch objective of RCAs, evaluation of adverse impact on EFH would consider the tradeoff of conservation and socioeconomic costs and benefits based on the practicability standard in Federal regulations at 50 CFR 600.815(a)(2)(iii).

4.11.1 Summary of the Impacts of the Alternatives

There are no models or methodology available to estimate the amount and spatial distribution of fishing effort, and, thus, effects on EFH, over the long term. Like other environmental components, the environmental baseline described in Section 3.3 is the best available indicator of the range and intensity of future impacts. Potential changes or trends in the groundfish fishery could make direct and indirect impacts of the proposed action different from the past (also described in Section 4.4.2). Implementation of IFQ management for the bottom-trawl fishery has changed fishing behavior. Overall fishing effort initially decreased in 2011, while CPUE increased. To the degree this represents a long-term trend, adverse impact from fishing on groundfish EFH could be lower, compared to the baseline period. Participants in the shorebased IFQ fishery can use any legal groundfish gear, and a substantial portion of sablefish catch is now made with fixed gear. Fixed gear has fewer adverse impacts, measured by recovery time, than trawl gear. Compared to the baseline, this could result in fewer adverse impacts. Changes in the boundaries to GCAs could have ancillary adverse or beneficial impacts on groundfish EFH, depending on whether areas estimated to have recovered are subject to fishing or fishing in other areas is restricted. Since it is not possible to predict the amount and distribution of fishing effort under the alternatives, ACLs may be used as a proxy for fishing opportunity.

<u>No Action Alternative</u>: Fishing opportunity would remain unchanged under the No Action Alternative. Section 4.2.5.1 summarized projected catch for commercially important species. Ratios between the No Action Alternative (2014) ACLs and action alternative ACLs are also shown. These ratios are used as a proxy for the increase in fishing opportunity to summarize potential impacts on groundfish EFH resulting from changes in fishing effort. As discussed above, a correlation between fishing opportunity (ACLs) and fishing effort was not detected in a comparison of historical ACLs and fishing effort approximated from trawl logbook data tow times. Therefore, only very large increases in potential fishing opportunity would imply increases in fishing effort. Furthermore, economic conditions—such as demand for fishery products and changes in input costs for fishing vessels would likely influence fishing effort as much as or more than management policies. Large-scale changes in management (outside the scope of the proposed action) could also affect fishing effort. As an example, information presented in Section 3.3.3.3 shows there was a decrease in trawl fishing effort and an increase in CPUE that coincided with the implementation of IFQ management in 2011. Further increases in CPUE would indicate decreasing adverse impacts on EFH from fishing, at least relative to catch and landings. Conversely, attainment of ACLs (catch divided by the ACL) is low for many groundfish stocks, leaving scope to increase catch within the constraints established by current harvest specification policies. In addition to changes in demand and input costs, technical factors that increase efficiency (e.g., in the IFQ fishery catching target species, while avoiding species for which quota pounds are limited) could produce a net increase in fishing effort with corresponding adverse impacts to EFH.

Preferred Alternative: The ratio of Preferred Alternative ACLs to the No Action Alternative ACLs would be 1.1 for both the commercially important non-nearshore and nearshore species. Given the poor correlation between fishing opportunity and fishing effort, it is unlikely that this change would result in increased fishing effort and adverse impacts. As described above, both adverse impacts from fishing and beneficial impacts due to mitigating factors could occur due to actions outside the scope of the proposed action. Other factors being equal, it is reasonable to conclude that the range and intensity of impacts would be comparable to those that occurred during the baseline period as described in Section 3.3.

Alternative 1: The ratio of Alternative 1 ACLs to the No Action Alternative ACLs would be 1.9 for commercially important non-nearshore species and 1.1 for commercially important nearshore species. As discussed above, available information does not demonstrate a relationship between the size of ACLs (a proxy for fishing opportunity) and fishing effort. It is reasonable to conclude, all other factors being equal, that an increase in non-nearshore fishing opportunity (which includes the bottom-trawl fishing) would result in an increase in fishing effort. This could increase adverse impacts from fishing to groundfish. As described above, both adverse impacts from fishing and beneficial impacts due to mitigating factors could occur due to actions outside the scope of the proposed action.

Alternative 2: The ratio of Alternative 2 ACLs to the No Action Alternative ACLs would be 1.6 for commercially important non-nearshore species and 0.9 for commercially important nearshore species. As with Alternative 1, the rate for commercially important non-nearshore species ACLs might translate into an increase in fishing effort and corresponding adverse impacts on groundfish EFH. As described above, both adverse impacts from fishing and beneficial impacts due to mitigating factors could occur due to actions outside the scope of the proposed action.

4.12 Long-term Impacts of Setting Harvest Specifications and Management Measures on the California Current Ecosystem

4.12.1 Impact Evaluation Methods

Section 3.4.3 reviews published results from the use of the California Current Atlantis Ecosystem Model to evaluate the cumulative effects of fishery removals on ecosystem structure. Kaplan (2014, reproduced in Appendix A) conducted a similar evaluation of the harvest policies proposed in the Amendment 24 alternatives to simulate and evaluate food web impacts of groundfish fisheries. As noted by Kaplan, these simulations do not take into account stressors such as habitat damage by fishing gear, climate change, or ocean acidification.

The analysis uses the 10-year projections from groundfish stock assessments, but it extends the simulation period to 30 years to better reveal food web effects. Selected catch streams from the stock assessment projections were used for the first 10 years of the simulation; catch projections were extended for at least another 20 years based on the fishing mortality rates experienced in the tenth year of the projection period. The state of nature scenarios from the stock assessment projections were converted to ecosystem productivity by transferring the productivity parameters lnRo (log of initial, unfished number of recruits), steepness (h), and natural mortality (M) from the assessments to the ecosystem model.[68] Four catch streams are modeled:

- **High Catch Stream**: ABC removals of P* = 0.45 when the stock assessments assumed the stocks were in their high states of nature. This extreme scenario assumes a median catch scalar across Atlantis functional groups of 10.3x, relative to the benchmark Recent Average catches (ranging from 1.7x for Sablefish to 618x for Small shallow rockfish).
- **Moderately High Catch Stream**: ABC removals of P* = 0.45 when the stock assessment assumed the stock was in its base case state of nature. The exception is for Atlantis functional groups that include overfished species, for which the moderately high catch stream corresponds to catches equal to the 2014 ACL. Overall, the moderately high catch stream assumes a median catch scalar across Atlantis functional groups of 2.7 times, relative to the benchmark Recent Average catches (ranging from 1.1 times for Sablefish to 68 times for Small shallow rockfish). Catches of groups with overfished species are scaled by less than or equal to 2.8 times their benchmark Recent Average catches.
- **Recent Average Catch Stream**: Recent Average Catch when the stock assessment assumed the stock was in its base case state of nature.
- **Low Catch Stream**: The lower of recent average catch or ABC removals of P*=0.25, when the stock assessment assumed the stock was in its low state of nature.

Since the Pacific whiting (hake) total allowable catch is established through a bilateral process with Canada under the Pacific Whiting Act, and not through this proposed action, whiting catch was not varied among scenarios. This species has an important structuring role in the California Current Ecosystem, both as forage during early life stages and a piscivore (fish eater) when adult. Pacific whiting stock size is highly variable in response to conditions affecting recruitment of juveniles into the fishable, adult population. Though the model does not include these episodic recruitment events, the high and low ecosystem productivity states considered here may bracket the productivity of Pacific whiting, as well as the other groundfish stocks evaluated within this EIS. For Pacific whiting, by years 25 to 30, the high productivity scenario (under recent average catches) yields abundance that is 1.16 times higher than base

[68] In the discussion here, the term “state of nature” can be confusing. As discussed elsewhere in this EIS, the term refers to uncertainty about the true value of key parameters in the stock assessments. Low and high state of nature parameter values represent the tails of the likelihood distribution for the value. Within a stock assessment, these distributions are developed independent of any explicit consideration of ecosystem state.

productivity, and low productivity yields abundance that is 0.78 times that of base productivity. Therefore, the model results address alternative levels of whiting productivity, though not alternative whiting harvest levels.

Results are reported with respect to the following metrics, which correspond to the metrics reported in Section 3.4.3 from Kaplan (2012):

- Mean trophic level of the catch
- Mean trophic level of biomass
- Ratio of target species biomass to catch
- Total system biomass
- Abundance of piscivorous fish (trophic level >= 4)
- Abundance of forage fish
- Abundance of krill (euphausiids)
- The number of healthy assessed stocks above B25 (flatfish) or B40
- The number of healthy non-assessed stocks above B25 (flatfish) or B40
- Abundance of marine mammals and birds ("median depletion" of these stocks)

The two healthy stocks' metrics require an estimate of B_{25} or B_{40}, and the abundance of marine mammals and birds metric requires an estimate of B_{100}. These were calculated based on an unfished Atlantis simulation with base productivity and no fishing. Each of the 10 metrics is standardized relative to its value in a benchmark management scenario that projects a base case productivity state of all stocks in the ecosystem model, with recent average catches projected into the future.

4.12.2 Evaluation of the Alternatives

The simulations bracket the harvest specification policies of the alternatives to evaluate the broadest possible range of impacts. The Low Catch scenario corresponds to the lower of Recent Average Catch or the policy in Alternative 2 (P*=0.25), while the benchmark simulation (Recent Average Catch, base case productivity) is representative of the No Action Alternative. As noted above, recent average catch under base case productivity is the benchmark for comparison. (Thus in Table 4-232, values are 1.00 across all the metrics for this scenario.) The High and Moderately High Catch scenarios bracket Alternative 1. The Preferred Alternative (default HCRs, represented by 2014 HCRs) is intermediate in this range, especially assuming the base case state of nature. Combining four catch stream scenarios with three ecosystem productivity states results in 12 sets of results. Since the 10-year metrics show the same trends as the metrics from averaging values for years 25 to 30, the focus below is on the year 25 to 30 metrics, which are displayed in Table 4-233.

Table 4-232. Value of ecosystem metrics, average over years 25 to 30.

	Mean trophic level of the catch	Mean trophic level of biomass	Ratio of target species biomass to catch	Total system biomass	Abundance of piscivores	Abundance of forage fish	Abundance of krill (euphausiids)	Num. healthy assessed stocks	Num. healthy non-assessed stocks	Abundance of birds and mammals
Low Productivity, Low Catch	0.99	0.99	1.00	0.97	1.17	1.03	0.98	1.00	1.00	1.00
Low Productivity, 'Recent Average' Catch	0.99	0.99	0.99	0.97	1.16	1.03	0.98	1.00	1.00	1.00
Low Productivity, Moderately High Catch	1.00	0.98	0.84	0.94	0.85	1.03	1.03	1.00	1.00	1.00
Low Productivity, High Catch	1.00	0.98	0.77	0.92	0.42	1.04	1.02	0.86	1.00	1.00
Base Productivity, Low Catch	1.00	1.00	1.01	1.00	1.01	1.00	1.01	1.00	1.00	1.00
Base Productivity, 'Recent Average' Catch	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Base Productivity, Moderately High Catch	1.01	0.99	0.84	0.97	0.76	1.01	1.08	1.00	1.00	1.00
Base Productivity, High Catch	1.01	0.98	0.78	0.95	0.49	1.01	1.01	0.86	1.00	1.00
High Productivity, Low Catch	1.01	1.01	1.09	1.05	1.37	0.97	0.98	1.00	1.00	1.00
High Productivity, 'Recent Average' Catch	1.01	1.01	1.08	1.05	1.35	0.97	0.96	1.00	1.00	1.00
High Productivity, Moderately High Catch	1.02	1.00	0.90	1.01	1.10	0.98	1.11	1.00	1.00	1.00
High Productivity, High Catch	1.02	0.99	0.81	0.99	0.54	1.00	1.17	0.91	1.00	1.00

Source: (Table A4 in Kaplan 2014, reproduced in Appendix A, Table A-3). "Productivity" refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream). For visual interpretation, cells are colored proportional to the cell value, ranging from lowest (red) to highest (green), with yellow indicating a value of 1.

Table 4-233. Predicted biomass per functional group, under base ecosystem productivity, average over years 25 to 30.

Functional Group	Low Catch	Recent Average Catch	Moderately High Catch	High Catch
Large planktivores	1.00	1.00	1.11	1.33
CANARY ROCKFISH	1.01	1.00	1.03	0.72
Small planktivores	1.00	1.00	1.01	1.01
Large flatfish	1.00	1.00	0.57	0.00
Shortbelly rockfish	1.00	1.00	1.04	1.08
Large demersal predators	1.00	1.00	0.76	0.59
Salmon	1.00	1.00	1.00	1.00
Large pelagic predators	1.00	1.00	1.00	1.01
Migrating birds	1.00	1.00	1.00	1.00
Pacific hake	1.00	1.00	1.00	1.01
Sablefish	1.12	1.00	0.84	0.61
Deep vertical migrators	1.00	1.00	1.01	1.01
Deep misc. fish	1.00	1.00	1.00	1.00
Misc. nearshore fish	1.00	1.00	1.04	1.12
Midwater rockfish	1.00	1.00	0.98	0.79
Surfperch	1.00	1.00	0.99	0.99
Dover sole	1.00	1.00	0.04	0.00
Small shallow rockfish	1.00	1.00	0.90	0.00
Deep small rockfish	1.00	1.00	0.93	0.88
Deep large rockfish	1.01	1.00	0.96	0.63
Small flatfish	1.00	1.00	0.98	0.98
Small demersal sharks	1.22	1.00	0.91	0.29
Large demersal sharks	1.00	1.00	1.00	1.00
YELLOWEYE AND COWCOD	1.00	1.00	0.98	0.66
Misc. pelagic sharks	1.00	1.00	1.03	1.09
Shallow large rockfish	0.99	1.00	0.86	0.69
Skates and rays	1.00	1.00	0.90	0.87
Surface seabirds	1.00	1.00	1.00	1.00
Diving seabirds	1.00	1.00	1.00	1.00
Pinnipeds	1.00	1.00	1.00	1.00
Transient orcas	1.00	1.00	1.00	1.00
Baleen whales	1.00	1.00	1.00	1.00
Dolphins and porpoises	1.00	1.00	1.02	1.06
Toothed whales	1.00	1.00	1.00	1.01
Sea otter	1.00	1.00	1.00	1.00
Cephalopods	1.00	1.00	0.97	0.94

Table 4-233 (continued). Predicted biomass per functional group, under base ecosystem productivity, average over years 25 to 30.

Functional Group	Low Catch	Recent Average Catch	Moderately High Catch	High Catch
Shallow benth. filt feeders	1.00	1.00	1.00	1.00
Other benthic filter feeders	1.00	1.00	1.02	1.03
Deep benthic filter feeders	1.00	1.00	1.00	1.00
Benthic herb. grazers	1.00	1.00	1.00	1.00
Deep macrozoobenthos	1.00	1.00	1.00	1.00
Megazoobenthos	1.00	1.00	1.00	1.00
Shallow macrozoobenthos	1.00	1.00	1.00	1.00
Shrimp	1.00	1.00	1.03	1.19
Large zooplankton	1.01	1.00	1.08	1.01
Deposit feeders	1.00	1.00	1.00	0.99
Macroalgae	1.00	1.00	1.00	1.00
Seagrass	1.00	1.00	1.00	1.00
Carnivorous infauna	1.00	1.00	1.00	1.01
Gelatinous zooplankton	1.00	1.00	0.99	1.00
Large phytoplankton	1.00	1.00	0.99	1.00
Small phytoplankton	1.00	1.00	1.01	1.01
Mesozooplankton	1.00	1.00	0.99	1.00
Microzooplankton	1.00	1.00	1.00	0.97
Pelagic bacteria	1.00	1.00	1.00	0.99
Benthic bacteria	1.00	1.00	1.01	1.00
Meiobenthos	0.99	1.00	0.99	0.99
Labile detritus	1.00	1.00	1.00	1.00
Refractory detritus	1.00	1.00	1.00	0.99

Source: (Table A5 in Kaplan 2014, reproduced in Appendix A). The model is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Groups with catches specified by these alternate catch streams are denoted by red text. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream). For visual interpretation, cells are colored proportional to the cell value, ranging from lowest (red) to highest (green), with yellow indicating a value of 1.

4.12.2.1 Direct Impacts Assuming Base Ecosystem Productivity

Three metrics represent direct impacts to harvested stocks: Ratio of Target Species Biomass to Catch, Abundance of Piscivores, and Number of Healthy Assessed Stocks.

Under base productivity of the ecosystem model, the Low Catch scenario (analogous to Alternative 2) led to ecosystem metrics within 1 percent of the Recent Average Catch benchmark scenario (the No Action Alternative). This is due to the underlying catch streams themselves, since Recent Average Catches are equal to Low Catch streams for most functional groups.

The primary impact of increased catches (High Catch streams, analogous to Alternative 1 and high state of nature) is on the Abundance of Piscivores, which directly reflects the abundance of groundfish fishery target species. The High Catch streams caused an approximate 50 percent reduction in Abundance of Piscivores, and the Moderately High catch streams caused an approximate 25 percent reduction in this metric. The Number of Healthy Assessed Stocks and the Ratio of Target Species Biomass to Catch metrics reflect the abundance of both groundfish and other stocks. These two metrics decline by at most approximately 20 percent after 25 to 30 years of High Catch and approximately 15 percent after 25 to 30 years of Moderately High Catch. Other ecosystem metrics responded by less than 5 percent. By years 25 to 30, the Abundance of Krill increases slightly due to indirect effects discussed below. Overall, the metrics that best reflect food web effects (rather than effects of direct harvest) suggest minimal impacts of the tested harvests.

The sensitivity of the three metrics representing direct impacts to harvested stocks (Ratio of Target Species Biomass to Catch, Abundance of Piscivores, and Number of Healthy Assessed Stocks) to increased catches should be expected *a priori.* Relative to the benchmark scenario (Recent Average Catch, base case productivity, representative of the No Action Alternative), the High Catch scenario (analogous to Alternative 1, high state of nature) involves a median catch increase across Atlantis functional groups of 10.3 times, and the Moderately High Catch scenario involves a median catch increase of 2.7 times.

The main direct impact predicted by the ecosystem model under High Catch streams is full depletion of large flatfish (e.g., arrowtooth flounder), small shallow rockfish, and Dover sole (to an approximate 0 biomass by year 30). Species that show 30 to 70 percent declines in biomass under the High Catch stream (analogous to Alternative 1, high state of nature), relative to biomasses under the benchmark catch stream (Recent Average Catch, base case productivity, representative of the No Action Alternative) include sablefish, small demersal sharks, yelloweye and cowcod, shallow large rockfish, deep large rockfish, and large demersal predators such as lingcod.

Like the High Catch scenario, the Moderately High Catch streams (analogous to Alternative 1, base case state of nature) led to substantial declines for several functional groups: nearly 100 percent for Dover sole, approximately 40 percent for Large Flatfish, and approximately 25 percent for Large Demersal predators after 25 to 30 years. The abundance of all other groups was within approximately 15 percent of the benchmark simulation (the No Action Alternative analogue). Within the ecosystem model, these three groups can sustain the benchmark catch level, but cannot sustain the large increases in catch (e.g., an 11-fold increase for Dover sole) assumed under Moderately High Catch, or the much higher increases assumed under High Catch.

These simulations assume specified catches for years 1 to 10, and constant fishing mortality rates for years 11 to 30 with no management feedback. This implies no management response to new information about stock status, which is unlikely. In fact, the biennial harvest specifications process is the mechanism for making such adjustments. Maintaining policies resulting in high catch streams when productivity results in biomass decline (depletion) is unlikely given the feedback mechanisms in the management system. A management strategy evaluation approach would be necessary to simulate these feedback mechanisms. The approach is currently being actively developed, and it will be further reviewed by the SSC to help inform management strategy evaluation methods and the applicability of the methods for inclusion into future Atlantis model simulations.

4.12.2.2 Indirect Impacts, Assuming Base Ecosystem Model Productivity

Under the base ecosystem productivity state, higher catches (Under High Catch or Moderately High Catch, Alternative 1 analogues) led to moderate indirect effects through the food web; abundance of krill was predicted to increase by 1 to 8 percent by years 25 to 30, as predators (groundfish) on krill were removed. Similarly, shrimp biomass increased in abundance by 3 to 19 percent. The strongest indirect effect of the High Catch scenario was an increase in a predator of krill, Large planktivores (mackerel) (30 percent increase under High Catch and approximately10 percent increase under Moderately High Catch). A predator on large planktivores, Miscellaneous pelagic sharks, also therefore increased, though by less than 10 percent. Cephalopods declined slightly (less than or equal to 6 percent) due to shark predation (Table 4-19).

As predation and competition by harvested groundfish decreased in scenarios with higher catch, Miscellaneous nearshore fish (croaker, sculpin) and shortbelly rockfish both increased 4 percent (under Moderately High Catch) and 12 percent and 8 percent, respectively (under High Catch). These two groups have low and constant fishing mortality rates that are not varied here; thus, the responses are due to food web effects only.

Dolphins and porpoises increased 6 percent under High catch and 2 percent under Moderately High catch, and other mammal and bird groups showed less than 1 percent response to increased catches (Table 4-219). All other vertebrate and invertebrate groups responded to High Catches by less than 5 percent. Overall, the ecosystem model predicted a limited food web response, which should be viewed as a qualitative prediction of potential ecosystem response.

4.12.2.3 Low and High Ecosystem Productivity

Kaplan (2014, reproduced in Appendix A) also evaluated the effect of changes in ecosystem model productivity, in combination with the four catch streams. In these simulations, the productivity of the ecosystem model was adjusted to approximate the productivity implied by the ‘States of Nature’ from the 37 stock assessments, as well as the Pacific whiting (hake) stock assessment.

Similar to when the ecosystem was assumed at base productivity, in high productivity and low productivity states, most ecosystem metrics declined by less than 5 percent relative to their benchmark values by Year 10 or Year 25 to 30. Again, the exceptions are Ratio of Target Species Biomass/Catch (which partially reflects groundfish species tested with the catch streams), and Abundance of Piscivores and Number of Healthy Assessed Stocks (which echo the direct effects forced with the catch streams).

The most extreme mismatch between ecosystem productivity and catch streams occurred in the low productivity state and High Catch scenario, where Abundance of Piscivores fell to 42 percent of the value in the benchmark scenario by years 25 to 30. This is due to declines in the same species noted above for the base productivity state and High Catch scenario, with the addition of 20 to 25 percent declines in abundance of Pacific whiting, Deep small rockfish, and Small flatfish. This is a direct result of the parameterization of lower productivity for these stocks in this scenario. In particular, compared to base productivity, at low productivity, increasing catches from Recent Average Catch to High Catch led to stronger declines approximately 20 percent additional decline) in the Yelloweye and cowcod, Deep large rockfish, Small flatfish, Large demersal predators, and Small demersal sharks (dogfish) functional groups. Therefore, the direct impact of the catch streams on these species or groups is stronger in the low productivity state compared to high productivity.

4.12.3 Summary of the Impacts of the Alternatives

In summary, the main effect of the action alternatives, bracketed by the catch streams used in the Atlantis California Current Ecosystem Model simulations, was on the groundfish stocks directly harvested in these simulations. This is reflected in the ecosystem metrics of Piscivores, Number of Healthy Assessed Stocks, and Target Biomass/catch.

Food web effects were evident but not common. In the Moderately High catch scenario, and especially in the High catch scenario, the Atlantis ecosystem model predicted some indirect effects via krill, species linked to krill, and some prey of groundfish. Low catch streams, and resulting model dynamics, are similar to the No Action Alternative benchmark (Recent Average Catch, base productivity).

Ecosystem model high and low productivity states likely bracket the range of uncertainty regarding stock productivity, but it is difficult to place probabilities on these alternate ecosystem model productivities. Overall, most ecosystem metrics responded by more than 5 percent, regardless of the productivity assumed in the ecosystem model. However, the three ecosystem metrics that directly reflect groundfish abundance are more sensitive to the catch streams at low ecosystem productivity states.

The Preferred Alternative (2014 HCRs, representing the defaults) was not explicitly modeled with respect to the catch streams from the stock assessment projections. For 13 stocks, the default HCR is ACL=ABC and P*=0.45, the policy applied to all stocks under Alternative 1.[69] For other stocks, the default HCRs result in lower ACL values. The sum of the catch streams for Alternative 2 under the base case state of nature is one-third the sum for Alternative 1 under the high state of nature (equivalent to the High Catch scenario used in the Atlantis simulation) and 3.5 times the sum for the Recent Average Catch stream under the base case (the benchmark or the No Action Alternative scenario in the Atlantis simulation). This suggests that The Preferred Alternative would have direct and indirect impacts intermediate between the Moderately High Catch scenario (Alternative 1, base case state of nature) and the Recent Average Catch benchmark scenario. However, as discussed in Section 4.10, historical catch (or recent average catch) has been well below catch limits for most stocks. While ACL attainment could increase for some target stocks, it is very unlikely that it will approach the aggregate level of the catch streams used in this evaluation, which is based on full attainment of ACLs for all stocks.

[69] These stocks are aurora rockfish, blackgill rockfish S of 40º10’ N. latitude, blue rockfish S of 42º N. latitude, cabezon (California), cabezon (Oregon), chilipepper rockfish, English sole, gopher rockfish S of 40º10’ N. latitude, greenstriped rockfish, lingcod N of 40º10’ N. latitude, petrale sole, rougheye/blackspotted rockfish, and splitnose rockfish.

4.13 Long-term Impacts of Setting Harvest Specifications and Management Measures on Protected Species

Setting harvest specifications does not directly affect protected species. Furthermore, an analysis of groundfish trawl logbook data does not reveal any clear relationship between catch limits and fishing effort (Appendix A). As discussed in Section 3.3.3.3, fishing effort in the shoreside trawl fishery has declined substantially since 2010, while catch has generally increased. Equivalent information is unavailable for fixed gear fisheries. Section 3.2.3 reports participation trends in groundfish fixed gear and trawl fisheries during the baseline period (2003 to 2012). Non-nearshore fixed gear fishery participation has remained relatively stable, while nearshore fixed gear fishery participation has declined. The trend in effective fishing effort is not directly related to participation, but it is unlikely that fishing effort increased during the baseline period. Over the long term, alternative harvest policies represented by the Amendment 24 alternatives are indistinguishable with respect to the effect on protected species. The spatiotemporal distribution of gear-specific fishing effort is expected to be similar to historical patterns (the No Action Alternative). To the degree that the amount and spatiotemporal distribution of gear-specific fishing effort does not change from historical patterns, adverse impacts on protected species from the groundfish fishery are likely to be equivalent to the historical impacts described in Section 3.5, which serve as a proxy for describing the impacts of the No Action Alternative.

NMFS and USFWS have engaged in Section 7 consultations with respect to the effects of the groundfish fishery on ESA-listed species; Section 3.5.2 summarizes the resulting Incidental Take Statements. Over the long term, exceeding these levels would likely trigger reinitation of the Section 7 consultation and the development of additional measures to ensure that takes do not jeopardize the continued existence of listed species.

Marine mammals not listed under the ESA are still protected under the MMPA. Estimated takes of non-ESA-listed marine mammals in groundfish fisheries are unlikely to result in PBR being exceeded if takes are generally similar to what has been experienced during the baseline period. This should allow these species to recover to their optimum sustainable population levels.

Seabirds not listed under the ESA are incidentally killed in groundfish fisheries. Generally, the level of mortality is negligible with respect to the population status of these species. Black-footed albatross has the highest number of estimated mortalities across observed species (Jannot et al. 2011) and is listed as Vulnerable on the IUCN Red List. Mitigation measures being implemented in fixed gear fisheries based on the USFWS Section 7 consultation for short-tailed albatross are likely to also reduce mortality of this species into the future.

4.13.1 Summary of the Impacts of the Alternatives

As discussed with respect to impacts on EFH, there are a variety of factors that could influence the intensity and distribution of fishing effort, which is an indirect proxy for interactions with, and adverse impacts on, protected species. As discussed above, gear switching the shoreside IFQ fishery could shift an increasing proportion of fishery landings from bottom trawl to fixed gear, depending on market conditions. Since changes in fishing effort cannot be predicted, fishing opportunity, represented by projected ACLs, is the only available metric to assess and summarize the impacts. In addition, protected species are designated under other applicable laws including the ESA, MMPA, and MBTA. These laws have standards, such as take estimates described in ITSs and estimates of serious injury and mortality from marine mammal stock assessment reports. Information from analyses pursuant to these laws (biological opinions, stock assessment reports) is summarized in Section 3.5. Furthermore, the ESA and MMPA have adaptive management features, including the reinitiation of consultation under Section 7 of the ESA and the requirement for NMFS to annually categorize fisheries with respect to the likelihood of serious injury and mortality and make a negligible impact determination pursuant to the MMPA. Although the direct and indirect impacts of the proposed action on protected species cannot be predicted with any certainty, a substantial increase in the level of take would trigger action under applicable law to mitigate any increased take, if necessary.

No Action Alternative: As discussed in Section 4.11.1, the amount of fishing effort under the No Action Alternative would likely be similar to what has occurred during the baseline period. Changes in the distribution of fishing effort cannot be predicted, but RCA configurations would likely remain the same as during the recent past. As noted above, gear switching is allowed in the shoreside IFQ fishery, and, since implementation, a substantial portion of the sablefish allocation has been caught with fixed gear. As noted by Saez et al. (2013), non-nearshore (sablefish) fixed gear fisheries pose an elevated risk for large cetaceans migrating offshore. However, the fishery is listed as Category III under the MMPA.

The Preferred Alternative: As discussed in Section 4.11.1, the amount of fishing effort under the Preferred Alternative would likely be similar to the No Action Alternative, based on a comparison of current and projected ACLs, used as a proxy for fishing opportunity. As with the No Action Alternative, it is not possible to predict how the distribution of fishing effort and gear use might change in relation to potential interactions with protected species. All other factors being equal, takes during the baseline period, as summarized in applicable biological opinions for ESA-listed species and by WCGOP for non-ESA listed protected species (marine mammals and seabirds) would be a reasonable approximation of the expected level of takes over the long term. See Section 3.5 for a summary.

Alternative 1: As discussed in Section 4.11.1, the amount of fishing effort in non-nearshore fisheries could increase under Alternative 1 compared to the No Action Alternative in response to an increase in fishing opportunity. All other factors being equal, this could increase interactions with protected species. However, the external factors discussed above affecting the distribution and intensity of fishing effort make any conclusion uncertain. If takes of ESA-listed species were to exceed thresholds identified in applicable biological opinions, NMFS Protected Species Division could reinitiate a Section 7 consultation. This could result in additional measures being imposed on groundfish fisheries to reduce takes to below levels determined to jeopardize the continued existence of the listed species. Likewise, marine mammal takes could prevent NMFS from making a negligible impact determination under the MMPA. NMFS would then likely implement mitigation measures to reduce the level of serious injury and mortality to marine mammals.

Alternative 2: As discussed in Section 4.11.1, the amount of fishing effort in non-nearshore fisheries could increase under Alternative 2 compared to Alternative 1 but would likely be less of an increase than under Alternative 1. As discussed above, if takes were to increase above thresholds established under the ESA and MMPA, then additional mitigation measures may be imposed.

4.14 Long-term Impacts of Setting Harvest Specifications and Management Measures on Non-groundfish Species

Section 3.6 describes non-groundfish species caught in groundfish fisheries based on WCGOP estimates (Bellma et al. 2013). Over the long term, it is not possible to predict how non-groundfish catch could change, especially since there is no correlation between total catch and non-groundfish catch during the baseline period (2003 to 2011). Non-groundfish are not targeted and are infrequently landed on groundfish directed trips for economic and regulatory reasons. These factors are unlikely to change in the foreseeable future. Therefore, patterns of non-groundfish catch during the baseline period provide the best available information for future catch.

Tribal shoreside and at-sea whiting sectors accounted for 38 percent of non-groundfish catch. Management measures for these sectors are not directly established as part of the proposed action. Instead, the Federal government, through the Council process, reaches an agreement on the level of catch that will occur in the tribes' usual and accustomed fishing grounds. Non-groundfish catch declined in the shorebased IFQ/trawl sector, which accounts for the largest proportion of non-groundfish catch in tribal commercial sectors at 28 percent, over the baseline period from 7.7 percent (2,240 mt) in 2003 to 3.4 percent (809 mt) in 2011. The drop in 2011 could be an ancillary effect of trawl rationalization if changes in fishing strategies have an indirect effect on non-groundfish catch. Gear switching could be a factor, because fixed gear fisheries generally have lower bycatch of non-groundfish. The shorebased IFQ sector is subject to IBQ for Pacific halibut, which is effective in controlling bycatch mortality of this commercially important species.

4.14.1 Summary of the Impacts of the Alternatives

No Action Alternative: There is no information to conclude that non-groundfish catch would differ substantially from the average level during the baseline period. Fishery monitoring allows any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

Preferred Alternative: There is no information to conclude that non-groundfish catch would differ substantially from the average level during the baseline period. Increase in midwater trawl effort would likely continue as a result of higher widow and shortbelly rockfish ACLs. Increased midwater trawl might result in increased encounters with species such as squid, pollock, American shad Pacific sardine, sharks, jack mackerel, chub mackerel, herring, and smelts. Fishery monitoring would allow any such change to be detected. Annual harvest specifications for CPS species include an estimate of the incidental catch of each species caught while fishermen are targeting non-CPS species. Because CPS species harvest guidelines include an incidental catch portion, the risk of overfishing species managed under the CPS FMP as a result of catch in the groundfish midwater trawl fisheries is reduced. Relative to other non-groundfish species, each vessel in the shorebased trawl IFQ program is currently required to carry one observer to monitor catch and estimate at-sea discards. Incidental catch levels of non-groundfish will continue to be monitored allowing biological concerns with incidental catch levels to be identified. Over the long-term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

Alternative 1: There is no information to conclude that non-groundfish catch would differ substantially from the average level during the baseline period. Fishery monitoring would allow any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

Alternative 2: There is no information to conclude that non-groundfish catch would differ substantially from the average level during the baseline period. Fishery monitoring would allow any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP.

4.15 Cumulative Impacts

The CEQ requires a cumulative effects analysis (40 CFR part 1508.7). The purpose of a cumulative effects analysis is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the intent is to focus on those effects that are truly meaningful. This section of the EIS addresses the significance of the expected cumulative impacts as they relate to the federally managed groundfish fishery.

4.15.1 Affected Resources

In Chapter 3 (Description of the Affected Environment), the environmental components affected by the proposed action are identified and described. Therefore, the significance of the cumulative effects will be discussed in relation to those affected environmental components as grouped below:

- Groundfish (Section 3.1)
- Socioeconomic environment or human communities (Section 3.2)
- Essential fish habitat (Section 3.3)
- California Current ecosystem (Section 3.4)
- Protected species (Section 3.5)
- Non-groundfish fish stocks (Section 3.6)

4.15.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the management unit of species in the Groundfish FMP. The geographic scope of the affected resources listed above is the EEZ of the states of Washington, Oregon, and California.

4.15.3 Temporal Boundaries

The temporal scope of past and present actions for the affected resources encompasses actions that occurred after FMP implementation (1982) and, more specifically, during the baseline period, 2003 to 2012, which is the temporal context within which affected resources are described in Chapter 3. For endangered species and other protected resources, the scope of past and present actions is determined by analysis pursuant to the ESA and MMPA, including biological opinions for the groundfish fishery and marine mammal stock assessment reports. The temporal scope of future actions for all affected resources extends about 15 years into the future. This period was chosen to characterize conditions during future biennial management periods for which harvest specifications and management measures will be set.

4.15.4 Effects of Past, Present, and Reasonably Foreseeable Future Actions Other than the Proposed Action

A regular cycle of stock assessment, setting harvest specifications, and establishing related management measures allows the Council and NMFS to assess the status of the fisheries and to make necessary adjustments to ensure that there is a reasonable expectation of meeting the objectives of the Groundfish FMP and the MSA, especially the objective of achieving OY while preventing overfishing. Achieving OY involves monitoring stock characteristics (fishing mortality, recruitment, etc.) and formally assessing stocks where the data are available. The management framework is adaptive such that the receipt of new information informs decisions about setting harvest limits in future years through each biennial harvest specifications cycle. Compliance with this regulatory regime should result in positive long-term outcomes, taking into account the cumulative impacts of past, present, and reasonably foreseeable future Federal fishery management actions. Limiting fishing effort through regulatory actions can often have negative short-term socioeconomic impacts. These impacts are usually necessary to bring about long-term sustainability of a given resource, which should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon groundfish stocks.

Past and present fishery management actions and their effects are described in Chapter 3. In addition to fishery management actions, other past, present, and reasonably foreseeable future actions are considered (e.g., water pollution and climate change). The cumulative effect results from the combination of the effects of these past and present actions, reasonably foreseeable future actions, and the proposed action. Ongoing and reasonably foreseeable actions with detectable effects are summarized below. Establishing harvest specifications and management measures for future bienniums would be part of the proposed action.

Fishery Management Related Actions

- Past groundfish harvest specifications and management measures. Past harvest specifications contribute to the current status of managed stocks. Management measures directly or indirectly control catch, affecting stock status, fishing opportunity, harvester costs and net revenue, and personal income and employment in fishing communities.
- Review of groundfish essential fish habitat designation and mitigation measures. The Council has completed Phase II of a three-phase review process. Phase I consisted of compiling available information on Pacific Coast groundfish habitat associations, fishing activities, prey species, and many other elements of groundfish EFH. During Phase II, proposals for revised designations of groundfish EFH and additional mitigation measures were solicited, and eight proposals were reviewed and reported on to the Council in November 2013. In Phase III, the Council will consider action to amend the components of groundfish EFH.
- The Council's Fishery Ecosystem Plan. The Council is developing measures to protect unfished and unmanaged forage fish species pursuant to an initiative identified in the FEP. This action involves amending all current FMPs to prohibit targeted harvest of specified forage species. These protections could benefit both currently unmanaged fish stocks and managed stocks that depend on forage fish.
- Regulatory adjustments to the trawl rationalization program. Through a series of rulemakings based on Council recommendations, a variety of adjustments to the trawl rationalization program are being implemented. In general, these measures are intended to make rationalized fisheries operate more efficiently and/or clarify the intent of regulations. Measures that have been implemented or are in the rulemaking process include, but are not limited to, eliminating the prohibition on further quota pound trading after December 15 each year, changing requirements for observer/catch monitor contractors, establishing chafing gear regulations, and establishing fees to recover costs of the program, as required by the MSA. Future measures include establishing a common start date for the Pacific whiting season for all sectors and allowing a vessel to be registered to permits with both trawl and fixed gear endorsements and to use the resulting combined limit. The Council is also developing a regulatory package to allow electronic monitoring as an alternative to human observers. Beginning in 2014, the Council will prioritize the development of all new management measures not implemented through the biennial process. The first of these omnibus considerations occurred at the June 2014 Council meeting. Creating a

useful inventory of external fishery-related actions (Agenda Item F.3.a, Attachment 2, June 2014).

- Seabird avoidance measures. A regulatory package to implement requirements from the Section 7 consultation for short-tailed albatross is currently in development.
- Regulation of fisheries for species other than groundfish. Other fisheries contribute to the mortality of biological resources also affected by groundfish fisheries, particularly protected species. Catch of groundfish in non-groundfish fisheries is regulated and accounted for through the biennial management process and is, therefore, directly affected by the proposed action. Adverse impacts from other gear types may also combine with impacts on EFH from groundfish gear. Fishery removals from all sources also have long-term effects on the trophic structure of the California Current ecosystem.

Not Related to Fishing

- Water pollution. A variety of activities introduce chemical pollutants and sewage and cause changes in water temperature, salinity, DO, and suspended sediment into the marine environment. Although these activities tend to affect nearshore waters, they adversely impact identified affected biological resources if a substantial part of their life cycle occurs in these waters. Examples of these activities include, but are not limited to, agriculture, port maintenance, coastal development, marine transportation, marine mining, dredging, and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality, and they may, indirectly, constrain the sustainability of the managed resources, non-target species, and protected resources.
- Other authorities to conserve biological resources considered in this EIS. The MSA (50 CFR 600.930) imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH. NMFS also reviews certain activities that are regulated by Federal, state, and local authorities and that cause adverse effects on the marine environment through processes required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The jurisdiction of these activities is in "waters of the U.S." and includes both riverine and marine habitats. Under the Fish and Wildlife Coordination Act (Section 662), agencies must consult with USFWS over certain activities affecting freshwater habitats. This act provides another avenue for review of actions by other Federal and state agencies that may impact resources that NMFS manages. NMFS and USFWS share responsibility for implementing the ESA. Federal agencies are required to ensure that their activities do not jeopardize the continued existence of species listed under the ESA or result in the destruction or adverse modification of designated critical habitat for those species. This provides a way for NMFS to review actions by other entities that may impact endangered and protected resources whose management units are under NMFS' jurisdiction.
- Cyclical and ongoing climate change. Section 3.4.5 (System Forcing and Climate Change), Section 3.4.6 (Implications of Climate Change for Groundfish Fisheries), and Section 3.4.7 (Baseline Status of the California Current Ecosystem) describe the effects of climate on ecosystem components. Cyclical phenomena include ENSO, PDO, and NPGO. As noted in Section 3.4.6, range shifts of target species may cause the biggest climate change-related impact on fisheries.

Sections 4.15.4.1 through 4.15.4.6 discuss the effects of these past, present, and reasonably foreseeable future actions on the environmental components evaluated in this EIS.

4.15.4.1 Groundfish Stocks

Past groundfish harvest specifications and management measures. Specification of catch limits and management measures consider stock productivity and fishing mortality. Improvements in stock assessment methods and the management system have been effective at ending and preventing overfishing since the beginning of this century. It is unknown how past fishing practices changed the genetic structure of the groundfish populations. In the past (1980 to 1990s), differences in science, management of the fishery, and ocean conditions resulted in the decline of multiple groundfish species and led to the implementation of rebuilding plans. Rebuilding plans have been implemented, and overfished stocks' numbers are increasing. The OFL has been exceeded occasionally for some stocks, but not persistently enough (e.g., more than once in four years) to require broad reevaluation of the management system. The OFL contribution for some stocks managed in complexes may have been exceeded.

Review of groundfish EFH designation and mitigation measures. Mitigation measures that reduce adverse impacts on EFH may result in increased stock productivity.

The Council's Fishery Ecosystem Plan. The FEP considers prey availability of groundfish species that are prey, as well as species that are groundfish prey. Forage fish protection measures may have a marginal effect on maintaining stock abundance of prey species for piscivorous groundfish. The Council has more information to inform management decision-making through Annual State of the Ecosystem reports.

Regulatory adjustments to the trawl rationalization program. Since these adjustments primarily focus on program efficiency and reducing harvester costs, they would have negligible impacts on groundfish stock status.

Seabird avoidance measures. These measures would have negligible impacts on groundfish stock status, as they are not anticipated to affect fishing effort levels. Thus, implementation of seabird avoidance measures are not considered further as contributing to a cumulative effect on groundfish stocks.

Regulation of fisheries for species other than groundfish. Measures implemented to reduce takes of protected species could also indirectly affect fishing opportunity and catch. Decreased fishing mortality would have a beneficial impact on groundfish stocks.

Water pollution. Impacts are localized in nearshore areas and marine project areas where they occur. Therefore, water pollution would have negligible impacts on groundfish stock status.

Other authorities to conserve biological resources considered in this EIS. These authorities do not affect groundfish management and, therefore, would have negligible impacts on groundfish stock status.

Cyclical and ongoing climate change. Warm-water phases in cyclical climate phenomena decrease the productivity of many groundfish stocks. Climate change may lead to range shifts decreasing local abundance of groundfish.

4.15.4.2 Socioeconomic Environment

Past groundfish harvest specifications and management measures. Implementation of stock rebuilding measures in the late 1990s caused a substantial decline in fishing opportunity and ex-vessel revenue.

Review of groundfish essential fish habitat designation and mitigation measures. If mitigation measures were to indirectly reduce catch, there would be an adverse impact.

The Council's Fishery Ecosystem Plan. This initiative could potentially have negative short-term socioeconomic impacts if actions taken to protect forage species and unmanaged species were to result in reduced harvest opportunity for managed species.

Regulatory adjustments to the trawl rationalization program. For the most part, these actions are intended to increase efficiency and flexibility, which would have a beneficial impact.

Seabird avoidance measures. These measures would impose modest capital costs on fixed gear vessels to install tori lines and may increase operational costs modestly for these vessels.

Regulation of fisheries for species other than groundfish. Management regulations for other fisheries would have negligible impacts on groundfish ex-vessel revenue, but might affect total revenue accruing to fishing communities.

Water pollution. Nearshore water quality has negligible impacts on groundfish stock productivity and therefore, would be unlikely to affect ex-vessel revenue.

Other authorities to conserve biological resources considered in this EIS. Reinitiation of Section 7 consultations for ESA-listed species affected by the groundfish fishery could result in additional reasonable and prudent measures and terms and conditions. These measures could reduce fishing opportunity and/or increase operational costs. Since there is no information to suggest that the operation of the groundfish fishery will change substantially in the foreseeable future, it is unlikely that groundfish fisheries would impose substantially higher takes on listed species; the same is true for marine mammals and seabirds not listed under the ESA. However, other external factors (e.g., water pollution, climate change) could affect population productivity, changing the assessment of the contributory impacts of the groundfish fishery.

Cyclical and ongoing climate change. Over the very long term (more than 10 years), sea level rise and changes in storm activity could increase costs for maintaining and/or replacing fishery-related infrastructure in fishing communities. If infrastructure were not maintained or replaced in a port, fishery landings would be made elsewhere, reducing income for the affected port. Shifts in the distribution of economically important groundfish, such that less of the stock would be available to the fishery, would have adverse impacts.

4.15.4.3 Essential Fish Habitat

Past groundfish harvest specifications and management measures. Groundfish Conservation Areas, which are closed to specified gear types to reduce bycatch of overfished species, have been implemented through the harvest specifications process, beginning in 2003. EFH may have recovered from the adverse impacts of fishing in areas continuously closed to fishing for sufficient time. The length of time needed depends on habitat type and gear type (Section 3.3.1).

Review of groundfish EFH designation and mitigation measures. The current review could result in the Council adopting additional mitigation measures to address the adverse impacts of fisheries on EFH. It may be several years before any such amendment is finalized.

The Council's Fishery Ecosystem Plan. One of the initiatives identified consequent of the FEP is a cross-FMP EFH initiative. The concept is to "identify habitat areas that are considered highly productive or biodiverse under more than one FMP" and coordinate mitigation measures.

Regulatory adjustments to the trawl rationalization program. These regulatory changes by and large have negligible effects on EFH, except for proposed regulations to define chafing gear on midwater trawl codends. The draft EA for this action concludes that it would result in "a minimal increase in contact with benthic habitat as the result of additional chafing gear coverage, particularly relative to soft bottom and minimal to no increase in contact with hard bottom."

Seabird avoidance measures. These measures do not affect fisheries in a way that would change the level of adverse impacts to EFH from fishing.

Regulation of fisheries for species other than groundfish. Other than non-groundfish trawl (e.g., pink shrimp, California halibut), gear types used for other species have negligible to no impact on groundfish EFH. There would be no foreseeable regulatory changes for other fisheries likely to affect adverse impacts of fishing to groundfish EFH.

Water pollution. Water pollution has localized adverse impacts on groundfish EFH, for example in estuaries (designated as a habitat area of particular concern).

Other authorities to conserve biological resources considered in this EIS. As described above, NMFS has several means under which it can review non-fishing actions of other Federal or state agencies that may impact NMFS' managed resources and the habitat on which they rely prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of direct and indirect negative impacts those actions could have on habitat utilized by resources under NMFS' jurisdiction.

Cyclical and ongoing climate change. The way in which climate forcing will affect EFH is not well understood. Effects would depend on the location of EFH and changes in climate forcing vectors such as water temperature and chemistry, currents, and upwelling.

4.15.4.4 California Current Ecosystem

Past groundfish harvest specifications and management measures. As discussed in Section 3.4.3, simulation indicates that past groundfish harvests have had substantial direct effects on managed groundfish stocks, but modest indirect effects on other components of the ecosystem.

Review of groundfish essential fish habitat designation and mitigation measures. Groundfish EFH is also habitat for other benthic biota ranging from interstitial microorganisms to sponges and corals. Section 3.3 described EFH, including impacts and mitigation considered under Amendment 19. Section 4.4 discusses mitigating measures adopted under Amendment 19 and in place under the No Action Alternative that would remain in place under the Preferred Alternative. The difference between the magnitude of adverse effects on EFH caused by various gear types and the estimated recovery times would be the same those as under the No Action Alternative.

The Council's Fishery Ecosystem Plan. The purpose of the FEP is to enhance the Council's species-specific management programs with more ecosystem science, broader ecosystem considerations, and management policies that coordinate Council management across its Fishery Management Plans and the California Current Ecosystem. To the degree that this purpose is met, the FEP may have a marginal positive effect on the CCE, as measured by the indicators described in Section 3.4.3. However, as discussed in that section and in Section 4.5 and Section 4.12, the range of harvest policies likely to be implemented by the Council would not result in substantial indirect impacts, as measured through model simulation.

Regulatory adjustments to the trawl rationalization program. These changes have a negligible effect on the CCE. Even if increased program efficiency allowed higher attainment of allocations, Atlantis simulation suggests that substantially higher harvest would be necessary to result in more than negligible changes in ecosystem indicators.

Seabird avoidance measures. Abundance of marine mammals and seabirds is one of the metrics used in the Atlantis CCE Model evaluation of harvest specifications policies (Section 4.12). This implies that greater abundance is a positive ecosystem attribute. The seabird avoidance measures are intended to reduce the mortality of seabirds in fixed fisheries and, thus, would have a positive impact on the CCE.

Regulation of fisheries for species other than groundfish. As noted in Section 3.4.3, simulation results suggest that CPS purse seine fisheries have substantial indirect effects on CCE attributes. A substantial change in current harvest policies would be necessary to produce a discernible change in ecosystem attributes.

Water pollution. As already noted, relative to the fishery management area, pollution is concentrated in relatively small areas, generally along the coastline closest to terrestrial sources. Therefore, pollution would have a relatively marginal effect on the ecosystem of affected resources.

Other authorities to conserve biological resources considered in this EIS. As noted above, these authorities may have a small effect on the overall quality of marine habitats. To the degree that these improvements would contribute to the productivity of organisms, there may be a marginal benefit to the CCE.

Cyclical and ongoing climate change. Cyclical changes have transient effects on the productivity of constituent organisms and, thus, CCE structure. These variations may be considered part of the baseline and would continue to occur into the future. Climate change would likely have moderate to substantial impacts on CCE structure.

4.15.4.5 Protected Species

Past groundfish harvest specifications and management measures. Past fishery management actions taken through the FMP process have had a positive cumulative effect on ESA-listed and MMPA-protected species through the reduction of fishing effort (potential interactions) and implementation of gear requirements.

Review of groundfish EFH designation and mitigation measures. Mitigation measures adopted through this review process that restrict fishing by area would reduce the likelihood of fishery interactions with protected species in those areas, but might be expected to increase interactions with protected species in areas bordering/surrounding these restricted areas.

The Council's Fishery Ecosystem Plan. There are no initiatives stemming from the FEP that would be likely to change fishery interaction rates with protected species.

Regulatory adjustments to the trawl rationalization program. There is no information to determine how these changes might affect overall fishing effort or interaction rates. Establishing a common start date for all Pacific whiting fishery sectors takes into account minimizing Chinook salmon bycatch. To the degree that measures to increase operational efficiency allow harvesters to increase CPUE, there might be a marginal beneficial impact.

Seabird avoidance measures. These measures would have direct positive impacts by reducing mortality of seabirds in fixed gear fisheries.

Regulation of fisheries for species other than groundfish. Other fisheries also take protected species and, therefore, would contribute to cumulative effects in terms of total mortality. The cumulative effects analysis in relevant biological opinions (NMFS 2006; NMFS 2012a) contains detailed information on these other sources of mortality (Section 3.5.2).

Water pollution. Of the ESA-listed species likely to be adversely affected by the proposed action (see Section 3.6.2), Chinook salmon, eulachon, and green sturgeon reside or transit coastal and estuarine waters where pollution from terrestrial sources might be locally concentrated. These species might be adversely affected. The biological opinion (NMFS 2012a) identifies the adverse impact of water pollution on green sturgeon prey resources.

Other authorities to conserve biological resources considered in this EIS. NMFS' authority under the ESA (and USFWS' authority for seabirds) directly affects prosecution of the groundfish fishery so that it does not jeopardize the continued existence of any listed species. Permitting of activities under the MMPA is intended to achieve optimal sustainable population levels for marine mammals for both ESA-listed and non-listed marine mammals.

Cyclical and ongoing climate change. As with other biological resources, climate change is likely to affect population productivity and occurrence. Effects might be beneficial or adverse, depending on the species and its requirements. The net effect of climate change on protected species cannot be predicted.

4.15.4.6 Non-groundfish Species

Past groundfish harvest specifications and management measures. Biennial specifications and management measures generally have not regulated the catch of non-groundfish species, except for Pacific halibut, but have affected fishing opportunity and behavior, which might indirectly affect bycatch of these species. Catch of these species would be monitored, and the effect on population abundance would be negligible.

Review of groundfish essential fish habitat designation and mitigation measures. Any benefit from the development of additional mitigation measures could benefit non-groundfish species that also depend on groundfish EFH.

The Council's Fishery Ecosystem Plan. No initiatives are identified that would address bycatch.

Regulatory adjustments to the trawl rationalization program. None of these measures would likely materially affect non-groundfish bycatch.

Seabird avoidance measures. These measures would not be likely to affect bycatch of non-groundfish materially, because they would be intended to be minimally disruptive to fishing operations.

Regulation of fisheries for species other than groundfish. Non-groundfish species with directed fisheries are managed under other Council FMPs, other Federal authorities, or state authority (e.g., Dungeness crab, Pacific halibut, Pacific sardine, salmon, squid). For those species, catch in groundfish fisheries would generally be accounted for when determining catch limits and management measures for target fisheries.

Water pollution. As discussed for other biological resources, water pollution could adversely affect species that occur in coastal or estuarine areas where pollution levels would be elevated.

Other authorities to conserve biological resources considered in this EIS. These authorities (habitat protection, measures pursuant to the ESA) would be likely to have negligible effects on protected species bycatch, given how indirectly they would affect productivity of protected species populations.

Cyclical and ongoing climate change. As with other biological resources, climate change could positively or negatively affect non-groundfish population productivity and occurrence. The overall effect cannot be predicted.

4.15.5 Summary of the Direct and Indirect Effects of the Proposed Actions

This section briefly summarizes the direct and indirect effects of the proposed actions evaluated in this DEIS. The Council considered changes to the Slope Rockfish stock complexes, but it decided not to make a change to the complex structure and address the underlying conservation concern (high catches of rougheye/blackspotted and shortraker rockfish relative to their contributing OFLs) described in Section 2.5. The Council's Preferred Alternative was, instead, to establish a sorting requirement and inseason management measures to better monitor and control catch of these stocks. The Council also reorganized the Other Fish complex by reducing it to three stocks, cabezon in Washington, kelp greenling, and leopard shark. The other stocks in this complex are either designated separate stocks to be managed with their own specifications, or as ecosystem component species, which are monitored, but not actively managed. These changes are expected to have both short-term and long-term positive effects in terms of better attaining management objectives.

The evaluation of the Amendment 24 proposed action considers the long-term impacts of setting harvest specifications and management measures through the biennial process. As discussed in Chapter 1, "long-term" is generally considered to be 10 years, although, in specific contexts (e.g., California Current ecosystem), effects are better discerned in simulation over 25 to 30 years.

4.15.5.1 2015-2016 Biennial Harvest Specifications Including Changes to the Other Fish Complex and Designation of EC Species

Groundfish Stocks (Section 4.1) and Management Measures (Section 4.2): All overfished species are rebuilding consistent with trajectories from current rebuilding plans, and current rebuilding plans would be maintained under all of the alternatives, with the exception of cowcod. The 2013 assessment and the rebuilding plan for cowcod indicate that the stock will reach rebuilding sooner; therefore, the T_{TARGET} is proposed to be revised from 2068 to 2020 under the action alternatives. Management measures are structured so the ACLs under each alternative would not be exceeded. Except for petrale sole, the projected attainment of all overfished species would be well below ACLs.

Non-trawl RCA adjustments to align RCA contours more closely to the true depths off California would allow non-trawl vessels increased access to fishing areas, while maintaining the intent of the depth contours, under all of the action alternatives. To the degree that there is a precise correlation between depth and catch rates, under action alternatives there could be a marginal increase in the catch of overfished species such as bocaccio, canary, cowcod, and yelloweye rockfishes. Trip limit increases for minor shelf rockfish intended to reduce discarding (i.e., turn discards into landed catch and thereby improve catch accounting) and increase attainment of the non-trawl HG might result in a small increase in the catch of overfished species, particularly in the south. However, mortality for bocaccio south of 40°10' N. latitude is projected to be consistent with the rebuilding measures for the stock. Removing the non-trawl prohibition on retention during the winter months (except in period 2 in the south) would increase the non-trawl lingcod season length, while maintaining moderate trip limits. This was seen as the most viable means of increasing attainment of the lingcod ACL without increasing interactions with overfished species. Canary rockfish retention in the recreational fisheries would be prohibited under the No Action Alternative. A retention allowance for canary rockfish in the Oregon recreational fishery would be expected to improve data available for future stock assessments without increasing total catch mortality (incidentally caught fish that would otherwise be discarded could be landed). Increased lingcod bag limits from two to three fish in the California recreational fishery could result in increased overfished species catch if anglers were to spend more time on the water fishing for an additional lingcod. All total catch mortality is projected to be managed within the ACLs. A scientific sorting requirement for shortraker rockfish and rougheye/blackspotted would be implemented under the action alternatives. The requirement would be expected to improve the data reported on state landing receipts and electronic fish tickets.

Relative to non-overfished species, the risk of overfishing under the Preferred Alternative would be similar to the No Action Alternative. The risks under Alternative 1 would be highest for species where there would be no added precaution to address management and scientific uncertainty. Affected species would include sablefish, shortspine thornyhead, or minor nearshore rockfish. Alternative 2 would have the most conservative harvest rates and the lowest overall risk of overfishing. However, for stocks and stock complexes where the attainment of the ACL is relatively low, the harvest rates under Alternative 2 would have a similar risk of overfishing as the other alternatives. For stocks and stock complexes that have exceeded 90 percent of the ACL, including cabezon off Oregon, California scorpionfish, Pacific whiting, sablefish, shortspine thornyhead north, and Minor Nearshore Rockfish North, Alternative 2 would have the lowest risk of overfishing, but the greatest impact on fisheries.

Constant catch ACLs used for three trawl-dominant species, Dover Sole, widow rockfish, and shortbelly, would continue, but would be increased under the Preferred Alternative. As trawl-dominant species, fishery-dependent observer data are available for monitoring catch season. An increase in the Dover sole ACL from 25,000 mt to 50,000 mt under the Preferred Alternative would not be projected to result in overfishing or the stock dropping below B_{MSY} in the next 10 years. Dover sole occur coastwide, with the highest densities found between 110 and 270 fm. RCA modifications (change in seaward boundary between 40°10’ and 45°46’ N. latitude, and coordinate changes to the 200 fm modified contour off Oregon) might allow greater access to petrale sole, as well as to Dover sole. The projected catch would likely be affected by the sablefish allocation, which would be increased under the Preferred Alternative. In addition to sablefish, species historically caught with Dover sole include IFQ species (shortspine and longspine thornyheads, other flatfish—rex sole and minor slope rockfish—aurora rockfish), trip limit species (longnose skate), species proposed to be designated as EC species (Pacific grenadier, Pacific flatnose), and non-FMP species (roughtail skate, giant grenadier, hagfish and a diverse complex of eelpouts) (PFMC 2014). Roughtail skate and giant grenadier would be designated as EC species under the action alternatives.

The Preferred Alternative would increase the constant catch ACL for widow rockfish, a healthy stock, from 1,500 mt to 2,000 mt. Widow rockfish would be projected to remain above B_{MSY} under all of the alternatives. However, the productivity and status of the stock are highly uncertain, as the available biomass indices are not informative. The highest densities of widow rockfish occur north of 37º N. latitude at depths of 55 to 160 fm. The Trawl RCAs restrict bottom trawling in much of the area with the highest densities. However, north of 40°10’ N latitude midwater trawl is occurring within the RCAs after the start of the primary whiting season for the shorebased IFQ program. At night, adults form large schools off bottom where they can be targeted with midwater trawl. Widow rockfish co-occur with Pacific whiting, yellowtail rockfish, chilipepper rockfish, shortbelly rockfish, bocaccio, and minor shelf rockfish (vermilion rockfish and speckled rockfish), and they have been associated with canary rockfish (PFMC 2014).

The constant catch ACL for shortbelly rockfish would increase from 50 to 500 mt under the Preferred Alternative. Shortbelly rockfish is a healthy and valuable forage species that is taken incidentally. Shortbelly rockfish are found south of 46º N. latitude, with the highest density found between 50 and 155 fm. The Trawl RCAs restrict bottom-trawl access to much of the area with the highest shortbelly rockfish density. However, north of 40°10' N latitude, midwater trawl is occurring throughout the EEZ after the start of the primary whiting season for the shorebased IFQ program. At times, shortbelly rockfish have been caught in large numbers by trawlers targeting other semi-pelagic rockfish (usually chilipepper and widow rockfish). An ACL of 500 mt is less than 10 percent of the ABC and would allow access to co-occurring groundfish without overfishing shortbelly rockfish or jeopardizing its role in the ecosystem.

Removing spiny dogfish from the Other Fish Complex and managing it with its own specifications under the action alternatives would reduce the risk of overfishing over the No Action Alternative (managing the stock within the Other Fish complex). The ABC would be based on a P* value of 0.4 and a new $F_{50\%\ FMSY}$ harvest rate for elasmobranchs. Spiny dogfish is a healthy stock with a high PSA vulnerability score, indicating a high concern for overfishing. Using more conservative F_{MSY} harvest rates for elasmobranchs would buffer against uncertainty even with the higher P* value.

The ABC for shortspine thornyhead stocks north and south of 34º27' N. latitude would be based on a P* value of 0.4 under the Preferred Alternative (0.45 under the No Action Alternative and Alternative 1). Shortspine thornyhead is a healthy stock with a medium concern for overfishing. Under the No Action Alternative and Alternative 1, the ACL would be a reduction of 4.0 percent from the OFL. Under the Preferred Alternative, the application of a P* of 0.40 would result in an ACL that would be a 17 percent reduction from the OFL. Alternative 2 would result in a 38 percent reduction from the OFL. The reductions from OFL would buffer against model and management uncertainty. The added precaution would reduce the risk of overfishing the true OFL. In the north, management uncertainty is low, since most of the catch occurs in the trawl fishery, where full observer coverage is required. Management uncertainty is higher in the south where shortspine thornyhead are mostly targeted in the limited entry fixed gear fishery which is observed at a 20 to 25 percent rate. Limited entry non-trawl trip limit increases for shortspine thornyhead north would be intended to reduce discarding to increase attainment of the non-trawl HG and, thereby, improve catch accounting.

For the Minor Nearshore Rockfish complex north, the 40-10 precautionary adjustment was applied to determine the China rockfish contribution to the stock complex ACL. China rockfish north is a precautionary zone stock with one of the highest PSA vulnerability scores, indicating a major concern relative to the risk of overfishing. China rockfish are an important species in the nearshore recreational and nearshore commercial fisheries, particularly the commercial live-fish fishery. Under the Preferred Alternative and Alternative 1, the Minor Nearshore Rockfish North ACL would be a 22 percent reduction from the OFL, in contrast to the No Action Alternative where the ACL would be a 6 percent reduction from the OFL. Alternative 2 would be the most precautionary alternative relative to Minor Nearshore Rockfish with an OFL to ACL reduction of 55 percent in 2015 and 53 percent in 2016.

Although the Minor Nearshore Rockfish North ACL attainment has been high, reaching 100 percent in 2011, management measures have prevented the ACL from being exceeded. State nearshore management plans and policies mitigate the risks of overfishing. State HGs and a Federal HG for Minor Nearshore Rockfish in the area between 40°10 and 42° N. latitude under the Preferred Alternative would reduce the risk of overfishing the complex. Under state management, most if not all, landed component species within the minor nearshore complex must be sorted to species. For 2015-2016, the states will take an active, coordinated role in managing these stocks. Because the state may also take inseason action independent of NMFS, the Preferred Alternative would not be expected to result in overfishing of the complex OFL. There is little observer coverage or data on at-sea discards for catch that is taken in the recreational fisheries and nearshore commercial fisheries. Therefore, the error in total catch mortality estimates is higher than for trawl-dominant species. Overfishing concern could arise if catch allocated within the nearshore complex were shifted to vulnerable species such that the catch of component stocks would exceed the OFL contributions.

The restructured Other Fish complex ACL is equal to the complex ABC set equal to 0.45, consistent with the removal of many species from the complex, including spiny dogfish. The Other Fish complex under the Preferred Alternative, Alternative 1, and Alternative 2 would consist of shallow-water species that are primarily caught within 3 miles of shore, in state waters. Removing the other existing species for an EC designation would reduce the risks to the species left in the complex (cabezon off Washington, kelp greenling, and leopard shark). The risk of overfishing would be reduced because some of the recommended EC species were effectively inflator stocks to the complex with relatively larger OFL contributions that increased the risk of overfishing more vulnerable stocks managed in the complex.

Socioeconomic Environment (Section 4.3): Total projected ex-vessel revenue under the Preferred Alternative would be expected to increase by $16 million in 2015 and by $19.3 million from annual average revenue during the baseline period. Recreational angler trips would be expected to increase by 25,800 coastwide under the Preferred Alternative.

For the foreseeable future, changes in ex-vessel revenue, net revenue (a proxy for commercial fishery profits), recreational angler trips, and personal income will, in part, be a function of fishing opportunity determined by stock yield and management measures. Based on assumptions about yield and potential policies for setting harvest specifications (as described in the Amendment 24 alternatives), catches would be expected to increase under most model scenarios, assuming management succeeded in achieving management objectives for stock biomass size and related fishing mortality levels. Fishing opportunity could decline if stock yields were below the base level conditions or more conservation management policies, such as using a P* value of 0.25 to determine the ABC (Alternative 2), were used for all stocks.

Recent average catch mortality is, in most cases, lower than projected ACLs under scenarios combining different assumptions about potential yield and policies for determining ABCs. These scenarios suggest that revenue and personal income is likely to increase over the long term. Historically, however, there has been a lot of inter-annual volatility in ex-vessel revenue in both a positive and negative direction. Declines in revenue can occur because of unaccounted for changes in yield and changing market conditions affecting prices.

Essential Fish Habitat (Section 4.4): Bottom trawl gear has greater adverse impacts to EFH compared to other gear types, although fixed gear is more readily deployed on rocky habitats that have slower recovery times from the adverse effects of fishing. The amount and spatiotemporal distribution of fishing effort are the primary impact mechanisms. While fishing opportunity under the Preferred Alternative (measured by projected landings) is forecast to increase by about 10 percent from the No Action Alternative, recent historical data suggest that CPUE in the bottom trawl fishery has also been increasing. Furthermore, there is scant evidence in historical data for a direct correlation between increased fishing opportunity (measured by ACLs) and changes in fishing effort. Under the action alternatives, the seaward boundary of the trawl RCA between 40°10 N. latitude and 45°46' N latitude would be changed to the 200 fm modified depth contour year round. Opening this area year-round under the Preferred Alternative is therefore likely to have effects on EFH that only slightly greater than under the No Action Alternative.

California Current Ecosystem (Section 4.5): Since ecosystem effects take a long time to be manifested, it is not possible to distinguish between short-term and long-term policy choices. The alternatives considered for the 2015-2016 biennial harvest specifications would parallel those considered under Amendment 24. In general, the alternatives with a more conservative policy (2015-2016 Alternative 2 and Amendment 24 Alternative 2, P*=0.25) could be equated, as could the alternatives with the most risk-prone policy (2015-2016 Alternative 1, Amendment 24 Alternative 1, P*=0.45). Scenarios bracketing the range of harvest policies and ecosystem productivity regimes were modeled. Scenarios with very high harvest levels and low ecosystem productivity had the most pronounced effects, resulting in significant direct effects (effects of fishing on harvested stocks) and detectable indirect effects (effects on other ecosystem components in response to changes in the abundance of harvested stocks).

Total system biomass, a general measure of indirect effects, ranged from a decline of 8 percent from the benchmark scenario (recent average catch, most likely ecosystem productivity state) for the low productivity-high catch scenario to an increase of 5 percent under the high productivity-low catch scenario. For most stocks, low catch was represented by recent average catch streams. Thus, if catch did not change substantially from recent levels, few if any indirect effects would be predicted. The effect of fishing under the groundfish FMP would not likely have a substantial effect on predator-prey relationships. After 25 to 30 years, the productivity of Pacific whiting under a high productivity scenario (under recent average catches) yields abundance that is 1.16 times higher than base productivity, and low productivity yields abundance that is 0.78 times that of base productivity. The model results address alternative levels of whiting productivity, though not alternative whiting harvest levels.

<u>Protected Species (Section 4.6)</u>: Harvest specifications and management measures would be projected to result in higher catches compared to the No Action Alternative and baseline levels. Similar to other environmental components, the impacts of the action alternatives on protected species during the 2015-2016 biennial period would be measured in terms of take, and resulting mortality would only be relevant within a long-term context, considering the effect of such take on population size and viability. For ESA-listed species, NMFS Protected Resources Division and USFWS have consulted on the effects of the groundfish fishery. Information on effects is provided in biological opinions, which contain ITSs. The ITSs include estimates of the number of listed species likely to be taken, a determination of whether take levels jeopardize the continued existence of the species, and measures that NMFS must implement to mitigate estimated levels of take. If these take levels were exceeded, consultations might be reinitiated and new mandatory measures identified.

The level of protected species take would be expected to be similar under all of the alternatives, with no measureable change over the No Action Alternative in the short term, in the long term, or cumulatively. For the groundfish fishery, an adaptive management approach would be used in which new data would be considered relative to the previous risk assessments and biological opinions prepared for the groundfish FMP. The adaptive management process would provide for an evaluation of current data and would allow action to be taken should changes occur such that there would be a conservation concern.

<u>Non-groundfish Species (Section 4.7.)</u>: The WCGOP's Groundfish Management Multiyear Data Product (Bellman et al. 2013) includes catch estimates of non-groundfish species in groundfish fisheries. Focusing on groundfish-directed fisheries (limited entry permit vessels, open access vessels targeting groundfish, and tribal fisheries targeting groundfish), approximately 334 non-groundfish species or groups (including partially or unidentified species) were observed caught from 2002 to 2012. Non-groundfish catch, by weight, accounts for about 2 percent of total catch in these fisheries. Table 3- shows the most commonly caught non-groundfish by weight, in rank order, and accounting for just over 90 percent of the non-groundfish catch. About 54 percent of the non-groundfish catch by weight is invertebrate species, including crabs, followed by grenadiers and sharks, each accounting for about 5 percent.

Commercially important species—such as Pacific halibut, Dungeness crab, and salmon—are commercially valuable and have directed fisheries. Commercially valuable species are managed under other Council FMPs, other Federal authority, or by the states. Fishing mortality in the groundfish fishery is taken into account (i.e., incidental catch reductions before harvest specifications are set) when managing such directed fisheries.

Increased midwater trawling would likely occur under the Preferred Alternative over the other alternatives, given the larger widow rockfish and shortbelly rockfish ACLs. These increased ACLs could allow greater opportunity to target yellowtail and chilipepper rockfish. If this were to occur, non-groundfish species that co-occur with groundfish species targeted with midwater trawl, such as northern anchovy, Pacific sardine, American shad, squid, and Pacific herring, could increase. However, it is not possible to project catch of the non-groundfish species.

It is reasonable to conclude that, across all the alternatives, non-groundfish catch would not differ substantially in the short term or long term from the No Action Alternative, which is considered to be the average level during the baseline period (2002 to 2012). Fishery monitoring would allow any such change to be detected. Over the long term, if continuing catch of a non-groundfish species in the groundfish fishery triggered a conservation concern, appropriate mitigation measures could be implemented through other Federal/state authorities or pursuant to the Groundfish FMP. It is likely that the effects of the proposed action would be neutral.

4.15.5.2 Amendment 24

Groundfish Stocks (Section 4.8); Management Measures (Section 4.9): The Preferred Alternative would have overall neutral effects on groundfish stocks. Most of the flatfish species are not caught at levels of high attainment relative to the ACLs, with the exception of petrale sole. Petrale sole is an important trawl target. Given the dominance of flatfish as a trawl species, catch monitoring uncertainty is low. In general, there is low risk of depleting flatfish stocks through overfishing. The projected depletion trends using the base case state of nature indicate that the arrowtooth flounder, petrale sole, English sole, and Dover sole would remain above B_{MSY} under all of the alternatives.

Most Minor Nearshore Rockfish assessments rely on fishery CPUE indices and the fisheries compositional data (i.e., age and length data from sampled fisheries) to inform stock status and dynamics. Therefore, there is considerably more uncertainty in the long-term projections for Minor Nearshore Rockfish than for the other species analyzed in this EIS. Minor Nearshore Rockfish are dominant in the non-trawl fisheries (both commercial and recreational) and, therefore, have a higher catch monitoring uncertainty than trawl-dominant species. The assessments are also generally more uncertain since there are no fishery-independent indices of abundance informing abundance trends. Black rockfish (California and Oregon), black rockfish (Washington), and gopher would remain above B_{MSY} under the Preferred Alternative, Alternative 1, and Alternative 2. The No Action Alternative would result in black rockfish off Washington dipping to just below B_{MSY} by 2024. Gopher rockfish would become overfished by 2024 under the No Action Alternative ACL. Projections were not provided for brown, China and copper rockfish, or for California scorpionfish.

Shelf Rockfish Species (including Minor Shelf Rockfish complex) are caught by both the trawl and fixed gear sectors, although there is some variation among species, based on their relative selectivity to different gears. For instance, greenstriped rockfish, while not targeted in any fishery, tend to be more readily caught in trawl gears than fixed gears. Catch monitoring precision, therefore, varies by species, based on their relative gear selectivity. There is more certain catch estimation for those species dominant to the trawl fishery, given the 100 percent observer coverage for those fleets. Current overfishing risks are low for Shelf Rockfish in general and have been since implementation of RCAs over ten years ago. Under all of the alternatives, bocaccio, chilipepper, greenstriped rockfish, widow rockfish, and yellowtail rockfish would remain above B_{MSY}. Canary rockfish would continue to rebuild slowly, but would not reach B_{MSY} by 2024. Under the 2014 ACL and with an SPR of 88.7 percent (the No Action Alternative and Preferred Alternative), the stock would slowly approach B_{MSY}. Cowcod would continue to rebuild slowly, but would not reach B_{MSY} under Alternative 1 or 2. Cowcod would rebuild by 2020 with an SPR harvest rate of 82.7 percent under the No Action Alternative and the Preferred Alternative. Yelloweye rockfish would rebuild under all of the alternatives other than Alternative 1.

Slope Rockfish (including Minor Slope Rockfish) are caught by both the trawl and fixed gear sectors, although there is some variation among species on their relative selectivity to different gears. Catch monitoring precision, therefore, varies by species based on their relative gear selectivity, with more certain catch estimation for those species dominant to the trawl fishery, given the level of observer coverage for those fleets. Under all of the alternatives, aurora rockfish, longspine thornyhead, shortspine thornyhead, rougheye/blackspotted rockfish, splitnose rockfish, and sharpshin rockfish would remain above B_{MSY} throughout the time series. Blackgill would remain above the overfished level, but would only reach B_{MSY} by 2020 with a P* of 0.25 (Alternative 2). Darkblotched rockfish would rebuild by 2015 (as projected from the 2013 assessment) and would remain above B_{MSY} under all of the alternatives. Under the 2014 ACL, and with an SPR of 88.7 percent (the No Action Alternative and Preferred Alternative), the stock would slowly approach B_{MSY}. POP would continue to rebuild slowly, but would not reach B_{MSY} under Alternative 1 or Alternative 2. POP would rebuild with an SPR harvest rate of 84.6 percent (the No Action Alternative and Preferred Alternative).

Under all of the alternatives, lingcod north and south, longnose skate, and spiny dogfish would remain above B_{MSY} throughout the time series. Cabezon off Oregon would remain above $B_{MSY,}$ but would approach B_{MSY} under Alternative 1 (P*=0.45). Sablefish would shows an upward trend, but would remain below B_{MSY} under all of the alternatives.

The Council and its advisory bodies evaluate fishery performance throughout the year and may recommend inseason adjustments at appropriate Council meetings. The Council manages total catch of groundfish species by monitoring landings and incidental catch inseason and then making inseason adjustments to ensure that annual total catch does not exceed allowable harvest amounts. As part of the process, the GMT monitors the fishery throughout the year by using the most current catch, effort, and other relevant data from the fishery and considering any new information that may identify resource issues requiring a management response. From time to time, non-biological issues may arise that require the Council to recommend management actions to address certain social or economic issues in the fishery and attain OY while preventing overfishing. The Council may evaluate current information and issues to determine if social or economic factors warrant adjustments to achieve the Council's established management objectives. This adaptive and effective approach to management would continue under all of the alternatives.

Over the long term, only adjustments of routine management measures are considered. The objective of routine management measures is to control catch so that catches achieve do not exceed ACLs. Management measures are not an affected environmental component, but rather are an impact mechanism intermediate between stock conservation objectives (reflected by ACLs) and ultimate impacts on the environmental components evaluated in other sections of the EIS.

Socioeconomic Environment (Section 4.10): Ex-vessel revenue is a function of fishing opportunity determined by catch limits and related management measures, technical factors (e.g., the ability of harvesters to catch target species while avoiding species with low ACLs), and market demand. For many stocks, recent average catch represents the low end of 10-year projections. Harvest policies have a relatively modest effect on catch limits compared to variability in stock productivity, which is largely outside the control of management. External factors, primarily trawl rationalization, may lead to more agglomeration with a larger proportion of landings in fewer ports. The proposed action would have overall mixed effects on the socioeconomic environment.

Essential Fish Habitat (Section 4.11): The amount and spatiotemporal distribution of fishing effort would be the primary impact mechanisms for the proposed action on EFH. As discussed above, over the long term, stock productivity has a much larger influence on fishing opportunity compared to harvest policies. Catch levels and resulting fishing effort would be insufficiently correlated to predict that the proposed action would increase the level of adverse impacts to EFH from fishing. Given this uncertainty and the fact that no major regulatory changes affecting the operational characteristics of the groundfish fishery would be reasonably foreseeable, it is likely that the effect of the proposed action would be neutral.

California Current Ecosystem (Section 4.12): Harvest policies would be likely to result in catches within the range of historical catch and would not result in substantial indirect effects as measured by ecosystem indicators. It is likely that the effects of the proposed action would be neutral.

Protected Species (Section 4.13): The amount and spatiotemporal distribution of fishing effort would be the primary impact mechanisms for the proposed action on protected species. As discussed above, over the long term, stock productivity would have a much greater influence on fishing opportunity than harvest policies. Catch levels and resulting fishing effort would be insufficiently correlated to predict that the proposed action would increase fishery interactions with protected species. Given this uncertainty and the fact that no major regulatory changes affecting the operational characteristics of the groundfish fishery would be reasonably foreseeable, the effect of the proposed action will would likely be neutral.

Non-groundfish Species (Section 4.14): There is no information to indicate that bycatch of non-groundfish species would differ from baseline levels. The effects of the proposed action likely would be neutral.

4.15.6 Magnitude and Significance of Cumulative Effects

In determining the magnitude and significance of the cumulative effects, the additive and synergistic effects of the proposed action, as well as past, present, and future actions, must be taken into account. This analysis of total cumulative effects considers the following: (1) impacts from past and present actions forming the environmental baseline, plus (2) reasonably foreseeable future actions, plus (3) impacts from the proposed action and alternatives.

Table 4-234 summarizes the combined effects of past, present, and reasonably foreseeable future actions, other than the proposed action and alternatives (summarized above), affecting the environmental components evaluated in this EIS. Table 4-235 summarizes the conclusions made above on the impacts of past, present, and reasonably foreseeable actions when combined with the impacts of the proposed actions. Based on these assessments, the magnitude and significance of cumulative effects are determined.

Table 4-234. Summary effects of past, present, and reasonably foreseeable future actions on the environmental components evaluated in this EIS.

Environmental Component	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Groundfish Stocks	**Mixed (Low Positive and Low Negative)** Most stocks above or near target biomass; however, some stocks remain overfished	**Low to Moderate Positive** The current management framework is effective in rebuilding stocks to the target biomass and achieving optimum yield	**Low Positive** No actions are identified that would reduce the effectiveness of the management framework	**Low Positive** No actions are identified that would reduce the effectiveness of the management framework; however misspecification of catch limits and management error could occur; climate change may reduce local abundance
Socioeconomic (Human Communities)	**Mixed (Low Positive and Low Negative)** Fishery resources have supported profitable industries but management measures associated with stock rebuilding have curtailed fishing opportunities; trawl rationalization increased operational flexibility	**Mixed (Low Positive and Low Negative)** Stock status and yield have allowed fishery revenues to increase; falling participation and agglomeration may concentrate revenues in fewer communities	**Low Positive** No actions are identified that would accelerate falling participation and agglomeration	**Low to Moderate Positive** Stock status and yield have allowed fishery revenues to increase; falling participation and agglomeration may concentrate revenues in fewer communities
Essential Fish Habitat	**Low to Moderate Positive** Evidence suggests that trawl fishing effort is falling; past actions have mitigated adverse effects of fishing on EFH	**Mixed (Low Positive and Low Negative)** Trawl fishing effort stable; ongoing actions continue to mitigate adverse effects of fishing on EFH; Trawl RCA boundary change proposed	**Low Positive** Trawl fishing effort not likely to increase; future actions likely to enhance the mitigation of adverse effects of fishing on EFH	**Low to Moderate Positive** Trawl fishing effort not likely to increase; future actions likely to enhance the mitigation of adverse effects of fishing on EFH
California Current Ecosystem	**Mixed (Low Positive and Low Negative)** Based on simulations, the development of fisheries has had both positive and negative indirect effects on ecosystem attributes	**Neutral** Ongoing prosecution of fisheries at current levels not expected to change ecosystem attributes from the baseline; other actions likely have negligible impacts	**Mixed (Low Positive and Low Negative)** Ongoing prosecution of fisheries at current levels not expected to change ecosystem attributes from the baseline; climate change likely to have moderate to substantial impacts	**Neutral** Ongoing prosecution of fisheries at current levels not expected to change ecosystem attributes from the baseline; climate change likely to have moderate to substantial impacts

Table 4-234 (continued). Summary effects of past, present, and reasonably foreseeable future actions on the environmental components evaluated in this EIS.

Environmental Component	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Protected Species	**Mixed (Low Positive and Low Negative)** Protected species take modest in groundfish fisheries and documented through observer program; requirements of ESA, and MMPA implemented	**Low Positive** Most populations increasing; ESA and MMPA mitigation addressed and ongoing	**Low Positive** Most populations increasing; future adverse effects likely to be addressed through ESA and MMPA	**Low Positive** Most populations increasing; adverse effects likely to be addressed through ESA and MMPA
Non-groundfish Species	**Neutral** Bycatch in groundfish fisheries is negligible	**Neutral** Bycatch in groundfish fisheries is negligible	**Neutral** Bycatch in groundfish fisheries is negligible	**Neutral** Bycatch in groundfish fisheries is negligible

Table 4-235. Summary of the cumulative effects of the proposed actions.

Affected Resources	Baseline*	Past, Present, and Reasonably Foreseeable Future Actions	2015-2016 Harvest Specifications and Management Measures	Amendment 24 Proposed Action	Cumulative Effects
Groundfish Stocks	Low to Moderate Positive (Section 3.1)	Low Positive	Low Positive	Neutral	Low Positive
Human Communities	Mixed (Low Positive and Low Negative) Section 3.2)	Mixed (Low to Moderate Positive)	Low Positive	Mixed (Low Positive and Low Negative)	Low Positive
Essential Fish Habitat	Low to Moderate Positive (Section 3.3)	Low Moderate Positive	Mixed (Low Positive and Low Negative)	Neutral	Low to Moderate Positive
California Current Ecosystem	Neutral (Section 3.4)	Neutral	Neutral	Neutral	Neutral
Protected Species	Low Positive (Section 3.5)	Low Positive	Neutral	Neutral	Low Positive
Non-Groundfish Stocks	Neutral (Section 3.6)	Neutral	Neutral	Neutral	Neutral

* Although the temporal scope of past and present actions for the affected resources encompasses actions that occurred after FMP implementation (1982), the baseline period is 2003 to 2012, which is the temporal context within which affected resources are described in Chapter 3.

Impact Definitions for Table 4-232 and 4-233

- Positive
    - Groundfish Stocks, Non-groundfish Species, Protected Species: actions that increase stock size
    - EFH: actions that improve or reduce disturbance of habitat
    - California Current Ecosystem: actions that do not substantially and adversely change ecosystem indicators (see Section 3.4.3 for a description of indicators used with the Atlantis CCE Model)
    - Socioeconomic (Human Communities): actions that increase revenue and wellbeing of fishermen and/or associated businesses
- Mixed: both positive and negative effects that are not offsetting
- Neutral: positive and/or negative effects are negligible, or positive and negative effects are offsetting
- Negative
    - Groundfish Stocks, Non-groundfish Species, Protected Species: actions that decrease stock size
    - EFH: actions that degrade or increase disturbance of habitat
    - California Current Ecosystem: actions that substantially and adversely change ecosystem indicators (see Section 3.4.3 for a description of indicators used with the Atlantis CCE Model)
    - Socioeconomic (Human Communities): actions that decrease revenue and wellbeing of fishermen and/or associated businesses

Summary of Cumulative Effects

Groundfish: There would be low positive cumulative effects compared to the No Action Alternative, because 2015-2016 harvest specifications and management measures and long-term harvest policies would be intended to return or maintain stocks at levels at or above their target biomass levels. Fishing practices would not be likely to change the reproductive success of any stocks, and fishing mortality would not be likely to result in overfishing or stocks becoming overfished. Genetic structure of the groundfish stocks would not likely be affected by fishing under the groundfish FMP. There would be a risk that catch limits could be mis-specified and/or that management measures would not prevent ACLs from being exceeded. Because of precautionary reductions built into the management framework, the likelihood that overfishing would occur is low. Over time, catch data systems and stock assessment techniques would improve, lessening the likelihood of mis-specification and/or overfishing.

Socioeconomic Environment: There would be low positive cumulative effects compared to the No Action Alternative, because 2015-2016 harvest specifications and management measures are forecast to result in increased ex-vessel revenue. Over the long term, likely year-to-year declines in ex-vessel revenue would be expected due to changes in target stocks' yield outside of the management system. However, there is no information indicating that year-to-year revenue volatility would exceed baseline variability. External factors (trawl rationalization) could lead to greater agglomeration and ex-vessel revenue being concentrated in fewer fishing communities.

Essential Fish Habitat: There would be low to moderate positive cumulative impacts compared to the No Action Alternative, because external actions (existing EFH protections, EFH review process) have been implemented and might lead to additional measures to mitigate the adverse impacts of fishing on groundfish EFH. Changes to RCA configurations would be evaluated for potential effects on groundfish EFH that has recovered from the adverse effects of fishing.

California Current Ecosystem: there would be neutral cumulative effects compared to the No Action Alternative, because Atlantis California Current Ecosystem Model simulations indicate that harvest policies would not result in substantial changes, as measured by ecosystem indicators. External factors (climate change) could result in adverse effects, such as range shifts and changes in physical dynamics of the system (water temperature, pH, currents, upwelling), but the nature and magnitude of these effects cannot be precisely predicted.

Protected Species: there would be low positive cumulative effects compared to the No Action Alternative, because external actions (ESA Section 7 consultations, MMPA permitting) would evaluate cumulative impacts and identify mitigation measures that might be required. Most protected species populations affected by the proposed actions are recovering.

Non-groundfish Species: There would be neutral cumulative effects compared to the No Action Alternative, because no substantial change in bycatch of non-groundfish species would be expected, either from short-term (2015-2016) or long-term (Amendment 24) management of the groundfish fishery. Bycatch of non-groundfish species would be negligible compared to target catch of non-groundfish species or stock yield where known.

Chapter 5 CONSISTENCY WITH THE GROUNDFISH FMP AND MSA NATIONAL STANDARDS

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 that 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 described below.

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.

MSA section 303(a)(3) requires that each FMP include an estimate of MSY and OY for the fishery. OY is the amount of fish that will provide the greatest overall benefit to the U.S., particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems. OY is prescribed as such on the basis of the MSY from the fishery as reduced by any relevant economic, social, or ecological factor; and in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery. The harvest specification action alternatives are consistent with the OY harvest management framework described in Chapter 4 of the Groundfish FMP. The 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 OYs are based on MSY or MSY as reduced in consideration of social, economic, or ecological factors. The most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing (50 CFR Section 600.310(b)). In establishing OYs, the interim step of calculating OFLs, ABC, and ACLs is taken (FMP Section 4.1). OFL is the MSY harvest levels associated with the current stock abundance. Over the long term, if OFLs are fully harvested, the average of the OFLs would be MSY. ABC is a threshold below the OFL, which accounts for scientific uncertainty in the estimate of OFL. ACL is a harvest specification set at or below ABC, and it is intended to prevent overfishing. The ACLs are established to achieve OY. The OY for a stock or stock complex is the long-term average of the stock or stock complex ACLs.

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. Changes to the Minor Slope Rockfish and Other Fish stock complexes were considered as part of the proposed action. The Council determined that reorganizing the Minor Slope Rockfish complexes by removing rougheye/blackspotted and blackgill rockfish and creating a coastwide complex would not be the most effective way to address current conservation concerns. Instead, increased monitoring coupled with inseason management changes, if necessary, are proposed. The Other Fish stock complex is reduced to three stocks that share greater similarity in terms of life history and fishery susceptibility. Spiny dogfish is removed and managed with its own ACL to address conservation concerns with catch of this species. Other species are designated EC species, because active management is unnecessary, but monitoring of their catch will continue. Removing these species from the Other Fish complex also reduces the likelihood of exceeding the contributing OFLs of the remaining stocks since some of the removed stocks accounted for large contributions to the complex ACL.

Because of past overfishing, seven groundfish stocks are currently declared overfished. Widow rockfish was determined to be rebuilt in 2011 and was no longer 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 2015, but will be managed under its rebuilding plan for the 2015-2016 biennial cycle. The rebuilding plan for Petrale sole is the 25-5 precautionary reduction from the ABC to set the rebuilding ACL.

The remaining overfished species will be managed under the current rebuilding plan SPR harvest rate. For cowcod, the Council recommended a precautionary ACL of 10 mt, consistent with the harvest control rule in the current rebuilding plan and recommended a change in T_{target} to the year of 2020. Catches will be managed to a 4-mt ACT in recognition of uncertainty about current stock assessment results.

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 relative to this proposed action: stock assessments, rebuilding analyses, and methods for determining management reference points (OFL, ABC, ACL, etc.); these areas form 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 more than 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, be 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. The 2014 Groundfish SAFE document reviews the basis for alternative harvest specifications and references the stock assessments that were used. It also describes the methods that were used to determine reference points for harvest specifications (OFL, ABC, ACL, etc.) for stocks and stock complexes.

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, the No Action Alternative does not represent the best available science.

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. The 2014 Groundfish SAFE document 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 the fact that 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.

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 4.2 describes these allocation decisions. Emphasis is placed on equitable division, while achieving conservation goals. Decision-making on these allocations occurs through the Council process, which facilitates substantial participation by state representatives and the public. 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 non-trawl fleets. These measures include the 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 shorebased 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 shorebased 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 that are proposed by the states and are 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 are minimized. Appendix B 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 (Section 4.3). These effects were taken into account in choosing the Preferred Integrated Alternative (incorporating harvest specifications and related management measures). Target species catch for each alternative is projected based on these management measures; this 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).

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 shorebased 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). Non-trawl sectors use cumulative trip limits as the principal catch control tool. Because trip limits are based on landings, setting them at a low level to discourage directed and incidental catch of overfished species 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 shorebased 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 CP sector 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 shorebased 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. The observer data are 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 more often fishing seaward of the RCA 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 expiration of the moratorium on quota share trading 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 2005) and to 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. A Phase 1 report was presented to the Council in August 2012 (PFMC 2012). 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).

The EIS for the proposed action also contains the information required to be contained in a fishery impact statement, Section 303a(9), for Amendment 24.

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, WDFW, ODFW, and CDFW held public hearings to solicit input on the formulation of management measures.

Table 5-1 summarizes Council's 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 2015-2016 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 2015-2016. Adopt new management measures for detailed analysis.
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 components for the 2015-2016 management program.
November 12-19, 2014	Adopt revised 2015 and 2016 OFLs, ABCs, and ACLs for English sole, yellowtail rockfish north of 40°10' N. latitude, sharpchin rockfish, and rex sole, as well as the harvest specifications for the Minor Slope Rockfish complexes and the Other Flatfish complex.

Chapter 6 NEPA AND OTHER APPLICABLE LAWS

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 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 Record of Decision (ROD), in the case of a Final EIS (FEIS)
- 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 ROD documenting whether to approve, partially approve, or disapprove this proposed action under the MSA.

6.2 Notice of Intent and Public Scoping Under NEPA

NMFS, in coordination with the Council, published a Notice of Intent (NOI) on August 22, 2013 (78 FR 52133), to announce the intent to develop and prepare an EIS. The NOI summarized public comment opportunities, described the proposed actions, and reviewed potentially affected resources.

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 (NEPA). 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 30 days, ending on September 23, 2013. Four comments were received during the 30-day public comment period. The National Park West Coast Region described management policies and requirements in West Coast marine areas managed by the National Park Service. Three additional comments were received supporting the proposed action.

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, FINAL Environmental Assessment. Published by the Pacific Fishery Management Council in October 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. 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 (lead for management measures analysis)
- Christopher "Kit" Dahl, Pacific Fishery Management Council (lead for essential fish habitat, California current ecosystem, protected species, non-groundfish species, long-term socioeconomic impacts, document management)
- John DeVore, Pacific Fishery Management Council (lead for harvest specifications)
- Edward Waters, Contracting Economist (lead for 2015-2016 socioeconomic impacts)

This EIS was prepared and evaluated in consultation with NMFS and the Council. In addition, members of the GMT and the 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:

- Sarah Biegel, NMFS West Coast Region, NEPA Coordinator
- Ryan Couch, NOAA GC, Attorney
- Kevin Duffy, NMFS West Coast Region, Groundfish Section
- Mariam McCall, NOAA GC, Attorney
- Becky Renko, NMFS West Coast Region, Groundfish Section
- Sarah Williams, NMFS West Coast Region, Groundfish Section

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. 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
- 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, Oregon State
- California Coastal Commission

Members of the public may also ask to be on the distribution list, but no requests were made.

In addition, a notice of availability of the DEIS published in the *Federal Register* on October 24, 2014. The DEIS was available for a 45-day public comment period. During that time, any member of the public could have called the Council office and requested a copy of the DEIS for their review. The public comment period for the DEIS closed on December 8, 2014. Three comment letters were received, and they are attached in Appendix D. The responses to those comments are addressed in Chapter 8.

Questions concerning this document and requests for additional copies of this document may be addressed to the following individual:

Mr. Frank Lockhart
National Marine Fisheries Service, West Coast Region
7600 Sand Point Way
Seattle, WA 98115
frank.lockhart@noaa.gov
(206) 526-6142

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 two-year period to the next. With this view in mind, this EIS evaluates the impacts of the ongoing action over a longer time period than two years. Biennial changes to the management program may then be evaluated in more focused analyses, as described below, based on 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, prepare a tiered NEPA analysis, or take other appropriate action to ensure compliance with NEPA in future biennial cycles. (See 40 CFR 1502.9(c)(1), 1502.20).

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, is 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 MSA (see Chapter 5), NEPA, and the APA, 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 that all Federal activities directly affecting 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 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 it 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 that 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 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 necessary to minimize impacts from the Federal action, and the terms and conditions with which the action agency must comply.

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.

On November 21, 2012, the USFWS issued a biological opinion concluding that the groundfish fishery will not jeopardize the continued existence of the short-tailed albatross. The USFWS also concurred that the fishery is not likely to adversely affect the marbled murrelet, California least tern, southern sea otter, bull trout, or bull trout critical habitat.

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 MMPA mandates that each fishery be classified by the level of serious injury and mortality of marine mammals that occurs incidental to each fishery and be reported in the annual Marine Mammal Stock Assessment Reports for each stock. On the 2012 List of Fisheries, the Washington/Oregon/California 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. As Steller sea lions and humpback whales are also protected under the MMPA, incidental take of these species from the groundfish fishery must be addressed under MMPA section 101(a)(5)(E). 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, NID, and this fishery has been added to the list of fisheries authorized to take Steller sea lions (77 FR 11493, Feb. 27, 2012). On September 4, 2013, based on its NID 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). 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 IT 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 Order 12866 (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 a reasoned determination that 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 that the regulatory agency systematically and comprehensively considers all available alternatives, so that 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) that 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’ usual and accustomed fishing areas (described at 50 CFR 660.324). Each of the treaty tribes has the discretion to administer its fisheries and to establish its 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 and the USFWS entered into a Memorandum of Understanding on June 14, 2012. The protocols in this consultation will guide agency regulatory actions and policy decisions 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: The 2015-2016 groundfish harvest specifications and management measures are consistent to the maximum extent practicable with the approved coastal management programs of the states of Washington, Oregon, and California. This determination was submitted for review by the responsible state agencies under section 307 of the Coastal Zone Management Act on October 17, 2014.

ESA: NMFS and USFWS have completed section 7 consultations concluding that ongoing operation of the groundfish fishery is not likely to jeopardize the continued existence of any species listed under the ESA or result in the destruction or adverse modification of critical habitat.

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. More recently, the best available information also indicates that the 2014 Pacific whiting fishery exceeded the 11,000 Chinook and 0.05 Chinook salmon/mt whiting reinitiation triggers. Accordingly, the reinitiated consultation will also address that exceedance. NMFS has determined that ongoing fishing under the proposed action, prior to the completion of the consultation, would not likely 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. Therefore, the proposed action is consistent with sections 7(a)(2) and 7(d) of the ESA.

Marine Mammal Protection Act: Section 3.5.3 describes the incidental take of marine mammals, and Section 4.6 assesses the effects of the proposed action on marine mammals. Although the operation of groundfish fisheries may differ from previous management cycles, there is no information to indicate that continued operation of the fishery in the 2015-2016 biennial period would lead to an increase in serious injury/mortality of non-ESA-listed marine mammals. .

Migratory Bird Treaty Act: The proposed action would be 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 evaluated impacts to seabirds and concluded that the proposed action would not significantly impact seabirds (Section 4.6 evaluated potential 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, would not require collection of information subject to the Paperwork Reduction Act.

Executive Order 12898 (Environmental Justice): The proposed action would not result in disproportionate adverse impacts on low income and minority communities.

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 coordination 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 West Coast 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 WCR staff to provide information needed for the Regulatory Impact Review and Regulatory Flexibility Act analyses.

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Chapter 8 RESPONSE TO COMMENTS

8.1 Introduction

When preparing a Final EIS, an agency must address comments received on the DEIS, either by modifying the alternatives in the DEIS, supplementing the DEIS alternatives, revising the analyses, making factual corrections, or explaining why the comments do not warrant further agency response (40 CFR 1503.4). A 45-day public comment period on the DEIS for this action began on October 24, 2014, and ended on December 8, 2014 (79 FR 63622, October 24, 2014).

Three comment letters were received. Comments on the DEIS were provided by the U.S. Environmental Protection Agency (EPA), the U.S. Department of Interior, and the Ocean Conservancy. The primary issues raised in the comments related to how future NEPA requirements will be met, how the preferred alternative changes the future opportunity for public involvement, the implications of the proposed action relative to the specification of OY, and the risk to stocks relative to the use of default HCRs. This chapter summarizes the substantive comments received on the DEIS and provides the responses from NMFS to those comments. Copies of the three comment letters received may be found in Appendix D.

8.2 Response to comments

The following comments are in response to issues raised in the letter received from the Ocean Conservancy:

Comment 1: The requirements of NEPA must be complied with in future years. As currently written, the DEIS lacks an explanation of how NEPA will be complied with in the future. The nature and duration of the EIS is unclear as is the decision-making process that will be followed in subsequent biennial cycles. We request clarification on whether and how subsequent biennial cycles will be supplemented or tiered from and for what duration.

Response: The adoption and adjustment of regulations for managing the groundfish fishery is an ongoing, adaptive process. Changes in the type and intensity of environmental impacts do not tend to differ substantially from one two-year period to the next. With this view in mind, this EIS evaluates the impacts of the ongoing action over a longer time period than two years. Biennial changes to the management program may then be evaluated in more focused analyses that are based on CEQ regulations and NMFS policies and procedures for implementing NEPA.

NMFS fully intends to comply with the requirements of NEPA in future biennial specification cycles. During each biennial cycle, the proposed action will be evaluated relative to the requirements of NEPA, and NMFS will make a determination regarding the type of documentation that will be required to support the action. As noted in the DEIS, when harvest specifications (and related management measures) are adjusted, NMFS will determine whether to supplement this EIS, prepare a tiered NEPA analysis, or take other appropriate action to ensure compliance with NEPA (see 40 CFR 1502.9(c)(1), 1502.20). As part of the public process for setting biennial harvest specifications and management measures, which is discussed in response to Comment 2 below, the scope of the Council's potential recommendations regarding changes from default harvest control rules or changes to management measures will be one factor informing NMFS' decision on what is necessary for compliance with NEPA. NMFS anticipates that steps taken in a given biennial cycle to comply with NEPA will be made known to the public either at Council meetings, through the rulemaking process, or both. NMFS believes that this approach is consistent with CEQ guidelines and will fulfill the requirements of NEPA.

Comment 2: The full slate of public participation options must be maintained in each 2-year process for setting catch specifications. The biennial groundfish specifications are "regulations," and as such, NMFS is required by the MSA and APA to offer them for formal public notice and comment via the Federal Register, even if public access is also promoted via the Council process. The FEIS must clarify how the public transparency aspects of MSA, APA, and NEPA will be complied with in subsequent biennial cycles including a commitment to biennial catch specifications that are subject to public notice and comment every two years.

Response: The process for setting biennial harvest specification is detailed in Chapter 5 of the FMP and summarized here. The Council develops harvest specification and management measure recommendations over the course of at least three meetings. At the first meeting, usually November of odd-numbered years, the Council reviews new stock assessments and rebuilding analyses; makes recommendations relative to the use of the assessments and rebuilding analyses for management of the fishery; proposes OFLs, ABCs, and a range of ACLs; and provides further direction to advisory bodies as needed. Public comment is considered at this point. In some cycles, stock assessment reviews may occur at meetings prior to November. At the second meeting, usually held in April of even-numbered years, the Council tentatively adopts the harvest specifications and preliminarily adopts management measures. Public testimony is considered before the Council makes its recommendations. At the third meeting, usually in June of even-numbered years, the Council makes its final recommendations on harvest specifications and management measures. Public testimony is considered before the Council makes these recommendations. Upon receipt of the Council's recommendations and supporting rationale, NMFS publishes a proposed rule in the Federal Register, making the Council's recommendations available for public comment. Following the public comment period on the proposed rule, NMFS takes into account any comments or additional information, and publishes a final rule in the Federal Register. All OFLs, ABCs, ACLs, and any ACTs, HGs, or quotas remain in effect until revised, and, whether revised or not, will be announced at the beginning of the biennial fishing period along with other specifications. The Council's process for development of the biennial harvest specifications is clearly defined in Chapter 5 of the FMP, and it identifies where there are opportunities for public participation, as well as the intent to conduct a full rulemaking with notice and comment. These provisions of the FMP are not substantively altered by Amendment 24, and they will continue to ensure public involvement, both at the Council level, and during informal rulemaking, to the extent required by the MSA and APA.

Section 4.6.3 of the FMP describes rebuilding plans. Changes to key rebuilding plan elements are done through full (notice and comment) rulemaking. A rebuilding plan remains remain in effect for the specified duration of the rebuilding program, or until modified. It is likely that rebuilding plans will be revised over time to respond to new information, changing conditions, and success or lack of success in achieving the rebuilding schedule and other goals. Changes to key rebuilding parameters (HCR or T_{TARGET}) for a particular stock will be published through full (notice and comment) rulemaking. The FMP specifically states that public participation is critical to the development, implementation, and success of management programs.

The regulations relevant to the setting of harvest specifications are found at § 660.60 (a) and (b), which state that the Pacific Coast Groundfish fishery is managed on a biennial, calendar-year basis with harvest specifications and management measures being announced biennially. Harvest specifications for each species or species group are set for two sequential calendar years. In addition, the regulations at § 660.40 describe the standards to be used to establish ACLs for overfished stocks. The regulations at § 660.60 also state that the setting of harvest specifications will be done according to the framework standards and procedures in the FMP and other applicable law and will be published in the Federal Register. No changes to these regulations are being proposed. NMFS believes that the Council process specified in the FMP and supported by regulation is built on transparency and clearly identifies the opportunity for public involvement throughout the process.

Comment 3: Amendment 24 has implications for achieving OY and how OY factors are analyzed. The Pacific Council's OY policy for groundfish is described in Chapter 4 of the Groundfish FMP. OY is described in one single paragraph in Section 4.7 of the FMP, and OY is not mentioned at all in the overview of the harvest specification and management process in Section 5.1. The OY determination does not consider the necessary OY factors (economic, social, and ecological) in any meaningful or explicit way. Instead, OY is simply the "long-term average of the stock or stock complex's ACL." On the whole, OY is not assessed or specified in the FMP; OY is not integrated into the ACL-setting process in any meaningful prospective way and the OY requirement is simply applied retrospectively, if at all. While there is consideration of OY factors in the groundfish management process, the FMP falls short of MSA's requirement to "assess and specify" OY sufficiently.

Response: NMFS recognizes that FMPs and regulations promulgated pursuant to the MSA must be consistent with the national standards, including National Standard 1 of the MSA. 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 U.S. fishing industry. The determination of OY and the linkage to ACLs are presented in multiple sections of Chapter 4 of the FMP. Chapter 5 discusses the specifications setting and apportionment procedures.

Section 4.1 describes how the FMP uses an interim step of calculating OFLs, ABCs, and ACLs in establishing OYs. OFL is the MSY harvest level associated with the best estimate of stock abundance. Over the long term, if OFLs are fully harvested, the average of the OFLs would be MSY. ABC is a threshold below the OFL, which accounts for scientific uncertainty in the estimate of OFL. ACL is a harvest specification set at or below ABC and is intended to prevent overfishing. The ACLs are established to achieve OY in the fishery. The OY for a stock or stock complex is the long-term average of the ACLs. While OY is a long-term average amount of desired yield, there is, for each year, an annual amount of fish that is consistent with achieving the long-term OY. NMFS believes that OY is fully integrated into the ACL-setting process in a meaningful way.

In retrospect, management of the fishery has been effective in the past 10 years. Overfishing has rarely occurred, the biomass for most stocks are near or above B_{MSY}, and overfished stocks are being rebuilt consistent with timing and other requirements of section 304(e)(4) of the MSA. Table 4-134 and Table 4-135 of this FEIS show that total catch mortality for the majority of groundfish stocks and stock complexes has been well below the ACLs (2011 and 2012) and OYs (2002 to 2010) in the long term. For the few species where total catch mortality has approached the ACLs in recent years (i.e., sablefish, nearshore rockfish complex, cabezon off Oregon), additional precaution is proposed to be taken when setting the harvest specifications, and/or additional management mechanisms would be available to keep catch within the proposed ACLs.

Consideration of OY factors (economic, social, and ecological) in the groundfish management process occurs in the setting of ACLs. NMFS recognizes that OY remains a key concept and requirement of the MSA. However, with the requirement for setting OFL, ABC, and ACLs, the concept of specifying OY as an annual target has become intertwined with the groundfish specification process. The analysis of economic, ecological, and social factors are considered in Chapter 4 of this FEIS in both a quantitative and qualitative manner. For several species, ACLs are proposed to be set below the ABCs to accommodate management uncertainty, socioeconomic concerns, or other considerations. For example, this includes overfished species with ACLs based on rebuilding plans and most species where a constant catch strategy is used. For shortbelly rockfish, the constant catch strategy would set the ACL at less than 10 percent of the ABC to allow access to co-occurring groundfish without overfishing shortbelly rockfish or jeopardizing its role in the ecosystem. NMFS believes that the FMP provisions for setting harvest specifications and management measures and the analysis contained in documentation supporting the proposed action meet the MSA's requirements.

Comment 4: Amendment 24 would amend the Groundfish FMP to describe default HCRs and management measures to be considered during subsequent biennial cycles. The NEPA analysis for Amendment 24 must be broad and reach beyond the methods used to set ACLs; rather, it must consider the FMP as a whole and analyze how the FMP itself affects the marine ecosystem. Setting a P in the range of 0.40 and 0.45 implies a policy statement by NMFS and the Council that the very real risk of inadvertent overfishing is not important and the consequences of overfishing on ecosystems and fishing communities is not a concern. The commenter urges analysis of impacts of the groundfish FMP on the CCE as compared to an unfished state.*

Response: NMFS agrees with the commenter that the Atlantis model, described in Appendix A of this FEIS, is one step towards using ecosystem-based management in the consideration of alternative harvest policies for the groundfish fishery, including accounting for OY. However, ecosystem models such as Atlantis are intended for strategic, "big picture" analyses to evaluate broad types of ecological impacts and policy decisions. Such ecosystem models have limitations in providing tactical advice, such as precise setting of single species quotas. Appendix A, Section A1.4, of this FEIS specifically addresses the caveats in the Atlantis model. As the Council and NMFS move forward, they anticipate improvements in ecosystem modeling. With a growing body of literature on ecosystem-based fisheries management and a newly adopted Fishery Ecosystem Plan for the Pacific Coast, accounting for species interactions and environmental variability within fisheries management is evolving. Ecosystem-based considerations may continue to be incorporated into the specifications in a number of ways.

In the groundfish fishery, the Council and NMFS encourage the incorporation of environmental information into stock assessments. Stock assessors are strongly encouraged to develop assessments in a collaborative environment by forming working groups, holding pre-assessment workshops, and consulting with other stock assessment and ecosystem assessment scientists. Integrated Ecosystem Assessment teams are also encouraged to evaluate alternative models and analyses that incorporate ecosystem considerations and cross-FMP interactions that may affect stock dynamics. The SSC has developed separate Terms of Reference for reviewing new methods that might be used in stock assessments, including methods and tools to incorporate ecosystem processes. In the selection of STAR panelists for reviewing groundfish stock assessments, the Terms of Reference indicate that it is desirable to include the selection of STAR panelists with expertise in ecosystem models or processes, as well as knowledge of the role of groundfish in the ecosystem. To facilitate future assessments, the STAR panel reports are to include the following: prioritized recommendations for future research and data collection, including methodology and ecosystem considerations for the subsequent assessment.

The commenter suggested that an analysis be conducted to consider the impacts of the groundfish fishery on the CCE as compared to an unfished state. Chapter 3, Section 3.4.3, discussed Kaplan et al. (2012) where the Atlantis ecosystem simulation model was used to assess the cumulative effects of fisheries on the CCE. The model provided an assessment of the effects of fishing by different fleets on various ecosystem components and indicators of ecosystem health in both the short term and long term (50 years). Figure 3-15 shows the effect on ecosystem attributes from a state of no fishing to a state where all fleets are active. Therefore, the information the commenter is requesting was considered in this FEIS.

The commenter supports the concept of default HCRs as an efficient process mechanism, but urges the Council and NMFS to set the default HCRs at more precautionary levels to minimize risks to the ecosystem and economic health of fishing communities. The Council and NMFS considered alternatives with lower P* values for both the 2015 and 2016 harvest specifications and management measures (Alternative 2) and for amending the FMP to establish default harvest control rules (Alternative 2). Alternative 2 under each issue considered using a P* of 0.25.

To derive the ABC, the SSC-recommends sigma values that result in a reduction from the OFL for each species category. In addition, the P* value links to a corresponding fraction that further reduces the OFL to derive an ABC. As the P* value is reduced, the probability of the ABC being greater than the "true" OFL becomes lower. A P* of 0.45, when combined with a sigma value of 0.36 (category 1 stocks), corresponds with a reduction of 4.4 percent from the OFL when deriving the ABC. The P* of 0.45 is more risk averse than the policy used for healthy stocks in biennial management prior to implementation of Amendment 23 in 2011 when the OY was set equal to the MSY harvest level associated with the best estimate of stock abundance (this is currently the OFL). 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. A P* of 0.45, when combined with sigma values of 0.72 and 1.44 (category 2 and 3 stocks) corresponds to an 8.7 percent and a 16.6 percent reduction from the OFLs, respectively. In contrast, the P* value of 0.25 would result in a reduction from the OFL of 21.6 percent when combined with a sigma of 0.36, 38.5 percent when combined with a sigma of 0.72 percent, and 63.1 percent when combined with a sigma of 1.44 percent. Moreover, ACLs for many stocks are already set far below the ABC and, thus, may be unaffected by P*. For these stocks, added precaution is taken with the default harvest control rules, such as rebuilding plan HCRs, constant catch strategies, or individual stocks or stock complexes with a P* of .40.

As noted under Comment 3, management of the fishery has been largely effective in the past 10 years. Overfishing has rarely occurred; the biomass for most stocks is near or above $B_{MSY,}$ and overfished stocks are being rebuilt consistent with timing and other requirements of section 304(e)(4) of the MSA. Table 4-134 and Table 4-135 of this FEIS show that total catch mortality for the majority of groundfish stocks and stock complexes has been well below the ACLs (2011 and 2012) and OYs (2002 to 2010) in the long term.

Chapter 9 INDEX OF TOPICS

APPENDIX A: CATCH PROJECTION MODELS

A.1 Ecosystem Model Analyses to Investigate Food Web Impacts of Alternative Harvest Policies to inform the Groundfish Tier I EIS

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A.1.1 Executive Summary

This analysis explored potential food web impacts that may stem from the alternative groundfish harvest levels considered in this EIS. An Atlantis ecosystem model was applied to predict ecosystem effects of groundfish harvest over a 30 year simulation period. Ten ecosystem metrics were calculated to quantify the impacts of the alternative harvest levels. Overall, the metrics that best reflect food web effects (rather than effects of direct harvest) suggest minimal impacts of the tested harvests, with most metrics remaining within 5% of the benchmark values that assumed continuation of recent average catch levels. Three metrics that primarily reflect the abundance of groundfish (Ratio of Target Species Biomass to Catch, Abundance of Piscivores and Number of Healthy Assessed Stocks) declined when catches were increased, as would be expected *a priori*. Food web effects were evident but not common: in the Moderately High catch scenario, and especially in the extreme High catch scenario, the Atlantis ecosystem model predicted some indirect effects via krill, species linked to krill, and some prey of groundfish. In an exploration of ecosystem model high and low productivity states, most ecosystem metrics responded to the simulated catch levels by <5% regardless of the productivity assumed in the ecosystem model. However, the three ecosystem metrics that directly reflect groundfish abundance are more sensitive to the catch streams when ecosystem productivity is low.

A.1.2 Introduction

This analysis aims to explore potential food web impacts that may stem from the alternative groundfish harvest levels considered in this Tier I Environmental Impact Statement (EIS).

A limited set of harvest policies from this EIS is selected below, which brackets the range of possible groundfish catches. In a single species context, these harvest policies were implemented by stock assessment authors (Table A-1), who projected fish population dynamics and catches for a 10 year period (see elsewhere in this EIS). To explore the extent to which groundfish harvest impacts other species such as forage groups, mammals, and birds, here I used the 10 year catch projections to drive an Atlantis ecosystem model that includes food web interactions.

In Agenda Item H.6.b, Supplemental SSC Report to the November 2013 meeting, the SSC of the Pacific Fishery Management Council recommended that the Atlantis ecosystem model be applied to consider ecosystem effects of groundfish harvest, to inform this Tier I EIS.

In addition to published fishing scenarios (Kaplan et al. In Press, 2012a, 2012b), the Ecosystem subcommittee of the SSC requested:

- 30 year projections, with catch streams based on those from single species projections for 10 years, then extending the catch projections for at least another 20 years based on the fishing mortality rates experienced in the tenth year of the projection period.
- "High" catch scenario in which the catches by species are set to those for high state of nature and a high P*, and another "low" catch scenario in which the catches by species are set to those for low state of nature and a low P*.

Below, I discuss the Atlantis ecosystem model, the ecosystem metrics used to score these scenarios, and methods to construct the 'productivity states' of the ecosystem model, which capturing the disparate states of nature in 37 assessments for groundfish and Pacific hake.

A.1.3 Atlantis Ecosystem model

The Atlantis ecosystem model simulates the California Current marine ecosystem, from Point Conception to the US-Canada border. The model spans the continental shelf and slope, to 2400m depth. The model domain is divided into 82 two dimensional regions, and the water column is divided into as many as seven depth layers in the areas farthest offshore. This "end-to-end" ecosystem model includes 62 biological functional groups, including plankton, fish, birds, and mammals. Vertebrates are parameterized with age structure and explicit recruitment relationships, while invertebrates are modeled as biomass (nitrogen) pools. Recruitment is drawn from deterministic Beverton-Holt stock-recruit curves (Horne et al. 2010) and is not strongly periodic, nor is it driven by oceanography. Oceanographic forcing of temperature and currents in this Atlantis model is driven by a simple repeating loop of oceanography from a Regional Ocean Modeling System (ROMS) for the period 1958-2004. With the exceptions noted below, the model is parameterized to represent 2008 biomasses, as well as fishing mortality rates imposed by twenty fleets (gear types) in that year. The model is described in detail in previous publications (Horne et al. 2010; Kaplan et al. 2012a, 2013). For assessed groundfish, Horne et al. (2010) describe the initial parameterization that is largely based on stock assessment estimates of biomass, von Bertalanffy growth parameters, length-weight relationships, and recruitment parameters. The subsequent calibration process aims to produce model dynamics that reproduce historical biomass trends (from assessments or surveys) and stock productivity (i.e., F_{MSY}).

The Atlantis code base was developed by CSIRO Australia, and has been used in Australia and internationally for Management Strategy Evaluation, to identify ecosystem indicators, to evaluate indirect effects of harvest policies, and to consider cumulative impacts of fisheries, climate, and ocean acidification (Fulton et al. 2005, 2014; Kaplan et al. 2010; Griffith et al. 2011). The code base is described in detail in Fulton (2001) and Fulton et al. (2007).

End-to-end ecosystem models such as Atlantis are intended for strategic, 'big picture' analyses to evaluate broad types of ecological impacts and policy decisions. Such ecosystem models are not intended to provide tactical advice, such as precise setting of single species quotas or specific placement of fishery management zones. Fulton et al. (2011) discuss lessons learned from 13 Atlantis models, and the appropriate role of Atlantis for informing ecosystem-based management.

A.1.4 Caveats

This analysis simulates and evaluates food web impacts of groundfish fisheries. It does not include habitat damage by fishing gear (Collie et al. 2000; Kaiser et al. 2006), nor does it include stressors such as climate change or ocean acidification. Kaplan et al. (2012a) discuss relevant caveats for the application of this ecosystem model in the evaluation of cumulative impacts. The analysis here focuses on effects of alternative harvest policies for groundfish fleets. Harvests by other fleets, including the Pacific hake fleets, are kept at constant levels (% yr^{-1}) in these simulations.

A.1.5 Ecosystem Metrics

I calculated ten ecosystem metrics to capture the main ecosystem effects of the scenarios. Additionally, the biomass response of individual functional groups or species is reported. The ten ecosystem metrics have previously been calculated for this Atlantis model by Kaplan et al. (2012a). The set of metrics was drawn primarily from the IndiSeas project (www.indiseas.org), as well as from the California Current Integrated Ecosystem Assessment (Levin & Schwing 2011; Levin et al. 2013). The ten metrics are:

- Mean Trophic Level of the Catch
- Mean Trophic Level of Biomass
- Ratio of Target Species Biomass to Catch
- Total System Biomass
- Abundance of Piscivorous Fish (trophic level >= 4)
- Abundance of Forage Fish
- Abundance of Krill (euphausiids)
- The Number of Healthy Assessed Stocks above B_{25} (flatfish) or B_{40}
- The Number of Healthy Non-assessed Stocks above B_{25} (flatfish) or B_{40}
- Abundance of Marine Mammals and Birds ("median depletion" of these stocks)

Metrics are reported for year 10 and for years 25-30 (averaged) of the simulation. To inform the 'healthy stocks' and Abundance of Marine Mammals and Birds metrics, I estimated unfished abundance (B_{100}, in comparison to B_{25} or B_{40}) from an Atlantis simulation with base productivity and no fishing.

Each of the metrics was standardized relative to its value in a baseline scenario – a benchmark management scenario that projects a base case productivity state of all stocks in the ecosystem model, with recent average catches projected into the future.

A.1.6 Scenarios

Here we focus on the ecosystem impacts of the following combinations of catch streams and ecosystem model productivity states:

		Ecosystem model productivity:		
		Low Productivity	Base Productivity	High Productivity
Catch streams from assessments:	Low Catch Stream			
	Recent Average Catch Stream			
	Moderately High Catch Stream			
	High Catch Stream			

Catch streams and productivity states are described below. The focus of the results is on base ecosystem model productivity (center column above), but high and low ecosystem productivity are also discussed.

A.1.7 Catch Streams from Assessments

I initially focused on the most extreme catch streams available from the stock assessment projections considered here. The High Catch stream corresponds to ABC removals of P* = 0.45 when the stock assessments assumed the stocks were in their high states of nature. This extreme scenario assumes a median catch scalar across Atlantis functional groups of 10.3x, relative to the benchmark Recent Average catches (ranging from 1.7x for Sablefish to 618x for Small shallow rockfish) (Table A-2 and Table A-3). Low Catch streams for Atlantis are the lower of either the Recent Average Catch or ABC removals of P*=0.25, when the stock assessment assumed the stock was in its low state of nature. Note that the Pacific hake (whiting) fishery is outside the scope of the actions in this EIS, so hake catch was not varied between scenarios here. The ten year catch streams are reported in Table A-2. Catch projections were extended for another 20 years based on the fishing mortality rates experienced in the tenth year of the projection period.

Following discussion with the SSC at the April 2014 Pacific Fishery Management Council meeting, I added an additional 'Moderately High' catch stream. For most Atlantis functional groups, this Moderately High catch stream corresponds to ABC removals of P* = 0.45 when the stock assessment assumed the stock was in its base case state of nature. The exception is for Atlantis functional groups that include overfished species (Table A-2), for which the moderately high catch stream corresponds to catches equal to the 2014 ACL. Overall, the moderately high catch stream assumes a median catch scalar across Atlantis functional groups of 2.7x, relative to the benchmark Recent Average catches (ranging from 1.1x for Sablefish to 68x for Small shallow rockfish). Catches of groups with overfished species are scaled by less than or equal to 2.8x their benchmark Recent Average catches.

(Other catch streams presented elsewhere in this EIS are intermediate and are therefore not considered here. Catch streams were only considered for use in this ecosystem analysis if they were available for all species within an Atlantis functional group, see Appendix Table A-2 below).

A.1.8 Productivity States of Ecosystem Model

The 37 groundfish assessments considered in this Tier I EIS, and their states of nature, are presented in Table A-1 below. In this analysis I created a low ecosystem productivity state (all stocks unproductive), a base case productivity state, and a high productivity state (all stocks productive). Due to their large biomass and potential ecosystem implications, parameterization of Pacific hake was also altered in the ecosystem model simulations, with accompanying productivity states.

Within individual stock assessments (Table A-1), the main parameters varied by assessment authors to determine the states of nature are natural mortality *M*, steepness *h,* historical catches, and initial depletion. Varying these parameters and data lead to changes in productivity in the stock, as estimated by the assessment. This shift in productivity is evident in the estimates of management quantities such as depletion, current biomass, and MSY.

To translate these states of nature from the stock assessment to productivity states of the ecosystem model requires that we transfer the productivity parameters from all assessments to the ecosystem model. These productivity parameters are lnRo (log of initial, unfished number of recruits), steepness (*h*), and natural mortality (*M*). LnRo is typically estimated, while steepness and natural mortality are typically fixed at some value; jointly they dictate the estimated productivity of the assessed stock. Steepness and lnRo can be translated directly to alpha and beta in the form of the Beverton Holt recruit relationship that is used for these stocks in Atlantis. Natural mortality *M* can be assigned to the Atlantis equivalent natural mortality.

For the stock assessments conducted using Stock Synthesis, assessment authors provided the parameter estimates for *M, h,* and *LnRo* for a low (unproductive), high (productive), and base case state of nature, as defined by Stock Assessment Review panels. Four data-moderate stock assessments involved the use of exSSS (Cope et al. 2014): yellowtail and sharpchin rockfish, and Rex and English sole. For these species, I created low and high states of nature by sampling from the posterior parameter distribution for *M, h,* and *LnRo*. We found the median, 12.5%, and 87.5% quantiles of *LnRo*, and the associated values of *M* and *h*. Since the Pacific hake and sablefish assessments did not explicitly include states of nature, I defined a low and high state of nature in a manner similar to the data-moderate stocks, using the joint distribution of the posteriors distributions for *M, h,* and *LnRo* .

Additional details regarding translation of stock assessment states of nature to ecosystem model productivity states are presented in the Appendix, along with details regarding translation of species into Atlantis functional groups.

A.1.9 Results

Under The focus of this analysis is on the impact of the catch streams, not the effect of changes in ecosystem model productivity. Therefore I focus below first on the Base Productivity scenarios (center column of the scenario diagram above). Results are compared relative to the benchmark scenario (Base Productivity and Recent Average catches).

A.1.9.1 Ecosystem Metrics

Under base productivity of the ecosystem model, the primary impact of increased catches (High Catch streams) is on the Abundance of Piscivores, which directly reflects the abundance of groundfish fishery target species. The High Catch streams caused a ~50% reduction in Abundance of Piscivores, and the Moderately High Catch streams caused a ~25% reduction in this metric. Two other metrics reflect the abundance of groundfish but other stocks as well: Number of Healthy Assessed Stocks, and Ratio of Target Species Biomass to Catch. These two metrics decline by at most ~20% after 25-30 years of High Catch and ~15% after 25-30 years of Moderately High Catch (Figure A-1 and

Table A-3). Other metrics of the ecosystem responded by less than 5%. By years 25-30 the Abundance of Krill increases slightly due to indirect effects discussed below. Overall, the metrics that best reflect food web effects (rather than effects of direct harvest) suggest minimal impacts of the tested harvests.

most functional groups Recent Average Catches are equal to Low Catch streams. In all results below, Year 10 metrics show the same trends as Years 25-30, and the focus below is on the longer-term metrics (Table A-4 and Table A-5). Under base productivity of the ecosystem model, the primary impact of increased catches (High Catch streams) is on the Abundance of Piscivores, which directly reflects the abundance of groundfish fishery target species. The High Catch streams caused a ~50% reduction in Abundance of Piscivores, and the Moderately High Catch streams caused a ~25% reduction in this metric. Two other metrics reflect the abundance of groundfish but other stocks as well: Number of Healthy Assessed Stocks, and Ratio of Target Species Biomass to Catch. These two metrics decline by at most ~20% after 25-30 years of High Catch and ~15% after 25-30 years of Moderately High Catch (Figure A-1 and Table A-3). Other metrics of the ecosystem responded by less than 5%. By years 25-30 the Abundance of Krill increases slightly due to indirect effects discussed below. Overall, the metrics that best reflect food web effects (rather than effects of direct harvest) suggest minimal impacts of the tested harvests.

A.1.9.2 Direct impacts, Assuming Base Ecosystem Model Productivity

The sensitivity of the three metrics (Ratio of Target Species Biomass to Catch, Abundance of Piscivores and Number of Healthy Assessed Stocks) to increased catches should be expected *a priori.* Relative to Recent Average Catch, High Catch involves a median catch increase across Atlantis functional groups of 10.3x, and Moderately High Catch involved a median catch increase of 2.7x (Table A-3). The main direct impact predicted by the ecosystem model under High Catch is full depletion of Large flatfish (e.g., arrowtooth flounder), Small shallow rockfish, and Dover sole (to ~0 biomass by year 30, Table A-6). Species that show 30-70% declines in biomass under the High Catch stream, relative to biomasses that would result from Recent Average Catch, include sablefish, Small demersal sharks, Yelloweye and Cowcod, Shallow large rockfish, Deep large rockfish, and Large demersal predators such as lingcod (Table A-6). Since all these groups are directly driven by the catch streams considered in this EIS, additional single species analyses (stock assessment projections) should be considered for these species. For instance, single species stock assessment projections predict depletion of Dover sole to approximately B_{40} (Section 4.8.1.2 in the main text of this EIS) under harvests equivalent to our Moderately High Catch stream. Thus Dover sole in both models can sustain the Recent Average Catch levels, but for this stock and several others, the Atlantis model is not productive enough to support both the very large harvest increases associated with Moderately High Catch, and the explicit predation demands included in the ecosystem model. Note also the simulations here assume specified catches for years 1-10, and constant fishing mortality rates for years 11-30. In the ecosystem model simulations, there is no management feedback, meaning no reduction of fishing rates if stocks decline below thresholds.

The Moderately High Catch streams led to nearly 100% declines of Dover sole, ~40% declines of Large flatfish, and ~25% declines of Large demersal predators after 25-30 years (Table A-6). Within the ecosystem model, these three groups can sustain the benchmark, Recent Average Catches, but can’t sustain the large increases in catch (e.g., 11 fold increase for Dover sole) assumed under Moderately High Catch, or the much higher increases assumed under High Catch.

The Moderately High Catch streams led to abundance of all other groups that was within approximately 15% of benchmark (Recent Average Catch) abundances. In summary, the three ecosystem metrics (Ratio of Target Species Biomass to Catch, Abundance of Piscivores and Number of Healthy Assessed Stocks) simply echo the biomass responses of these groundfish species or groups to harvests in the ecosystem model.

A.1.9.3 Indirect Impacts, Assuming Base Ecosystem Model Productivity

Under this base productivity of the ecosystem model, higher catches led to moderate indirect effects through the food web. Under High Catch or Moderately High Catch, abundance of krill was predicted to increase by 1-8% by years 25-30, as predators (groundfish) on krill were removed (Table A-5 and Table A-6). Similarly, shrimp biomass increased in abundance by 3-19%. The strongest indirect effect of the High Catch scenario was an increase in a predator of krill, Large planktivores (mackerel) (30% increase under High Catch and ~10% increase under Moderately High catch). A predator on large planktivores, Miscellaneous pelagic sharks, also therefore increased, though by less than 10%. Cephalopods declined slightly (≤ 6%) due to shark predation (Table A-6).

As predation and competition by harvested groundfish decreased in scenarios with higher catch, Miscellaneous nearshore fish (croaker, sculpin) and Shortbelly rockfish both increased 4% (under Moderately High Catch) and 12% and 8%, respectively (under High Catch). These two groups have low and constant fishing mortality rates that are not varied here, thus the responses are due to food web effects only.

Dolphins and porpoises increased 6% under High Catch and 2% under Moderately High Catch, and other mammal and bird groups showed less than 1% response to increased catches (Table A-6). All other vertebrate and invertebrate groups responded to High Catches by <5%. Overall, the ecosystem model predicted a limited food web response, which should be viewed as a <u>qualitative</u> prediction of potential ecosystem response.

A.1.9.3 Low and High Ecosystem Productivity

A secondary portion of this analysis was to consider the effect of changes in ecosystem model productivity (Figure A-2 and Figure A-3), in combination with the three catch streams. Here, the productivity of the ecosystem model was adjusted to approximate the productivity implied by the 'states of nature' from the 37 stock assessments, as well as the Pacific hake stock assessment.

Similar to when the ecosystem was assumed at Base Productivity, at High Productivity and Low Productivity most ecosystem metrics declined by less than 5% relative to their benchmark values by Year 10 or Year 25-30 (Figure A-2, Figure A-3, Table A-4, and Table A-5). Again, the exceptions are Ratio of Target Species Biomass/Catch (which partially reflects groundfish species tested with the catch streams), and Abundance of Piscivores and Number of Healthy Assessed Stocks (which echo the direct effects forced with the catch streams).

The most extreme mismatch between ecosystem productivity and catch streams occurred in the Low Productivity High Catch scenario, where Abundance of Piscivores fell to 42% of the value in the benchmark scenario by years 25-30. This is due to declines in the same species noted above for the Base Productivity High Catch scenario, with the addition of 20-25% declines in abundance of Pacific hake, Deep small rockfish, and Small flatfish. This is a direct result of the parameterization of lower productivity for these stocks in this scenario. In particular, compared to Base Productivity, at Low Productivity increasing catches from Recent Average Catch to High Catch led to stronger declines (~20% additional decline) in the Yelloweye and cowcod group, Deep large rockfish, Small flatfish, Large demersal predators, and Small demersal sharks (dogfish). Therefore, the direct impact of the catch streams on these species or groups is stronger at Low Productivity than High Productivity.

A.1.10 Conclusions

In summary, the main effect of the catch streams considered here was on the groundfish stocks directly harvested in these simulations. This is reflected in the ecosystem metrics of Piscivores, Number of Healthy Assessed Stocks, and the Ratio of Target Biomass to Catch. These same predictions could also be provided from single species stock assessment projections, and the results here should be compared to predictions from those models.

Food web effects were evident but not common. In the Moderately High Catch scenario, and especially in the extreme High catch scenario, the Atlantis ecosystem model predicted some indirect effects via krill, species linked to krill, and some prey of groundfish. Low catch streams, and resulting model dynamics, are similar to ‘benchmark’ Recent Average Catch.

Ecosystem model high and low productivity states likely bracket the range of uncertainty regarding stock productivity, but it is difficult to place probabilities on these alternate ecosystem model productivities. Overall, most ecosystem metrics responded by <5% regardless of the productivity assumed in the ecosystem model. However, the three ecosystem metrics that directly reflect groundfish abundance are more sensitive to the catch streams at low ecosystem productivity states.

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Table A-1. States of nature from groundfish assessments for the species considered in this analysis. Base case column is colored to indicate the main fixed parameters or data that determined the states of nature. For instance, all yellow rows involve increasing natural mortality M (productive high state of nature) versus decreasing M (unproductive low state of nature).

Stock	**Basis for States of Nature**		
	States of Nature		
	Low	**Base**	**High**
Arrowtooth flounder	Catch = 0.5 * base model		Catch = 2 * base model
	M female = 0.106; M male = 0.234	M female = 0.166; M male = 0.274	M female = 0.246; M male = 0.354
Aurora rockfish	M female = 0.033	M female = 0.035	M female = 0.037
Black rockfish (CA-OR)	Low trawl catch	Medium trawl catch	High trawl catch
	M female = 0.21; M male = 0.14	M female = 0.24; M male = 0.16	M female = 0.27; M male = 0.18
Black rockfish (WA)	M female = 0.18; M male = 0.12	M female = 0.24; M male = 0.16	M female = 0.285; M male = 0.19
Blackgill rockfish S of 40º10’ N lat.	M female = 0.046; M male = 0.048	M female = 0.063; M male = 0.065	M female = 0.086; M male = 0.089
Blue rockfish S of 42º N lat.	High catch stream	Medium catch stream	Low catch stream
	M female = 0.07; M male = 0.09	M female = 0.1; M male = 0.12	M female = 0.13; M male = 0.15
Bocaccio S of 40º10’ N lat.	Upweight trawl logbook and triennial survey time series		Upweight S CA recreational CPUE and CalCOFI larval abun. time series
Cabezon (CA)	M female = 0.2; M male = 0.25	M female = 0.25; M male = 0.3	M female = 0.3; M male = 0.35
Cabezon (OR)	M female = 0.2; M male = 0.25	M female = 0.25; M male = 0.3	M female = 0.3; M male = 0.35
Canary rockfish	h = 0.35	h = 0.51	h = 0.72
Chilipepper rockfish S of 40º10’ N lat.	h = 0.34	h = 0.57	h = 0.81
Copper rockfish S of 42º N lat.	Bottom quartile of starting depletion	Interquartile of starting depletion	Upper quartile of starting depletion
Cowcod (Conception)	12.5% of posterior distribution	50% of posterior distribution	87.5% of posterior distribution
Darkblotched rockfish	M female = 0.036	M female = 0.05	M female = 0.082
Dover sole	M female = 0.11; M male = 0.125	M female = 0.117; M male = 0.142	M female = 0.12; M male = 0.159
English sole	Bottom quartile of starting depletion	Interquartile of starting depletion	Upper quartile of starting depletion
Gopher rockfish S of 40º10’ N lat.	Emphasis of 1 for CPFV CPUE index	Emphasis of 5 for CPFV CPUE index	Emphasis of 10 for CPFV CPUE index

Table A-1 (continued). States of nature from groundfish assessments for the species considered in this analysis. Base case column is colored to indicate the main fixed parameters or data that determined the states of nature. For instance, all yellow rows involve increasing natural mortality M (productive high state of nature) versus decreasing M (unproductive low state of nature).

Stock	Basis for States of Nature		
	States of Nature		
	Low	Base	High
Greenspotted rockfish S of 42º N lat.	M female = 0.056	M female = 0.065	M female = 0.074
Greenstriped rockfish	M female = 0.06	M female = 0.08	M female = 0.1
Lingcod S of 40º10' N lat.	Excludes rec. CPUE index	Includes rec. CPUE data; excludes age data	Includes age data
Lingcod N of 40º10' N lat.	M female = 0.16; M male = 0.285	M female = 0.18; M male = 0.32	M female = 0.2; M male = 0.355
Longnose skate	Low historical catch		High historical catch
	NWFSC survey q = 0.654	NWFSC survey q = 0.83	NWFSC survey q = 1.046
Longspine thornyhead	$\ln(R_0) = 11.5$	$\ln(R_0) = 11.8243$	$\ln(R_0) = 12.3$
Pacific ocean perch	h = 0.35	h = 0.4	h = 0.55
Petrale sole	M female = 0.12	M female = 0.15	M female = 0.19
Rex sole	Bottom quartile of starting depletion	Interquartile of starting depletion	Upper quartile of starting depletion
Rougheye/blackspotted rockfish	M female = 0.037	M female = 0.042	M female = 0.047
Sablefish	12.5% of the asymptotic distribution	50% of the asymptotic distribution	87.5% of the asymptotic distribution
Sharpchin rockfish	Bottom quartile of starting depletion	Interquartile of starting depletion	Upper quartile of starting depletion
Shortspine thornyhead	$\ln(R_0) = 9.7$	$\ln(R_0) = 10.32$	$\ln(R_0) = 11.2$
Spiny dogfish	75% of historic removals	100% of historic removals	150% of historic removals
	M female = 0.061	M female = 0.064	M female = 0.066

Table A-1 (continued). States of nature from groundfish assessments for the species considered in this analysis. Base case column is colored to indicate the main fixed parameters or data that determined the states of nature. For instance, all yellow rows involve increasing natural mortality M (productive high state of nature) versus decreasing M (unproductive low state of nature).

Stock	**Basis for States of Nature**		
	States of Nature		
	Low	**Base**	**High**
Splitnose rockfish	Low recent recruitments (lower 95% CI of 2000-06 rec. devs.)	Recruit devs. estimated in model	High recent recruitments (upper 95% CI of 2000-06 rec. devs.)
Starry flounder (CA)	Trawl logbook CPUE q = 0.00509 (1.33*base model q)	Trawl logbook CPUE q = 0.00383 (1.33*base model q)	Trawl logbook CPUE q = 0.00287 (0.75*base model q)
Starry flounder (OR + WA)	Trawl logbook CPUE q = 0.00496 (1.33*base model q)	Trawl logbook CPUE q = 0.00373 (1.33*base model q)	Trawl logbook CPUE q = 0.00280 (0.75*base model q)
Widow rockfish	h = 0.54	h = 0.76	h = 0.95
Yelloweye rockfish	75% of annual base case catches before 2000	100% of annual base case catches before 2000	150% of annual base case catches before 2000
	h = 0.383	h = 0.441	h = 0.508
Yellowtail rockfish	Bottom quartile of starting depletion	Interquartile of starting depletion	Upper quartile of starting depletion

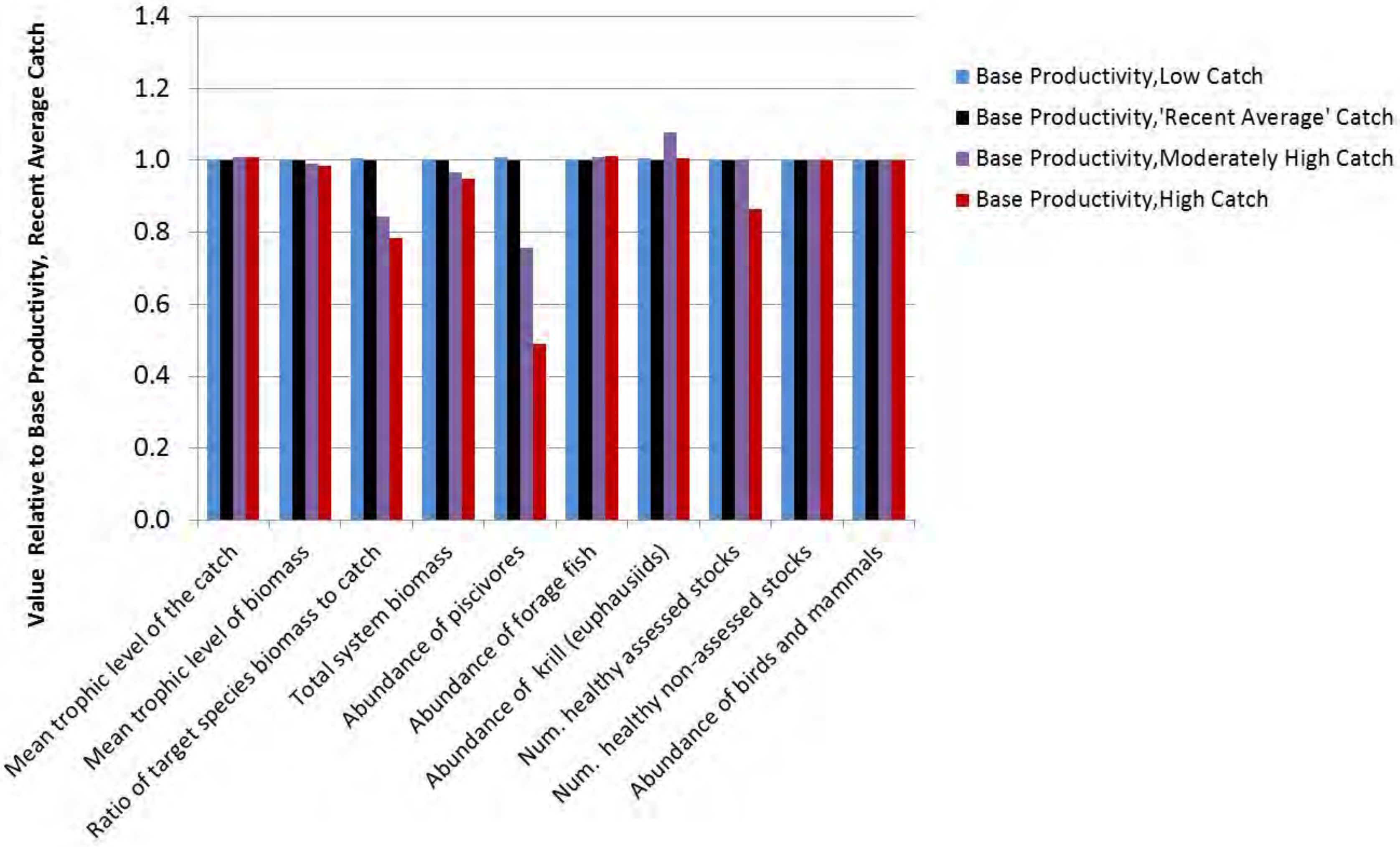

Figure A-1. Value of ecosystem metrics, average over years 25-30. 'Base Productivity' refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream).

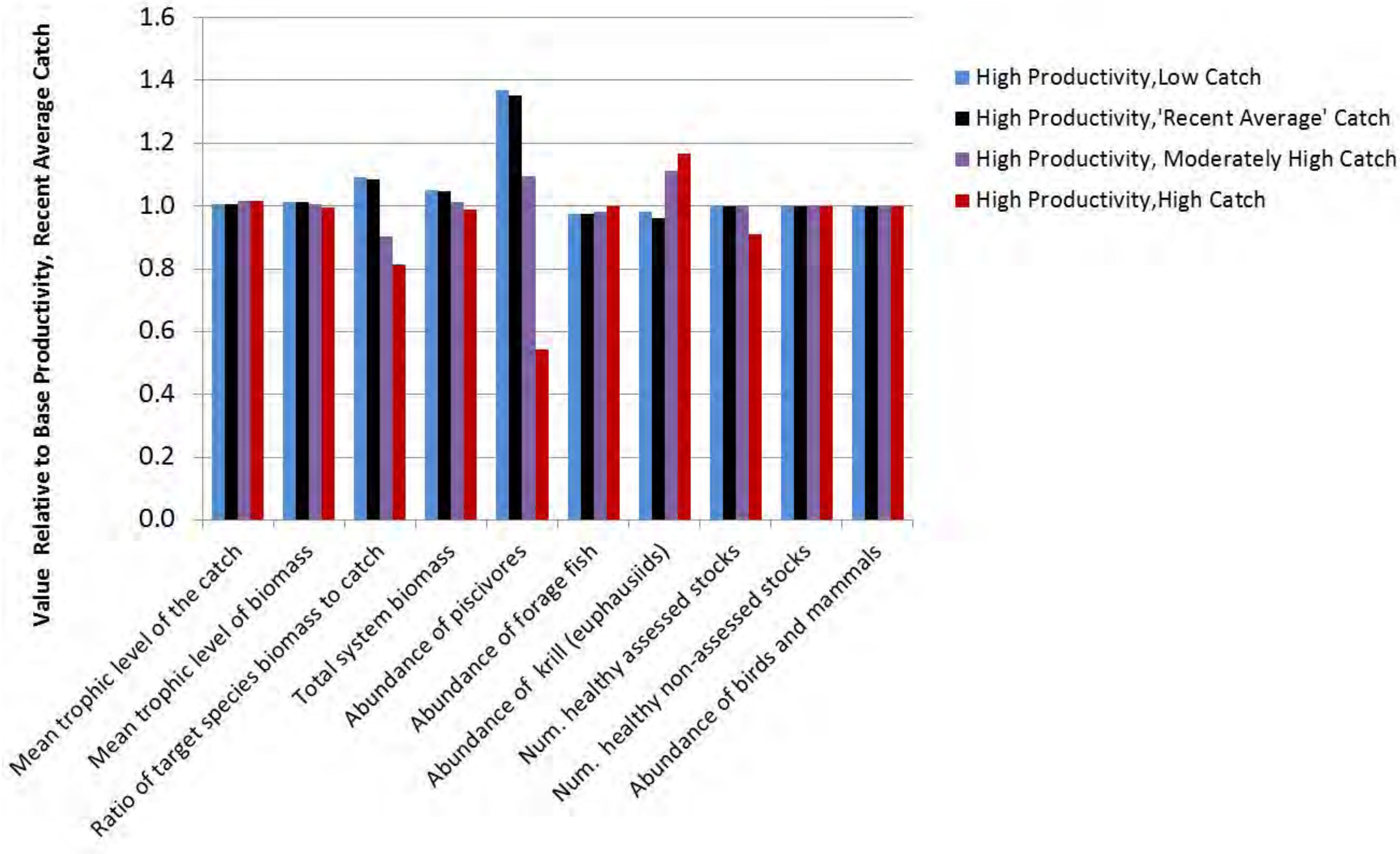

Figure A-2. Value of ecosystem metrics, average over years 25-30. 'High Productivity' refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream).

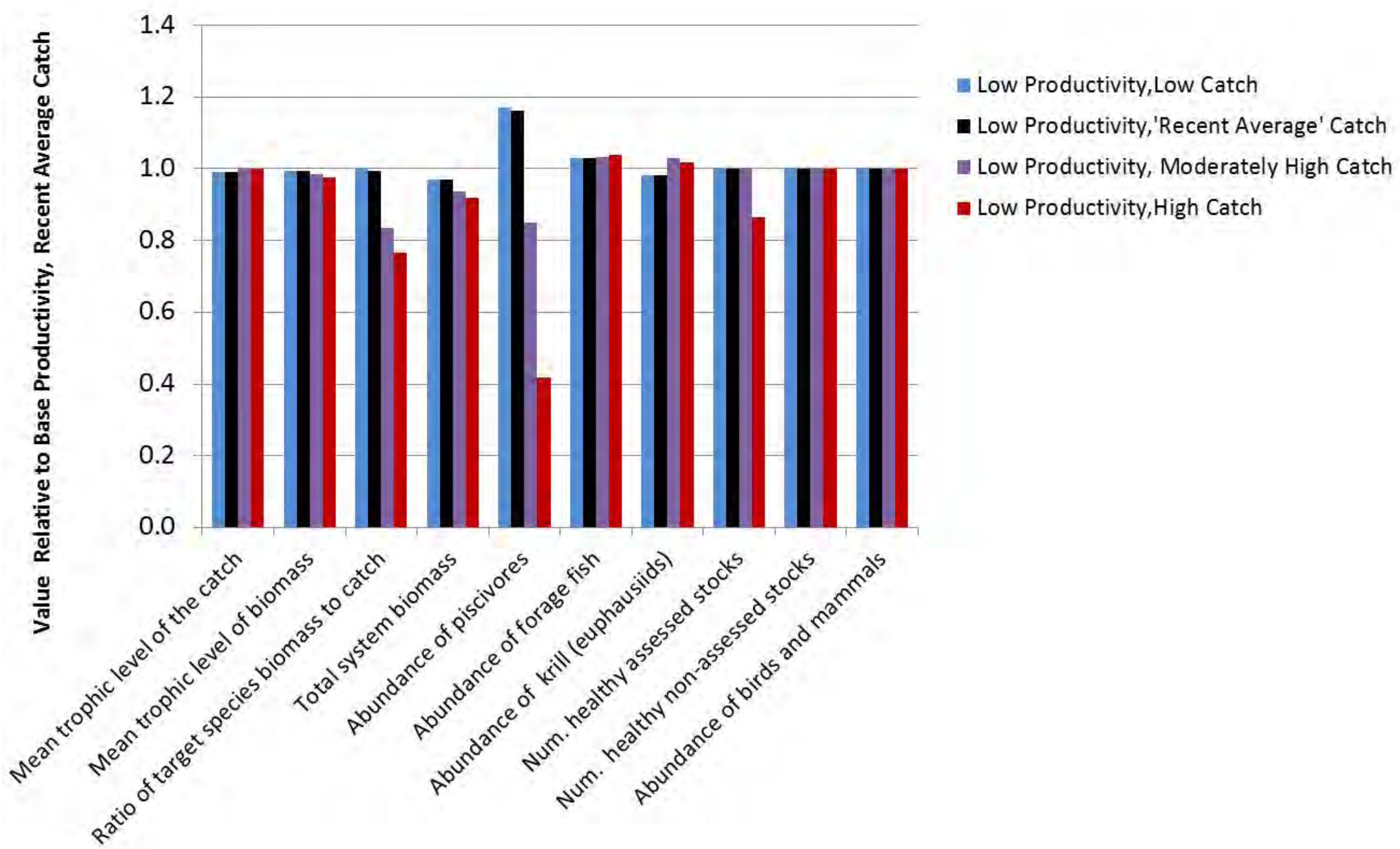

Figure A-3. Value of ecosystem metrics, average over years 25-30. 'Low Productivity' refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream).

Translation of Stock Assessment States of Nature to Ecosystem Model Productivity States

Natural mortality (*M*) translated from Assessment to Atlantis

I calculate the difference between female natural mortality in each assessment state of nature, and female natural mortality in the base case state of nature. I vary natural mortality in the Atlantis model by the equivalent amount. The Atlantis model does not explicitly model separate sexes.

In cases where multiple assessed species comprise a single Atlantis functional group, I weight the increment or decrement to M by the relative biomass of species within the group (Table A-2).

Stock recruit parameters: Translation of ln(Ro) to Atlantis α

The California Current Atlantis model applies a Beverton Holt stock recruit relationship for the fish species considered here:

$$R = \alpha * S / (\beta + S)$$

where R is number of recruits, α represents the maximum number of recruits produced (number of individuals), S is the spawning stock biomass, and β represents the spawning stock biomass at which recruitment is one-half maximum.

I calculate the ratios of *Ro* (equivalent to $e^{ln(Ro)}$) in the stock assessment high and low states of nature relative to *Ro* in the base case, and apply these as multiplicative scalars to the Atlantis parameter α. For instance

$$\alpha_{HighProductivity} = \alpha_{BaseProductivity} * \frac{Ro_{HighStateOfNature}}{Ro_{BaseStateOfNature}}$$

In cases where multiple assessed species comprise a single Atlantis functional group (Table A-2), this scalar applied to the Atlantis parameter α is:

$$\sum_{i=1}^{numSpecies} Ro_{i,thisStateOfNature} \Bigg/ \sum_{i=1}^{numSpecies} Ro_{i,BaseStateOfNature}$$

Stock recruit parameters: Translation of steepness to Atlantis β

In the Atlantis Beverton Holt stock recruit relationship for the fish species considered here:

$$R = \alpha * S / (\beta + S)$$

We can treat β as

$$\beta = S_0 * b$$

Where S_0 is unfished spawning stock biomass, and *b* is the fraction of S_0 at which recruitment is one-half maximum. The value of *b* can be solved for algebraically given the value of steepness (*h*) from each stock assessment.

For each stock assessment case (base, high, and low), I calculated a value of *b* based on steepness. From this I calculate the ratio between the *b* for a high (or low) state of nature, and the base case *b*, and apply these as multiplicative scalars to the Atlantis parameter β . For instance:

$$\beta_{HighProductivity} = \beta_{BaseProductivity} * \frac{b_{HighStateOfNature}}{b_{BaseStateOfNature}}$$

In cases where multiple assessed species comprise a single Atlantis functional group, I first calculate an average of steepness of species in the group, weighted by the relative biomasses of species within the group (Table A-1). This was repeated to obtain a functional-group estimate of steepness for high, base, and low states of nature. Steepness was then converted to b and β as described above.

Stock assessments conducted using XDB-SRA (Extended Depletion-Based Stock Reduction Analysis) use a Schaefer-Pella–Tomlinson–Fletcher production relationship that is distinct from other assessments' stock recruit relationships (Dick and MacCall (2011), Cope et al. (2014)). For species assessed with XDB-SRA, I was not able to adjust the stock recruit parameters. These species are brown, China, and copper rockfish, and cowcod, which are all of relatively low biomass and may therefore be expected to have minimal impacts at the ecosystem scale.

Translation of Stock Assessment Species to Atlantis Functional Groups

The 37 stock assessments involve 16 functional groups within Atlantis. Functional groups are either a single species or aggregates of species with similar life histories, diets, spatial distributions, or fishery characteristics. This aggregation is necessary for computational reasons within the Atlantis model, and due to data availability. For the present analysis, we assign the 37 stocks to a functional group. Species assignments to functional groups are contained in Table A-1.

Table A-2. Assignment of assessed species to Atlantis function groups. Note that 'weight in functional group' may not sum to 1 for functional groups that lack assessments for all species. Asterisk indicates overfished species.

Common name (stock assessment)	Atlantis functional group	Weight in functional group
Canary rockfish*	Canary rockfish*	1
Blackgill rockfish	Deep large rockfish	0.03
Darkblotched rockfish*	Deep large rockfish *	0.27
Rougheye/blackspotted rockfish	Deep large rockfish	0
Shortspine thornyhead	Deep large rockfish	0.68
Aurora rockfish	Deep small rockfish	0.024
Longspine thornyhead	Deep small rockfish	0.53
Sharpchin rockfish	Deep small rockfish	0.21
Splitnose rockfish	Deep small rockfish	0.24
Dover sole	Dover sole	1
Cabezon (All CA)	Large demersal predators	0.01
Cabezon (OR)	Large demersal predators	0.01
Lingcod (WA & OR)	Large demersal predators	0.85
Lingcod (CA)	Large demersal predators	0.13
Arrowtooth flounder	Large flatfish	0.23
Petrale sole	Large flatfish	0.2
Bocaccio*	Midwater rockfish*	0.04
Chilipepper rockfish	Midwater rockfish	0.13
Pacific ocean perch*	Midwater rockfish*	0.04
Widow rockfish	Midwater rockfish	0.48
Yellowtail rockfish	Midwater rockfish	0.29
Pacific whiting	Pacific hake	1
Sablefish	Sablefish	1
Black rockfish (S of Cape Falcon)	Shallow large rockfish	0.06
Black rockfish (N of Cape Falcon)	Shallow large rockfish	0.06
Blue rockfish	Shallow large rockfish	0.087
Greenspotted rockfish (CA N of Pt. Con.)	Shallow large rockfish	0.038
Greenspotted rockfish (CA S of Pt. Con.)	Shallow large rockfish	0.038
Longnose skate	Skates and rays	0.63
Spiny dogfish	Small demersal sharks	0.76
English sole	Small flatfish	0.2
Rex sole	Small flatfish	0.45
Starry flounder (OR & WA)	Small flatfish	0.01
Starry flounder (CA)	Small flatfish	0.01
Gopher rockfish	Small shallow rockfish	0.01
Greenstriped rockfish	Small shallow rockfish	0.28
Yelloweye rockfish*	Yelloweye and Cowcod*	0.85

Table A-3. Catch streams from stock assessments, translated to catches of Atlantis ecosystem model functional groups. Catches in metric tons per year.

Year	Small shallow rockfish	Deep small rockfish	Small flatfish	Deep large rockfish	Dover sole	Midwater rockfish	Sablefish	Canary rockfish	Large flatfish	Large demersal predators	Small demersal sharks
High Catch Stream											
2015	12758	12527	13490	11140	143855	15315	10829	1361	55696	7822	5722
2016	12060	12090	10152	10959	120245	14421	11552	1348	47355	7027	5670
2017	11407	11616	8235	10769	103976	13939	12129	1338	42752	6366	5619
2018	10805	11116	7187	10578	92765	13431	12521	1333	40223	5834	5569
2019	10256	10610	6626	10393	84983	13058	12751	1330	38833	5413	5521
2020	9760	10118	6230	10217	79503	12655	12812	1329	38027	5081	5475
2021	9316	9659	5931	10050	75559	12264	12766	1329	37499	4819	5429
2022	8920	9237	5725	9891	72635	12014	12729	1331	37108	4611	5385
2023	8569	8857	5572	9740	70386	11798	12664	1334	36798	4445	5342
2024	8257	8530	5459	9597	68580	11517	12601	1337	36554	4311	5301
Moderately High Catch Stream											
2015	1397	7982	9860	2308	86098	4873	6909	119	13270	5782	2346
2016	1348	7793	7424	2308	73526	4873	7524	119	11938	5279	2330
2017	1300	7570	6075	2308	64462	4873	8063	119	10922	4868	2314
2018	1254	7324	5267	2308	57974	4873	8486	119	10173	4545	2298
2019	1211	7068	4826	2308	53329	4873	8795	119	9648	4295	2282
2020	1170	6817	4542	2308	49981	4873	8978	119	9297	4103	2266
2021	1132	6579	4368	2308	47536	4873	9072	119	9068	3956	2251
2022	1096	6363	4231	2308	45712	4873	9155	119	8917	3840	2237
2023	1064	6172	4132	2308	44308	4873	9203	119	8814	3749	2222
2024	1035	6006	4061	2308	43187	4873	9238	119	8739	3675	2208

Table A-3 (continued). Catch streams from stock assessments, translated to catches of Atlantis ecosystem model functional groups. Catches in metric tons per year.

Year	Small shallow rockfish	Deep small rockfish	Small flatfish	Deep large rockfish	Dover sole	Midwater rockfish	Sablefish	Canary rockfish	Large flatfish	Large demersal predators	Small demersal sharks
Base Catch Stream, Equivalent to Recent Average Catch											
2015	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2016	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2017	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2018	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2019	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2020	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2021	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2022	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2023	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
2024	21	1065	207	1249	7551	1760	6485	47	4027	1168	1619
Low Catch Stream											
2015	21	1065	207	950	7551	1760	2452	0	4027	1168	472
2016	21	1065	207	966	7551	1760	2898	0	4027	1168	475
2017	21	1065	207	981	7551	1760	3347	0	4027	1168	478
2018	21	1065	207	994	7551	1760	3767	0	4027	1168	480
2019	21	1065	207	1007	7551	1760	4136	0	4027	1168	482
2020	21	1065	207	1020	7551	1760	4437	0	4027	1168	484
2021	21	1065	207	1033	7551	1760	4676	0	4027	1168	486
2022	21	1065	207	1047	7551	1760	4887	0	4027	1168	487
2023	21	1065	207	1060	7551	1760	5059	0	4027	1168	489
2024	21	1065	207	1073	7551	1760	5205	0	4027	1168	490

Table A-4. Value of ecosystem metrics at year 10. 'Productivity' refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream). For visual interpretation, cells are colored proportional to the cell value, ranging from lowest (red) to highest (green), with yellow indicating a value of 1.

	Mean trophic level of the catch	Mean trophic level of biomass	Ratio of target species biomass to catch	Total system biomass	Abundance of piscivores	Abundance of forage fish	Abundance of krill (euphausiids)	Num. healthy assessed stocks	Num. healthy non-assessed stocks	Abundance of birds and mammals
Low Productivity,Low Catch	1.00	1.00	1.02	0.99	1.13	1.01	1.00	1.00	1.00	1.00
Low Productivity,'Recent Average' Catch	1.00	1.00	1.01	0.99	1.12	1.01	1.00	1.00	1.00	1.00
Low Productivity,Moderately High Catch	1.00	0.99	0.91	0.97	0.86	1.01	0.99	0.90	1.00	1.00
Low Productivity,High Catch	1.00	0.99	0.91	0.96	0.47	1.01	0.97	0.70	1.00	1.00
Base Productivity,Low Catch	1.00	1.00	1.00	1.00	1.01	1.00	1.00	1.00	1.00	1.00
Base Productivity,'Recent Average' Catch	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Base Productivity,Moderately High Catch	1.00	1.00	0.90	0.98	0.78	1.00	0.99	0.90	1.00	1.00
Base Productivity,High Catch	1.00	0.99	0.90	0.97	0.50	1.00	0.97	0.75	1.00	1.00
High Productivity,Low Catch	1.00	1.00	1.02	1.01	1.15	0.99	0.99	1.00	1.00	1.00
High Productivity,'Recent Average' Catch	1.00	1.00	1.02	1.01	1.14	0.99	0.99	1.00	1.00	1.00
High Productivity, Moderately High Catch	1.00	1.00	0.92	0.99	0.95	0.99	0.98	0.90	1.00	1.00
High Productivity,High Catch	1.01	0.99	0.90	0.98	0.55	1.01	0.97	0.85	1.00	1.00

Table A-5. Value of ecosystem metrics, average over years 25-30. 'Productivity' refers to productivity of the ecosystem model, which is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream). For visual interpretation, cells are colored proportional to the cell value, ranging from lowest (red) to highest (green), with yellow indicating a value of 1.

	Mean trophic level of the catch	Mean trophic level of biomass	Ratio of target species biomass to catch	Total system biomass	Abundance of piscivores	Abundance of forage fish	Abundance of krill (euphausiids)	Num. healthy assessed stocks	Num. healthy non-assessed stocks	Abundance of birds and mammals
Low Productivity,Low Catch	0.99	0.99	1.00	0.97	1.17	1.03	0.98	1.00	1.00	1.00
Low Productivity,'Recent Average' Catch	0.99	0.99	0.99	0.97	1.16	1.03	0.98	1.00	1.00	1.00
Low Productivity, Moderately High Catch	1.00	0.98	0.84	0.94	0.85	1.03	1.03	1.00	1.00	1.00
Low Productivity,High Catch	1.00	0.98	0.77	0.92	0.42	1.04	1.02	0.86	1.00	1.00
Base Productivity,Low Catch	1.00	1.00	1.01	1.00	1.01	1.00	1.01	1.00	1.00	1.00
Base Productivity,'Recent Average' Catch	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Base Productivity,Moderately High Catch	1.01	0.99	0.84	0.97	0.76	1.01	1.08	1.00	1.00	1.00
Base Productivity,High Catch	1.01	0.98	0.78	0.95	0.49	1.01	1.01	0.86	1.00	1.00
High Productivity,Low Catch	1.01	1.01	1.09	1.05	1.37	0.97	0.98	1.00	1.00	1.00
High Productivity,'Recent Average' Catch	1.01	1.01	1.08	1.05	1.35	0.97	0.96	1.00	1.00	1.00
High Productivity, Moderately High Catch	1.02	1.00	0.90	1.01	1.10	0.98	1.11	1.00	1.00	1.00
High Productivity,High Catch	1.02	0.99	0.81	0.99	0.54	1.00	1.17	0.91	1.00	1.00

Table A-6. Predicted biomass per functional group, under base ecosystem productivity, average over years 25-30. The model is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Groups with catches specified by these alternate catch streams are denoted by red text. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream).

	Base Productivity, Low Catch	Base Productivity, Recent Average Catch	Base Productivity, Moderately High Catch	Base Productivity, High Catch
Large planktivores	1.00	1.00	1.11	1.33
Canary rockfish	1.01	1.00	1.03	0.72
Small planktivores	1.00	1.00	1.01	1.01
Large flatfish	1.00	1.00	0.57	0.00
Shortbelly rockfish	1.00	1.00	1.04	1.08
Large demersal predators	1.00	1.00	0.76	0.59
Salmon	1.00	1.00	1.00	1.00
Large pelagic predators	1.00	1.00	1.00	1.01
Migrating birds	1.00	1.00	1.00	1.00
Pacific hake	1.00	1.00	1.00	1.01
Sablefish	1.12	1.00	0.84	0.61
Deep vertical migrators	1.00	1.00	1.01	1.01
Deep misc. fish	1.00	1.00	1.00	1.00
Misc. nearshore fish	1.00	1.00	1.04	1.12
Midwater rockfish	1.00	1.00	0.98	0.79
Surfperch	1.00	1.00	0.99	0.99
Dover sole	1.00	1.00	0.04	0.00
Small shallow rockfish	1.00	1.00	0.90	0.00
Deep small rockfish	1.00	1.00	0.93	0.88
Deep large rockfish	1.01	1.00	0.96	0.63
Small flatfish	1.00	1.00	0.98	0.98
Small demersal sharks	1.22	1.00	0.91	0.29
Large demersal sharks	1.00	1.00	1.00	1.00
Yelloweye and cowcod	1.00	1.00	0.98	0.66
Misc. pelagic sharks	1.00	1.00	1.03	1.09
Shallow large rockfish	0.99	1.00	0.86	0.69
Skates and rays	1.00	1.00	0.90	0.87
Surface seabirds	1.00	1.00	1.00	1.00
Diving seabirds	1.00	1.00	1.00	1.00
Pinnipeds	1.00	1.00	1.00	1.00
Transient orcas	1.00	1.00	1.00	1.00
Baleen whales	1.00	1.00	1.00	1.00
Dolphins and porpoises	1.00	1.00	1.02	1.06
Toothed whales	1.00	1.00	1.00	1.01
Sea otter	1.00	1.00	1.00	1.00
Cephalopods	1.00	1.00	0.97	0.94

Table A-6 (continued). Predicted biomass per functional group, under base ecosystem productivity, average over years 25-30. The model is forced by catch streams (low, high, moderately high, or recent average) taken from stock assessments. Groups with catches specified by these alternate catch streams are denoted by red text. Values are reported relative to benchmark scenario (Base productivity and Recent Average catch stream).

	Base Productivity, Low Catch	Base Productivity, Recent Average Catch	Base Productivity, Moderately High Catch	Base Productivity, High Catch
Shallow benth. filt feeders	1.00	1.00	1.00	1.00
Other benthic filter feeders	1.00	1.00	1.02	1.03
Deep benthic filter feeders	1.00	1.00	1.00	1.00
Benthic herb. grazers	1.00	1.00	1.00	1.00
Deep macrozoobenthos	1.00	1.00	1.00	1.00
Megazoobenthos	1.00	1.00	1.00	1.00
Shallow macrozoobenthos	1.00	1.00	1.00	1.00
Shrimp	1.00	1.00	1.03	1.19
Large zooplankton	1.01	1.00	1.08	1.01
Deposit feeders	1.00	1.00	1.00	0.99
Macroalgae	1.00	1.00	1.00	1.00
Seagrass	1.00	1.00	1.00	1.00
Carnivorous infauna	1.00	1.00	1.00	1.01
Gelatinous zooplankton	1.00	1.00	0.99	1.00
Large phytoplankton	1.00	1.00	0.99	1.00
Small phytoplankton	1.00	1.00	1.01	1.01
Mesozooplankton	1.00	1.00	0.99	1.00
Microzooplankton	1.00	1.00	1.00	0.97
Pelagic bacteria	1.00	1.00	1.00	0.99
Benthic bacteria	1.00	1.00	1.01	1.00
Meiobenthos	0.99	1.00	0.99	0.99
Labile detritus	1.00	1.00	1.00	1.00
Refractory detritus	1.00	1.00	1.00	0.99

A.2 Input-Output Model for Pacific Coast Fisheries, 2013 Revisions and Extensions

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Abbreviations and Acronyms

AKFIN	Alaska Fisheries Information Network
BEA	Bureau of Economic Analysis
CDFG	California Department of Fish and Game
EDC	Economic Data Collection Program
IMPLAN	Impact Analysis for Planning (regional input-output software)
IO	input-output
IO-PAC	input-output model for Pacific Coast fisheries
NAICS	North American Industry Classification System
NERIOM	Northeast Region Commercial Fishing Input-Output Model
NMFS	National Marine Fisheries Service
NWFSC	Northwest Fisheries Science Center
ODFW	Oregon Department of Fish and Wildlife
PSMFC	Pacific States Marine Fisheries Commission
PacFIN	Pacific Fisheries Information Network
WDFW	Washington Department of Fish and Wildlife
WDOR	Washington Department of Revenue

A.2.1 Introduction

The NWFSC's Input-Output model for Pacific Coast Fisheries (IO-PAC) is designed to estimate the changes in economic contributions and economic impacts resulting from policy, environmental, or other changes that affect fishery harvest. IO-PAC was built by customizing the Impact Analysis for Planning (IMPLAN) regional input-output software. The original methodology employed in developing this model was similar to that used in the Northeast Fisheries Science Center's Northeast Region Commercial Fishing Input-Output Model (Steinback and Thunberg, 2006). The development and design of IO-PAC is documented in detail in Leonard and Watson (2011). This paper presents recent updates to IO-PAC. The updates presented are part of an ongoing effort to continually improve the IO-PAC model with the latest available data and improvements in regional impact modeling capabilities. The updates of IO-PAC include incorporating more recent available data, the addition of a recreational fishing component, the addition of separate catcher processor and mothership sectors, and revisions to the model construction.

The data updates made to date include the following. One, the underlying Impact Analysis for Planning (IMPLAN) data is changed from the 2006 base year to 2010. Two, the fish-ticket (landings) data from

Pacific Fisheries Information Network (PacFIN) is changed from 2006 to 2012. Three, the commercial vessel production functions incorporate the latest data from the voluntary Limited Entry and Open Access Surveys conducted by the Norwest Fisheries Science Center. Four, it incorporates data collected as part of the Economic Data Collection (EDC) program for first receivers and shorebased processors. Five, it incorporates data from the 2011 Marine Recreational Expenditure Survey.

The addition of a recreational fishing component involves incorporating data collected on marine recreational expenditures (Lovell et al. 2013), charter vessel cost earnings data collected by the Pacific States Marine Fisheries Commission and Southwest Fisheries Science Center (Pacific States Marine Fisheries Commission, 2004) and the Northwest Fisheries Science Center in 2006.

The revisions to IO-PAC construction are done to reduce effort involved in making changes to fishing sector production functions over time and simplify the process of building numerous port level models. 2010 IMPLAN data uses the Version 3 software update of IMPLAN. The original version of IO-PAC modified IMPLAN Version 2 software. Transitioning the unique fishing industry information in IO-PAC from IMPLAN Version 2 to Version 3, provides numerous initial obstacles, but ultimately enables a more efficient method to incorporate fishing sector production function changes and changing model study areas.

A.2.2 IMPLAN Data

IMPLAN collects, organizes, and econometrically estimates the data that is necessary to construct regional economic impact models. These data, collectively referred to as the region's social accounts, consist of purchases of inputs, labor, and capital by the respective sectors of the economy, the production of each sector, household demands in the region, sources of income of households in the region, taxes paid and government spending in the region, and the region's imports and exports. IMPLAN constructs county-level social accounts based on a variety of data sources including the U.S. Census Bureau, U.S. Bureau of Economic Analysis (BEA), and employment and wages covered by unemployment insurance data.

The current update to IO-PAC changes the underlying IMPAN data from 2006 to 2010. The IMPLAN data are used in IO-PAC to characterize the non-fishing economy of the regions such as the agricultural, manufacturing, trade, and service sectors, as well as the various institutions in the region such as households and governments. A major revision in the industry sectoring scheme was made in the 2008 IMPLAN data. In 2008 the IMPLAN data transitioned to 440 unique industry sectors from the 509 used in 2006. This change necessitated a new mapping of factor expenditures made by seafood harvesters and wholesalers into IMPLAN sectors. The new mapping scheme for the 440 IMPLAN sectors is presented in detail in Appendix A.

A.2.3 PacFIN Data

The current update changes the fish-ticket data utilized by IO-PAC from 2006 to 2012. PacFIN data include fish ticket and vessel registration information that is supplied by California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), and Washington Department of Fish and Wildlife (WDFW). Each time a commercial fishing vessel lands fish along the West Coast, it is documented by a fish ticket. For all commercial landings sold to shoreside wholesale fish dealers or processors, the fish buyers are required to fill out a fish ticket that describes the species, weight, and total price paid for the fish purchased. If a commercial fishing harvester sells directly to consumers, the harvester is responsible for recording the receipts, filling out fish tickets, and remitting the information to the appropriate state agency. These data, when aggregated into vessel classifications and commodity types, comprise the total revenue or industry output estimates that are included in the model. PacFIN also contains information on the vessel identification of the seller, gear type used to catch the fish, date of transaction, and port where the fish were landed. Vessel registration information supplied by the states includes some physical characteristics such as length and engine horsepower. Table A-7 provides of a summary of the data that is currently used in IO-PAC, and its application. For commercial fishing vessels, it indicates that the PacFIN data are used in generating vessel production functions, estimates of total industry output (revenue), and total vessel employment. For processors the data are used in generating processor industry output and processor employment[1].

The IO-PAC update makes two changes in how the PacFIN data are used in the model. Previously, the length of the vessel, which is contained in PacFIN, was used in conjunction with moorage rates by length at a sample of ports along the West Coast to estimate average annual moorage expenditures by vessel classification. This approach to estimating moorage expenditures is no longer necessary due to changes in the NWFSC's cost earnings surveys. The cost earnings surveys now directly query vessel owners about moorage expenditures. Additionally, PacFIN data is no longer used exclusively to assign vessels to the Radtke and Davis (2000) classification scheme. Because PacFIN contains fish-ticket data from only shoreside landings made on the West Coast, there are no landings data for Alaska fisheries vessels and at-sea vessels (motherships and catcher processors). In the last version of IO-PAC both of these vessel classifications were blank, so impacts could not be estimated for these sectors. In this update vessels are assigned to the Alaska category by using information derived from the Alaska Fisheries Information Network (AKFIN). For vessel IDs that appear in PacFIN, personnel from the Pacific States Marine Fishery Commission (PSMFC) provided data that indicates whether a vessel had landings in Alaska in 2008. Vessels with landings in Alaska were assigned to the Alaska fisheries vessel category.

[1] For a detailed discussion of how the PacFIN data fulfills these roles, see Leonard and Watson (2010).

Table A-7. IO-PAC data sources and applications.

	Open Access Survey (2009, 2008)	Limited Entry Fixed Gear Survey (2010, 2009)	Marine Rec. Exp. Survey (2011)	WA and OR Charter Vessel Survey (2006)	West Coast Charter Vessel Survey (2000)	EDC DATA (2011)
Data Year	2009	2010	2011	2006	2000	2011
Application						
Commercial Vessels						
Production Functions	X	X				X
Vessel Industry Output				X	X	X
Vessel Employment	X	X				X
Processors						
Production Functions						X
Processor Industry Output						X
Processor Employment						X
Recreational Fishing						
Expenditures			X			
Charter Prod. Functions				X	X	
Charter Industry Output			X	X	X	
Charter Employment			X	X	X	
Non-Fishing Data						

Table A-7 (continued horizontally). IO-PAC data sources and applications.

	IMPLAN	PacFIN Fish Ticket
Data Year	2010	2012
Application		
Commercial Vessels		
Production Functions		X
Vessel Industry Output	X	X
Vessel Employment		X
Processors		
Production Functions	X	
Processor Industry Output	X	X
Processor Employment	X	X
Recreational Fishing		
Expenditures		
Charter Prod. Functions		
Charter Industry Output		
Charter Employment		
Non-Fishing Data	X	

A.2.4 Commercial Fisheries Economic Data

Cost earnings surveys provide the data necessary to construct the commercial fishing vessel and processor production functions. Since the last version of IO-PAC, the EDC program has been established as a data source. Previously, the model relied solely on the voluntary limited entry trawl, limited entry fixed gear, and open access surveys for commercial fishery cost data. The commercial vessel production functions now rely on EDC data for limited-entry trawl, catcher processors, motherships and shorebased processors.

A.2.4.1 Voluntary Cost-Earnings Surveys

The vessel production functions currently use data from the most recent voluntary, limited entry fixed gear survey and open access survey. Since the first version of IO-PAC was completed, the voluntary surveys have been reprised. Because of the expanded scope and increased detail of the more recent surveys, incorporating the data has the added benefit of likely increasing the accuracy of IO-PAC, especially for vessel classifications that were previously not covered or partially covered. The expanded scope is the result of a changed target population of the open access survey. The increased detail is the result of an increased number of cost categories for all the voluntary surveys. These additional cost categories permit improved specification of the production functions. Previous costs categories used in the model included fuel and oil; food and crew provisions; ice; bait; repairs, maintenance, and improvements; insurance; permit leases; permit purchases; interest and financial services; crew expense; and captain expense. The new additional cost categories include moorage, enforcement, dues, offloading, and trucking. Responses to the surveys can be easily matched to vessel landings by species, gear type, physical characteristics, and permit information contained in PacFIN. A short description of the surveys follows[2].

The survey population for the limited entry fixed gear survey consisted of all vessels with a limited entry fixed gear permit and at least $1,000 in landings in 2010. This survey collected information for 2009 and 2010, and used in-person interviews. There were 57 completed responses out of a total of 138 vessels for a response rate of 41%. The principle classification of respondents was sablefish (*Anoplopoma fimbria*) fixed gear, and other vessel classifications covered were Alaska, crabber, other groundfish fixed gear, and other < $15,000.

The survey population for the open access survey consisted of all commercial fishing vessels that: 1) landed at least $1,000 of salmon, groundfish, crab or shrimp at West Coast ports during 2008, 2) had at least one trip on which groundfish, salmon, crab or shrimp accounted for a majority of revenue from landings, and 3) did not hold a limited entry permit. Survey data was collected via in-person interviews and mail questionnaires. The population of targeted vessels for the most recent survey was expanded considerably from the 2005 and 2006 version because of the addition of crab and shrimp to the first two requirements. There were 1,712 vessels that met the above three requirements, and 1,098 vessels for which a telephone and address was obtainable. There were 440 completed responses for a response rate of 40.0% among those vessels where contact information was available. Responses came from vessels classified as Alaska, crabber, sablefish fixed gear, other groundfish, salmon troller, salmon netter, shrimper, and other less than $15,000.

A.2.4.2 Mandatory EDC Surveys

In January 2011, the West Coast groundfish trawl fishery transitioned to a new, management approach known as a Catch Share Program. The Catch Share Program consists of an IFQ program for the shorebased trawl fleet and cooperative programs for the at-sea mothership and CP trawl fleets. The economic benefits of the West Coast groundfish trawl fishery and their distribution will likely change under trawl rationalization. To monitor these changes, the rationalization program includes a mandatory

[2] For a more detailed description of the survey programs and summary statistics used in constructing the production functions, see the forthcoming NOAA Technical Memoranda by Lian.

economic data collection program. Using data collected from industry members, the EDC program monitors whether the goals of the Catch Share Program have been met. The EDC program will also help meet the requirements of the Magnuson-Stevens Act for catch share evaluation. The regulations detailing the Economic Data Collection program are available in 50CFR 660.114.

The EDC program collects vessel/plant characteristics, capitalized investments, annual expenses, annual earnings, crew/labor payments, and quota and permit expenses from the following types of businesses.

> Limited Entry Trawl Catcher Vessels - All owners, lessees, and charterers of a catcher vessel registered to a limited entry trawl endorsed permit.
>
> Motherships - All owners, lessees, and charterers of a mothership vessel registered to a mothership permit.
>
> CPs - All owners, lessees, and charterers of a catcher processor vessel registered to a CP-endorsed limited entry trawl permit.
>
> First Receivers/Shorebased Processors - All owners and lessees of a shorebased processor that received round or headed-and-gutted IFQ species groundfish or whiting from a first receiver, and all owners of a first receiver site license in 2011 and beyond.

The EDC data are used for several purposes in IO-PAC. For the shoreside trawl catcher vessel fleet, the EDC data replace the voluntary trawl survey data previously used. Additionally, it provides the first cost earnings data to permit the inclusion of the at-sea fleet (motherships and catcher processors) in the model. Last, it provides the data necessary to replace the default IMPLAN approach to generating shorebased processing employment, industry output (revenue), and production function used in the previous version IO-PAC. The default IMPLAN processor approach used in the previous version of IO-PAC had notable disadvantages, particularly that all species contained in IO-PAC were limited to the same markup to develop processor impacts.

A.2.5 The IO-PAC Model

Several aspects of the IO-PAC model are modified in the revision. To the existing vessel classification scheme in IO-PAC, the revision adds vessel sectors for motherships, catcher processors, and charter recreational fishing vessels. The underlying product flow assumptions are changed. The commercial vessel production functions are changed through the inclusion of more recent cost earnings data. Processor sector production functions and estimates of appropriate processor markups for different species are altered through the use of EDC data. Last, a recreational module is added to enable impact and contribution estimates of recreational fishing.

A.2.5.1 Industry/Commodity Scheme

The revised industry classification scheme modifies the Radtke and Davis (2000) vessel classification scheme by separating motherships and catcher processors and adding a sector for recreational charter vessels. In the Radtke and Davis (2000) sector scheme motherships and catcher processors are grouped together. In the revision they are separated into two industry classifications. The addition of a sector for recreational charter vessels is discussed in detail in Section 5.5 below. The IO-PAC codes for the industry sectors included in the model are displayed in Table A-8. The classification rules for the commercial fleet are presented in Table A-9. The classification scheme is hierarchical. Working from the top down, the rule description of the category that is met, is the classification for a vessel.

Table A-8. Industry categories and associated IMPLAN codes.

IO-PAC Code	Category description
509	Catcher processor
510	Mothership
511	Alaska fisheries vessel
512	Pacific whiting trawler
513	Large groundfish trawler
514	Small groundfish trawler
515	Sablefish fixed gear
516	Other groundfish fixed gear
517	Pelagic netter
518	Migratory netter
519	Migratory liner
520	Shrimper
521	Crabber
522	Salmon troller
523	Salmon netter
524	Other netter
525	Lobster vessel
526	Diver vessel
527	Other, more than $15,000
528	Other, less than $15,000
561	Bait ship
563	Wholesale seafood dealers
570	Recreational charter

Table A-9. Vessel sectors used in the IO-PAC. Modified from Radtke and Davis (2000).

Order	Vessel sector	Rule description
1	Catcher processor	Vessel registered to a catcher processor permit.
2	Mothership	Vessel registered to a mothership permit.
3	Alaska fisheries vessel	Alaska revenue is > 50% of vessel's total revenue.
4	Pacific whiting offshore and onshore trawler	Pacific whiting (*Merluccius productus*) PacFIN revenue plus U.S. West Coast offshore revenue is > 33% of vessel total revenue and total revenue is > $100,000.
5	Large groundfish trawler	Groundfish (including sablefish, halibut, and California halibut [*Paralichthys californicus*]) revenue from other than fixed gear is > 33% of vessel total revenue and total revenue is > $100,000.
6	Small groundfish trawler	Groundfish (including sablefish, halibut, and California halibut) revenue from other than fixed gear is > 33% of vessel total revenue and total revenue is > $15,000.
7	Sablefish fixed gear	Sablefish revenue from fixed gear is > 33% of vessel total revenue and total revenue is > $15,000.
8	Other groundfish fixed gear	Groundfish (including halibut and California halibut), other than sablefish, revenue from fixed gear is > 33% of vessel total revenue and total revenue is > $15,000.
9	Pelagic netter	Pelagic species revenue is > 33% of vessel total revenue and total revenue is > than $15,000.
10	Migratory netter	Highly migratory species revenue from gear other than troll or line gear is > 33% of vessel total revenue and total revenue is > $15,000.
11	Migratory liner	Highly migratory species revenue from troll or line gear is > 33% of vessel total revenue and total revenue is > $15,000.
12	Shrimper	Shrimp revenue is > 33% of vessel total revenue and total revenue is > $15,000.
13	Crabber	Crab revenue is > 33% of vessel total revenue and total revenue is > $15,000.
14	Salmon troller	Salmon revenue from troll gear is > 33% of vessel total revenue and total revenue is > $5,000.
15	Salmon netter	Salmon revenue from gill or purse seine gear is > 33% of vessel total revenue and total revenue is > $5,000.
16	Other netter	Other species revenue from net gear is > 33% of vessel total revenue and total revenue is > $15,000.
17	Lobster vessel	Lobster revenue is > 33% of vessel total revenue and total revenue is > $15,000.
18	Diver vessel	Revenue from sea urchins, geoduck (*Panopea abrupta*), or other species by diver gear is > 33% of vessel total revenue and total revenue is > $5,000.
19	Other > $15,000	All other vessels not above with total revenue > $15,000.
20	Other ≤ $15,000	All other vessels not above with total revenue ≤ $15,000.

The IO-PAC revision does not alter the commodities added to IMPLAN. The commodities are displayed in Table A-10, and include 32 different species/gear combinations as well as one bait commodity. The gear type portion of the commodity classification was constructed by grouping PacFIN fish ticket data with the gear categories presented in Table A-11.

Table A-10. Commodities added to IMPLAN and associated codes.

IO-PAC Code	Species and gear combinations
529	Whiting, at sea
530	Whiting, trawl
531	Whiting, fixed gear
532	Sablefish, trawl
533	Sablefish, fixed gear
534	Dover/thornyhead, trawl
535	Dover/thornyhead, fixed gear
536	Other groundfish, trawl
537	Other groundfish, fixed gear
538	Other groundfish, net
539	Crab, trawl
540	Crab, fixed gear
541	Crab, net
542	Crab, other gear
543	Shrimp, trawl
544	Shrimp, fixed gear
545	Salmon, trawl
546	Salmon, fixed gear
547	Salmon, net
548	Highly migratory species, fixed gear
549	Highly migratory species, net
550	Coastal pelagic species, trawl
551	Coastal pelagic species, fixed gear
552	Coastal pelagic species, net
553	Coastal pelagic species, other gear
554	Halibut, trawl
555	Halibut, fixed gear
556	Halibut, net
557	Other species, trawl
558	Other species, fixed gear
559	Other species, net
560	Other species, other gear
562	Bait

Table A-11. Gear groupings and associated PacFIN variables.

IO-PAC	Gear ID	Description
Trawl	TWL	Trawls except shrimp trawls
Trawl	TWS	Shrimp trawls
Fixed gear	NTW	Nontrawl gear
Fixed gear	HKL	Hook and line gear except troll
Fixed gear	TLS	Troll gear
Fixed gear	POT	Pot and trap gear
Net	NET	Net gear except trawl
Other gear	MSC	Other miscellaneous gear
Other gear	DRG	Dredge gear

The total landings by vessel type and species/gear combinations are displayed in Table A-12. Landings are classified in the species/gear classifications even if species for particular gear types are considered bycatch.

Table A-12. Landings by vessel type and commodity code, 2012 value ($).

IMPLAN code	Species and gear combinations	Vessel classification 511	512	513	514	515	516
529	Whiting, at sea						
530	Whiting, trawl	4,180,920	16,068,218	196,799	194,596		
531	Whiting, fixed gear					1,776	9
532	Sablefish, trawl	130,366	567,313	4,514,073	29,955	16,814	
533	Sablefish, fixed gear	2,451,307	328,698	63,023	6,032	14,174,786	183,881
534	Dover/thornyhead, trawl	27,471	490,942	7,327,862	66,764	21,744	
535	Dover/thornyhead, fixed gear	36,714		1,830	69	874,941	541,715
536	Other groundfish, trawl	165,730	1,128,407	7,839,678	213,820	46,821	
537	Other groundfish, fixed gear	45,131	199	2,855	534	549,742	2,117,212
538	Other groundfish, net			1,511	481		8
539	Crab, trawl			3,102	19		
540	Crab, fixed gear	5,634,280	1,182,112	2,846,861	44,053	5,151,838	93,344
541	Crab, net			13,486	885		
542	Crab, other gear						1,364
543	Shrimp, trawl	255,907	61,031	3,544,891	1,175	289,949	
544	Shrimp, fixed gear			366			7,548
545	Salmon, trawl						
546	Salmon, fixed gear	111,144		154,630	59,176	1,275,711	207,983
547	Salmon, net	2,497,833		27,823	49	63,045	1,275
548	HMS, fixed gear	590,379		40,308		772,928	84,174
549	HMS, net				317		
550	CPS, trawl	1,308	2,598	61	217		
551	CPS, fixed gear					370	486
552	CPS, net	858,628				11,124	
553	CPS, other gear						
554	Halibut, trawl			584,206	160,391		
555	Halibut, fixed gear	3,071,024		1,447	2,343	934,188	484,131
556	Halibut, net			146,113	91,936		
557	Other species, trawl	360	21,668	329,054	52,528		
558	Other species, fixed gear	10,827		1,607	17,184	113,009	177,950
559	Other species, net	2,535,623		78,153	54,138		
560	Other species, other gear					2,415	1,920
	Total	**22,604,951**	**19,851,185**	**27,719,736**	**996,662**	**24,301,202**	**3,903,000**

Table **A-12 continued horizontally. Landings by vessel type and commodity code, 2012 value ($).**

IMPLAN code	Species and gear combinations	Vessel classification 517	518	519	520	521	522	523
529	Whiting, at sea							
530	Whiting, trawl					493		
531	Whiting, fixed gear							
532	Sablefish, trawl		75		496,037	259,158		
533	Sablefish, fixed gear	171		197,586	85,294	3,960,871	250,232	152
534	Dover/thornyhead, trawl				586,773	304,982		
535	Dover/thornyhead, fixed gear	8,714		296	6	34,590	11,663	
536	Other groundfish, trawl				415,665	471,869		
537	Other groundfish, fixed gear	2,369		28,015	14,311	491,626	87,132	23
538	Other groundfish, net	115	4,606		642	595	24	134
539	Crab, trawl		3,093		8,864	627		
540	Crab, fixed gear	1,081,542	3,137	9,222,841	9,882,193	137,731,075	392,270	508,197
541	Crab, net		2,090					
542	Crab, other gear			936		194,176	8,526	
543	Shrimp, trawl			64,331	27,879,377	605,586	200	1,995
544	Shrimp, fixed gear				5,812,584	1,451,710		105,843
545	Salmon, trawl							
546	Salmon, fixed gear			2,528,100	8,253	6,584,447	10,359,841	174,575
547	Salmon, net	317,836		772	23,878	4,229,227	55,935	16,256,078
548	HMS, fixed gear	138,017	133,575	37,491,377	109,229	5,313,433	604,137	
549	HMS, net	67,936	50,379	5,719	5,377			
550	CPS, trawl				59			
551	CPS, fixed gear	257				16,160		
552	CPS, net	22,084,029	3		69	179,168		2,984
553	CPS, other gear					10,543		
554	Halibut, trawl		1,101		50,316	83,628		
555	Halibut, fixed gear	27,382	814	231,177	78,101	2,172,220	189,467	35,405
556	Halibut, net	13,750	22,321		207			
557	Other species, trawl				65,775	3,601	8	
558	Other species, fixed gear	25,641	4,188	1,491,324	905,219	1,387,966	115,412	4,464
559	Other species, net	61,572,591	974,600	198,548	63,085	637,303	20,141	291,812
560	Other species, other gear	41,604	38,418		4,002	154,089		
	Total	**85,381,953**	**1,238,400**	**51,461,022**	**46,495,312**	**166,279,144**	**12,094,987**	**17,381,661**

Table A-12 continued horizontally. Landings by vessel type and commodity code, 2012 value ($).

IMPLAN code	Species and gear combinations	Vessel classification 524	525	526	527	528	Total
529	Whiting, at sea						
530	Whiting, trawl					867	20,641,893
531	Whiting, fixed gear						1,785
532	Sablefish, trawl	518					6,014,310
533	Sablefish, fixed gear		54,683	297	110,404	379,612	22,247,027
534	Dover/thornyhead, trawl				8		8,826,546
535	Dover/thornyhead, fixed gear		22,705		374	27,210	1,560,828
536	Other groundfish, trawl				1,478	7,477	10,290,944
537	Other groundfish, fixed gear	506	86,607	31,053	42,692	856,865	4,356,871
538	Other groundfish, net		1,512		266	778	10,672
539	Crab, trawl				1,469	35	17,209
540	Crab, fixed gear	200,780	523,631	28,257	237,965	1,737,713	176,502,088
541	Crab, net	2,371	931		1,217	1,357	22,338
542	Crab, other gear			70		50,970	256,041
543	Shrimp, trawl				36,322	44,779	32,785,542
544	Shrimp, fixed gear	7,857	8,583		560	163,799	7,558,850
545	Salmon, trawl						
546	Salmon, fixed gear	13,072	99,871		99,485	572,937	22,249,225
547	Salmon, net	44,961			26,149	2,028,927	25,573,788
548	HMS, fixed gear		7,161		131,360	631,190	46,047,266
549	HMS, net	4,417	682			396	135,222
550	CPS, trawl				28		4,270
551	CPS, fixed gear		32			3,493	20,797
552	CPS, net	216	9,032			219,876	23,365,127
553	CPS, other gear					112	10,655
554	Halibut, trawl	12,196		63	22,739	12,020	926,660
555	Halibut, fixed gear	28,173	198,512	4,862	94,286	413,280	7,966,813
556	Halibut, net	35,329	36,826		2,179	22,646	371,308
557	Other species, trawl	524		13,133	627,988	4,333	1,118,971
558	Other species, fixed gear	219,647	11,890,192	25,017	3,405,400	491,854	20,286,901
559	Other species, net	4,548,738	53,267		9,689	203,450	71,241,136
560	Other species, other gear		38,538	9,118,385	382,526	284,985	10,066,881
	Total	**5,119,304**	**13,032,764**	**9,221,137**	**5,234,585**	**8,160,958**	**520,477,963**

A.2.5.2 Commercial Catcher-Vessel Production Functions

The vessel production functions in IO-PAC rely on the data from the voluntary fixed gear and open access surveys and mandatory EDC surveys. Table A-13 presents the vessel production functions included in IO-PAC. The expenditure categories shown in Table A-13 must be mapped into IMPLAN commodity codes for inclusion in the model. The mapping of the expenditure categories into IMPLAN commodity codes is presented in detail in Appendix A. While the expenditure categories have changed little in the IO-PAC update, the mapping to IMPLAN commodity codes has changed considerably due to the shift in the IMPLAN industry classification scheme from 509 unique sectors to 440.

A.2.5.3 Motherships and Catcher Processor Production Functions

The mothership and catcher processor production functions rely solely on EDC data. Cost-earnings surveys necessary to create production functions for these vessels were previously unavailable. These production functions are not shown in Table A-13 because the cost categories do not align with those used for shoreside vessels.

Table A-13. Percentage distribution of commercial fishing production functions by expenditure categories.

Expenditure categories (table continued horizontally below)	**Alaska**	**Pacific whiting trawler**	**Large groundfish trawler**	**Small groundfish trawler**	**Sablefish fixed gear**	**Other groundfish fixed gear**	**Pelagic netter**	**Migratory Netter**	**Migratory Liner**
Captain	9.7	16.8	19.7	11.4	15.7	16.8	18.1	18.1	11.7
Crew	18.4	16.7	13.1	11.4	23.0	20.9	17.8	17.8	8.9
Fuel & lubricants	8.8	12.5	11.1	8.5	5.9	10.1	8.4	8.4	5.7
Food and crew provisions	1.2	0.4	0.7	3.7	1.6	2.5	1.3	1.3	1.9
Ice	0.2	0.2	0.9	4.3	0.8	1.0	0.5	0.5	0.2
Bait	3.0	0.2	0.6	0.0	4.3	3.8	3.4	3.4	3.0
Repair & maintenance: vessel, gear, equipment	10.3	12.7	6.9	37.0	10.6	13.9	12.9	12.9	12.8
Insurance	6.3	4.0	3.7	0.0	3.2	5.4	4.3	4.3	3.8
Interest and financial services	1.1	0.0	0.0	0.0	0.2	0.9	0.7	0.7	3.2
Purchases of permits	6.3	0.0	0.0	0.0	7.9	3.1	3.5	3.5	0.8
Leasing of permits	0.3	0.0	0.4	0.0	0.9	0.0	0.1	0.1	0.0
Moorage	0.9	0.5	0.6	7.1	1.2	2.3	1.6	1.6	1.7
Landings taxes	1.4	3.8	5.0	6.4	1.5	0.8	1.6	1.6	0.0
Enforcement	0.2	0.5	0.4	1.8	0.2	0.6	0.2	0.2	0.1
Dues	0.3	0.3	0.8	0.0	0.3	0.1	0.4	0.4	0.4
Freight supplies	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1	0.0
Offloading	0.1	0.1	0.7	1.4	0.4	0.9	0.4	0.4	0.0
Trucking	0.1	0.1	0.1	0.0	0.2	1.3	0.2	0.2	0.0
Other miscellaneous	0.7	0.5	1.0	2.8	0.9	7.0	5.4	5.4	16.7
Communications	0.1	0.3	0.4	0.0	0.4	0.4	0.1	0.1	0.0
Travel	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Proprietary income	9.7	16.8	19.7	11.4	15.7	16.8	18.1	18.1	11.7
Total (%)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table A-13 continued horizontally. Percentage distribution of commercial fishing production functions by expenditure categories.

Expenditure categories (column list repeated from above)	**Shrimper**	**Crabber**	**Salmon troller**	**Salmon netter**	**Other netter**	**Lobster**	**Diver**	**Other >15,000**	**Other <15,000**
Captain	17.9	22.1	7.8	24.8	18.1	18.1	18.1	18.1	32.7
Crew	15.2	21.8	12.0	20.0	17.8	17.8	17.8	17.8	25.9
Fuel & lubricants	12.7	6.6	11.2	7.2	8.4	8.4	8.4	8.4	18.1
Food and crew provisions	1.5	1.1	3.8	1.5	1.3	1.3	1.3	1.3	4.8
Ice	1.1	0.4	0.3	0.6	0.5	0.5	0.5	0.5	1.5
Bait	3.9	4.6	0.5	1.6	3.4	3.4	3.4	3.4	3.4
Repair & maintenance: vessel, gear, equipment	22.2	11.1	18.3	14.2	12.9	12.9	12.9	12.9	31.4
Insurance	3.6	4.6	5.4	2.2	4.3	4.3	4.3	4.3	10.9
Interest and financial services	0.0	0.5	3.6	0.3	0.7	0.7	0.7	0.7	0.6
Purchases of permits	13.9	0.9	3.5	1.3	3.5	3.5	3.5	3.5	5.0
Leasing of permits	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
Moorage	2.5	1.2	5.1	2.1	1.6	1.6	1.6	1.6	9.0
Landings taxes	2.6	0.9	0.6	1.0	1.6	1.6	1.6	1.6	0.6
Enforcement	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.9
Dues	0.3	0.3	0.9	0.4	0.4	0.4	0.4	0.4	1.0
Freight supplies	0.3	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offloading	0.4	0.5	0.0	0.2	0.4	0.4	0.4	0.4	0.2
Trucking	0.3	0.3	0.6	0.9	0.2	0.2	0.2	0.2	1.0
Other miscellaneous	0.7	7.4	10.1	2.5	5.4	5.4	5.4	5.4	6.1
Communications	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0
Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proprietary income	0.6	15.4	16.2	19.0	19.0	19.0	19.0	19.0	-53.0
Total (%)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**.100.0**	**100.0**	**100.0**	**100.0**

*Percentages not shown due to confidentiality restrictions

A.2.5.4 Shoreside Processor Production Functions and Mark-ups

For shoreside processors located on the West Coast, the EDC data permits the building of a production function and mark-up by species. The Benchmark Input-Output data produced by the Bureau of Economic Analysis (BEA) contains a production function for seafood processors, which is used in IMPLAN for the default seafood processing sector. This production function is not specific to processors on the West Coast, so to the extent that processors on the West Coast differ from seafood processors nationally, the use of the Benchmark Input-Output production function will be a source of error. In the last version of IO-PAC, shoreside processor sales of seafood were made by using the markup margin information imbedded in the IMPLAN default seafood processing production function. Additionally, the output per-employee information in the default production function was used to make employment estimates. This previous approach has a couple of notable disadvantages. First, it is derived from data on all U.S. processors. The national data is heavily influenced by the processing activity that occurs in Alaska, where the production costs for fish and output per employee are likely different than shoreside seafood processors on the West Coast. To the extent that West Coast shoreside processors deviate from the processors nationally, there will be errors in both income and employment impact estimates. Second, the markup margin in the default approach is not species specific. While this approach will approximate the markup received by processors for all species on average, it lacks species specific detail. Based on the EDC data, markups differ substantially among different species.

The EDC data permits the specification of a production function specific to processors on the West Coast, and perhaps more importantly, it provides information on species specific mark-up for different fish species. IO-PAC uses data collected through the EDC to represent all shoreside processors on the West Coast. Using the EDC data in this application is a potential source of error, because not all processors of on the West Coast are required to complete a survey. An EDC survey is required of all owners and lessees of a shorebased processor that received round or headed-and-gutted IFQ species groundfish or whiting from a first receiver, and all owners of a first receiver site license in 2011 and beyond.[3] Processors that do not receive fish fitting this description are not included in the EDC program. Thus, no cost data is available for them. Because the lack of available data, we assume that all West Coast shoreside processors are represented by those who complete an EDC survey.

The processor production function was generated through dividing each of the expenditures displayed in Table A-14 by total revenue. The production function is built using 2011 data. The mapping of the cost categories into the appropriate IMPLAN sectors is detailed in Appendix A. The default production function in IMPLAN, which is based on the BEA's input-output table, is useful in mapping expenditure categories covered in the EDC to the appropriate commodity codes.

[3] For a complete definition see 50 CFR 660.114. Under NAICS some of these entities may be classified as fish and seafood merchant wholesalers, frozen specialty food manufacturing, or something else. For the purposes of IO-PAC they are considered processors.

Table A-14. Percentage distribution of processor production functions by expenditure categories.

Expenditure categories	Allocation Percent
Employee and worker payroll	15.7
Additives	0.4
Custom processing	1.3
Electricity	1.2
Freight	0.4
Insurance	0.5
Natural gas	0.1
Offsite storage and freezing	1.6
Packaging	3.5
Production supplies	0.4
Propane	0.2
Rental or lease of buildings, job-site trailers, and other structures	0.8
Rental or lease of processing machinery or equipment	0.2
Repair and maintenance on facility buildings, machinery, and equipment	1.6
Sewer and waste	0.3
Shoreside monitor	0.0
Water	0.7
Fish purchases	61.4
Cleaning supplies	0.1
Lease or purchase of quota pounds or shares	0.0
Licensing fees	0.1
Taxes	0.4
Nitrogen gas	0.1
Offload fees	0.2
Other	1.0
Proprietary income	7.8
Total (%)	**100.0**

Costs by category in Table A-14 were allocated to relevant cost categories in the default production function in proportion to their share in the default production function. The Benchmark Input-Output Table (BIOT) may have more than one category relevant to each EDC cost category. In other words, BIOT has greater detail about a specific cost category than is captured by the EDC. Information related to the use of these commodities by seafood processors is contained in their default production function in IMPLAN. For example, commodity codes relevant to the EDC category "Packaging" are shown in Table A-15. The default production function contains five categories that are applicable. These are the five industry categories that are involved in the production of a commodity that is likely used to make "Packaging." The default absorption numbers in the table are the allocation percentages of total industry output (revenue) to the respective expenditure categories. These percentages are used to guide the allocation of the EDC category "Packaging." The IO-PAC allocation is done in proportion to the default absorption.

Table A-15. IO-PAC distribution of processor cost example.

IMPLAN Code	Expenditure categories	Default Absorption	IO-PAC Allocation Percent
3107	Paperboard containers	1.668	80.335
3108	Coated and laminated paper, packaging paper and plastics film	0.289	13.924
3105	Paper from pulp	0.019	0.910
3146	Polystyrene foam products	0.010	0.477
			100.0

The markups by species groups contained in IO-PAC are shown in Table A-16. The markups were generated using 2011 EDC data. The markups are shown on the basis of revenue earned by processors for every dollar spent on the respective species.

Table A-16. IO-PAC processor markups by species group.

Expenditure categories	Markup
Whiting	2.52
Sablefish	1.50
Dover/thornyhead	5.18
Other groundfish	1.15
Crab	1.35
Shrimp	1.68
Salmon	1.28
HMS	1.48
CPS	1.83
Halibut	3.26

A.2.5.5 Recreational Fishing

The IO-PAC revision includes a new module to estimate economic impacts and contributions related to recreational fishing trips. Recreational expenditures by type and by fishing mode were obtained from Lovell et al. (2013). Table A-17 shows the recreational expenditures by type and mode.

Table A-17. Estimated 2011 Recreational Expenditures by Mode (*Thousands of 2006 dollars*).

	California		Oregon		Washington	
Expenditure Category	**For Hire**	**Private**	**For Hire**	**Private**	**For Hire**	**Private**
Auto Fuel	$15,658	$18,725	$1,418	$7,728	$1,917	$18,435
Auto Rental	$1,998	$136	$3	$12	$129	$74
Bait	$2,319	$10,513	$73	$3,295	$34	$3,699
Boat Rental	$1,050	$22,003	$1	$11,916	$9	$26,749
Charter Fees	$59,012	$571	$6,372	$37	$7,090	$0
Crew Tips	$8,733	$0	$516	$0	$840	$0
Fish Processing	$56	$0	$42	$11	$127	$0
Food from Grocery Stores	$9,784	$13,176	$726	$4,041	$864	$12,231
Food from Restaurants	$9,457	$5,237	$525	$2,505	$870	$3,943
Gifts & Souvenirs	$2,737	$174	$116	$188	$170	$415
Ice	$1,163	$2,310	$64	$870	$93	$1,704
Lodging	$4,180	$1,264	$599	$626	$843	$4,376
Parking & Site Access Fees	$2,419	$3,837	$42	$1,126	$16	$3,486
Public Transportation	$1,048	$169	$3	$11	$149	$884
Tournament Fees	$2,240	$237	$8	$291	$155	$625
Trip Total	**$121,968**	**$78,352**	**$10,625**	**$32,655**	**$13,337**	**$76,621**

Angler expenditures in Table A-17 were used to create expenditure vectors for calculating economic contribution and impacts associated with changes in recreational spending. Expenditures by category were divided by total trip expenditures by mode and state to apportion recreational spending among different IMPLAN and IO-PAC sectors.

The expenditure vectors can be used to calculate contribution and impact estimates from recreational trip spending. To use the expenditure vector, effort estimates must be transformed to recreational spending. Effort estimates are mapped into recreational spending for each state using the expenditure estimates in Table A-17 in conjunction with effort measured in number of trips obtained from Lovell et al. (2013). Expenditures by state were divided by trips to obtain state level mean expenditures per trip and mode.

The expenditure vectors and mean recreational expenditures can be used for contribution and impact estimates for the sub-state level port areas in IO-PAC under the assumption that recreational spending within a port area does not differ from the state averages. For example, this assumes a recreational angler in Puget Sound purchases the same basket of goods and services as a recreational angler who fishes off the Washington coast. There is therefore a potential source of error in applying the expenditure vectors to all port areas within each state. Expenditures in some port areas could deviate from the state-level expenditure vectors. However, to make sub-state level estimates this assumption is necessary because it is unknown how expenditures differ among port areas. By assuming the same expenditure profile for each port area in a state, differences in the economic effects of changes in recreational spending are driven by changes in recreational fishing trips in each area and differences in their respective regional economies rather than differences in the types of goods purchased in each region.

A "charter vessel" is not contained in the default version of IMPLAN. In the standard IMPLAN model, the charter vessel industry is included in “Other amusement, gambling, and recreation industries” (IMPLAN sector 410), along with many other diverse industries. This IMPLAN sector includes charter vessel operations, but it also includes other important industries such as skiing. A charter sector was added using an approach similar to that used for adding the commercial fishing sectors. The results from surveys of charter vessels in CA, OR, and WA were used to create production functions for charter businesses. In addition, survey results were used to create total industry output, employment, employee compensation, proprietor income and taxes paid. For every dollar of output, amounts are paid to providers of inputs from other sectors, so that every dollar of charter vessel output can be broken into material input costs and value above costs of inputs, which is value-added

The WA and OR charter sectors were created using the results of a 2006 survey of marine charter fishing businesses in WA and OR by the Northwest Fisheries Science Center[4]. The marine charter survey collected information about cost and revenue, vessel characteristics, operator characteristics, and current market conditions in the industry. The marine charter fishing industry in Washington and Oregon consisted of an estimated 217 vessels in 2006 with $15.4 million in direct revenue and employed an estimated 345 individuals. Completed surveys were received from 95 ocean going vessels in 2006. Seven surveys were incorrectly completed and were treated as non-responses. The effective sample was 53 vessels in Oregon and 35 vessels in Washington for a total survey response rate of 41%.

Total industry output was apportioned to value added and material components as displayed in Table A-18 along with their associated IMPLAN sectors. Some of the associated sectors indicate “Margined.” In I/O models, expenditures are expressed in terms of producer prices, which is the value of goods at the point of production rather than at the retail level. Consequently, for goods that are not produced at the time of service, such as gasoline, the prices paid by final consumers must be allocated to the portion going to the retailer, wholesaler, transportation, and manufacturing (Olson and Lindall, 1999).

According to the production function, an average of 53% of each dollar generated by charter vessel operations is spent on inputs from other sectors. The remaining 47% is value added, which goes to employee compensation, proprietary income, taxes, and other income. The intermediate expenditures were translated into absorption coefficients, which are the percentages of each dollar of revenue spent on each input. For example, an absorption coefficient of 0.05 was calculated for insurance expenses,

[4] The survey methodology and complete results will appear in a forthcoming manuscript by Leonard and Watson: “The role of charter boat operations in fishing communities: a social and economic analysis of the marine charter boat fleets in Oregon and Washington.” The manuscript is obtainable from the author by request.

meaning that, on average, charter businesses spend 5 cents of each dollar of revenue on inputs from the insurance sector. In this same way, absorption coefficients were calculated for each input sector.

Table A-18. Estimated 2006 Average WA and OR Charter Industry Production Function and Associated IMPLAN Sectors.

Outlay Categories	Allocation (%)	IMPLAN Sector
Vessel Related		
Proprietary Income	27.2	Proprietary Income
Captain's Payments	8.6	Employee Compensation
Other Crew Payments	3.2	Employee Compensation
Office Labor and Other Labor	1.1	Employee Compensation
Engine Overhaul	3.7	Ship building and repairing
All Other Vessel Maintenance	3.8	Ship building and repairing
Electronics Maintenance	0.8	Electronic equipment repair and maintenance
Haulout	1.4	Ship building and repairing
Moorage	2.0	Other amusement and recreation
Purchase of New Gear	1.5	Sporting goods, hobby, book stores (Margined)
Vessel Insurance	5.0	Insurance carriers
Vessel Professional Services	0.6	Other miscellaneous prof. and tech. services
Vessel Advertising	2.1	Advertising and related services
Fuel	10.8	Petroleum refineries (Margined)
Fishing Supplies	3.0	Sporting goods and athletic goods mfg. (Margined)
Bait Expenses	1.2	Animal prod., except cattle, poultry (Margined)
Food and Drink	0.1	PCE vector 1111
Taxes and Government Fees Domestic	6.6	Indirect Business Taxes
Taxes and Government Fees Foreign	0.0	Indirect Business Taxes
Commissions for Booking Agents	5.7	Travel arrangement and reservation services
Telephone and Other Communications	1.1	Telecommunications
Other Vessel Related	8.4	Monetary authorities and depository credit
Booking Operation Related		
Labor for Shorebased Personnel	0.15	Employee Compensation
Advertising	0.40	Advertising and related services
Insurance	0.44	Insurance carriers
Professional Service	0.07	All other miscellaneous prof. and tech.
Association Fees	0.01	Civic, social, professional organizations
Telephones	0.39	Telecommunications
Other Office Expenses	0.65	All other miscellaneous mfg. (Margined)
Lease/Loan Payments on Vehicles	0.04	Monetary authorities and depository credit
Legal/Financial Services	0.01	All other miscellaneous prof. and tech.
Other Booking Related	0.01	All other miscellaneous mfg. (Margined)

The CA charter sector was created using the results of a survey conducted by Pacific States Marine Fisheries Commission (PSMFC) and Southwest Fisheries Science Center. The survey collected cost and earnings information for the year 2000 from the West coast charter and head boat fleet (PMFC, 2004). The population targeted by the survey consisted of vessels operating out of California, Oregon and

Washington that provided ocean recreational fishing trips on a commercial basis during 1997-1998. Approximately 12% of the charter and head boats licensed to operate in California, Oregon and Washington were sampled using a stratified random sampling approach. Each stratum consisted of a particular combination of region and size class. Vessels were categorized according to the region of their home port: southern California (for homeports from the Mexican border to Point Conception), northern California (for homeports north of Point Conception to the Oregon border), Oregon, and Washington. Vessel size class was defined in terms of vessel length: "small" for lengths of 15-30 feet, "medium" for lengths of 31-49 feet, and "large" for lengths greater than 49 feet.

To develop a single production function for charter vessel businesses in CA, a weighted average of the survey results was used. The cost and earnings data collected in the survey was weighted by category for Northern CA Large, Northern CA Medium, Northern CA Small, Southern CA Large etc. based on the relative frequency of the cohort in the total population. The weighted average cost function for CA charter businesses along with the assigned IMPLAN categories appears in Table A-19.

Table A-19. Estimated 2000 Average California Charter Industry Production Function and Associated IMPLAN Sectors.

Outlay Categories	Allocation (%)	IMPLAN Sector
Proprietary Income	45.21	Proprietary Income
Captain and crew	12.19	Employee Compensation
Labor for Shorebased Personnel	1.25	Employee Compensation
Engine Overhaul	1.21	Ship building and repairing
All Other Vessel Maintenance	3.57	Ship building and repairing
Electronics Maintenance	0.22	Electronic equipment repair and maintenance
Haulout	1.09	Ship building and repairing
Moorage	1.89	Other amusement and recreation
Purchase of Gear or Equipment	3.50	Sporting goods and athletic goods mfg. (Margined)
Insurance	1.16	Insurance carriers
Professional Services	0.37	Other miscellaneous prof. and tech. services
Advertising	1.31	Advertising and related services
Fuel	7.20	Petroleum refineries (Margined)
Supplies	2.27	Sporting goods and athletic goods mfg. (Margined)
Bait	5.18	Animal prod., except cattle, poultry (Margined)
Food and Drink	2.59	PCE vector 1111
Fees Paid to Domestic Governments	1.72	Indirect Business Taxes
Fees Paid to Foreign Governments	2.00	Indirect Business Taxes
Commissions Paid for Booking Trips	5.02	Travel arrangement and reservation services
Telephones	0.60	Telecommunications
Other	0.15	All other miscellaneous mfg. (Margined)
Other Office Expenses	0.32	All other miscellaneous mfg. (Margined)
Landing Taxes	0.41	Indirect Business Taxes
Mortgage for Vessel	4.32	Monetary authorities and depository credit
Association Fees	0.23	Civic, social, professional organizations
Lease or Loan of Motor Vehicles	0.25	Monetary authorities and depository credit

Total industry output for charter vessels in CA were estimated using weighted revenues from the survey. Average revenue in each stratum was weighted in the same manner as costs. The weighted average revenue estimate was then multiplied by the total number of charter vessels in CA in 2000 to estimate total industry revenue. Employment by charter vessels in CA was estimated by dividing total industry output by the weighted average output per employee collected in the survey. The weighted average output per employee was estimated through the same stratum weighting method discussed above.

A.2.5.6 Product Flow

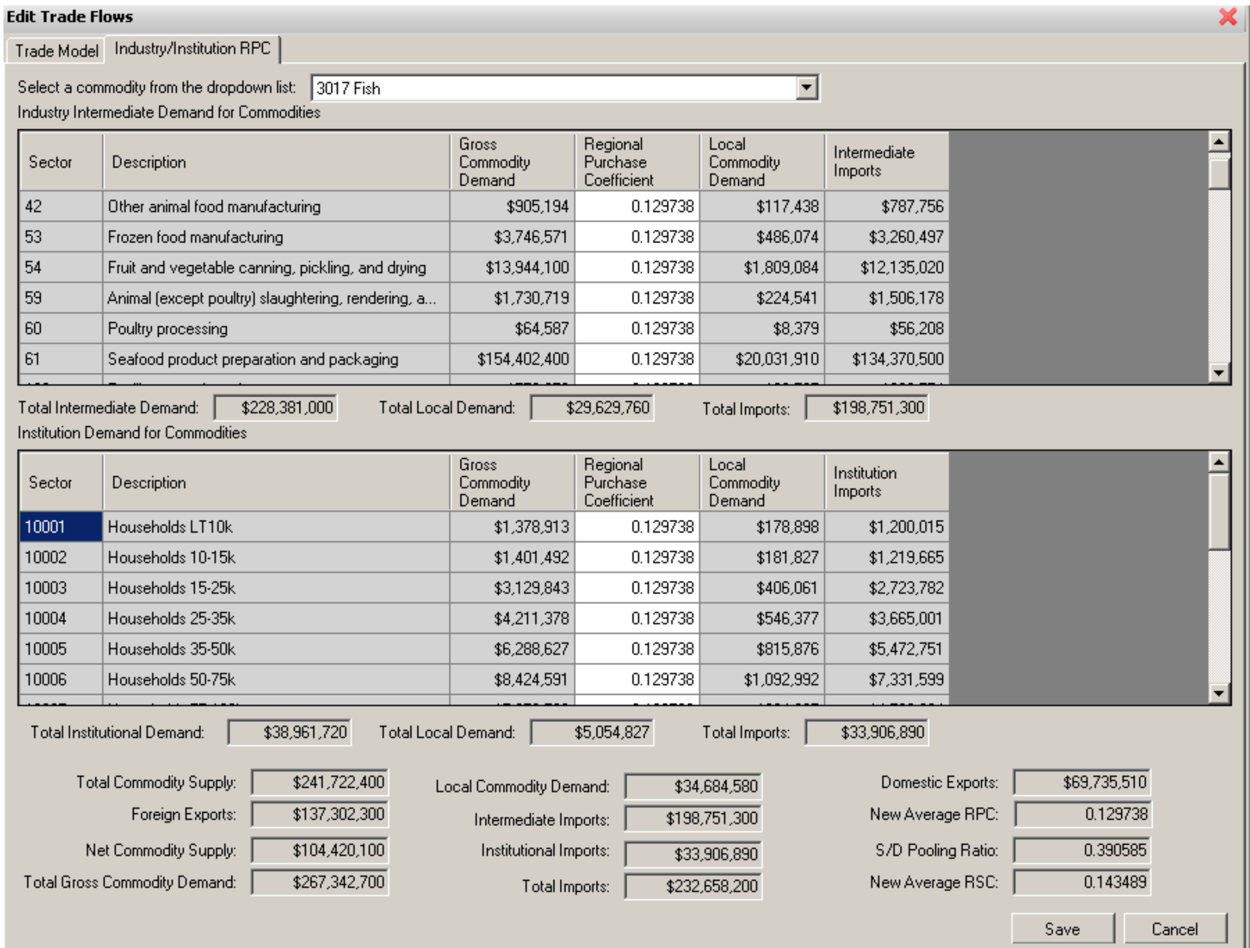
The product flow of fishery resources is complex and there are few sources of data that can be used to accurately account for these transactions in an economic model. Product flow refers to the flow of fish from harvesters to processors, wholesale seafood dealers, restaurants, households, and other sources of demand for fish. Like other fishery IO models (Kirkley et al. 2004, Steinback and Thunberg 2006), IO-PAC relies on simplifying assumptions. The assumptions about the flow of fish in IO-PAC are changed in the revision. For the state and West Coast level study areas, the revisions involve different product flow assumptions for groundfish trawl fish from other gear/species combinations. For port level models, groundfish trawl fish is treated the same as all other fish, and a new approach of using IMPLAN to develop product flow assumptions is used. The collections data by the Washington Department of Revenue (WDOR) Enhanced Food Fish Tax is no longer used.

For fish harvested with groundfish IFQ, the assumptions about product flow are driven by data collected through the EDC program. Under trawl rationalization, all IFQ fish sold by harvesters must be received by an entity with a First Receivers License. Those with Licenses are required to complete an EDC survey, so there is no harvested fish that is bypassing these first receivers. As described above, these first receivers are treated as processors. Hence, for the West Coast as whole and the state level study areas, all groundfish trawl quota fish flows to “processors” as defined here. None goes directly to other businesses and households that demand fish without going through the processing channel.

Due to cross hauling, it is possible that fish landed in a port, will not be processed therein. At this time we are unable to quantify this cross-hauling activity for either IFQ or non-IFQ fish. Consequently, we handle both in the same manner. Because we currently cannot quantify the cross-hauling activity, IMPLAN data about processor demand for fish within a study area (port group) are utilized. The IMPLAN commodity balance sheets were used in the last version of IO-PAC for this same purpose.

The revision uses the trade flow information in IMPLAN differently because the previous approach underestimates the amount of fish that flows from harvesters to processors. In the last version of IO-PAC, it was assumed that processor demand for fish from harvesters followed the econometrically derived regional purchase coefficient (RPC) in IMPLAN. The primary issue with this approach is that processor demand for fish from harvesters is equivalent to all other sources of fish demand (households, restaurants, grocery stores, hospitals, etc.). All agents of demand are treated the same. They all source the same proportion of their demand for fish from harvesters within the study area. This issue is exemplified by examining the demand for harvested fish in Oregon. Figure A-4 was generated by constructing a default IMPLAN model for each study area, then viewing the Industry/Institution RPC tab under the Edit Trade Flows function in IMPLAN. Figure A-4 indicates that Gross Commodity Demand for fish among processors in the state of Oregon is $154,402,400. Essentially, this indicates that in order to support their level of production in Oregon, processors needed $154 million in raw fish. The Local Commodity Demand column indicates that $20 million of this demand for raw fish was sourced from harvesters in Oregon. The reason 12.9% of demand was fulfilled by harvesters in Oregon, is that the RPC of 0.129738 applies to all sources of demand, which are shown in the figure as Other animal food manufacturing, Frozen food manufacturing, Poultry processing, and all the household income groups.

Given the nature of the fish harvester and processor relationship on the West Coast, we contend that it is more appropriate to assume that harvesters will satiate demand for fish among processors before they sell fish to any other type of buyer. Due to Trawl Rationalization, this is certainly the case with groundfish, where fish landed with trawl quota must be sold to a licensed First Receiver and we contend that this approach is more accurate even for non-trawl quota species as well. Hence, for all port group study areas, IO-PAC assumes that landings from the fish harvesting sectors flow to seafood processors in the same proportion as the ratio of default IMPLAN processor demand (sector 61) to the available fish harvesting sector (17) supply. This proportion can be determined using Figure A-4. The Gross Commodity Demand of seafood processors in Oregon is $154 million. The Total Commodity Supply in the figure of $241.7 million represents the total fish landings in Oregon. Utilizing this assumption, the amount that flows to processors is (154.40/241.72) ≈ 0.639. Since this is a state level model, the 63.9% would apply to of all non-IFQ fish. For IFQ fish at the port level, the same approach is used.



Sector	Description	Gross Commodity Demand	Regional Purchase Coefficient	Local Commodity Demand	Intermediate Imports
42	Other animal food manufacturing	$905,194	0.129738	$117,438	$787,756
53	Frozen food manufacturing	$3,746,571	0.129738	$486,074	$3,260,497
54	Fruit and vegetable canning, pickling, and drying	$13,944,100	0.129738	$1,809,084	$12,135,020
59	Animal (except poultry) slaughtering, rendering, a...	$1,730,719	0.129738	$224,541	$1,506,178
60	Poultry processing	$64,587	0.129738	$8,379	$56,208
61	Seafood product preparation and packaging	$154,402,400	0.129738	$20,031,910	$134,370,500

Sector	Description	Gross Commodity Demand	Regional Purchase Coefficient	Local Commodity Demand	Institution Imports
10001	Households LT10k	$1,378,913	0.129738	$178,898	$1,200,015
10002	Households 10-15k	$1,401,492	0.129738	$181,827	$1,219,665
10003	Households 15-25k	$3,129,843	0.129738	$406,061	$2,723,782
10004	Households 25-35k	$4,211,378	0.129738	$546,377	$3,665,001
10005	Households 35-50k	$6,288,627	0.129738	$815,876	$5,472,751
10006	Households 50-75k	$8,424,591	0.129738	$1,092,992	$7,331,599

Figure A-4. IMPLAN trade flow of fish in Oregon (2010).

A.2.6 Model Construction

The revisions to IO-PAC construction are done to reduce effort involved in making changes to fishing sector production functions over time and simplify the process of building numerous port level models. The original version of IO-PAC modified IMPLAN Version 2 software. IMPLAN Version 3 software is used for in the IO-PAC revision. Version 3 provides a new method for importing changes in expenditures made by fishing vessels and recreational anglers. Expenditure changes can now be imported into IMPLAN using EXCEL templates provided by IMPLAN. Model construction in IO-PAC is constructed through the use of several of these EXCEL templates. With the change, the modeling is done primarily using spreadsheets rather than with modifications to the IMPLAN database. The change permits easy modification of production functions used in the model, and also changes in study areas can be accomplished easily. The ease in changing production functions is important because the survey data from which they are built are continually being updated. The ease in changing study areas is important because study areas of interest often deviate from those used in groundfish management. For example, the new approach permits an easy shift to study areas of interest in salmon management. The following discussion borrows content from the Version 3.0 User's Guide (MIG, 2010).

In IMPLAN Version 3, contributions and impacts are estimated by setting up activities of different types. Activities are groupings of one or more Events that represent spending changes within a study area. Activities come in six different types: industry change, commodity change, labor income change, household spending change, industry spending pattern, and institutional spending pattern. Each activity type is appropriate for different types of analysis. By enabling spending changes of six different types, IMPLAN Version 3 is more flexible than Version 2, but skill by the analyst is more critical in determining which type of activity is most appropriate for a particular estimate. The activity types used in IO-PAC are briefly described below.

A.2.6.1 IMPLAN Activity Types

Industry Change is used to estimate the economic impact or contribution of a particular industry, where industry refers to a group of establishments that engage in similar types of economic activity. The most widespread industry classification scheme is the North American Industrial Classification System (NAICS). IMPLAN has its own industry classification scheme where each group consists of one or more NAICS categories. An example of an industry change is to estimate the effect of a $1 million change in demand among "wood window and door" manufacturers in a particular study area.

Commodity Change is used to estimate the economic impact or contribution of a particular good or service. Commodities may be produced by one or more industries and institutions, where institutions are households and governments. All industries in IMPLAN have a primary commodity of the same name as the industry. Thus, the primary commodity of wood window and door manufacturers is the commodity "Wood windows and doors". However, wood window and door manufacturers also produce the commodity "Wood kitchen cabinets and countertops." An impact or contribution estimate due to a demand change for a particular commodity will affect all industries that produce the commodity. For example, shocking the commodity "wood windows and doors" will affect wood window and door manufacturers, but it will also affect the industry "sawmills and wood preservation."

It is important to note that multipliers used to develop estimates are produced for each endogenous industry or institution in IMPLAN. The effective multiplier for a commodity-based estimate is a weighted combination of the multipliers of the affected industries and institutions. The weighting among industries for a particular commodity is the respective market share for the commodity. The government institutional sectors (State and Local Government, Federal Govt. Non-Defense, etc.) are often treated as exogenous. As a result, their institutional contribution to production is treated as a leakage in impact/contribution estimates. This is a principle difference between industry-based versus commodity-based estimates.

Labor Income Change is used to estimate how changes in employee compensation or proprietor income will affect the economy. This would be the appropriate approach if one wanted to estimate the impact of increased payments to employees in a study area.

Industry Spending Patterns are particularly useful in modeling the fishing industry with primary cost earnings data collected from participants. The following was taken from Version 3.0 User's Guide (MIG, 2010).

> "Industry Spending Patterns allow you to import an Industry's production function, or build an Industry from data about its expenditures. This Activity type works with coefficients of total budget spending, allowing you to use Level to create a series of estimates about the impacts of different expenditures to a single Industry. One thing to remember when using

> Industry Spending patterns is that their coefficients typically do not include their labor income spending, and therefore the coefficients sum to less than 1.00. To ensure that the full impact of spending in an Industry is captured, you will need to create a Labor Income impact to compliment your Industry Spending pattern."

Institution Spending Patterns are useful in modeling the change in households or government spending. In IO-PAC, we use the State and Local Government Non-Education spending pattern to model the effect of taxes paid by fishing industry participants. This marks a departure from the last version of IO-PAC in which taxes were shifted to the value-added account "Indirect business taxes." Because of changes in the IMPLAN software, this approach is no longer possible.

A.2.6.2 Importing Fishery-Specific Information

All of the above activity types can be created in EXCEL and imported into the IMPLAN software. For the industry additions in IO-PAC, the procedure involves mapping the production function information in Tables A-13, A-14, A-18, and A-19 into IMPLAN commodities using the bridge information displayed in Appendix A.

Table A-20 displays an example of an Industry Spending Pattern activity EXCEL template that is imported into IMPLAN. After the activity is imported into IMPLAN the "Local Direct Purchase" that is set to 100% on the import must be set to the "SAM Model Value" using the IMPLAN interface. All of these SAM model values will be unique to the study area in question. The Large Groundfish Trawler activity is now ready to estimate the indirect and induced effects of goods and services purchased by the Large Groundfish Trawl vessels. The effects of payments to captain, crew, and proprietors using the analysis by parts approach.

Table A-20. Large Groundfish Trawler industry spending pattern example.

Activity Type	Activity Name	Actiity Level
Industry Spending Pattern	Large Groundfish Trawler	1

Sector	Event Value	Local Direct Purchase
3001	0.00000093	100%
3002	0.00000553	100%
3003	0.00033032	100%
3004	0.00020865	100%
3005	0.00001093	100%
3006	0.00000951	100%
3010	0.00000296	100%
3013	0.00009052	100%
3015	0.00000200	100%
3017	0.00775418	100%
3027	0.00000015	100%
3041	0.00024154	100%
3042	0.00003284	100%
3043	0.00005496	100%
3044	0.00003994	100%
3045	0.00000112	100%
3046	0.00006533	100%
3047	0.00023512	100%
3048	0.00007519	100%
3050	0.00005003	100%
3051	0.00022556	100%
3052	0.00019185	100%
3053	0.00051625	100%
3054	0.00074862	100%
3055	0.00061542	100%
3056	0.00021462	100%
3057	0.00012303	100%
3058	0.00007312	100%
3059	0.00164051	100%
3060	0.00040442	100%
3062	0.00075784	100%
3063	0.00042171	100%
3064	0.00003310	100%
3065	0.00032730	100%
3066	0.00018928	100%
3067	0.00007958	100%
3068	0.00022747	100%
3069	0.00027572	100%
3070	0.00976184	100%
3083	0.00024055	100%
3085	0.00021683	100%
3105	0.00112477	100%

Table A-20 (continued). Large Groundfish Trawler industry spending pattern example.

Activity Type	Activity Name	Actiity Level	Activity Year
Industry Spending Pattern	Large Groundfish Trawler	1	2010

Sector	Event Value	Local Direct Purchase
3107	0.00508185	100%
3109	0.00066741	100%
3115	0.06619659	100%
3138	0.00245623	100%
3141	0.00000244	100%
3142	0.00152794	100%
3149	0.00023378	100%
3150	0.00018634	100%
3216	0.00020329	100%
3225	0.00210726	100%
3227	0.00012873	100%
3256	0.00021006	100%
3259	0.00034217	100%
3266	0.00014568	100%
3271	0.00028796	100%
3283	0.00133483	100%
3290	0.14267499	100%
3319	0.06811651	100%
3321	0.00000141	100%
3323	0.00005121	100%
3324	0.01079769	100%
3326	0.03849354	100%
3329	0.00048528	100%
3330	0.00118954	100%
3332	0.00000710	100%
3333	0.00120790	100%
3334	0.00002567	100%
3335	0.00028480	100%
3337	0.00083260	100%
3339	0.00002267	100%
3340	0.00001297	100%
3354	0.01136448	100%
3357	0.04634027	100%
3393	0.00087277	100%
3394	0.00145541	100%
3410	0.00677249	100%
3416	0.00414619	100%
3425	0.00867350	100%
3436	0.00009212	100%

A.2.6.3 Analysis by Parts

In typical IO analysis, a shock to aggregate demand is placed on one of the industry sectors or commodities that are included in the model. Total economic impacts or contributions are then estimated as the backward linked effect of a demand change on the target industry or commodity. To calculate the estimate, the direct effect of the demand change is multiplied with the respective industry multipliers.

As explained by Manshel (2012) "Analysis-by-parts (ABP) does not start with an impact on a target industry sector or commodity. Instead, we will specify the goods and services the target industry purchases in order to satisfy a demand or production level. The purchase of these goods and services from local sources actually represent the first round of indirect purchases by the target industry. In addition to the goods and services (first part) we need to analyze the impact of the payroll (second part) of our target industry necessary to meet the new demand or production level."

In ABP the indirect and induced effects of goods and services purchased by a fishing vessel sector is the "first part" of calculating the economic impact of a given level fishery harvest. The "second part" is payments to captain, crew, and proprietors. The impact of payments to captain, crew, and owners for a given level of harvest is estimated separately using the Labor Income Activity described above. The sum of these two impacts is the total indirect and induced effects of a given level of fishery harvest. To these indirect and induced effects the direct effects must be added to reach the total effects of a given level of harvest. An example of the approach is shown below.

In IO-PAC, there are a few additional wrinkles in the ABP approach. First, on the commercial side because we are modeling the effect to both processors and harvesters, the ABP must be done for both. Additionally, the treatment tax revenue paid by harvesters is one additional "part" needed to estimate each impact for state and West Coast level study areas. Taxes are part of the production function of the commercial fishing harvesters. These taxes paid are not part of their industry spending patterns. For state and West Coast study areas, these taxes are assumed to be endogenous. The implication is that government spending will be affected by changes in tax payments from fishery participants. These payments are assumed to be subsequently spent by state and local governments. State and local government spending is expected to follow the State and Local Government Non-Education institutional spending pattern that is contained in IMPLAN.

A.2.7 Impact Estimation

IO-PAC can be used to assess the impact of a given fishery management action when an externally derived, exogenous assessment of how the action will affect the gross output of industries or commodities that are included in the model is available. With an exogenous estimate of the effect of a management action on fish harvest, IO-PAC will estimate the backward-linked impacts of the action on the economy. On the commercial side, economic impacts can be made on a commodity or industry basis.

IO models are designed to estimate the backward linked effects of a change in demand on a given industry or change in demand for a given commodity. For commercial vessel landings, IO-PAC utilizes a technique outlined by Steinback (2004) to use IO models for a change in production rather than a change in demand. If we were using the IO model in the standard way to estimate the backward linked impact of a shock to processed seafood demand, we would run a single direct commodity effect on processed seafood. The backward linked effect of that change in processed seafood demand would hit every firm involved in the production and distribution of seafood. A margin would hit the retailers, wholesalers, and processors. Harvesters would be hit as an indirect effect, because they supply the processors with a production input. The processor multiplier would have an embedded indirect effect of a change in harvester landings. The approach outlined by Steinback (2004) involves exogenously shocking the relevant seafood sectors (harvesters and processors) and setting their regional purchase coefficients (RPCs) to 0 to avoid double counting and feedback effects. By following this approach the IO model gives us the economic impact of a change in "demand" for seafood at the processor and harvester stages of production separately. Because the RPC on harvesters is set to 0, there is no indirect effect on harvesters from a change in processor production. Because the indirect effect on harvesters of a shock to processors is absent, the two effects can be summed without double counting.

With a given change in commercially harvested fish, how are the economic impacts estimated? One must decide whether a shock is more appropriately targeted on a commodity or industry sector included in the model. The appropriateness of commodity versus industry shocks depends on the research question.[5] Assuming the appropriate target is the Large Groundfish Trawlers (LGT) industry sector, the impacts are estimated as follows. First, the LGT revenue is run through their production function. The LGT production function is in the form of an industry spending pattern imported into IMPLAN. The function can be seen using the "Setup Activities" screen in IMPLAN (Figure A-5). The activity is named "Large Groundfish Trawler." Choosing the activity will cause the production function information specific to LGTs to show up in the events window. The "Sum of Event Values" at the bottom of Figure 3 shows the total share of LGT output that is used for factors of production excluding labor, so 45% of LGT revenue is used for inputs such as fuel, insurance, etc. The exogenous change in LGT harvest is entered in the "Level" cell. In this example, $1 million in revenue is entered.

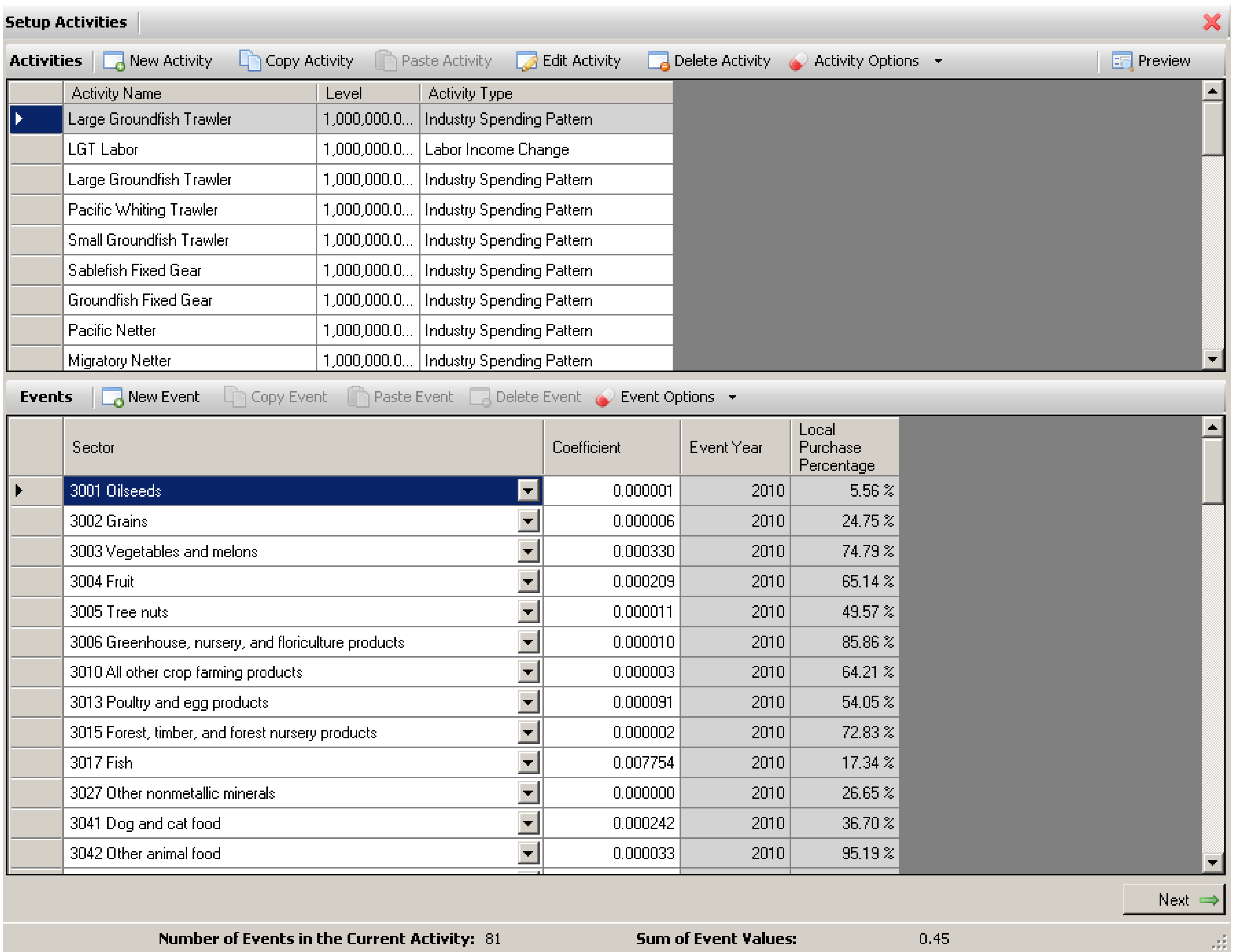


Figure A-5. Large Groundfish Trawler industry spending pattern activity.

Second, employee compensation and proprietary income is shocked with the same $1 million. The labor effect is contained in the activity "LGT Labor." It is imported as a Labor Income Change. The labor income in the event is set to the proportion of total industry output (TIO) among LGTs that is paid to employees (captain and crew) and proprietors (vessel owners). Figure A-6 indicates that among LGTs the shares paid to employees and proprietor are 0.39 and 0.11 respectively. Importing labor income as a share of TIO, allows the "Level" to be shocked with the same exogenous revenue run through the LGT spending pattern. In this example, we shocked LGT revenue by $1 million.

[5] See Leonard and Watson (2011) for a more detailed discussion of commodity versus industry impacts.

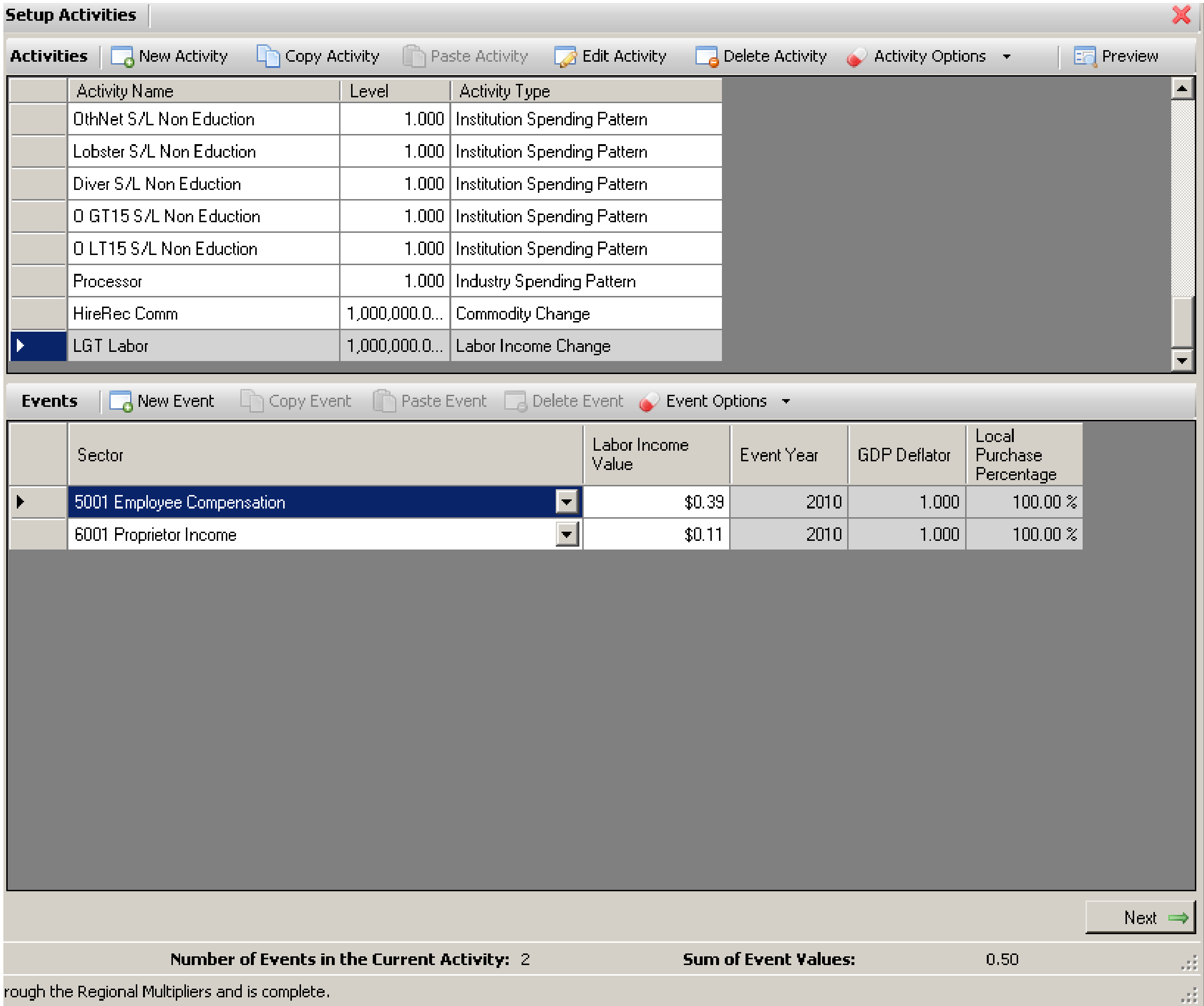


Figure A-6. Large Groundfish Trawler labor income.

Third, since the study area for this model is the whole West Coast, we import the institution spending pattern for State and Local Government Non-Education (SLG). The share of industry output paid in taxes is treated as endogenous in the state level and West Coast study areas. The base institution spending pattern for SLG is put in EXCEL and coefficients for each of the commodity purchases' are scaled so that the sum of commodity purchases equals the share of TIO paid in taxes among LGTs. This enables the "Level" to be shocked with the same exogenous revenue run through the LGT spending pattern. In this example, we shocked LGT revenue by $1 million (Figure A-7).

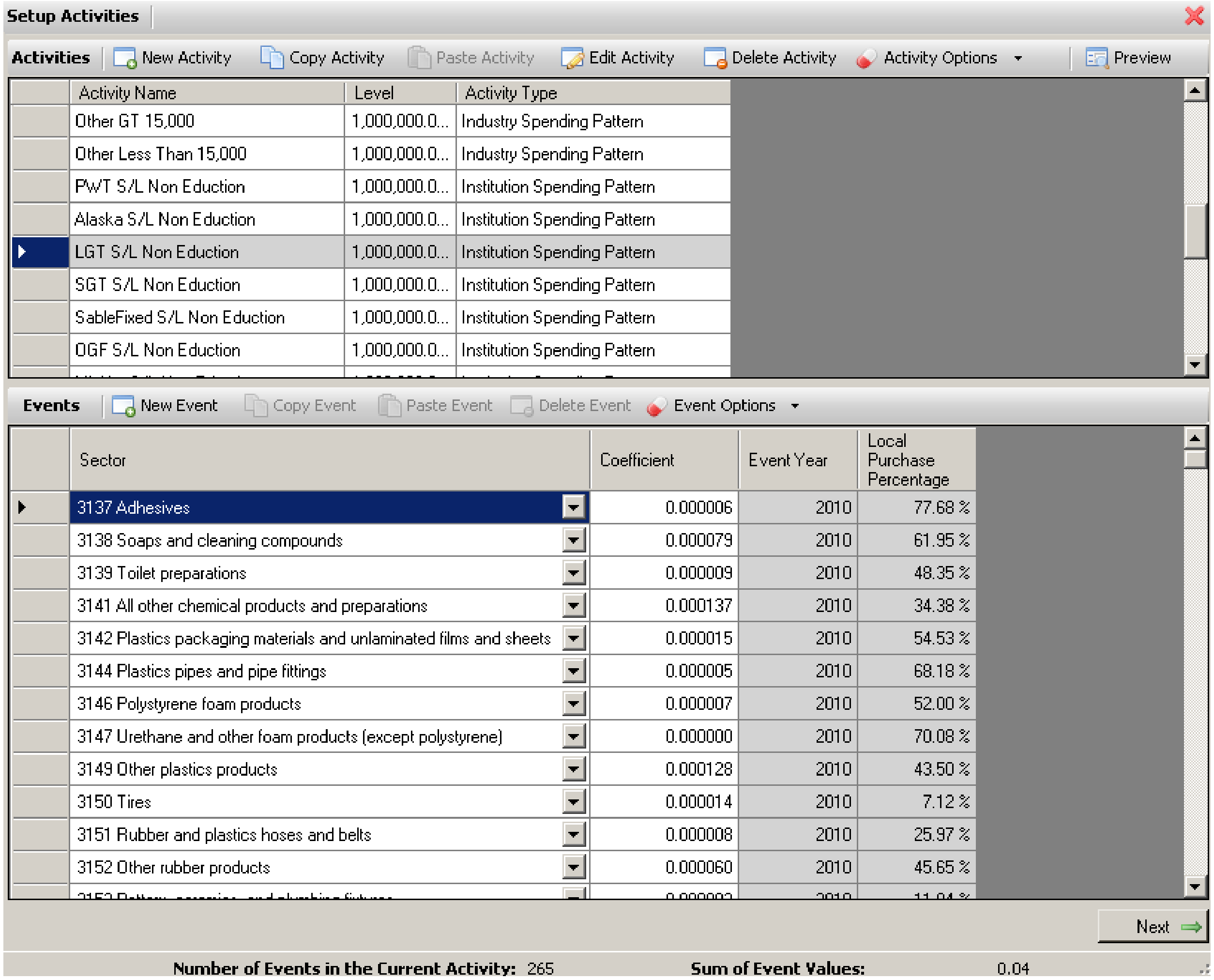


Figure A-7. Large Groundfish Trawler state and local govt. non-education.

To complete the intermediate and induced effect of a $1 million change in LGT revenue, the Large Groundfish Trawler spending pattern, LGT labor income, and LGT S/L Non-Education are all combined in a single analysis scenario dubbed "LGT" in Figure A-8.

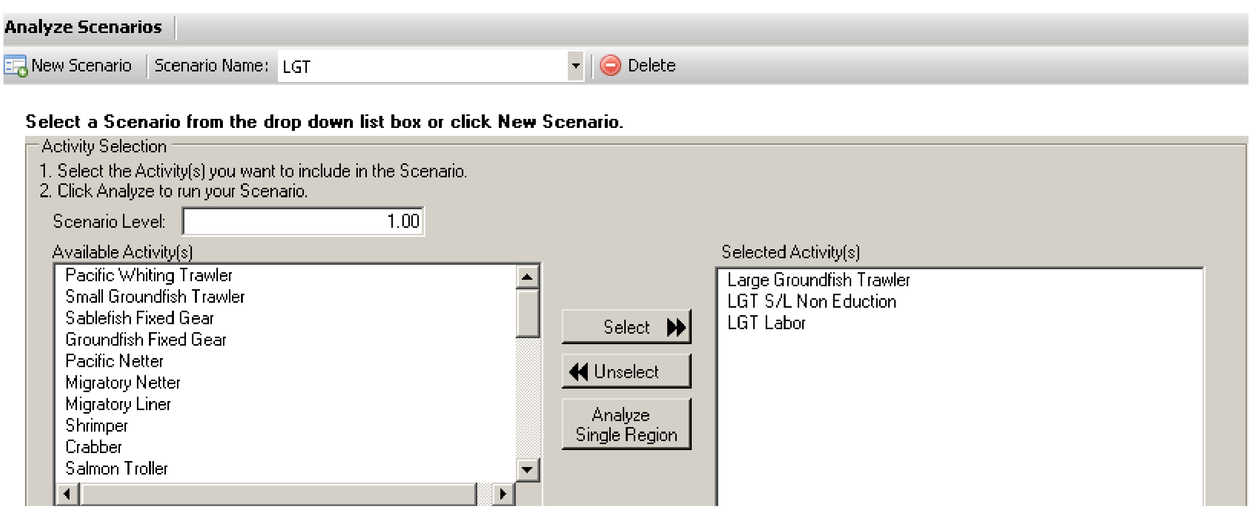


Figure A-8. Large Groundfish Trawler impact scenario.

The analysis by parts results indicate the total indirect and induced effects of a $1 million change in LGT revenue. The impact results for the West Coast study are for an increase in output of $1.58 million and an employment change of 11.28 jobs. This is the total indirect and induced effect of a $1.0 million change in LGT harvest. To this amount, the direct effects on harvesters must be added (Steinback et. al, 2008). The direct output and employment of LGTs are $1.0 million and 4.4, respectively. Altogether, the direct, indirect, and induced effect on output is $2.58 million and on employment is 15.7 jobs.

After estimating sales by seafood processors, the analysis by parts approach must be conducted in the same manner as for harvesters. Estimated sales changes for seafood processors are made by using product flow in IMPLAN for the default seafood processing sector (71) and markup margin information obtained through the EDC program. For all port level study areas, it is assumed that landings from the fish harvesting sectors flows to seafood processors in the same proportion as the default IMPLAN intermediate processor demand (sector 61) to fish harvesting supply (17) ratio. This value is determined by constructing a default IMPLAN model for the study area of interest, then examining the commodity balance sheet for the harvested fish (commodity 3017). For the West Coast example here, it is assumed that 100% is processed. Fish landings that are purchased by the processing sector in each study area are converted into revenue changes by applying the margins derived from the EDC data (Table A-12). These producer values are then entered as the change in direct sales for the seafood processing sector. For each study area, ΔL_k represents the change in total fish landings among vessel classification k, p represents the ratio of processor demand (sector 61) of the commodity fish to the available fish harvesting supply (sector 17), and m_j represents the markup for species j, then the change in sales for seafood processors (ΔPS) is given by

$$(11)\quad \Delta PS = \sum_k \sum_j \Delta L_k (p)(m_j)$$

In our example of a $1.0 million change for LGT, assume that the landings are comprised only of sablefish. For the West Coast it is assumed that 100% of the sablefish is processed. Table A-16 indicates that the markup for sablefish is 1.5, so for a $1.0 million increase in sablefish delivered to processors, processor revenue is $1.5 million. The analysis by parts approach is used to estimate the impact of the $1.5 million in the same manner as for harvesters. The total output and employment change resulting from a $1.5 million change in processor revenue are $2.4 million and 17.2, respectively.

The results from the analysis by parts results for both LGTs and processors are combined to reach the total change resulting from $1.0 million change on LGT sablefish landings. Because LGTs and processor effects are separated as a result of our breaking the link between processors and harvesters, the results of each can be added together without double counting. The sum of both the LGT and processor effects is $5.0 million in economic output and 36 jobs.

On the recreational side, recreational spending vectors for private and charter vessel effort are created in EXCEL and imported into IMPLAN as commodity and industry change vectors. The commodity change and industry change vectors are scaled so that the sum of all affected commodities and industries equals one. Because the vectors are scaled, a change in recreational spending is entered using the "Level" under "Set Up Activities" in IMPLAN. A snapshot of private boat recreational commodity purchases is shown Figure A-9. A hypothetical expenditure change of $1.0 million is entered in the "Level." Notice that the sum of event values near the bottom of the figure is 0.75. This indicates that 75% of every dollar in expenditure entered in the "Level" will be distributed to the commodity categories. The other 25% is accounted for in the industry changes for private boat recreational fishing. 25% of each dollar in the "Level" will be distributed to one of the industry categories. The total effect of the $1.0 million change is done by creating an "Activity Scenario" that includes both the commodity changes and industry changes. In this $1.0 million example, the total economic output estimate is $1.88 million and 14.5 jobs.

Setup Activities

Activities | New Activity | Copy Activity | Paste Activity | Edit Activity | Delete Activity | Activity Options

Activity Name	Level	Activity Type
Lobster S/L Non Eduction	1.000	Institution Spending Pattern
Diver S/L Non Eduction	1.000	Institution Spending Pattern
O GT15 S/L Non Eduction	1.000	Institution Spending Pattern
O LT15 S/L Non Eduction	1.000	Institution Spending Pattern
HireRec Comm	1,000,000.0...	Commodity Change
LGT Labor	2,000,000.0...	Labor Income Change
Processor	1,480,000.0...	Industry Spending Pattern
Processor Payroll	1,480,000.0...	Labor Income Change
PrivRec Comm	1,000,000.0...	Commodity Change
PrivRec Ind	1,000,000.0...	Industry Change
PrivRec Comm2	1,000,000.0...	Commodity Change

Events | New Event | Copy Event | Paste Event | Delete Event | Event Options

Sector	Commodity Value	Event Year	Output Deflator	Local Purchase Percentage
3115 Refined petroleum products	$0.20	2010	1.000	80.04 %
3002 Grains	$0.00	2010	1.000	24.75 %
3003 Vegetables and melons	$0.00	2010	1.000	74.79 %
3004 Fruit	$0.00	2010	1.000	65.14 %
3005 Tree nuts	$0.00	2010	1.000	49.57 %
3006 Greenhouse, nursery, and floriculture products	$0.00	2010	1.000	85.86 %
3010 All other crop farming products	$0.00	2010	1.000	64.21 %
3013 Poultry and egg products	$0.00	2010	1.000	54.05 %
3014 Animal products, except cattle, poultry and eggs	$0.00	2010	1.000	27.27 %
3017 Fish	$0.00	2010	1.000	100.00 %
3018 Wild game products, pelts, and furs	$0.00	2010	1.000	22.83 %
3027 Other nonmetallic minerals	$0.00	2010	1.000	26.65 %
3041 Dog and cat food	$0.00	2010	1.000	36.70 %
3042 Other animal food	$0.00	2010	1.000	95.19 %
3043 Flour and malt	$0.00	2010	1.000	68.42 %
3044 Corn sweetners, corn oils, and corn starches	$0.00	2010	1.000	20.70 %
3045 Soybean oil and cakes and other oilseed products	$0.00	2010	1.000	47.80 %

Number of Events in the Current Activity: 69 **Sum of Event Values:** 0.75

Figure A-9. Private Recreation Commodity Purchases.

A.2.8. Discussion

The revision of IO-PAC is intended to make use of the latest commercial fishery cost earnings data collected by the Northwest Fisheries Science Center, incorporate more recent IMPLAN data, add a recreational component that can be used for contribution and impact estimates resulting from recreational fishing trips, add separate mothership and CP sectors, and migrate IO-PAC to IMPLAN version 3.

Since the first version of IO-PAC was completed (Leonard and Watson, 2011), the voluntary cost earning surveys used to develop the production functions for the commercial fishing sectors in the model have been reprised and the EDC data has become available. The IO-PAC revision incorporates these latest survey results. Because of the expanded scope and increased detail of the more recent surveys, incorporating the more recent data has the added benefit of likely increasing the accuracy of IO-PAC, especially for vessel classifications that were previously not covered or partially covered.

The revision to IO-PAC increases the baseline IMPLAN data from 2006 to 2010. The IMPLAN data are based on economic relationships in 2010 as opposed to 2006 before the revision. The economy wide data that is contained in IMPLAN is slow to change. Technical change and demand remain in the economy as a whole remain relatively stable. As a result, the 2010 IMPLAN data will be suitable for use in IO-PAC for several years to come[6].

The inclusion of a recreational component permits the revised version of IO-PAC to be used for recreational fishing contribution and impact estimates. The inclusion of the recreational component was enabled through the use of recreational expenditure data for 2011 (Lovell et al., 2013) and charter vessel cost earnings data collected by the PSMFC (2004) and the NWFSC in 2006.

The revision also includes shoreside processor data collected through the EDC. The inclusion of the EDC data likely reduces the error in estimating processor impacts. Prior to the EDC, estimates where made using non-species specific production function margins (mark-up) for seafood processors. A limitation to the prior approach is that a dollar of any species will generate the same revenue to processors. While less obvious, the prior approach was also prone to error because the default production functions contained in IMPLAN are based on Economic Census data for processors in the entire United States. If seafood production practices on the West Coast differ from those of the United States as a whole, this approach is prone to error.

The current revision includes a substantial change in model construction that migrates IO-PAC to IMPLAN version 3 software. This migration reduces the effort in making production function changes when newer cost earnings data are available and in creating models for different study areas. The real advantage of the new approach is that once the production functions for the different fishery sectors are completed in a model for one study area, such as the West Coast, they can be imported into an alternative study area with click of a button. Models for all 22 study areas included in the model can be completed in a couple of days rather than weeks. Additionally, the new approach permits customised study areas to be completed with minimal effort.   Last

A.2.9. References

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[6] Opinions differ as to how frequently the input output data should be update. Based on the CIE review of IO-PAC completed in October 2009, the opinion of reviewers was every 3-5 years. The Benchmark Input-Output Table constructed by Bureau of Economic Analysis is updated every five years.

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Appendix: Bridge between Expenditures and IMPLAN Sectors

Factor expenditures by harvesters and seafood wholesalers were allocated to IMPLAN sectors. The following lists represent the bridge between harvester and seafood wholesaler expenditures and IMPLAN sectors. The main difference between these allocations and those presented in Leonard and Watson (2011) is the movement to a new industry classification system in IMPLAN.

Harvester Expenditures

Fuel and lubricant expenses were allocated based on the IMPLAN default margin table for sector 115 (petroleum refineries).

Sector	Title	Proportion
3115	Refined petroleum products	0.393794
3319	Wholesale trade distribution services	0.361077
3333	Rail transportation services	0.006754
3334	Water transportation services	0.005192
3335	Truck transportation services	0.008658
3337	Pipeline transportation services	0.004953
3326	Retail Services - Gasoline stations	0.219571
	Total	1.000000

Food and beverage expenses were allocated based on the IMPLAN personal consumption expenditure vector 1111. This vector represents the national average expenditure pattern for groceries. However, following the approach of Steinback and Thunberg (2005), purchases associated with the two default seafood sectors (i.e., commercial fishing and seafood product preparation and packaging) were reallocated to sector 60 (frozen food manufacturing), believed to better reflect likely consumption habits aboard commercial fishing vessels.

Sector	Title	Proportion
3001	Oilseeds	6.36E-05
3002	Grains	0.000379
3003	Vegetables and melons	0.022642
3005	Tree nuts	0.000749
3004	Fruit	0.014302
3006	Greenhouse, nursery, and floriculture products	0.000652
3010	All other crop farming products	0.000203
3013	Poultry and egg products	0.006205
3015	Forest, timber, and forest nursery products	0.000137
3027	Other nonmetallic minerals	1.00E-05
3041	Dog and cat food	0.016556
3042	Other animal food	0.002251
3043	Flour and malt	0.003767
3044	Corn sweetners, corn oils, and corn starches	0.002738
3045	Soybean oil and cakes and other oilseed products	7.65E-05
3046	Shortening and margarine and other fats and oils products	0.004478
3047	Breakfast cereal products	0.016116
3048	Raw and refined sugar from sugar cane	0.005154
3050	Chocolate cacao products and chocolate confectioneries	0.003429

Sector	Title	Proportion
3051	Chocolate confectioneries from purchased chocolate	0.015461
3052	Nonchocolate confectioneries	0.01315
3053	Frozen foods	0.035386
3054	Canned, pickled and dried fruits and vegetables	0.051314
3055	Fluid milk and butter	0.042184
3056	Cheese	0.014711
3057	Dry, condensed, and evaporated dairy products	0.008433
3058	Ice cream and frozen desserts	0.005012
3059	Processed animal (except poultry) meat and rendered byproducts	0.112448
3060	Processed poultry meat products	0.027721
3062	Bread and bakery products	0.051946
3063	Cookies, crackers, and pasta	0.028906
3064	Tortillas	0.002269
3065	Snack foods including nuts, seeds and grains, and chips	0.022435
3066	Coffee and tea	0.012974
3067	Flavoring syrups and concentrates	0.005455
3068	Seasonings and dressings	0.015592
3069	All other manufactured food products	0.018899
3070	Soft drinks and manufactured ice	0.06019
3141	All other chemical products and preparations	0.000167
3319	Wholesale trade distribution services	0.098877
3332	Air transportation services	0.000487
3333	Rail transportation services	0.002832
3334	Water transportation services	0.001729
3335	Truck transportation services	0.013268
3339	Couriers and messengers services	0.001554
3340	Warehousing and storage services	0.000889
3321	Retail Services - Furniture and home furnishings	9.66E-05
3323	Retail Services - Building material and garden supply	0.001584
3324	Retail Services - Food and beverage	0.196583
3326	Retail Services - Gasoline stations	0.016591
3329	Retail Services - General merchandise	0.006296
3330	Retail Services - Miscellaneous	0.00834
3436	Noncomparable foreign imports	0.006314

Ice expenses were allocated based on the IMPLAN default margin table for sector 70 (soft drink and ice manufacturing).

Sector	Title	Proportion
3070	Soft drinks and manufactured ice	0.628331
3319	Wholesale trade distribution services	0.10275
3333	Rail transportation services	0.000222
3334	Water transportation services	3.14E-05
3335	Truck transportation services	0.006453
3324	Retail Services - Food and beverage	0.193154
3326	Retail Services - Gasoline stations	0.069058
	Total	**1.000000**

Repair and maintenance expenses for vessel gear and equipment were allocated to sector 290, which includes ship building and repairing.

Sector	Title	Proportion
3290	Ships	1.00
	Total	**1.00**

Moorage expenses were allocated to sector 410, which includes the activities of marinas. Marinas usually offer mooring, dockage, and haul out services for a fee.

Sector	Title	Proportion
3410	Other amusement and recreation	1.00
	Total	**1.00**

Insurance expenses for vessels were allocated to sector 357, which includes establishments primarily engaged in underwriting and assuming the risk of insurance policies.

Sector	Title	Proportion
3357	Insurance	1.00
	Total	**1.00**

Interest and financial services were allocated to sector 354, which includes establishments primarily engaged in financial services.

Sector	Title	Proportion
3354	Monetary authorities and depository credit services	1.00
	Total	**1.00**

Purchases and leases of permits were allocated to IMPLAN's value-added sector, other income.

Sector	Title	Proportion
Value-added	Other Income	1.00
	Total	**1.00**

Enforcement expenses were allocated to sector 416, which includes electronic and precision equipment repair and maintenance.

Sector	Title	Proportion
3416	Electronic and precision equipment repairs and maintenance	1.00
	Total	**1.00**

Dues were allocated to sector 425, which includes civic, social, professional, and similar organizations.

Sector	Title	Proportion
3425	Civic, social, and professional services	1.00
	Total	**1.00**

Moorage expenses were allocated to sector 410, which includes the activities of marinas. Marinas usually offer mooring, dockage, and haul out services for a fee.

Sector	Title	Proportion
3410	Other amusement and recreation	1.00
	Total	**1.00**

Freight supplies expenses were allocated using the default IMPLAN margin table for sector 126 (paperboard container manufacturing).

Sector	Title	Proportion
3107	Paperboard containers	0.581083
3319	Wholesale trade distribution services	0.016356
3332	Air transportation services	0.000463
3333	Rail transportation services	0.026539
3335	Truck transportation services	0.130381
3330	Retail Services - Miscellaneous	0.245178
	Total	**1.000000**

Offloading expenses were allocated to sector 410, which includes the activities of marinas. Marinas usually offer mooring, dockage, and haul out services for a fee.

Sector	Title	Proportion
3410	Other amusement and recreation	1.00
	Total	**1.00**

Truck transportation was allocated to sector 335, truck transportation.

Sector	Title	Proportion
3335	Truck transportation services	1.00
	Total	**1.00**

All other vessel expenditures were allocated according to proportions contained in the production function of the default commercial fishing sector in IMPLAN. This allocation scheme is identical to that developed by Steinback and Thunberg (2006) for the miscellaneous trip supplies cost category in the Northeast Region Commercial Fishing Input-Output Model. They summed the absorption coefficients associated with the manufacturing sectors that produce the commodities used in the commercial fishing production function and allocated the commodity expenditures to the appropriate manufacturing industries. Additionally, their estimates include average wholesale, transportation, and retail margins across all the manufacturing sectors since the majority of these purchases occur at the retail level.

Sector	Title	Proportion
3083	Curtains and linens	0.008560
3085	All other textile products	0.007716
3105	Paper from pulp	0.040025
3107	Paperboard containers	0.180838
3109	All other paper bag and coated and treated paper	0.023750
3138	Soaps and cleaning compounds	0.047259
3138	Soaps and cleaning compounds	0.040146
3142	Plastics packaging materials and unlaminated films and sheets	0.054372
3149	Other plastics products	0.008319
3150	Tires	0.006631
3216	Air conditioning, refrigeration, and warm air heating equipment	0.007234
3225	Other engine equipment	0.074987
3227	Air and gas compressors	0.004581
3256	Watches, clocks, and other measuring and controlling devices	0.007475
3259	Electric lamp bulbs and parts	0.012176
3266	Power, distribution, and specialty transformers	0.005184
3271	Primary batteries	0.010247
3283	Motor vehicle parts	0.047500
3333	Rail transportation services	0.001000
3319	Wholesale trade distribution services	0.161000
3323	Retail Services - Building material and garden supply	0.001000
3324	Retail Services - Food and beverage	0.185000
3326	Retail Services - Gasoline stations	0.013000
3329	Retail Services - General merchandise	0.014000
3330	Retail Services - Miscellaneous	0.038000
	Total	**1.000000**

Tax expenditures for state and West Coast models were allocated to IMPLAN's State and Local Government Non-Education expenditure vector.

Sector	Title	Proportion
Institution Spending Pattern	State and Local Government Non-Education	1.00
	Total	**1.00**

Wages and salaries of employees (captain and crew) were allocated to the value-added sector, employee compensation.

Sector	Title	Proportion
Value-added	Employee compensation	1.00
	Total	**1.00**

Vessel residuals were allocated to the value-added sector, proprietary income.

Sector	Title	Proportion
Value-added	Proprietary income	1.00
	Total	**1.00**

Seafood Processors
Seafood processor purchases were allocated as follows.

Additives

Commodity	Title	Proportion
3046	Shortening and margarine and other fats and oils products	0.5860
3059	Processed animal (except poultry) meat and rendered byproducts	0.1989
3045	Soybean oil and cakes and other oilseed products	0.1428
3044	Corn sweeteners, corn oils, and corn starches	0.0077
3126	Other basic organic chemicals	0.0647
	Total	**1.000000**

Custom processing was allocated to the processed seafood commodity.

Sector	Title	Proportion
3061	Seafood products	1.0000
	Total	**1.00**

Electrical utility expenses

Sector	Title	Proportion
3031	Electricity, and distribution services	1.0000
	Total	**1.00**

Freight expenses

Sector	Title	Proportion
3335	Truck transportation services	0.853
3333	Rail transportation services	0.039
3332	Air transportation services	0.108
	Total	**1.00**

Insurance expenses

Sector	Title	Proportion
3357	Insurance	1.0000
	Total	**1.00**

Natural gas and propane gas expenses

Sector	Title	Proportion
3032	Natural gas, and distribution services	0.9924
3020	Oil and natural gas	0.0076
	Total	**1.00**

Offsite storage and freezing

Sector	Title	Proportion
3340	Warehousing and storage services	1.000
	Total	**1.00**

Packaging

Sector	Title	Proportion
3107	Paperboard containers	0.8034
3108	Coated and laminated paper, packaging paper and plastics film	0.1392
3105	Paper from pulp	0.0091
3146	Polystyrene foam products	0.0048
3142	Plastics packaging materials and unlaminated films and sheets	0.0435
	Total	**1.000000**

Production supplies

Sector	Title	Proportion
3327	Retail Services - Clothing and clothing accessories	0.2941
3325	Retail Services - Health and personal care	0.2206
3329	Retail Services - General merchandise	0.4853
	Total	**1.000000**

Rental or lease of buildings, job-site trailers, and other structures

Sector	Title	Proportion
3360	Real estate buying and selling, leasing, managing, and related services	1.0000
	Total	**1.00**

Rental or lease of processing machinery or equipment

Sector	Title	Proportion
3365	Commercial and industrial machinery and equipment rental and leasing services	1.0000
	Total	**1.00**

Repair and maintenance on facility buildings, machinery, and equipment

Sector	Title	Proportion
3039	Maintained and repaired nonresidential structures	0.363
3388	Services to buildings and dwellings	0.364
3417	Commercial and industrial machinery and equipment repairs and maintenance	0.273
	Total	**1.00**

Sewer and waste

Sector	Title	Proportion
3390	Waste management and remediation services	1.0000
	Total	**1.00**

Shoreside monitors

Sector	Title	Proportion
3375	Environmental and other technical consulting services	1.0000
	Total	**1.00**

Water expenses

Sector	Title	Proportion
3033	Water, sewage treatment, and other utility services	1.0000
	Total	**1.00**

Other processors expenditures were allocated according to proportions contained in the production function of the default processing sector in IMPLAN that were not allocated to any of the cost categories already used above.

Sector	Title	Proportion
3319	Wholesale trade distribution services	0.2569
3014	Animal products, except cattle, poultry and eggs	0.2188
3381	Management of companies and enterprises	0.1361
3380	All other miscellaneous professional, scientific, and technical services	0.0636
3377	Advertising and related services	0.0411
3369	Architectural, engineering, and related services	0.0402
3354	Monetary authorities and depository credit intermediation services	0.0294
3190	Metal cans, boxes, and other metal containers (light gauge)	0.0189
3351	Telecommunications	0.0170
3366	Leasing of nonfinancial intangible assets	0.0135
3362	Automotive equipment rental and leasing services	0.0132
3374	Management, scientific, and technical consulting services	0.0125
3367	Legal services	0.0119
3368	Accounting, tax preparation, bookkeeping, and payroll services	0.0106
3413	Restaurant, bar, and drinking place services	0.0097
3338	Scenic and sightseeing transportation services and support activities for transportation	0.0084
3376	Scientific research and development services	0.0074
3356	Securities, commodity contracts, investments, and related services	0.0068
3414	Automotive repair and maintenance services, except car washes	0.0061
3149	Other plastics products	0.0047
3373	Other computer related services, including facilities management	0.0047
3425	Civic, social, and professional services	0.0043
3118	Petroleum lubricating oils and greases	0.0042
3411	Hotels and motel services, including casino hotels	0.0041
3021	Coal	0.0041
3202	Other fabricated metals	0.0040
3112	All other converted paper products	0.0035
3355	Nondepository credit intermediation and related services	0.0034
3372	Computer systems design services	0.0030
3416	Electronic and precision equipment repairs and maintenance	0.0028
3386	Business support services	0.0026
3138	Soaps and cleaning compounds	0.0025
3236	Computer terminals and other computer peripheral equipment	0.0022

Sector	Title	Proportion
3375	Environmental and other technical consulting services	0.0021
3432	Products and services of State & Local Govt enterprises (except electric utilities)	0.0021
3433	Used and secondhand goods	0.0019
3418	Personal and household goods repairs and maintenance	0.0019
3352	Data processing- hosting- ISP- web search portals	0.0018
3384	Office administrative services	0.0015
3148	Plastics bottles	0.0014
3336	Transit and ground passenger transportation services	0.0014
3363	General and consumer goods rental services except video tapes and discs	0.0014
3382	Employment services	0.0010
3389	Other support services	0.0009
3405	Independent artists, writers, and performers	0.0008
3247	Other electronic components	0.0008
3216	Air conditioning, refrigeration, and warm air heating equipment	0.0007
3320	Retail Services - Motor vehicle and parts	0.0006
3283	Motor vehicle parts	0.0006
3387	Investigation and security services	0.0006
3331	Retail Services - Nonstore, direct and electronic sales	0.0005
3106	Paperboard from pulp	0.0005
3324	Retail Services - Food and beverage	0.0005
3415	Car wash services	0.0004
3195	Machined products	0.0004
3404	Promotional services for performing arts and sports and public figures	0.0004
3228	Material handling equipment	0.0003
3323	Retail Services - Building material and garden supply	0.0003
3407	Fitness and recreational sports center services	0.0003
3239	Other communications equipment	0.0003
3141	All other chemical products and preparations	0.0002
3403	Spectator sports	0.0002
3326	Retail Services - Gasoline stations	0.0002
3410	Other amusements and recreation	0.0002
3266	Power, distribution, and specialty transformers	0.0002
3330	Retail Services - Miscellaneous	0.0002
3163	Other concrete products	0.0002
3259	Electric lamp bulbs and parts	0.0002
3322	Retail Services - Electronics and appliances	0.0002
3321	Retail Services - Furniture and home furnishings	0.0002
3370	Specialized design services	0.0001
3328	Retail Services - Sporting goods, hobby, book and music	0.0001
3237	Telephone apparatus	0.0001
3238	Broadcast and wireless communications equipment	0.0001
3402	Performing arts	0.0000
3313	Office supplies (except paper)	0.0000
	Total	**1.000000**

Wages and salaries of employees were allocated to the value-added sector, employee compensation.

Sector	Title	Proportion
Value-added	Employee compensation	1.00
	Total	**1.00**

Processor residuals were allocated to the value-added sector, proprietary income.

Sector	Title	Proportion
Value-added	Proprietary income	1.00
	Total	**1.00**

A.3 Commercial Landings Distribution Model

The purpose of the commercial fishery landings distribution model (LDM) is to inform the PFMC's management processes by projecting where (PacFIN PCID) landings are likely to occur under a set of alternative scenarios (e.g., alternative ACLs or management measures). The projected landings ports can then be mapped onto Port Area aggregations to allow comparison of the geographic distribution of ex-vessel revenues under the alternatives. Since all the alternatives are modeled consistently, projections from the LDM facilitate comparison of the alternatives in an apples-to-apples fashion.

A list of Port Areas and underlying PCIDs is shown in Tables A-21 and A-22. Although used primarily to inform the groundfish management processes, the LDM methodology can be applied to analyze any west coast fishery. In the case of groundfish, exvessel revenue results from the LDM, aggregated by Port Area, are fed directly into the IO-Pac input-output and vessel net revenue projection models, where they are used to calculate and compare economic impacts under the different alternatives[7].

A.3.1 Data Elements

The core of the LDM is a recent-year commercial fishing landings data report from the Pacific Coast Fisheries Information Network (PacFIN) data system. The standardized PacFIN daily (vdrfd) or monthly (vfcmrfd) vessel landing summary can be used for this purpose. The PacFIN website briefly describes the vdrfd table thus:

Vdrfd table: The relationship between vessels, tickets, date-of-landing, permit(s), fish-ticket category, and post-distribution species id code. (Produced by prod/refresh_vdrfd.sql.)

For analyzing the 2015-2016 groundfish management specifications, a vdrfd table for 2013 was used.

Key data elements of the LDM provided by the PacFIN data report include:

- Inventories of all species (SPIDs including nominal and market categories after application of species composition factors), round weights and ex-vessel values landed during the year by port ((PCID).
- Assignment of each landing to a fisheries management sector.
- Distribution of species landings and revenues by vessel (DRVID).
- Distribution of species landings and revenues among first receivers (Processor ID)

This historical information forms one of baselines against which changes under the management alternatives can be measured.

A.3.2 Model

Groundfish landings records in the vessel landings table are categorized by fisheries sector (PacFIN "dahl_sector"). This categorization is based on permit status, PFMC catch area, port, species and gear used. The fisheries sector categories align with the GMT fishery sector projection models listed below. The GMT models project landings in each of five sectors under the management alternative as part of their overall analysis of harvest specifications and management measures.

[7] IO-Pac is a set of regional economic impact models constructed using landings data, vessel expenditure estimates, and secondary economic data to estimate income and employment impacts resulting from a change in the distribution of commercial fishery landings. It is maintained by Northwest Fisheries Science Center (NWFSC) and used by the Pacific Fishery Management Council (PFMC) to estimate economic impacts of West Coast fishery management actions.

The next step is to compute the base year percentage of landings for each fishery sector by each combination of Area, Vessel ID, SPID and PCID. The "area" used for this calculation varies according to the resolution of the corresponding fishery sector projection model, as noted below. The percentages are then applied to the results from the GMT fishery sector projection models to estimate the geographic distribution of landings across ports (PCIDs) in each fishery.

To project the geographic distribution of landings under the alternatives, results from the commercial fisheries sector landings projection models are applied to the landings percentages calculated from the vdrfd report as noted above. Unless indicated otherwise (by the GMT model results or the proposed management measures) landings under the alternatives are assumed to occur in the same ports in proportion to landings observed in the base year vdrfd table. Only landings of the main economic groundfish species that are modeled for each fisheries sector are of concern in the LDM. Landings of nongroundfish species, incidentally caught groundfish species and overfished species such as canary rockfish, bocaccio and cowcod are generally ignored, as these are not managed under the Groundfish FMP or do not generate significant revenues in groundfish fisheries.

The level of detail carried over from the GMT models to the LDM varies considerably by fisheries sector. The most detailed results are produced by the IFQ catch projection model which generates a table of projected landings by species category for each groundfish permit ID.

Less detailed results and mappings are used to link the LDM with the remaining fishery sector models. For example, the Non-nearshore fisheries model projects landings of sablefish (and incidentally-caught overfished species) in aggregate for the LE and OA fixed gear fisheries north of 36° north latitude. So, unless otherwise constrained or indicated under the alternatives, a port (PCID) that received, e.g., 8% of the north of 36° LE fixed gear sablefish landings in 2011 is expected to receive 8% of projected north of 36° LE fixed gear sablefish landings under each alternative each year of the biennial cycle. The same rationale is applied to distribute OA-DTL fixed gear sablefish landings.

Linkage between the LDM and the Nearshore fisheries model is similar, except that additional area detail in the nearshore model is incorporated to distribute projected landings of nearshore groundfish species by area to the ports (PCIDs) associated with each catch area and in proportion to the distribution of landings observed in the base year vdrfd data table.

The main features the model inputs and additional procedures used for integrating this information in the LDM are described below:

1. **IFQ catch projection model:** Projected groundfish target species landings by each vessel/permit participating in the IFQ fishery. The list of IFQ target species projected includes Sablefish, Longspine thornyhead, Shortspine thornyhead, Dover sole, Arrowtooth flounder, Petrale sole, English sole, Other flatfish and Pacific whiting. Incidental landings of non-target and overfished IFQ species are also projected by the model however these projections are not generally relevant for economic analysis.
2. **Non-nearshore fisheries model**: Projected maximum aggregate landings of sablefish and incidentally caught overfished species by vessels participating in the fixed-gear LE and OA-DTL fisheries north of 36°. Only projected sablefish landings are used in the economic analysis. Note: To date sablefish landings south of 36° have not been explicitly modeled by the GMT. Instead the sablefish OYs/ACLs under each alternative are compared with landings observed in the base year, and then the resulting ratios are applied in order to project landings under the alternatives.
3. **Nearshore fisheries model:** Projected aggregate landings by area (Oregon, California north of 40°10´ and California south of 40°10´) of nearshore target species (black rockfish, blue rockfish, cabezon, kelp greenling, lingcod, and other minor nearshore rockfish) by vessels participating in

the fixed gear OA fishery. Landings of canary and yelloweye rockfish are also projected, although these landings are not generally relevant for economic analysis of this sector.

4. **At sea whiting fisheries model:** Projected alternative allocations of Pacific whiting to the at sea CP and mothership fisheries, constrained by anticipated relevant overfished species allocations and observed bycatch rates, if applicable.
5. **Tribal fisheries model:** Projected total whiting (shoreside and at sea) and non-whiting groundfish target species landings by the tribal groundfish fisheries.

A.3.2.1 IFQ Fishery

Information in the final end-of-year run for the relevant year from the IFQ catch projection model is used to adjust records in the vdrfd table for IFQ fishery participants. This step produces a calibrated landings report that can be linked with IFQ catch projections generated for each groundfish management option or alternative. Projected landings by vessels (permits) are assumed to distribute to ports (PCIDs) based on where those vessels (permits) landed in the base year vdrfd table. Note: Although Pacific whiting harvest is regulated separately from the non-whiting groundfish specifications process, whiting landings by vessels/permits participating in the IFQ fishery are also modeled in this method. A range of possible Pacific whiting harvests is sometimes analyzed in the groundfish DEIS for purposes of comparison.

A.3.2.2. Non-Nearshore Fisheries

Total sablefish landings projected under each option or alternative by the non-nearshore fisheries model for fixed gear LE and OA-DTL fisheries north of 36° are distributed to participating vessels and ports (PCIDs) in proportion to where sablefish landings occurred in the base year vdrfd table. For areas south of 36° a different procedure is used. The ratio of sablefish landings in the base year to the corresponding sablefish ACL is calculated. This ratio is then applied to the ACL projected under each option or alternative to estimate total sablefish landings south of 36° under the corresponding scenarios. Estimated total landings are then distributed to associated landing ports south of 36° in proportion to where sablefish landings occurred in the base year vdrfd table.

A.3.2.3 Nearshore Fisheries

For the fixed gear OA fishery, total projected nearshore target species landings under each option or alternative projected by the nearshore fishery model are distributed to participating vessels and ports in the proportions observed in the base year vdrfd table. Nearshore target species distributed in this manner include black rockfish, blue rockfish, cabezon, kelp greenling, lingcod, and other minor nearshore rockfish. The Nearshore OA model includes three nearshore fishery catch areas: Oregon, California north of 40°10′ and California south of 40°10′.

A.3.2.4 At-sea Whiting Fisheries

Total projected whiting catch by the two nontribal at sea whiting fisheries (CPs and motherships) are distributed among vessels that participated in the whiting fishery in proportion to their participation in the base year. Pacific whiting harvest is regulated separately from the nonwhiting groundfish specifications process, but a range of possible Pacific whiting harvests is sometimes analyzed in the groundfish DEIS for purposes of comparison.

A.3.2.5 Tribal Groundfish Fisheries

Total projected landings and deliveries under each option or alternative by the tribal groundfish fisheries, including shoreside and at-sea whiting, are distributed among vessels and ports that participated in those fisheries in proportion to their participation in the base year.

A.3.3 Assumptions and Caveats

Major simplifying assumptions are highlighted here, including:

- Average exvessel prices observed in the base year will carry over to the projection period(s).
- There is no cross hauling of raw product. That is landings in each port are also processed there.
- Average annual ex-vessel prices are assumed to apply in each port no matter when during the year landings occur.

One concern with this approach is that the more exvessel prices deviate from the range of prices observed in the base year, the more inaccurate projected revenue impacts may be. However if better information is available on future exvessel price trends, it is possible to incorporate this type of information into the revenue projections.

Landings and revenue impacts projected for groundfish by the LDM are used in the IO-Pac model to estimate community income impacts under the alternatives. To the degree that processing activities, the vessel's home port, or the residences of owners and workers are located in the port of landing, then a larger portion of the impacts generated by these landings will to accrue in the community associated with the port. However to the extent that processing activities, the vessel's home port, or the residences of workers and owners are located elsewhere, the pattern of landings may overstate the impact of these activities in the local economy. Where landings are made in one port but a vessel's home port or crew reside elsewhere, or where first receivers transport landings elsewhere for processing, at least a portion of projected income impacts may be attributed to the wrong port.

A.3.4 Results

Results from the LDM are used as inputs to estimate community income and employment impacts and vessel sector net revenues ("profits") under the alternatives. Projected revenues by species, fishing sector and port are fed into the IO-Pac model to generate community personal income and employment impacts under each alternative. Projected landings and revenue for groundfish species by each groundfish fishery sector coupled with vessel cost estimates from IO-Pac are also used to estimate net revenues accruing to vessel owners participating in west coast groundfish fisheries. Estimates from these two models are used to compare and contrast economic impacts under a range of groundfish management alternatives.

Table A-21. List of Washington and Oregon Port Groups and PacFIN PCIDs in the Landings Distribution Model.

Port Group Area	County	PCID	Port Name
WASHINGTON			
Puget Sound	Whatcom	BLN	Blaine
	Whatcom	BLL	Bellingham Bay
	San Juan	FRI	Friday Harbor
	Skagit	ANA	Anacortes
	Skagit	LAC	La Conner
	Snohomish	ONP	Other North Puget Sound Ports
	Snohomish	EVR	Everett
	King	SEA	Seattle
	Pierce	TAC	Tacoma
	Thurston	OLY	Olympia
	Mason	SHL	Shelton
North Washington Coast	Jefferson	TNS	Port Townsend
	Clallam	SEQ	Sequim
	Clallam	PAG	Port Angeles
	Clallam	NEA	Neah Bay
	Clallam	LAP	La Push

Table A-21 (continued). List of Washington and Oregon Port Groups and PacFIN PCIDs in the Landings Distribution Model.

Port Group Area	County	PCID	Port Name
South & Central WA Coast	Grays Harbor	CPL	Copalis Beach
	Grays Harbor	GRH	Grays Harbor
	Grays Harbor	WPT	Westport
	Pacific	WLB	Willapa Bay
	Pacific	LWC	Ilwaco/Chinook
	Klickitat	OCR	Other Columbia River Ports
OREGON			
Columbia River	Multnomah	CRV	Psuedo Port Code for Columbia River
Astoria-Tillamook	Clatsop	AST	Astoria
	Clatsop	GSS	Gearhart - Seaside
	Clatsop	CNB	Cannon Beach
	Tillamook	NHL	Nehalem Bay
	Tillamook	TLL	Tillamook / Garibaldi
	Tillamook	NTR	Netarts Bay
	Tillamook	PCC	Pacific City
Newport	Lincoln	SRV	Salmon River
	Lincoln	SLZ	Siletz Bay
	Lincoln	DPO	Depoe Bay
	Lincoln	NEW	Newport
	Lincoln	WLD	Waldport
	Lincoln	YAC	Yachats
Coos Bay	Lane	FLR	Florence
	Douglas	WIN	Winchester Bay
	Coos	COS	Coos Bay
	Coos	BDN	Bandon
Brookings	Curry	ORF	Port Orford
	Curry	GLD	Gold Beach
	Curry	BRK	Brookings

Table A-22. List of California Port Groups and PacFIN PCIDs in the Landings Distribution Model.

CALIFORNIA			
Crescent City	Del Norte	CRS	Crescent City
	Del Norte	ODN	Other Del Norte County Ports
Eureka	Humboldt	ERK	Eureka (Includes Fields Landing)
	Humboldt	FLN	Fields Landing
	Humboldt	TRN	Trinidad
	Humboldt	OHB	Other Humboldt County Ports
Fort Bragg	Mendocino	BRG	Fort Bragg
	Mendocino	ALB	Albion
	Mendocino	ARE	Arena
	Mendocino	OMD	Other Mendocino County Ports
San Francisco (incl. Bodega Bay)	Sonoma	BDG	Bodega Bay
	Marin	BOL	Bolinas
	Marin	TML	Tomales Bay
	Marin	RYS	Point Reyes
	Marin	OSM	Other Son. and Mar. Co. Outer Coast Ports
	Marin	SLT	Sausalito
	Alameda	OAK	Oakland
	Alameda	ALM	Alameda
	Alameda	BKL	Berkely
	Contra Costa	RCH	Richmond
	San Francisco	SF	San Francisco
	San Mateo	PRN	Princeton
	San Francisco	SFA	San Francisco Area
	San Francisco	OSF	Other S.F. Bay and S.M. Co. Ports
Monterey	Santa Cruz	CRZ	Santa Cruz
	Monterey	MOS	Moss Landing
	Monterey	MNT	Monterey
	Monterey	OCM	Other S.C. and Mon. Co. Ports
Morro Bay	San Luis Obispo	MRO	Morro Bay
	San Luis Obispo	AVL	Avila
	San Luis Obispo	OSL	Other S.L..O. Co. Ports
Santa Barbara	Santa Barbara	SB	Santa Barbara
	Santa Barbara	SBA	Santa Barbara Area
	Ventura	HNM	Port Hueneme
	Ventura	OXN	Oxnard
	Ventura	VEN	Ventura
	Ventura	OBV	Other S.B. and Ven. Co. Ports
Los Angeles	Los Angeles	TRM	Terminal Island
	Los Angeles	SPA	San Pedro Area
	Los Angeles	SP	San Pedro
	Los Angeles	WLM	Willmington
	Los Angeles	LGB	Longbeach
	Orange	NWB	Newport Beach
	Orange	DNA	Dana Point
	Orange	OLA	Other LA and Orange Co. Ports
San Diego	San Diego	SD	San Diego
	San Diego	OCN	Oceanside
	San Diego	SDA	San Diego Area
	San Diego	OSD	Other S.D. Co. Ports

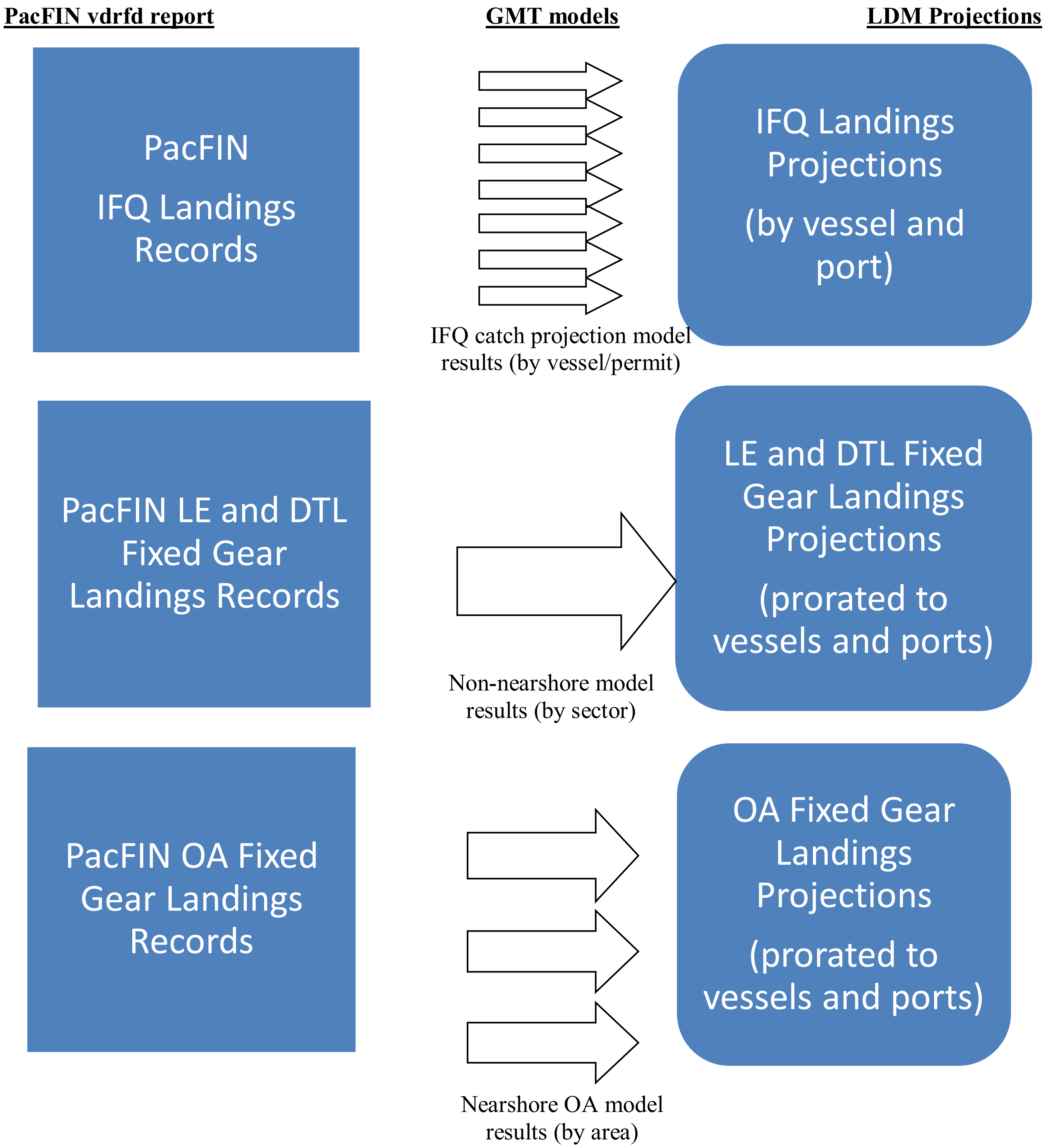

Figure A-10. Linkages between base year data, GMT landings projections, and the LDM.

Note: Results from the at sea whiting fisheries and tribal fisheries models are incorporated in similar fashion.

A.4 Description of the Trawl IFQ Sector Landings Projection Model

A model was constructed to predict landings of IFQ species under the 2015-16 ACL alternatives by vessels participating in IFQ sector fisheries. The sectors modeled included shorebased whiting, non-whiting trawl, and non-trawl IFQ fishery sectors. Assignment of vessels/permits to sector categories was based on IFQ sector participation as recorded in their 2013 PacFIN landings summaries and vessel quota pound (QP) account transactions (NMFS Vessel Account database).

The allocation of each IFQ species to the shorebased IFQ sector was computed for each alternative. "Un-adjusted" allocations varied across alternatives according to the ACLs evaluated under each alternative. These allocations were then adjusted based on historical attainment (catch as a fraction of the allocation). The first step was to recognize that the lowest level of catch during the 2011-2013 period represented a "floor", or the minimum catch attainment level for each IFQ species, and that total catch of each IFQ species could not exceed its allocation under the alternative. Therefore the smaller of either 2011-2013 historical annual catch or the allocation was identified for each IFQ species under each alternative. This value was then compared to the attainment-adjusted allocation, and the larger of these two values was chosen as the "adjusted allocation" to use for each IFQ species under each alternative. Table A-23 shows example calculations for two IFQ species: Canary rockfish where the attainment-adjusted allocation is used, and English sole where the minimum annual amount debited during 2011-2013 is used.

Table A-23. Example of 2015 adjusted allocations for two IFQ species: Canary rockfish (Preferred Alternative) and English sole (Alternative 2).

	A	B	C	D	E
	Un-adjusted allocation	Minimum annual amount debited, 2011-2013	Minimum of A, B	Attainment-adjusted allocation	"Adjusted Allocation" Value Used (maximum of C, D)
Canary rockfish	95,376	8,125	8,125	21,825	21,825
English sole	15,347,411	302,936	302,936	221,781	302,936

Landings were then projected at the individual vessel/permit level for each alternative using the following formula:

$$Projected\ Landings_{p,s} = \frac{Pd_{p,s}}{Td_s} \times Lf_s \times Adj\ Alloc_s$$

Where:

$Projected\ Landings_{p,s}$ = Landings of IFQ species s by vessel/permit p

$Pd_{p,s}$ = amount of IFQ species s debited by vessel/permit p during 2011-2013

Td_s = total amount of IFQ species s debited during 2011-2013

Lf_s = the landed catch fraction of IFQ species s during 2011-2013. (Note: Catch was obtained from the Vessel Account database, and landed catch was obtained from the PacFIN vdrfd table.)

$Adj\ Alloc_s$ is the adjusted allocation for IFQ species s (the result in column E in Table A-23, above).

Ex-vessel values were imputed to the IFQ species landings under the alternatives using coastwide average exvessel revenue per pound received for IFQ species landings in 2013.

Round weight and associated ex-vessel revenue of each IFQ species landed by each participating vessel/permit were then merged into the landings distribution model (LDM) and assigned to landings ports based on the distribution of IFQ landings recorded by the vessel/permit in 2013. Results from the LDM were used to derive economic impact indicators under the alternatives including total ex-vessel revenue, accounting net revenue by fisheries sector, and income impacts and employment impacts by port area[8].

It is important to note that this model does not accommodate the effects of decisions by vessel/permits to change target strategies from prior years, thereby resulting in different relative needs for QP of IFQ target species and associated IFQ incidental catch species. Nor does it account for the many external factors affecting quota attainment and landings, such as QP trading between vessel accounts, change in ex-vessel prices, unfavorable weather, and unexpected changes in catch per unit effort (CPUE) or incidental species bycatch rates.

A.5 Non-Nearshore

The non-nearshore model projects bycatch impacts for limited entry and open access fixed gear vessels that are fishing seaward of the non-trawl RCA. The main focus is on bycatch of the rebuilding rockfish, canary and yelloweye in particular, as described in Appendix D. This model was reviewed by the SSC in 2013 and endorsed as "best available science and appropriate for use in the 2015-16 specifications process" (Agenda Item F.7.b Supplemental SSC Report June 2013). WCGOP observations on discards and landed catch 2002-2012 provide the primary data input for estimating bycatch with PacFIN fish ticket data also providing information on the distribution of catch among gear types. Data from 2012 were the most recent data available at the time of the analysis.

As also described in Appendix C, sablefish is the primary target for vessels fishing in these sectors. The sablefish ACL north of 36° N. latitude is apportioned according to the formal intersector allocations shown in Figure A-10. Management measures are intended to keep the total mortality—i.e., discard mortality and landings—within the allocation for each sector. Because of the economic importance of sablefish, the bycatch impact analysis assumes that the annual sablefish allocation will be fully attained by the fixed gear fleets seaward of the RCA. WCGOP bycatch observations are therefore expressed as a ratio to the expected landings of sablefish.

[8] Accounting net revenues, income and employment impacts were generated using the IO-PAC model for estimating commercial fishery-related economic impacts. Fisheries industry detail in IO-PAC is estimated from economic data surveys of vessels and processors participating in West Coast fisheries. The model is maintained by Northwest Fisheries Science Center and used by the Pacific Fishery Management Council to estimate economic impacts of West Coast fishery management actions.

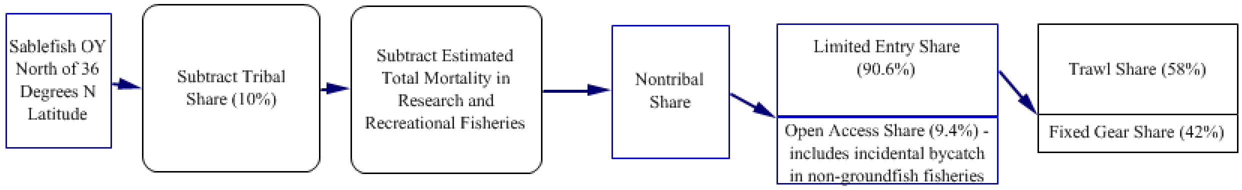

Figure A-11. The formal intersector allocations of sablefish north of 36° N. latitude.

The structure of the projection model has not been changed from that used during the past 3 analyses (2009-10 through 2013-14). Newly available observations were added such that the model now combines data from the fixed gear sablefish fishery north and south of 40°10' N. latitude from the years 2002-2012. Data from each year is weighted equally. There are tradeoffs with data accuracy and precision involved with stratifying observations to finer levels across attributes (i.e., time, area, depth, and gear type). Aggregating data across years allows reporting of retained and discarded catch of groundfish species by gear type at a finer latitudinal and depth scale than would otherwise be possible. Differences in the encounter rate of yelloweye and canary rockfish between depths and areas are the major focus of the model and so these stratifications have taken priority. The data is stratified by gear because of the differences in the rate of encounter between pot and longline gear types.

Data summarizing observed retained and discarded catch from fishing efforts north of 40°10' N. latitude are stratified across three alternative depth ranges that are used to evaluate the potential impact of extending the seaward boundary of the non-trawl RCA on bycatch levels. As described in Appendix D, the seaward RCA boundary is the key bycatch management measures in these non-nearshore sectors. Although the range of depths recorded for an individual fixed gear set by observers is commonly much smaller than for observed trawl tows, there is some uncertainty in the assignment of catch and discard from many sets to a specific 25 fm interval. For this exercise, the average of the beginning and ending depths of each set was used to represent the depth at which all fish on the set were caught.

The area stratification used in this model was developed first for use in the 2009-10 biennial management cycle. This stratification was arrived at through consideration of canary and yelloweye bycatch north of 40°10' N. latitude by depth and area and provides the Council with the option of employing differential seaward RCA boundaries within these areas. Four subareas were identified bounded by: Cape Mendocino at 40°10' N. latitude, the boundary of the Columbia and Eureka INPFC areas (43°10' N. latitude), Cascade Head (45.064°10' N. latitude), Point Chehalis (46.888°10' N. latitude), and the U.S.-Canada border. Several alternative boundaries were evaluated. Analysts determined that the four listed above provided the greatest contrast and reliability between areas of high and low yelloweye bycatch. Since rockfish bycatch in the pot gear fleet is very small and there are very limited numbers of pot gear observations in some areas, results for this group are summarized with respect to depth only (without subareas). The seaward boundary of the non-trawl RCA south of 40°10' N. latitude has always been 150 fm and so no data is available shallower than that depth.

To produce estimates of catch by area, the model must assume a distribution of sablefish catch between the areas north and south of 40°10' N. latitude and between longline and pot gear types for both the open access and limited entry sectors. The assumed distribution is based on fish ticket landings for the years 2002-2012 (Table A-24). The 2002-2012 average of WCGOP observed landings are then used to project the distribution of the longline catch north of 40°10' N. latitude among the four management subareas (Table A-25). The model then applies WCGOP observed discard rates to these projected catch distributions using the appropriate area, depth, and gear stratification to produce annual estimates of discard for the rebuilding rockfish encountered by the non-nearshore fixed gear sectors. Discard rates were calculated by dividing the total observed discard weight for each species by the weight of retained sablefish and are reported in Table A-26 through Table A-29. Data is available for all species encountered in the non-nearshore sectors, however, this projection model focuses on the rebuilding rockfish stocks and the potential need to adjust the seaward boundary of the RCA to lower their catch. The total mortality of other groundfish species discarded and landed by these sectors is reviewed and accounted for annually and will be addressed if catch reaches levels where a sector allocation or other catch limit is at risk of being exceeded. If necessary, the structure and data in this model could be used to project bycatch of species for which discard becomes a concern in the non-nearshore sectors.

Table A-24. Distribution of fish ticket landings among longline (hkl) and pot gear types in the limited entry and open access non-nearshore fixed gear sectors, 2002-2012.

	LIMITED ENTRY						OPEN ACCESS				
	36° - 40°10' N lat		North of 40°10' N lat		TOTAL		36° - 40°10' N lat		North of 40°10' N lat		TOTAL
	hkl	pot	hkl	pot	(LE)		hkl	pot	hkl	pot	(OA)
2002	154	15	783	345	1,297	2002	125	83	138	16	362
2003	201	24	1,013	587	1,825	2003	126	148	246	29	550
2004	214	58	1,264	573	2,109	2004	90	156	191	13	449
2005	212	-	1,320	618	2,150	2005	111	262	419	105	896
2006	186	50	1,389	562	2,187	2006	83	247	280	186	796
2007	190	39	1,118	392	1,738	2007	31	217	186	33	467
2008	227	38	1,146	398	1,809	2008	64	208	273	25	570
2009	436	56	1,499	440	2,431	2009	276	326	305	38	944
2010	507	57	1,429	469	2,462	2010	444	294	218	29	985
2011	794	93	1,172	303	2,362	2011	155	208	176	45	584
2012	567	92	969	214	1,841	2012	60	98	127	22	307
Total	3,687	520	13,101	4,901	22,209	Total	1,565	2,246	2,559	540	6,911
% of LE total	17%	2%	59%	22%	100%	% of OA total	23%	32%	37%	8%	100%

Table A-25. Distribution of observed longline sablefish landings among the four management subareas north of 40°10' N. latitude, 2002-2012.

	North of 40°10' N	40°10' - Col./Eur. line 43°	Col./Eur. line 43° - Cascade Head 45.064°	Cascade Head 45.064° - Pt. Chehalis 46.888°	North of Pt. Chehalis 46.888°
Observed sablefish landings (mt)	2,863	453	833	548	1,029
% of total in each area strata					
Total		**16%**	**29%**	**19%**	**36%**
min (02-12)		6%	17%	4%	8%
max (02-12)		26%	42%	45%	55%
mean (02-12)		15%	29%	20%	36%
stdev (02-12)		7%	9%	12%	16%

Table A-26. Rates of species discard (2002-2012 average) for the rebuilding rockfish species relative to retained sablefish, used to project bycatch impacts for longline gear south of 40°10' N. latitude and for pot gear types north and south of north of 40°10' N. latitude.

	36° - 40°10' N. lat.		**North of 40°10' N. Lat** Pot		
	Longline	Pot	100 fm	125 fm	150fm
Bycatch ratios (total catch lbs / retained sablefish lbs)					
Rebuilding species					
Bocaccio	0.0000	0.0000	0.0000	0.0000	0.0000
Canary rockfish	0.0000	0.0000	0.0000	0.0000	0.0000
Cowcod	0.0000	0.0000	0.0000	0.0000	0.0000
Darkblotched rockfish	0.0009	0.0007	0.0011	0.0011	0.0012
Pacific ocean perch	0.0000	0.0000	0.0000	0.0000	0.0000
Petrale sole	0.0001	0.0001	0.0000	0.0000	0.0000
Yelloweye rockfish	0.0000	0.0000	0.0000	0.0000	0.0000

Table A-27. Rates of species discard (2002-2012 average) observed on fixed gear sablefish sets deeper than 100 fm for rebuilding rockfish species, relative to retained sablefish, used to project bycatch impacts for longline gear north of 40°10' N. latitude by management subareas.

	North of 40°10' N	**40°10' - Col./Eur. line 43°**	**Col./Eur. line 43° - Cascade Head 45.064°**	**Cascade Head 45.064° - Pt. Chehalis 46.888°**	**North of Pt. Chehalis 46.888°**
Bycatch ratios (total catch lbs / retained sablefish lbs)					
Rebuilding species					
Bocaccio	0.0001	0.0004	0.0000	0.0000	0.0001
Canary rockfish	0.0010	0.0000	0.0001	0.0014	0.0019
Cowcod	0.0000	0.0000	0.0000	0.0000	0.0000
Darkblotched rockfish	0.0036	0.0114	0.0045	0.0016	0.0004
Pacific ocean perch	0.0003	0.0005	0.0001	0.0002	0.0003
Petrale sole	0.0002	0.0000	0.0001	0.0001	0.0005
Yelloweye rockfish	0.0005	0.0004	0.0006	0.0002	0.0007

Table A-28. Rates of species discard (2002-2012 average) observed on fixed gear sablefish sets deeper than 125 fm for rebuilding rockfish species, relative to retained sablefish, used to project bycatch impacts for longline gear north of 40°10' N. latitude by management subareas.

	North of 40°10' N	40°10' - Col./Eur. line 43°	Col./Eur. line 43° - Cascade Head 45.064°	Cascade Head 45.064° - Pt. Chehalis 46.888°	North of Pt. Chehalis 46.888°
Bycatch ratios (total catch lbs / retained sablefish lbs)					
Rebuilding species					
Bocaccio	0.0001	0.0003	0.0000	0.0000	0.0000
Canary rockfish	0.0007	0.0000	0.0001	0.0003	0.0017
Cowcod	0.0000	0.0000	0.0000	0.0000	0.0000
Darkblotched rockfish	0.0042	0.0118	0.0051	0.0023	0.0005
Pacific ocean perch	0.0002	0.0005	0.0002	0.0003	0.0002
Petrale sole	0.0001	0.0000	0.0001	0.0001	0.0003
Yelloweye rockfish	0.0003	0.0003	0.0003	0.0002	0.0004

Table A-29. Rates of species discard (2002-2012 average) observed on fixed gear sablefish sets deeper than 150 fm for rebuilding rockfish species, relative to retained sablefish, used to project bycatch impacts for longline gear north of 40°10' N. latitude by management subareas.

	North of 40°10' N	40°10' - Col./Eur. line 43°	Col./Eur. line 43° - Cascade Head 45.064°	Cascade Head 45.064° - Pt. Chehalis 46.888°	North of Pt. Chehalis 46.888°
Bycatch ratios (total catch lbs / retained sablefish lbs)					
Rebuilding species					
Bocaccio	0.0000	0.0002	0.0000	0.0000	0.0000
Canary rockfish	0.0007	0.0000	0.0001	0.0001	0.0018
Cowcod	0.0000	0.0000	0.0000	0.0000	0.0000
Darkblotched rockfish	0.0050	0.0129	0.0067	0.0026	0.0005
Pacific ocean perch	0.0002	0.0005	0.0001	0.0003	0.0001
Petrale sole	0.0001	0.0000	0.0000	0.0001	0.0001
Yelloweye rockfish	0.0001	0.0001	0.0001	0.0001	0.0002

A.6 Sablefish Daily Trip Limit 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.

A.6.1 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.

A.6.2 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 WCGOP, 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.

A.7 Trip Limit Model for the Non-trawl Fixed-gear Lingcod, Shortspine Thornyhead, Bocaccio, and Minor Shelf Rockfish Complex Fishery Sectors

A.7.1 Analytical Description

The purposes of this analysis are to compare predicted commercial landings (mortality) between the No Action Alternative and the Preferred Alternatives, and to assist the Pacific Fishery Management Council in recommending final preferred alternatives for the 2015-2016 biennial management cycle. This is completed for selected fishery sectors with the goal to keep final mortality within ACLs under P* values of 0.45 and 0.25. This is accomplished by using a catch-based fleet capacity trip limit model that the state of California developed for selected state managed fisheries. It has been adapted for the following fishery sectors, with trip limit mortality estimate analyses completed for the options within the fishery sectors:

- Lingcod
  - Option 1a – No Action
  - Options 1b, 1c – North of 40°10' N. latitude (limited entry (LE) and open access (OA) sectors) trip limit increases for periods 3-5 and November with continued closures for periods 1 and 2 and closed in December
  - Options 2a and 2b –For the LE sector north of 40°10' N. latitude; trip limit increases for periods 3, 4, and 5, and modest trip limits for periods 1 and 2 and November and December.
  - Options 2a and 2b for the LE sector south of 40°10' N. latitude; modest trip limit for period one and December, closed period 2, and status quo trip limits for periods 3 -5 and November.
  - Options 2a and 2b for the OA sector north of 40°10' N. latitude, modest trip limits for periods 1 and 2 and November and December and trip limit increases for periods 3 – 5.
  - Options 2a and 2b for the OA sector, south of 40°10' N. latitude; a modest trip limit for period 1 and December, closed period 2, and the remaining months continuing at the status quo amount (Option 1a – No Action).
- Shortspine thornyhead (LE sector only)
  - Option 1a – No Action
  - Option 1b – Modest trip limit increases for north of 34°27' N. latitude
  - Option 1c – Larger trip limit increases for north of 34°27' N. latitude
- Bocaccio (LE and OA sectors) trip limit increases for south of 34°27' N. latitude
  - Option 1 – No Action
  - Option 2a – Modest trip limit increases for south of 34°27' N. latitude
  - Option 2b – Larger trip limit increases for south of 34°27' N. latitude
- Minor shelf rockfish complex (LE and OA sectors) trip limit increases for south of 34°27' N. latitude
  - Option 1 – No Action
  - Option 2a – Modest trip limit increases for south of 34°27' N. latitude
  - Option 2b – Larger trip limit increases for south of 34°27' N. latitude

The following tables give the detailed trip limit information (No Action and the proposed options) for each fishery sector analyzed for the 2015-2016 biennial management cycle.

- Table A-30 – Lingcod coastwide
- Table A-31 – Shortspine thornyhead north of 34°27' N. latitude
- Table A-32 – Trip limits (pounds per vessel per period) for bocaccio south of 34°27' N. latitude comparing Option 1 (No Action) to the proposed Option 2a and Option 2b trip limit structures. Trip limits apply to both the limited entry and open access non-trawl fixed-gear sectors.– Bocaccio south of 34°27' N. latitude
- Table A-33 – Trip limits (pounds per vessel per period) for the minor shelf rockfish complex south of 34°27' N. latitude comparing Option 1 (No Action) to the proposed Option 2a and Option 2b trip limit structures. Trip limits apply to both the limited entry and open access non-trawl fixed-gear fishery sectors. – Minor shelf rockfish complex south of 34°27' N. latitude

Table A-30. Lingcod commercial coastwide trip limits (reported in pounds per vessel) comparing the No Action Option (Option 1a) to options that increase the bi-monthly trip limit to 1,200 pounds and 1,600 pounds for the limited entry sector and increases to 600 pounds per month and 800 pounds per month for the open access sector (Options 1b, and 1c). Also presented are proposed trip limits that establish trip limits for periods 1 and 2 and December, with period 2 closed south of 40°10' N. latitude for both sectors (Options 2a and 2b).

Proposed lingcod trip limits based on the No Action Option (1a) and Options 1b and 1c						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 1a	closed	closed	800	800	800	400 (Nov only)
Option 1b	closed	closed	1,200	1,200	1,200	600 (Nov only)
Option 1c	closed	closed	1,600	1,600	1,600	800 (Nov only)
Open access						
Option 1a	closed	closed	400 lb/month (Dec closed)			
Option 1b	closed	closed	600 lb/month (Dec closed)			
Option 1c	closed	closed	800 lb/month (Dec closed)			
Proposed lingcod trip limits that apply to the area **NORTH** of 40°10' N. latitude with a year-long season structure						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 2a	200 lb/2 months	200 lb/2 months	1,200 lb	1,200 lb	1,200 lb	600 lb for Nov (200 lb for Dec)
Option 2b	200 lb/2 months	200 lb/2 months	1,600 lb	1,600 lb	1,600 lb	800 lb for Nov (200 lb for Dec)
Open access						
Option 2a	100 lb/month	100 lb/month	600 lb/month (100 lb for Dec)			
Option 2b	100 lb/month	100 lb/month	800 lb/month (100 lb for Dec)			
Proposed lingcod trip limits that apply to the area **SOUTH** of 40°10' N. latitude with March/April closed						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 2a	200 lb/2 months	closed	800 lb	800 lb	800 lb	400 lb for Nov (200 lb for Dec)
Option 2b	200 lb/2 months	closed	800 lb	800 lb	800 lb	400 lb for Nov (200 lb for Dec)
Open access						
Option 2a	100 lb/month	closed	400 lb/month (100 lb for Dec)			
Option 2b	100 lb/month	closed	400 lb/month (100 lb for Dec)			

Table A-31. Trip limits (pounds per vessel per period) for shortspine thornyheads north of 34°27' N. latitude comparing Option 1 (No Action) to the proposed Option 2a and Option 2b trip limit structures. Trip limits are for the limited entry non-trawl fixed-gear fishery.

	Period and trip limits (applies to the vessel (pounds) per two month period)					
Option	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Option 1 (No Action)	2,000	2,000	2,000	2,500	2,500	2,500
Option 2a	2,250	2,250	2,250	2,500	2,500	2,500
Option 2b	2,500	2,500	2,500	2,500	2,500	2,500

Table A-32. Trip limits (pounds per vessel per period) for bocaccio south of 34°27' N. latitude comparing Option 1 (No Action) to the proposed Option 2a and Option 2b trip limit structures. Trip limits apply to both the limited entry and open access non-trawl fixed-gear sectors.

	Period and trip limits (applies to the vessel (pounds) per two month period)					
Option	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Option 1 (No Action)	300	Closed	300	500	500	500
Option 2a	750	Closed	750	750	750	750
Option 2b	1,000	Closed	1,000	1,000	1,000	1,000

Table A-33. Trip limits (pounds per vessel per period) for the minor shelf rockfish complex south of 34°27' N. latitude comparing Option 1 (No Action) to the proposed Option 2a and Option 2b trip limit structures. Trip limits apply to both the limited entry and open access non-trawl fixed-gear fishery sectors.

	Period and trip limits (applies to the vessel (pounds) per two month period)					
Option	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Option 1 (No Action)	3,000 (750)	Closed	3,000 (750)	3,000 (750)	3,000 (750)	3,000 (750)
Option 2a	4,000 (1,500)	Closed	4,000 (1,500)	4,000 (1,500)	4,000 (1,500)	4,000 (1,500)
Option 2b	5,000 (2,500)	Closed	5,000 (2,500)	5,000 (2,500)	5,000 (2,500)	5,000 (2,500)

Note: Open access trip limits are in parentheses

A.7.2 Model Description

The trip limit model used in these analyses was developed by the CDFW and has been used during the past decade in the state management of cabezon, kelp greenling, and California sheephead. It has also been used for black and blue rockfishes, bocaccio, and the minor shelf rockfish complex. It is a catch-based fleet capacity model structured around the concept of examining the targeted species harvest mortality amount for every vessel within a fishery sector for each of the allowable fishing periods compared to what each of those vessels could have theoretically taken for each of those periods. A per period proportion is calculated based upon a base year time frame and it is this proportion that is used to estimate what each vessel will take under various trip limit scenarios and assumptions. This proportionality per period approach lends itself to a high degree of flexibility in that it can account for trip limits that may have changed over time and area and by fishery sector (LE and OA), fishery seasonal closures, potential differences in season harvest rates due to market demand changes, changing number of vessels per period, various proposed trip limit combinations, and the influence of other fisheries. Each fishing period is defined as a two month period starting with January/February. The one exception to this is the lingcod OA sector where one month periods are used. Target species harvest mortalities used in the model are those recorded from commercial dealer landing receipts for the three states with species composition adjustments made either at the state level and/or through the PacFIN algorithm. In the case of the lingcod fishery, the model also has the ability to differentiate lingcod landed with and without the take of nearshore species. This is necessary so that only those lingcod landings made with nearshore species are included in the GMT's nearshore bycatch model, which is used to estimate the mortality of overfished species taken within the nearshore fishery for Oregon and California. All lingcod landed by the non-trawl fixed-gear fleet (non-IFQ), however, are factored into the total annual mortality estimate.

A.7.3 Model Input Data and Output

Commercial landings data are extracted from the PacFIN's vdrfd table and are then summarized using one or more of the criteria mentioned above (Figure A-12). PacFIN's vdrfd table accommodates for species composition expansion adjustments, and therefore differs from the raw amounts reported on the states' dealer receipts. For each vessel per period, those species target data are ranked in a descending order so that for each period, the top vessel is ranked first. Period mortality data may be an average amount per vessel per period or total gross amounts may be used instead. Regardless of method that is chosen, that amount is compared to what each vessel could have taken if it has taken its maximum allowable amount. (This theoretical maximum amount is derived by either averaging the period trip limits over the base period or by summing the trip limit amounts, if trip limits were changed or were different from period to period within a year or from year to year during the base period.) Each vessel is then assigned a proportional percentage amount where the proportion percentage = reported harvest-mortality ÷ theoretical maximum harvest. It is this calculated amount that is multiplied times the amount of the proposed trip limit. These multiplied amounts are then summed for each period with the annual estimated harvest mortality then being the summed amounts for all periods combined. Whenever possible, discard mortality is factored into the final estimate by using proxy values calculated from WCGOP data if they are available. This annual estimate is then compared to the ACL or to a harvest guideline (HG) amount. The numerical summary for the trip limit model is provided in formulas (1) and (2):

$$T_{e/p} = \Sigma\ (X_i/T_{Max})(T_{Pi}) \qquad (1)$$

Where $T_{e/p}$ = Total fleet mortality estimate (e) per open period (p)

X_i = Vessel harvest (either total or average per period for each vessel (i))

T_{Max} = Total theoretical maximum a vessel could have taken for the given period (either gross total or average per period)

T_p = Trip limit (proposed amount for the given period (p))

$$\text{And: } T_A = \Sigma\ T_{e/p} \qquad (2)$$

Where T_A = Total annual mortality estimate

For the lingcod estimates, that portion of the overall lingcod mortality estimate that is determined to come from landings made in conjunction with nearshore fishery landings is inserted into the GMT nearshore bycatch model to estimate OFS mortalities. In this situation, mortality amounts for both the LE and OA sectors are combined since the nearshore bycatch model does not differentiate between these two sectors. Additionally for the nearshore bycatch model, the appropriate lingcod landings are stratified by three areas: 1) Oregon, 2) California north of 40°10' N. latitude, and 3) California south of 40°10' N. latitude. This needs to be configured in this manner because the nearshore model is designed to only accept summarized landings stratified by these three areas.

A.7.5 Assumptions and Limitations

A difficulty encountered in estimating what the final annual mortality will be for a given fishery sector is a means to estimate latent capacity. There are two major types of latent capacity in these fishery sectors: within and without. Latent capacity within a fishery sector comes about when participants in a fishery change their fishing behavior in response to increases in the trip limit structure. Some who have taken relatively small amounts of fish may decide to increase their fishing to capitalize on increased landing amounts (assuming that they have a buyer willing to purchase these increased amounts). There may be others who have taken modest to high amounts who now feel it is advantageous to “max out.” The other major type of latent capacity is the more difficult one to quantify. This is the one where participants enter a fishery that they have not participated in before or have not participated in for a lengthy time. While this may be true of the LE fisheries, it can be an especially difficult problem in the OA fisheries. For this latter situation, various methods have been tried to estimate how many participants may decide to jump into an open access fishery that now has increased trip limit amounts. This model is not designed to estimate what potential number of participants may enter the future but rather it has a method built in to compensate for within fishery latent capacity. To do this, the model assumes that any vessel participant that has taken at least 80 percent of more of its theoretical maximum in the past (again, calculated per period) will probably be likely to continue to do so and may be inclined to “max out.” This results in a 20 percent “buffer.” As such, the model assigns all vessels in this category a proportional take amount of 100 percent. For example, if a given vessel took 85 percent of its theoretical maximum during a period when the trip limit was 500 pounds, if that trip limit is increased to 600 pounds, then the model assigns that vessel’s estimated take to be 600 pounds (not 85% x 600 = 510 pounds). This over-estimating compensates for a certain level of within the fishery sector latent capacity. In cases where a potential trip limit structure will decrease, this becomes more a real potential in that those who took a substantial amount of what they could have taken will be very inclined to take all that they can at lower levels. Of course, if trip limits are reduced to a point that participants cannot earn enough money to make fishing trips economically viable, then the sector may essentially collapse to a certain degree, or at least experience a substantial decline in activity.

Linked to the issue of latent capacity, the model assumes that there won’t be a substantial change in fishing behavior as a result of trip limit adjustments – especially if proposed trip limit adjustments are modest. In cases where proposed trip limit increases may be substantial, that 20 percent buffer may correspondingly be increased in an attempt to compensate for a greater level of latent capacity mortality. This, to a degree, addresses a total annual mortality estimates in relation to an ACL or HG, but does not address how many new participants may decide to fish, as mentioned above. The model does not have a component that factors in (or estimates) what the level of potential harvest will be that will cause or stimulate new participants to enter a fishery. This is a level where it becomes economically profitable to fish – be it for those already participating to one degree or another or for those contemplating entering the fishery.

One area that has not been developed with this model, but could be done so in the future should the need arise, is considering the possibility of different trip limits based on different gear types used within a fishery sector.

Because WCGOP discard mortality estimates have not been readily available in all cases, proxy values were calculated whenever possible. This is not as good a method as having actual amounts for each of the fishery sectors. The GMT and Council staff are working with WCGOP staff to resolve this issue.

A.7.6 Results

Because the results of the trip limit analyses for the 2015-2015 biennial management cycle are presented in greater detail in Appendix B, Section B.9, only summary tables of the estimated projected mortality amounts (mt) for each sector under the two P* levels of 0.45 and 0.25 are presented here (Table A-34, Table A-35, Table A-36, and Table A-37). These projected commercial fishery sector mortality estimates are compared to the non-trawl fixed-gear allocation portion of the ACLs (or HGs) with a percent of the allocation.

Table A-34. Lingcod coastwide commercial mortality estimates using the status quo season structure (closed during periods 1, 2 and December coastwide) comparing No Action (Option 1a) to Options 1b and 1c. The limited entry bimonthly trip limits are shown, along with open access monthly trip limits in parentheses.

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.45						
	Proposed Bimonthly and Monthly Trip Limits (lb)	Estimated Take (mt)	2015		2016	
			Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 1a	800 (400)	88.9	1,950.7	4.6%	1,857.8	4.8%
Option 1b	1,200 (600)	122.3	1,950.7	6.3%	1,857.8	6.6%
Option 1c	1,600 (800)	155.1	1,950.7	8.0%	1,857.8	8.3%

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.25						
	Proposed Bimonthly and monthly Trip Limits (lb)	Estimated Take (mt)	2015		2016	
			Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 1a	800 (400)	88.9	1,444.1	6.2%	1,375.4	6.5%
Option 1b	1,200 (600)	122.3	1,444.1	8.5%	1,375.4	8.9%
Option 1c	1,600 (800)	155.1	1,444.1	10.7%	1,375.4	11.3%

Note: For the limited entry sector, the November trip limits are 400 lb under Option 1a, 600 lb under Option 1b, and 800 lb under Option 1c. The non-trawl allocations are a combination of those for north and south of 40°10' N

Table A-35. Projected mortality estimates (mt) for the 2015-2016 biennial management cycle for shortspine thornyhead (north of 34°27' N. latitude) analyzed under this section are given for the P* values of 0.45 and 0.25. Projected commercial mortality estimates are compared to the non-trawl allocation amounts (in parentheses).

SHORTSPINE THORNYHEAD		P*0.45		P*0.25	
		2015 (84.3)	2016 (83.4)	2015 (61.4)	2016 (60.8)
Option	Projected Mortality (mt)	Percent of Allocation	Percent of Allocation	Percent of Allocation	Percent of Allocation
Option 1a	77.3	91.7%	92.7%	125.9%	127.1%
Option 1b	80.3	95.3%	96.3%	130.8%	132.1%
Option 1c	83.4	98.9%	100.0%	135.8%	137.2%

Table A-36. Projected commercial mortality estimates (mt) for the 2015-2016 biennial management cycle for bocaccio analyzed under this section are given for the P* values of 0.45 and 0.25. Projected mortality estimates are compared to the non-trawl allocation amounts (in parentheses).

BOCACCIO	Projected Mortality				P*0.45 and P*0.25	
	South of 34°27' N. lat.		40°10' – 34°27'		2015 (258.8)	2016 (268.7)
	LE	OA	LE+OA	Total	Percent of Allocation	Percent of Allocation
Option 1	1.1	2.5	0.9	4.5	1.7%	1.7%
Option 2a	1.7	6.2	0.9	8.8	3.4%	3.3%
Option 2b	2.2	12.4	0.9	15.5	6.0%	5.8%

Table A-37. Projected commercial mortality estimates (mt) for the 2015-2016 biennial management cycle for the minor shelf rockfish complex analyzed under this section are given for the P* values of 0.45 and 0.25. Projected mortality estimates are compared to the non-trawl allocation amounts (in parentheses). For the minor shelf rockfish complex, the projected mortality amounts at the various options include the recreational sector estimate.

MINOR SHELF ROCKFISH COMPLEX	Projected Mortality					P*0.45		P*0.25	
	South of 34°27' N. lat.		40°10' – 34°27'	South of 40°10' N. lat.		2015 (1,382.2)	2016 (1,384.0)	2015 (659.7)	2016 (659.7)
Option	LE	OA	LE+OA	Rec.	Total	Percent of Allocation		Percent of Allocation	
Option 1	3.9	14.3	16.1	354	388.3	28.1%	28.1%	58.9%	
Option 2a	4.3	24.0	16.1	354	398.4	28.8%	28.8%	60.4%	
Option 2b	5.4	39.9	16.4	354	415.7	30.1%	30.0%	63.0%	

A.7.7 Data Flow Chart Description of Nearshore Trip Limit Model

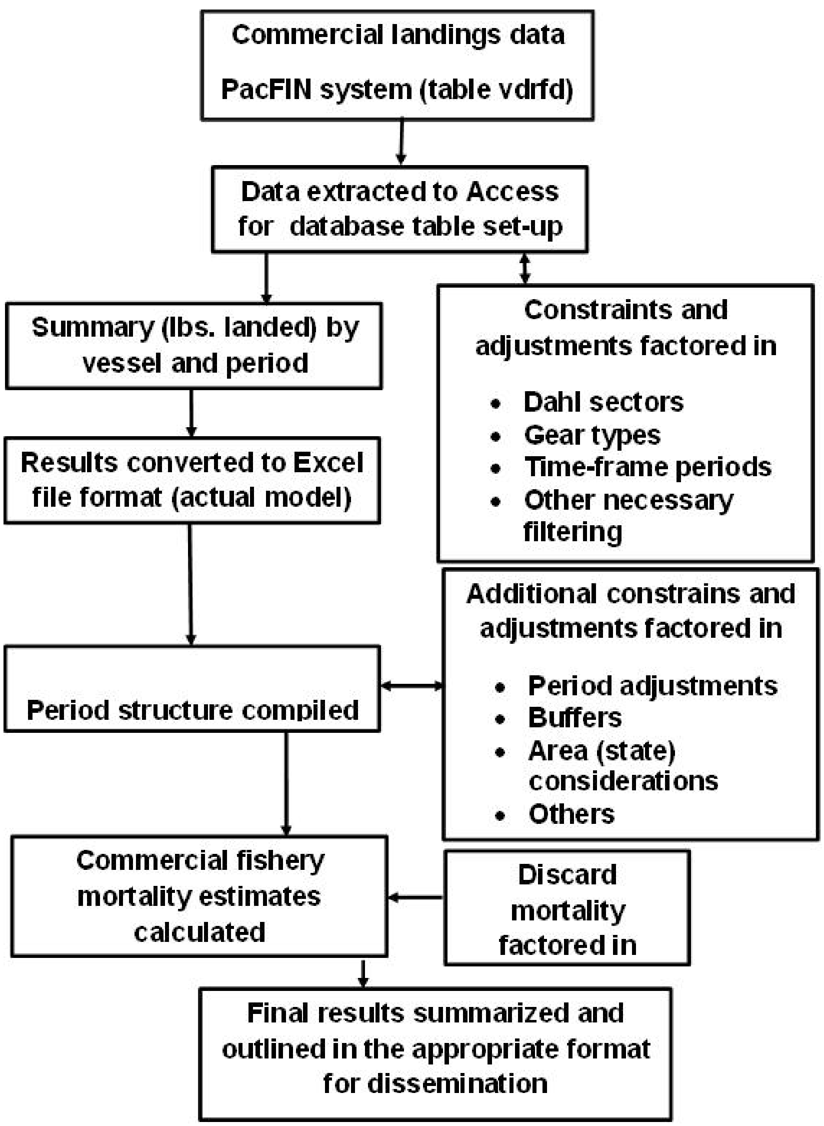

Figure A-12. Commercial data input/output flow chart for the catch-based fleet capacity trip limit model.

A.8 Nearshore

A.8.1 Modeling Open Access Impacts

Impacts associated with the directed open access daily-trip-limit fishery targeting sablefish are modeled using the primary sablefish model described above. Nearshore commercial fisheries in waters off Oregon and California are modeled separately from offshore efforts targeting sablefish.

A.8.2 Modeling Nearshore Commercial Impacts

The nearshore commercial bycatch model incorporates fleet-wide discard estimates by depth from WCGOP data, landings data from PacFIN, and depth-specific discard mortality rates derived by the GMT (refer to 2009-2010 FEIS for a full description of the model). The WCGOP began pilot coverage of vessels targeting nearshore rockfish and associated species, such as cabezon and kelp greenling, in January 2003 for the California nearshore fishery and in May 2004 for the Oregon nearshore/rockfish fisheries. Data from these vessels from January 2003 – December 2012 were averaged for analyses (grand means). Data from 2012 were the most recently available data at the time of the analysis, and represents an additional three years of WCGOP data included in the model relative to data that were shown in the 2013-2014 FEIS . Although the number of observed trips has increased since the WCGOP began monitoring the fleet, coverage levels are still lower than for other fleets and thus greater uncertainty in estimating discard relationships exists in Table A-38.

Table A-38. Summary of WCGOP observer coverage (2003-2012)

Area/Depth	# Trips	# Sets	# Vessels
North of 42° N lat.			
0-10 fm	774	958	113
10-20 fm	887	1,117	116
> 20 fm	59	65	29
42° to 40° 10' N lat.			
0-10 fm	197	273	29
10-20 fm	296	354	24
> 20 fm	38	42	11
South of 40° 10' N lat.			
0-10 fm	454	740	99
10-20 fm	360	470	76
> 20 fm	95	124	25

In 2010-11, the nearshore model structure was modified to include finer area stratifications and used modified landings data to project overfished species mortalities. These modifications would facilitate management, provide greater protection to stocks while minimizing adverse impacts to communities, and provide the best estimate of fishery needs. Although few changes are proposed to the model for 2015-16, many changes are being explored that could go into effect during 2015-2016. Many of these potential changes are based on recommendations from the SSC Economic Subcommittee (Agenda Item F.7, SSC Supplemental Report, June 2013). Some minor changes to the model have been made relative to that shown in the in the 2013-2014 FEIS, and those changes are described below.

The nearshore model is stratified into three areas based on available WCGOP data: (1) north of 42° N latitude; (2) between 42° and 40°10' N latitude; and (3) south of 40°10' N latitude. These finer area stratifications facilitate overfished species impact projections on a smaller scale, reduce adverse actions to lower bycatch areas, and allowed incorporation of state specific management measures.

Instead of using a single previous year of landings data to project overfished species mortalities, average landings were used as the best estimate of fishery needs and to develop the No Action alternative. For this starting point, average landings from the last five years (2008-2012) were used for both Oregon and California. Landings data were adjusted from this starting point based on new information (e.g., change in ACL) or based on increased availability of overfished species (e.g., higher nearshore allocation of yelloweye rockfish). For example, landings data were changed for the Preferred Alternative relative to No Action, based on changes in the ACL, taking into account state landing caps and overfished species mortalities. In other words, opportunities were maximized for this fishery where available while staying within available overfished species impacts and within target-species ACLs. Note that in the 2013-2014 FEIS, only four years of landings data were evaluated for model input (the 3 highest of the 4 most recent years were included in the model). The change we show here, using the average of the five most recent years of available data) was based on input from the SSC Economic Subcommittee (Agenda Item F.7, SSC Supplemental Report, June 2013).

Table A-39, Table A-40, and Table A-41 summarize the ratios of observed, discarded and retained catch for the three stratified areas, as well as discard mortality rates, for each of the three depth intervals (0-10 fm, 11-20 fm, and 21-50 fm) used to model impacts in nearshore commercial fisheries. Changes to these tables relative to those shown in the 2013-2014 FEIS include:

(a) Addition of 3 years of data from WCGOP (i.e., 2003 – 2012 instead of 2003 – 2009).
(b) Widow rockfish was deleted from these tables, because the stock is no longer overfished.
(c) The discard mortality rate was changed for bocaccio in the 11-20 fm depth bin from 54% to 51%. This was a correction.
(d) Mortality is assumed to be 100% for darkblotched rockfish and cowcod in this document (e.g., Table A-40), whereas those cells were left blank in the 2013-2014 FEIS. Discard mortality for these species was not provided by the GMT in the 2009-2010 FEIS. This value of 100% will continue to be applied to this model until commercial discard mortality rates are formally adopted for those species.

A.8.3 Allocation of Overfished Species (Canary and Yelloweye Rockfish) Between States

In 2011-12, a de-facto allocation for canary rockfish (OR = 26.7 percent; CA = 73.3 percent) and yelloweye rockfish (OR = 72.7 percent; CA = 27.3 percent) was used which resulted from specific landings that were meant to keep both fisheries at harvest levels similar to previous years. These catch share percentages were maintained for modeling 2015-2016 impacts of the various alternatives. These catch share percentages were also applied in the 2013-2014 FEIS.

A.8.4 Potential Model Updates and Changes Recommended by the SSC Economic Subcommittee

The GMT presented background information on the nearshore model to the SSC Economic Subcommittee for review on March 8, 2013. The PowerPoint presentation and document provided to the SSC Economic Subcommittee can be found ftp://ftp.pcouncil.org/pub/GMT/Overfished_Species_Projection_Models/....._Info/. Recommendations for model improvements were subsequently provided by the SSC Economic Subcommittee (Agenda Item F.7, SSC Supplemental Report, June 2013). The SSC report concluded the GMT models reviewed in the 2012-13 time frame represented the best available science and were appropriate for use in the 2015-16 SPEX analysis. The SSC report also pointed to specific areas where models could be updated or improved but did not necessarily suggest that these items had to be completed for the 2015-16 SPEX. Instead, they suggested that continued work and dialogue regarding these updates be planned in the near future, for example, in the "off-years" (i.e., even numbered years when stock assessments are not being reviewed).

The GMT provided responses to the SSC Economic Subcommittee that included a timeline for implementing recommended changes (Agenda Item G.4.c, Supplemental GMT Report, September 2013; Agenda Item G.7.b, Supplemental GMT Report, September 2013). One recommended addition to the model has been fulfilled (i.e., addition of coefficient of variations, CVs around estimated mortalities of overfished species). However, the method to calculate CVs, provided by WCGOP, has not been reviewed by the SSC. Therefore, the CVs produced by the current model are not shown in this document.

A.8.5 Other Model Considerations

In addition to recommendations provided by the SSC Economic Subcommittee (Agenda Item F.7, SSC Supplemental Report, June 2013), other model updates that may be considered by the GMT during the off-year cycle include:

(a) Evaluate whether mortality shown for > 20 fm (currently assumed to be 100% for overfished species; Table A-39) should be revisited. The recreational surface mortality rates for depths between 20 and 30 fathoms are substantially lower than 100% (e.g., the mortality for yelloweye rockfish in the 21-30 fm depth bin was 56% when commercial rates shown in Table A-39 were adopted; see 2009-2010 FEIS). At that time, the GMT decided to adopt 100% mortality for 21-30 fm depth bin because of the low level of observer coverage within that bin.

(b) Evaluate whether the assumed proportion of nearshore species caught by "recreational-like gear" has changed since the 2009-2010 FEIS, and whether the proportions should be updated for Oregon and California. These proportions are used for calculating discard survival for overfished species (and non-overfished species). Overfished species caught by gear that was not "recreational like" were assigned discard mortality values of 100%, whereas rockfishes caught by gear that was considered "recreational like" were assigned discard mortality rates equal to those used by recreational fisheries (see 2009-2010 FEIS). The relative proportion of "recreational like" to "non-recreational like" gears was estimated using 2004-2006 Oregon logbook data. It is likely that the proportion has changed considerably since 2006.

Table A-39. Average bycatch and discard rates (2003-2012) from the commercial nearshore projection model north of 42° N. latitude.

NORTH of 42° N. lat.	Observed discard (mt) 0-10 fm	11-20 fm	> 20 fm	Observed retained (mt) 0-10 fm	11-20 fm	> 20 fm	% of observed landings by depth 0-10 fm	11-20 fm	> 20 fm	Discard mortality rate 0-10 fm	11-20 fm	> 20 fm
Rebuilding species												
Bocaccio	0.000	0.000	0.000	0.000	0.000	0.000				30%	51%	100%
Canary rockfish	0.247	0.887	0.082	0.000	0.001	0.000				32%	54%	100%
Darkblotched rockfish	0.000	0.000	0.000	0.000	0.082	0.000				100%	100%	100%
Yelloweye rockfish	0.189	0.767	0.073	0.001	0.001	0.000				32%	56%	100%
Other species												
Black rockfish	1.785	1.614	0.044	37.092	37.592	1.132	48.9%	49.6%	1.5%	23%	42%	90%
Blue rockfish	1.047	2.086	0.098	1.525	2.819	0.140	34.0%	62.9%	3.1%	29%	49%	100%
Cabezon	0.746	1.230	0.029	6.704	13.031	0.442	33.2%	64.6%	2.2%	7%	7%	7%
Kelp greenling	1.195	1.233	0.027	6.317	5.802	0.163	51.4%	47.2%	1.3%	7%	7%	7%
Lingcod	6.397	9.511	0.490	6.311	11.433	0.859	33.9%	61.5%	4.6%	7%	7%	7%
Other minor nearshore rockfish	0.158	0.318	0.025	2.609	5.663	0.386	30.1%	65.4%	4.5%	24%	48%	100%

Table A-40. Average bycatch and discard rates (2003-2012) from the commercial nearshore projection model from 42° N. latitude to 40°10' N. latitude.

42° to 40°10' N. lat.	Observed discard (mt) 0-10 fm	11-20 fm	> 20 fm	Observed retained (mt) 0-10 fm	11-20 fm	> 20 fm	% of observed landings by depth 0-10 fm	11-20 fm	> 20 fm[1]	Discard mortality rate 0-10 fm	11-20 fm	> 20 fm
Rebuilding species												
Bocaccio	0.000	0.000	0.000	0.000	0.001	0.000				30%	51%	100%
Canary rockfish	0.104	0.737	0.158	0.000	0.000	0.000				32%	54%	100%
Darkblotched rockfish	0.000	0.000	0.000	0.000	0.000	0.000				100%	100%	100%
Yelloweye rockfish	0.025	0.309	0.227	0.000	0.000	0.000				32%	56%	100%
Other species												
Black rockfish	0.168	0.167	0.004	20.786	26.774	1.415	42.4%	54.7%	2.9%	23%	42%	90%
Blue rockfish	0.298	0.815	0.089	1.687	7.239	0.930	17.1%	73.4%	9.4%	29%	49%	100%
Cabezon	0.220	0.211	0.040	0.801	1.052	0.174	39.5%	51.9%	8.6%	7%	7%	7%
Kelp greenling	0.242	0.214	0.019	0.191	0.418	0.007	30.9%	67.9%	1.2%	7%	7%	7%
Lingcod	0.724	1.494	0.128	1.579	3.027	0.887	28.7%	55.1%	16.1%	7%	7%	7%
Other minor nearshore rockfish	0.002	0.013	0.012	0.575	1.652	1.065	17.5%	50.2%	32.4%	24%	48%	100%

[1/]The Preferred Alternative RCA for this area is 20 fm. To accommodate this, the GMT adjusts values under > 20 fm to 0%, and adds the value shown under that column to the 11-20 fm column. For example, if a 20 fm RCA is adopted, then "% of observed landings" under the 11-20 fm column becomes 54.7% + 2.9% = 57.6%.

Table A-41. Average bycatch and discard rates (2003-2012) from the commercial nearshore projection model south of 40°10' N. latitude.

SOUTH of 40°10' N. lat.	Observed discard (mt)			Observed retained (mt)			% of observed landings by depth			Discard mortality rate		
	0-10 fm	11-20 fm	> 20 fm	0-10 fm	11-20 fm	> 20 fm	0-10 fm	11-20 fm	> 20 fm	0-10 fm	11-20 fm	> 20 fm
Rebuilding species												
Bocaccio	0.000	0.001	0.001	0.000	0.025	0.064				30%	51%	100%
Canary rockfish	0.031	0.765	0.718	0.000	0.000	0.000				32%	54%	100%
Cowcod	0.000	0.000	0.000	0.000	0.000	0.000				100%	100%	100%
Darkblotched rockfish	0.000	0.000	0.000	0.000	0.001	0.011				100%	100%	100%
Yelloweye rockfish	0.000	0.015	0.015	0.000	0.000	0.000				32%	56%	100%
Other species												
Black rockfish	0.191	0.129	0.028	0.551	0.548	0.063	47.4%	47.2%	5.5%	23%	42%	90%
Blue rockfish	0.265	0.443	0.316	0.411	0.436	0.125	42.3%	44.9%	12.9%	29%	49%	100%
Cabezon	2.313	0.309	0.044	5.423	0.258	0.089	94.0%	4.5%	1.5%	7%	7%	7%
Deeper nearshore rockfish	0.232	0.260	0.080	2.453	4.893	1.687	27.2%	54.2%	18.7%	23%	48%	100%
Kelp greenling	0.675	0.228	0.104	0.490	0.078	0.025	82.6%	13.1%	4.3%	7%	7%	7%
Lingcod	1.967	1.960	0.474	2.357	2.161	0.602	46.0%	42.2%	11.8%	7%	7%	7%
Shallow nearshore rockfish	0.900	0.813	0.332	4.873	2.198	1.081	59.8%	27.0%	13.3%	25%	49%	100%

A.9 Washington Recreational

A.9.1 Modeling Washington Recreational Impacts

The Washington Ocean Sampling Program generates catch and effort estimates for the recreational boat-based groundfish fishery, which are provided to Pacific States Marine Fisheries Commission (PSMFC) and incorporated directly into RecFIN. The ocean sampling program provides catch in total numbers of fish, and also collects biological information on average fish size, which is provided to RecFIN to enable conversion of numbers of fish to total weight of catch. Boat egress from the Washington coast is essentially limited to four major ports, which enables a sampling approach to strategically address fishing effort from these ports. Effort estimates are generated from exit-entrance counts of boats leaving coastal ports while catch per effort is generated from boat intercepts at the conclusion of their fishing trip. The goal of the program is to provide information to RecFIN on a monthly basis with a one-month delay to allow for inseason estimates. For example, estimates for the month of May would be provided at the end of June. Some specifics of the program are:

Exit/entrance count - boats are counted either leaving the port (4:30 AM - end of the day) or entering the port (approximately 8:00 AM through end of the day) to give a total count of sport boats for the day.

Unit of sample – The unit of sample used by the ocean sampling program is a single boat trip.

Interview - boats are encountered systematically as they return to port; anglers are interviewed for target species, number of anglers, area fished, released catch data and depth of fishing (non-fishing trips are recorded as such and included in the effort expansion). The ocean sampling program collects information on released catch but does not collect information on the condition of the released fish. Therefore, released catches must be post-stratified as live or dead based upon an assumed discard mortality rate. Onboard observers are deployed on charter vessels throughout the salmon season primarily to observe hatchery salmon mark rates but also to collect rockfish discard information on these trips.

Examination of catch - catch is counted and speciated by the sampler. Salmon are electronically checked for coded wire tags and biodata are collected from other species.

Sampling Rates - vary by port and boat type. Generally, at boat counts less than 30, the goal is 100 percent coverage. The sampling rate goal decreases as boat counts increase (e.g., at an exit count of 100, sample rate goal is 30 percent; over 300, sample rate goal is 20 percent). Overall sampling rates average approximately 50 percent coastwide through March-October season.

Sampling Schedules - due to differences in effort patterns, weekdays/weekend days are stratified. Usually, both weekend days and a random 3 of 5 weekdays are sampled.

Personnel - Ocean sampling program staff include two permanent biologists coordinating data collection, one permanent technician generating in-season estimates of groundfish catch, approximately twenty-two port samplers, three on-board observers and one data keypuncher.

Volume of data - Between 20,000 and 30,000 boat interviews completed per season coastwide.

Data Expansion:

Algorithm for expanding sampled days:

$$\frac{\text{Exit Count}}{\text{Total boats sampled}} * P_s \text{ sampled} = P_t$$

where P_s = any parameter (anglers, fish retained, fish released) within a stratum,

and P_t = total of any parameter with stratum for the sample day

Algorithm for expanding for non-sampled days:

$$\text{Total Weekday Catch} = \frac{\Sigma(P_t) \text{ on sampled weekdays}}{\text{number weekdays sampled}} * \text{no. of weekdays in stratum}$$

$$\text{Total Weekend Catch} = \frac{\Sigma(P_t) \text{ on sampled weekend days}}{\text{number weekend days sampled}} * \text{no. weekend days in stratum}$$

Total weekend catch + total weekday catch = total catch in stratum

Notes on Data Expansion:

Salmon and halibut catch estimates are stratified by week; catch estimates for all other species are stratified by month. All expansions are stratified by boat type (charter or private), port, area and target species trip type (e.g., salmon, halibut, groundfish, and albacore)

A.9.2 Pre-Season Catch Projections

Projected impacts for Washington's recreational fishery are essentially based upon recent years harvest as estimated by the Washington Ocean Sampling Program and incorporated in RecFIN. This is especially true if recreational regulations remain consistent.

Washington's management measures have relied on the use of depth closures in waters deeper than 20 or 30 fathoms since 2005 and therefore historical catch estimates will be representative of projected mortalities. Depth restrictions for Washington's recreational fisheries are primarily designed to reduce encounters with yelloweye and canary rockfish but are especially restrictive to keep yelloweye rockfish impacts below the Washington recreational fishery harvest target. Because the ACL alternatives and the resulting Washington recreational harvest target for yelloweye rockfish that is being considered for 2015-2016 is only slightly higher than the yelloweye harvest target adopted for 2013-2014, only minor changes to depth restrictions and other management measures are being proposed for this management cycle and as such recent years catch and effort estimates from 2012 is the basis for projected catch for 2015-2016.

WDFW doesn't use a formal model to produce estimates of projected impacts under various management measure scenarios but has relied instead on an ad hoc approach that uses historical catch on a case by case basis to evaluate impacts to overfished species. This approach has likely been effective given the minimal changes to management measures over time and fairly level trends in effort. This approach was reviewed and approved by the SSC Economics and Groundfish Subcommittees (SSC E-G/F) in the fall of 2012 as long as fishery related drivers of effort remained relatively constant. With the review, the SSC E-G/F recommended a retrospective analysis of how effort projections compare with post-season effort estimates for past SPEX cycles to better understand the historical performance of Washington's ad hoc approach. Table A-42 and Figure A-13 Show that actual angler effort has increased since 2009 while pre-season projections were estimating slightly decreasing effort over time.

Table A-42. Washington recreational angler trips targeting bottomfish by private and charter vessels as projected pre-season compared to actual post season estimates of effort.

Year	Projected Effort			Actual Effort		
	Private	Charter	Total	Private	Charter	Total
2009	6598	15387	21985	5759	11882	17641
2010	6598	15387	21985	8299	11224	19523
2011	6024	11991	18015	9555	13764	23319
2012	6024	11991	18015	9078	15186	24264
2013	8299	11224	19523	10622	14096	24718

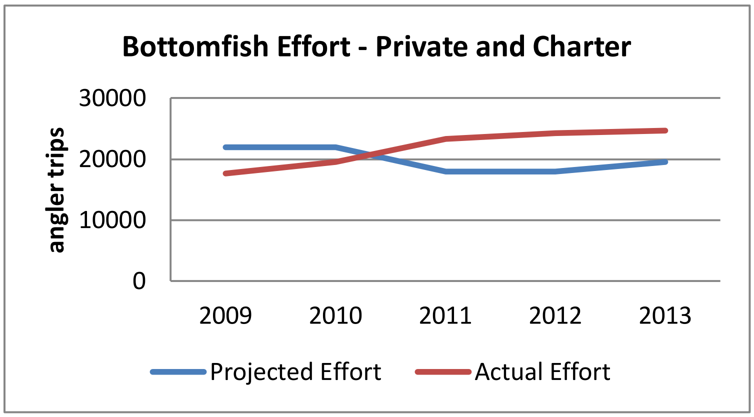

Figure A-13. Washington recreational angler trips targeting bottomfish by both private and charter vessels as projected pre-season compared to actual post season estimates of effort.

A.9.3 Inseason Catch Projections for 2015-2016

Inseason catch projections are based upon the most recent ocean sampling program estimates and incorporated in RecFIN (with a one-month time lag) with subsequent months extrapolated from the pre-season catch projections. Beginning in 2009, depth dependent mortalities have been applied uniformly to all discarded fish coast wide through RecFIN. 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.

A.10 Oregon Recreational

Groundfish mortality associated with regulatory scenarios for each alternative were projected using the Oregon Recreational Model, which was reviewed by the Science and Statistics Committee (SCC) and found to “use appropriate data and methods and provides a sound basis for management decisions” for the 2015-2016 Groundfish Biennial Specifications Process (PFMC 2013).

The model, described below, has been updated since the review to incorporate all recommendations made by the SSC (e.g., inclusion of variances to provide measures of uncertainty). Additional updates were made to accommodate new data sources (e.g., mortality rates for rockfish released with descending devices and the proportion of fish release with the devices) and to increase ease of use for users to manipulate model inputs (e.g., a user interface “switchboard” was developed for all model inputs).

A.10.1 Harvest and Discard Mortality Calculations

Groundfish impacts by recreational anglers in Oregon are estimated and tracked inseason by the Oregon Department of Fish and Wildlife (ODFW). Impacts consisting of weights of harvested fish and released fish that are presumed to die (discard mortality) are estimated for ocean boat anglers using Oregon Recreational Boat Survey (ORBS) data and are estimated for shore and estuary anglers using Shore and Estuary Bank Survey (SEBS) data from 1998-2002 (program discontinued after 2002). Impacts are monitored inseason for black rockfish, blue rockfish, yelloweye rockfish, canary rockfish, other nearshore rockfish species complex (quillback, China, grass, brown, and copper rockfish), greenlings species complex (rock and kelp greenling), and cabezon.

Methods: Ocean Boat Fishery

Harvest and discard mortality estimates (mt) are calculated by month and are typically completed within thirty days of the end of the month. Harvest estimate calculations, number of harvested fish multiplied by the average weight of harvested fish, remain the same as in previous cycles.

Discard mortality estimate calculations, number of discarded fish multiplied by average weight of discarded fish multiplied by discard mortality rate, remain the same as well. However, new methods for calculating discard mortality rates is now being used based on the availability of released fish by depth data obtained by ORBS and the use of descending devices. The new method is advantageous because: (a) greater sample sizes (e.g., > 1000 vs. 51 yelloweye rockfish), (b) incorporates private boat data, (c) accounts for monthly variations in catches (fixed rates previously used for all months), (d) same methodology used by the Recreational Fisheries Information Network (RecFIN) and (e) estimates should be closer to what is actually occurring. The new ORBS depth data is also very useful for economic modeling because percentages of effort by depth bin can be calculated and potential decreases in angler trips due to proposed depth restrictions can be modeled. Mean weights of discarded fish continue to be calculated from observed charter trips (updated with newest data) since accurate weights of discarded fish cannot be obtained from angler reported releases.

Only a fraction (typically > 20 percent) of anglers are interviewed; therefore, a total discard mortality rate is applied to expanded total discards. Since discard mortality rates vary by depth bin, the total discard mortality rate is the sum of the products, by depth bin, of the proportion of fish released (from ORBS data) multiplied by the discard mortality rate (from GMT depth dependent discard mortality matrix; Table A-43). An example of a total discard mortality calculation is shown in Table A-44.

Table A-43. GMT discard mortality rates for select rockfish species by depth bin. The discard mortality rates of cabezon, lingcod, and greenling species are 7%, regardless of depth, to account for hooking mortality.

	Mortality Rate				
Species	**< 10 fm**	**11-20 fm**	**21-30 fm**	**31-40 fm**	**> 40 fm**
Black	11%	20%	29%	63%	63%
Blue	18%	30%	43%	100%	100%
Brown	12%	22%	33%	100%	100%
China	13%	24%	37%	100%	100%
Copper	19%	33%	48%	100%	100%
Quillback	21%	35%	52%	100%	100%
Canary	21%	37%	53%	100%	100%
Yelloweye	22%	39%	56%	100%	100%

Table A-44. Sample calculation of the new method for calculating total discard mortality using data of fish release by depth (obtained from angler interviews). Total discard mortality rate is multiplied by released fish to determine total discard mortality (mt).

Depth bin (fm)	Fish	Proportion		Mortality Rate		Product
0-10	6	0.133	*	0.22	=	0.029
11-20	24	0.533	*	0.39	=	0.208
21-30	12	0.267	*	0.56	=	0.149
> 30	3	0.067	*	1.00	=	0.067
				Σ	=	0.453

Methods: Shore and Estuary

Landings and discard impacts for shore and estuary caught species were modeled on a season total basis using the 1998-2002 averages from the discontinued Oregon SEBS program. This fishery is managed for a year-round season, as it does not impact yelloweye or canary rockfish. The metric tons were adjusted for changes in length limits applied to cabezon and greenling since that period. Cabezon and greenling that were landed from 1998-2002 that would be sub-legal under current regulations are now considered discards. A mortality rate of 7 percent was applied to all species discarded in the shore and estuary fishery to account for hooking mortality, as the waters are not deep enough to cause mortality from barotrauma.

A.10.2 Groundfish Fishery Projection Model

Introduction

Depth restriction is the main management method used by ODFW in the recreational groundfish fishery to reduce overfished species impacts, particularly yelloweye rockfish. Further depth restrictions may be implemented inseason if anglers are projected to attain overfished species caps before the end of the season with existing preseason depth restrictions. Exceeding overfished species caps can result in complete closure of the recreational groundfish fishery (and possibly the Pacific halibut fishery), regardless of remaining quota of harvestable species. Implementing shallower depth restrictions reduces overfished species impacts by reducing catches (catch rates increase with depth) and decreasing discard mortality (mortality rate increases with depth). Depth restrictions can also affect impacts of harvestable groundfish species (e.g., impacts to groundfish more commonly caught in shallower waters may increase if anglers are restricted to shallower waters).

The depth restriction impact model, outlined in Table A-45, utilizes the data of angler reported catch rate and effort by depth bin. To increase sample sizes for catch rates and proportions of anglers by depth bin, data from months with similar status quo depth restrictions is pooled (Jan-Mar; Apr-Sept; Oct-Dec). Pooling also occurs across years to further increase sample sizes. Catch rates and proportions of anglers by depth bin vary among pooling periods but are the same within a period, average groundfish anglers is a three year mean for the month, and the rest of the variables are fixed for all months (fish weight, discard mortality rate by depth bin, and weight conversion). Table A-45 models discard mortality, and can be changed to model harvest by replacing discard mortality rates to 1.00 for all depth bins (catch rate is also change to harvested per angler instead of released per angler).

Table A-45. Example of data and calculations used in the depth restriction projection model for the groundfish fishery and an example of the difference in estimates between a 40 fathom depth restriction and a 30 fathom depth restriction. This example projects discard mortality and a harvest projection can be made by changing the discard mortality rates to 1.00 for all depth bins (and changing catch rates from discarded per angler to harvest per angler).

40 fm depth restriction														
Depth bin (fm)	Catch per angler		Proportion of anglers		avg. anglers		Mean fish weight (kg)		Discard mort. rate		Kg to mt conv.		Impact by bin	
<10 fm	0.013	x	0.381	x	12185	x	1.289	x	0.22	x	0.001	=	0.016	
10-20	0.041	x	0.489	x	12185	x	1.289	x	0.39	x	0.001	=	0.123	
20-25	0.129	x	0.063	x	12185	x	1.289	x	0.56	x	0.001	=	0.071	
25-30	0.126	x	0.018	x	12185	x	1.289	x	0.56	x	0.001	=	0.020	
30-40	0.027	x	0.050	x	12185	x	1.289	x	1.00	x	0.001	=	0.021	
												∑ =	0.252	= Expected impact
30 fm depth restriction														
<10 fm	0.013	x	0.400	x	12185	x	1.289	x	0.22	x	0.001	=	0.017	
10-20	0.041	x	0.515	x	12185	x	1.289	x	0.39	x	0.001	=	0.129	
20-25	0.129	x	0.066	x	12185	x	1.289	x	0.56	x	0.001	=	0.075	
25-30	0.126	x	0.019	x	12185	x	1.289	x	0.56	x	0.001	=	0.021	
												∑ =	0.242	= Expected impact

Table A-45 also shows how differences in projected impacts by depth restriction are calculated. All variables remain the same except for the proportion of anglers by depth bin. No declines in angler trips are assumed because we know little of changes in angler behavior in response to regulatory changes and it is better to have models that overestimate impacts for catch accounting and conservation purposes. In this example, the proportion of anglers that fished the 30-40 fathom depth bin (dark grey box) is proportionally redistributed among the available depth bins given a 30 fathom depth restriction (light grey boxes). This was done instead of a shift to the next deepest depth bin available because deep water trips are typically specialty trips for large lingcod (anecdotal evidence) and it is assumed that these displaced anglers would return to “typical bottomfish trips”.

An advantage to this model is that variables can easily be adjusted provided due evidence. For example, if we develop a method to better predict angler effort.

A summary table of projected outputs by depth restrictions by month is automatically updated given new data and is used for management purposes (Table A-46). Two versions exist of the model for projecting impacts by depth restriction in the groundfish fishery. The preseason version uses data prior to the projection year and the inseason version uses data from the projection year when it becomes available. The data pooling rules are the source of change for the inseason version.

Table A-46. Summary table of projected canary rockfish impacts (mt) by month and depth restriction from the groundfish fishery.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.01	0.01	0.03	0.04	0.16	0.15	0.14	0.18	0.05	0.02	0.00	0.00	0.79
20 fm	0.03	0.04	0.10	0.12	0.32	0.35	0.39	0.46	0.17	0.07	0.02	0.01	2.09
30 fm	0.05	0.07	0.16	0.17	0.41	0.47	0.53	0.62	0.23	0.12	0.03	0.02	2.88
40 fm	0.07	0.08	0.20	0.18	0.41	0.48	0.54	0.63	0.24	0.15	0.03	0.02	3.03
50 fm	0.05	0.06	0.14	N/A	N/A	N/A	N/A	N/A	N/A	0.10	0.02	0.02	0.39
100+ fm	0.07	0.09	0.21	N/A	N/A	N/A	N/A	N/A	N/A	0.16	0.04	0.02	0.60

Average Weights used in Models

Average weights of released yelloweye rockfish and canary were assumed to increase with depth in the old calculation method and the old groundfish depth projection model; however, the same weights are used in the new versions because there does not appear to be a relationship between depth and weight of either species (Figure A-14; from catch data from observed charter trips). Fixed mean weights were consequently used for yelloweye rockfish (1.29 kg) and canary rockfish (0.69 kg) in the new method for calculating discard mortality and in the new groundfish depth projection model. Data of weights of fish caught beyond 40 fathoms is lacking and should be addressed in the future to determine if the same average weights are applicable to deep water (> 40 fathoms).

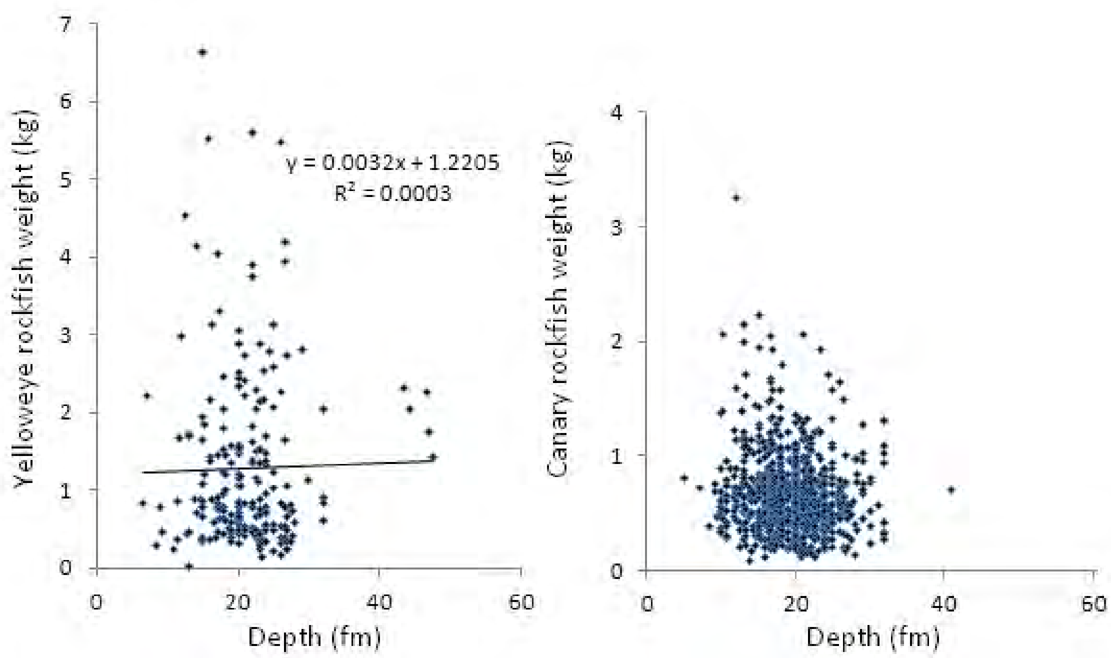

Figure A-14. Relationship between depth and weight of released yelloweye rockfish and canary rockfish from observed charter trips, 2006-2010.

Incorporation of Variance into the Groundfish Projection Model

Point estimates of depth restriction models are valuable for setting preseason depth restrictions by month. However, greater than expected impacts of yelloweye rockfish often lead to greater inseason depth restrictions. Incorporation of variance into the yelloweye rockfish projection model allows for development of prediction intervals that are useful for management decisions because it gives managers a better understanding of potential ranges of impacts.

Yelloweye rockfish encounters are extremely variable (Figure A-15) and difficult to predict. For example, June 2011 discards (~950 fish; outlier dot) were more than twice expected.

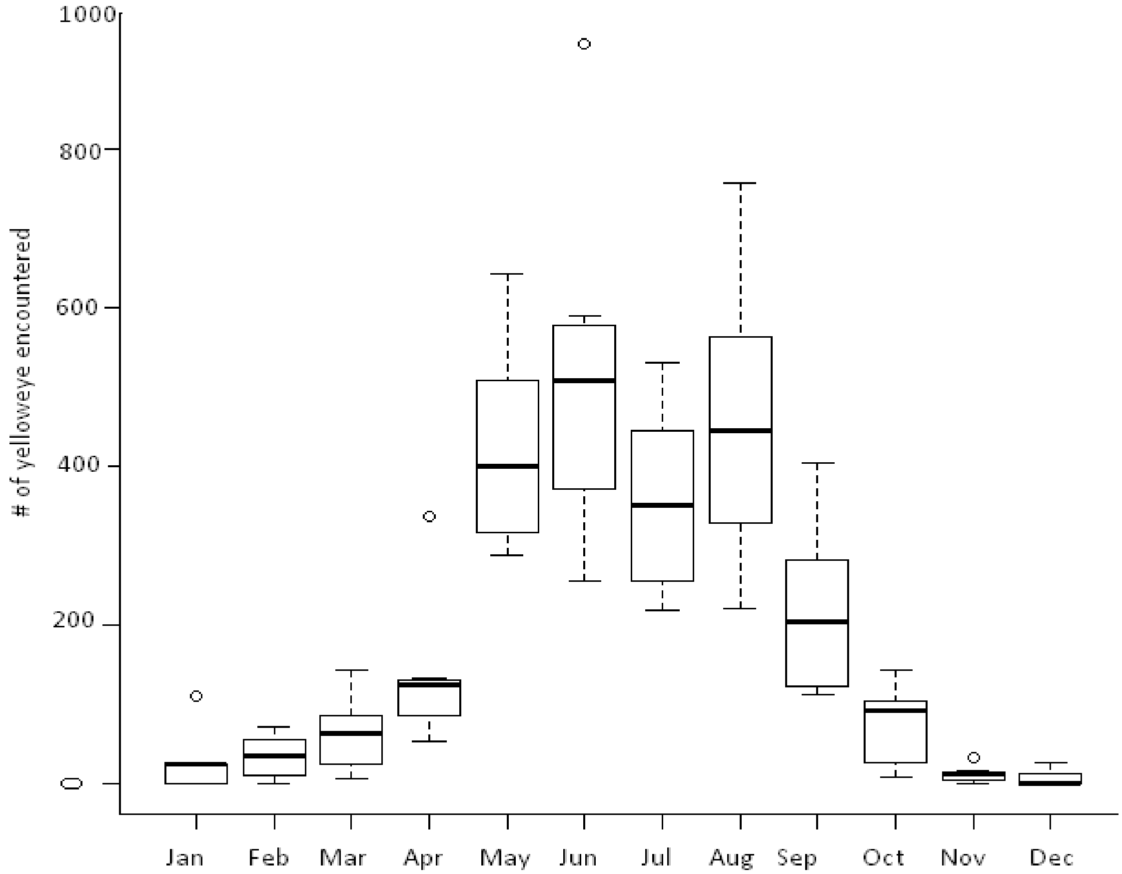

Figure A-15. Number of yelloweye rockfish encountered (discarded and harvested illegally) by month from recreational anglers in Oregon, 2004-2011.

Variation in yelloweye rockfish discards is attributed to variance in effort (total and by depth bin) and catch rates because the other variables are fixed (e.g., average fish weight, discard mortality rates). Catch rates (discarded per angler) and angler trips are also highly variable (Figure A-16 and Figure A-17).

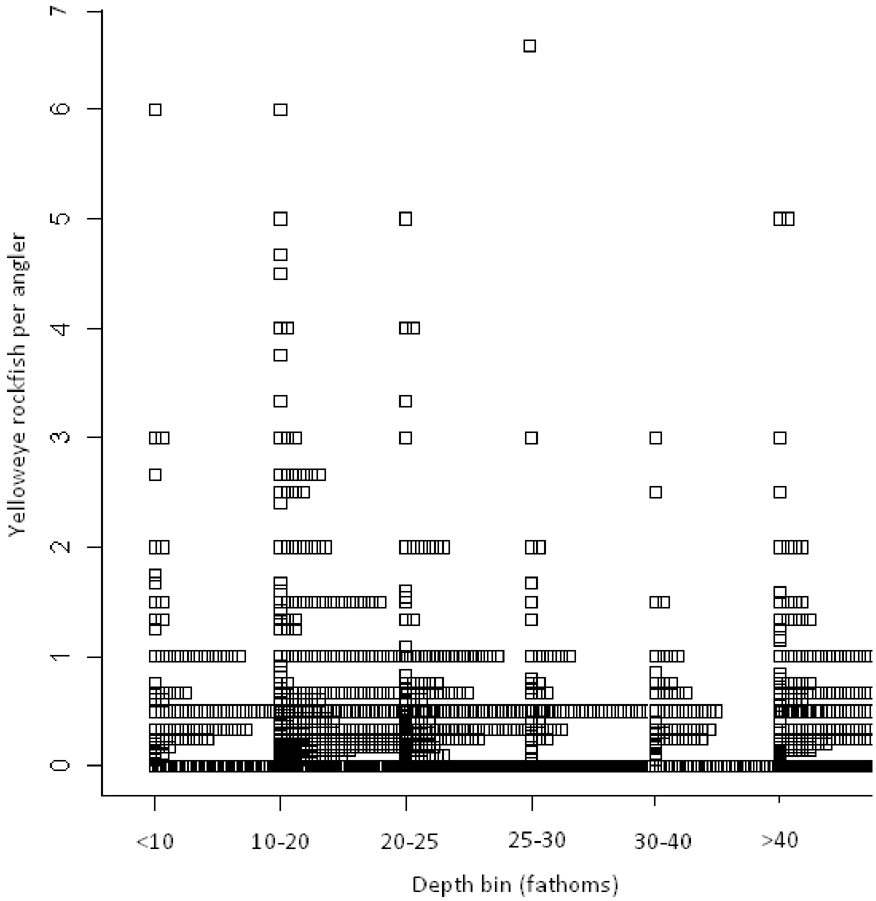

Figure A-16. Yelloweye rockfish catch rates (discards per angler) by depth bin.

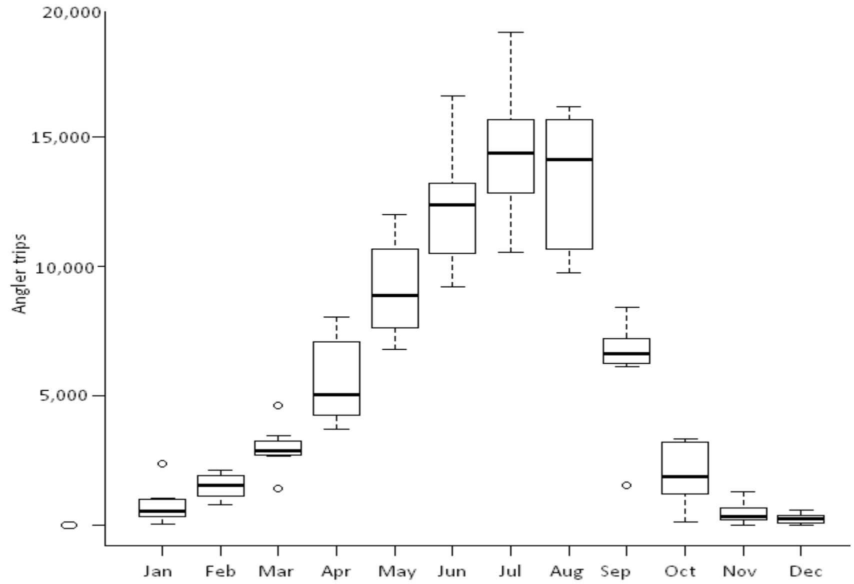

Figure A-17. Groundfish angler trips by month, 2004-2011.

Due to all the variation in variables used in modeling, a standard error based prediction interval would likely provide too wide of bands for management purposes (i.e., upper bounds above harvest guide line for all depth restrictions and negative lower bounds, especially if a small alpha value is used). Further, carryover of variances to develop prediction intervals would require complex calculations that may be beyond the skill sets of fishery managers.

For simplicity and to simulate more probable yelloweye rockfish impacts, pseudo prediction intervals were developed using upper and lower ranges of catch rates and angler effort. Combined record high catch rates and effort would represent a worst case scenario, whereas combined record low catch rates and effort would represent a best case scenario. Although possible, it is unlikely that record catch rates and effort would coincide (either high or low); therefore, actual impacts would not be expected outside of the pseudo prediction interval bands. Expected impacts, with pseudo prediction intervals, for a year round 30 fathom depth restriction are shown in Figure A-18.

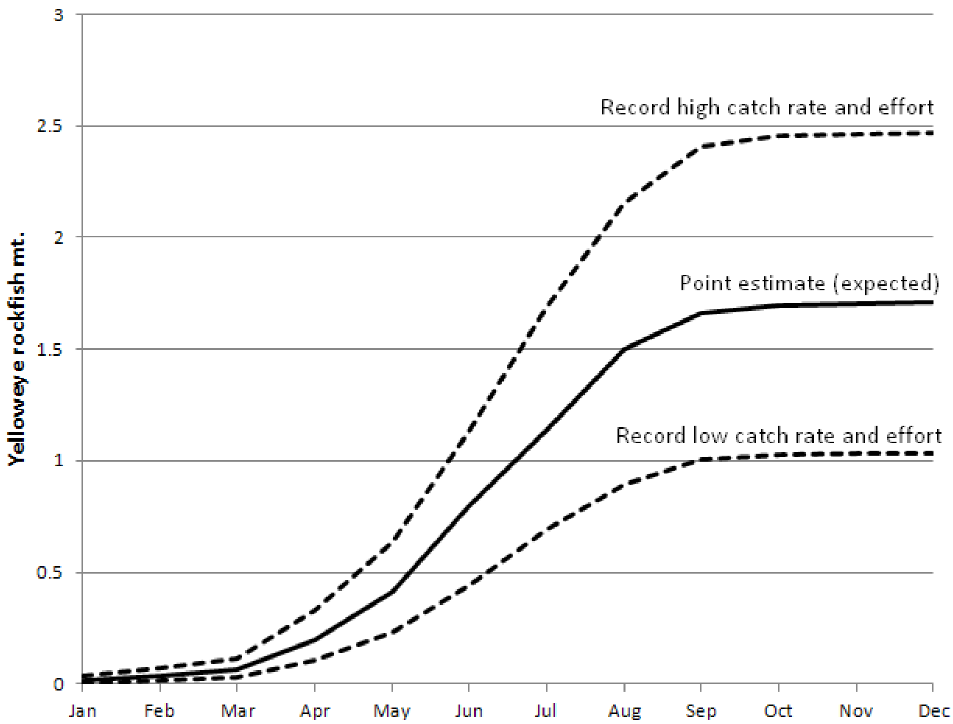

Figure A-18. Expected cumulative yelloweye impacts (average catch rates and effort) for a year round 30 fathom depth restriction and pseudo (not standard error derived) prediction intervals (record high and low catch rates and effort).

A.10.3 Projected Species Impacts from the Groundfish Projection Model

Five depth restriction alternatives were modeled for yelloweye rockfish (RF), canary RF, black RF, blue RF, greenlings (kelp greenling and rock greenling combined), cabezon, and other nearshore rockfish (brown, copper, China, grass, and quillback RF combined). The modeled depth restrictions were: < 20 fathoms, < 25 fathoms, <30 fathoms, < 40 fathoms, and > 40 fathoms (all-depths). Variables used in calculations were calculated by depth bin: 0-10 fathoms, 10-20 fathoms, 20-25 fathoms, 25-30 fathoms, 30-40 fathoms, and > 40 fathoms. Depth bins are similar to those used by the GMT due to similar discard mortality rates, but some GMT depth bins are split to allow projections of depth restrictions that could be less restrictive for management purposes. For example, a 20 fathom depth restriction severely hinders groundfish fishing for Garibaldi, but a 25 fathom restriction does not. Harvested and released impacts were calculated for species with federal landing caps (as required) and harvested impacts only for species with state landings caps. Tables of projected harvest and release impacts were created for each depth restriction alternative. Year totals for constant depth restrictions are summed, and combinations of depth restrictions during different months can be calculated by summing the corresponding month/depth values.

Black Rockfish

Annual black rockfish harvest impacts are projected to be less than the HG for all depth restriction alternatives (Table A-47). Greater harvests are expected with shallower depth restrictions because effort in deep bins, with lesser catch rates, would be shifted to shallower bins, with greater catch rates.

Table A-47. Projected black rockfish impacts (landed plus discard mortality) by month and by depth restriction, in mt.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	5.85	7.12	16.56	23.49	40.78	52.60	64.28	72.09	30.94	12.62	3.59	2.59	332.51
20 fm	5.91	7.20	16.76	23.73	41.22	53.17	64.97	72.88	31.27	12.77	3.62	2.62	336.13
30 fm	5.66	6.89	16.01	23.16	40.19	51.83	63.34	71.04	30.50	12.21	3.49	2.53	326.86
40 fm	5.36	6.51	15.10	23.09	40.05	51.65	63.12	70.79	30.39	11.53	3.33	2.44	323.35
50 fm	5.39	6.54	15.17	N/A	N/A	N/A	N/A	N/A	N/A	11.58	3.34	2.44	44.46
100+ fm	5.24	6.36	14.73	N/A	N/A	N/A	N/A	N/A	N/A	11.26	3.27	2.40	43.26

Blue Rockfish

Blue rockfish harvests are projected to be less than 40.0 mt for all depth restriction alternatives (Table A-48). Greater harvests are expected with intermediate depth restrictions (25-30 fathoms) because effort in deep bins, with lesser catch rates, would be shifted to intermediate depth bins, with greatest catch rates.

Table A-48. Projected blue rockfish harvest impacts (mt) by month and by depth restriction.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.14	0.17	0.42	0.61	1.11	1.44	1.75	1.97	0.82	0.31	0.07	0.04	8.85
20 fm	0.28	0.35	0.84	1.13	2.04	2.65	3.23	3.63	1.52	0.63	0.15	0.09	16.51
30 fm	0.32	0.40	0.96	1.22	2.22	2.88	3.51	3.94	1.65	0.72	0.17	0.10	18.10
40 fm	0.29	0.36	0.87	1.22	2.20	2.86	3.48	3.92	1.64	0.65	0.15	0.09	17.73
50 fm	0.26	0.32	0.77	N/A	N/A	N/A	N/A	N/A	N/A	0.58	0.13	0.08	2.15
100+ fm	0.26	0.33	0.79	N/A	N/A	N/A	N/A	N/A	N/A	0.59	0.14	0.08	2.19

Other Nearshore Rockfish Species Complex (brown, quillback, China, grass, and copper RF)

Other nearshore rockfish harvest impacts are analyzed by individual species, but are summed in this report because of the aggregate state landing cap for these species. Harvest estimates are projected to be less than 14.0 mt for all depth restriction alternatives (Table A-49). Unlike for black rockfish and blue rockfish, lesser harvest impacts are expected with shallower depth restrictions because effort in deep bins, with greatest catch rates, would be shifted to shallower bins, with lesser catch rates.

Table A-49. Projected other nearshore rockfish harvest impacts (mt) by month and depth restriction.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.04	0.05	0.13	0.19	0.35	0.45	0.55	0.62	0.26	0.10	0.02	0.01	2.79
20 fm	0.16	0.20	0.47	0.61	1.11	1.44	1.75	1.97	0.82	0.35	0.08	0.05	9.01
30 fm	0.29	0.36	0.86	0.91	1.65	2.14	2.61	2.93	1.23	0.64	0.15	0.09	13.85
40 fm	0.26	0.33	0.79	0.90	1.64	2.13	2.59	2.91	1.22	0.59	0.14	0.09	13.60
50 fm	0.20	0.25	0.61	N/A	N/A	N/A	N/A	N/A	N/A	0.46	0.11	0.07	1.70
100+ fm	0.19	0.24	0.58	N/A	N/A	N/A	N/A	N/A	N/A	0.43	0.10	0.06	1.61

Greenling Species Complex (rock greenling and kelp greenling)

Greenlings harvests are analyzed by individual species, but are summed in this report because of the aggregate state landing cap for these species. Harvest estimates are projected to be less than 8.2 mt for all depth restriction alternatives (Table A-50). Greater harvest impacts are expected with shallower depth restrictions because effort in deep bins, with lesser catch rates, would be shifted to shallower bins, with greater catch rates.

Table A-50. Projected greenlings harvest impacts (mt) by month and depth restriction.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.13	0.16	0.39	0.57	1.02	1.33	1.62	1.82	0.76	0.29	0.07	0.04	8.19
20 fm	0.10	0.12	0.29	0.44	0.80	1.04	1.27	1.43	0.60	0.22	0.05	0.03	6.38
30 fm	0.10	0.13	0.30	0.45	0.82	1.07	1.30	1.46	0.61	0.22	0.05	0.03	6.54
40 fm	0.09	0.12	0.28	0.45	0.82	1.06	1.29	1.45	0.61	0.21	0.05	0.03	6.46
50 fm	0.09	0.12	0.28	N/A	N/A	N/A	N/A	N/A	N/A	0.21	0.05	0.03	0.77
100+ fm	0.09	0.11	0.27	N/A	N/A	N/A	N/A	N/A	N/A	0.20	0.05	0.03	0.75

Cabezon

Cabezon impact projections after August may be uncertain because of limited harvest data in latter months due to early attainment of the cabezon quota in years since depth data become available (2009). Impacts for all depth restrictions are projected to be approximately 37 mt (Table A-51) if cabezon retention was allowed year round. However, the state of Oregon has implemented more restrictive management measures in state rules (1 fish sub-bag limit and delaying the season start until July 1) to reduce impacts. Cabezon catch rates are greater in shallow depth bins; therefore, cabezon impacts are expected to be greater for shallow depth bins.

Table A-51. Projected cabezon impacts (landed plus discard mortality) by month and depth restriction in mt.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	total
10 fm	0.52	0.65	1.56	2.29	4.15	5.38	6.56	7.37	3.08	1.17	0.27	0.17	33.20
20 fm	0.60	0.75	1.80	2.58	4.67	6.06	7.38	8.29	3.47	1.35	0.31	0.19	37.44
30 fm	0.56	0.71	1.70	2.50	4.53	5.88	7.16	8.05	3.37	1.27	0.29	0.18	36.21
40 fm	0.54	0.68	1.63	2.50	4.52	5.86	7.15	8.03	3.36	1.22	0.28	0.18	35.96
50 fm	0.49	0.62	1.49	N/A	N/A	N/A	N/A	N/A	N/A	1.11	0.26	0.16	4.13
100+ fm	0.52	0.66	1.57	N/A	N/A	N/A	N/A	N/A	N/A	1.18	0.27	0.17	4.37

Yelloweye Rockfish

Yelloweye rockfish harvest has been prohibited since 2004; therefore, the majority of impacts are now due to discard mortality. Yelloweye rockfish impacts are projected to be less than 2.3 mt for all depth restriction scenarios (Table A-52). Shallower depth restrictions are expected to reduce yelloweye rockfish impacts due to lesser catch rates and discard mortality rates in shallow water depth bins.

Table A-52. Expected yelloweye rockfish discard mortality by month and depth restriction in the bottomfish fishery.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.00	0.00	0.01	0.01	0.18	0.14	0.11	0.15	0.02	0.01	0.00	0.00	0.64
20 fm	0.01	0.02	0.04	0.02	0.26	0.24	0.23	0.17	0.07	0.03	0.01	0.00	1.11
30 fm	0.03	0.04	0.10	0.02	0.35	0.35	0.36	0.34	0.14	0.08	0.02	0.01	1.84
40 fm	0.06	0.07	0.17	0.02	0.36	0.36	0.38	0.33	0.15	0.13	0.03	0.02	2.07
50 fm	0.04	0.05	0.12	N/A	N/A	N/A	N/A	N/A	N/A	0.09	0.02	0.01	0.34
100+ fm	0.05	0.06	0.15	N/A	N/A	N/A	N/A	N/A	N/A	0.11	0.03	0.02	0.42

Canary Rockfish

Canary rockfish release impacts are projected to be less than 3.5 mt for all depth restriction alternatives (Table A-53). Shallower depth restrictions are expected to reduce catch rockfish release impacts due to lesser catch rates and mortality rates in shallow water depth bins.

Table A-53. **Expected canary rockfish discard mortality (mt) by month and depth restriction in the bottomfish fishery.**

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
10 fm	0.01	0.01	0.03	0.04	0.16	0.15	0.14	0.18	0.05	0.02	0.00	0.00	0.79
20 fm	0.03	0.04	0.10	0.12	0.32	0.35	0.39	0.46	0.17	0.07	0.02	0.01	2.09
30 fm	0.05	0.07	0.16	0.17	0.41	0.47	0.53	0.62	0.23	0.12	0.03	0.02	2.88
40 fm	0.07	0.08	0.20	0.18	0.41	0.48	0.54	0.63	0.24	0.15	0.03	0.02	3.03
50 fm	0.05	0.06	0.14	N/A	N/A	N/A	N/A	N/A	N/A	0.10	0.02	0.02	0.39
100+ fm	0.07	0.09	0.21	N/A	N/A	N/A	N/A	N/A	N/A	0.16	0.04	0.02	0.60

A.10.4 Pacific Halibut Fishery Projection Model

Yelloweye rockfish and canary rockfish are typically the only groundfish species with impact limits that are caught in the Pacific halibut fishery; therefore, Pacific halibut fishery projection models exist only for these species.

The previous model was ratio based and projected 0.00557 mt of yelloweye rockfish and 0.003065 mt of canary rockfish per 1,000 lbs. of Oregon recreational Pacific halibut quota. However, a ratio based projection method appears inappropriate because there does not appear to be a relationships between Oregon recreational Pacific halibut quota and yelloweye rockfish catches (Figure A-19; $R2 < 0.01$) nor canary rockfish catches (Figure A-20; $R2 < 0.01$) (given in fish due to change in discard mortality calculations). Yelloweye rockfish and canary rockfish may be unrelated to Pacific halibut quota because of different habitat preferences of the fish (i.e., rocky reefs for rockfish and gravel/sand for Pacific halibut).

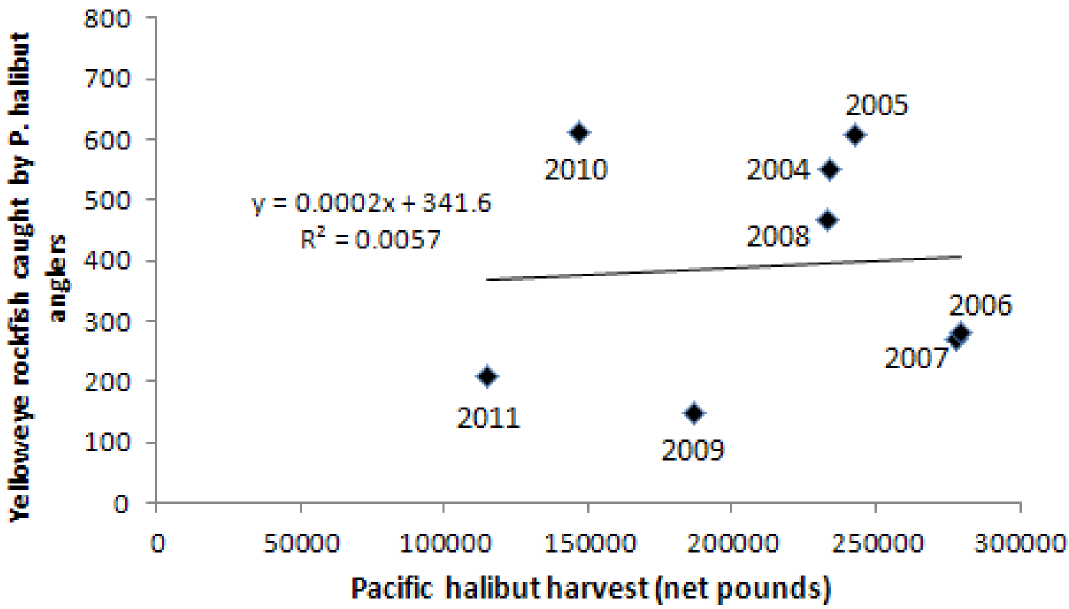

Figure A-19. Relationship between yelloweye rockfish catches (discards) and Oregon Pacific halibut quota.

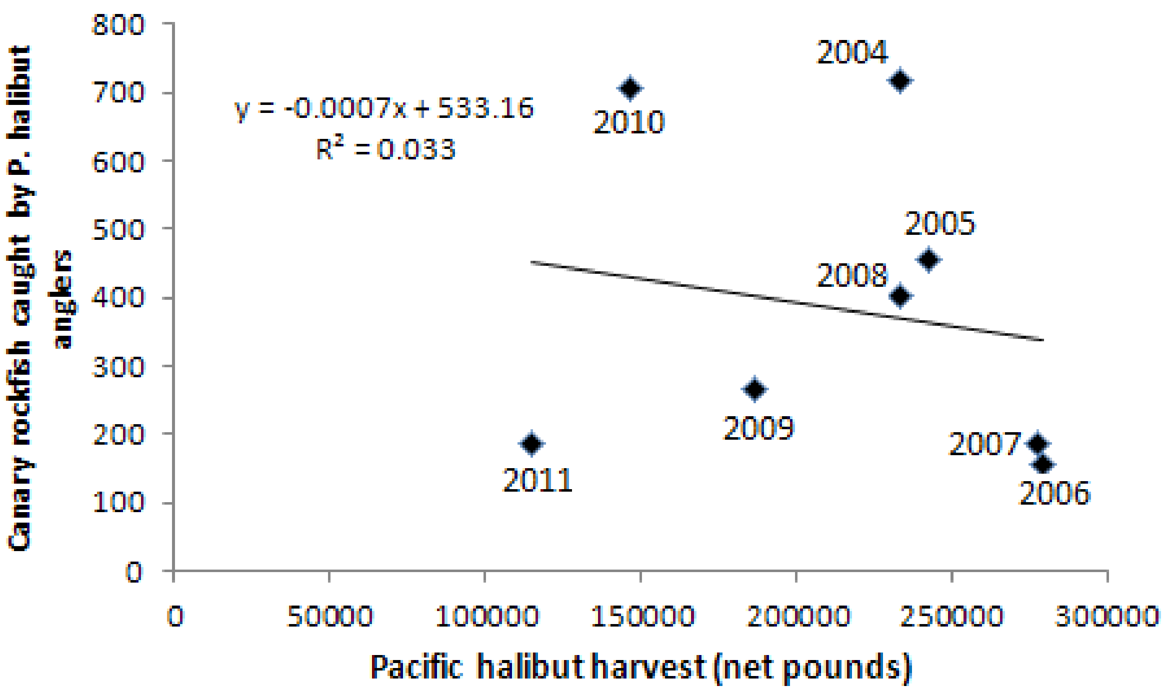

Figure A-20. Relationship between canary rockfish catches (discards) and Oregon Pacific halibut quota.

Instead of using a ratio based approach, the Pacific halibut model simply uses mean impacts, regardless of quota (0.49 mt for yelloweye rockfish and 0.69 mt for canary rockfish).

Incorporation of Variance into the Pacific Halibut Projection Model

Prediction intervals (not confidence intervals) for a one year prediction of canary rockfish and yelloweye rockfish were made for α=0.1 and 0.2 values using the following formula.

$$\bar{X} \pm K \cdot s \qquad K = t_{1-\alpha/k,n-1}\sqrt{\frac{1}{n}+\frac{1}{m}}$$

k = number of sampling periods interested in
m = number of samples per sampling period
n = number of background samples
1-α/2k = level of confidence

The yelloweye rockfish prediction intervals were 0.49 ± 0.68 (α=0.1) and ± 0.405 (α=0.2). The canary rockfish prediction intervals were 0.69 ± 0.44 (α=0.1) and ± 0.26 (α=0.2). These wide ranges make it difficult to project future impacts of these species from the Pacific halibut fishery.

A.10.5 Bag Limit Models

Bag limits have been used by ODFW to manage the recreational groundfish fishery since 1976. The rockfish, greenling, and cabezon (RGC) aggregate bag limit encompasses the most commonly harvested groundfish species. The RGC bag limit since 2004 has ranged from five to ten fish. This variation was used to determine if RGC bag limits can be used to alter angler catch rates and impacts of RGC target species or incidentally caught overfished species. Only black rockfish and blue rockfish catch rates appear to be affected by differences in RGC bag limits; therefore, RGC bag limits only appear to be effective at manipulating impacts (mt landed) of those species. Catch rates of other species included in the RGC bag limit, including overfished species, are not expected to be affected by RGC bag limit adjustments (catch rates unrelated to RGC bag limits). Of RGC species, cabezon are least affected by bag limits. Even year-round one cabezon sub-bag limits are not expected to result in significant cabezon harvest reductions.

Introduction

Bag limits are a commonly used fisheries management method for controlling harvests. Only anglers with catches within the scope of bag limit changes are affected. For example, a bag limit reduction from six fish to four fish will not affect the catches of those anglers that caught zero to four fish. Bag limits reductions would be expected to reduce releases of overfished species (harvest prohibited) because anglers may catch bag limits in less time, resulting in decreased fishing effort. However, bag limit reductions may not reduce prohibited species impacts if releases of these species are more dependent on where anglers fish than how long they fish.

Analysis of Adjustments to the Rockfish, Greenling, and Cabezon (RGC) Aggregate Bag Limit

Analysis of bag limit adjustments used data from angler interviews from the Oregon Recreational Boat Survey (ORBS) since 2004 (first year yelloweye rockfish and canary rockfish harvest was prohibited). The RGC bag limit has been five through eight and ten (Table A-54). RGC bag limit analysis was performed for black rockfish (RF), blue RF, greenlings (rock greenling and kelp greenling combined), cabezon, other nearshore RF (brown RF, grass RF, China RF, quillback RF, and copper RF combined), yelloweye RF, and canary RF.

Table A-54. RGC bag limits by month and by year, 2004-2014.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	10	10	10	10	10	10	10	10	10	10	10	10
2005	8	8	8	8	8	8	8,5	5	5	5	5	5
2006	6	6	6	6	6	6	6	6	6	6	6	6
2007	6	6	6	6	6	6	6	6	6	6	6	6
2008	6	6	6	6	6	6	6,5	5	5	5	5	5
2009	6	6	6	6	7	7	7	7	7	7	7	7
2010	7	7	7	7	7	7	7	7	7	7	7	7
2011	7	7	7	7	7	7	7	7	7	7	7	7
2012	7	7	7	7	7	7	7	7	7	7	7	7
2013	7	7	7	7	7	7	7	7	7	7	7	7
2014	7	7	7	7	7	7	7	7	7	7	7	7

Black Rockfish

A percentage of anglers caught RGC bag limits that were comprised only of black rockfish for all RGC bag limits (5, 6, 7, 8, 10; Table A-55); therefore, adjustments to RGC bag limits can be used to alter black RF harvests. Differences between black rockfish harvests under different RGC bag limits were made by (a) multiplying the percent of anglers that caught zero fish by zero, the percent that caught one by one, the percent that caught two by two, and so on until 10 for each RGC bag limit, (b) summing those products for each RGC bag limit, and (c) comparing the total values for each RGC bag limit. Angler catch rates that exceed bag limits were removed due to probable data errors (e.g., 57 black rockfish per angler under a five RGC limit). Projections of black rockfish catches under two, three, four and nine RGC bag limits were also made by shifting the percentage of anglers that caught the bag limit under a greater RGC bag limit to the bag limit of a lower RGC bag limit. For example, a projection of a nine RGC bag limit was made from the 10 RGC bag limit by deleting the 7.5 percent of angers that caught 10 fish and by adding that 7.5 percent to the percentage that caught nine fish. Projections of two, three, and four RGC bag limits were made from when the RGC bag limit was six rather than five due to much greater sample size (78,729 anglers vs. 10,343 anglers). A multiplier table was then created to compare black rockfish harvests under different RGC bag limits (Table A-55). To determine differences between harvests for a given month under different RGC bag limits, multiply the harvest impact estimate by the multiplier.

Table A-55. Percent of bottomfish anglers that caught 0-10 black RF (fish/ang) under 5, 6, 7, 8, and 10 RGC bag limits and projected percent of anglers that would have caught 0-10 black RF under 2, 3, 4, and 9 RGC bag limits. Projected angler percentages of 2-4 bag limits were based off data from when the bag limit was 6 instead of 4 due to a greater sampler size.

fish/ ang	Bag Limit								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0	11.70	11.70	11.70	12.80	11.70	12.00	10.80	13.10	13.10
1	12.70	12.70	12.70	17.90	12.70	15.00	11.50	9.20	9.20
2	75.60	11.20	11.20	15.50	11.20	14.50	9.90	7.90	7.90
3	0.00	64.40	12.30	15.80	12.30	12.80	9.90	7.50	7.50
4	0.00	0.00	52.10	21.40	14.60	11.00	11.20	8.70	8.70
5	0.00	0.00	0.00	16.70	21.10	12.60	12.30	7.20	7.20
6	0.00	0.00	0.00	0.00	16.40	12.80	12.30	7.70	7.70
7	0.00	0.00	0.00	0.00	0.00	9.30	13.80	9.10	9.10
8	0.00	0.00	0.00	0.00	0.00	0.00	8.20	10.60	10.60
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.00	11.50
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50

Table A-56 calculation of a bag limit of 4 (based off 6) example: The percentage of anglers that would have caught 1-3 fish is the same for bag limits of 4 and 6 (would not have been affected by a bag limit of 4). Those that caught 5 or 6 fish (with a bag of 6) would have had their catches reduced to 4 fish with a bag limit of 4, so the expected percentage of anglers catching the limit with a 4 fish bag limit is the sum of the anglers that caught 4-6 fish with a bag limit of 6 (14.6 + 21.1 + 14.6 = 52.1).

Table A-56. Multiplier table to compare differences in black RF harvests (mt) under different RGC bag limits.

	Bag from:								
Bag to:	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2	1.000	0.718	0.585	0.618	0.490	0.495	0.406	0.339	0.333
3	1.393	1.000	0.814	0.860	0.683	0.690	0.566	0.472	0.464
4	1.711	1.228	1.000	1.057	0.839	0.847	0.695	0.579	0.570
5	1.619	1.163	0.946	1.000	0.794	0.802	0.658	0.548	0.540
6	2.040	1.465	1.192	1.260	1.000	1.010	0.829	0.691	0.680
7	2.019	1.450	1.180	1.247	0.990	1.000	0.850	0.684	0.673
8	2.462	1.768	1.439	1.520	1.207	1.219	1.000	0.834	0.821
9	2.953	2.120	1.726	1.824	1.448	1.463	1.200	1.000	0.985
10	2.999	2.153	1.753	1.852	1.470	1.486	1.218	1.016	1.000

Blue Rockfish

The same bag limit analysis was used for blue rockfish and black rockfish. As for black rockfish, RGC bag limits can be used to adjust blue rockfish impacts, although to a much lesser degree because a lesser percentage of anglers are catching RGC bag limits that consist only of blue rockfish (<1%; Table A-57) than black rockfish (7.5 percent-16.7 percent). Accordingly, the blue rockfish multiplier table shows lesser impacts due to RGC bag limit changes than for black rockfish (Table A-58).

Table A-57. Percent of anglers that caught 0-10 blue rockfish (BRF/ang) under 5, 6, 7, 8, and 10 RGC bag limits and projected percent of anglers that would have caught 0-10 blue rockfish under 2, 3, 4, and 9 RGC bag limits.

fish/ ang	Bag Limit								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0	96.37	96.37	96.37	95.00	96.34	90.92	95.36	93.24	93.24
1	3.12	3.12	3.12	4.24	3.12	7.63	4.05	5.82	5.82
2	0.35	0.35	0.35	0.40	0.35	0.94	0.39	0.60	0.60
3	0.16	0.09	0.09	0.17	0.09	0.25	0.06	0.22	0.22
4	0.00	0.08	0.05	0.16	0.05	0.12	0.10	0.05	0.05
5	0.00	0.00	0.02	0.02	0.03	0.04	0.01	0.01	0.01
6	0.00	0.00	0.00	0.00	0.02	0.07	0.01	0.04	0.04
7	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.03	0.03
8	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A-58. Multiplier table to compare differences in blue rockfish harvests (mt) under different RGC bag limits.

Bag to:	Bag from:								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2	1.00	0.92	0.89	0.65	0.88	0.56	0.25	0.50	0.50
3	1.08	1.00	0.97	0.71	0.96	0.61	0.27	0.55	0.55
4	1.12	1.03	1.00	0.73	0.98	0.63	0.28	0.56	0.56
5	1.53	1.41	1.37	1.00	1.35	0.86	0.39	0.77	0.77
6	1.13	1.05	1.02	0.74	1.00	0.64	0.29	0.57	0.57
7	1.78	1.64	1.59	1.16	1.57	1.00	0.45	0.90	0.89
8	3.94	3.64	3.53	2.57	3.48	2.22	1.00	1.99	1.98
9	1.99	1.83	1.78	1.30	1.75	1.12	0.50	1.00	1.00
10	1.99	1.83	1.78	1.30	1.75	1.12	0.50	1.00	1.00

Other Nearshore Rockfish (China, quillback, copper, brown, and grass rockfish combined)

Other nearshore rockfish bag limit analysis was the same as used for black rockfish. Unlike for black rockfish and blue rockfish, RGC bag limits do not appear to affect other nearshore rockfish catch rates since (a) 0 percent of anglers caught RGC bag limits that comprised only of other nearshore rockfish, (b) the percentage of anglers that caught 0, 1, 2, and 3 other nearshore rockfish were similar for all RGC bag limits, and (c) greater than 99 percent of anglers caught fewer than 2 other nearshore rockfish for all RGC bag limits (Table A-59).

Table A-59. Percent of anglers that caught 0-10 other nearshore rockfish (fish/ang) under 5, 6, 7, 8, and 10 RGC bag limits and projected percent of anglers that would have caught 0-10 other nearshore rockfish under 2, 3, 4, and 9 RGC bag limits.

fish/ang	Bag Limit								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0	92.75	92.75	92.75	95.63	92.75	92.79	95.82	95.01	95.01
1	6.45	6.45	6.45	4.02	6.45	6.61	3.97	4.82	4.82
2	0.80	0.61	0.61	0.28	0.61	0.41	0.18	0.09	0.09
3	0.00	0.18	0.12	0.07	0.12	0.13	0.03	0.07	0.07
4	0.00	0.00	0.06	0.00	0.05	0.04	0.00	0.01	0.01
5	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Greenlings (kelp greenling and rock greenling)

RGC bag limits would be expected to have little to no impact on greenlings catch rates since (a) fewer than 0.01 percent of anglers harvested RGC bag limits that were comprised only of greenlings, (b) the percentage of anglers that caught 0, 1, 2, and 3 greenlings were similar for all RGC bag limits, and (c) greater than 99 percent of anglers caught fewer than 2 greenlings for all RGC bag limits (Table A-60).

Table A-60. Percent of anglers that caught 0-10 greenlings (fish/ang) under 5, 6, 7, 8, and 10 RGC bag limits and projected percent of anglers that would have caught 0-10 greenlings under 2, 3, 4, and 9 RGC bag limits.

fish/ang	Bag Limit								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0	96.4	96.4	96.4	95.0	96.3	90.9	95.4	93.2	93.2
1	3.1	3.1	3.1	4.2	3.1	7.6	4.0	5.8	5.8
2	0.4	0.4	0.4	0.4	0.4	0.9	0.4	0.6	0.6
3	0.2	0.1	0.1	0.2	0.1	0.3	0.1	0.2	0.2
4	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overfished Rockfish: Yelloweye Rockfish and Canary Rockfish

Since harvest of yelloweye and canary rockfish is prohibited, anglers can continue to catch and release these species until they stop fishing (due to RGC attainment or other). Lesser overfished species releases would be expected with reduced RGC bag limits because of reduced fishing effort per angler (less time to catch limit). However, there is a curvilinear relationship between RGC bag limit and percentages of anglers releasing 1-4 yelloweye or canary rockfish (peaks at RGC bag limit of 7; Figure A-21 and Figure A-22). The curvilinear relationship may be due to the rebuilding of the stocks; greater catches have occurred in recent years (7 and 6 RGC bag limits) than earlier years (8 and 10 RGC bag limits). It is also possible that encounters of overfished stocks may be more related to where an angler fishes than how long they fish.

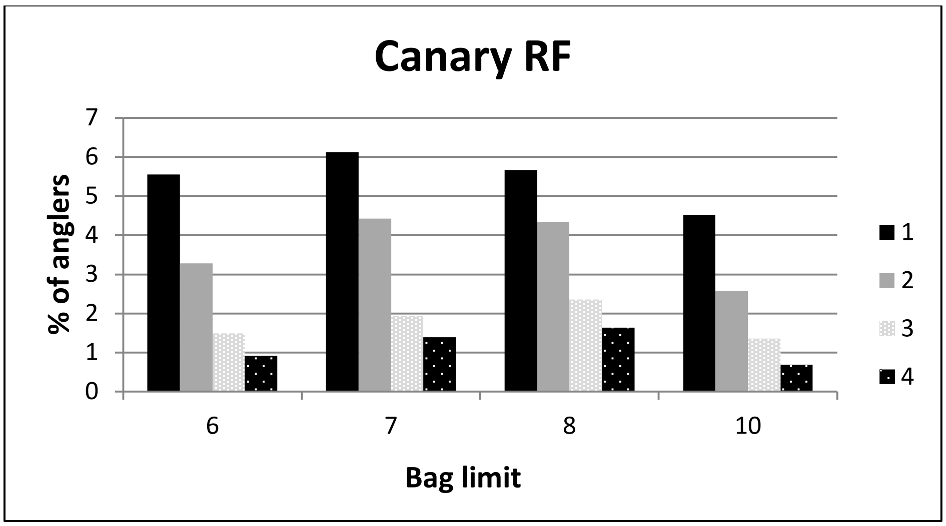

Figure A-21. Percentage of anglers that caught 1-4 canary rockfish under 6-10 RGC bag limits.

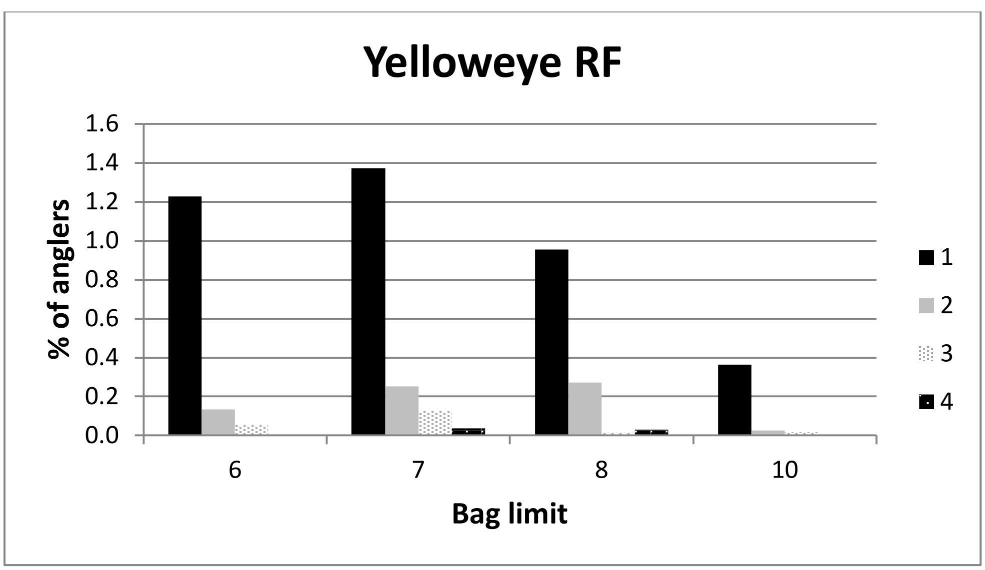

Figure A-22. Percentage of anglers that caught 1-4 yelloweye rockfish under 6-10 RGC bag limits.

A.10.6 Multivariate Forecasting: Yelloweye Rockfish (excluding management regulations)

Yelloweye rockfish have been the most constraining groundfish species because ACLs of this species have generally been obtained before catch limits of other non-overfished groundfish species or species complexes. Therefore, the objective of most management measures is to reduce yelloweye rockfish impacts, to allow greater utilization of other groundfish stocks. The ability to accurately predict yelloweye catches could increase the effectiveness of management measures. Unfortunately, yelloweye rockfish catches are rare (Figure A-23), highly variable (Figure A-24), and do not appear to be strongly related to economic indicators (e.g., gas prices, stock market, unemployment), weather (e.g., wind, waves, or ocean condition (wind and waves interaction together), or strength of other fisheries (e.g., tuna, halibut, and salmon harvests; Figure A-25). Weak relationships between the mentioned indicators and yelloweye impacts would lead to poor goodness of fit with multivariate analysis (e.g., regression), and would lead to wide prediction intervals with little value for management purposes. Until more accurate predictions of yelloweye rockfish impacts can be made, inseason management of groundfish fisheries will have to remain reactionary.

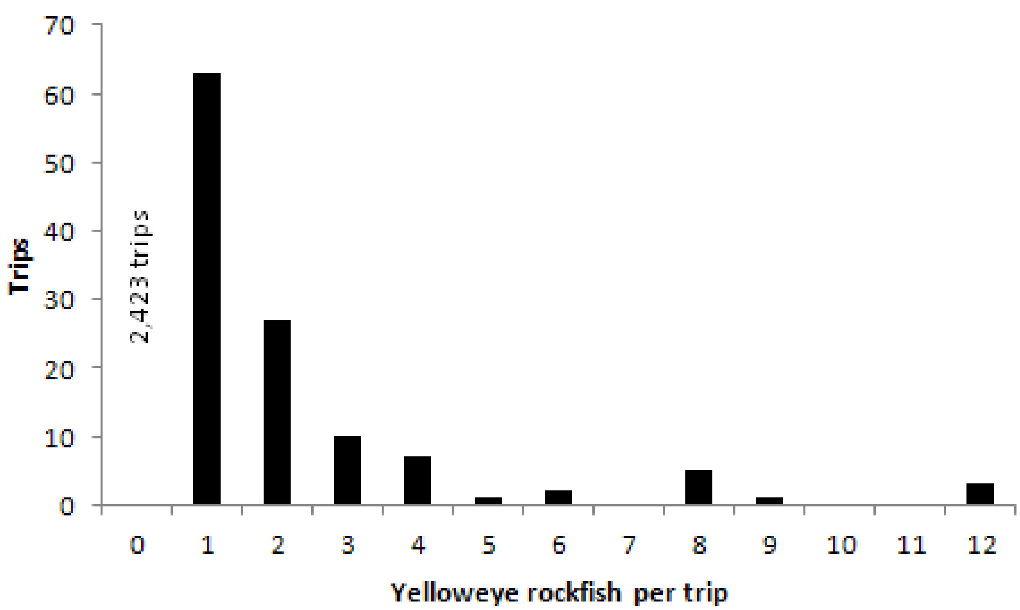

Figure A-23. Yelloweye rockfish per angler trip for June 2011.

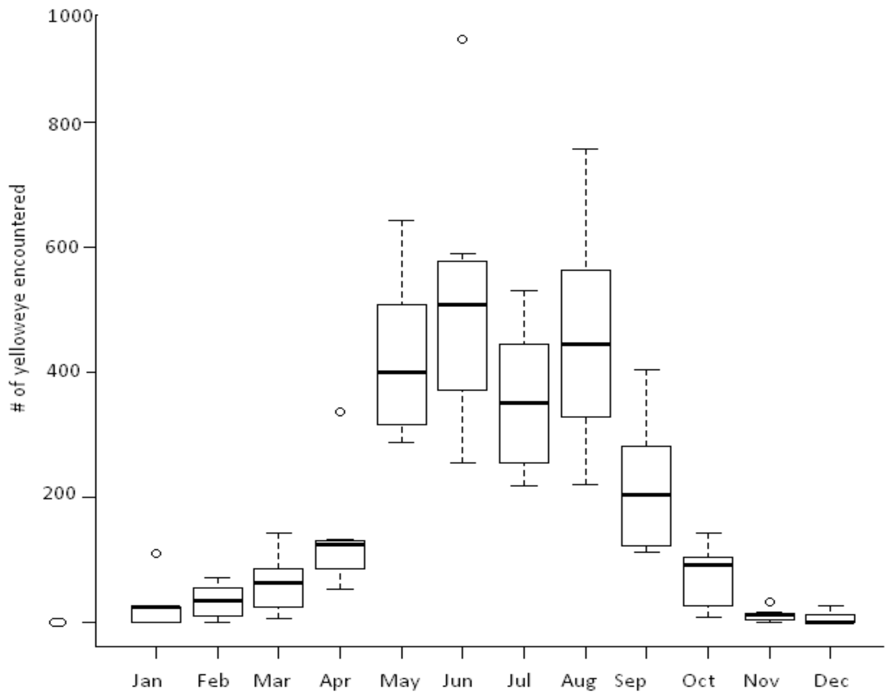

Figure A-24. Yelloweye rockfish encounters (landed + released) by month for the bottomfish fishery, 2004-2011.

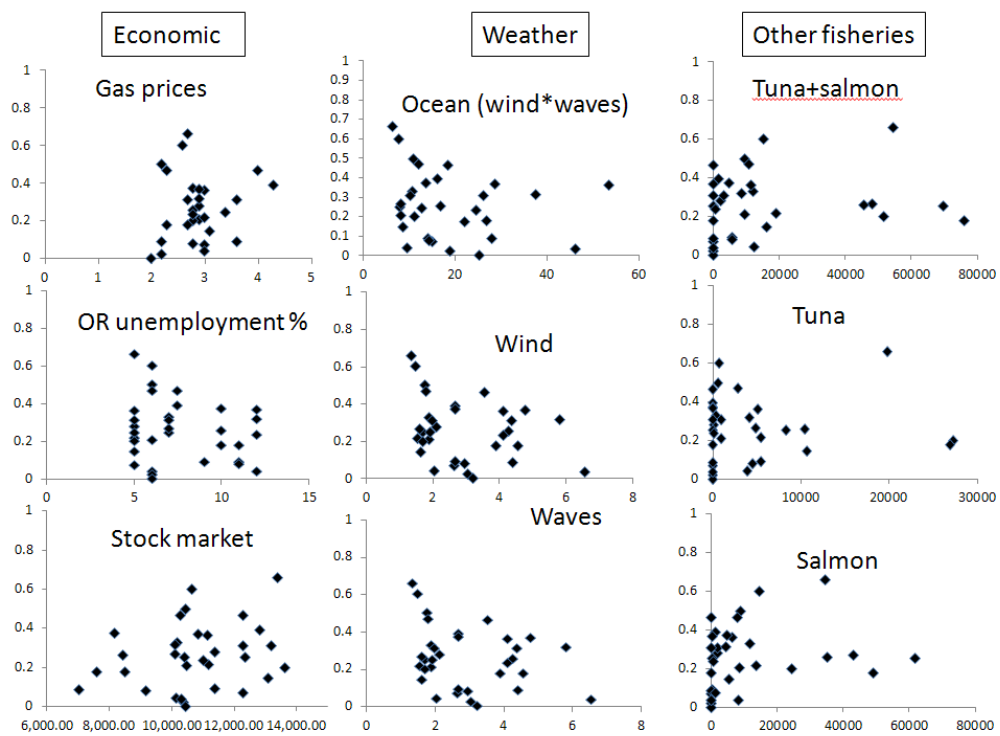

Figure A-25. Relationship between yelloweye impacts and economic indicators, weather, and strength of other fisheries for months with < 40 fm depth restrictions (months with majority of impacts), 2004-2010. Y axis = mt of yelloweye rockfish; x axis units: gas = $, unemployment = %; stock market = DOW points; ocean = kts X swell feet; wind = kts; waves = swell feet; other fisheries = fish landed).

A.10.7 Model Performance

The ability to accurately predict groundfish species impacts (harvests and discards) under different management restrictions is essential to reduce the possibility of inseason closures of fisheries. In Oregon, the ability to predict groundfish species impacts given different depth restrictions in the groundfish fishery is of greatest importance because other management restrictions do not appear capable of significantly manipulating impacts (e.g., bag limits unless set unrealistically low) or have not been examined (e.g., additional area closures). Of particular concern is the ability to accurately predict yelloweye rockfish impacts since they are the most limiting species to groundfish management in Oregon (only species in which quotas are typically obtained and because impacts cannot be reduced by prohibiting harvest because retention is always prohibited). Although the same models are used to predict impacts of all groundfish species with impact caps, only the ability of models to predict yelloweye rockfish impacts is examined, due to their relative importance, by comparing actual versus expected impacts.

Effects of New Data Source for Determining Discard Mortality Rates

Acquiring data of anger catches and efforts by depth has given ODFW a much greater understanding of where anglers fish, how angler behavior may be affected by depth restrictions, and what actual discard mortalities are compared to when only observed charter data on fish releases was available. This information shows that discard mortalities rates fluctuate and that the assumption of fixed discard mortalities used in previous calculations of discard mortalities was consequently inaccurate. Since the same fixed discard mortalities were used in both the old projection model and old discard mortality rate calculations, this created a greater chance of more aligned estimates and projections (although more inaccurate) than with the new projection model, which has to account for the variable discard mortality rates of the new calculation method.

Model Performance 2010-2011: Actual Versus Expected Impacts for Discard Mortality from Groundfish Fishery

The old projection model became obsolete when it was discovered that assumption of fixed discard mortality rates was incorrect for the groundfish fishery; therefore, there is no need to compare the predictive ability of the old and new models for the discard mortality from the groundfish fishery.

Instead, projected discard mortality from the groundfish fishery is compared with two variations of the new model. The preseason version of the new model uses only data prior to the projection year and the inseason version uses monthly data from the projection year when it becomes available. The inseason version was expected to have better predictive abilities because it could incorporate trends from the projection year that would be expected to continue for the entire year (e.g., greater than expected catch rates from Jan-May would be expected to result in greater than expected catch rates for the rest of the year).

As expected, the inseason version was better at predicting total year discard mortality than the preseason version for 2010 (-12.6 percent and -21.4 percent error, respectively) and 2011 (-6.8 percent and -11.2 percent error, respectively) (Table A-61). Percent error for the inseason version was greatest during months with relatively low impacts (typically > 20 percent and often nearly 100 percent or greater; Jan-Mar and Sep-Dec). Discard mortality is very difficult to accurately project during these months because efforts are much less than during summer months (small sample size issue) and catch rates are highly variable. Of greater concern is the ability to accurately predict discard mortality during summer months (Jun-Aug) when the majority of impacts occur. Percent error with the inseason version was less than 20 percent for each of these months during 2010 and during July of 2011. The relatively large percent error during June 2011 (-63.3 percent) was due more than double record yelloweye rockfish discards (released fish) for the month (due to record catch rates and record effort). Inclusion of the record June 2011 catch rate data into model caused the inseason projections for July-Sept to increase, but actual catch rates returned to normal, resulting in projections greater than what actually occurred for the period.

Table A-61. Actual versus expected yelloweye rockfish discard mortalities from the groundfish fishery for the preseason (PRE; using data before projection year) and inseason (IN; using data for the projection year when available) versions of the new projection method. Negative error = projection < actual.

	2011								2010							
		Expected (mt)		Actual (mt)	Actual - expected		% error			Expected (mt)		Actual (mt)	Actual - expected		% error	
Month	Depth	PRE	IN		PRE	IN	PRE	IN	Depth	PRE	IN		PRE	IN	PRE	IN
Jan	All	0.027	0.027	0.023	-0.004	-0.004	19.1	19.1	All	0.022	0.022	0.012	-0.010	-0.010	76.3	76.3
Feb	All	0.047	0.047	0.029	-0.018	-0.018	64.2	64.2	All	0.026	0.026	0.035	0.009	0.009	-24.7	-24.7
Mar	All	0.071	0.071	0.026	-0.045	-0.045	174.1	174.1	All	0.056	0.056	0.063	0.007	0.007	-10.7	-10.7
Apr	40	0.104	0.102	0.052	-0.052	-0.050	99.4	95.6	40	0.082	0.086	0.033	-0.049	-0.053	151.8	164.1
May	40	0.177	0.174	0.165	-0.012	-0.009	7.2	5.4	40	0.148	0.155	0.313	0.165	0.158	-52.8	-50.5
Jun	40	0.205	0.201	0.547	0.342	0.346	-62.6	-63.3	40	0.172	0.180	0.181	0.009	0.001	-5.1	-0.6
Jul	20	0.172	0.236	0.210	0.038	-0.026	-18.1	12.4	40	0.280	0.224	0.241	-0.039	0.017	16.2	-7.0
Aug	20	0.147	0.203	0.151	0.004	-0.052	-2.9	34.1	20	0.099	0.157	0.132	0.033	-0.025	-24.9	19.1
Sep	20	0.072	0.099	0.055	-0.017	-0.044	29.9	78.7	20	0.044	0.069	0.062	0.018	-0.007	-28.9	11.5
Oct	All	0.061	0.048	0.136	0.075	0.088	-55.2	-64.7	20	0.021	0.023	0.004	-0.017	-0.019	420.8	470.4
Nov	All	0.014	0.012	0.001	-0.013	-0.011	834.8	701.3	20	0.006	0.006	0.000	-0.006	-0.006	no impacts	
Dec	All	0.01	0.008	NA	NA	NA	NA	NA	20	0.003	0.003	0.005	0.002	0.002	-39.1	-39.1
Total		1.097	1.220	1.396	0.299	0.176	-21.4	-12.6		0.959	1.007	1.080	0.121	0.073	-11.2	-6.8

Near 100 percent discard mortalities of yelloweye rockfish caught in the Pacific halibut fishery make it possible to compare the old and new models for projecting discard mortality in the fishery. Both methods are much simpler than the groundfish discard mortality models: the old method is ratio based and projects 0.00557 mt of yelloweye rockfish per 1,000 lbs. of Pacific halibut quota for Oregon fisheries and the new method assumes 0.455 mt total, regardless of the Oregon quota.

The new model resulted in a smaller mean percent error than the old model (-15 percent and 95 percent, respectively) and consequently appears to be the better projection model (Table A-62). Inconsistencies in percent errors with the old model means that a simple ratio approach would not fit the data well or have accurate predictive abilities.

Table A-62. Actual versus expected yelloweye rockfish discard mortality from the Pacific halibut fishery. Negative error = projection < actual.

		Expected		Actual - Expected		% error	
Year	Actual	New	Old	New	Old	New	Old
2011	0.531	0.466	1.044	0.065	-0.513	-12%	97%
2010	0.770	0.466	0.886	0.304	-0.116	-39%	15%
2009	0.312	0.466	1.036	-0.154	-0.724	49%	232%
2008	1.010	0.466	1.200	0.544	-0.190	-54%	19%
2007	0.590	0.466	1.264	0.124	-0.674	-21%	114%
				Mean error =		-15%	95%

A.11 California Recreational

A.11.1 Harvest and Discard Mortality Calculations

Introduction

Groundfish mortality from the recreational fishery in California is estimated and tracked inseason by the CDFW and the Pacific States Marine Fisheries Commission. From 1980 to 2003, estimates of mortality in the California recreational fishery were generated from data collected under the Marine Recreational Fisheries Statistical Survey (MRFSS). The CRFS began in January 2004 to provide catch and effort estimates for marine recreational finfish fisheries, with increased sampling frequency and improved effort estimation methods compared to MRFSS. The goal of the CRFS is to produce, in a timely manner, marine recreational fishery data needed for sustainable management of California's marine resources.

CRFS places a high priority on meeting data needs for actively managed species, and produces estimates of mortality consisting of weights of harvested and released fish. Mortality estimates are produced by CRFS for all species encountered in the recreational fishery, but groundfish mortality is monitored inseason for black rockfish (RF), blue RF, yelloweye RF, canary RF, cowcod, bocaccio, minor nearshore RF (black and yellow, gopher, kelp, olive, calico, quillback, China, grass , brown, blue and copper RF), greenlings (rock and kelp greenling), California scorpionfish, cabezon, and lingcod. The current CRFS and preceding MRFSS programs provide the estimates of mortality and other parameters used in modeling season structures as well as mortality estimates used in inseason to keep mortality within harvest limits.

Methods

The CRFS program produces estimates of total catch and fishing effort of marine recreational anglers in California. Field sampling is conducted at over 500 publicly-accessible sites during daylight hours to gather catch and effort data. A telephone survey of licensed anglers is also conducted to gather data on effort when field observations of effort are not feasible, such as fishing at night and fishing from boats that return to private marinas. Data gathered from field sampling, telephone surveys, sport fishing license sales, and mandatory CPFV logs are combined to estimate catch and effort. A more detailed description of surveys used to collect data on fishing effort and catch rates is provided in Table A-63.

CRFS samples all recreationally caught marine finfish in California, generally year-round for all modes. Data on catch and effort are collected for the four major modes of fishing which include private and rental boats (PR), CPFVs also commonly called party boats or charter boats (PC), man-made structures (MM), and beaches and banks (BB)[9]. The Angler License Directory Telephone Survey (ALDTS) is a monthly survey that collects angler data for all fishing modes, both access types (public and private), and daytime and nighttime fishing. These data are used to estimate effort on beaches and banks and to make an under-coverage adjustment for private-access effort of private and rental boats. Data collection methods are consistent statewide and result in estimates that are directly comparable between districts.

Estimates are produced for each fishing mode in each of six districts by adding estimates stratified by seven trip types (i.e., salmon, bottomfish, etc.) and water areas (inland and ocean waters; inside and outside 3 miles). In estimating average weight for each stratum, pooling rules based on time and area are used to achieve a minimum sample size.

Mortality estimates for boat modes account for depth dependent mortality. A depth dependent mortality rate is applied to the proportion of catch by depth in each month in each 10 fm depth bin. A mortality rate of 7% was applied to cabezon, lingcod, greenling, and rockfish discarded in the shore and estuary fishery

[9] The primary private and rental boats sites (PR1) include public ramps, hoists, and other launch facilities where the majority (at least 90 percent) of fishing effort and catch occurs in California.

to account for hooking mortality. Monthly estimates are produced and preliminary estimates are available one month after the end of the sampling period.

The CRFS estimation methodology has been reviewed by the RecFIN Technical Subcommittee of the SSC as well as the national Marine Recreational Information Program (MRIP). Some of the recommendations from MRIP have already been implemented including use of logbooks to estimate fishing effort in the PC mode, which was implemented in 2011. Additional changes may be implemented in the future to further improve estimation methods. As this data becomes available, it can be incorporated in the California catch projection model.

Table A-63. Types of surveys used in the California Recreational Fisheries Survey (CRFS) to collect data on fishing effort (effort) and catch (fish caught and kept and fish caught and released) rates (catch per unit effort, CPUE).

Mode	Estimate	**Public Access** (publicly-accessible sites covered by field surveys)		**Private Access** (sites not accessible to general public; not covered by field surveys)	
		Day ☼	**Night ☾**	**Day ☼**	**Night ☾**
1° Sites Private & Rental Boats	Effort	Field Survey	Under-coverage adjustment [1]	Under-coverage adjustment [1]	
	CPUE	Field Survey	Use estimate from day	Use estimate from day	
2°Sites Private & Rental Boats	Effort	Field Survey	Under-coverage adjustment [1]	Under-coverage adjustment [1]	
	CPUE	Field Survey	Use estimate from day	Use estimate from day	
CPFV	Effort	CPFV logs and Field Checks[2]		Not Applicable	
	CPUE	Field Survey (onboard & dockside)			
Man-made Structures	Effort	Field Survey	NO ESTIMATE	NO ESTIMATE	
	CPUE	Field Survey			
Beaches & Banks	Effort	Telephone Survey[3]		Telephone Survey[3]	
	CPUE	Field Survey	Use estimate from day	Use estimate from day	

[1]Under-coverage adjustment using estimates from the Angler License Directory Telephone Survey (ALDTS) and the field access point surveys.
[2]Operators of CPFVs are required as a condition of their license to submit logs for each fishing trip. The CPFV logs and a field survey to estimate compliance are used to estimate CPFV effort.
[3]Angler License Directory Telephone Survey (ALDTS)

A.11.2 Groundfish Fishery Projection Model

Introduction

Due to the deeper depth distribution of overfished rockfish species and the desire to provide the longest season possible, depth restrictions have been the primary management tool used to minimize mortality on these species in the recreational groundfish fishery. In the Northern and Mendocino Management Areas (Figure A-26) depth restrictions are currently 20 fm and vessel safety concerns prevent implementing a shallower depth in the event that catches are tracking higher than projected. This leaves shorter seasons or inseason closure to prevent exceeding harvest limits. In other areas, shallower depth restrictions can be implemented inseason to reduce mortality. Although depth restrictions are a useful tool to reduce overfished species mortality, effort shifts into shallower waters can increase mortality on healthy shallow stocks. Depending on the magnitude of effort shift, it is possible that the fishery would be forced to close early to prevent exceeding harvest limits of the healthy shallow stocks, not overfished species.

The RecFISH catch projection model is an essential tool used to project mortality for regulation development and inseason management. In regulation development, the RecFISH model is used to determine what seasons and depth restrictions can be permitted while keeping mortality within allowable limits. For inseason management, it is the means to project mortality mid-season to determine how mortality is tracking relative to projections and whether modifications to depth restrictions or season closures would be necessary to prevent harvest limits from being exceeded.

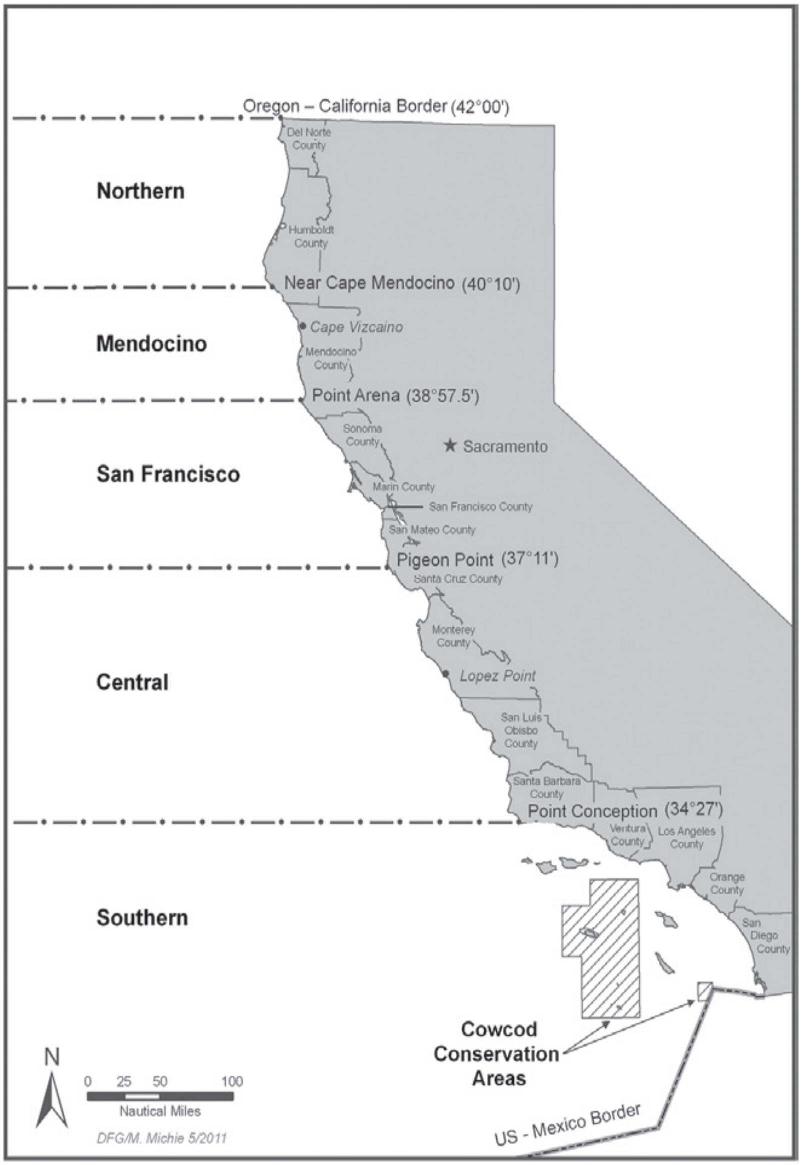

Figure A-26. California recreational groundfish management areas.

Model Description

The anticipated mortality from the California recreational fishery under a given depth and season restriction regime are modeled using the RecFISH model developed in 2004 under a contract with MRAG Americas, with subsequent augmentation of catch by depth and time parameters by CDFW. RecFISH allows projection of catch by depth and season length in each of the five groundfish management areas along the coast. The model incorporates proportion of catch by depth and time from historical unregulated periods and recent estimates of mortality in each of the groundfish management areas to project future mortality given various season and depth scenarios, while taking into account effort shifts between depths. The RecFISH model is catch based whereas the Oregon model is effort based. The RecFISH model assumes that the historical proportion of catch by time and depth is representative of what will occur in the future. The methods employed in the RecFISH model to project impacts from regulations analyzed in the 2015-2016 EIS are described in greater detail below.

Methods

Historical catch data by time and depth are used as the basis for projecting expected catch per two-month period ("wave") and 10 fm depth strata, for each management area and species. A flow chart indicating the data and methods used in RecFISH to project fishery impacts in 2015 and 2016 is provided in Figure A-27. The method includes the following steps:

<u>Step 1: Back-calculation of Expected Mortality in an Unregulated Fishery for Input Years</u>

The expected magnitude of unregulated catch by depth and month for each input year (2011 and 2012) is back-calculated to reflect fishing in an unregulated year in each management area. This is accomplished for each management area and species by expanding the catch in each regulated input year by what would be expected from an unregulated fishery using the historical proportion of catch by depth data and catch by time data from years in which there was no depth restriction in place.

In expanding baseline input catch data from regulated seasons to all depths and months, data from other areas were used to supplement the existing historical data when necessary. Catch data from Oregon during unregulated periods were added to historical data the Northern Management to obtain suitable sample sizes. Estimates of catch by time north of Point Conception from the unregulated period were dominated by the San Francisco and Central Management Areas where more effort was exerted over more months than to the north of Point Arena. Thus the proportion of catch by time from Oregon was used in the Northern and Mendocino Management Areas due to greater similarity in the timing of the fishery than to the south of Point Arena.

The following steps provide catch by depth and month expected under an unregulated season in each management area:

a. Obtain estimates of landed (A+B1) and discarded (B2+B3) catch of each species in each district from RecFIN for the base years (2011 and 2012); combine districts 1 and 2 to obtain an estimate for the Southern Management Area.
b. Obtain historical average proportion of sampled catch by depth for unregulated years with no depth restriction from RecFIN for fish caught in the PC and PR modes by each region and species. Depth of capture data was not recorded in the MRFSS survey until 1999, limiting the amount of data available to inform the unregulated proportion of catch by depth available before depth restrictions were put in place. Proxies were as needed for data-poor areas, using adjacent regions, similar species, etc.
    i. Northern Management Area: MRFSS sample data from north of 40°10' N. latitude to the OR/CA border from 1999 to 2003[10], Oregon data from 1999 to 2003 to supplement the sample size.
    ii. Mendocino, San Francisco, Central: MRFSS sample data from 1999 to 2000 from north of Point Conception[11].
    iii. Southern Management Areas: MRFSS sample data from 1999 to 2000 from south of Point Conception[12].
c. Obtain catch estimates by time data from RecFIN to calculate average proportion of catch by two month wave for each species and management area[13]. Assign proxies as needed for data-poor species/areas using the other region (North or South).
    i. Northern and Mendocino Management Area: Oregon estimates from 1993 to 1999. Oregon data were used to reflect the shorter duration of fishing activity in an unregulated period in these areas than to the south. Use of estimates from Point Conception to the OR/CA border would overestimate the duration appreciable fishing effort during the season due to the overwhelming contribution of catch from the San Francisco and Central Management Areas.
    ii. San Francisco, Central Management Area: MRFSS estimates from north of Point Conception to the OR/CA border for 1993 to 1999.
    iii. Southern Management Area: MRFSS estimates from 1993 to 1999 south of Point Conception to the Mexican Border.
d. Divide the total mortality in each regulated base year (2011 and 2012) by the proportion of annual mortality expected in those depths and months in an unregulated season to estimate the total catch expected in an unregulated fishery. If the depth restriction was less than 30 fm in the base year, the estimated mortality is divided by 1.276 prior to expansion to account for the effort shift inshore compared to unregulated depths; a factor of 1.393 is applied if the depth restriction was 20 fm.

    Example: In 2011, 27 mt of black rockfish catch accrued in the Central Management Area from May to October under a 40 fm depth restriction. Historical catch during these months and depths was 27 percent of the total expected in an unregulated season (see shaded cells in Table 2-1). The expected unregulated catch would equal 100 mt (27 mt/0.27).
e. Apportion the expected catch in an unregulated fishery from each input year by the historical proportion of catch by time and depth in Table A-64 to obtain a matrix of expected catch by two month wave and 10 fm depth bin for each species in each management area for each input year. An example is provided in Table A-64 using the 100 mt unregulated base year catch from the example in d above.

[10] Depth based data unavailable prior to 1999; depth restrictions introduced in 2004.
[11] Depth based data unavailable prior to 1999; depth restrictions introduced in 2001.
[12] *Ibid*
[13] Season restrictions were implemented after 1999; therefore more recent data could not be used to inform the proportion of effort by month throughout the year.

Table A-64. Example of an expansion table reflecting proportion of catch by time and depth expected for a given management area and species in an unregulated season for black rockfish.

	Two Month Wave	1	2	3	4	5	6
Depth	Depth/Wave Proportion	0.10	0.10	0.20	0.20	0.20	0.20
0-10 fm	0.05	0.005	0.005	0.01	0.01	0.01	0.01
>10-20	0.10	0.01	0.01	0.02	0.02	0.02	0.02
>20-30	0.10	0.01	0.01	0.02	0.02	0.02	0.02
>30-40	0.20	0.02	0.02	0.04	0.04	0.04	0.04
>40-50	0.20	0.02	0.02	0.04	0.04	0.04	0.04
>50-60	0.20	0.02	0.02	0.04	0.04	0.04	0.04
>60-70	0.05	0.005	0.005	0.01	0.01	0.01	0.01
>70-80	0.05	0.005	0.005	0.01	0.01	0.01	0.01
>80-90	0.05	0.005	0.005	0.01	0.01	0.01	0.01
>90-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>100	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A-65. Example of 100 mt of back calculated catch for an unregulated base year apportioned over 10 fm depth bins and 2 month waves reflecting the expected distribution of catch by time and depth for a given management area and species.

	Two Month Wave	1	2	3	4	5	6
Depth	Depth/Wave Proportion	0.10	0.10	0.20	0.20	0.20	0.20
0-10 fm	0.05	0.5	0.5	1.0	1.0	1.0	1.0
>10-20	0.10	1.0	1.0	2.0	2.0	2.0	2.0
>20-30	0.10	1.0	1.0	2.0	2.0	2.0	2.0
>30-40	0.20	2.0	2.0	4.0	4.0	4.0	4.0
>40-50	0.20	2.0	2.0	4.0	4.0	4.0	4.0
>50-60	0.20	2.0	2.0	4.0	4.0	4.0	4.0
>60-70	0.05	0.5	0.5	1.0	1.0	1.0	1.0
>70-80	0.05	0.5	0.5	1.0	1.0	1.0	1.0
>80-90	0.05	0.5	0.5	1.0	1.0	1.0	1.0
>90-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>100	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Step 2: Average Results for Unregulated Catch for Input Years

The tables of catch by depth and two month wave for each year from 2011 and 2012 reflecting unregulated seasons from back calculations are averaged with approximate equal weighting from a decay function with a weighting of 0.99, resulting in a "base season" model projection.

Step 3: Convert Mortality by Wave to Mortality by Month

The proportion of catch in each two month wave is divided by two to provide an approximation of the proportion of catch by time expected in a one month period.

Step 4: Apply Depth Dependent Morality Rates

To account for depth dependent mortality rates, base catch in each month and depth bin is multiplied by the average proportion of catch from discarded fish (B2 reported discarded live + B3 reported discarded dead) in the base years 2011-2012 for each species and management area. This results in the expected tonnage of discarded fish. The species specific depth dependent mortality rates (by 10 fm depth bin) derived by the GMT (or suitable proxy) are applied to the discarded catch to provide an estimate of the expected discards for each depth bin. The resulting discard mortality estimate is added to the expected tonnage of retained catch to provide a projection of total mortality for each depth bin and month. This is used as the "base season" reflecting the mortality expected in an unregulated fishery.

Step 5: Mortality Projection for Hypothetical Season and Depth Restrictions

The desired depth and season is applied to the "base season" by adding the values for the appropriate month and depth estimates for each management area to obtain the projected mortality of the species (or species group) in question.

Step 6: Accounting for Effort Shifts

An effort shift inshore is applied only when modeled depth restrictions are less than or equal to 30 fm to account for the expected redistribution of effort from the closed waters to the remaining open area in shallower water. The projected mortality is increased in proportion to the redistribution of effort observed in historical MRFSS effort by depth data from the unregulated period. If fishing is restricted to less than 30 fm, projected mortality in the open area is increased by 27.6%; under a 20 fm depth restriction projected mortality is increased by 39.3%.

Step 7: Adjustments for Length, Bag or Area Restrictions

Any projected change in mortality resulting from a change to the bag limit, length restriction or area closure (e.g., Yelloweye Rockfish Conservation Area) is applied to the final projection to obtain the projected impacts expected with all management measures in place. The anticipated percent reduction or increase in mortality expected from such management measures are estimated using recent CRFS data. Length frequency data from retained and discarded fish were used for analyzing length restrictions. Retained and discarded catch per angler data were used for bag limit analyses.

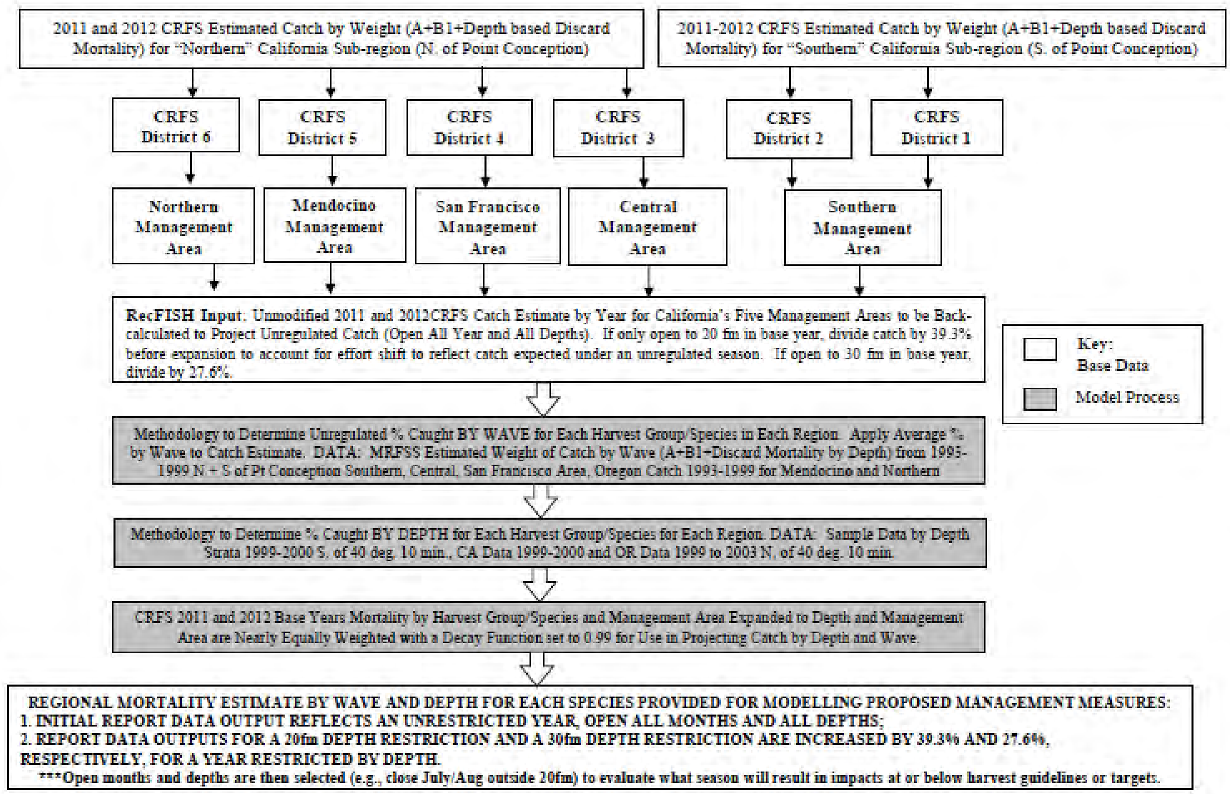

Figure A-27. Flow chart reflecting the steps in the 2015- 16 RecFISH California recreational groundfish projection model.

A.11.3 Projected Species Impacts from the Groundfish Projection Model

Recreational fisheries management for multi-species rockfish assemblages in California presents many challenges. In recent years, declining stocks of several rockfish species have dictated recreational groundfish seasons and depth restrictions in California. Increasingly complex region specific restrictions have been necessary to keep total catch of depleted species within the reduced harvest limits that are necessary to rebuild the stocks while providing as much fishing opportunity for healthy stocks as possible.

There are five groundfish management areas along the California coast for which the RecFISH model provides projections of mortality. Overfished species including canary rockfish, cowcod, and yelloweye rockfish limit the season and depth restriction that can be allowed in each management area. Yelloweye rockfish and to a lesser extent canary rockfish limit the season and depth restrictions in management areas north of Point Conception; cowcod limits the season and depth restriction in the Southern Management Area. Retention of these species is prohibited and shallower depth restrictions in combination with reduced seasons have been necessary to limit angler encounters (Figure A-28).

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Closed				May 15 – Oct 30 <20fm						Closed	
Mendocino	Closed				May 15 – Sept 2* <20fm				Closed			
San Francisco	Closed					Jun 1 – Dec 31 <30fm						
Central	Closed				May 1 – Dec 31 <40fm							
Southern	Closed		Mar 1 – Dec 31 <50fm									

* Sept 1 in 2014

Figure A-28. California recreational groundfish season and depth constraints for 2013-2014 as recommended by the Council in June 2012.

The “base model” of unregulated catch resulting from the back-calculation steps provides the projected mortality for all depths and months. This forms the basis for projections of mortality from hypothetical seasons and depth restrictions in each management area to evaluate whether the resulting total mortality is below the harvest limit for overfished species as well as target stocks/complexes. Allocations to the California recreational fishery are state-wide or divided geographically at 40°10' North latitude (e.g., minor nearshore rockfish complex, bocaccio, and cowcod). The allocation is first divided among management areas to maximize the season length, and then access to deeper depths is considered depending on the remaining residual. The model projections for a given season and depth restriction regime can also be adjusted to account for the estimated increases or decreases in the projected impacts anticipated to result from bag, length or area closures (e.g., yelloweye rockfish conservation areas).

Projected impacts are based on data from 2011 and 2012, which are the most recent years of data reflecting the use of log books to estimate effort in the party charter mode, affecting estimates compared to previous years. Projected impacts for canary rockfish, cowcod, and yelloweye rockfish reflect mortality from discards as retention of these species is prohibited in the recreational fishery.

A.11.4 Model Output use in Management and Estimating Effort for use in the IO-PAC Model

Impacts on recreational groundfish fisheries are assessed by comparing the change in the estimated numbers of groundfish angler trips under the action alternatives with angler trips under No Action. Groundfish angler trips are stratified by management region and “mode” (i.e., whether the trips occur in commercial charter or private/rental boats). Since shore-based Beach and Bank and Man Made modes are open year round, they are excluded from the number of angler trips because differences in season lengths only pertains to the boat based modes.

In previous cycles, the average number of boat based trips per month in each stratum over the period modeled using the RecFISH model (2011-2012 for the 2015-2016 biennium) were used to estimate the total number of trips expected under the seasons modeled. If no historical data were available for a particular month, the number of trips in next available month in that management area were used as a proxy. After review of the model in 2012, the SSC requested that the effort projections be made using the proportion of historical “bottomfish effort” by time from a historical unregulated period. .

Estimates of effort for trips targeting bottomfish were not available from the MRFS survey, due to the lack of trip type stratification during the unregulated period prior to CRFS in 2004. Thus the proportion of catch by two month wave from the unregulated period (1993-1999) stratified at Point Conception was used as a proxy for effort in each month. The proportions of catch by time from California waters north of Point Conception were dominated by the contributions of catch and timing of the fishery in San Francisco and Central Management Measures with a greater number of anglers living near the coast and less inclement weather in the winter months. This made the timing catch as a proxy for effort in the Oregon recreational fishery more representative of timing north of Point Arena where weather is more inclement during the winter months as is the case in Oregon. Thus the proportion of catch in Oregon waters was used as a proxy for the proportion of effort by two month period north of Point Arena in the Northern and Mendocino Management Areas.

In months for which recent effort estimates from 2011 and 2012 were not available to calculate an average directly, historical proportion of catch by two month wave and effort in open months in recent years are used to project effort. Projections for each two month period were divided in half to provide estimates for each month in the period. . The sum of the angler trips during the months open to groundfish fishing under each alternative provides the basis for comparison of economic benefits to fishing communities. Estimates of the expenditures incurred per trip allow conversion of total trips to a dollar value that is used in the IO-PAC model as an estimate of economic benefit.

Changes in the number of angler trips and thus economic benefit resulting from changes to management measures other than fishing season (i.e., depth restriction, bag limits, size limits etc.) are not directly accounted for in the economic analysis. Changes in the depth restriction assume that fishing effort within a given month does not change, but rather effort is redistributed to the remaining fishing area. If such management measures allow increased season length, then the increased number of trips resulting from the management measure is accounted for. Only management measures affecting the mortality of species limiting the season length will reflect changes in the season and thus angler trips.

APPENDIX B: MANAGEMENT MEASURES

ACRONYMS

ABC	Acceptable biological catch
ACL	Annual catch limit
ACT	Annual catch target
AFSC	Alaska Fisheries Science Center
BRA	Bycatch Reduction Area
BRD	Bycatch reduction device
CCA	Cowcod Conservation Area
CDFW	California Department of Fish and Wildlife
Council	Pacific Fishery Management Council
CP	Catcher-processors
CPUE	Catch per unit of effort
DEIS	Draft Environmental Impact Statement
DTL	Daily trip limit
DTS	Dover sole, thornyhead, and trawl-caught sablefish complex
EEZ	Exclusive Economic Zone
EFH	Essential fish habitat
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
GAP	Groundfish Advisory Subpanel
GCA	Groundfish Conservation Area
GIS	Geographic Information System
GMT	Groundfish Management Team
HG	Harvest guideline
IBQ	Individual bycatch quota
IFQ	Individual fishing quota
LE	Limited entry
MPA	Marine Protected Area
mt	Metric ton
nm	Nautical mile
NMFS	National Marine Fisheries Service
NORPAC	North Pacific Database Program
NS1	National Standard 1
NWFSC	Northwest Fisheries Science Center
OA	Open access
ODFW	Oregon Department of Fish and Wildlife

OFL	Overfishing limit
OFS	Overfished species
OY	Optimum yield
PacFIN	Pacific Fishing Information Network
PSMFC	Pacific States Marine Fisheries Commission
QP	Quota pounds
RecFIN	Recreational Fishery Information Network
RCA	Rockfish Conservation Area
RCG	Rockfish-cabezon-greenling
SLA	Submerged Lands Act
SQ	Status quo
SSC	Scientific and Statistical Committee
SSTH	Shortspine thornyheads
SWFSC	Southwest Fisheries Science Center
VMS	Vessel monitoring system
WCGOP	West Coast Groundfish Observers Program
WCR	West Coast Region
WDFW	Washington Department of Fish and Wildlife

B.1 *Changes to Rockfish Conservation Area Coordinates*

Need for Action

Rockfish Conservation Areas (RCAs) are large area closures intended to protect a complex of species, such as overfished Shelf Rockfish species. A series of latitude and longitude coordinates that approximate depth contours are defined in Federal regulation (at 50 CFR 660.71-660.74) for each depth contour and used as a management line and the RCA structures are implemented by gear and/or fishery (e.g., trawl RCA, a non-trawl RCA, and recreational RCAs). The coordinates only approximate actual isobaths for two reasons. First, the waypoints defining the lines were defined using available bathymetry data, which have improved over time. Second, for enforcement purposes the lines defined by the waypoints are a more generalized, or simplified, representation of isobaths.

Often, changes to the coordinates that define RCAs are recommended during the biennial cycle to more closely align with the latest data on bathymetry. Under the action alternatives, 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 improved and more efficient access to target species while minimizing interactions with overfished species.

B.1.1 Oregon: Adjustments to the 200 fm Modified Line

Coordinates for the 200 fathom (fm) RCA line in Oregon were revised beginning January 1, 2013 to better align with depth contours (See 2013-2014 Final Environmental Impact Statement). However, coordinates for the 200-fm modified RCA, which are modified to provide access to shallower waters where petrale sole concentrations are greater (called petrale cut-outs), were not simultaneously adjusted. The result was areas where the petrale cut-outs on the 200 fm modified line were deeper than the 200 fm RCA (Figure B-1).

Management Options

No Action: The RCA coordinates currently in regulation would remain and in some areas the 200 fm modified line with petrale cut-outs would be deeper than the 200 fm line.

Option 1 (Preferred): Revise coordinates such that the 200 fm modified line is not deeper than the 200 fm line (Table B-1). The proposed coordinates are those currently available in regulation.

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

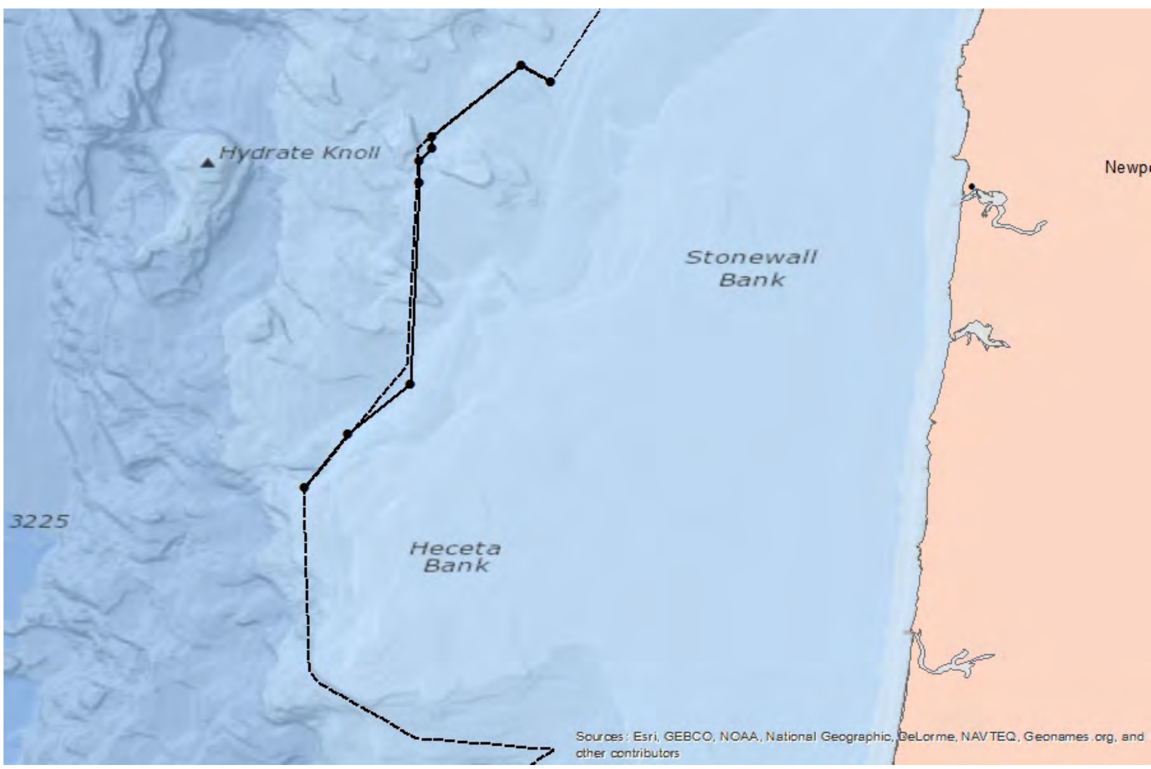

Figure B-1. Adjustments to the coordinates that establish the 200 fm modified line (with petrale cut outs). Dashed line represents the original 200 fm modified line. Solid line represents proposed changes (which use the same coordinates as the 200 fm line that does not contain petrale cut outs). Coordinates used in this figure were obtained from the West Coast Region (see http://tinyurl.com/ns5gsr3).

Comparison of the Management Options

Biological Impacts: The delineation of the RCA coordinates was based on an analysis of trawl logbook and survey data to determine the relative abundance and bycatch rates of overfished species according to bottom depth.[14] To the degree that there is a precise correlation between depth and catch rates, under action alternative there could be a marginal increase in the catch of overfished species, other fish species, and the potential take of protected species occurring in the opened area. But this rationale also supports the presumption that catch rates in the newly opened area would be comparable to rates seen when the 200 fm line is in place since Option 1 simply aligns the 200 modified line with the 200 line. By more closely aligning the depth contour with the actual bathymetry in the area this option is intended to meet the objective of RCA management of reducing bycatch rates of overfished species while having a beneficial impact in terms of fishing opportunity. In that sense impacts are within the scope described in previous groundfish harvest specifications Environmental Impact Statements (EIS), which evaluated the application of this RCA boundary. Depth-based management was first introduced in 2003 to control bycatch of overfished species. Dr. James Hastie of the Northwest Fisheries Science Center (NWFSC) analyzed trawl logbook and other data to correlate overfished species bycatch rates by depth zones. These data were subsequently integrated into a catch projection model he developed for the trawl fishery. Depth-based management has been implemented by defining waypoints for lines approximating various isobaths. Subsequent adjustments to these waypoints are intended to make them more accurately correspond to depth contours. RCA configurations have been evaluated in the harvest specifications EISs since 2003 with respect to their likely performance in mitigating overfished species bycatch. The accountability measures described above and in section 2.2 of the main EIS document provide additional layers of precaution with respect to the catch of groundfish. The risk of exceeding an annual catch limit (ACL) in the trawl fishery should be no greater than under the current line (No Action) if bycatch rates are not different in the open area than in other areas deeper than 200 fathoms. This inference is based on the same premise used in the original development of depth-based management to control bycatch overfished species, which is that bycatch rates for a given overfished species varies by depth.

Socioeconomic Impacts: The change proposed under the action option may have a marginal socioeconomic benefit for the shoreside trawl fishery because harvesters could access higher concentrations of petrale sole compared to No Action. The change in management cost, primarily those associated with enforcement of the RCA boundaries, would be minimal under the proposal. The compliance with the depth contours are monitored with vessel monitoring systems (VMS) that are currently required on all groundfish vessels.

B.1.2 Modifications to the Boundaries Defining Rockfish Conservation Areas off California

B.1.2.1 Modifications of the 60 fm Depth Contour: Two Southern California Bight Proposals

During the 2013-2014 biennial management cycle, the 60 fm depth contour was used as the shoreward boundary of the non-trawl RCA south of 34°27' N. lat. This boundary is intended allow access to target species while minimizing bycatch of overfished species (OFS) such as bocaccio, canary, cowcod, and yelloweye rockfishes.

[14] Pacific Fishery Management Council. 2003. Final environmental impact statement for the proposed groundfish acceptable biological catch and optimum yield specifications and management measures for the 2003 Pacific coast groundfish fishery. Portland, OR. January 2003.

Need for Action

The current 60 fm depth contour specified in regulation at 50 CRF 660.72(f) is intended to approximate the 60 fm isobath. To allow better access to target species while maintaining the intent of the 60 fm line, better alignment of the 60 fm line with the 60 fm isobath is necessary for waters off California.

Del Mar: Option A and Option C

No Action: Under No Action (described in Section 2.4.1 of the 2015-2016 EIS) the 60 fm depth contour created by the waypoints currently listed at 50 CRF 660.72(f) would be retained in 2015-2016 and beyond.

Option A (Industry Proposed): Table B-2 and Figure B-2 detail the changes proposed under Option A, which would

- Modify the 60 fm contour between waypoints #198 and 199 by adding five new waypoints, and
- Modify the 60 fm contour between waypoints #198 and #200 by adjusting waypoint #199

Option C (Preferred): Table B-3 and Figure B-3 detail the changes proposed under Option C, which would

- Add one new waypoint between existing waypoint #198 and waypoint #199

Discussion of the Options

Option A was submitted by industry to allow increased access to fishing areas currently closed as a result of the existing RCA shoreward boundary (see above reference, and Table B-2 and Figure B-2). However, under Option A, the proposed boundary adjustments would move a section of the shoreward 60 fm RCA shoreward boundary into waters deeper than 75 fm. Additionally, one waypoint that is proposed to be edited (#199) actually moves the 60 fm RCA shoreward boundary to waters less than 50 fm. For the Option A proposal, had the adjustments been deemed appropriate with the intent of the 60 fm line (at least from the initial analysis standpoint), fishing opportunities would have been increased for those members of the fleet fishing out of the greater San Diego area.

The CDFW submitted Option C, which is the Council-Preferred Option, that creates only one new waypoint between existing waypoint #198 and waypoint #199 (Table B-3 and Figure B-3). This option was submitted, not to address industry's proposal nor to address the issues identified above, but to better align the RCA shoreward boundary line to the 60 fathom contour line in this area.

San Diego: Option A and Option B

Industry also submitted another proposal with two options to accommodate an adjustment to the 60 fm RCA shoreward boundary west of San Diego that would allow better access to a tip of a reef and would make a slight alignment to the depth contour.

No Action: Under No Action (described in section 2.4.1 of the 2013-2014 EIS) the 60 fm depth contour created by the waypoints currently listed at 50 CRF 660.72(f) would be retained in 2015-2016 and beyond.

Option A (Preferred): Table B-4 and Figure B-4 detail the changes proposed under Option A, which would

- Modify the 60 fm contour between waypoints #205 and #207 by adjusting waypoint #206

Option B: Table B-4 details the changes proposed under Option B, which would

- Modify the 60 fm contour between waypoints #206 and #207 by adding a new waypoint.

Discussion of the Options

As proposed, Option A requests that the 60 fm waypoint #206 be moved whereas Option B requests that a new waypoint be inserted between waypoint #206 and #207. Moving the existing waypoint #206, as proposed, results in a move of approximately 228 meters (approximately 250 yards). This proposal does better align the RCA shoreward boundary to the depth contour, but only just slightly.

Comparison of the Management Options for Del Mar and San Diego Adjustments

Biological Impacts: The 60 fm RCA coordinates are currently used to establish the non-trawl RCA boundaries for the limited entry and open access fixed gear fisheries and the recreational fishery. The non-trawl fixed-gear fisheries do not require logbooks to be completed and as such, it is very difficult to determine the species that may be taken in the proposed area and/or adjacent areas. Reporting of fishing areas is limited to documentation of Fish and Wildlife catch block numbers on the commercial landings receipts. These, however, cover 10x10 mile grids and do not lend themselves to accurate accounting of what species were caught from any specific areas. Logbooks are required for CPFVs in the recreational fishery and reporting of fishing areas (i.e. Fish and Wildlife catch blocks) and associated accounting issues are the same as those for the commercial fixed gear fisheries. To the degree that there is not enough precise correlation between recorded catch by species and recorded fishing areas (blocks) under the action alternatives, there could be an increase of overfished species, other fish species, and the take of protected species in the opened areas.

Socioeconomic Impacts: The changes proposed under the action options may have a marginal socioeconomic benefit for the shoreside non-trawl fixed gear fishery managed under an RCA with a 60 fm contour as its shoreward boundary. Access to the reef tip under Option A in the San Diego area would be beneficial to the fishing community from the greater San Diego area. The change in management cost, primarily those associated with enforcement of the RCA boundaries, would be minimal (if any) under the proposal. The compliance with the depth contours are monitored with VMS that are currently required on all groundfish vessels. No socioeconomic benefit is expected for the recreational fishery because no increase in angler trips is expected simply as a result of modifying this boundary.

Table B-2. Del Mar, Option A: Coordinate list for proposed modifications to the 60 fm RCA shoreward boundary off Del Mar, California.

	Boundary Line	**Coordinates**
ID	**Name**	**Degrees, decimal minutes**
198	Current waypoint (keep)	32°57.39' N, 117°18.72' W
--	Proposed modification (add after #198)	32°56.50' N, 117°19.80' W
--	Proposed modification (add after #198)	32°56.50' N, 117°19.72' W
--	Proposed modification (add after #198)	32°56.36' N, 117°19.06' W
--	Proposed modification (add after #198)	32°56.24' N, 117°19.04' W
--	Proposed modification (add after #198)	32°56.00' N, 117°19.16' W
199	Proposed modification (modify #199)	32°55.64' N, 117°18.46' W
200	Current waypoint (keep)	32°52.81' N, 117°17.09' W

Table B-3. Del Mar, Preferred Option C: Alternate option for the Del Mar proposal that modifies the 60 fm RCA shoreward boundary off Del Mar, California.

	Boundary Line	**Coordinates**
ID	**Name**	**Degrees, decimal minutes**
198	Current waypoint (keep)	32°57.39' N, 117°18.72' W
--	Proposed modification (add between waypoints #198 and #199)	32°56.00' N, 117°19.16' W
199	Current waypoint (keep)	32°55.64' N, 117°18.46' W

Table B-4. San Diego, Preferred Option A and Option B: Coordinate list for proposed modifications to the 60 fm RCA shoreward boundary south of Del Mar, west of San Diego, California. This proposal is made under two Options: Option A would adjust waypoint #206 and Option B proposes to add a waypoint between waypoints #206 and #207.

	Boundary Line	**Coordinates**
ID	**Name**	**Degrees, decimal minutes**
San Diego Option A (Preferred)		
205	Current waypoint (keep)	32°45.58' N, 117°22.38' W
206	Proposed modification (modify #206)	32°44.89' N, 117°21.89' W
207	Current waypoint (keep)	32°43.52' N, 117°19.32' W
San Diego Option B		
206	Current waypoint (keep)	32°44.98' N, 117°22.87' W
--	Proposed modification (add between #206 and #207	32°44.89' N, 117°21.89' W
207	Current waypoint (keep)	32°43.42' N, 117°19.32' W

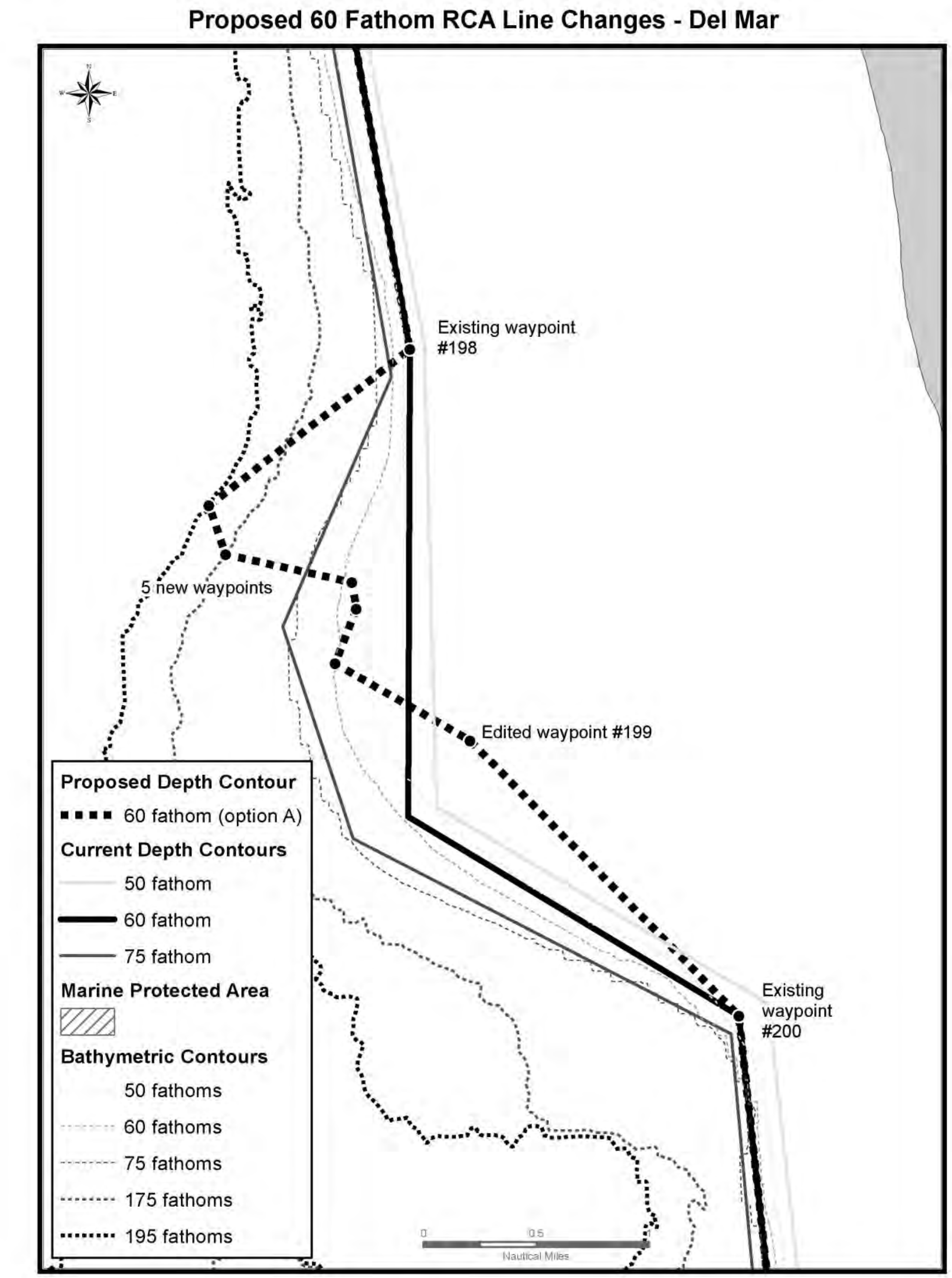

Figure B-2. Del Mar, Option A: Modification to the 60 fm contour off Del Mar, California, proposed by industry. ***Bathymetry based on NOAA National Geophysical Data Center, U.S. Coastal Relief Model, Retrieved May, 2014, http://www.ngdc.noaa.gov/mgg/coastal/crm.html.***

Proposed 60 Fathom RCA Line Changes - Del Mar

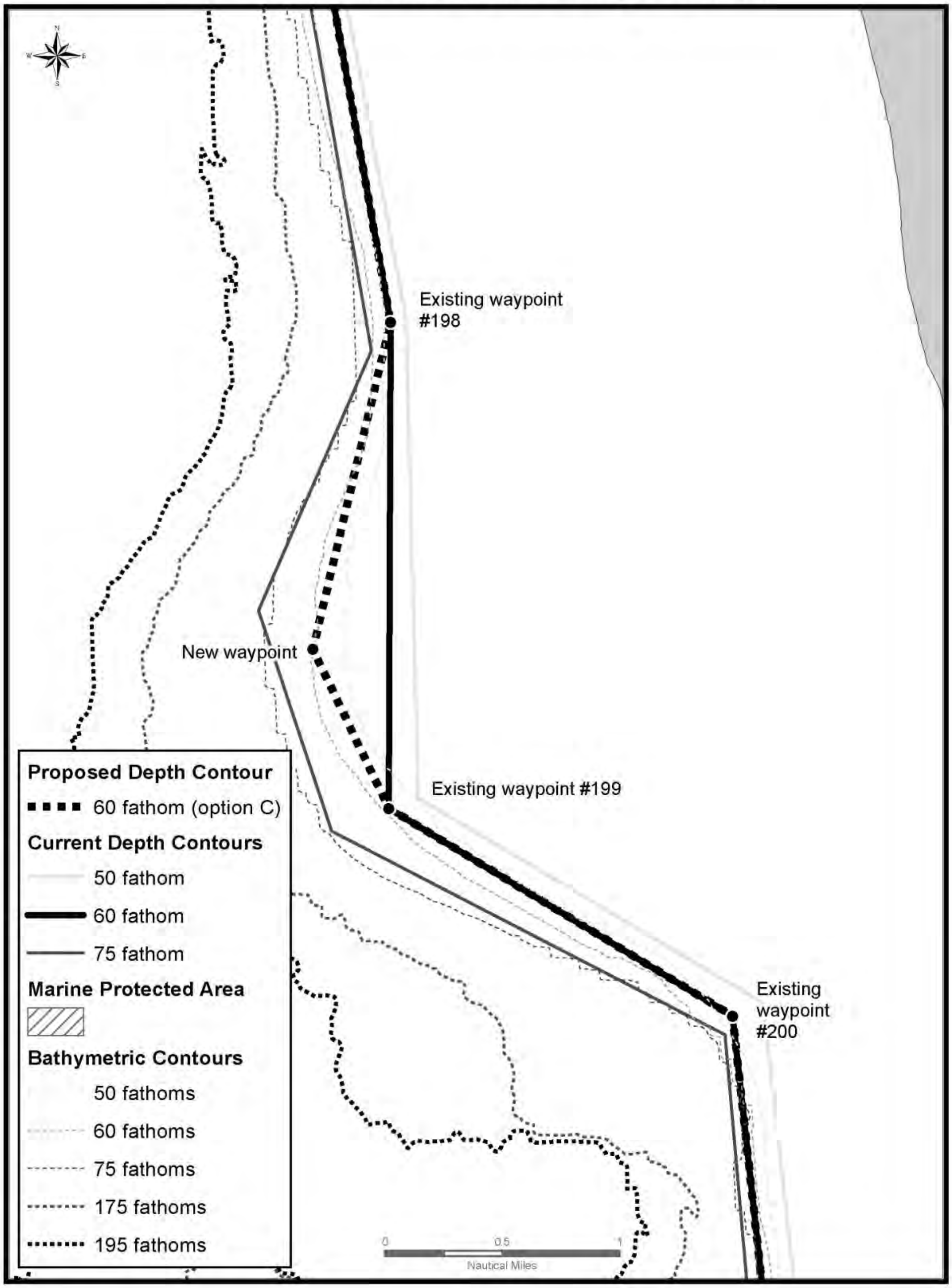

Figure B-3. Del Mar, Preferred Option C: Modification to the 60 fm contour off Del Mar, California, proposed by CDFW and recommended by the Council. ***Bathymetry based on NOAA National Geophysical Data Center, U.S. Coastal Relief Model, Retrieved May, 2014, http://www.ngdc.noaa.gov/mgg/coastal/crm.html.***

Proposed 60 Fathom RCA Line Changes - South of Del Mar

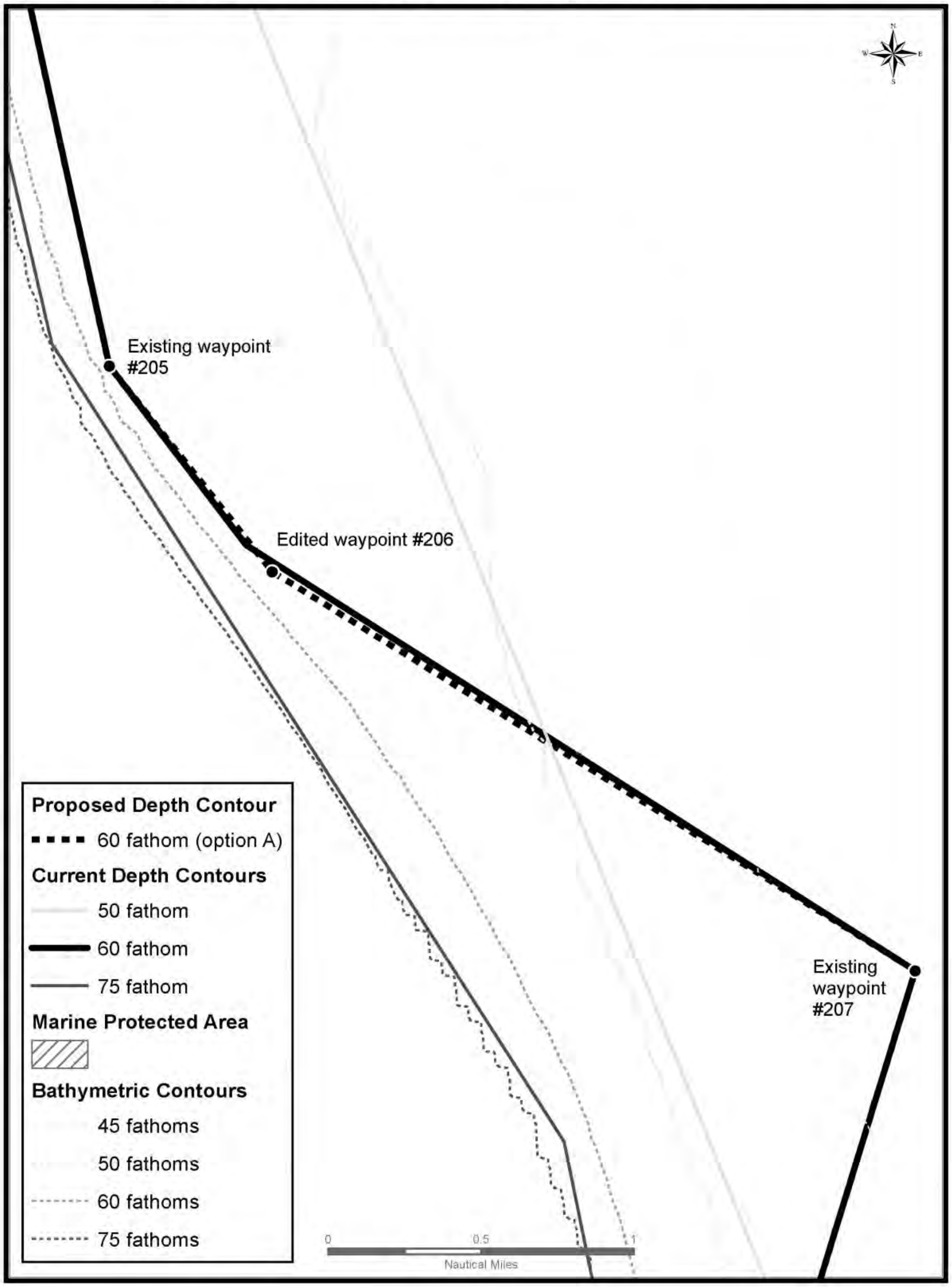

Figure B-4. San Diego, Preferred Option A and Option B. Modification to the 60 fm contour south of Del Mar, west of San Diego, California, proposed by industry. This version shows waypoint #206 as an edited adjustment (Option A). Option B would be to add this waypoint between waypoints #206 and #207. ***Bathymetry based on National Oceanic and Atmospheric Administration National Geophysical Data Center, U.S. Coastal Relief Model, Retrieved May, 2014, http://www.ngdc.noaa.gov/mgg/coastal/crm.html.***

B.1.2.2 **Modifications of the 50 fm Depth Contour: Northern Channel Islands Proposal**

During the 2013-2014 biennial management cycle, the 50 fm depth contour was used as the shoreward boundary of the recreational RCA (660.360). This boundary is intended allow access to target species while minimizing bycatch of overfished species (OFS) such as bocaccio, canary, cowcod, and yelloweye rockfishes.

Need for Action

The current 50 fm depth contour specified in regulation at 50 CRF 660.72(c) approximates the 50 fm isobath around the north Channel Islands – San Miguel, Santa Rosa, and Santa Cruz. To allow better access to non-trawl fishing areas for non-OFS species while maintaining the intent of the 50 fm line, better alignment of the 50 fm line with the 50 isobath is necessary for waters off California.

Management Options

No Action: Under No Action (described in section 2.4.1 of the 2013-2014 EIS) the 50 fm depth contour created by the waypoints currently listed at 50 CRF 660.72(c) would be retained in 2015-2016 and beyond.

Option A: Table B-5 and Figure B-5 detail the changes proposed under Option A, which would

- Modify the 50 fm depth contour between waypoints #2 and #4 by adjusting waypoint #3 with a new set of coordinates,
- Modify the 50 fm depth contour between waypoints #4 and #5 by adding five new waypoints,
- Modify the 50 fm depth contour between waypoints #20 and #21 by adding a new waypoint,
- Modify the 50 fm depth contour between waypoints #21 and #23 by adjusting waypoint #22,
- Modify the 50 fm depth contour between waypoints #23 and #25 by adjusting waypoint #24, and
- Modify the 50 fm depth contour between waypoints #25 and #26 by adding a new waypoint.

Option B (Preferred): Table B-6 and Figure B-6 detail the proposed changes under Option B, which would

- Adjust existing waypoint #3 and
- Add a new waypoint between the existing waypoint #2 and the adjusted waypoint #3.
- Incorporate all the other proposed industry adjustments as proposed under Option A.

Discussion of the Options

Under Option A, the new point inserted between waypoint 25 and 26 causes the modified 50 fm line to cross over the 60 fm line. Option B addresses this new waypoint insertion below. Option B, however, better aligns the RCA coordinates to the 50 fm contour around the Northern Channel Islands by modifying existing waypoint #3 and adding a new waypoint between the modified waypoint #3 and existing waypoint #2. In doing so, it would also provide more fishing areas (Table B-6 and Figure B-6).

The proposed waypoint adjustments do overlap with some existing MPAs around the Channel Islands. Also, essential fish habitat (EFH) areas always need to be considered, although none were identified as being affected by the proposed adjustments, specifically the Richardson Rock EFH. Specific coordinates of EFH area may be found in Federal Regulations 50 CFR 660.75-79. Under both Option A and Option B, the addition of a new waypoint between existing waypoint 25 and waypoint 26 would adjust the RCA boundary that transects through the Richardson Rock Marine Protected Area (MPA). The adjusted RCA boundary would allow slightly more fishing area immediately south of the Richardson Rock MPA southern boundary. Since fishing is not allowed within the MPA, the adjusted RCA boundary would not affect the MPA nor would it have any effect on the Richardson Rock Exempted Fishing Permit (EFP), which has the same southern boundary as the MPA. Aside from these issues regarding MPAs and EFHs, access to these areas would be beneficial to the fishing community from the greater Santa Barbara area.

Comparison of the Management Options

Biological Impacts: In the event the non-trawl fisheries were managed with a 50 fm contour, a marginal increase in opportunities would be expected as a result of these changes. The likelihood that increased encounters with overfished species may also occur would probably be minimal given that the proposed changes are small and do not greatly increase allowable fishing areas. However, no quantitative evaluation has been completed.

Under the Preferred Option (Option B), slightly more fishing area would be allowed compared to Option A, without an expected increase in overfished species encounters. This is surmised because the increased area does not extend into appreciably deeper habitat where increased encounters of overfished species could potentially occur.

Socioeconomic Impacts: The changes proposed under the action alternatives may have a marginal socioeconomic benefit for the non-trawl fisheries in the event they are managed under an RCA with a 50 fm contour as its shoreward boundary. Access to this additional small area would be beneficial to the fishing community from the greater Santa Barbara area, but to what degree it is unknown. The change in management cost, primarily those associated with enforcement of the RCA boundaries would be minimal (if any) under the proposal. The compliance with the depth contours are monitored with VMS that are currently required on all commercial groundfish vessels.

Table B-5. Channel Islands, Option A: Coordinate list for proposed modifications to the 50 fm boundary around the northern Channel Islands, California.

	Boundary Line	Coordinates
ID	Name	Degrees, decimal minutes
2	Current waypoint (keep)	34°07.80' N, 120°30.99' W
3	Proposed modification (modify #3)	34°08.770' N, 120°25.740' W
4	Current waypoint (keep)	34°05.85' N, 120°17.13' W
--	Proposed modification (add after #4)	34°05.73' N, 120°05.93' W
--	Proposed modification (add after #4)	34°06.140' N, 120°04.860' W
--	Proposed modification (add after #4)	34°05.700' N, 120°03.170' W
--	Proposed modification (add after #4)	34°05.670' N, 119°58.980' W
--	Proposed modification (add after #4)	34°06.340' N, 119°56.780' W
5	Current waypoint (keep)	34°05.57' N, 119°51.34' W
20	Current waypoint (keep)	33°50.97' N, 119°57.03' W
--	Proposed modification (add between #20 and #21)	33°50.250' N, 120°00.00' W
21	Current waypoint (keep)	33°50.03' N, 120°03.00' W
22	Proposed modification (modify #22)	33°51.060' N, 120°03.730' W
23	Current waypoint (keep)	33°54.49' N, 120°12.85' W
24	Proposed modification (modify #24)	33°58.900' N, 120°20.150' W
25	Current waypoint (keep)	34°00.71' N, 120°28.21' W
--	Proposed modification (add between #25 and #26)	34°02.200' N, 120°30.370' W
26	Current waypoint (keep)	34°03.60' N, 120°30.60' W

Table B-6. Channel Islands, Preferred Option B: Coordinate list for alternate option modifications to the 50 fm boundary around the northern Channel Islands, California.

	Boundary Line	Coordinates
ID	**Name**	**Degrees, decimal minutes**
2	Current waypoint (keep)	34°07.80' N, 120°30.99' W
--	Proposed modification (add after # #2)	34°08.42' N, 120°27.92' W
3	Proposed modification	34°09.31' N, 120°27.81' W
4	Current waypoint (keep)	34°05.85' N, 120°17.13' W
--	Proposed modification (add after #4)	34°05.73' N, 120°05.93' W
--	Proposed modification (add after #4)	34°06.140' N, 120°04.860' W
--	Proposed modification (add after #4)	34°05.700' N, 120°03.170' W
--	Proposed modification (add after #4)	34°05.670' N, 119°58.980' W
--	Proposed modification (add after #4)	34°06.340' N, 119°56.780' W
5	Current waypoint (keep)	34°05.57' N, 119°51.34' W
20	Current waypoint (keep)	33°50.97' N, 119°57.03' W
--	Proposed modification (add between #20 and #21)	33°50.250' N, 120°00.00' W
21	Current waypoint (keep)	33°50.03' N, 120°03.00' W
22	Proposed modification (modify #22)	33°51.060' N, 120°03.730' W
23	Current waypoint (keep)	33°54.49' N, 120°12.85' W
24	Proposed modification (modify #24)	33°58.900' N, 120°20.150' W
25	Current waypoint (keep)	34°00.71' N, 120°28.21' W
--	Proposed modification (add between #25 and #26)	34°02.200' N, 120°30.370' W
26	Current waypoint (keep)	34°03.60' N, 120°30.60' W

Proposed 50 Fathom RCA Line Changes - Northern Channel Islands

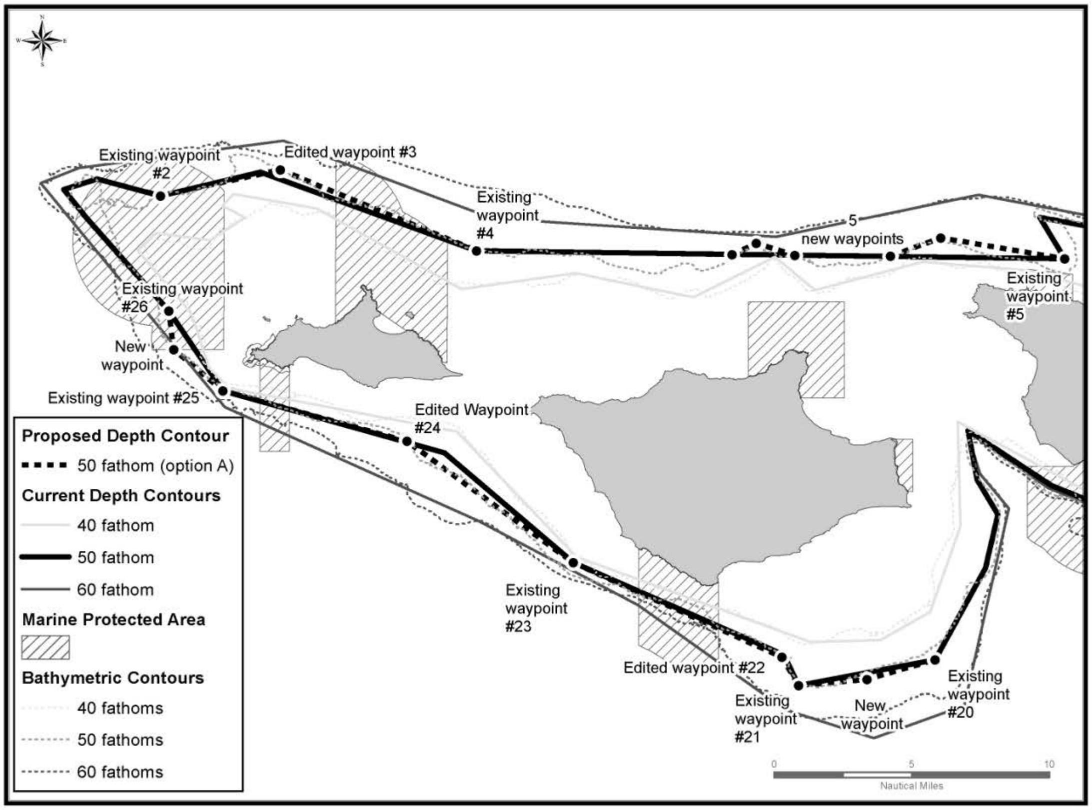

Figure B-5. Channel Islands, Option A: Modifications to the 50 fm contour around the northern Channel Islands of San Miguel, Santa Rosa, and Santa Cruz Islands, California, proposed by industry. ***Bathymetry based on National Oceanic and Atmospheric Administration National Geophysical Data Center, U.S. Coastal Relief Model, Retrieved May 4, 2014, http://www.ngdc.noaa.gov/mgg/coastal/crm.html.***

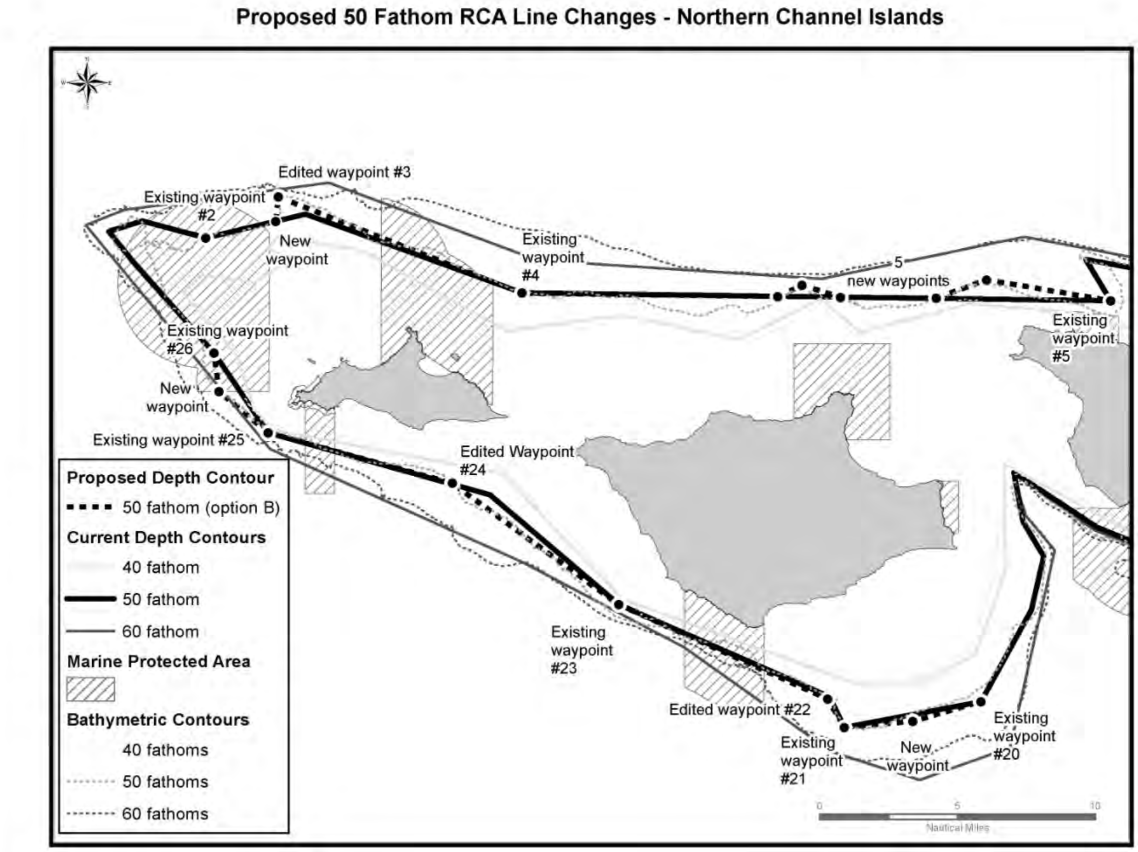

Figure B-6. Channel Islands, Preferred Option B: Modification to the 50 fm contour around the northern Channel Islands of San Miguel, Santa Rosa, and Santa Cruz Islands, California, proposed by CDFW and recommended by the Council. ***Bathymetry based on National Oceanic and Atmospheric Administration National Geophysical Data Center, U.S. Coastal Relief Model, Retrieved May, 2014, http://www.ngdc.noaa.gov/mgg/coastal/crm.html.***

B.2 *Establish New Rockfish Conservation Area Coordinates – 300 and 350 fm*

Need for Action

The Council requested that the GMT propose coordinates for and analyze possible 300 and 350 fathom RCAs north of 40°10' N. latitude. These RCAs were proposed as possible management measures to aid in reducing catch of rougheye/blackspotted rockfish during the 2015-16 biennium. At the April 2013 meeting, the Council requested "... trawl RCA boundary alternatives at 300 fm and 350 fm for analysis." The regulatory definition of trawl gears includes bottom trawl and midwater gears. Thus this analysis considers the impacts of implementing depth closures for bottom trawl gears targeting Dover sole, thornyheads, and sablefish, and midwater gears targeting Pacific whiting (i.e., shorebased individual fishing quota and at-sea). The available analysis can be found below in the Biological and Socioeconomic Impacts section. Other analysis regarding RCA changes can be found in the Final Environmental Assessment for Trawl RCA Boundary Modifications, completed by the National Marine Fisheries Service (NMFS) in February 2014.

The proposed waypoints could be further modified if any of the following are desired by the Council: match the proposed RCA lines to the existing 250 fathom RCA line when they cross that existing RCA line; create proposed RCA lines that are "bumped out" and parallel the existing 250 fathom RCA line; and/or engage the fishing industry and fisheries enforcement officers in the practicalities associated with implementing these proposed lines and modifying them as appropriate. These are described under "Future considerations" below.

Management Options

No Action: The deepest RCA boundaries available in regulation would be 250 fathoms.

Option (Preferred): Table B-7 and Table B-8 contain the latitude and longitude coordinates (i.e., waypoints) adopted by the Council for future use in management.

Methodology for creating waypoints

These waypoints were developed using geographic information system (GIS) software (ArcGIS 10.1) and are based on 300 and 350 fathom bathymetry contours.[15] More information, such as the files used to create these lines, will be available for the public at the following FTP site: ftp://ftp.pcouncil.org/pub/GMT/Proposed_300_350_RCAs/.

Figure B-7 provides an example of issues that emerged when developing these proposed waypoints. First, the 300 and 350 fathom bathymetry contours are very detailed and creating RCA lines directly following these contours would not be practical. Therefore, these contours were approximated and straightened using several tools available in ArcGIS.[16] Second, there were several areas where the existing 250 fathom RCA line (unmodified for petrale, defined in regulation at §660.74) touched or overlapped the 300 and 350 fathom bathymetry contours.[17] When this occurred, the analyst visually and manually adjusted these lines to pull them outside of the 250 fathom RCA (Figure B-8 provides an example).

Given the availability and resolution of the data and the complexity of certain features like undersea canyons, matching RCA boundary lines to actual bathymetry is difficult. The original and current purpose

[15] Source of bathymetry contours: NOAA National Geophysical Data Center, http://www.ngdc.noaa.gov/mgg/bathymetry/relief.html (accessed 5/19/14).
[16] The following ArcGIS 10.1 tools were used to develop, simplify, and straighten the 300 fm and 350 fm bathymetry contour lines: "Neighborhood Selection (Geostatistical Analyst)", "Simplify Line (Cartography)", and the "Edit Vertices" tools.
[17] The coordinates of existing RCA boundary lines, including the 250 fathom line, can be downloaded from the NMFS West Coast Region's website: http://www.westcoast.fisheries.noaa.gov/fisheries/management/groundfish_closures/rockfish_areas.html

of boundary lines is not to match the bathymetry perfectly, but to create regulatory lines that approximate depth contours, would be enforceable, and would be effective at lowering bycatch to the desired degree. To overcome this difficultly when the currently existing RCAs were first developed, RCA lines such as the 250 fathom line were manually adjusted after feedback from the fishing industry, enforcement, and the GMT (i.e., RCAs were designed to approximate bathymetry contours).

Future considerations

The 300 and 350 fathom RCA lines and waypoints shown in this document could be viewed as the first of many steps. Adjusting these lines could be the next step of the process. Various methods can be used to adjust these lines to approximate the depth contours while at the same time being enforceable, understandable, logical, and be effective at lowering bycatch. One approach that may be used to adjust these base lines is the traditional approach that was used when RCAs were first created (i.e., through consultations with NMFS, States, Tribes, Groundfish Advisory Subpanel, GMT, Enforcement Consultants, etc.). Various analytical tools can be applied to help this process and ensure that existing RCA lines that are shallower (e.g., 250 fathom line) do not cross the new "deeper" RCA lines (i.e., the 300 and 350 fathom lines). One approach that can be applied to ensure that lines do not cross is to set the RCAs equal at those locations. That is, when the 300 or 350 fathom line crosses the 250 fathom line, the 300 or 350 fathom line would simply follow the 250 fathom line. This approach is often used now to correct RCA lines that cross. An example of this approach is shown in Figure B-9. Other approaches could also be applied. For example, one could simply extend the existing 250 fathom line in increments (e.g., by 0.5 nm, 1 nm, 3 nm, etc.) to create new RCAs that do not necessarily approximate depth contours but instead, follow the pattern of shallower RCA lines that currently exist. An example of this novel approach is shown in Figure B-10.

Table B-7. Proposed waypoints (decimal degrees) for the proposed 300 fathom RCA line.

	latitude	longitude		latitude	longitude		latitude	longitude		latitude	longitude
1	48.23805	-125.722	40	46.53289	-124.586	79	44.22716	-125.008	118	40.62666	-124.653
2	48.2233	-125.684	41	46.52164	-124.55	80	43.95658	-124.98	119	40.56284	-124.714
3	48.15031	-125.764	42	46.47564	-124.544	81	43.89512	-124.934	120	40.51873	-124.696
4	48.09913	-125.794	43	46.30289	-124.676	82	43.815	-124.916	121	40.4207	-124.621
5	48.07393	-125.696	44	46.29164	-124.667	83	43.78082	-124.794	122	40.37395	-124.546
6	47.89843	-125.635	45	46.2417	-124.566	84	43.65907	-124.729	123	40.28916	-124.542
7	47.89191	-125.586	46	46.22092	-124.648	85	43.49788	-124.739	124	40.31489	-124.854
8	47.89583	-125.548	47	46.17638	-124.703	86	43.43511	-124.862	125	40.29333	-124.838
9	47.91317	-125.49	48	46.10217	-124.768	87	43.38396	-124.752	126	40.26391	-124.753
10	47.96345	-125.41	49	46.08716	-124.831	88	43.33254	-124.778	127	40.24733	-124.651
11	48.02782	-125.363	50	46.05116	-124.842	89	43.33052	-124.888			
12	47.84189	-125.331	51	46.00373	-124.835	90	43.02533	-124.909			
13	47.76836	-125.132	52	45.93873	-124.77	91	42.94672	-124.942			
14	47.71967	-125.127	53	45.79726	-124.77	92	42.81248	-124.93			
15	47.5583	-125.164	54	45.7633	-124.788	93	42.7113	-124.868			
16	47.5248	-125.036	55	45.74414	-124.778	94	42.72986	-124.835			
17	47.45409	-124.97	56	45.56331	-124.768	95	42.71373	-124.769			
18	47.47689	-124.915	57	45.39798	-124.713	96	42.63573	-124.738			
19	47.46197	-124.876	58	45.39849	-124.743	97	42.53415	-124.829			
20	47.40913	-124.82	59	45.27022	-124.778	98	42.5064	-124.777			
21	47.33607	-124.813	60	45.13998	-124.658	99	42.48499	-124.855			
22	47.33427	-124.855	61	45.13577	-124.702	100	42.33332	-124.744			
23	47.30371	-124.91	62	45.17175	-124.748	101	42.30082	-124.808			
24	47.23329	-124.918	63	45.10914	-124.782	102	42.20673	-124.696			
25	47.25581	-125.027	64	45.03192	-124.772	103	41.92915	-124.628			
26	47.09323	-125.027	65	44.96264	-124.714	104	41.79916	-124.558			
27	47.05663	-124.969	66	44.94028	-124.755	105	41.55749	-124.538			
28	46.99229	-125.022	67	44.95702	-124.818	106	41.51464	-124.556			
29	46.91509	-125.038	68	44.92048	-124.846	107	41.46701	-124.528			
30	46.858	-125.006	69	44.90414	-124.942	108	41.33499	-124.511			
31	46.84235	-124.95	70	44.84668	-124.906	109	41.1206	-124.426			
32	46.8258	-124.958	71	44.79168	-124.953	110	40.92916	-124.562			
33	46.67913	-124.861	72	44.62085	-124.888	111	40.80083	-124.561			
34	46.6369	-124.861	73	44.54914	-124.932	112	40.81164	-124.615			
35	46.61414	-124.819	74	44.47665	-124.945	113	40.74833	-124.553			
36	46.63994	-124.734	75	44.36959	-124.933	114	40.69422	-124.559			
37	46.56586	-124.639	76	44.36968	-124.885	115	40.68908	-124.641			
38	46.5224	-124.713	77	44.32161	-124.911	116	40.67205	-124.643			
39	46.49695	-124.677	78	44.25498	-125	117	40.66271	-124.593			

Table B-8. Proposed waypoints (decimal degrees) for the proposed 350 fathom RCA line.

	latitude	longitude		latitude	longitude		latitude	longitude		latitude	longitude
1	48.20789	-125.821	40	46.80554	-125.088	79	44.77745	-124.983	118	41.99173	-124.696
2	48.20766	-125.791	41	46.80914	-124.972	80	44.69275	-124.921	119	41.55916	-124.553
3	48.23371	-125.727	42	46.67414	-124.889	81	44.60287	-124.908	120	41.51402	-124.566
4	48.20757	-125.714	43	46.64865	-124.909	82	44.52987	-124.952	121	41.45619	-124.540
5	48.12996	-125.794	44	46.6096	-124.87	83	44.47795	-124.967	122	41.32876	-124.524
6	48.09757	-125.798	45	46.60958	-124.82	84	44.30117	-124.965	123	41.16406	-124.447
7	48.06944	-125.708	46	46.62941	-124.726	85	44.2578	-125.003	124	41.11057	-124.456
8	47.96539	-125.669	47	46.57146	-124.652	86	44.22915	-125.014	125	41.04448	-124.505
9	47.93788	-125.703	48	46.56145	-124.685	87	43.92831	-125.002	126	40.96423	-124.637
10	47.92745	-125.702	49	46.5183	-124.737	88	43.90044	-124.947	127	40.85553	-124.640
11	47.89265	-125.642	50	46.48883	-124.683	89	43.78876	-124.922	128	40.82421	-124.656
12	47.8835	-125.587	51	46.51937	-124.613	90	43.75253	-124.828	129	40.73507	-124.567
13	47.89996	-125.5	52	46.51381	-124.554	91	43.59856	-124.755	130	40.73426	-124.567
14	47.98708	-125.361	53	46.47654	-124.55	92	43.57113	-124.774	131	40.69786	-124.566
15	47.86287	-125.342	54	46.31247	-124.679	93	43.61883	-124.832	132	40.69509	-124.649
16	47.82184	-125.368	55	46.31978	-124.741	94	43.60081	-124.851	133	40.66907	-124.650
17	47.76433	-125.14	56	46.28832	-124.745	95	43.5546	-124.792	134	40.66434	-124.617
18	47.7158	-125.133	57	46.25437	-124.618	96	43.50623	-124.815	135	40.56374	-124.718
19	47.62014	-125.174	58	46.11664	-124.777	97	43.49837	-124.858	136	40.52059	-124.702
20	47.60496	-125.213	59	46.0912	-124.835	98	43.41441	-124.898	137	40.42083	-124.626
21	47.48363	-125.21	60	46.05164	-124.852	99	43.37613	-124.848	138	40.36875	-124.550
22	47.46343	-125.167	61	45.96473	-124.837	100	43.29472	-124.928	139	40.29397	-124.566
23	47.52303	-125.037	62	45.92786	-124.798	101	43.04086	-124.916	140	40.32119	-124.868
24	47.4408	-124.965	63	45.80497	-124.779	102	42.939	-124.952	141	40.28373	-124.851
25	47.46202	-124.942	64	45.78564	-124.828	103	42.81507	-124.95	142	40.24422	-124.775
26	47.45998	-124.88	65	45.76029	-124.808	104	42.68156	-124.88	143	40.24391	-124.682
27	47.40857	-124.823	66	45.72083	-124.842	105	42.6686	-124.848			
28	47.34138	-124.821	67	45.6871	-124.825	106	42.70941	-124.847			
29	47.33828	-124.859	68	45.69054	-124.779	107	42.71691	-124.833			
30	47.29996	-124.921	69	45.48589	-124.8	108	42.68499	-124.786			
31	47.24007	-124.933	70	45.40154	-124.748	109	42.63387	-124.757			
32	47.26666	-125.047	71	45.3675	-124.79	110	42.53112	-124.846			
33	47.09044	-125.036	72	45.26751	-124.781	111	42.51059	-124.797			
34	47.05555	-124.973	73	45.22428	-124.766	112	42.48839	-124.865			
35	47.01889	-125.007	74	45.05831	-124.828	113	42.43829	-124.833			
36	46.98667	-125.029	75	44.98262	-124.792	114	42.33006	-124.776			
37	46.91473	-125.044	76	44.95035	-124.951	115	42.30914	-124.861			
38	46.85661	-125.013	77	44.9005	-124.966	116	42.11665	-124.753			
39	46.85164	-125.081	78	44.84664	-124.933	117	42.0409	-124.779			

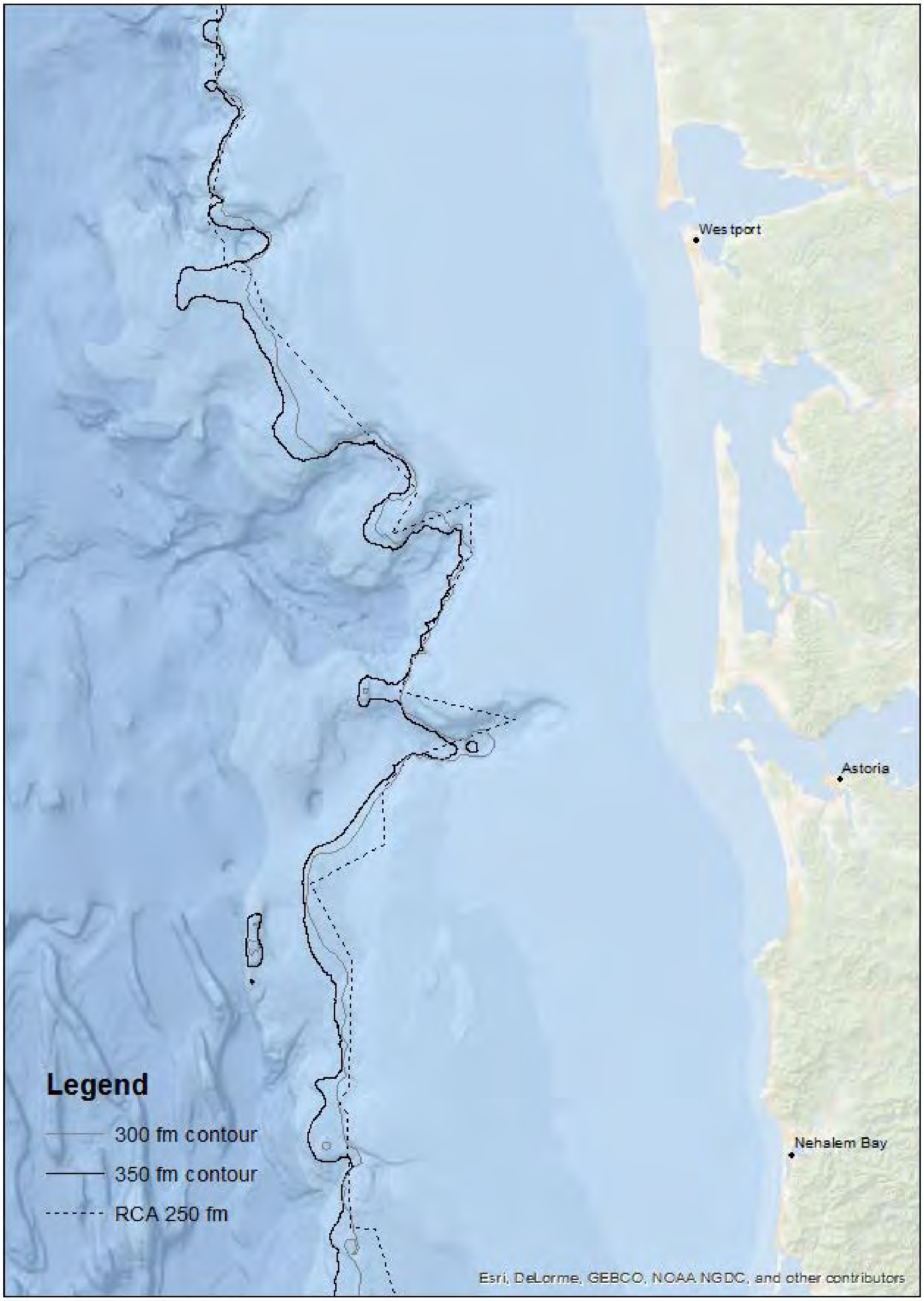

Figure B-7. An example of where the existing 250 fathom Trawl RCA (unmodified for petrale sole) overlaps with the 300 and 350 fathom bathymetry contours.

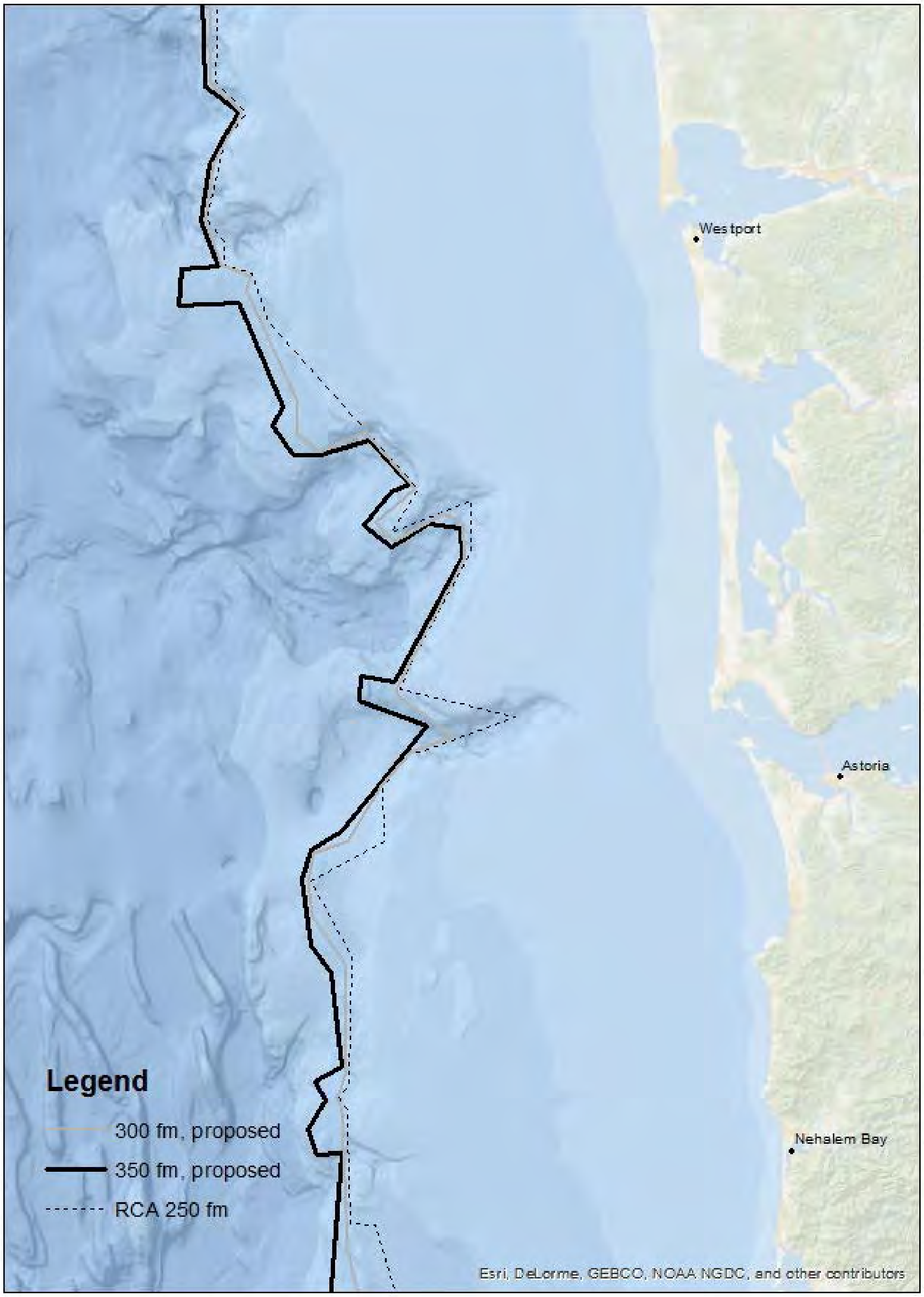

Figure B-8. An example of manual adjustments to the proposed 300 and 350 fathom lines where they overlap with the existing 250 fathom RCA line (unmodified for petrale sole).

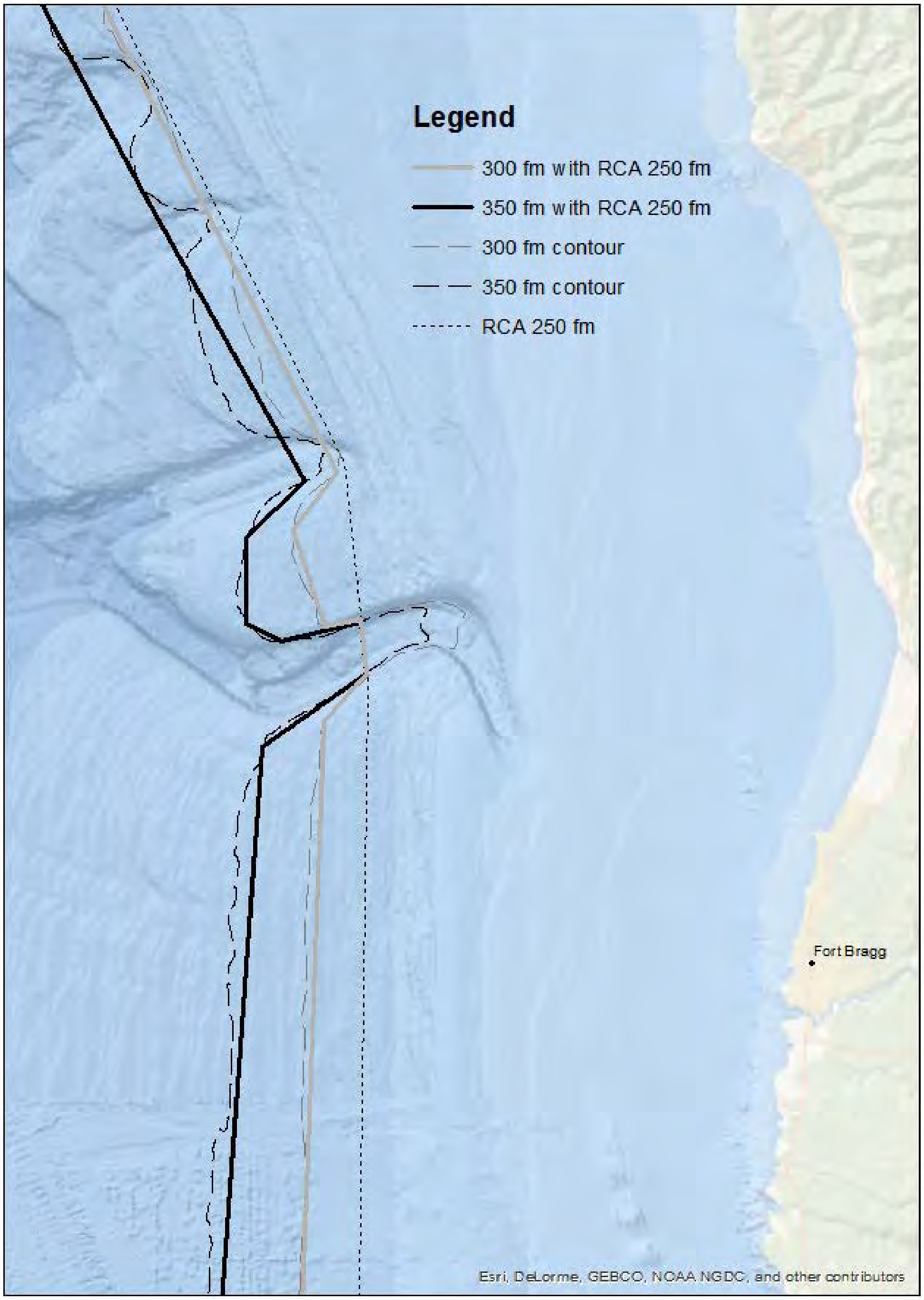

Figure B-9. An example of an approach to deal with areas where new RCA lines, based on 300 and 350 fathom bathymetry contours, cross an existing RCA line (e.g., 250 fathom line). In these areas, the new RCA lines could follow the existing RCA line.

Figure B-10. An example of an approach to create new RCA lines by extending an existing 250 fathom line in increments (e.g., by 0.5 nm, 1.5 nm, and 3 nm). These lines would follow the pattern of the existing RCA line which does not approximate bathymetry contours in all areas.

Data Used in the Analysis

For this analysis, observer data were used: West Coast Groundfish Observer data (WCGOP) and North Pacific Observer data (NORPAC). Haul level Pacific Fishery Information Network (PacFIN) landings data were not analyzed in time to be submitted as part of this report but total landings and average annual price for targeted species from 2002-2012 were used. “Rougheye/blackspotted” in this analysis combines rougheye, blackspotted, and an undifferentiated rougheye/shortraker group. Depth bins in Tables B-1 to 7 were based on average depth of fishing for bottom trawl gears (limited entry trawl/catch shares sector) and shoreside whiting sector, and bottom depth (rather than fishing depth) was used for the at-sea whiting sector. Depth bins were defined by existing and proposed RCA lines to investigate incremental change in rougheye/blackspotted catch as depths increased. Latitude bins were defined by existing latitudinal breaks for RCAs in regulation. Figures 1-3 are basic maps of these latitudinal areas and the proposed and existing RCA lines.

When considering the following analysis and time period analyzed (2002-2012), the following should be noted:

- the 100-150 fathom area has been closed coastwide to bottom trawl since 2004 and is referred to as the "core RCA" area;
- the 150-200 fathom area from 45° 46 to 40° 10' N. latitude has been closed in some years since 2004, except for when the petrale modified RCA has been in place;
- outside of the depths and areas mentioned above, fishing has occurred except when RCA areas have been closed seasonally;
- the bottom trawl gear category used in this analysis (within the Limited Entry trawl/catch shares sector) and the shoreside whiting sector (midwater trawl gear) have been part of the catch shares fishery (individual fishing quota or IFQ) since 2011; an analysis of rougheye/blackspotted catch before and after 2011 may be informative; and
- the shoreside whiting sector was subject to full retention as an exempted fishing permit fishery (EFP) since the 1990s. No observer coverage was required for this sector during this period. This explains why the data years available for this sector were 2011-2012 only, and why the number of hauls in this sector were much lower than for the other two (Table B-11). The data years available for the at-sea whiting sector and bottom trawl gear category were 2002-2012.

The relevance of using set, up, or average fishing depth information from the WCGOP data for this analysis s should be highlighted. For bottom trawl gears, these variables would seem appropriate but for midwater gears used in the shoreside whiting sector, using this variable may be questionable. Though bottom depth would be more appropriate for this analysis because RCAs approximate depth regardless of where in the water column fishing is occurring, bottom depth information is not available from the WCGOP. Given the available data, a spatial analysis using latitude and longitude coordinates of fishing locations for the shoreside whiting sector would be a better way of characterizing fishing effort in the depth and latitude ranges presented below. For midwater gears used by the at-sea whiting sector, both fishing and bottom depth information are available from the NORPAC, and bottom depth was used in this analysis.

<u>Biological impacts</u>
Table B-9 provides estimates of total observed catch of rougheye/blackspotted. Table B-10 provides estimates of average observed rougheye/blackspotted catch per target species haul; i.e., total catch of rougheye/blackspotted (Table B-9) divided by the total number of hauls that caught a targeted species (Table B-11). Pacific whiting is the target for the at-sea whiting sector; Dover sole, thornyheads, and sablefish (DTS) were the target species for the bottom trawl gears; and sablefish is the target for the limited entry/open access (LE/OA) fixed gear sectors. All nominal and species group market categories were included for the DTS target species (e.g., nominal shortspine thornyhead) and species groups (e.g., undifferentiated rougheye/shortraker group) were included for this analysis. Table B-12 provides estimates of average observed catch per haul of target species in each sector. Table B-13 through Table B-15 provide information about rougheye/blackspotted catch within latitude and depth bins, by sector.
<u>No Action:</u> In Table B-9 through Table B-15, the following depth bins are relevant to No Action: 100-150, 150-200, and 200-250 fathoms.

<u>Options:</u> In Table B-9 through Table B-15, the following depth bins are relevant to the proposed RCA lines: 250-300, 300-350, and greater than 350 fathoms.

Table B-9. Rougheye/blackspotted rockfishes, total observed catch (metric tons), by fishery sector and depth (fathoms), north of 40° 10' N. lat., 2002-2012. Shoreside whiting is from 2011-2012 only. Average fishing depth was used for bottom trawl and shoreside whiting; bottom depth was used for at-sea whiting. Cells with "—" indicate depth areas with no observations.

	0 – 100		100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
Bottom trawl	--		7.09	43.39	62.17	27.40	4.50	3.88
Shoreside whiting	2.04		22.05	17.48	5.95	3.04	0.07	0.73
At-sea whiting	0.05		0.55	10.85	63.61	113.98	66.07	76.95

Table B-10. Rougheye/blackspotted rockfishes, average observed catch (metric tons) per haul, by fishery sector and depth (fathoms), north of 40° 10' N. lat., 2002-2012. Shoreside whiting is from 2011-2012 only. Average fishing depth was used for bottom trawl and shoreside whiting; bottom depth was used for at-sea whiting.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
Bottom trawl	0.012	0.016	0.010	0.004	0.001	0.001
Shoreside whiting	0.021	0.026	0.019	0.034	0.005	0.031
At-sea whiting	0.000	0.002	0.011	0.027	0.033	0.024

Table B-11. Target species, total number of observed hauls, by fishery sector and depth (fathoms), north of 40° 10' N. lat., 2002-2012. Shoreside whiting is from 2011-2012 only. Average fishing depth was used for bottom trawl and shoreside whiting; bottom depth was used for at-sea whiting. Cells with "--" indicate depth areas with no observations.

	0 – 100	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
Bottom trawl	--	609	2,737	6,191	7,655	3,454	3,816
Shoreside whiting	1,252	870	680	320	90	14	24
At-sea whiting	2,297	5,629	5,185	5,655	4,200	2,031	3,195

Table B-12. Target species, average observed catch per haul, by fishery sector and depth (fathoms), north of 40° 10' N. lat., 2002-2012. Shoreside whiting is from 2011-2012 only. Average fishing depth was used for bottom trawl and shoreside whiting; bottom depth was used for at-sea whiting.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
Bottom trawl	0.48	0.65	1.39	1.74	1.62	1.68
Shoreside whiting	50.79	39.30	40.31	47.31	50.40	64.93
At-sea whiting	43.35	45.35	45.91	48.71	51.27	46.35

Table B-13. Bottom trawl gears (limited entry trawl/catch shares sector), total observed catch (metric tons) of rougheye/blackspotted rockfishes, by latitude and average fishing depth (fathoms), north of 40° 10' N. lat., 2002-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	0.10	0.01	0.08	0.62	0.02	0.03
48°10' - 45°46'	6.16	36.48	45.46	18.91	3.66	3.24
45°46' - 40°10'	0.83	6.90	16.63	7.87	0.83	0.61

Table B-14. Shoreside whiting sector, total observed catch (metric tons) of rougheye/blackspotted rockfishes, by latitude and average fishing depth (fathoms), north of 40° 10' N. lat., 2011-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	*	*	*	*	*	*
48°10' - 45°46'	17.59	10.94	5.02	2.74	0.07	0.73
45°46' - 40°10'	5.07	6.55	0.92	0.31	0.00	*

*No rougheye/blackspotted rockfish were observed in this depth/latitude combination.

Table B-15. At-sea whiting sector, total observed catch (metric tons) of rougheye/blackspotted rockfishes, by latitude and bottom depth (fathoms), north of 40° 10' N. lat., 2002-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	0.06	0.11	0.04	0.06	0.47	1.78
48°10' - 45°46'	0.17	6.49	49.82	109.95	64.20	74.12
45°46' - 40°10'	0.32	4.25	13.75	3.97	1.40	1.06

Socioeconomic impacts

When considering average observed catch per haul of Pacific whiting, the shoreside and at-sea whiting sectors have rates relatively consistent through all depth ranges, 100 fathoms to greater than 350 fathoms (Table B-12). Average observed catch per haul of DTS for bottom trawl gears generally increased as depth increased (Table B-12). This suggests that targeted species may be caught in depths deeper than the deepest Trawl RCA line currently in regulation (250 fathoms). However, the number of hauls from which this information was derived is small for the shoreside whiting sector in particular (Table B-11). Despite the potential ability of these sectors to catch their target species in deeper depths, the cost to reach these areas, in terms of fuel and time, and potential risks for safety at sea, may increase.

The following tables provide information about the estimated value of target species in each depth and latitude bin. Relative proportions for each sector were calculated for each depth/latitude combination based on the observed catch of target species across each sector. Each proportion was then multiplied by the total landings of the target species across all years during the 2002-2012 time period (pounds; PacFIN landings data) for bottom trawl and at-sea whiting sectors. The 2011-2012 time period was used for the shoreside whiting sector. Finally, this target species landings estimate for each depth/latitude combination was multiplied by the average annual price per pound for that target species (average annual price, 2002-2012). These values were used to estimate an average value per year for each depth/latitude combination (total value / number of years) and shown in Table B-16, Table B-17, and Table B-18.

Table B-16. Bottom trawl gears (limited entry trawl/catch shares sector), average revenue per year of target species, by latitude and average depth (fathoms), north of 40° 10' N. lat., 2002-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	$13,460	$1,116	$988	$2,664	$4,550	$2,154
48°10' - 45°46'	$44,995	$282,522	$788,126	$1,109,092	$463,763	$361,634
45°46' - 40°10'	$19,799	$191,484	$1,516,672	$2,470,546	$1,032,441	$1,358,144

Table B-17. Shoreside whiting sector, average revenue per year of target species, by latitude and average depth (fathoms), north of 40° 10' N. lat., 2011-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	*	*	*	*	*	*
48°10' - 45°46'	$6,320,390	$2,293,280	$751,860	$595,605	$113,929	$277,478
45°46' - 40°10'	$5,189,580	$3,415,674	$2,003,679	$314,079	$36,806	*

*No rougheye/blackspotted rockfish were observed in this depth/latitude combination.

Table B-18. At-sea whiting sector, average revenue per year of target species, by latitude and bottom depth (fathoms), north of 40° 10' N. lat., 2002-2012.

	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350	> 350
North of 48°10'	$1,337,976	$528,586	$20,228	$21,856	$22,761	$34,938
48°10' - 45°46'	$675,257	$1,083,297	$2,033,576	$2,691,441	$1,659,671	$2,916,940
45°46' - 40°10'	$4,313,874	$4,274,529	$4,444,756	$2,408,422	$924,021	$755,396

Discussion

The proposal to establish new coordinates approximating the 300 and 350 fathom depth contours were intended to provide options for reducing encounters with rougheye/blackspotted rockfish. That is, depth-based management options other than the existing 250 fathom RCA line, a closure out to 700 fathom, or a complete fishery closure. Under this proposal, fishing would be allowed from 300/350 fathoms to 700 fathoms. Approximately 94 percent of observed hauls containing target species occurred in the area 150 to 300 fathoms and 97 percent from 150 to 350 fathoms, a substantial disruption to fishing operations (Table B-11). Under this proposal, new fishing opportunities and target strategies may need to be explored from 300/350 fathoms to 700 fathoms. Though there is no immediate need for these lines, and the threshold that triggers this need is currently unclear, the 300 and 350 fathom lines would reduce bycatch of rougheye/blackspotted more than the existing 250 fathom line (Table B-9). The economic consequences of applying these proposed lines will not be worse than applying other tools currently available (i.e., a complete fishery closure or a closure out to 700 fathoms), in the case that existing RCA lines and tools are insufficient.

The analysis does not examine changes in target species catch per unit of effort (CPUE), related revenue impacts, impacts to overfished species, other incidental species (e.g. Shelf Rockfish Complex), or effects on port communities. For example, if deeper areas were closed off to bottom trawling, then effort shifts to more shoreward areas that could severely curtail fishery operations due to limited availability of canary and yelloweye quota. However, the analysis does capture the essential difference between leaving the area open and closing out to 250 fathoms in terms of rougheye/blackspotted impacts. Likewise, it should be easy to understand the difference in magnitude of the implications from placing the RCA line at 250 fathoms and closing everything beyond 100 fathoms without knowing exactly what species might be caught and in what amounts. This is unlikely to be predicted with a high degree of certainty regardless, since we have never had occasion to use such measures in conjunction with the IFQ fishery.

Bottom trawl gears

Depth-based management tools for bottom trawl gears include RCAs to control catch of species, for example, target species, bycatch species, and overfished species. Currently, the shoreward boundary is 100 fathoms and the seaward RCA boundary from 48°10' to 45°46' N. latitude is 150 fathoms and 200 fathoms from 45°46' to 40°10' N. latitude. A 250 fathom RCA line is available in regulation.

Substantial reductions of rougheye/blackspotted rockfish would be expected if fishing were prohibited from the 100 fathom shoreward boundary to a seaward 250 fathom (Table B-9). From 2002-2012, 75 percent (105 mt) of rougheye/blackspotted were caught on observed hauls from 150 fathom to 250 fathom. In that same time period, 37 percent of the observed bottom trawl hauls for target species occurred in bottom depths from 150 to 250 fathoms (Table B-11).

For bottom trawl gears, the highest total catch of rougheye/blackspotted rockfishes (2002-2012) were observed between 48°10' and 45°46' for the 150-200 and 200-250 fathom depth areas (Table B-13). The corresponding average revenue per year of DTS is moderate in these areas (Table B-16). The average revenue per year of DTS is highest in areas between 45°46' N. lat. and 40°10' N. lat. where bottom depths are 200 fathoms or more (Table B-16). The corresponding total observed catch of rougheye/blackspotted (2002-2012) in these depth/latitude areas was lower than in other areas (Table B-13).

Application of the 300 and 350 fathom Line to Midwater Gears

Currently, the only depth-based management tool available for the Pacific whiting sectors are called Bycatch Reduction Areas (BRA), since vessels are allowed to fish in the trawl RCA during the primary whiting season (i.e., the trawl RCAs do not apply). BRA apply to vessels on Pacific whiting trips using midwater gear during the primary whiting season and prohibit fishing shoreward of the 75, 100, and 150 fathom depth contours (see regulations at 660.131(c)(4) Subpart D). BRAs are automatic actions implemented by NMFS when NMFS projects that a sector will exceed an allocation for a non-whiting groundfish species specified for that sector before the sector's whiting allocation is projected to be reached.

For 2015-2016, the Council has not proposed sector-specific allocations for rougheye/blackspotted. As such, the criteria for NMFS to use automatic actions for implementing BRAs do not appear to be satisfied. This is in contrast to RCA adjustments for bottom trawl gears which are recommended by the Council and, most typically, implemented through inseason action. If the Council is interested in BRAs to control rougheye/blackspotted rockfish catch, they should be designated as routine and not as an automatic action.

Shorebased Midwater Whiting

For the shoreside whiting sector, the highest total catch of rougheye/blackspotted rockfishes (2002-2012) were observed between 48°10' and 45°46' for the 100-150 and 150-200 fathom depth areas (Table B-14). The corresponding average revenue per haul of Pacific whiting was high in these areas (Table B-17). The average revenue per year of the target species is highest in areas between 48° 10' and 45° 46' N. latitude for the areas between 100-200 fathoms, and 45° 46' to 40° 10' N. latitude for the 100-250 fathoms (Table B-17). The corresponding total observed catch of rougheye/blackspotted (2002-2012) in these depth/latitude areas was low (Table B-14).

At-Sea Sectors

Rougheye/blackspotted rockfish catches by depth in depths in areas shoreward of 300 or 350 fathoms can be found in Table B-9. From 2002-2012, 92 percent of the at-sea hauls occurred in depths shallower than 300 fathoms (Table B-11). As such, it appears that prohibiting fishing shallower than 300 fathoms could result in a substantial disruption of fishing operations compared to historical activities. As mentioned above, future analysis should also consider analyzing only 2011-2012 data, years in which the at-sea sectors were rationalized, as different patterns may be evident before and during this time period. Further, evaluating the individual sectors (e.g., CP and mothership) might also be warranted.

For the at-sea whiting sector, this analysis shows that the highest total catch of rougheye/blackspotted rockfishes (2002-2012) were observed between 48° 10' and 45° 46' for the depth area from 200 fathoms and higher (Table B-15). The corresponding average revenue per year of Pacific whiting was moderate to high in these areas (Table B-18). The average revenue per year of the target species is highest in areas between 48° 10' and 45° 46' N. latitude in depths from 200 fathoms and deeper, and in all depths between 45° 46' and 40° 10' N. latitude (Table B-18). The corresponding total observed catch of rougheye/blackspotted (2002-2012) in these depth/latitude areas ranged from low to high (Table B-15).

Other considerations

There has been some discussion about the ability of rougheye/blackspotted rockfishes, as well as rockfishes (*Sebastes spp.*) in general, to survive in depths deeper than 250 fathoms. The recent stock assessment for blackgill rockfish indicated that this species has “among the deepest distribution of all of the California Current *Sebastes* and live at the edge of the low oxygen (hypoxic) conditions that characterize the slope waters of the California Current” (Field and Pearson 2011). The stock assessment also reported that blackgill are known to have a depth distribution of 48-420 fathoms (87-768 meters) but only one blackgill rockfish was caught in a haul greater than 328 fathoms (600 meters) in the ten years that the NWFSC combined bottom trawl survey has been conducted. It should be noted that the historical nomenclature of rougheye and blackspotted rockfishes have been confused with shortraker and blackgill rockfishes, so the current understanding of the depth distribution of blackgill rockfish may or may not be directly comparable to rougheye/blackspotted rockfish. Regarding rougheye and blackspotted rockfishes, the Alaska Fisheries Science Center (AFSC) surveys from 1961-2005 (7,775 tows) found blackspotted rockfish in deeper depths than rougheye rockfish; both were observed in depths up to 275 fathoms. Also of note, two rougheye rockfish were caught with midwater trawl gear in the Gulf of Alaska at a maximum gear depth of 275-500 fathoms over 985-1,038 fathoms of bottom depth (Orr and Hawkins, 2007). Although these may be rare occurrences, the presence of rougheye away from the bottom suggests that management decisions related to midwater fisheries should not be focused purely on bottom depths or oxygen levels, but ideally be based on spatial areas where rougheye occur. Finally, as mentioned above, depth ranges in this analysis were chosen at 50 fathom increments to explore whether rougheye/blackspotted catch in the midwater and bottom trawl sectors showed concentrations across different depths. The latitudinal breaks in this analysis are based on current regulations associated with existing RCA lines. However, these latitudinal ranges are large. For example, 45°46' to 40°10' N. lat. covers an area from northern California to just south of the Columbia River (Figure B-12). It may be worthwhile to explore smaller, more discrete latitudinal areas to more precisely focus in on high rougheye/blackspotted bycatch areas similar to the rougheye groundfish conservation area analysis, which was moved into the Omnibus prioritization. The Council has successfully implemented yelloweye rockfish conservation areas, for example, in lieu of closing larger areas of the coast.

Other information about areas with higher bycatch rates of rougheye/blackspotted, such as spatial information collected by the at-sea and shoreside whiting sectors, may be helpful for informing other, more discrete latitudinal (and depth) areas such as groundfish conservation areas (GCAs) or "hot spots".[18] If the Council chose to evaluate management lines other than those currently in regulation, the following is provided for a historical perspective. Since the inception of RCAs on the west coast, RCAs have been implemented within the following number of management areas north of 40° 10' N. latitude: one area (2002-2006), seven areas (2007-2008), four areas (2007-part of 2014), and three areas (part of 2014).

[18] See Agenda Item C.9.b, Supplemental GMT Report 2, April 2014.

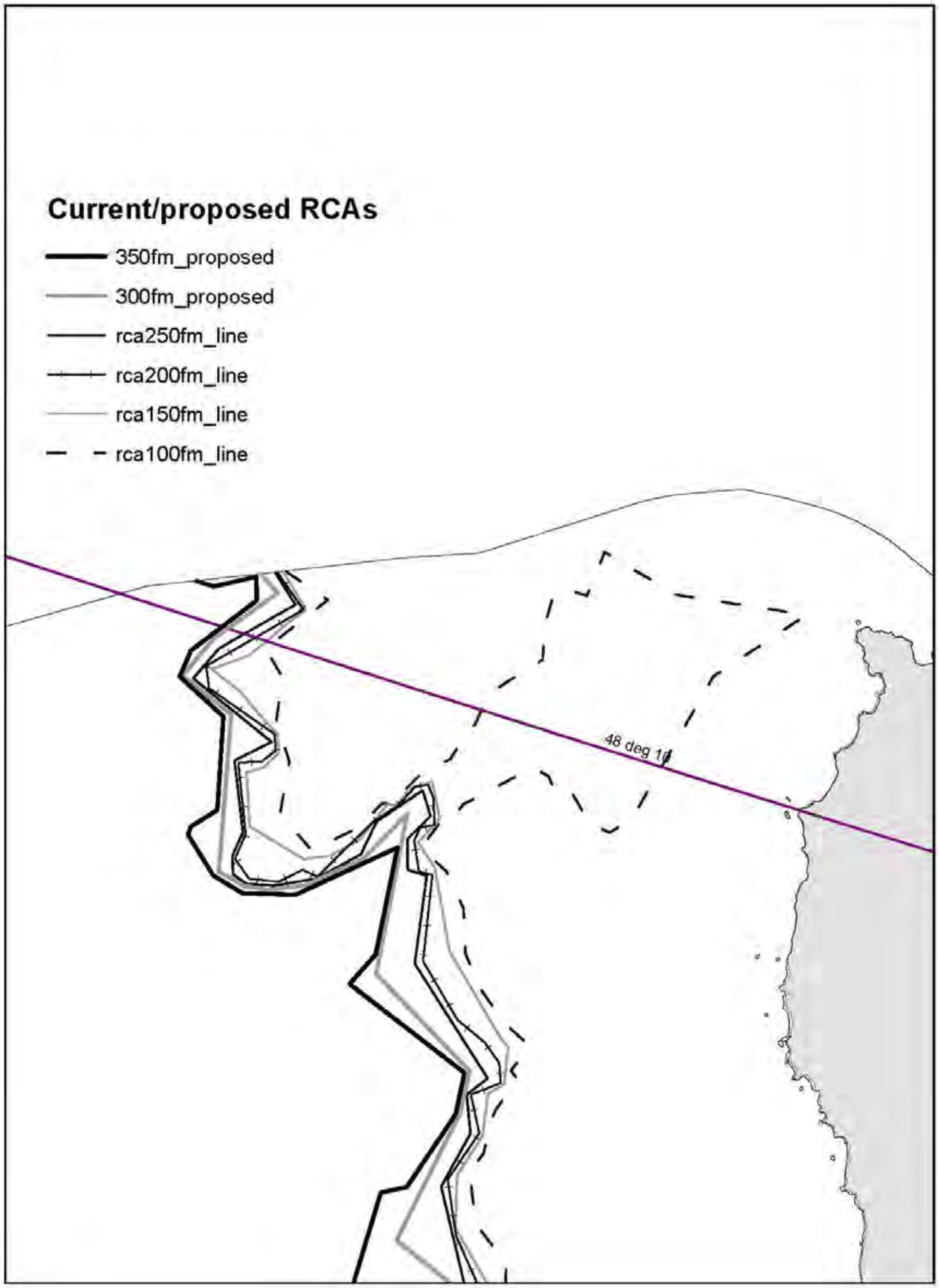

Figure B-11. Proposed and existing RCA lines, north of 48° 10' N. latitude.

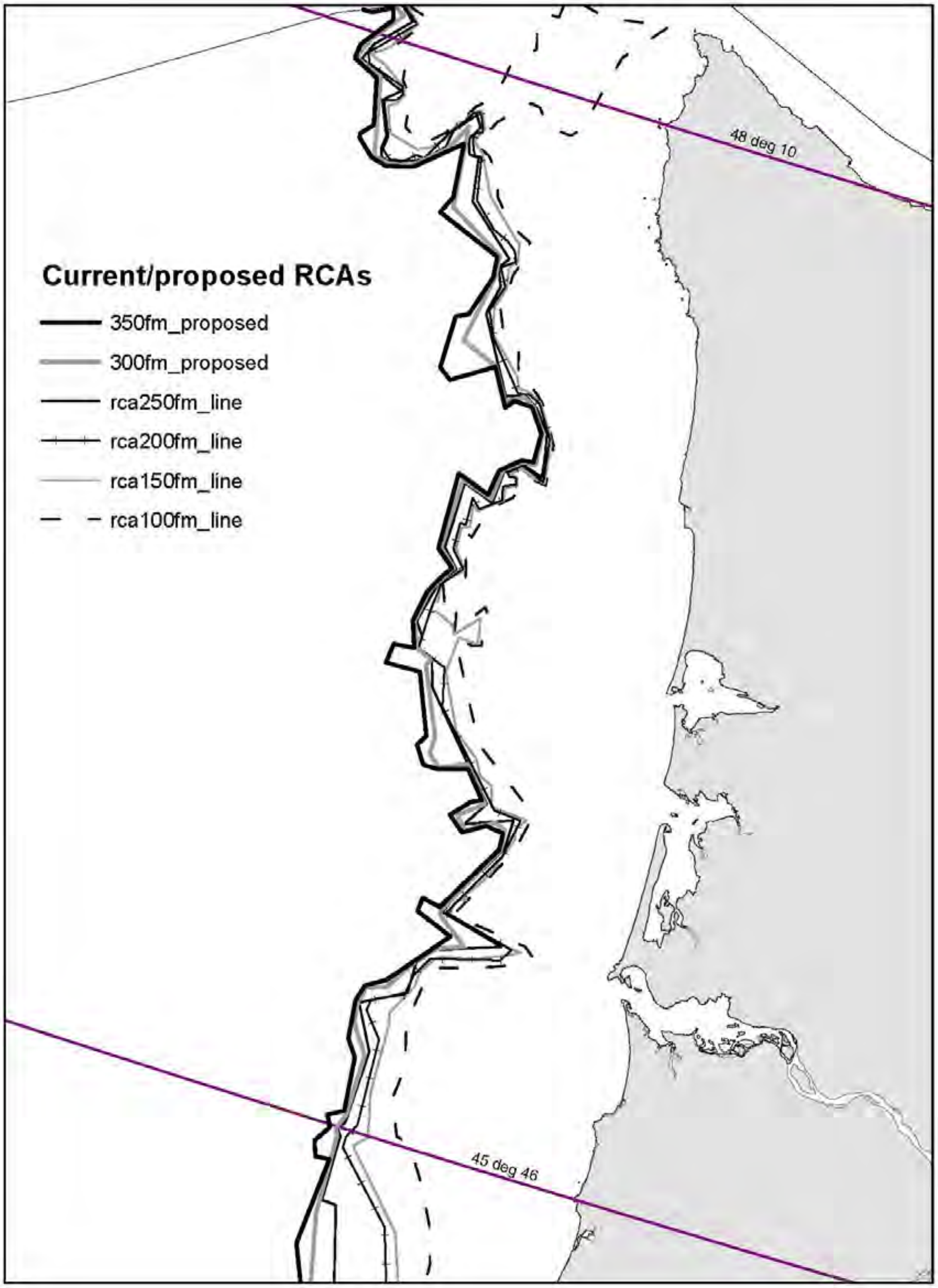

Figure B-12. Proposed and existing RCA lines, between 45° 46' and 48° 10' N. latitude.

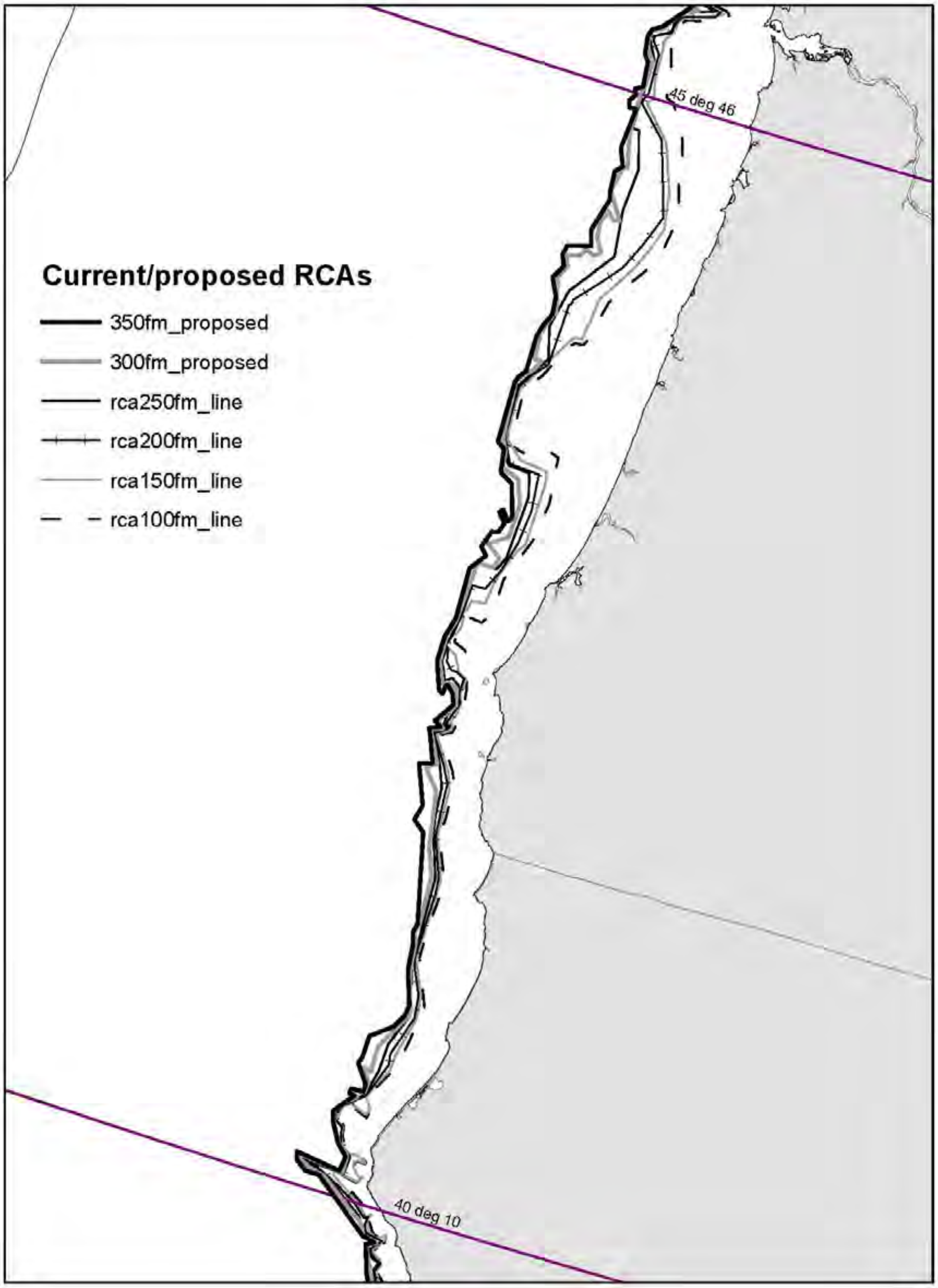

Figure B-13. Proposed and existing RCA lines, between 40° 10' and 45° 46' N. latitude.

B.3 *Trawl: Set-asides to cover carryover if trawl allocation exceeded*

Current regulations provide for a carryover provision that allows a limited amount of surplus quota pounds (QP) or individual bycatch quota (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 carryover provision was designed to increase individual flexibility for harvesters, improve economic efficiency, and achieve optimum yield (OY) while preserving the conservation of stocks. The Council requested consideration of the 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. Projections and unused set-asides are already considered when evaluating surplus carryover (for example, see Agenda Item D.4.b, Supplemental GMT Report), therefore this measure is unnecessary.

B.4 *Within Non-Trawl: Two-Year Yelloweye Sharing - Evaluating uncertainty of yelloweye catches in the nearshore and non-nearshore commercial fixed gear sectors*

Need for Action

The Council considered transferring up to 0.6 mt of the yelloweye rockfish non-trawl allocation fishery harvest guideline (HG) from the non-nearshore sector to the nearshore sector, because nearshore sector landings are often constrained due to the low amount of yelloweye rockfish provided to the sector. Further, shoreward adjustments of the non-trawl RCA (e.g., changing from 30 to 20 fm) have been implemented when the yelloweye rockfish nearshore share or the non-trawl HG was projected to be exceeded. The intent of this measure is to reduce the probability of the nearshore fixed gear sector from exceeding its catch share of yelloweye rockfish, while providing some relief to the management measure constraints (e.g., the 20 fm RCA structure) imposed by the low yelloweye catch share.

Background and Context

The Council considers the two-year allocations for yelloweye rockfish every biennial cycle based on the projected impacts (i.e., forecasts of total fishing mortality, provided by the GMT and other factors). The nearshore and non-nearshore sectors are assigned a “share” of the non-trawl allocation. The sectors’ shares and projected impacts (i.e., total fishing mortality) for yelloweye under the Preferred Alternative (PA), both with and without a transfer of 0.6 mt, are shown in Table B-19. Without a transfer (No Action) the non-nearshore fishery shows a surplus buffer of 0.6 to 0.7 mt, whereas the nearshore fishery shows a buffer of 0.0 to 0.1 mt. On the other hand, if a 0.6 mt transfer were made from non-nearshore to nearshore, then the projected catch for the non-nearshore fishery would be only 0.0 to 0.1 mt lower than its catch share, whereas the nearshore fishery would realize a buffer of 0.6 to 0.7 mt between its projected yelloweye catch and its share. Note that the analyses shown below focused on a maximum transfer amount of 0.6 mt, even though the Council considered all amounts between 0.0 and 0.6 mt. Results for anything in between 0.0 and 0.6 mt may be roughly interpolated from this analysis.

Table B-19. The sector shares and projected impacts of yelloweye rockfish with and without the transfer of 0.6 mt (under Preferred Alternative).

		Without transfer		With transfer	
		2015	**2016**	**2015**	**2016**
Non-nearshore	Share	1.1	1.2	0.5	0.6
	Projection	0.5	0.5	0.5	0.5
	Difference	0.6	0.7	0.0	0.1
Nearshore	Share	1.2	1.3	1.8	1.9
	Projection	1.2	1.2	1.2	1.2
	Difference	0.0	0.1	0.6	0.7

Catch estimates and model projections are subject to considerable uncertainty that has yet to be fully evaluated.[19] This uncertainty is relevant here because, as shown in Table B-19, a 0.6 mt transfer would completely remove the buffer between the projected catch and the sector share in the non-nearshore sector (for 2015) and increase the buffer in the nearshore sector to 0.6 mt (for 2015). As it stands now, there is only a 0.0 to 0.1 mt buffer between the nearshore sectors' share and projected catch, and there are management measure constraints (e.g., the 20 fm RCA from 40°10' N. latitude) due to the low current yelloweye catch share.

Estimating and Accounting for Uncertainty – Monte Carlo Simulations

Uncertainty is associated with two separate but related yelloweye-impact estimates: (1) the retrospective annual estimates of total mortality produced by the Northwest Fisheries Science Center (NWFSC); and (2) the GMT's forecasts/projected impacts. The analyses used here focus primarily on evaluating the first. The principal analysis shown below uses a Monte Carlo simulation approach based on WCGOP sampling rates and observed patterns of yelloweye catch in these sectors to gauge the relative level of uncertainty surrounding yelloweye catches. The uncertainty seen in the simulation results can be related to the projected impacts and aid with interpretation of how confident we can be in those forecasts.

For highly discarded species like yelloweye, catch is not known with certainty because not all catch is observed. Annual mortality estimates are produced with statistical sampling and estimation methods that are inherently uncertain. The purpose of the GMT's catch projections is to inform the Council on what the annual catch estimates might be under a given management measure scenario. Like most all forecasts, they involve uncertainty as well. With the non-nearshore and nearshore projection models, the GMT provides the Council with point estimates of catch without any quantitative measure of uncertainty around those estimates. The Council, recognizing that the forecasts are uncertain, has often taken a precautionary approach in establishing sector shares and more formal sector allocations. The level of precaution or tolerable risk is a key policy decision. With increased access to and additional years of data from WCGOP, attempts have begun to better quantify the uncertainty and inform the Council of the risks.

[19] PFMC Briefing Book April 2014, Agenda Item C.8.b, Supplemental GMT Report.

Accuracy and Precision

As brief background, uncertainty in measurements and estimation can be thought of in terms of accuracy and precision. These two terms are used differently among technical disciplines, but here we think of accuracy in terms of bias.[20] An unbiased estimate will accurately reflect the true value yet do so subject to some level of precision. Absent perfect precision, repeated estimates/measurements will vary from one another with the degree of variability proportional to the precision of the estimate/measurement. Highly imprecise estimates will vary widely, but if repeated and unbiased, the average of the estimates will reflect the true value accurately. In contrasting circumstances, it would be possible to have highly precise but inaccurate estimates/measurements. In such cases, repeated estimates/measurements would vary little but vary around something other than the true value.

WCGOP sampling and catch estimation methods are designed to produce unbiased, accurate estimates. There is little that can be done easily to evaluate if the accuracy is being achieved (the observer effect/bias where fishing vessels operate differently when an observer is aboard making the observations non-representative). Here we assume that the estimates are indeed accurate and that precision is the main source of uncertainty.

The precision of an estimate will vary largely based on two main variables: (1) the sampling rate/coverage level, and; (2) the variability and frequency of the event being measured. In general, precision will be greater with higher sampling coverage and regular, frequent catch events. In contrast, for a given level of sampling coverage, precision will be lower to the degree that the event is rare and variable.

Last, sampling uncertainty from limited precision would exist even if the unit being measured is fixed or static (e.g. the circumference of the Earth). The event we are focused on here is the yelloweye catch over a year, which is not likely to be fixed. Catch is expected to vary from year to year depending on fishing effort, the areas fished, changes in management regulations, etc. Moreover, the expectations for a rebuilding stock like yelloweye is that the catch rate will increase as the stock increases in abundance and expands its distribution, increases in density, or both. Imprecision in estimates makes upward trends difficult to detect. Increases in catch from one year to the next might be signal or could just be sampling noise. The same is true for downward trends where the encounter rate may have truly decreased. Making predictions about future catch with noisy historical data makes the forecasting challenge even more so.

Methods and Results

Patterns of Yelloweye Catch and Observer Coverage in the Nearshore and Non-nearshore Sectors

As shown in Table B-20, annual estimates of yelloweye catch have shown a high degree of variability in both the nearshore and non-nearshore fixed gear sectors. As highlighted above, sampling error is likely a major component of the variability. Consistent with the latter, variability has been higher in the nearshore sector where sampling coverage levels have been lower (Table B-21 and Table B-22).
Variability can be described in absolute terms (i.e., in the unit of measurement), which in this case is catch weight expressed as metric tons (mt), or in relative terms (e.g. the coefficient of variation, which expresses the variability relative to the average value). Considering variability in absolute terms is important because the Council considers and recommends allocations and less formal apportionments of catch in terms of metric tons. Table B-20(c) displays the variability seen in metric tons by comparing the annual estimates against the grand mean (i.e., the average across all available annual estimates).
Relative measures of variability are also useful, especially for comparing variability between the sectors. For example, an estimate that is truly more imprecise than another may appear more precise when viewed in absolute terms simply because its average value is smaller. Table B-20 (b) shows one form of relative

[20] For example, see Box 1.2 in National Research Council. Review of Recreational Fisheries Survey Methods. Washington, DC: The National Academies Press, 2006.

variability by comparing the annual estimates in each sector to the estimates made in the previous years. In the nearshore sector, estimates have dropped by 80 percent and increased by more than 800 percent. The non-nearshore sector has experience less variability in this measure, yet has seen a 75 percent drop and a 50 percent gain. Table B-20 (d) shows the percent difference of the annual estimates compared to the average over the timeframe ("grand mean"). This measure is of interest because such grand means of bycatch ratios currently serve as the foundation for the GMT's projection models for these sectors. Both sectors show wide variability on this measure as well further underscoring the challenge of forecasting yelloweye catches.

Table B-20. Variability of total mortality estimates for yelloweye rockfish in the nearshore and non-nearshore commercial fixed gear sectors, 2003-2012.

(a) NWFSC Total Mortality Estimate (source: GMMultiYr_DataProduct Dec. 23, 2013)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore	0.3	1.1	0.9	0.8	1.9	2.5	0.5	0.1	0.8	1.8
Non-nearshore	1.6	1.1	0.6	0.7	0.7	0.8	1.2	0.3	0.3	0.3

(b) Annual estimate relative to estimate of previous year

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore	--	3.67	0.82	0.89	2.38	1.32	0.20	0.20	8.00	2.25
Non-nearshore	--	0.69	0.55	1.17	1.00	1.14	1.50	0.25	1.00	1.00

(c) Difference (mt) between annual estimate and 2003-2012 average in each sector
(nearshore = 1.1 mt, non-nearshore = 0.8 mt).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore	-0.8	0.0	-0.2	-0.3	0.8	1.4	-0.6	-1.0	-0.3	0.7
Non-nearshore	0.8	0.3	-0.2	-0.1	-0.1	0.0	0.4	-0.5	-0.5	-0.5

(d) Ratio of annual estimate to 2003-2012 average

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore	0.27	1.00	0.82	0.73	1.73	2.27	0.45	0.09	0.73	1.64
Non-nearshore	2.00	1.38	0.75	0.88	0.88	1.00	1.50	0.38	0.38	0.38

Overview of the Data Used and Aim of the Simulation Methods

WCGOP provided the observer data sets matched to the data used for the GMT's nearshore and non-nearshore projection models. These datasets are considered confidential and therefore are available only to a subset of the GMT that have confidentiality agreements in place with WCGOP.

The basic observer coverage statistics for the non-nearshore and nearshore sectors are shown in Table B-21 and Table B-22. The WCGOP coverage rates reported in those tables were taken from a table downloadable from their Sector Data Products webpage.[21] For the non-nearshore sector, we are focused on the area north of 36° N. latitude and the observer coverage levels reported in Table B-21 combine the Limited Entry Sablefish Endorsed, Non-Sablefish-Endorsed Fixed Gear, and Open Access vessels that are classified as part of this sector.

By design, WCGOP focuses on observing a certain percentage of landings as opposed to certain percentage of trips. Likewise the bycatch ratios WCGOP uses to expand observed discard to the total fleet are expressed in terms of landed catch. However, for simplicity of modeling the simulations, presented here use trip as the main unit of analysis.

If trips contributed the same level of overall landings per year, the two would be equivalent. Yet this is not the case and some trips contribute a higher portion of the landings in both the nearshore and non-nearshore sectors. If coverage levels were reported in terms of the trips observed per year, then the coverage would be lower in both sectors. Nonetheless, we do not expect our choice to focus the simulation on trips instead of landings to affect the usefulness of the simulation results. If WCGOP maintains the same sampling plan and general levels of observer coverage, then the relationship between observer coverage and landings per trip would be expected to hold. And if so, the simulations should provide means to evaluate the general patterns we should expect to continue into the future.

The frequency with which yelloweye have been encountered by trip is one of the main variables in the simulations. Table B-19 and Figure B-15 report the total number of trips with yelloweye catch observed ("non-zero" trips) divided by total observed trips for the nearshore and non-nearshore sectors. These figures illustrate that the per trip frequency of yelloweye catch in the nearshore sectors has been over double of that seen in the non-nearshore sectors. The per trip frequency has varied for both sectors over the time series.

The other main variable of interest is the magnitude of catch on non-zero trips. Whereas the frequency of yelloweye catch on a trip in the non-nearshore sectors is half of that in the nearshore sectors, the magnitude of catch on non-zero trips is over twice, on average, of the catches in the nearshore sectors (Figure B-16 and Figure B-17). The distribution of non-zero catches across all years of the non-nearshore and nearshore data are further displayed in Figure B-18 thru Figure B-21.

[21] http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/sector_products.cfm

Table B-21. Summary of nearshore sector WCGOP observations used to establishing the frequency with which yelloweye are encountered on a trip and the level at which the sector is observed each year. The "*" in 2003 indicates that the statistic could not be displayed because of confidentiality.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Trips Observed	--	108	367	308	341	303	225	239	253	349	386
Trips w/ yelloweye	--	*	34	16	25	45	29	17	11	38	65
% of observed trips with yelloweye	--	*	9%	5%	7%	15%	13%	7%	4%	11%	17%
WCGOP coverage %	--	2%	7%	5%	7%	6%	4%	4%	5%	6%	8%

Table B-22. Summary of non-nearshore sector WCGOP observations used to establishing the frequency with which yelloweye are encountered on a trip and the level at which the sector is observed each year.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Trips Observed	102	269	256	251	275	358	335	304	512	443	304
Trips w/ yelloweye	21	25	13	18	13	10	10	8	4	7	9
% of observed trips with yelloweye	21%	9%	5%	7%	5%	3%	3%	3%	1%	2%	3%
WCGOP coverage %	18%	17%	12%	27%	17%	22%	29%	7%	22%	22%	22%

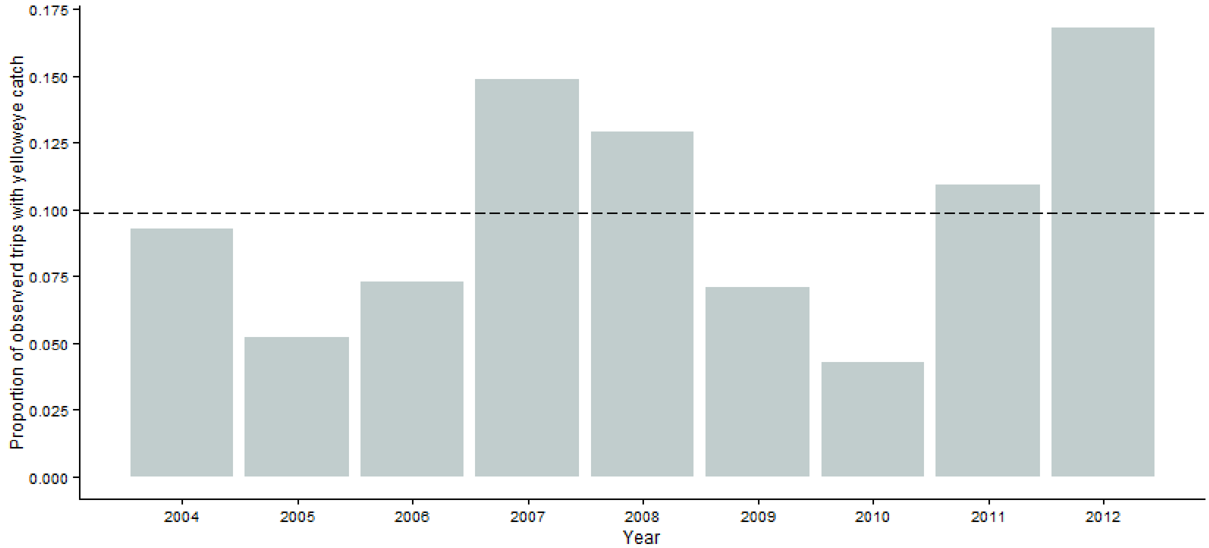

Figure B-14. Annual proportion of observed trips in the nearshore commercial fixed gear sectors where yelloweye were encountered. The 2004-2012 average is displayed by the dashed line (2003 was excluded because of confidentiality).

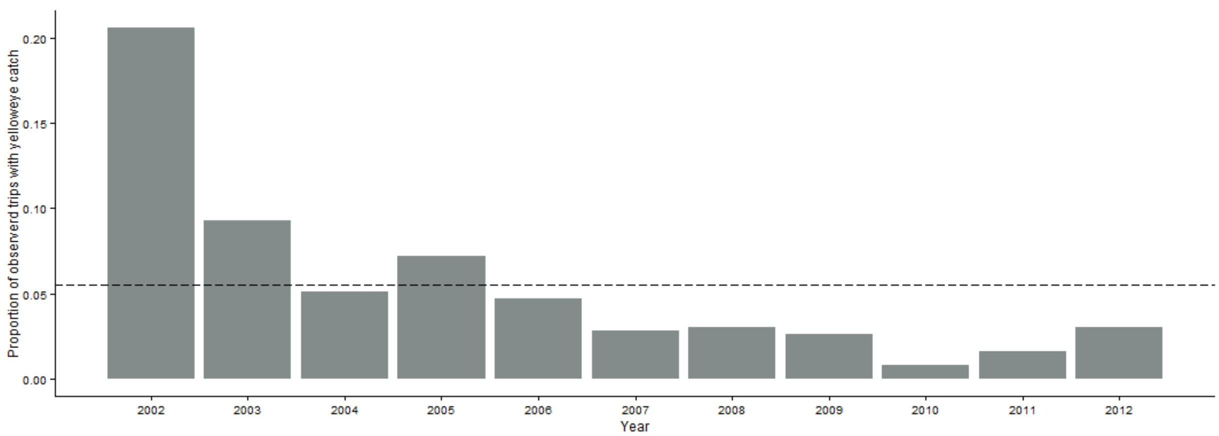

Figure B-15. Annual proportion of observed trips in the non-nearshore commercial fixed gear sectors where yelloweye were encountered. The 2002-2012 average displayed by the dashed line.

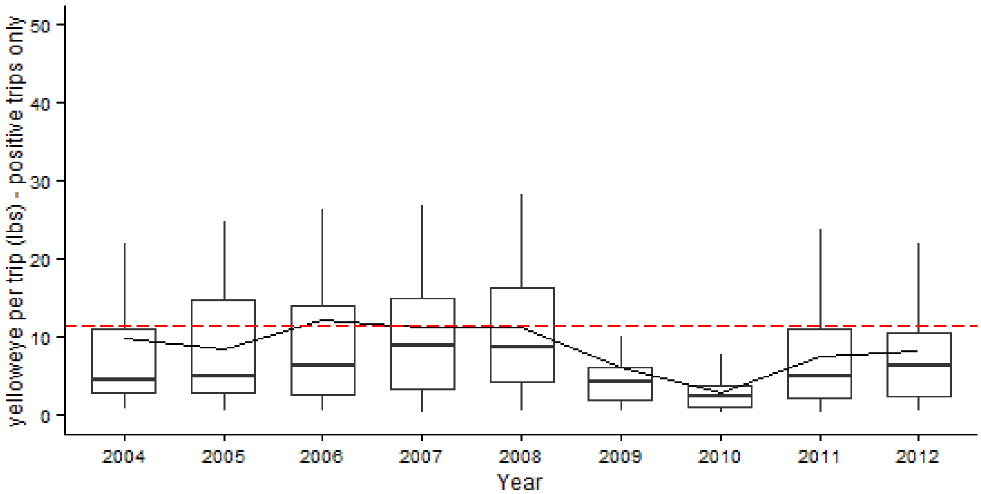

Figure B-16. Boxplots of yelloweye catches (zeros excluded) by trip and year in the nearshore commercial fixed gear sectors. Outer edges of the boxes show the 25th and 75th percentile levels with the middle line representing the median value. The solid line connects the average value for each year. In all but 2010, the averages are noticeably larger than the median because of large catch events. The dashed line shows the 2004-2012 average ("grand mean"). Outliers are not displayed because of confidentiality. A y-axis extending to 200 would display all outliers with room to spare. To give some sense of the range of the outliers, the average of the top 5 percent of all trips, across all years is 68 lb.

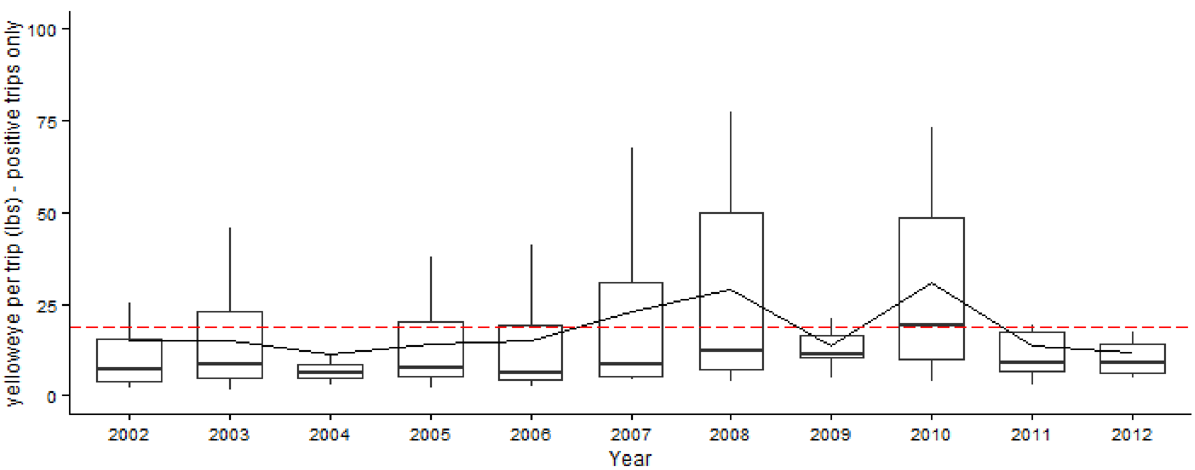

Figure B-17. Boxplots of yelloweye catches (zeros excluded) by trip and year in the non-nearshore commercial fixed gear sectors. See Figure B-16 for explanation of boxplots and lines. Outliers are not displayed because of confidentiality. A y-axis extending to 175 would display all outliers with room to spare. To give some sense of the range of the outliers, the average of the top 5 percent of all trips, across all years is 103 lb.

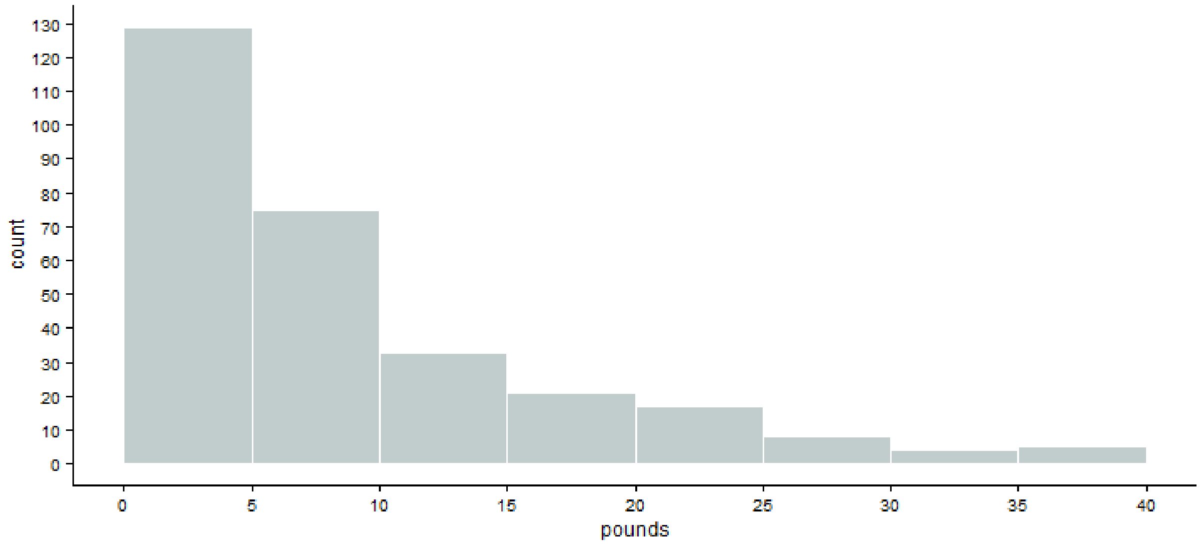

Figure B-18. Histogram showing nearshore catches of yelloweye rockfish over 2002-2012 on observed non-zero trips for catches less than 40 lb (lb) (bins are in increments of 5 lb).

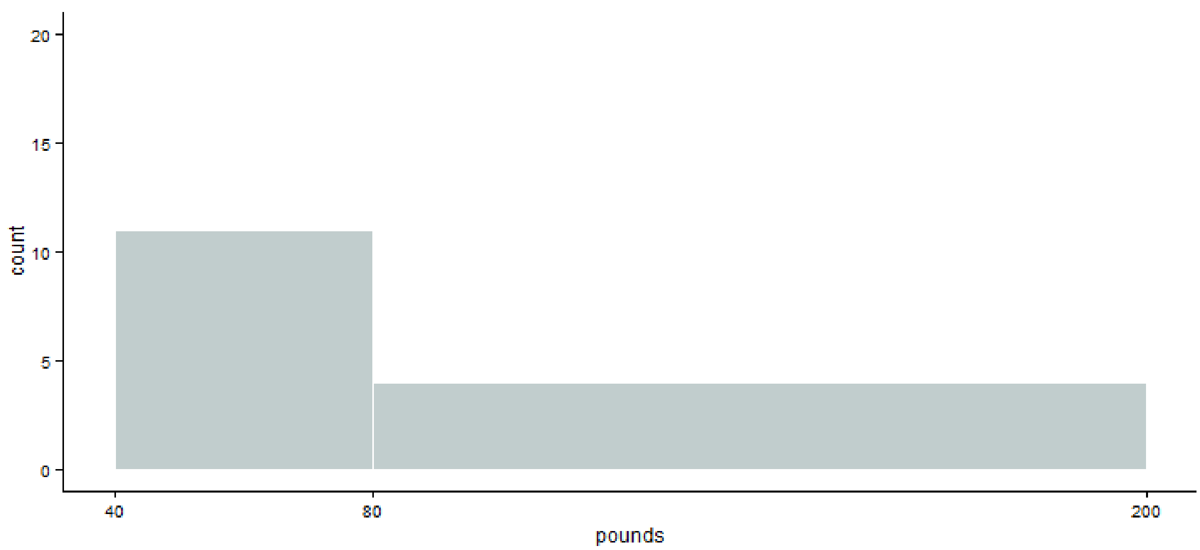

Figure B-19. Histogram showing nearshore catches of yelloweye rockfish 2002-2012 on observed non-zero trips for catches greater than 40 lb over (irregular bins of 40-80 lb and 80-200 lb were chosen to preserve confidentiality).

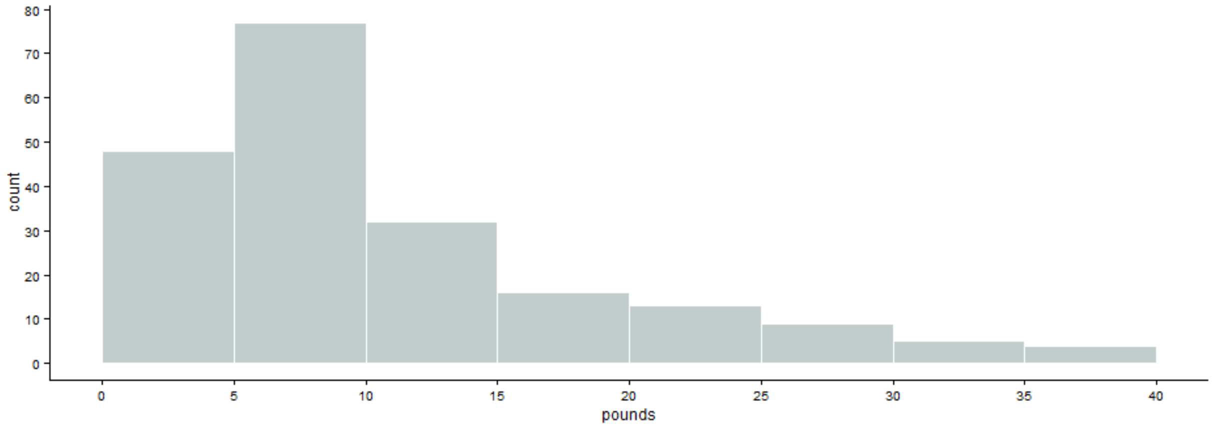

Figure B-20. Histogram showing non-nearshore catches of yelloweye rockfish over 2002-2012 on observed non-zero trips for catches less than 40 lb (bins are in increments of 5 lb).

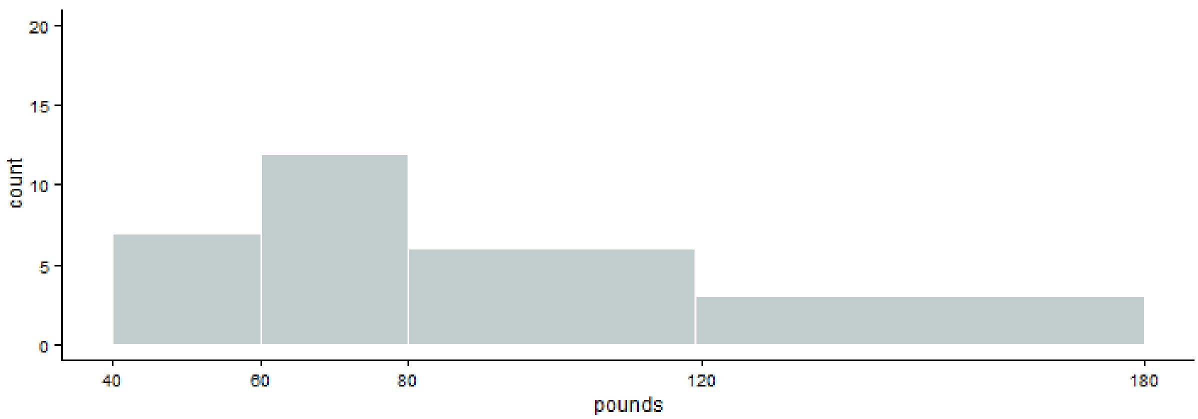

Figure B-21. Histogram showing non-nearshore catches of yelloweye rockfish 2002-2012 on observed non-zero trips for catches greater than 40 lb over (irregular bins of 40-60 lb, 60-80 lb, 80-120 lb, 120-180 lb were chosen to preserve confidentiality).

The Simulation Steps

There are two main parts to the simulations. The first constructs a universe of 100,000 fishing trips where the yelloweye catch per trip is the main variable of interest. The second involves randomly sampling from this set of trips. Each involves several steps described in the following list. The simulation was conducted using the program R.

1. Simulate the universe of 100,000 trips and yelloweye catch per trip for each sector based on the pattern of non-zero trips and the magnitude of catches observed on those trips:
   - Generate 100,000 binomial runs representing whether the trip caught yelloweye or not (i.e., 1 = yelloweye caught, 0 = no yelloweye caught). The binomial probability of a non-zero trip was itself randomly drawn from a random normal distribution based on the mean and standard deviation observed over the relevant time periods in each sector. The draws were truncated to prevent negative numbers using the "truncnorm" package.
   - The magnitude of catch per trip was drawn from a random lognormal distribution generated from the mean and standard deviation of actual trip level catches observed by WCGOP over the full data series of non-zero yelloweye trips.
   - The simulated catch per trip was produced by multiplying the catch per trip by the 1 or 0 drawn from the binomial random draws.
   - The simulated trip catch was capped at twice the observed maximum catch because the lognormal random distribution with a large number of draws produces a few implausibly large catches.

2. Sample from the universe of simulated trips based on varying coverage levels and produce a simulated "true" and estimated annual catch for 10,000 runs:
   - The total number of trips and observer coverage level per simulation run were randomly drawn from normal distributions based on the means and standard deviations from the actual WCGOP data.
   - The total number of trips drawn then set the sample size for the run (i.e., if the total number of trips was 100, 100 samples would be drawn from the set of 100,000 trips). The "true" annual catch was then calculated by summing the catches from all the selected trips.
   - This draw of the total trips per run was then sampled with the sample size set to the number of observed trips (the total trips multiplied by the coverage percentage drawn for the run). The simulated estimated annual catch was the calculated by summing the catch from these trips divided by the coverage level.

The simulated samples were all taken using R's sample function. All samples were taken without replacement. The input parameters for the random draws and years of data used for each are identified in Table B-23. In the nearshore sectors, observer coverage was low in 2003 and therefore data from that year was excluded. All years of data were used for the non-nearshore sectors except for the binomial probability of non-zero yelloweye trips. As can be seen in Figure B-15, there appears to be a downward trend in the number of trips encountering yelloweye in those sectors, and so based on this apparent trend, we chose to use data from only 2004-2012. An example of the simulation structure and random draws is shown in Table B-24.

Table B-23. Input values for the simulations.

		Non-nearshore	Nearshore
binomial probability of non-zero trip (normal)	*mean*	3.6%	9.0%
	s.d.	2.0%	5.0%
	truncated	0% - 20%	0% - 25%
	years used	2004-2012	2004-2012
non-zero catch events (lognormal)	*mean/mean.log*	27.4 / 2.77	11.6 / 1.78
	s.d./s.d.log	31.6 / 1.03	17.7 / 1.18
	years used	2002-2012	2004-2012
total trips per run (normal)	*mean*	1,776	4,995
	s.d.	923	1,533
	truncated	500-5000	500-10,000
	years used	2002-2012	2004-2012
observer coverage per run (normal)	*mean*	19.5%	5.8%
	s.d.	6.3%	1.3%
	truncated	5% - 30%	2%-20%
	years used	2002-2012	2004-2012

Table B-24. The first ten of the 100,000 simulated trips from the nearshore simulation provided to show the basic structure of the simulations. The second step of the simulation involved drawing random samples of varying sizes from the "Lb. Caught" column.

Trip	Encounter?	Lb. if Yes	Lb. Caught
1	1	16.5	16.5
2	0	31.3	0.0
3	0	17.1	0.0
4	0	2.6	0.0
5	0	6.3	0.0
6	0	4.8	0.0
7	1	1.3	1.3
8	0	3.0	0.0
9	0	7.6	0.0
10	0	4.3	0.0

Simulation Metrics and Results

The metrics produced by the simulations focus on the relative degree of precision and variability that we should expect with the annual catch estimates of yelloweye. The metrics reported here, each calculated as a ratio, include:

- *Variability in the "true" catch* (*"True" Variability*): this metric reports how the simulated "true" catch in each run differed from the average across all runs. It is calculated as the simulated true catch in each run divided by the average.
- *Annual fluctuation* (*"True" Ann. Fluctuation and Estimated Ann. Fluctuation*): this metric was calculated by dividing the simulated true catch and catch estimate in a run by the same in the prior run. This metric allows some evaluation of the year to year variation we might expect in actual catch rates and in the catch estimates.

- *Sampling error* (*Estimated Error*): represents the ratio of the simulated estimate of catch and the simulated true catch in each run (i.e., a value over 1 indicates an overestimate and under 1 is an underestimate).
- *Annual Estimate relative to the 10 Year Average* (Estimated to 10 Year Avg.): this ratio expresses how far the simulated catches in each run differed from a 10 year average. The 10 year average was calculated by dividing the 10,000 runs into increments of 10. This metric is meant to tbe comparable to the long-term average catch ratios that serves as the basis for the GMT's current catch projection models.

We do not report metrics of the simulated catches in absolute terms, i.e., pounds or metric tons, because we did not attempt to reproduce WCGOP's actual sampling design and catch estimation methods in the simulations. WCGOP uses a more complicated multi-stage, stratified sampling design and employs catch estimation methods intended to support the areas and sector of interest to the Council. In addition, in the nearshore sectors, yelloweye that are released with certain fishing gears are assumed to survive depending on depth. The simulations do not attempt to model the depth or gear of catch. For this and other reasons, the simulated catch amounts are therefore not expected to precisely match the real catch estimates. The simulated estimates of annual catch are, however, close in terms of general magnitude to the estimates produced over 2003-2012. The metrics of relative variability should therefore provide useful insight into the relative precision of the existing WCGOP catch estimates and the GMT's projection model outputs.

At the same, sampling theory holds that WCGOP's stratified sampling design should produce more precise estimates than the simple random sampling we use in the simulation. We view the metrics of relative precision as rough measures of the degree of variability we might expect under the range of observer coverage and patterns of yelloweye experienced to date. Understanding how these factors influence the general magnitude of uncertainty and variability is our primary aim. We did not attempt to precisely quantify the statistical variance in the data and the simulations may overstate the variability to some degree. Yet as seen below, the results are not inconsistent with the level of variability actually seen in the sectors over 2003-2012 (Table B-20).

The results are shown in Table B-25 and Table B-26. We report multiple statistics for each metric, including the mean and median and the 10th and 90th percentile values. We also provide information about a number of other percentile levels constructed as intervals. For example, the 50 percent interval is bounded by the 25th and 75th percentiles and the 90 percent interval is bounded by the 5th and 95th percentile. To contrast the way the values can be read: the 90th percentile reports a "one-sided" look and indicates that 90 percent of all runs fell below that value, and in turn, that only 10 percent fell above it. The 90 percent interval, on the other hand, provides a "two-sided" look and indicates that 90 percent of the runs fell within that interval, and in turn, that only 10 percent of the runs were either higher or lower than the values on each end of the interval. Likewise, the intervals could be viewed in a "one-sided" manner by looking to only one end (e.g., the upper end of the 50 percent interval is the 75th percentile, therefore only 25 percent of the runs came in larger than the value it reports).

Table B-25. Results from the nearshore simulation. See the bulleted list in the text for the definition of the metrics.

	"True"		Estimated		
	Variability	Ann. Flucuation	Error	Ann. Fluctuation	to 10 Year Avg.
Median	1.000	1.000	0.950	0.995	0.950
Mean	1.000	1.160	0.997	1.430	1.000
10th percentile	0.600	0.541	0.570	0.381	0.440
90th percentile	1.400	1.873	1.490	2.633	1.620
Intervals	"True"		Estimated		
	Variability	Ann. Flucuation	Error	Ann. Fluctuation	to 10 Year Avg.
50% (*25th - 75th*)	0.79 1.21	0.74 1.36	0.73 1.19	0.62 1.61	0.67 1.27
75% (*12.5th - 87.5th*)	0.65 1.36	0.58 1.73	0.60 1.41	0.43 2.37	0.49 1.54
90% (*5th - 95th*)	0.46 1.51	0.42 2.34	0.47 1.71	0.28 3.72	0.32 1.85

Table B-26. Results from the non-nearshore simulation. See the bulleted list in text for the definition of the metrics.

	"True"		Estimated		
	Variability	Ann. Flucuation	Error	Ann. Fluctuation	to 10 Year Avg.
Median	0.960	0.993	0.960	0.991	0.917
Mean	1.000	1.294	1.002	1.880	1.000
10th percentile	0.440	0.409	0.490	0.285	0.323
90th percentile	1.590	2.484	1.550	3.478	1.602
Intervals	"True"		Estimated		
	Variability	Ann. Flucuation	Error	Ann. Fluctuation	to 10 Year Avg.
50% (*25th - 75th*)	0.66 1.29	0.63 1.57	0.71 1.23	0.54 1.88	0.58 1.34
75% (*12.5th - 87.5th*)	0.49 1.52	0.46 2.25	0.54 1.48	0.33 3.03	0.37 1.70
90% (*5th - 95th*)	0.35 1.80	0.31 3.33	0.37 1.79	0.19 5.36	0.22 2.07

Summary of Results and Discussion

The results shown above demonstrate the high level of variability in annual yelloweye catches for both the nearshore and non-nearshore fishery, and this variability should be taken into account when deciding upon yelloweye sharing between these sectors (Table B-19). Presently, projected catches are provided as point estimates based on average historical catches. Annual variability should be taken into account when evaluating these projections relative to harvest targets.

Mortality of yelloweye rockfish from 2003–2012 ranged from 0.1 mt to 2.5 mt for the nearshore fishery and 0.3 to 1.6 mt for the non-nearshore fishery (Table B-27). Highlighted cells represent those years where the yelloweye rockfish mortality would have exceeded the Preferred Alternative catch share for 2015. These sectors, combined, would have exceeded each of their 2015 PA catch share on five occasions; the non-trawl commercial fishery as a whole, however, would have exceeded their allocation (at the 2015 PA level) of yelloweye rockfish only twice in 10 years.

Table B-27. Variability of total mortality estimates for yelloweye rockfish in the nearshore and non-nearshore commercial fixed gear sectors, 2003-2012. Highlighted cells represent cases where the catch would have exceeded the 2015 Preferred Alternative catch share (1.1 mt for non-nearshore and 1.2 mt for nearshore) and the sum of the two catch shares (2.3 mt). Data source: West Coast Groundfish Observer Data (WCGOP), GMMultiYr_DataProduct Dec. 23, 2013.

Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nearshore	0.3	1.1	0.9	0.8	1.9	2.5	0.5	0.1	0.8	1.8
Non-nearshore	1.6	1.1	0.6	0.7	0.7	0.8	1.2	0.3	0.3	0.3
Total	1.9	2.2	1.5	1.5	2.6	3.3	1.7	0.4	1.1	2.1

Numerous tables were provided above that further illustrate annual variation in yelloweye mortality by the fixed gear fisheries. Summarized results from some of these tables are shown in Table B-28. A challenge to the management of yelloweye (and other infrequently caught species) is that the variability in mortality estimates is a combination of the variability in encounter rates and the sampling error associated with extrapolating from the fraction of those rare encounters that are observed. The large sampling error suggests that observation error is a large part of the variability in observed mortality. This uncertainty should not prevent the council from taking action, but illustrates the challenges in projecting the impacts of any management measure and the difficulty in quantifying those impacts if and when they occur. To put this sampling error into perspective, for the nearshore fishery, the 90% interval around the point estimate ranges from 47% of the point estimate (e.g., about half) to 171% of the estimate (i.e., about double).

Table B-28. Comparison of nearshore and non-nearshore observer effort (trips) and catch of yelloweye rockfish (mt) using various metrics. Data source: WCGOP.

Metric	Nearshore	Non-nearshore
Average number of trips observed (2003-2012)	288	331
% WCGOP coverage (2003-2012)	5.4%	19.7%
Average % of observed trips with yelloweye (2004-2012)	9.8%	3.6%
Catch share (Preferred Alt., 2015)	1.2	1.1
Projected catch (Preferred Alt, 2015)	1.1	0.5
Avg. mortality (2003-2012)	1.1	0.8
Std. Dev. mortality (2003-2012)	0.8	0.4
Estimated sampling error (90% interval of estimated catch / true catch)	47% – 171%	37% – 179%

Discussion of Results

As to the results here, we begin by noting that the average sampling error metric shows a high degree of accuracy in both sectors, as is expected with random sampling. Across all runs, the catch estimate was 1.002 times the true estimate in the non-nearshore and 0.997 in the nearshore (i.e., 0.2 percent and 0.3 percent off).

At the same time, the catch estimates showed variability across individual runs. Under the conditions run in the simulations , we would expect catch estimates to be within ~30 percent of the true catch half of the time in the non-nearshore sectors, and ~20 percent in the nearshore sectors. Looking more toward the extremes, 10 percent of the runs in the non-nearshore simulations fell higher or lower than 0.37 and 1.86 times the true value (i.e., 63 percent lower and 86 percent higher). That same interval for the nearshore simulations is 0.47 to 1.71. Somewhat counter intuitively, the nearshore simulation shows more precision than the non-nearshore simulation despite having lower coverage levels. It may be that the lower frequency of non-zero trips in the non-nearshore counteracts the expected effect of higher observer coverage.

While the sampling error is an important consideration, in reality the "true" catch is never known and the Council can only respond to the estimates of the true catch. So understanding the expected year to year variability in the catch estimates is of most interest here.
Considering the degree of year to year fluctuation in the estimates, the results show that on average the estimates were 1.43 times the previous' years estimate in the nearshore and 1.88 times in the non-nearshore. The use of ratios and the influence of large outliers may make the mean values of limited value here. The intervals provide a fuller picture. Looking at the 50 percent interval, we see that half of the runs fluctuated between 0.62 and 1.61 over the previous year in the nearshore and 0.54 and 1.88 in the non-nearshore. The 8 fold increase seen in the nearshore catch estimate between 2010 and 2011 (Table B-20(b)) would have fallen within the upper 1 percent of the nearshore simulation runs (not shown in Table B-25).

With the 10 year average metric, we see half the runs in the non-nearshore coming in 0.58 to 1.34 times the size of their respective 10 year averages and 0.67 to 1.27 times in the nearshore simulation runs. Considering only the situation where the 10 year average to underestimate the catch estimate, the catch was double the average around 5 percent of the non-nearshore runs. Not reported in the table, yet the average of the upper 5th percentile values was 2.44. In the nearshore simulations, the variation was lower with the upper 5th percentile populated by values greater than 1.85 times their respective 10 year average with an average value of 2.15.

Last, as can been seen in the metrics reported for the simulated true catches, the simulated true catches showed considerable variation as well. The variability in the probability of encountering yelloweye on trip and variability in the size of the catch when encountered created a range of simulated annual catches. This variable signal in the annual catches drives a lot of the noise seen in the simulated catch estimates.

Impacts of Shifting up to 0.6 mt from Non-nearshore to Nearshore Fixed Gear Sectors

Impacts to the Nearshore Fishery

Under the PA, the nearshore fishery season structure would remain as described in Agenda Item F.7.a, Attachment 3, June 2014. The shoreward RCA would remain at 30 fathoms for Oregon and 20 fathoms for northern California (north of 40° 10′ N. latitude). Landings of target species would remain as shown in Table 4-19 in that attachment. However, the Council is considered and took actions that may increase the catch of yelloweye rockfish by the nearshore fishery (e.g., increase lingcod trip limits; see below). Clearly, since we provide point estimates for projected yelloweye catch relative to harvest targets, any increase in harvesting lingcod, or ther management measures that may liberalize this fishery, may result in projected yelloweye catch that may exceed the PA nearshore allocation.
Shifting as much as 0.6 mt of yelloweye rockfish to the nearshore fishery would provide socioeconomic benefits. Those benefits may include:

- California and Oregon
    - Provide the opportunity to increase trip limits for lingcod during May - October, and allow lingcod retention during the currently closed season (December – April).
- Oregon
    - Increase landings of black rockfish from 120 mt (PA) to 137.9 mt (state landing cap).
    - Increase the likelihood of retaining the 30 fm RCA (moved from 20 fm to 30 fm in 2013).

- California
    - Increase landings of nearshore species.
    - Move the RCA from 20 fm (PA) to 30 fm north of 40° 10′ N. latitude.

Shifting as much as 0.6 mt of yelloweye rockfish from the non-nearshore fishery to the nearshore fishery may therefore allow increased landings and revenue of lingcod and other nearshore groundfish species. Allowing this sector to fish to 30 fathoms (instead of 20 fathoms) may also open (or help to keep open) productive fishing grounds, which may result in fewer days at sea, higher revenue per day, and less gear conflicts. In addition, allowing fishing out to 30 fathoms may reduce the catch of other nearshore rockfish which may become a constraining species group for commercial and recreational fisheries. Additional yelloweye impacts relative to management measures considered by the Council, and relative to potential increases in landings, are shown in Table B-29.

Table B-29. Projected increase in yelloweye rockfish catch by the nearshore fixed gear sectors under various management measures and increased landings, relative to those shown for the PA.

Action	Yelloweye Impact
Increase Lingcod Trip Limit Coastwide (Alt 2a)[a]	+0.1
Increase Lingcod Trip Limit Coastwide (Alt 2b)[a]	+0.2
Increase Oregon Landings of black rockfish from 120 mt to 138.7 mt	+0.1
Move RCA for northern California from 20 fm to 30 fm	+0.3

[a]These increased trip limits include allowing lingcod retention during the closed season for both limited entry (200 lbs / 2 months) and open access (100 lbs / month). No additional yelloweye mortality is expected at these lingcod trip limits during the closed season, because no additional effort or targeting for lingcod would be expected (see Agenda Item F.7.a, Supplemental Attachment 10, June 2014, Table B-38).

Impacts to the Non-Nearshore Fishery

Shifting the entire 0.6 mt from the non-nearshore sectors to the nearshore sectors would result in no to little buffer for the non-nearshore sectors (Table B-19), and therefore increase the likelihood of yelloweye catches exceeding the non-nearshore catch share. In the event this fishery exceeded its catch share, the primary management measure available to reduce yelloweye catch is to move the seaward boundary of the non-trawl RCA deeper. Table B-30 illustrates the projected yelloweye rockfish mortality at available RCAs. The No Action and PA provides for a 100 fathoms seaward RCA.

Table B-30. Projected yelloweye rockfish mortality for the non-nearshore fixed gear sectors under PA sablefish allocations for 100 fathom (PA), 125 fathom, and 150 fathom seaward RCAs.

Seaward RCA	Yelloweye Mortality (mt)
100 fm (PA)	0.5
125 fm	0.4
150 fm	0.2

Moving the RCA deeper in this fishery may close productive fishing grounds which may (a) cause vessels to travel farther (increasing fuel cost) and fish longer (more days at sea) to catch their sablefish tier limit or daily trip limit, and (b) increase gear conflicts.

Other Considerations

Importance of Fishery Stability

Stability in fisheries is important, as it is in any business. The way we currently manage these fixed gear fisheries may, in general, lead to instability. For example, using point estimates (average landings) to project catches for fisheries that show variable catches annually, promotes instability in management measures applied to the fishery because these fisheries show high inter-annual variation in catches (see Table B-27 and Table B-28). The likelihood of exceeding annual harvest limits increases as the buffer between the projected catch estimate and the harvest limit decreases.

Fairness

Some may argue that there is inequity in the current yelloweye catch share situation, where one sector (i.e., non-nearshore fixed gear) appears to have a substantial yelloweye buffer relative to projected catch whereas the other sector (nearshore) has little to no buffer before reaching its catch share. Note that what may be most important is not whether one sector exceeds its catch share, but instead that the sectors combined do not exceed the sum of their catch shares. Regardless, the inter-annual variability of yelloweye catch should be addressed and the risk of exceeding catch shares discussed when making a decision to adjust the current catch share structure.

Remaining below the ACL

The ultimate goal is to ensure that groundfish fisheries remain below their ACLs. Even though GMT scorecards typically project that most of the yelloweye rockfish ACL will be harvested (e.g., for 2014, the most current GMT Overfished Species Scorecard projects that 17.1 of 18.0 mt of the ACL will be taken; see Agenda Item F.4.b, Supplemental GMT Report, June 2014), in reality, all fisheries combined have not caught more than 70 percent of the ACL during recent years (Table B-31). Reasons include: (a) set-asides are based on high or highest catches attained and (b) even though some sectors may exceed their allocation, it is unlikely that all sectors will exceed each of their allocations at the same time. The result has been annual catches much lower than the ACL or OY during recent years (Table B-31).

Table B-31. Annual yelloweye rockfish mortality relative to the ACL (or OY) for 2008-2012. Data: from the West Coast Groundfish Observer Program Reports on Estimated Discard and Catch.

Year	Mortality (mt)	ACL (or OY)	% of ACL
2012	12	17	68%
2011	9	17	52%
2010	8	14	54%
2009	11	17	63%
2008	12	20	58%

Simulations to Explore the Risk of Exceeding the Coastwide ACL
A simple simulation exercise was conducted to explore the risk of exceeding the coastwide ACL for yelloweye. This analysis follows the general idea of previous analyses on estimating risk associated with spiny dogfish and rougheye rockfish (see Agenda Item C.4.b, REVISED GMT Report, April 2014 and Agenda Item F.7.a, Attachment 6, June 2014).

First, the recorded catches from each sector were examined for trends over the period 2004 to 2011 which had the most complete and accessible data. Catch of yelloweye declined significantly (based on linear model fit to estimated mortality) for the Tribal Shoreside and Washington Recreational sectors. The largest changes occurred prior to 2007. The more recent period from 2007-2011 had no significant trends in catch for any sector and therefore was chosen as the basis for the analysis. The average and standard deviation of catch was calculated for each sector. These values were then used to simulate values from a normal distribution of catches for each sector. Some sectors had zero values in some years which made the use of a lognormal assumption problematic. The simulated values were truncated at zero to avoid negative values, but were not limited below the allocation for any sector, thus allowing simulated values to exceed the allocations. The simulated sector-specific catches were summed to form a simulated distribution of total coastwide catch.

The simulation was then repeated with a set of changes intended to provide an upper bound to the potential impact of a shift of 0.6 mt from the non-nearshore fixed gear sector to the nearshore fixed gear sector. Although the projected increase for the nearshore sector is only 0.1, the simulated values were increased by 0.6 to provide an upper limit. Furthermore, the standard deviation of the simulated catches from the nearshore sector was doubled, again to provide a conservative estimate of potential changes, not because the variability is expected to increase. Last, the non-nearshore sector simulations were left unchanged under the assumption that a reduction of 0.6 mt from the allocation would not further constrain that sector. Research catch set-asides are difficult to predict for future years so as a conservative estimate, the 2014 set-aside value of 3.3 mt was added to the total simulated catch in all cases.

The resulting distribution of simulated coastwide catches (Figure B-22) show that the overall probability of exceeding the 18 mt ACL for 2015 is less than 0.7 percent under the status-quo patterns and increases to 2.1 percent with the changes made to provide an upper limit for the magnitude of the increase under a transfer of 0.6 from the non-nearshore allocation to the nearshore sectors. The probabilities associated with the higher 19 mt ACL for 2016 are 0.4 percent and 1.1 percent, with and without the change in allocations.

This simulation exercise depends on numerous simplifying assumptions, including the assumption that future catches will have the same mean and standard deviation as catches over the period 2007-2011, that variability in catches among sectors are independent. Past patterns have depended on inseason management measures to keep catches within the sector shares and such measures will continue to be used in the future in ways that are difficult to include in this simple analysis. This analysis also did not include the estimation uncertainty that was explored in greater detail in Agenda Item F.7.a, Attachment 6, June 2014 (B.4, pages 27-40). Future catch projections would ideally include both true variability in catch and estimation uncertainty. Therefore, the probabilities calculated here should only be considered as qualitative estimates of the relatively low risk of exceeding the ACL and the relatively small increase in that risk even if the average catch increased by 0.6 mt, which is unlikely under the management measure being considered.

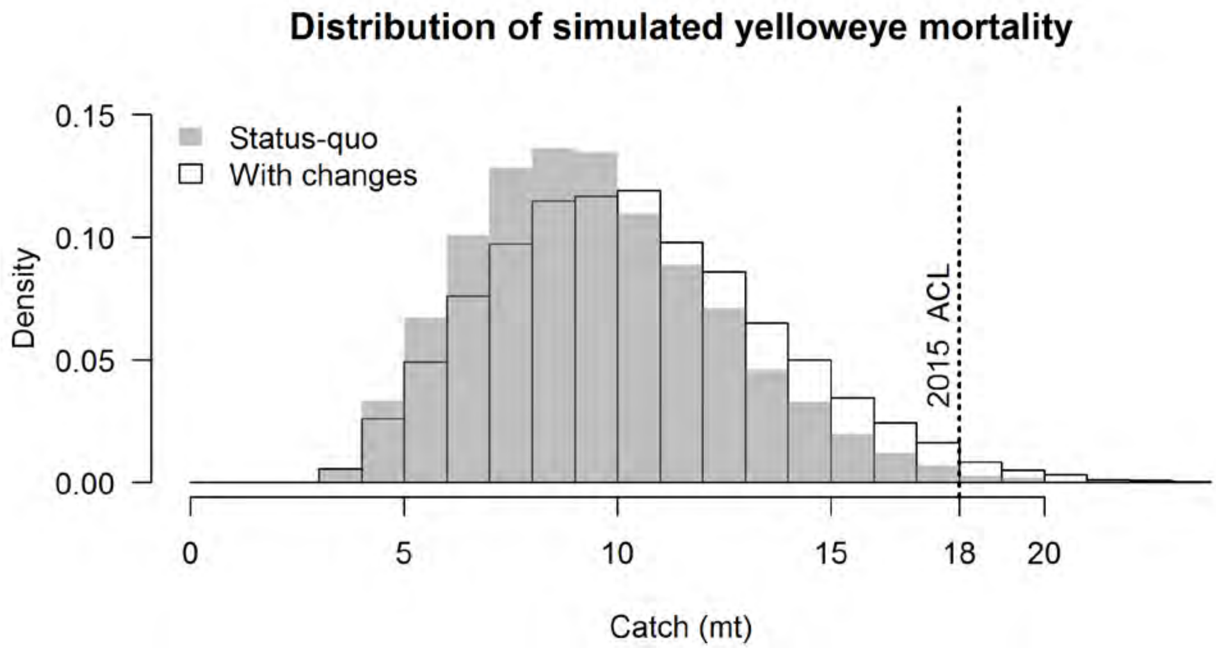

Figure B-22. Distribution of simulated yelloweye catches under status-quo management measures and with maximum changes associated with a shift of 0.6 mt allocation from the non-nearshore to the nearshore (blue). The simulations depend on many simplifying assumptions and are intended to represent an upper bound of the impact of changes in allocations.

Council FPA Recommendations and Projected Impacts

The Council FPA recommended transferring 0.5 mt from the non-nearshore sector to the nearshore sector, which is 0.1 mt lower than the maximum transfer amount analyzed herein. Relative to shares and projections shown in Table B-19, this may reduce the yelloweye buffer for the non-nearshore sector to 0.1 – 0.2 mt for 2015 and 2016, respectively, while for the nearshore fishery, the PA buffer shown in Table B-19 would be increased to 0.5 – 0.6 mt for 2015 and 2016, respectively. This additional buffer for the nearshore sectors provided room for other Council FPA recommendations that may provide increased opportunities for the commercial nearshore sector (see Table B-29). These FPA recommendations included (a) move the shoreward non-trawl RCA in northern California from 20 fm to 30 fm (projected to increase yelloweye mortality by +0.3 mt), (b) allow Oregon landings of black rockfish to reach their current landing cap of 138.7 mt (projected to increase yelloweye mortality by +0.1 mt relative to PPA), and (c) adopt increased commercial lingcod trip limits for commercial non-trawl sectors (projected to increase yelloweye mortality by +0.1 mt). The net result is a projected yelloweye buffer for the nearshore sector of 0.1 to 0.2 mt for 2015 and 2016, respectively.

These Council FPA recommendations provide similar yelloweye buffers for the nearshore and non-nearshore sectors (i.e., 0.1 and 0.2 mt for each sector for 2015 and 2016, respectively). Although the summed buffer for the two commercial non-trawl sectors under these actions is lower than shown in Table 1, the annual variability in yelloweye estimated mortality shown in these analyses (i.e., see Table B-27 and Table B-28) may result in yelloweye mortalities much lower or much higher than those projected during certain years, whereas the average mortality across years may remain within each sectors catch share. Nonetheless, the probability of exceeding the yelloweye rockfish ACL due to these Council-recommended actions is exceptionally low (see Table B-31 and Figure B-22).

B.5 *Within Non-Trawl: Consideration of State-Specific Nearshore Rockfish Harvest Guidelines North of 40°10' N. latitude*

Need for Action

In April 2014, the Council requested analysis of options for allocation of the Nearshore Rockfish complex north of 40°10' N. latitude to keep mortality at or within the ACL including 1) No Action, 2) utilizing the miles of coastline north of 40°10' N. Lat., 3) the recent recreational and commercial historical catch from 2004-2012 (Agenda Item C.4.b, Supplemental GMT Report 2), and 4) a hybrid allocation method which uses miles of coastline for copper, China and quillback rockfishes and historical catch from 2004-2012 for the remaining species. In options 1 and 2, blue rockfish apportionment was initially based on stock assessment lines (California vs. Washington-Oregon assessment), with subsequent allocation between Oregon and Washington based on recreational and commercial historical catch from 2004-2012. Miles of coastline was not used to apportion blue rockfish between Oregon and Washington because of the large disparity in historical catch (Agenda Item C.4.b, Supplemental GMT Report 2, Tables 2 and 3) which indicated a decline in relative abundance along the coast not reflected when allocation is conducted using miles of coastline.

Catch data used to apportion the coastwide ACL under the two HG options using historical catch have been updated since the April meeting. Prior Recreational Fishery Information Network (RecFIN) queries for recreational catch data included inland areas in Washington not managed by the Council. The updates resulted in changes to the Nearshore Rockfish complex harvest guideline options (i.e., proportions of the ACL distributed among states), primarily to the historical catch option, but still reflect the range of HG Options recommended for analysis by the Council in April.

This analysis provides information on the implications of state-specific Nearshore Rockfish complex HG for the area north of 40°10' N. Lat. Options for the state-specific HGs are based on historical catch and miles of coastline in California, Oregon and Washington, as described above. Management under HGs from alternate allocation options are compared to the No Action Alternative of status quo management for the Nearshore Rockfish complex with an ACL north of 40°10′ N. Lat.. The management measures needed to prevent mortality from exceeding complex level HGs and the implication for stock status and fishery participants are analyzed for each option.

Background

Under No Action, the Nearshore Rockfish complex OFL consists of contributions of the component stocks to the entire complex, stratified at 40°10′ N. Lat. Under status quo management, a complex level ACL is assigned to each region north and south of that management boundary (see the draft environmental impact statement; DEIS). This analysis provides the implications for the nearshore fisheries from instituting a HG in each state (Table B-32). Note that Nearshore Rockfish complex mortality from the tribal fishery is negligible and the tribes will notify the Council if this is expected to change in the future.

We evaluate three options for implementing HGs, in addition to No Action, for each state north of 40°10′ N. Lat. The first is stratified on the basis of miles of coastline, using the length of the three nautical mile boundary line delineating state and Federal waters as a proxy for coastline length in each state (see Appendix 1). The second method is based on average historical catch for all sectors between 2004 and 2012. The third is based on a hybrid method applying miles of coastline to stocks that are ubiquitously distributed along the coast (i.e., China, quillback and copper rockfish), while the historical catch method is applied to those remaining species that show a cline in abundance also noted in scientific literature, including blue rockfish allocated by assessed areas north and south of the California-Oregon border and allocated between Oregon and Washington using historical catch. This analysis is intended to help better understand the needs of the fishing community relative to the constraints from management under state-specific harvest guidelines.

Ideally, allocating catch would involve a measure of relative abundance along the coast, but no such index is currently available for Nearshore Rockfish. In the absence of these data, two proxy methods of allocating have been presented; historical catch from 1916-2012 and the miles of coastline within the assessed area (Agenda Item C.4.b, GMT Report 2, April 2014; Agenda Item C.9.b, GMT Report 2, April 2014). The three options analyzed herein were developed after considerations were made regarding these original allocation methods. There are implications of these decisions for the commercial nearshore and recreational sectors in each state that make this a contentious issue. There are, however, scientific principles that can help inform sound decisions in the selection of allocations resulting in harvest guidelines. Examples of considerations for the three options analyzed in this paper are described below.

Considerations for Allocation Options

Considerations for Option 2: Miles of Coastline

Allocation using miles of coastline within each assessed area may prevent potential over-allocation to over-harvested areas that can result when historical catch is used. This method provided an alternative to catch based allocation alternatives. The primary assumption of this method is that the relative abundance is consistent along the coast. This assumption may not be valid 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. Although, for species such as China, quillback, copper and blue rockfishes that are relatively common throughout the assessed range, the distribution of habitat is unlikely to be perfectly uniform between states. Hence, this method may over-allocate or under-allocate, depending on which assumptions are violated. In instances where regulations and mortality for ubiquitously distributed species varies greatly among states, and a declining trend in CPUE or assessments results in a portion of the species range, the historical catch method may be preferred over miles of coastline to prevent over allocation of fish at the edge of their range. Thus, the assumption of uniform distribution is likely violated when miles of coastline is applied to species such as blue, olive, brown, gopher, black and yellow and grass rockfish, as indicated by the distribution of catch in PacFIN and RecFIN, and in published literature showing the range of each species indicating that they are less common or absent to the north (Love et al. 2002).

Considerations for Option 3: Average Historical Catch

When historical catch is employed to allocate among states, there is potential for over-allocation to states that harvested the most fish. Table B-32 contains commercial mortality (the average landings (mt) in the commercial fishery from PacFIN plus discard mortality estimated from the nearshore projection model) and recreational mortality (mt) (RecFIN) of Nearshore Rockfish stocks north of 40°10′ N. Lat. 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, SSC Report, March 2014). Allocation using historical catch assumes that catch is proportional to abundance, which may not be the case due to differences in management among states. The annual catch by sector (Figure B-23) and annual, average, and range of catches by sector from 2004-2012 (Table B-32) reflect a combination of regulations, permitting systems, participation, constraints from overfished species and relative abundance of each species.

Overfished species constraints affected regulations on target stocks (e.g., seasons, depth restrictions and trip limits), limiting harvest to varying degrees among states from 2004 to 2012. A description of how regulations have varied over this period in each state and sector is provided in Appendix 2. Notable changes in regulations to reduce yelloweye rockfish mortality include a shallower depth restriction in the

California and southern Oregon nearshore commercial fisheries starting in 2009 when the shoreward rockfish conservation area (RCA) boundary was moved from 30 fm to 20 fm to reduce yelloweye rockfish mortality. This adversely affected the ability of the fishery participants in California and Oregon to access deeper nearshore species. Depth restrictions and season lengths in the California recreational fishery have been severely limited by yelloweye rockfish mortality since 2008 after overages in 2007 necessitated inseason action to reduce season lengths and shallower depth restrictions to 20 fm (Appendix 2), which has continued in order to minimize yelloweye rockfish mortality. In addition, the Oregon recreational fishery was limited to shallower depth restriction of 20 fm from 40 fm part of the year starting in 2007, shifting effort onto Nearshore Rockfish habitat. The Washington recreational fishery has had consistent regulations since 2005, when depth restrictions of 20 fm and 30 fm went into place during part of the year shifting effort onto shallower depths.

Differential management among states shown above may differentially affect catch among states. It should be noted that other factors may also affect catch (e.g., environment, markets, distribution, and abundance). Figure B-23 provides annual catch patterns for the various sectors among states. For example, Nearshore Rockfish mortality in the California recreational and commercial fisheries declined abruptly in the years after their respective 20 fm depth restrictions were implemented. The Washington recreational catch has remained relatively steady over the 9-year period shown Figure B-23, as it was shown above that regulations have remained somewhat constant since 2005 (see Appendix 2). Interestingly, Oregon commercial and recreational Nearshore Rockfish catches have shown increases since many restrictions shown in Appendix 2 were put in place. It should be pointed out that much of this Oregon Nearshore Rockfish increase may be attributed to blue rockfish catch.

The differential management among states, along with differing degrees of participation in each sector among states, affects historical catch and thus allocation, which may cause it to deviate from representation of relative abundance along the coast. For example, Washington prohibited their commercial nearshore fishery and reduced their bag limit to ten fish in 1995 as a precautionary measure to preserve recreational fishing opportunities for the future, which might have been subject to further restrictions if allocation were shared with a commercial fishery. The participation in angler trips between Washington, Oregon and California are expected to vary affecting mortality due to season lengths, perceived opportunity (bag limits, depth restrictions) and angler population size in each state. In addition, Oregon and California have differing commercial permitting systems for their fisheries. These factors, and those shown in previous paragraphs, may cause allocations based on historical catch to deviate from relative abundance. Those areas with more liberal regulations or higher participation are likely to have disproportionately high Nearshore Rockfish mortality compared to the actual relative abundance along the coast.

For species with strong clines in abundance along the coast, the historical catch based method may capture the trend and allocate accordingly, where allocation by miles of coastline would not due to the assumption of uniform distribution. The aforementioned changes and differences in management should be considered when evaluating the true needs of the fishing communities and potential bias in allocation in each region and provide an impetus for weighing the assumptions regarding miles of coastline as an alternative method depending on the distribution of the species among other circumstances.

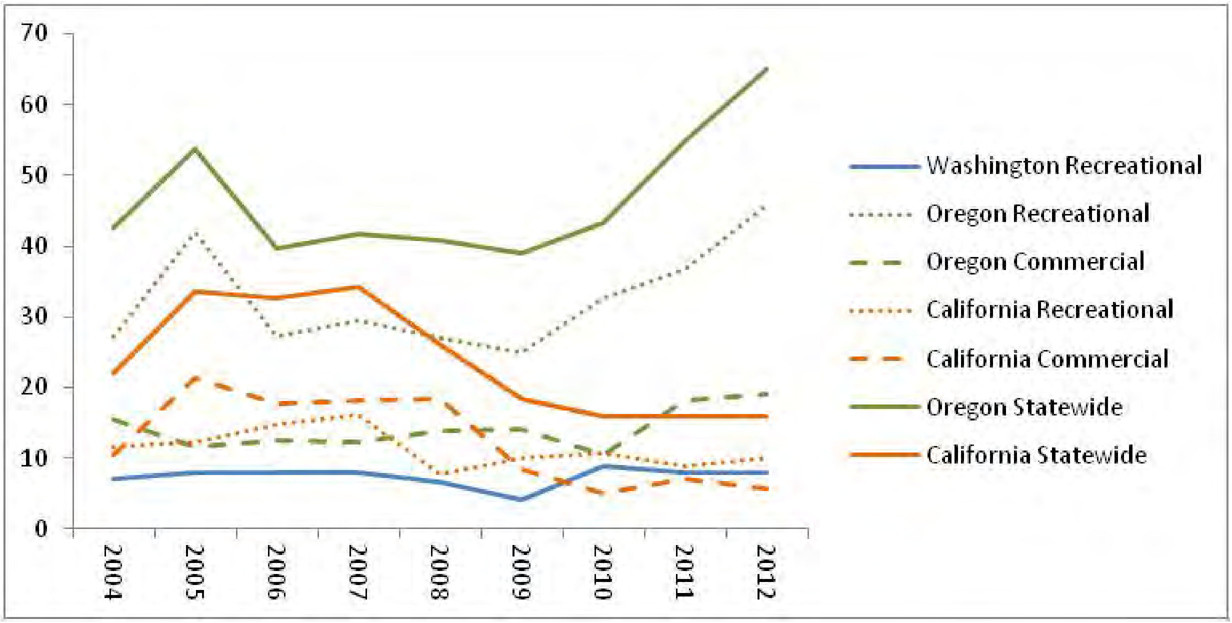

Figure B-23. Nearshore Rockfish Complex mortality estimates (mt) by state and sector in each year from 2004-2012.

Table B-32. Nearshore Rockfish Complex mortality estimates (mt) by state and sector in each year from 2004-2012 as well as the average and range of mortality from periods with less constraint (2004-2007) and greater constraint (2008-2012) from yelloweye rockfish. Recreational data were from RecFIN for Washington (ocean boat only), Oregon (ocean boat only), and California (ocean boat, shore, and estuary).

Year	Washington Recreational	Oregon Recreational	California Recreational	Oregon Commercial	California Commercial N. 40°10′ N. Lat.	Total
2004	7.06	27.18	11.61	15.40	10.46	71.71
2005	7.96	41.90	12.21	11.74	21.28	95.09
2006	8.00	27.20	14.84	12.47	17.85	80.36
2007	7.95	29.42	16.14	12.41	18.23	84.15
2008	6.72	26.91	7.69	13.84	18.38	73.54
2009	4.26	24.88	10.01	14.15	8.39	61.69
2010	8.99	32.78	10.82	10.57	5.16	68.32
2011	8.10	36.66	8.84	18.28	7.02	78.9
2012	7.93	45.88	10.10	19.06	5.84	88.81
2013	6.23	38.1	9.3	NA\1	NA\1	NA
Average 2004-2007	7.74	31.43	13.70	13.01	16.96	82.83
Range 2004-2007	7.06-8.00	27.18 - 41.90	11.61 - 16.14	11.74 - 15.40	10.46 - 21.38	71.71 – 95.09
Average 2008-2012	7.20	33.42	9.49	15.18	8.96	74.25
Range 2008-2012	4.26-8.99	24.88 - 45.88	7.69 - 10.82	10.57 - 19.06	5.16 - 18.38	61.69 – 88.81
Average 2004-2012	7.44	32.53	11.36	14.21	12.51	78.06
Range 2004-2012	4.26-8.99	24.88 - 45.88	7.69 -16.14	10.57 - 19.06	5.16 -21.28	61.69 – 95.09

Considerations for Option 4: Hybrid Method

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. Lat. (e.g., gopher, olive, black and yellow, brown, kelp and grass rockfish; Table B-32). 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.

The GMT provides some considerations to allow the Council an alternate way to evaluate the allocation options in a way that extends beyond the needs of the fishery. These methods attempt to approximate the relative abundance of component species given the assumptions implicit in their application to provide a logical basis for allocation. Where the range appears to reach its edge within the management area, average catch may be a more reasoned approach and where large differences in catch occur along the range of an otherwise ubiquitously distributed species in the region, miles of coastline may be preferable, to avoid violation of assumptions implicit in each method. Future off-year scientific research designed to quantify catch and abundance relative to available habitat would greatly improve allocation methods.

Pros and Cons of Each Option in Light of Considerations Presented

The pros and cons of each method given considerations regarding allocation with each are described in Table B-33.

Table B-33. Comparison of the pros and cons of each Nearshore Rockfish complex allocation option.

Allocation Option	Pro	Con
Miles of Coastline	Less potential for over allocation to depleted areas than historical catch if harvest is more reflective of management policies than fish abundance. Provides an alternative to catch based allocation methods	Some species are far less common at the edge of their range and would be over-allocated to some areas since the method assumes abundance is proportional to miles of coastline.
Historical Catch (2004-2012)	Reflects the recent historical pattern of commercial and recreational fisheries. Accounts varying trends in abundance with latitude at the edge of a species range.	Potential for over-allocation to areas that are more depleted. Overfished species constraints limited harvest to varying degrees between states affecting allocations. Doesn’t address areas where commercial fisheries are prohibited.
Hybrid Option	Minimizes allocation biases presented by application of historical catch to areas with higher removals/depletion and miles of coastline for species at the edge of their range.	Still does not reflect differences in reef habitat and relative abundance across states, but neither do the other options. Still subject to the biases of each method, but attempts to minimize the degree of bias given apparent trends in abundance and distribution of component stocks.

Comparison of Historical Mortality and Projected Mortality under the Preferred Alternative and No Action to Nearshore Harvest Guideline Allocation Alternatives

The projected mortality in each state and sector under the No Action Option, Preferred Alternative Alternative 4, the average mortality between 2004 and 2012, and the range of catch during this period are presented in Table B-34. There are no Nearshore Rockfish mortality projection models for the trawl and non-nearshore fishery, but based on historical data, mortality in the trawl and non-nearshore fisheries is expected to be trace (Agenda Item C.4.a, Attachment 3, Table 4-13). Mortality in 2013 is not yet available for the nearshore fixed gear fishery, but this information is available for the recreational fishery, which demonstrates that mortality in the most recent year of the recreational fishery was 6.2 mt for Washington, 38.1 mt for Oregon and 9.3 mt for California.

Projections for Nearshore Rockfish for all coastwide sectors north of 40°10′ N. Lat. total 76.7 mt under no action. The average catch for 2004-2012 is 81.6 mt for all sectors combined; results for each state are also provided for comparison under each alternative. The projected mortality under the Preferred Alternative is 80.0 mt without harvest guidelines or interstate coordination of catch tracking and inseason response, making it difficult to reduce mortality to prevent overages against the shared aggregate ACL. The average catch as well as projected mortality under the status quo (SQ) and Preferred Alternative (Table B-34) will exceed the 2015-2016 ACL of 69 mt, indicating that management measures will likely be needed to reduce aggregate mortality. Decisions on the part of the Council relative to allocations will involve tradeoffs potentially affecting fishing opportunity in each state.

The methods used to project mortality for 2015-2016 with methods approved by the SSC in each recreational and commercial fishery are described below:

Nearshore Fixed Gear: The commercial nearshore model projects mortality of overfished species and targeted nearshore species based on the expected (e.g., landings of Nearshore Rockfish, black rockfish, kelp greenling, cabezon, lingcod, and California scorpionfish (S of 40°10'N. latitude.). The nearshore model applies past discard rates (from the WCGOP) to expected landings by depth, along with depth-specific discard mortality rates, to estimate total mortality of discarded and landed nearshore species. The GMT notes that the nearshore commercial bycatch projection model estimates discard of nearshore species based on expected landings coupled with discard rates provided by WCGOP; however, discard rates are based on past management measures. If trip limits (and expected landings) are reduced dramatically, the model may grossly underestimate discard.

Washington Recreational: The Washington recreational model uses historical catch to project total mortality of overfished and Nearshore Rockfish species. Nearshore rockfish projected impacts for this analysis used the historical high catch by species from the 2009 through 2013 time period as the projected impacts under the No Action Alternative. Washington does not have a nearshore commercial fishery so projections of Nearshore Rockfish have not been needed to ensure that catch stays within sector specific allocations. This analysis includes Nearshore Rockfish caught in all recreational fisheries including those targeting salmon and halibut and any restrictions to Nearshore Rockfish retention would be applied to all fisheries. Recreational fishing effort in salmon and halibut fisheries can vary annually contributing to variable encounter rates with Nearshore Rockfish. Using the 2009-2013 high catch to model projected impacts results in more conservative management measures, that are expected to keep catch of Nearshore Rockfish within the range of HG options for the Washington recreational fishery. Catch by month and management area during this time period was used to estimate projected impacts for the WA Nearshore Rockfish complex HG Options. The proportion of Nearshore Rockfish caught by depth and month for each management area was used with current surface release mortality rates to estimate discard mortality by month.

Oregon Recreational: The Oregon recreational catch projection model uses the last 3 years of data in producing projections of Nearshore Rockfish mortality. Table B-34 displays the results of the Oregon recreational model projections of Nearshore Rockfish mortality under Alternative 3.

California Recreational: The California recreational catch projection model used mortality in 2011 and 2012 as the base data for projections. Three options are available for the season structure for the California recreational fishery and the projected mortality of 15.6 mt, 15.4 mt and 6.7 mt, respectively, with the season with the highest projected mortality of Nearshore Rockfish complex displayed in Table B-32.

Table B-34. Projected Nearshore Rockfish complex mortality under the No Action Alternative, the Preferred Alternative, average mortality from 2004-2012 and, allocation under each HG alternative by state and sector (in mt).

Sector	No Action Mortality	Projected Mortality under Preferred Alt	Average Mortality and Range 2004-2012	HG Miles of Coastline Option 2	HG Historical Catch Option 3	HG Hybrid Approach Option 4
Washington Total	**10.5**	**10.5**	**7.44** (4.26 -8.99)	**15.68**	**5.05**	**7.66**
--Recreational Groundfish	*10.5*	*10.5*	*7.44 (4.26 - 8.99)*			
--Directed OA: Nearshore	*NA*[1/]	*NA*[1/]	*NA*[1/]			
Oregon Total	**45.6**	**48.9**	**46.74 (39.03-64.94)**	**29.93**	**37.94**	**36.29**
--Recreational Groundfish	*30.5*	*30.5*	*32.53 (24.88 - 45.88)*			
--Directed OA: Nearshore[2/]	*15.1*	*18.4*	*14.21 (10.57 - 19.06)*			
California Total	**20.6**	**24.5**	**23.87 (15.86 - 34.37)**	**23.15**	**25.76**	**24.80**
--Recreational Groundfish	*11.7*	*15.6*	*11.36 (7.69 -16.14)*			
--Directed OA: Nearshore [3/]	*8.9*	*8.9*	*12.51 (5.16 -21.28)*			
Total All Sectors	**76.7**	**80.0**	**78.06 (61.69 – 95.09)**	**68.75**	**68.75**	**68.75**

1/The state of Washington has not had a commercial nearshore fishery since 1995.

2/For Oregon, projected landings and additional discard mortality for each column are: No Action (15.0 mt + 0.1 mt), Preferred Alternative (18.3 + 0.1 mt), 2004-2012 average (14.21 + .08 mt), Option 1 (9.6 + 0.05 mt), Option 2 (10.7 + 0.06 mt), and Option 3 (10.4 + 0.06 mt).

3/The California commercial blue rockfish mortality estimate for 2008 from PacFIN reflected expansion of a single sample to a value of 21.6 mt, which is not representative of expected mortality from landing receipts from Commercial Fishery Information System totaling 7.8 mt. The projected impacts and average mortality from the PacFIN estimate is provided in brackets.

Management Options

Option 1: No Action: Continue to manage the Nearshore Rockfish complex, holding impacts to the complex level ACL in each region.

Preferred Option: Starting in 2015, the west coast states will be responsible for monitoring and managing catches of Nearshore Rockfish north of 40°10' N. latitude. If harvest levels in a particular state approach 75 percent of the state-specific HGs, which are based on status quo harvest levels, the states will consult via a conference call and determine whether inseason action is needed. In the event inseason action is needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

Option 2: Miles of Coastline: Manage the Nearshore Rockfish complex according to state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting apportionment based on the miles of coastline in each state.

Option 3: Historical Catch: Manage the Nearshore Rockfish complex according to state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting apportionment based on the historical recreational and commercial catch between 2004 and 2012.
Option 4: Hybrid Method: Manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting a hybrid method of apportionment based on miles of coastline for China, quillback and copper rockfish and the historical recreational and commercial catch between 2004 and 2012 for the remaining species.

Data and Examples of Available Management Measures

Washington

Recreational: The Washington recreational fishery was modeled for season structure alternatives necessary to keep total mortality of overfished species within state specific HGs in the draft DEIS. Projected moralities for Nearshore Rockfish were not included in that analysis. Additional management measures needed to keep Nearshore Rockfish catch under the Washington HG alternative are explored here. For the most part, Nearshore Rockfish are not targeted in Washington’s recreational fisheries and retention is incidental while anglers target other groundfish, salmon and halibut. The primary tool analyzed to reduce total mortality of Nearshore Rockfish is non-retention. Projected mortality for Nearshore Rockfish was analyzed based on the season structure under the Preferred Alternative for the Washington recreational fishery. Note that mortality estimates, allocations and projections do not include mortality from the Puget Sound or Strait of Juan de Fuca since they are not managed with the Council process. In addition, mortality from shore based modes are not accounted for in estimates, projections or allocations.

Commercial: Washington has prohibited a commercial nearshore fishery since 1995.

Oregon

Recreational: The Oregon recreational fishery was modeled for various season structure scenarios to keep impacts to overfished species within the sector-specific HGs (canary and yelloweye rockfish) in the DEIS. Mortalities of key non-overfished species, given those season structures, were also projected in the DEIS. Further management measures, such as sub-bag limit or non-retention, will likely be needed to reduce impacts to the Nearshore Rockfish complex. Oregon intends to develop the within-Oregon commercial-recreational split through state processes. Determining which management measures are necessary to stay within that split will also occur through state processes. Note that mortality estimates, allocations and projections do not include mortality from the shore based modes as they have not been sampled in recent years. The mortality in these modes continues, though it is not reflected in estimates or allocations. Since they are excluded from allocations and estimates, it is assumed that the results are consistent with the outcome had they been included in both, though further analysis by the GMT is warranted. Discussion of their inclusion in future estimates or retrospectively for this analysis is a point of consideration for the Council and the GMT in June.

Commercial: The Oregon commercial nearshore fishery was modeled assuming the shoreward RCA at 30 fm for all options. The input for this model is estimated landings of Other Nearshore Rockfish. Discard rates were applied to these estimated landings to project discard of Nearshore Rockfish (based on WCGOP data). Depth-specific mortality rates were then applied to the discarded portion of the catch to estimate discard mortality. Total mortality may then be estimated by summing the landings and estimated discard mortality.

Management measures will likely have to be implemented to reduce mortality of Nearshore Rockfish (including blue rockfish) for each of the harvest guideline options. Under the Preferred Alternative and No Action, state trip limits for vessels with nearshore endorsed black rockfish and blue rockfish permits (i.e., nearshore permitted vessels) would remain at approximately 700 lb per 2-month period for Nearshore Rockfish (not including blue rockfish). Vessels with black rockfish and blue rockfish permits would also be allowed to retain 1,000 to 1,700 lb per period of black rockfish and blue rockfish (combined) under the Preferred Alternative. See the DEIS for more information regarding state permit system.

Landings are monitored closely during the season (i.e., near-real time), which provide the opportunity to implement and evaluate impacts of reduced (or increased) trip limits. Trip limit options may include (a) trip limit reductions to allow for year-around deliveries of Nearshore Rockfish or (b) less severe trip limits during part of the year but at some point, impose no retention (i.e., all Nearshore Rockfish encountered would be discarded). Note that separate blue rockfish trip limits may be considered, because blue rockfish and black rockfish are currently managed under a combined trip limit. It is uncertain at this point (a) when trip limits may be imposed and (b) what the trip limit levels should be under the harvest guideline options.

California

Recreational: The current California recreational catch projection model (RecFISH) was used to project mortality with a given season and depth restriction under each of the Options. These data and analytical methods allowed mortality to be projected from combinations of season lengths and bag limit that keep Nearshore Rockfish mortality within respective harvest guideline under each of the Options. California recreational catch estimates and projections account for mortality in all modes including shore and boat based angling and saltwater areas including bays and estuaries.

Commercial: PacFIN data were used for overall complex landings summaries whereby a simple five-year average (2008-2012) was used as a proxy for mortality estimates. Because PacFIN data were used, PacFIN estimates do not include discard mortality amounts. However, estimated discard mortality for Nearshore Rockfish have been included by using those generated by the nearshore bycatch model. California's Commercial Fishery Information System data were used for nearshore permit license summaries. Last, the GMT's nearshore bycatch projection model was used to estimate overfished species (OFS) mortality in the commercial nearshore fixed gear fishery.
Management measures for the northern California Nearshore Rockfish fishery, currently in place, include a shoreward RCA boundary of 20 fm, trip limits for both black rockfish and the Nearshore Rockfishes as a sub-trip limit of the overall Nearshore Rockfish complex, a state nearshore permit system, and a gear

restriction that limits the number of hooks one may use within one mile of shore. The most obvious management measure change that may need to be considered to achieve necessary mortality reductions would be a reduction in the black rockfish/Other Nearshore Rockfish trip limit structure. Under No Action, the current trip limit is set at 8,500 lb per vessel per bi-monthly period for all six periods. Of that bi-monthly amount, no more than 1,200 lb may be species other than black rockfish. It is this part that needs to be more closely examined as a possible source for a management measure change. A trip limit reduction in this sub-trip limit amount could also partially address concerns regarding the mortality of overfished species. Another trip limit option would be to design trip limits specific to each period rather than have an "across-the-boards" single amount for all six periods. Last, a management measure option could be to have one or possibly two periods closed to fishing. A sub-option to this seasonal closure approach may be to close the fishery for one month in one or more periods.

B.5.1 Comparison of Options under the Preferred ACL Alternative (P* 0.45)

B.5.1.1 **Option 1: No Action**

Continue to manage the Nearshore Rockfish complex, holding impacts to the complex level ACL in each region. Under the No Action Option (Option 1), the Nearshore Rockfish complex would be subject to the ACL for all sectors and states combined. The Nearshore Rockfish complex is stratified at 40°10′ N. Lat. with an ACL of 69 mt to the north and 1,049 mt to the south in 2015 with a P* of 0.45 under the preferred specifications.

Fishing Activity under Option 1 (No Action)

Washington

Recreational: Under the No Action Alternative, 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. Washington has a 12 fish daily bag limit with sub bag limits of 10 rockfish, 2 lingcod and 1 (northern management area) or 2 (southern management areas) cabezon. Depth restrictions are the primary tool used to keep overfished species impacts below state HGs. Depth restrictions are more sever in the area north of the Queets River (Marine Area 3 and 4) where encounters with yelloweye and canary rockfish are the greatest. Management measures under the Preferred Alternative differ only slightly from the No Action Alternative. Under the Preferred Alternative, 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 fm in the area south of 46°58 N. latitude 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.

Commercial: Closed

Oregon

Recreational: Currently the recreational fishery has a 10-fish marine bag limit in Federal regulations. State regulations have reduced that bag limit to 7 fish. The fishery is open to all depth January-March and October-December and restricted to inside of 40 fm (30 fm in state rule) April-September. Blue rockfish has a state-specified landing cap and is tracked separately from the other Nearshore Rockfish. Other Nearshore Rockfish also have a state-specified landing cap (13.6 mt), in place since 2002, and are tracked inseason. When the landing cap of either are approached the state takes inseason action, usually going to non-retention of that species or group, while the remainder of the fishery season structure and regulations remain unchanged.

Commercial: As of 2014, state-specified landing caps for the commercial nearshore fishery are 14.2 mt (Other Nearshore Rockfish excluding blue rockfish) and 137.9 mt (black rockfish and blue rockfish combined). The number of limited entry permits currently issued is 51 for black and blue rockfish without the nearshore endorsement and 70 for black and blue rockfish with the nearshore endorsement. Management measures for the Oregon commercial fishery under No Action would be similar to those described for the Preferred Alternative (see the DEIS). The RCA may remain at 30 fm because impacts to overfished species are projected to fall below the Oregon share for yelloweye rockfish and canary rockfish. Trip limits will remain low for non-permitted vessels (see DEIS) to cover incidental catch of certain nearshore species (e.g., 15 lb per trip of black rockfish, blue rockfish, Other Nearshore Rockfish, and other nearshore species for vessels using legal commercial nearshore fishing gear; other trip limits are available for incidental catch in salmon troll fisheries and in trawl fisheries). State-regulated trip limits for permitted vessels would likely remain at current levels (i.e., 700 lb per period of Nearshore Rockfish complex, excluding blue rockfish, and 1,000 lb to 1,700 lb per period for black rockfish and blue rockfish combined (Table B-35). These limits are lower than those shown in Federal regulation.

Table B-35. Oregon commercial nearshore trip limits (No Action) for permitted vessels during 2014. Limits for vessels without black rockfish and blue rockfish permits, and those without a nearshore endorsement, are much lower than shown below to accommodate incidental catch (see DEIS). These trip limits are more conservative than those shown in Federal regulation.

Oregon Commercial Nearshore Trip Limits (lb; 2014)	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Black rockfish + blue rockfish	1,000	1,200	1,700	1,600	1,200	1,000
Other Nearshore Rockfish (excluding blue rockfish)	700	700	700	700	700	700

California

Recreational: Currently the recreational fishery is subject to a 10 fish Rockfish Cabezon and Greenling bag limit with restricted seasons and depths in each of 5 management areas to limit mortality on overfished and target stocks. The season length in the California recreational fishery under the status quo ACL Alternative in the Northern Management Area is May 15th to October 31st with a depth restriction of 20 fm to keep mortality of yelloweye rockfish below the HG for the recreational fishery. Under the Preferred ACL Alternative, California recreational season and depth restriction Option 1 would allow a March 1 to December 31 season and 20 fm depth restrictions given harvest limits/guidelines on overfished and target stocks in 2015-2016, without limitations from a state Nearshore Rockfish complex HG.

Commercial: At present, the Nearshore Rockfish complex is managed in four regions: the North Coast Region is from 42° N. Lat. (the Oregon-California border) to 40°10' N. Lat. (near Cape Mendocino). Current trip limits and open and closed periods in each region are provided in Table B-36 below. Depth restrictions vary by region with a 20 fm depth restriction to the north of 40°10′ N. Lat., 30 fm south to Point Conception at 34°27′ N. Lat. and 60 fm south of 34°27′ N. Lat.. Currently gear restrictions restrict fishery participants to 15 hooks per line with no more than 150 hooks in use to take nearshore fish stocks within one mile of shore within certain Fish and Wildlife Districts. In addition, the fishery is a subject to a state restricted access permit system for the shallow nearshore fishery. To enter this shallow nearshore fishery, two existing permits must be purchased and transferred to a new participant within the same management region; one of those permits must then be surrendered back to the Department. The intent of this method is to achieve capacity goals for the fishery and reduce participation relative to historical levels to help prevent overharvest. There are no transferable permits for the deeper Nearshore Rockfish fishery, preventing new entry at the present.

Most fish are sold live for a premium relative to dead fish. This creates an impetus to fish in shallower depths where mortality is lower compared to deeper depths, thus discards are subject to a relatively low mortality compared to depths greater than 30 fm where discards are deemed 100 percent dead.

Notwithstanding the options presented in this analysis, a major factor that influenced fishing activity in California's northern management region was the change of the RCA shoreward boundary from 30 fm to 20 fm to avoid yelloweye rockfish encounters, beginning in 2009. The effects of this boundary change are apparent when examining the commercial landings over the past decade (Figure B-20). California's northern commercial fishery experienced a 55 percent decrease in harvest from 2008 to 2009 and a 39 percent decrease from 2009 compared to 2010.

Table B-36. California commercial Federal cumulative two-month trip limits (No Action) for 2014 that apply to the vessel and to the permit holder for the shallow and deeper Nearshore Rockfish sectors. Trip limits per two-month period (reported in lb) are the same for both the Federal limited entry and open access entry sectors used by the state's restricted access Nearshore Rockfish fishery program.

NORTH Between 42° and 40°10' N. Lat.	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Black rockfish + Nearshore Rockfishes. No more than 1,200 lb of which may be species other than black rockfish (applies to all periods)	8,500	8,500	8,500	8,500	8,500	8,500

Note: For the shallow nearshore fishery, permit holders may catch and land the two-month trip limit only in the region in which their permit is issued. Holders of a deeper Nearshore Rockfish permit may catch and land deeper Nearshore Rockfish anywhere in the state where and when fishing is permitted.

Biological Impacts under Option 1 (No Action)

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 1 are summarized in Table B-37. Further description of the mortality in each state and sector is provided in the text below.

Table B-37. Projected Nearshore Rockfish mortality (mt) north of 40°10′ N. Lat. from each state and sector under Option 1 (No Action).

<table>
<tr><th rowspan="3"></th><th colspan="2">Washington</th><th colspan="2">Oregon</th><th colspan="2">California</th><th rowspan="2">Grand Total</th></tr>
<tr><th>Rec</th><th>Com</th><th>Rec</th><th>Com</th><th>Rec</th><th>Com</th></tr>
<tr><td>10.5</td><td>Closed</td><td>30.5</td><td>15.1</td><td>11.7</td><td>8.9</td><td rowspan="2">76.7</td></tr>
<tr><td>State Total</td><td colspan="2">10.5</td><td colspan="2">45.6</td><td colspan="2">20.6</td></tr>
</table>

Washington

Recreational: Projected mortality of the Nearshore Rockfish complex under the No Action Option and Preferred Alternative is 10.5 mt. Season length and structure are the same for both alternatives.

Commercial: Closed

Oregon

Recreational: The projected landings under the No Action Option for blue rockfish is 17.5 mt, for other Nearshore Rockfish 13.0 mt, for total Nearshore Rockfish mortality of 30.5 mt.

Commercial: The projected landings of Nearshore Rockfish under the No Action Option is 15.0 mt in aggregate, and consists of blue rockfish (4.6 mt) and the remaining species of Nearshore Rockfish (10.4 mt). The nearshore projection model provides an additional estimate of discard mortality at 0.07 mt (blue rockfish and other Nearshore Rockfish combined), resulting in a total mortality of 15.07 mt for Nearshore Rockfish complex in the Oregon nearshore commercial fishery. This is lower than shown under the Preferred Alternative (see the DEIS), where projected landings are 18.3 mt for Nearshore Rockfish (and additional discard mortality projected at 0.1 mt).

California

Recreational: The aggregate mortality of Nearshore Rockfish complex in the Northern Management Area under the No Action Option would be 11.7 mt of which 2.5 mt would be blue rockfish. Under the Preferred Alternative ACL a season length as long as March 1 – December 31 could be accommodated, which would result in an aggregate mortality of Nearshore Rockfish complex of 15.6 mt of which 3.3 mt would be blue rockfish.

Commercial: The aggregate mortality in the Nearshore Rockfish complex under the No Action Option is projected to be 8.9 mt. This aggregate does not include black rockfish. In the north, blue rockfish take is expected to be 4.9 mt out of the 8.9 mt aggregate total.

Projected Overfished Species Mortality under Option 1 (No Action)

Washington

Recreational: The projected overfished species mortality under the No Action Option and the season structure under the Washington recreational Preferred Alternative is 2.83 mt of yelloweye rockfish and 0.75 mt of canary rockfish which are below the Washington recreational HG.

Commercial: Closed

Oregon

Recreational: The projected overfished species mortality under the No Action Option is 2.2 mt of yelloweye rockfish and 3.2 mt of canary rockfish, the same as under the Preferred Alternative. These projections are below the sector-specific HG.

Commercial: The projected overfished species mortality under No Action Option is 0.8 mt of yelloweye rockfish and 0.9 mt of canary rockfish. These projections are slightly different than shown under

Preferred Alternative, where yelloweye rockfish mortality was projected at 0.9 mt and canary rockfish mortality was projected at 1.1 mt. These projections are equal to or less than the Oregon catch share.

California

Recreational: The overfished species mortality projected to accrue under the No Action Option are 1.7 mt of yelloweye rockfish, 16.3 mt of canary rockfish, 100.1 mt of bocaccio and 1.0 mt of cowcod. Under the Preferred Alternative overfished species mortality projected to accrue are 2.9 mt of yelloweye rockfish, 19.8 mt of canary rockfish, 117.6 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: The overfished species mortality projected to accrue under the No Action Alternative for north of 40°10' N. Lat. are 0.3 mt of yelloweye rockfish, 0.7 mt of canary rockfish, 0.4 mt of bocaccio and 0.0 mt of cowcod. Under the Preferred Alternative, overfished species mortality projected to accrue are 0.2 mt of yelloweye rockfish, 0.5 mt of canary rockfish, 0.4 mt of bocaccio and 0.0 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Stock Status

Nearshore Rockfish

None of the stocks of nearshore species are currently deemed overfished. Recent aggregate mortality for all sectors has perennially exceeded the 2015-2016 ACL of 69 mt in all but two of nine years between 2004 and 2012 (Table B-32). Steps to reduce mortality should be taken to prevent further overharvest relative to 2015-2016 ACLs and reduce the potential for stocks to be harvested down to overfished status.

Overfished Species

The mortality of overfished species is projected to remain below their respective harvest limits/guidelines. Thus the stock status and rebuilding plans for overfished species are not expected to be adversely affected under No Action Option 1.

Socioeconomic Impacts under Option 1 (No Action)

Washington

Recreational: Under the No Action Option, and the season structure under the Washington recreational Preferred 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 fm 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. Under the No Action Alternative, angler trips are expected to be similar to what was seen in 2013 and 2014.

Commercial: Closed

Oregon

Recreational: Under the No Action Option, the season structure, bag limits, and most other management measures will remain the same as in 2013 and 2014. Therefore, angler trips and associated expenditures are expected to remain similar to what was seen in 2013 and 2014.

Commercial: Under the No Action Option, landing caps, trip limits, and RCA boundaries are expected to remain the same as in 2013 and 2014. Therefore, trips, expenditures, landings, and revenues are expected to remain similar to that seen in 2013 and 2014. Note that even though management measures would remain similar between Preferred Alternative and No Action, landings of Nearshore Rockfish under Preferred Alternative (18.3 mt) may be higher than that shown under No Action (15.0 mt).

California

Recreational: Under the No Action Option the season and depth restrictions will remain the same as in 2014, but 4.5 months of additional fishing opportunity (4,379 angler trips) would be forgone in the Northern Management Area relative to what could be afforded given the harvest specifications and allocations of overfished and target stocks in 2015-2016 under the Preferred Alternative ACL.

Commercial: Under the No Action Option the state restricted access permit system, Federal trip limits, season and depth restrictions will remain the same as in 2014. However, routine inseason adjustments could be recommended by the Council if any of the fishery sectors displayed harvest behavior that deviate substantially from the expected amounts. As a result, no adversely affected changes to the socio-economic interests of coastal communities would be anticipated.

B.5.1.2 **Preferred Option**

Starting in 2015, the west coast states will be responsible for monitoring and managing catches of Nearshore Rockfish north of 40°10' N. latitude. If harvest levels in a particular state approach 75 percent of the state-specific HGs (Table B-38), which are based on status quo harvest levels, the states will consult via a conference call and determine whether inseason action is needed. The HGs for Washington and Oregon would be state HGs and not established in Federal regulations. In California, the HG would be specified in Federal regulation and apply only in the area 40°10' N. latitude to 42° N. latitude. In the event inseason action is needed, the states of Washington and Oregon would take action through state regulation. California would propose changes through Federal regulations. Inseason updates would be provided to the Council at the September and November meetings.

Table B-38. Annual state-specific harvest guidelines (HGs) for the Nearshore Rockfish complex north of 40°10' N. latitude for 2015-2016, and 75 percent of each HG that would trigger consultation and coordination.

	Harvest Guideline	75% of HG
Washington a/	10.5	8
Oregon a/	48.4	36
California b/	23.7	18
Total	82.6	62.0

a/ The values for Washington and Oregon would be state HGs.
b/The California HG would be specified in Federal regulation and apply only in the area 40°10 N. latitude to 42° N. latitude.

B.5.1.3 **Option 2: Miles of Coastline**

Option 2 is to manage the Nearshore Rockfish complex according to state-specific harvest guidelines stratified north and south of 40°10′ N. Lat., with apportionment north based on the miles of coastline in each state as reflected in Table B-39. The 3 nm state boundary was measured as the proxy for miles of coastline.

Table B-39. Allocations of Nearshore Rockfish north of 40°10′ N. Lat. under Option 2 derived using miles of coastline in each state.

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
Total	68.76				15.68	29.93	23.15

Fishing Activity under Option 2 Compared to Option 1 (No Action)

Washington

Recreational: The Washington HG under Option 2 is 15.68 mt which is higher than the project impacts Under No Action (Option 1). Therefore, the Washington recreational fishery would operate under the season structure described under the Preferred Alternative with no additional management measures needed to keep the catch of Nearshore Rockfish under the Washington HG for this HG Option.

Commercial: Closed

<u>Oregon</u>

Under Option 2, the Oregon Nearshore Rockfish complex harvest guideline is lower than the current combined commercial and recreational state-specified landing caps and average annual catches. We showed above that expected Nearshore Rockfish mortality for Oregon fisheries combined is 45.6 mt for No Action and 48.9 mt for Preferred Alternative. The Oregon harvest guideline under this option is 29.9 mt (Table B-39), or 34 percent lower than expected mortality under No Action and 39 percent lower than expected under Preferred Alternative. State landing caps for both commercial and recreational fisheries will have to be reduced dramatically to accommodate this lower target. It is the GMT's understanding that Oregon intends to develop the commercial-recreational split of the Oregon HG through subsequent state processes.

Recreational: Once the state determines the sector-specific allocation, management measures will need to be examined, then implemented through state rules. A preliminary examination of possible management measures has begun. A bag limit analysis revealed that the majority of anglers encounter less than one Nearshore Rockfish per trip. Therefore changes in bag limit will likely not be a viable option. The likely measure will be non-retention for some months of the fishing season, incorporating discard mortality for the non-retention months into the impact projections. Since most anglers encounter less than one Nearshore Rockfish per angler trip and they are generally not targeted, prohibiting retention during certain months, is not expected to influence the number of angler trips, how often, when or where anglers go fishing. It may require anglers to be on the water longer to fill their daily bag limit, however since the majority of anglers do not fill their entire bag each day, this is anticipated to have minimal impacts.

Commercial: Under Option 2, the RCA depth restriction of 30 fm would remain in place because projected catch of overfished species would remain at or below the Oregon catch share. Measures other than depth management will have to be implemented to reduce the mortality of Nearshore Rockfish (including blue rockfish) under this option. For example, under No Action, the commercial fishery was projected to land 15 mt of Nearshore Rockfish (including blue rockfish), resulting in total mortality of 15.1 mt, including discard. Using proportions of current landing caps and average landings between Oregon recreational and commercial fisheries (see Preferred Alternative in the DEIS), the Oregon commercial fishery would receive 9.6 mt of Nearshore Rockfish (including blue rockfish), or a reduction of 36 percent relative to No Action and a 48 percent reduction relative to Preferred Alternative. These reductions may require lower trip limits, periods of non-retention, or some combination of the two. In addition, a new and separate landing cap and trip limit for blue rockfish may be required to remain within the harvest guideline under Option 2 (currently, blue rockfish is managed using landing caps and trip limits in combination with black rockfish).

It should be pointed out that trip limit reductions may not equate to a 1:1 reduction in total landings. In other words, if it were required to reduce landings by 36 percent, then it may be necessary to reduce trip limits by much more than 36 percent relative to No Action. In most fisheries, relatively few individuals or vessels reach trip limits. Most vessels land somewhat less than trip limit levels. As such, if trip limits were solely used to reduce landings, and if the Oregon recreational to commercial ratio (split) remained the same as under No Action, then trip limit reductions would likely have to be much more than 36 percent (i.e., trip limits for this fishery would need to be much lower than 700 lb x 0.64 = 448 lb per period under Option 1). There are other considerations that industry and Oregon Department of Fish and Wildlife (ODFW) staff must discuss and analyze before effective trip limits can be identified. For example, impacts of trip limits vary with the season in which they are applied. Finally, trip limits can be applied along with periods of non-retention, which will alter the level of the trip limit needed. Preferences by the Oregon nearshore fleet need to be identified and additional modeling is required before more specificity can be provided.

California

Recreational: Under Option 2, 23.15 mt would be allocated to California, of which, the recreational catch share is 12.9 mt, accommodating a May 1 to October 31 season with a 20 fm depth restriction in the Northern Management Area. While this would provide an additional half month of fishing opportunity relative to the status quo, the recreational fishing season would have to be reduced by four months relative to the longest season under the Preferred Alternative of March 1 to December 31st. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish species during part of the season.

Commercial: Under Option 2 the RCA depth restriction of 20 fm would remain in place as well as the trip limit structure. Because the Nearshore Rockfish complex harvest has been at or below the ACLs in recent years (see Figure (cite the correct figure)), it is not anticipated that Option 2 will have an adverse effect on the northern Nearshore Rockfish fishery; thus fishing activity is expected not to change. However, trip limit reductions could be implemented should the need arise, with possible decreases that may be as much as 30 percent less than the current trip limit amount. Another possibility to be considered is to have period closures. Additionally, California's northern management region is somewhat isolated from the adjacent region(s). Because of this, northern region participants tend not to fish in other management regions (for those holding a deeper Nearshore Rockfish permit), nor would they be likely to because the trip limits for the northern region are higher than any of the other regions. Also, it is not expected that holders of a deeper Nearshore Rockfish permit, who may also hold a shallow permit in any of the other southerly regions, would travel to the northern management region to fish because they would only be allowed to catch and land the deeper Nearshore Rockfishes – their shallow nearshore permit would not be valid north of 40°10' N. Lat.. In effect, it would probably not be economically justifiable for them to fish north of 40°10' N. latitude.

Biological Impacts Under Option 2 Compared to Option 1

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 2 are summarized in Table B-40. Further description of the mortality in each state and sector is provided in the text below.

Table B-40. Projected Nearshore Rockfish mortality (mt) north of 40°10′ N. Lat. from each state and sector under Option 2 (miles of coastline). Sector-specific allocations within states are provided as an example and are based on No Action. These intra-state allocations are subject to change.

	Washington		**Oregon**		**California**		**Total**
	Rec	**Com**	**Rec**	**Com**	**Rec**	**Com**	
Mortality	10.5	Closed	20.3	9.6	12.6	10.3	63.3
State Total	10.5		29.9		22.9		
Allocation	15.68		29.93		23.15		69
Projected Percent Attainment	66.9%		100%		98.9%		91.7%

Washington

Recreational: Under Option 1 the projected Washington recreational catch falls below the Washington HG of 15.68 mt with catch projected to be 10.5 mt. No negative biological impacts are expected.

Commercial: Closed

Oregon

Recreational: Under this option impacts to Nearshore Rockfish will need to be reduced. Oregon intends to allocate between the commercial and recreational sectors, and take management measures to stay within those allocations, through subsequent state processes. The most likely management measure will be non-retention of Nearshore Rockfish for some months of the fishing season. Table B-41 below shows the projected landings under the preferred season structure and the projected discard mortality from non-retention by month of the other Nearshore Rockfish and blue rockfish. Both are calculated on a month by month basis, as that is the smallest time unit currently available in the Oregon recreational model. To project total impacts, and determine which months might need to have non-retention, the landings for months open are added to the release mortality for non-retention months.

Table B-41. Oregon recreational fishery impacts (in mt) by month under preferred season structure and non-retention for the Nearshore Rockfish.

Projections	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Other Nearshore Rockfish												
Landings under SQ regulations	0.19	0.24	0.58	0.90	1.64	2.13	2.59	2.91	1.22	0.43	0.10	0.06
Non-retention release mortality	0.08	0.10	0.23	0.33	0.61	0.79	0.96	1.08	0.45	0.17	0.04	0.03
Blue Rockfish												
Landings under SQ regulations	0.27	0.34	0.82	1.25	2.24	2.90	3.54	3.98	1.66	0.61	0.14	0.09
Non-retention release mortality	0.27	0.11	0.27	0.39	0.70	0.91	1.10	1.24	0.52	0.21	0.05	0.03

As one example, non-retention in the months of July and August would reduce impacts of other Nearshore Rockfish species (not including blue rockfish) from 13 mt to 9.5 mt, or a 27 percent reduction. It is the GMT's understanding that Oregon intends to go through their public process to get angler input on which months to have non-retention.

Commercial: Under this option, commercial management measures will be applied to reduce Nearshore Rockfish mortality to 9.6 mt (including blue rockfish), or a 36 percent reduction relative to No Action (and 48 percent reduction relative to Preferred Alternative). This value may change depending on decisions regarding the Oregon recreational-commercial split. Regardless of the management measure applied (e.g., trip limits and/or non-retention), mortality will be reduced. Therefore, no negative biological impacts are expected under this option.

California

Recreational: The projected mortality on Nearshore Rockfish under Option 2 with a May 1 to October 31 season in the Northern Management Area with a 20 fm depth restriction is 12.6 mt of which 2.8 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 12.9 mt under this option.

Commercial: No anticipated negative biological impacts are expected for this option compared to Option 1. Because this option (as well as Options 3 and 4) could require reductions in harvest, biological impacts could actually be reduced to a small degree depending upon the amount of the reduction. Since California's northern fishery has taken less than 10 mt per year on average during the past five years, resultant decreases would be small.

Projected Overfished Species Mortality

Washington

Recreational: Projected overfished species impacts under this Option are the same as for the season structure under the Washington recreational Preferred Alternative.

Commercial: Closed

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than 0.01 percent increase in canary and yelloweye rockfish impacts, assuming no other changes to angler behavior.

Commercial: Under Option 2, if fishermen behavior remains the same as under No Action regarding fishing locations and fishing methods, but increased discarding of Nearshore Rockfish becomes necessary, then mortality of overfished species will remain unchanged relative to No Action. If, on the other hand, selection of fishing locations changes dramatically because of changes in trip limits or required non-retention of Nearshore Rockfish, then overfished species impacts may increase or decrease, depending on geographic locations selected. The direction or level of this potential change in catch of overfished species cannot be predicted in this analysis.

California

Recreational: Assuming season lengths under Option 1 of the Preferred Alternative in Management Areas south of 40°10′ N. Lat. and the May 1 to October 31 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 2 are 2.7 mt of yelloweye rockfish, 21.4 mt of canary rockfish, 118.3 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: Mortality of canary and yelloweye rockfish has been near the respective allocation amounts for these two species. As such, under Option 2 (as well as Options 3 and 4), projected mortality may have to be reduced. Using the nearshore bycatch model as a predictor, decreases in the black rockfish component may need to be considered as a means to achieve the necessary projected mortality decreases for these two overfished species so as to not exceed their allocations.

Stock Status

Nearshore Rockfish

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 2.

Overfished Species

Under Option 2 (miles of coastline), the overfished species mortality is expected to be below the harvest limits/guidelines. Thus stock status and rebuilding plans would not be adversely affected by management measures under Option 2.

Socio-economic Impacts compared to Option 1

Washington

Recreational: The socio-economic impacts would be the same under this Option compared to the No Action Option. Socio-economic impacts would continue to be driven by management measures necessary to keep the Washington recreational fishery within the Washington HG for yelloweye and canary rockfish. Recreational fishing effort is expected to be the same under Option 2 as under the management measures and season structure for the Washington recreational Preferred Alternative.

Commercial: Closed

Oregon

Recreational: Since most anglers encounter less than one Nearshore Rockfish per angler trip and they are generally not targeted, management measures necessary to reduce mortality of Nearshore Rockfish species is not expected to impact angler behavior, angler trips, nor any other socio-economic indicators. However, additional outreach and education on species identification will likely be necessary to help anglers stay within retention/non-retention regulations. It is impossible to predict how the additive impact of adding this regulation to others already in place might impact anglers' decisions on fishing activities.

Commercial: It is uncertain whether fishing behavior (i.e., fishing location and fishing gear) will change under this option relative to No Action (see above). However, if allocations remain the same between Oregon recreational and commercial fisheries, then landings may be reduced from 15.0 mt (No Action) to between 9.6 mt (maximum, if reduced trip limits resulted in avoiding Nearshore Rockfish altogether resulting in no discards, which is unlikely) to 7.2 mt (if encounters were similar to No Action and discarding was necessary, some of which will not survive. The 2013 price per pound for Other Nearshore Rockfish (weighted average including blue rockfish) was $3.80 per pound for Oregon nearshore fisheries (PacFIN). Under the potential scenarios shown here, lost ex-vessel revenue may range from $45,238 to $65,344 relative to No Action (the loss is higher relative to Preferred Alternative). Additional impacts may be incurred by vessels and crew if the decision is made to fish in less productive areas to avoid Other Nearshore Rockfish, for example. If such of a choice is made, then it may require extra time and fuel to catch other targeted species relative to No Action.

California

Recreational: Under Option 2, the season length would increase by a half month (205 angler trips) relative to the status quo fishery in the Northern Management Area, but the season would be reduced by four months (4,175 angler trips) relative to the longest proposed season with the Preferred Alternative ACLs (Option 1) resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: The northern commercial fishery is still recovering from the 2011 tsunami event and the loss of buyers during the past year or two. Currently, there is only one major active buyer in Crescent City. The economic structure of the northern area (essentially only Crescent City) is in a rebuilding phase with no expected time frame, at the present, that predicts when a return to status quo would be reestablished. This, however, is not a result of the options themselves, but an artifact of unavoidable events that have impacted this area. (See also the comments in the Change in Fishing Activity section, above.)

B.5.1.4 **Option 3 Historical Catch**

Option 3 is to manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting apportionment based on the recreational and commercial historical catch between 2004 and 2012 reflected in Table B-42.

Table B-42. Allocations of Nearshore Rockfish north of 40°10′ N. Lat. under Option 3 (historical catch) derived using the historical recreational and commercial catch between 2004 and 2012.

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black-and- yellow	0.01	0	0.21	0.79	0	0	0.01
Blue (CA)	17	NA	NA	1	0	0	17
Blue (OR & WA)	26.94	0.06	0.94	NA	1.67	25.27	0
Brown	1.75	0	0.08	0.92	0	0.14	1.61
Calico	0	NA	NA	NA	0	0	0
China	6.2	0.18	0.68	0.14	1.13	4.21	0.86
Copper	9.71	0.13	0.53	0.34	1.24	5.14	3.34
Gopher	0	0	0.29	0.71	0	0	0
Grass	0.55	0	0.49	0.51	0	0.27	0.28
Kelp	0.01	NA	NA	NA	0	0	0
Olive	0.26	0	0.03	0.97	0	0.01	0.25
Quillback	6.15	0.16	0.47	0.36	1.01	2.91	2.23
Treefish	0.18	0	0	1	0	0	0.18
Total					5.05	37.94	25.76

Fishing Activity under Option 3 Compared to Option 1

Washington

Recreational: The Washington recreational fishery would operate under season structure and management measures described under the Preferred Alternative. However because the Washington HG under Option 3 is lower than the historical catch, additional management measures would be needed to keep Nearshore Rockfish catch under the Washington HG for this option. To keep total mortality under the Washington HG, retention of Nearshore Rockfish would not be permitted for a portion of the year. Attainment of the Washington HG under this alternative is projected to occur by June 1 with retention of Nearshore Rockfish prohibited for the remaining 7 months of the year. Alternate combinations of months when Nearshore Rockfish would be prohibited may be explored.

Commercial: Closed

Oregon

Under Option 3, the Oregon Nearshore Rockfish complex harvest guideline is lower than the current combined commercial and recreational state-specified landing caps and average annual catches, but higher than Option 2. We showed under No Action for Nearshore Rockfish that the expected mortality for recreational and commercial fisheries combined is 45.6 mt (the expected mortality under Preferred Alternative is 48.9 mt). The Oregon harvest guideline under this option is 37.9 mt (Table B-42), 17 percent lower than expected mortality under No Action, and 22 percent lower than expected mortality under Preferred Alternative. State landing caps for both commercial and recreational fisheries will have to be reduced to accommodate this lower target. As noted under Option 2, Oregon intends to develop or modify the commercial-recreational split of the Oregon HG through state processes.

Recreational: Similar to Option 2, a combination of months of retention and months of non-retention will likely be required to keep impacts within the Oregon recreational HG.

Commercial: Similar to No Action, the RCA depth restriction of 30 fm would remain in place. However, as shown for Option 2, trip limits and/or no-retention may be needed to reduce mortality relative to No Action or Preferred Alternative. Trip limit reductions will be less severe than shown under Option 2. For example, using proportions of current landing caps and average landings between Oregon recreational and commercial fisheries (see Preferred Alternative in the DEIS), the Oregon commercial fishery would receive 11.2 mt of Nearshore Rockfish (including blue rockfish), or a reduction of 25 percent relative to No Action and a reduction of 39 percent relative to Preferred Alternative. This reduction may require either lower trip limits, periods of non-retention, or some combination for Nearshore Rockfish (excluding blue rockfish), along with a separate landing cap and separate trip limit for blue rockfish (see Option 2 for more details).

As shown for Option 2, trip limit reductions may not equate to a 1:1 reduction in total landings. In other words, if it were required to reduce landings by 25 percent, then it may be necessary to reduce trip limits by more than 25 percent. If trip limits (and/or non-retention) were solely used to reduce landings, and if the Oregon recreational-commercial allocation remained the same as under No Action, then trip limit reductions would likely have to be much lower than 700 lb x 0.75 = 525 lb per period. How much lower is uncertain. ODFW staff will meet with industry to identify most preferred management measures, and subsequent trip limit modeling will be performed based on options selected. See Option 2 for more details.

California

Recreational: Under Option 3, 25.3 mt would be allocated to California, of which the recreational catch share is 14.07 mt, accommodating a April 15 to December 31 season with a 20 fm depth restriction in the Northern Management Area. While this would provide an additional three months of fishing opportunity relative to the status quo, the recreational fishing season would have to be reduced by one and a half months relative to the longest season under the Preferred Alternative of March 1 to December 31st. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish species during part of the season.

Commercial: Same as Option 2.

Biological Impacts Under Option 2 Compared to Option 1

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 3 are summarized in Table B-43. Further description of the mortality in each state and sector is provided in the text below.

Table B-43. Projected Nearshore Rockfish mortality (mt) north of 40°10′ N. Lat. from each state and sector under Option 3 (historical catch). Sector-specific allocations within states are provided as an example and are based on No Action. These intra-state allocations are subject to change.

	Washington		**Oregon**		**California**		**Total**
	Rec	Com	Rec	Com	Rec	Com	
Mortality	5.1	Closed	26.8	11.2	14.2	11.45	68.7
State Total	5.1		37.9		25.7		
Allocation	5.05		37.94		25.76		68.75
Projected Percent Attainment	100%		100%		99.7%		99.9%

Washington

Recreational: Under Option 3, additional management measures will be implemented to reduce Nearshore Rockfish mortality in the Washington recreational fishery by approximately 52 percent compared to Option 1 (No Action).

Commercial: Closed

Oregon

Recreational: Under Option 3, similar to Option 2, non-retention will likely be required to keep impacts within the Oregon recreational HG. Table B-41 has the projections by month for the Nearshore Rockfish complex minus blue rockfish for retention and non-retention.

Commercial: Under this option, commercial management measures will be applied to reduce Nearshore Rockfish mortality to 11.2 mt, or a 25 percent reduction relative to No Action and 39 percent reduction relative to Preferred Alternative. This value may change depending on decisions regarding the Oregon recreational-commercial spit. Regardless of the management measure applied (e.g., trip limits are non-retention), mortality will be reduced. Therefore, no negative biological impacts are expected under this option.

California

Recreational: The projected mortality on Nearshore Rockfish under Option 3 with an April 15 to December 31 season with a 20 fm depth restriction in the Northern Management Area is 14.2 mt, of which 3.0 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 14.35 mt under this option.

Commercial: The projected mortality on Nearshore Rockfish under Option 3 is estimated to be 5.6 mt with no other management changes implemented.

Projected Overfished Species Mortality

Washington

Recreational: No additional overfished species mortality is projected compared to the No Action Alternative.

Commercial: Closed

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than 0.01 percent increase in canary and yelloweye rockfish impacts. This assumes no other changes to angler behavior.

Commercial: Same as Option 2.

California

Recreational: Assuming season lengths under Option 1 of the Preferred Alternative in Management Areas south of $40^{o}10'$ N. Lat. and the April 15 to December 31 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 3 are 2.8 mt of yelloweye rockfish, 21.4 mt of canary rockfish, 118.3 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: Same as Option 2.

Stock Status

Nearshore Rockfish

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 3.

Overfished Species
The projected mortalities of overfished species under Option 3 are the same as No Action (Option 1), which are below the respective harvest limits/guidelines. No adverse effects on stock status or rebuilding progress are expected under Option 3.

Socio-economic Impacts under Option 3 compared to Option 1

Washington

Recreational: Socio-economic impacts would continue to be affected by management measures necessary to keep the Washington recreational fishery within the Washington HG for overfished species (yelloweye and canary rockfish). In addition, under Option 3, recreational fishing opportunity would be further reduced. Prohibiting retention of Nearshore Rockfish for a portion of the season on top of other management measures already in place to protect overfished species may discourage angler participation in recreational fisheries. While it's difficult to predict angler behavior, any reduction in angler fishing effort will have negative socioeconomic impacts.

Commercial: Closed

Oregon

Recreational: Same as under Option 2 and Option 1 (No Action).

Commercial: It is uncertain whether fishing behavior (i.e., fishing location and fishing gear) will change under this option relative to No Action (see Option 2 above). However, if allocations remain the same between Oregon recreational and commercial fisheries, then landings may be reduced from 15.0 mt (No Action) to between 11.2 mt (maximum, if reduced trip limits result in avoiding Nearshore Rockfish altogether causing no discards, which is unlikely) to approximately 9.5 mt (if encounters were similar to No Action and discarding was necessary, some of which will not survive). The 2013 price per pound for Nearshore Rockfish (weighted average including blue rockfish) was $3.80 per pound for Oregon nearshore fisheries (PacFIN). Under the potential scenarios shown here, lost ex-vessel revenue may range from approximately $31,834 to $46,076 relative to No Action (the loss is higher relative to Preferred Alternative). Additional impacts may be incurred by vessels and crew if the decision is made to fish in less productive areas to avoid Nearshore Rockfish, for example. If such of a choice is made, then it may require extra time and fuel to catch other targeted species relative to No Action.

California

Recreational: Under Option 4, the season length would increase by three months (1,825 angler trips) relative to the status quo fishery in the Northern Management Area, but the season would be reduced by one and a half months (2,555 angler trips) relative to the longest season afforded under the Preferred Alternative ACLs (Option 1), resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: Same as Option 2.

B.5.1.5 **Option 4 Hybrid Method**

Option 4 is to manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting a hybrid method of apportionment based on miles of coastline for China, quillback and copper rockfish and the historical catch between 2004 and 2012 for the remaining species reflected in Table B-44.

Table B-44. Allocations of Nearshore Rockfish north of 40°10′ N. Lat. under Option 4 derived using miles of coastline for China, quillback and copper rockfish and the historical recreational and commercial catch between 2004 and 2012 for the remaining species.

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black-and-yellow	0.01	0	0.21	0.79	0	0	0.01
Blue (CA)	17	NA	NA	1	0	0	17
Blue (OR & WA)	26.94	0.06	0.94	NA	1.67	24.27	0
Brown	1.75	0	0.08	0.92	0	0.14	1.61
Calico	0	NA	NA	NA	0	0	0
China	6.2	0.26	0.49	0.25	1.6	3.06	1.54
Copper	9.71	0.26	0.49	0.25	2.51	4.79	2.41
Gopher	0	0	0.29	0.71	0	0	0
Grass	0.55	0	0.49	0.51	0	0.27	0.28
Kelp	0.01	NA	NA	NA	0	0	0
Olive	0.26	0	0.03	0.97	0	0.01	0.25
Quillback	6.15	0.26	0.49	0.25	1.59	3.04	1.52
Treefish	0.18	0	0	1	0	0	0.18
Total					7.37	36.58	24.8

Fishing Activity under Option 4 Compared to Option 1

Washington

Recreational: The Washington recreational fishery would operate under season structure and management measures described under the Preferred Alternative. However because the Washington HG under Option 4 is lower than the historical Nearshore Rockfish catch, additional management measures would be needed to keep Nearshore Rockfish catch under the Washington HG. To keep total mortality under the Washington HG, retention of Nearshore Rockfish would be prohibited for a portion of the year. The Washington HG under Option 4 is higher than Option 3 and so the time period when retention of Nearshore Rockfish would be prohibited would be slightly shorter. Attainment of the Washington HG under this alternative is projected to occur in mid-July with retention of Nearshore Rockfish prohibited for the remaining 5.5 months of the year. Alternate combinations of months when Nearshore Rockfish would be prohibited may be explored.

Commercial: Closed

Oregon

Under Option 4, the Oregon harvest guideline is similar to that shown under Option 3; Option 4 provides a harvest guideline of 36.6 mt and Option 3 shows a harvest guideline of 37.9 mt. As such, overall impacts will be similar between Option 4 and Option 3. See Option 3 for more details.

Recreational: Similar to Options 2 and 3 above, non-retention will likely be required for some months to keep impacts within the Oregon recreational HG.

Commercial: Similar to Option 3, with slightly more restrictive management measures. If the recreational-commercial split remains the same as shown under No Action, then commercial Nearshore

Rockfish mortality is expected to be 10.5 mt under Option 4 (whereas expected mortality under Option 3 is 11.2 mt). This represents a reduction of 30 percent to No Action and 43 percent relative to Preferred Alternative.

California

Recreational: Under Option 4, 24.8 mt would be allocated to California, of which, the recreational catch share is 13.79 mt, accommodating a May 1 to November 30 season with a 20 fm depth restriction in the Northern Management Area. While this would provide an additional two and month and a half of fishing opportunity relative to the status quo, the recreational fishing season would have to be reduced by three months relative to the longest season under the Preferred Alternative of March 1 to December 31st. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish species during part of the season.

Commercial: Same as Option 2.

Biological Impacts under Option 4 Compared to Option 1

Projected Nearshore Rockfish Mortality
The projected mortality in each state and sector under Option 4 are summarized in Table B-45. Further description of the mortality in each state and sector is provided in the text below.

Table B-45. Projected Nearshore Rockfish mortality north of 40°10′ N. Lat. from each state and sector under Option 4 (hybrid). Sector-specific allocations within states are provided as an example and are based on No Action. These intra-state allocations are subject to change.

	Washington		**Oregon**		**California**		
	Rec	Com	Rec	Com	Rec	Com	**Total**
Mortality	7.37	NA	26.13	10.45	13.34	11.2	68.49
State Total	7.37		36.58		24.54		
Allocation	7.37		36.58		24.80		69
Projected Percent Attainment	100%		100%		98.9%		99.6%

Washington
Recreational: Under Option 4, additional management measures would be implemented to reduce Nearshore Rockfish mortality in the Washington recreational fishery by 27 percent compared to Option 1.

Commercial: Closed

Oregon
Recreational: Similar to Options 2 and 3 above, a combination of months of retention and non-retention will be required.

Commercial: If the recreational-commercial split remains the same as shown under No Action, then commercial Nearshore Rockfish mortality is expected to be 10.5 mt under Option 4, a 30 percent reduction relative to No Action. Management measures will be used to reduce mortality to the target level. Therefore, no biological impacts are expected under this option.

California

Recreational: The projected mortality on Nearshore Rockfish under Option 4 with a May 1 to November 30 season with a 20 fm depth restriction in the Northern Management Area is 13.34 mt, of which 2.88 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 13.79 mt under this option.

Commercial: Same as Option 2.

Projected Overfished Species Mortality

Washington

Recreational: No additional overfished species mortality is projected compared to the No Action Alternative.

Commercial: Closed

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than 0.01 percent increase in canary and yelloweye rockfish impacts.

Commercial: Same as Options 2 and 3.

California

Recreational: Assuming season lengths under Option 1 of the Preferred Alternative in Management Areas south of 40°10′ N. Lat. and the May 1 to October 31 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 4 are 2.8 mt of yelloweye rockfish, 21.6 mt of canary rockfish, 118.3 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: Same as Option 2.

Stock Status

Nearshore Rockfish

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 4.

Overfished Species

The projected mortalities under Option 4 are the same as No Action (Option 1), which are below the respective harvest limits/guidelines. No adverse effects on stock status or rebuilding progress are expected under Option 4.

Socio-economic Impacts under Option 4 Compared to Option 1

Washington

Recreational: Socio-economic impacts would continue to be affected by management measures necessary to keep the Washington recreational fishery within the Washington HG for overfished species (yelloweye and canary rockfish). In addition, under Option 4, recreational fishing opportunity would be further reduced. Prohibiting retention of Nearshore Rockfish for a portion of the season on top of other management measures already in place to protect overfished species may discourage angler participation in recreational fisheries. While it's difficult to predict angler behavior, any reduction in angler fishing effort will have negative socioeconomic impacts.

Commercial: NA

Oregon

Recreational: Same as above Options

Commercial: Socio-economic impacts are between those shown for Options 2 and 4, if recreational-commercial split remain similar to No Action. It is uncertain whether fishing behavior (i.e., fishing location and fishing gear) will change under this option relative to No Action (see Options 2 and 3 above). However, if allocations remain the same between Oregon recreational and commercial fisheries, then landings may be reduced from 15.0 mt (No Action) to between 10.5 mt (maximum, if reduced trip limits result in avoiding Nearshore Rockfish altogether causing no discards, which is unlikely) to 8.6 mt (if encounters were similar to No Action and discarding was necessary, some of which will not survive). The 2013 price per pound for Nearshore Rockfish (weighted average including blue rockfish) was $3.80 per pound for Oregon nearshore fisheries (PacFIN). Under the potential scenarios shown here, lost ex-vessel revenue may range from $37,698 to $53,615 relative to No Action (the loss is higher relative to Preferred Alternative). Additional impacts may be incurred by vessels and crew if the decision is made to fish in less productive areas to avoid Nearshore Rockfish, for example. If such of a choice is made, then it may require extra time and fuel to catch other targeted species relative to No Action.

California

Recreational: Under Option 4, the season length would increase by one and a half months (589 angler trips) relative to the status quo fishery in the Northern Management Area, but the season would be reduced by three months (3,790 angler trips) relative to the longest season that can be afforded under the Preferred Alternative ACLs (Option 1) resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: Socio-economic impacts will be similar (slightly worse) than described under Option 3.

Discussion

Under status quo management and the Preferred Alternative seasons, the 69 mt ACL for the Nearshore Rockfish complex are projected to be exceeded. Even with coordinated interstate catch tracking of Nearshore Rockfish complex mortality, inseason action may prove difficult without harvest guidelines for each state on which to base the need for inseason action to reduce mortality as the ACL does not specify amounts to be taken by each state/sector. Establishing HGs for each state will provide a trigger for inseason action to prevent aggregate mortality from exceeding the ACL. The GMT hopes that the background information regarding proposed methods forming the basis for allocation and implications of each option for the fisheries in each state provided will help inform an allocation decision by the Council and to prevent future ACL overages, while minimizing adverse effects on the fishery.

B.5.2 Economic impacts under the harvest guideline options for Nearshore Rockfish north of 40^0 10' North latitude.

Economic impacts under the HG options for the Nearshore Rockfish complex north of 40^0 10′ North latitude were analyzed for the affected commercial and recreational fisheries. Under certain ACL alternatives, the GMT projects that the HG options would impact landings by portions of the Nearshore open access commercial fishery sector operating in Oregon and Northern California waters; and also on effort levels in recreational fisheries in Northern California, Oregon and, Washington.

Description of Harvest Guideline Options for Nearshore Rockfish

Option 1 ("No Action"): Continue to manage the Nearshore Rockfish complex, holding impacts to the complex-level ACL in each region.

Option 2: Manage the Nearshore Rockfish complex according to state-specific harvest guidelines stratified at 40°10′ N. latitude reflecting apportionment based on the miles of coastline in each state.

Option 3: Manage the Nearshore Rockfish complex according to state-specific harvest guidelines stratified at 40°10′ N. latitude reflecting apportionment based on the historical recreational and commercial catch between 2004 and 2012.

Option 4: Manage the Nearshore Rockfish complex according to state-specific harvest guidelines stratified at 40°10′ N. latitude reflecting a hybrid method of apportionment based on miles of coastline for China, quillback and copper rockfish and historical recreational and commercial catch between 2004 and 2012 for the remaining species in the complex.

Economic Impact Measures

B.5.2.1 Nearshore Open Access Commercial Fishery

Impacts on projected landings of Nearshore Rockfish by the commercial Nearshore OA sector by area (Oregon and Northern California) were translated into ex-vessel revenue impacts using average ex-vessel value per landed roundweight pound observed in 2013. Ex-vessel revenue impacts were distributed to likely landings ports (port areas) using the 2013 distribution of Nearshore Rockfish landings in port areas north of $40^0$10′ North latitude. The projected ex-vessel revenue impacts were translated into income impacts using IO-PAC commercial fishery income impact coefficients for West Coast port areas developed for analyzing commercial fisheries impacts under the 2015-16 Groundfish harvest specifications alternatives[22].

[22] IO-PAC is set of models used for estimating commercial and recreational fishery-related economic impacts. Fisheries industry detail in IO-PAC is estimated from economic data surveys of expenditures by vessels and processors and by recreational anglers participating in West Coast groundfish fisheries. The model is maintained by Northwest Fisheries Science Center and used by the Pacific Fishery Management Council to estimate economic impacts of West Coast fishery management actions (Leonard and Watson 2011).

B.5.2.2 Recreational Fisheries

Where available, the GMT's projections for recreational angler effort (number of angler-trips) under the relevant HG options were translated into income impacts using IO-PAC recreational fishery income impact multipliers for angler-trips originating from West Coast port areas. These multipliers were developed for analyzing recreational fishery impacts under the 2015-16 Groundfish harvest specifications alternatives. In cases where impacts on recreational fishing effort are expected but are currently not quantifiable due to outstanding uncertainties in how HG options would be implemented, qualitative indicators of the direction and magnitude of expected impacts are presented.

Economic Impact Results

The GMT projected a range of commercial fisheries landings impacts under the HG options, depending on how successful Nearshore OA fishery participants may be in avoiding encounters with Nearshore Rockfish. The endpoints of the range are labeled "best case" and "worst case", respectively. If harvesters are able to avoid discarding so that all Nearshore Rockfish catch were landed, then the best case landings scenario would result. However, if Nearshore Rockfish encounter rates are high so that discarding is necessary, then in order to accommodate the additional discard mortality the lower, worst case Nearshore Rockfish landings scenario would result.

Impacts were projected for affected commercial fisheries port areas and/or recreational fisheries management areas for each relevant Nearshore Rockfish HG option under the Council's Preferred ACL Alternative. Indicators are also presented for expected impacts under the Nearshore Rockfish HG with respect to ACL Alternative 2 (P*=0.25). Ex-vessel revenue and personal income impacts resulting from effects of the Nearshore Rockfish HG options on landings by the nearshore OA sector in affected port areas are shown in Table B-46 and Table B-47. Table B-46 shows projected impacts under the HG options on affected port areas in Oregon and Northern California compared with impacts if the Preferred ACL alternative were selected. Table B-47 compares impacts on the same list of affected port areas compared with projected impacts if the P*=0.25 ACL Alternative (Alternative 2) were selected. In both cases the baseline values against which the changes (gains or losses) are measured represent ex-vessel revenue and income impacts from the entire range of species caught by the Nearshore OA fishery, not just the portion attributable to harvest of Nearshore Rockfish complex species.

Nearshore Open Access Commercial Fishery Impacts

Table B-46 shows all Oregon port areas would be adversely affected under all four HG options, with the greatest impacts projected under HG Option 2. The most heavily impacted port area under HG Option 2 is Coos Bay-Brookings, which is projected to lose up to 8.5 percent (worst case) of its Preferred Alternative ex-vessel revenue and income from Nearshore OA fisheries. Table B-47 shows additional reductions in ex-vessel revenue and income from the already lower levels under Alternative 2 of approximately six percent for Coos Bay-Brookings under all four HG options. Ex-vessel revenue and income from Nearshore OA fisheries in the Crescent City-Eureka Port Area are projected to increase from their levels under Alternative 2 by up to approximately 10 percent under HG Option 3 (best case).

Table B-46. Projected change in ex-vessel revenue and personal income impacts by affected Port Area under the Nearshore Rockfish HG Options compared with corresponding levels projected for the entire range of species caught in the fishery under the Preferred ACL Alternative.

	Astoria-Tillamook	Newport	Coos Bay-	Crescent City-
Ex-vessel Revenue Impacts ($,000)				
Nearshore OA Exvessel Rev under PA	***151***	***65***	***1,170***	***420***
HG Option 1	-0	-1	-29	+17
HG Option 2				
worst case	-1	-2	-99	+2
best case	-1	-1	-77	+29
HG Option 3				
worst case	-1	-1	-78	-14
best case	-1	-1	-63	+40
HG Option 4				
worst case	-1	-2	-86	+2
best case	-1	-1	-69	+38
Income Impacts ($,000)				
Nearshore OA Inc Impact under PA	***85***	***76***	***921***	***331***
HG Option 1	-0	-1	-23	+16
HG Option 2				
worst case	-1	-2	-78	+2
best case	-1	-2	-61	+28
HG Option 3				
worst case	-1	-2	-61	-13
best case	-0	-1	-49	+38
HG Option 4				
worst case	-1	-2	-68	+2
best case	-0	-1	-54	+36

Table B-47. Projected change in ex-vessel revenue and personal income impacts by affected Port Area under the Nearshore Rockfish HG Options compared with corresponding levels projected for the entire range of species caught in the fishery under ACL

	Astoria-	Newport	Coos Bay-	Crescent City-Eurek
Ex-vessel Revenue Impacts ($,000)				
Nearshore OA Exvessel Rev under Alt 2	***137***	***60***	***948***	***412***
HG Option 1	-1	-1	-56	+19
HG Option 2				
worst case	-1	-1	-56	+4
best case	-1	-1	-56	+32
HG Option 3				
worst case	-1	-1	-56	-12
best case	-1	-1	-56	+42
HG Option 4				
worst case	-1	-1	-56	+4
best case	-1	-1	-56	+41
Income Impacts ($,000)				
Nearshore OA Inc Impact under Alt 2	***78***	***70***	***746***	***324***
HG Option 1	-0	-1	-44	+18
HG Option 2				
worst case	-0	-1	-44	+4
best case	-0	-1	-44	+31
HG Option 3				
worst case	-0	-1	-44	-12
best case	-0	-1	-44	+41
HG Option 4				
worst case	-0	-1	-44	+4
best case	-0	-1	-44	+39

Recreational Fishery Impacts

Table B-48 and Table B-49 show estimated recreational angler-trips and associated personal income impacts for areas where effects on recreational effort under the HG options are quantifiable.

Table B-48 shows projected effort and income impacts under the HG options for the Northern California Management Area compared with the corresponding quantities under the Preferred ACL alternative, season option 1 and status quo Nearshore Rockfish HG. Table B-49 compares projected impacts for all Washington Coast Port Areas compared with ACL Alternative 2 (P*=0.25) and Nearshore Rockfish HG Option 3, compared with ACL Alternative 2 (P*=0.25) and status quo Nearshore Rockfish HG. Preliminary analysis of the Oregon recreational fishery[23] indicates that under ACL Alternative 2 (P*=0.25), even prohibiting retention of Nearshore Rockfish year-round would still result in exceeding the recreational share of the Oregon HG by approximately 2 percent. Reducing recreational harvest of Nearshore Rockfish to stay within the HG would require closing the Oregon recreational fishery one or more months during the year (Table B-50).

Results in Table B-48 indicate projected declines in Northern California Management Area effort and income impacts compared with the Preferred Alternative under all four Nearshore Rockfish HG options, ranging from -4,400 angler-trips and $327 thousand (-18 percent) in personal income impacts under HG Option 1 to -2,600 angler-trips and $191 thousand (-11 percent) in personal income impacts under HG Option 3. Results in Table B-49 show projected declines under HG Option 3 compared with Alternative 2 (P*=0.25) for all Washington Coast Port Areas of 19.4 thousand angler-trips (-58 percent) and $3.6 million income impact (-64 percent)[24].

It is difficult to quantify the effects on Washington and Oregon angler effort under scenarios where Nearshore Rockfish retention is prohibited for one or more months. Since Nearshore Rockfish species are not targeted by most anglers (average catch is less than one per angler-trip), non-retention of Nearshore Rockfish by itself may not have much impact on angler effort. However, the cumulative effect of new management measures needed to stay within the Nearshore Rockfish HGs on top of management measures already in place to reduce encounters with overfished species may combine to discourage anglers from participating in recreational fisheries.

To illustrate the potential economic impact resulting from prohibition of Nearshore Rockfish retention in Washington and Oregon recreational fisheries under certain HG options, it is thought that impacts ranging from a 10 percent reduction under the less restrictive HG options to a 20 percent reduction in angler-trips targeting groundfish under the most restrictive HG option may be expected. By comparison, in 2012 there were 24,200 recreational bottomfish trips originating from Washington coastal ports and 72,500 recreational bottomfish trips originating from Oregon coastal ports. Together these trips generated an estimated $10.6 million in personal income impacts in Washington and Oregon coastal communities, an average of about $110 personal income impacts per angler-trip.

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[23] Once state-specified harvest guidelines are chosen by the Council, Oregon will need to conduct its state process to determine the commercial and recreational sharing of that HG. This preliminary analysis was done assuming the sharing percentages currently in place in Oregon regulations.

[24] Base level angler-trips and income impacts reported in Table B-49 under *No Action*, the *Preferred Alternative* and *Alternative 2* include about 9,400 Washington Coast Pacific halibut angler-trips.

Table B-48. Projected change in recreational angler-trips and personal income impacts for the Northern California Management Area under the Nearshore Rockfish HG Options compared with corresponding levels projected under the Preferred ACL Alternative and Season Option 1.

	No Action	*Preferred Alt Season Op 1*	Preferred Alt Season Op 1 + NS RF HG Option 1	Preferred Alt Season Op 1 + NS RF HG Option 2	Preferred Alt Season Op 1 + NS RF HG Option 3	Preferred Alt Season Op 1 + NS RF HG Option 4
North California Coast: Del Norte and Humboldt Counties						
Angler-trips (thousand)	*20.1*	*24.5*	*-4.4*	*-4.2*	*-2.6*	*-3.8*
Income Impacts ($,000)	*1,498*	*1,825*	*-327*	*-312*	*-191*	*-283*

Table B-49. Projected change in recreational angler-trips and personal income impacts for all Washington Coast Port Areas under Nearshore Rockfish HG Option 3 compared with corresponding levels projected under ACL Alternative 2 (P*=0.25)t.

	No Action	*Preferred Alt Season Op 1*	*Alt 2 Season Op 1*	Alt 2 (P*=.25) Season Op 1 + NS RF HG Option 3
Washington Coast: Neah Bay-La Push to Ilwaco-Chinook				
Angler-trips (thousand)	*33.6*	*33.6*	*33.6*	*-19.4*
Income Impacts ($,000)	*5,606*	*5,606*	*5,606*	*-3,608*

t Base level angler-trips and income impacts reported under *No Action*, the *Preferred Alternative* and *Alternative 2* include about 9,400 Washington Coast Pacific halibut angler-trips.

Table B-50. Potential change in Oregon recreational angler-trips from SQ based on example closure periods that may be required under Nearshore Rockfish HG Option 1 and ACL Alternative 2 (P*=0.25).

Closed Months	Total SQ Angler-trips	Change in Angler-trips from SQ	Percent Change
Jan-Feb	79,016	-2,789	-3.5%
Oct-Dec	80,251	-1,554	-1.9%

Methods used to measure the coastline for each state north of 40°10′ N. latitude.

At the March 2014 Council meeting, the Council requested that the GMT calculate the length of the coastlines of California (north of 40°10′ N. latitude), Oregon, and Washington, as a way of approximating the nearshore habitat off each state. Though there may be alternative methods for approximating nearshore habitat, the GMT used the State-Federal maritime boundary, i.e., the 3 nautical mile (nm) line, to estimate proportions of coastline among states (Figure B-25) as a starting point for this analysis.[25] Results of this analytical method (e.g., measurement of the 3 nm line (Table B-51) could be used as a basis for allocating Nearshore Rockfish among states. Details regarding this method are described below.

Proportion based on the 3 nm State-Federal maritime boundary

Congress established the 3 nm as the boundary between State and Federal jurisdiction over the seafloor with the Submerged Lands Act (SLA) of 1953 (43 U.S.C. §1301 et seq.). The 3 nm was established from the official shoreline, called the U.S. normal baseline, which "coincides with the low water line depicted on NOAA charts and includes closing lines across the entrances of legal bays and rivers, consistent with international law."[26] The baseline is approved by the interagency U.S. Baseline Committee and was last evaluated in 2002. The 200 nm Exclusive Economic Zone (EEZ) and 12 nm Territorial Sea boundaries extend from this same baseline.

Shapefiles (i.e., files used in ArcGIS) of the 3 nm boundary, the 200 nm EEZ boundary, and the western U.S. states were downloaded and projected to allow for measurement in ArcGIS (Table B-52). An "addition" was made by the analyst to connect the northern portion of the 3 nm boundary to the EEZ boundary that the U.S. shares with Canada because the shapefiles for these two boundary lines do not connect or overlap (See Figure B-25). The connection was made based on the Bonilla-Tatoosh line defined in Washington's regulations (WAC 220-16-490). The resulting 3 nm boundary line was then measured from the U.S./Canada border to what serves as the WA/OR boundary for the purposes of groundfish management (46°16' N. lat.), to the OR/CA boundary (42° N. lat.), and to the Oregon/California boundary to 40°10' N. latitude. The resulting measurements are shown in Table B-51.

This represents one of numerous methods available to measure or approximate miles of coastline. Other methods that the GMT looked at included directly measuring the shoreline (with and without inclusion of islands).[27] A visual comparison of the difference in detail between datasets (i.e., 3 nm line dataset compared to a shoreline dataset) is provided in Figure B-25, which represents a magnified excerpt of Figure B-24. Measurements of coastline may vary depending on many factors including the projected coordinate system used when measuring distances of features depicted on the map (e.g., UTM Zone 10N or WGS 1984), the spatial resolution of the map, image, or file that is used to create the shoreline dataset and the method for defining the shoreline (e.g., mean low water vs. high water). Defining the shoreline is a legal and policy matter as much as a scientific one.[28] These are matters of cartography of which GMT members have limited knowledge.

[25] If desired by the Council, the GMT could provide other methods.
[26] Source: http://catalog.data.gov/dataset/maritime-limits-and-boundaries-of-united-states-of-america
[27] The following shoreline dataset was used: NOAA et al. 1994. "NOA80K/ALLUS80K: Medium Resolution Digital Vector U.S. Shoreline shapefile Long Island Sound GIS project area." Available at: http://woodshole.er.usgs.gov/openfile/of2005-1162/data/basemaps/coastline/nos80k_faq.htm (accessed 5/21/14).
[28] According to the NOAA Shoreline Website, there is "no legal reference that designates one specific shoreline as the legal shoreline. Furthermore, there is no simple answer to this question as there are many legal, technical, and general uses of the terms related to shoreline (shoreline, coastline, baseline, mean high-water line, mean-low water line, etc.)." Source: "What is the legal U.S. shoreline?" Available at: http://shoreline.noaa.gov/faqs.html?faq=4 (accessed 5/21/14).

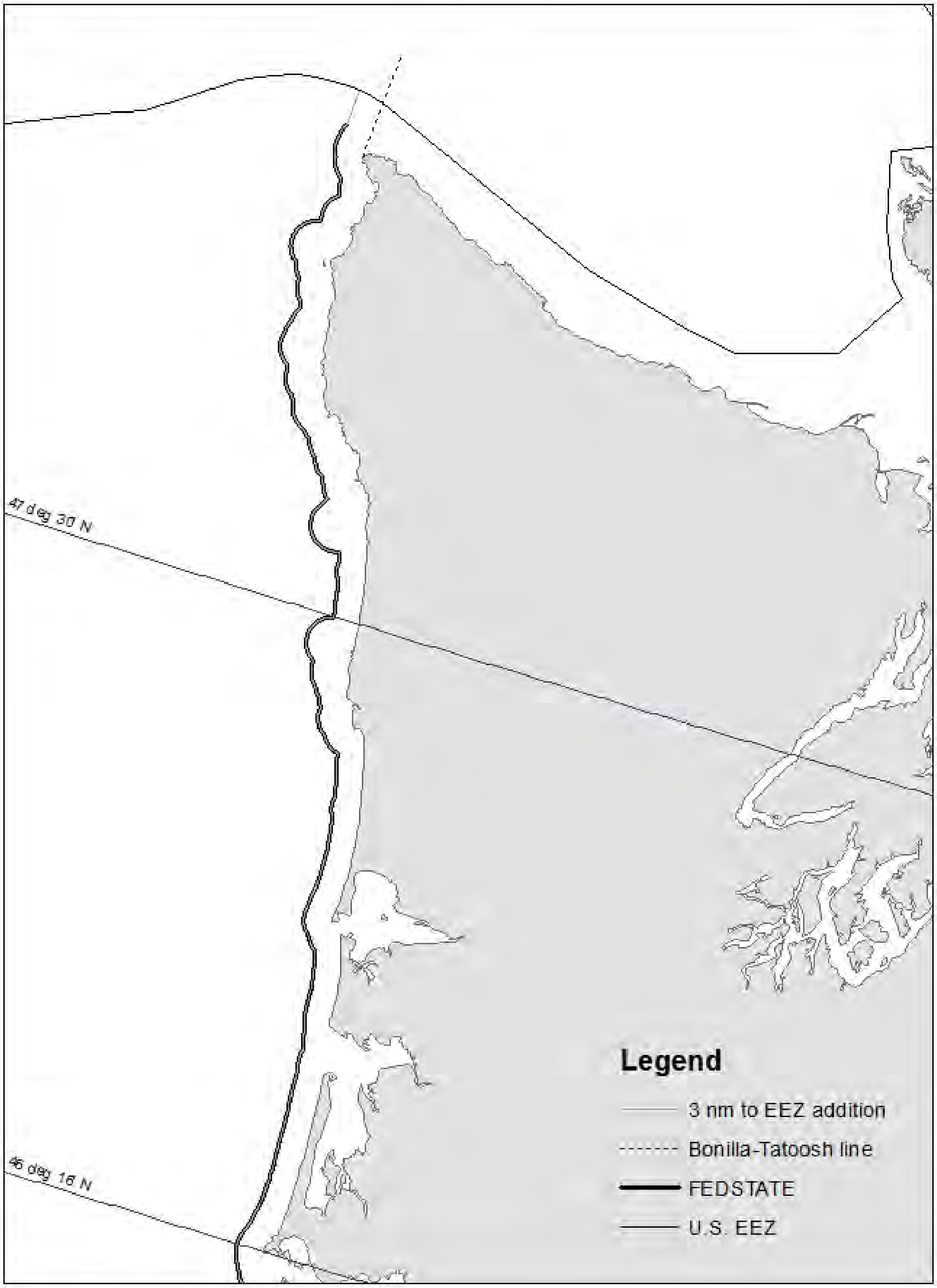

Figure B-24. Detail to show contrast between the coastline and the 3 nm state-Federal maritime boundary from the U.S./Canada EEZ to the WA/OR groundfish management line (46°16' N. latitude). The connection made from the 3 nm boundary with the EEZ is also shown.

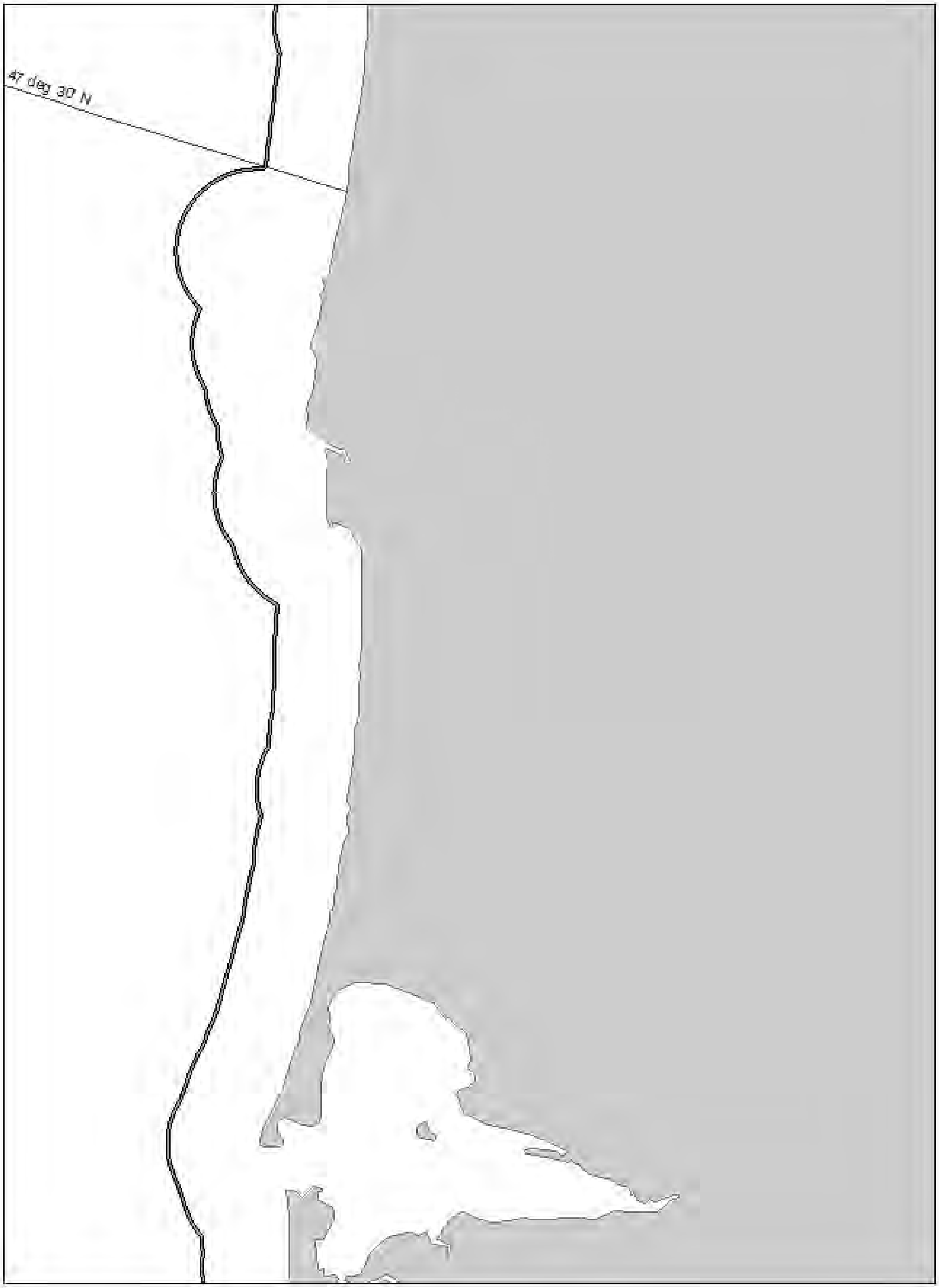

Figure B-25. Detail of Figure B-24, showing differences between the 3 nm line and the shoreline.

Table B-51. Distance estimates using 3 nm State-Federal maritime boundary. These differ from what was provided in Agenda Item C.4.b, Washington Department of Fish and Wildlife (WDFW) Report, April 2014.[29]

State	Distance (km)	Percentage of Coastline
Washington	280.01	26.0%
Oregon	530.97	49.3%
Northern California	265.58	24.7%
Total	1,076.56	100%

Table B-52. Source information used for measuring distance of the 3 nm State-Federal maritime boundary.

General information	
Software	ArcGIS 10.1
Projected Coordinate System	NAD_1983_2011_UTM_Zone_10N
Geographic Coordinate System	GCS_NAD_1983_2011
Datum	D_NAD_1983_2011
Shapefile information	
Projection of the west coast	U.S. Geological Survey (USGS). 2002. Data Categories: Basemap: State Bounds. Available at: http://coastalmap.marine.usgs.gov/regional/contusa/westcoast/pacificcoast/data.html (5/15/14). Metadata: http://coastalmap.marine.usgs.gov/GISdata/basemaps/boundaries/state_bounds/state_bounds.htm (5/15/14).
Projection of the EEZ	U.S. Geological Survey (USGS). 2013. Data Categories, Boundaries: survey areas, fed/state boundary, U.S. EEZ Boundary. Available at: http://coastalmap.marine.usgs.gov/regional/contusa/westcoast/pacificcoast/data.html (5/15/14). Metadata: http://coastalmap.marine.usgs.gov/GISdata/basemaps/boundaries/eez/NOAA/useez_noaa.htm (5/15/14).
3 nm state boundary	Bureau of Ocean Energy Management. 2002. Submerged Lands Act Boundary. Available at: http://www.marinecadastre.gov/Data/default.aspx (5/19/14).
Latitude lines	Created by GMT analyst, using the following latitude boundaries: 40°10' N., 42° N., and 46°16' N.
Bonilla-Tatoosh line	Created by GMT analyst, using the following coordinates in Washington state regulation at: WAC 220-16-490.

[29] The estimates provided in Table 1 differ from what was provided in the WDFW Report due to the following: 1) the Washington and Northern California proportions were accidentally transposed in the WDFW Report, and 2) the state-federal maritime line (SLA line) used for this GMT analysis utilized a different shapefile source. That is, the U.S. Geological Survey was the source of the SLA line for the WDFW Report and the Bureau of Ocean Energy Management was the source for this GMT analysis.

Regulatory timeline of regulations affecting management and thus mortality in each state and sector.

Year	Washington 1/	Oregon		California N. 40°10′ N. Lat.	
	Recreational	**Recreational**	**Commercial**	**Commercial**	**Recreational**
Pre 2004	Depth and Season Restrictions	Depth and Season Restrictions	(2003) Landing caps and 27 fm RCA implemented	(2003) Nearshore permit system implemented	10 fish, Open Year-Round No Depth Restriction, Dec 2003 closed
2004	year-round season; 10 rockfish bag limit	year-round season; 40 fm Apr-Sept; 10 marine fish bag limit	Limited entry implemented; 30 fm RCA; Mandatory logbooks; Landing cap increased	30 fm	10 fish RCG, Year-Round, Jan - Apr No Depth Restriction, May 1 - Dec 31 30 fm
2005	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season; 40 fm Apr- Sept; 5,8 fish	30 fm	30 fm	30 fm, 10 fish, May 1 - Dec 31
2006	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season, 40 fm Apr- Sept, 6 fish	30 fm Landing cap increased	30 fm Trip limits decreased	30 fm, 10 fish, May 1 - Dec 31
2007	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season, 40 fm Apr- Sept; 6 fish	30 fm Landing cap decreased	30 fm Trip limits increased	30 fm, 10 fish, May 1 - Sep 30
2008	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season; 20 and 40 fm Apr-Sept; 5,6 fish	30 fm	30 fm	20 fm, 10 fish, May 1 - Aug 31
2009	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season; 20 and 40 fm Apr-Sept; 6,7 fish	20 fm South/2 30 fm North/2	20 fm Trip limits increased	20 fm, 10 fish, May 15 - Sep 15
2010	year-round season; 10 rockfish bag limit; North Coast, 20 fm May 21 - Sept 30; South Coast, 30 fm March 15-June 15	year-round, season; 20 and 40 fm Apr-Sept; 7 fish	20 fm South/2 30 fm North/2 Landing cap increased	20 fm Trip limits increased	20 fm, 10 fish, May 15 - Sep 15

Year	Washington [1/]	Oregon		California N. 40°10′ N. Lat.	
	Recreational	Recreational	Commercial	Commercial	Recreational
2011	year-round season; 10 rockfish bag limit; North Coast, 20 fm June 1 - Sept 30; South Coast, 30 fm March 15-June 15	year-round season; 20 and 40 fm Apr- Sept; 7 fish	20 fm South[/2] 30 fm North[/2]	20 fm Trip limits increased & restructured	20 fm, 10 fish, May 15 - Oct 31
2012	year-round season; 10 rockfish bag limit; North Coast, 20 fm June 1 - Sept 30; South Coast 30 fm March 15-June 15	year-round season; 30 fm Apr- Sept; 7 fish	20 fm South[/2] 30 fm North[/2]	20 fm Trip limits increased	20 fm, 10 fish, May 15 - Oct 31

[1/] Washington has not had a commercial nearshore fishery since 1995

[2/] The shoreward RCA was 20 fm from the California border to 43° N. latitude, and 30 fm from 43° N. latitude to Washington border.

B.6 *Non-Trawl: Slope Rockfish Trip Limit Reductions*

Need for Action
This management measure change is intended to reduce limited entry and open access fixed gear (non-nearshore) catches of rougheye rockfish. Rougheye rockfish is managed in the Slope Rockfish North complex (north of 40°10 N. lat.) so catch control can only be applied for the complex as a whole.

Management Options

No Action: The current trip limits in regulation would remain as follows:

- Limited Entry Fixed Gear: 4,000 lbs/2 months
- Open Access Fixed Gear: Per trip, no more than 25 percent of weight of the sablefish landed

Option 1: Reduce trip limits for both limited entry and open access fixed gears.
Option 2: Prohibit retention of slope rockfish (i.e., non-retention).

Comparison of the Options

Biological Impacts

The fishery targets sablefish and this species comprises 91% of landings by weight and 98% by revenue. Since most vessels not target slope rockfish, fleet-wide they comprise only 4% of landings by weight and 1% by revenue. As shown in Table B-54 slope rockfish 30% of slope rockfish are discarded; the discard rate for rougheye rockfish is lower than the stock complex overall at 19%. Furthermore, vessels with a few exceptions do not reach the bimonthly cumulative landing limit. Table B-55 shows the frequency distribution of landing amounts of northern slope rockfish by vessel and two-month period during the years 2009-2013. Ninety percent of two-month landings amounts have been less than 1,500 pounds.

As shown in Table B-56, 8% of non-nearshore vessels making landings 2009-2013 accounted for the 32 landings above 3,500 pounds or 46% of total slope rockfish landings. More broadly, 22% of these vessels accounted for the 165 landings above 1,500 pounds or 80% of total slope rockfish landings. Put another way, there were only 11 vessels for which slope rockfish accounted for 20% or more of their landings during this period and the highest percentage.

Table B-57 shows a frequency distribution of the percent of vessel bimonthly landings amounts of groundfish that was slope rockfish. Ninety-one percent of the bimonthly groundfish landings had 10% or less slope rockfish and 39% of the landings had no slope rockfish. There were very few landings where slope rockfish comprised more than a quarter than the total groundfish landing.

This information suggests that such that there only a few vessels whose landings during a bimonthly period approached the current limits.

Given the level of landings, retention of slope rockfish, and the distribution of landings in relation to the trip limit, trip limits would have to be lowered substantially to reduce landings. Reducing the trip limit could affect the component of trips where slope rockfish is targeted. Since slope rockfish don't appear to be targeted on most trips and are landed incidentally, a non-retention measure is likely to lead to an increase in discards rather than a comparable reduction in catch.

Although trip limit reduction is intended to encourage vessels to change strategies to reduce catch, it could have unintended consequences. For example, vessels may redirect effort up on the shelf where they would more likely encounter canary and yelloweye rockfish. Since ACLs and allocations for these "choke species" are very low, such a strategy chance could necessitate other management restrictions.

Socioeconomic Impacts

Assuming compliance, a reduction in trip limits would reduce landings, and thus ex-vessel revenue to some degree. At the extreme, prohibiting retention of slope rockfish, a “zero trip limit,” would eliminate all potential ex-vessel revenue from slope rockfish landings. Ex-vessel revenue for slope rockfish averaged $54,000 a year for the 10-year period 2004-2013 with about two-thirds of this revenue coming from rougheye rockfish. Trip limit reductions would disproportionately affect those vessels that land higher amounts of slope rockfish and rougheye rockfish in particular given that this species accounts for a large proportion of slope rockfish ex-vessel revenue. Table B-58 shows that the 61 vessels in the top quartile of vessels landing slope rockfish accounted for 86% of total landings and 96% of resulting ex-vessel revenue in the five-year period, 2009-2013. This demonstrates that a small portion of the fleet accounts for most slope rockfish landings and revenue. In fact the top five ranked vessels in terms of nearshore rockfish landings accounted for 21% of landings and 26% of ex-vessel revenue.

Table B-53. Average annual landings (mt) and revenue of slope rockfish and sablefish by the non-nearshore fixed gear fishery, 2004-2013, landed north of 40°10 N. lat.

	Landings (mt)		Revenue ($1000s, inflation adjusted)	
Species/Group	**Annual Average**	**Percent of Total**	**Annual Average**	**Percent of Total**
Rougheye Rockfish	23	2.5%	$34	0.6%
Other Slope Rockfish	12	1.3%	$20	0.3%
Sablefish	839	90.9%	$5,841	98.1%

Inflation adjustment: Bureau of Economic Analysis Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [Index numbers, 2009=100]. June 25, 2014.
Source: PacFIN vdrfd 07/10/14. Port group codes used to select landings north of 40°10 N. lat.

Table B-54. Catch, landings, and discard rate for slope rockfish, 2009-2012, landed north of 40°10 N. lat.

Species/Group	Catch (mt)	Landings (mt)	Discard Rate
Rougheye Rockfish	236	191	19%
Other Slope Rockfish	180	102	43%
Total	416	292	30%

Sources. Catch: Bellman, M. A., J. Jannot, M. Mandrup, and J. McVeigh. 2013. Estimated discard and catch of groundfish species in the 2012 U.S. west coast fisheries, Supplemental material: 2002-2012 estimates [Data file]. NOAA Fisheries, NWFSC Observer Program, 2725 Montlake Blvd E., Seattle, WA 98112. Landings: PacFIN vdrfd 07/10/14. Port group codes used to select landings north of 40°10 N. lat.

Table B-55. Frequency distribution of landing size (pounds) by vessel and two-month period and percent of total nearshore rockfish landings accounted for each landing size bin, 2009-2013, for slope rockfish landed north of 40°10 N. lat. The first column lists the bins, which are the sizes in pounds of landings by a non-nearshore vessel during any two-month period, 2009-2013.

Pounds Bins	Bin Frequency	Cum. % of Pounds Bins	% of Total NS RF landings
<=500	1393	79.1%	18.4%
501-1000	121	85.9%	11.1%
1001-1500	83	90.6%	13.7%
1501-2000	48	93.4%	11.1%
2001-2500	40	95.6%	11.7%
2501-3000	22	96.9%	7.9%
3001-3500	23	98.2%	9.7%
3501-4000	27	99.7%	12.9%
More	5	100.0%	3.6%

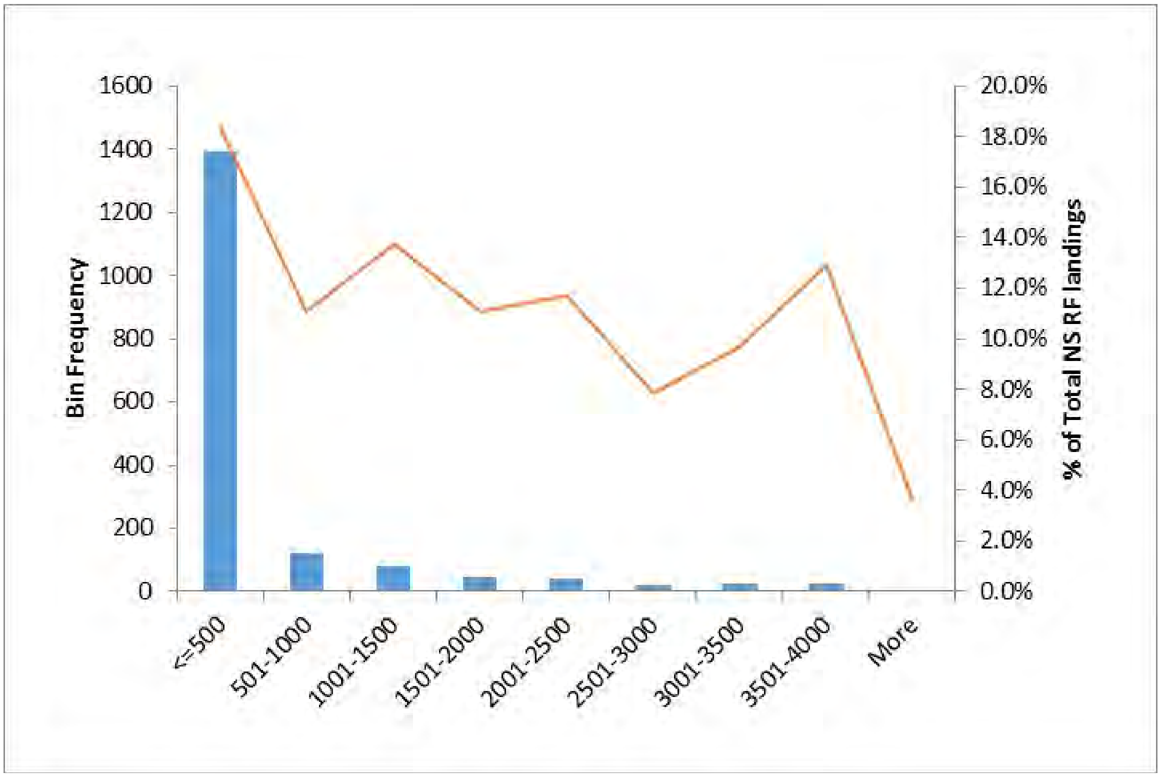

Figure B-26. Frequency distribution of two-month landing amounts and percent of total nearshore rockfish landings accounted for each landing amount bin.

Table B-56. Number of landing amounts by vessel and bimonthly period above 1,500 and 3,500 pounds and number of vessels accounting for these landings, 2009-2013.

Landing amount	No. landings	No. vessels	Pct. of vessels	Pct. of total shelf RF landings
>1,500	165	54	22%	80%
>3,500	32	20	8%	46%

Table B-57. Frequency distribution of the percent of vessel bimonthly groundfish landing amounts, 2009-2013, that was slope rockfish and for each bin the cumulative percent of total nearshore rockfish landings by these vessels for the time period.

Bin	Frequency	Cumulative % of Bins	Cumulative % of total NS RF landings
0	1121	38.92%	0.00%
>0-0.05	1196	80.45%	27.86%
0.06-0.1	313	91.32%	57.09%
0.11-0.15	140	96.18%	77.84%
0.16-0.2	50	97.92%	85.78%
0.21-0.25	29	98.92%	90.30%
0.26-0.3	12	99.34%	93.31%
0.31-0.35	6	99.55%	95.15%
0.36-0.4	3	99.65%	96.03%
0.41-0.45	5	99.83%	97.87%
0.46-0.5	3	99.93%	99.04%
More	2	100.00%	100.00%

PacFIN vdrfd 07/10/14. Port group codes used to select landings north of 40°10 N. lat.

Table B-58. Total landings (pounds) and revenue ($000s, inflation adjusted) of slope rockfish by vessel, 2009-2013, binned by quartile

	Pounds	% Total	$000	% Total
≤25% quartile	1,933	0.3%	$0	0.0%
> 25% quartile – Median	16,650	1.9%	$0	0.0%
> Median – 75% quartile	103,996	11.5%	$20	4.5%
>75% quartile – Maximum	761,176	86.3%	$439	95.5%

The Council requested an evaluation of a trip limit targeted at rougheye rockfish similar to what was established and implemented for blackgill rockfish in 2013. After much consideration of the data, the GMT concluded that a trip limit would not likely be effective for reducing fishing mortality on rougheye.

We recommend instead that the Council look to area-based management measures like hotspots or rockfish conservation areas to reduce encounters with rougheye for the fixed gear sectors. Such area measures are under consideration within the omnibus management measures planning. If the Council wishes to further consider trip limits, we would suggest looking to switching the limited entry fishery to a ratio based trip limit like in place for open access. Many on the team are skeptical that the ratio approach would be effective. It could be analyzed for implementation outside this main management measures process.

Limited time prevents us from fully summarizing all the analyses we considered in reaching this conclusion. To summarize the reason supporting the finding:

1. Only a few percentage of vessels in the limited entry and open access sectors are actually taking the existing limits.
2. Sablefish provide the main economic incentive in the fishery and rougheye and other slope rockfish appear to be caught incidentally. Trip limits are effective to the degree that they affect the incentive to target. They do not create a disincentive to avoid the incidentally caught fish and fish over the limit can simply be discarded.

The analysis is based on landings data from PacFIN as well as observer data from the WCGOP. The focus is mainly on areas north of 40^{0} 10' N. latitude because that is where the bulk of rougheye catch is taken.

Seasonal Patterns in Slope Rockfish Landings

Periods 3 thru 5 (May thru October) are where the majority of slope rockfish are landed in the open access and limited fixed gear sectors (Table B-59, Table B-60, and Figure B-28). For one thing, we note that this pattern would make inseason adjustments impractical because of the timing with which we would know if landings are tracking high or low and in which a trip limit change could be implemented.

Table B-59. Total landings of limited entry slope rockfish north by period combined over 2007-2013.

Period	Lbs. landed	Percent
1	17,722	2%
2	90,175	8%
3	293,048	26%
4	322,068	29%
5	349,671	32%
6	33,521	3%

Table B-60. Total open access north landings of slope rockfish by period over 2007-2013.

Period	Lbs. landed	Percent
1	3,703	4%
2	11,497	12%
3	27,606	28%
4	23,665	24%
5	26,394	27%
6	5,170	5%

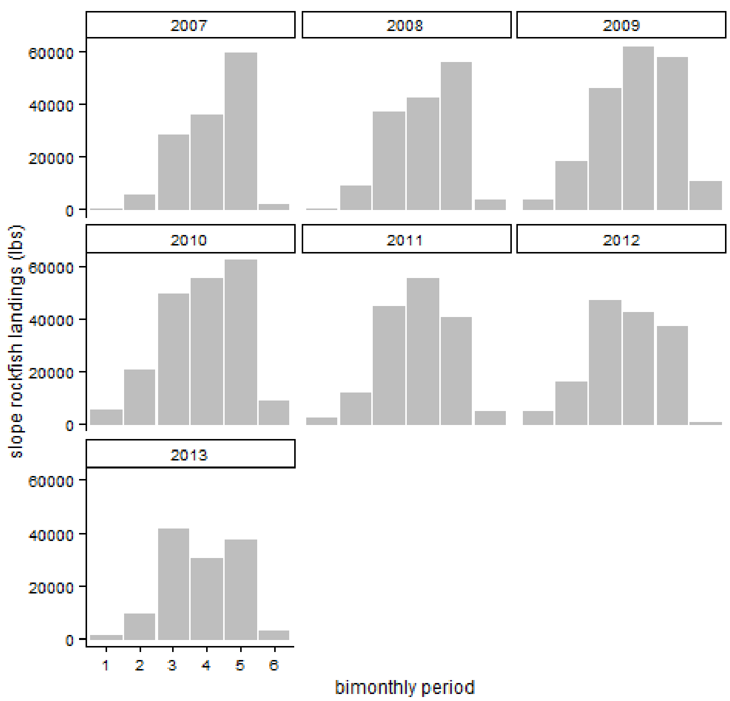

Figure B-27. Limited entry fixed gear landings of slope rockfish by bimonthly period and year in the north.

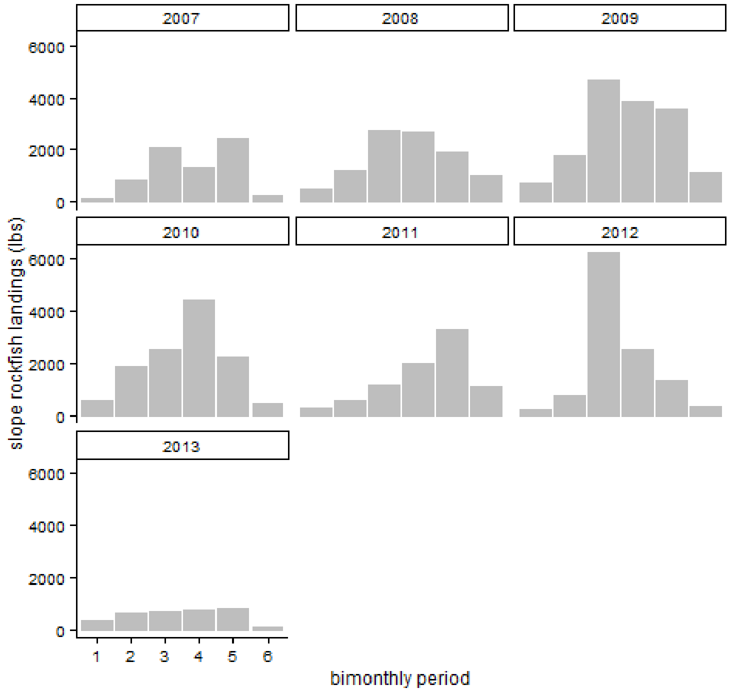

Figure B-28. Open access fixed gear landings of slope rockfish by year and period in the north.

The Council targeted a trip limit at blackgill while leaving it in the slope rockfish south stock complex. The GMT and Council were comfortable with the likely effectiveness of that trip limit because of targeting of blackgill in the south. In contrast, the GMT does not see reason to believe rougheye have been widely targeted. Likewise, we do not see indication that vessels differentiate among the slope rockfish and we understand that the various slope species are similarly marketable. To affect the landings of rougheye, a trip limit would likely still be best focused on all species as a whole as opposed to specifically on rougheye. Figure 3 shows that the slope species are retained to similar degrees. Figure 4 and Figure 5 show that rougheye (REYE), blackgill (BLGL), Darkblotched (DBRK), and redbanded (RDBD) are the most frequently caught species.

Table B-61 shows that rougheye have contributed less revenue on a vessel basis than blackgill. With blackgill, vessels reportedly set gear in different locations specifically to target the species. For rougheye we did not see such a pattern. The data reported in Table B-62 show that sablefish are caught 99.9 percent of the fixed gear hauls showing that hauls are not being set just to target slope rockfish. Sablefish provides the main economic incentive. We would therefore expect the trip limit for rougheye would create less of an incentive than did the trip limit for blackgill.

Likewise, we do not see indication that vessels differentiate among the slope rockfish and we understand that the various slope species are similarly marketable. To affect the landings of rougheye, a trip limit would likely still be best focused on all species as a whole as opposed to specifically on rougheye. Figure B-29 shows that the slope species are retained to similar degrees. Figure B-30 and Figure B-31 show that rougheye (REYE), blackgill (BLGL), Darkblotched (DBRK), and redbanded (RDBD) are the most frequently caught species.

Table B-61. Comparison of rougheye and blackgill in terms of their contribution to vessel revenues in the fixed gear sectors, 2007-2013. The set of vessels used here includes only vessels making landings of the species in at least six of the seven years. Data for blackgill is only for areas south of 36^0 N. latitude.

	Average Revenue		Average Percent Revenue		90th Percentile Revenue		90th Percentile Revenue	
Year	Rougheye	Blackgill	Rougheye	Blackgill	Rougheye	Blackgill	Rougheye	Blackgill
2007	$415.08	$2,042.52	0.46%	12.71%	$1,611.91	$6,619.80	1.64%	44.29%
2008	$587.85	$3,390.13	0.66%	9.78%	$1,554.38	$8,419.80	1.41%	20.32%
2009	$928.49	$5,901.00	0.70%	11.80%	$2,875.66	$13,330.40	1.89%	42.14%
2010	$873.50	$6,970.48	0.70%	12.00%	$1,725.18	$17,995.60	1.50%	36.17%
2011	$814.38	$10,714.26	0.53%	11.35%	$2,027.02	$5,554.40	1.10%	46.97%
2012	$929.38	$4,930.70	1.07%	16.99%	$2,096.47	$11,412.00	2.66%	74.60%
2013	$1,061.29	$422.09	1.71%	4.36%	$2,214.68	$1,015.60	2.99%	5.93%

Table B-62. Haul level catches of sablefish and slope rockfish on observed fixed gear sets, 2002-2012.

2002-12	Total lbs	% of lbs	# of sets	% of sets
North of 40 10’ N lat.				
Total sets	11,716,974	100.0%	8,644	100.0%
Sablefish	11,303,171	96.5%	8,633	99.9%
Slope rockfish (all)	413,804	3.7%	5,278	61.1%
Rougheye/blackspotted	169,152	1.5%	2,418	28.0%
Shortraker	36,738	0.3%	703	8.1%
Rougheye/shortraker	49,361	0.4%	244	2.8%
South of 40 10’ N. lat.				
Total sets	1,833,997	100.0%	2,999	100.0%
Sablefish	1,695,176	92.4%	2,909	97.0%
Slope rockfish (all)	138,821	8.2%	1,268	43.6%
Rougheye/blackspotted	2,543	0.1%	55	1.9%
Shortraker	81	0.0%	7	0.2%

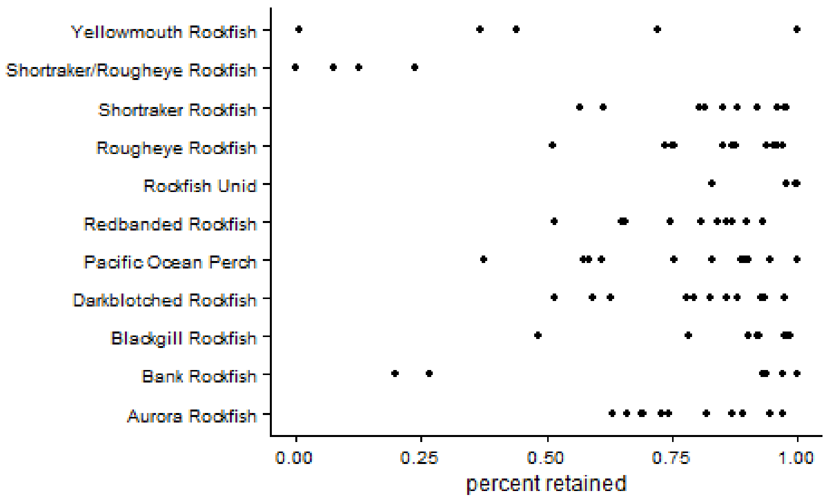

Figure B-29. Annual retention rates of slope rockfish caught in the non-nearshore fixed gear sectors. This suggests that most slope rockfish

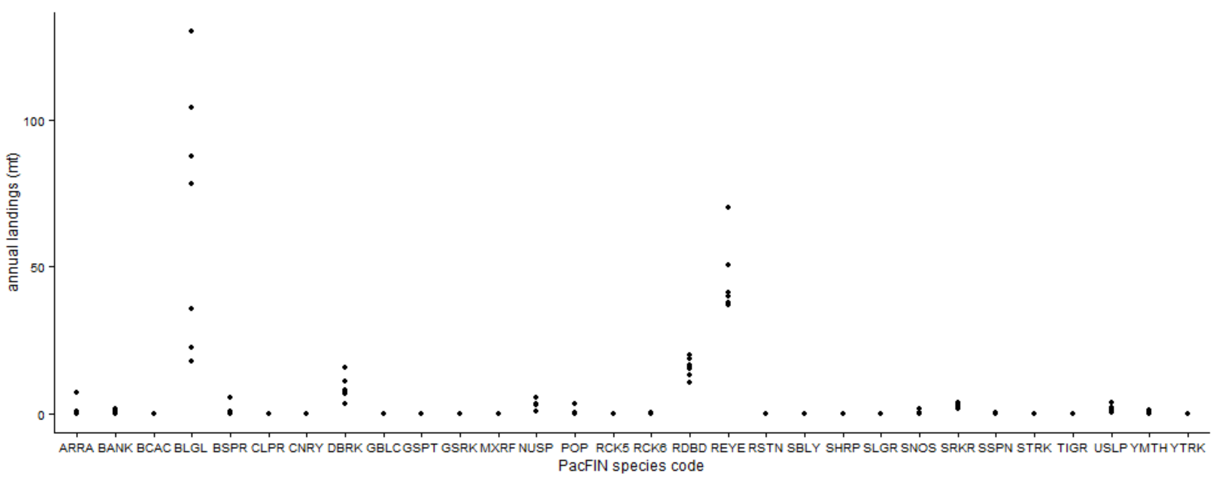

Figure B-30. Annual landings by species under the slope rockfish market category under the open access and limited entry slope rockfish trip limits, 2007-2013.

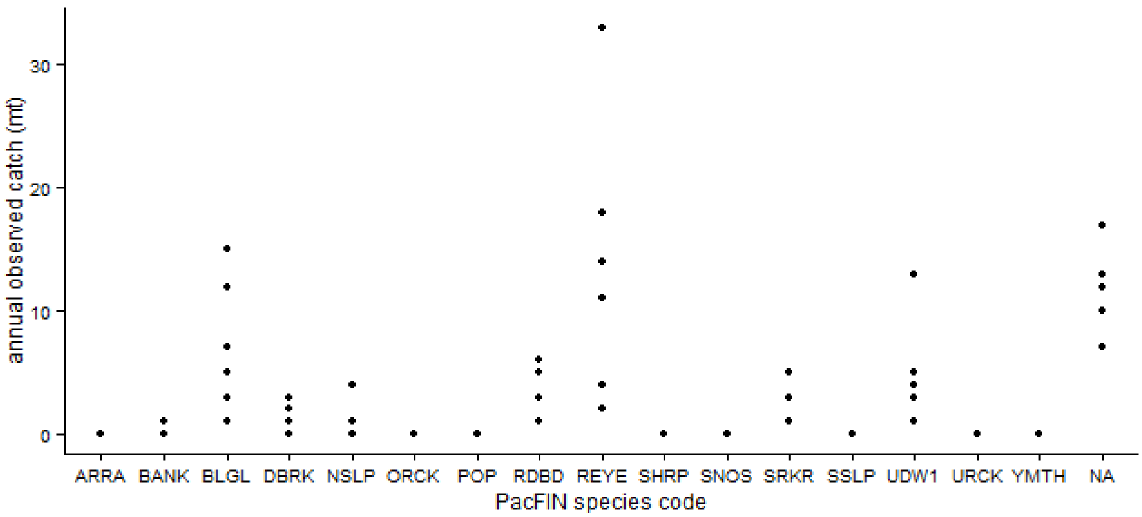

Figure B-31. Observed catches (i.e. not expanded to total catches) of slope rockfish 2007-2012.

A Small Percentage of Vessels Are Taking the Current Limits

The current slope rockfish limits in the north are 4,000 lbs per bimonthly period for limited entry. For open access, it is a true trip limit where the weight of slope rockfish can be no more than 25 percent of the weight of sablefish landed. Darkblotched is included as a slope rockfish for purposes of the trip limits. So few vessels are taking the trip limit that we had trouble displaying the data in a way that abides the "rule of three" that is intended to protect confidentiality. No vessels in the limited entry sector have taken their limits in period 1, 2, or 6. We can only report to the 90th percentile level by year while still complying with the rule of 3. Figure B-32 shows bimonthly landings up to that 90th percentile level. The upper 10th percentile in this set of years includes a minimum of 3, a maximum of 7, and an average and median of ~5 vessels per period (i.e. there could between 3 and 7 but most likely only 5 vessels past the rightmost points in the figure). Table B-63 shows that between 3.7 percent and 14.6 percent of vessels take at least 3,600 lbs of slope rockfish in at least one period over 2007-2013.

As for the open access sector, fewer than 10 percent of vessels take the full amount of slope rockfish allowed by the 25 percent limit. We did not have time to identify a way of reporting how many vessels took the full limit while complying with the rule of 3.

Nonetheless, these patterns in the limited entry and open access sectors suggest that trip limit reductions would not greatly reduce landings. Again, we would worry that the trip limit would create regulatory discards that would reduce landings but not reduce total mortality.

Figure B-32. Percentiles of sablefish landings by period, for periods 3-5, and year in the Limited Entry North sector.

Table B-63. Number of unique vessels landing at least 3,600 lbs of slope rockfish in a period ("high liners") by year vs. total unique vessels making landings in the LE north sector.

YEAR	"High Liners"	All	% of Hi-Liners
2007	9	69	13.0%
2008	8	76	10.5%
2009	12	82	14.6%
2010	8	85	9.4%
2011	3	81	3.7%
2012	8	77	10.4%
2013	6	64	9.4%

Table B-64. Open access north – slope rockfish as a percentage of sablefish landed per trip (e.g., in 2010 the 90th percentile means that weight of slope rockfish was 15 percent or less of the weight of sablefish landed on 90 percent of the trips).

	2007	2008	2009	2010	2011	2012	2013
50th	0%	0%	0%	0%	0%	0%	0%
70th	0%	1%	3%	2%	2%	2%	1%
80th	2%	3%	7%	6%	5%	5%	3%
90th	12%	10%	19%	15%	16%	19%	11%

Patterns in the depth and latitude of sets made on trips where rougheye and shortraker are caught
Last, we examined trips that catch rougheye or shortraker to see how they compare against trips that do not catch these species. The following plots (Figure B-33 - Figure B-36) compare all sets made on a trip so as to compare patterns in the latitude and depth. The plots follow the same structure. The outer shape is a violin plot, which is similar to a histogram but is smooth (instead of binned") and turned vertical and mirrored. In short, the "peaks" contain more sets than the "valleys. Inside the violin plots are boxplots, which display the median (thick middle line) and the 25th and 75th percentiles on the lower and upper edges of the box. The median identifies the midpoint at which half of the sets fall above and below.
As expected, trips that catch rougheye or shortraker make sets further north than those that do not. They also tend to make hauls shallower than the trips that do not.

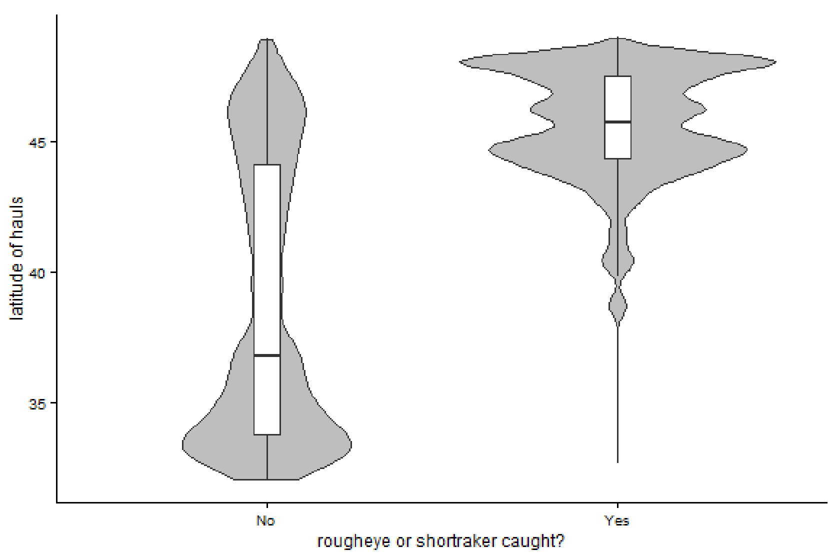

Figure B-33. Comparing sets by latitude coastwide. See text above for explanation.

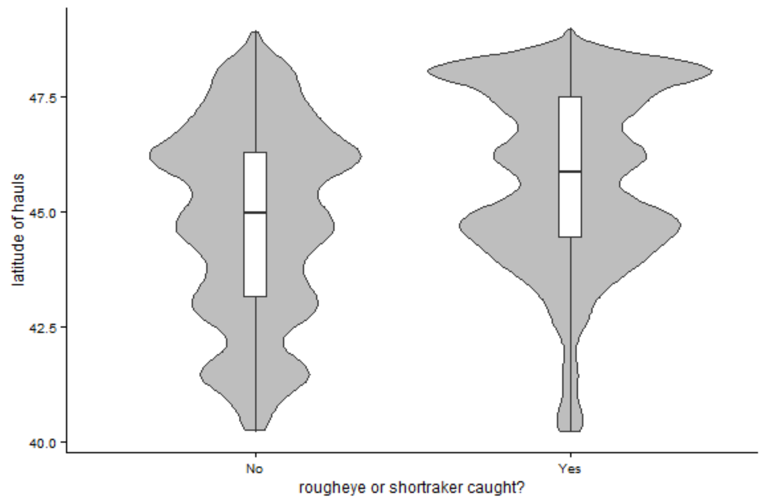

Figure B-34. Comparing latitude of sets in the area just north of 40° 10' N. latitude. See text above for explanation.

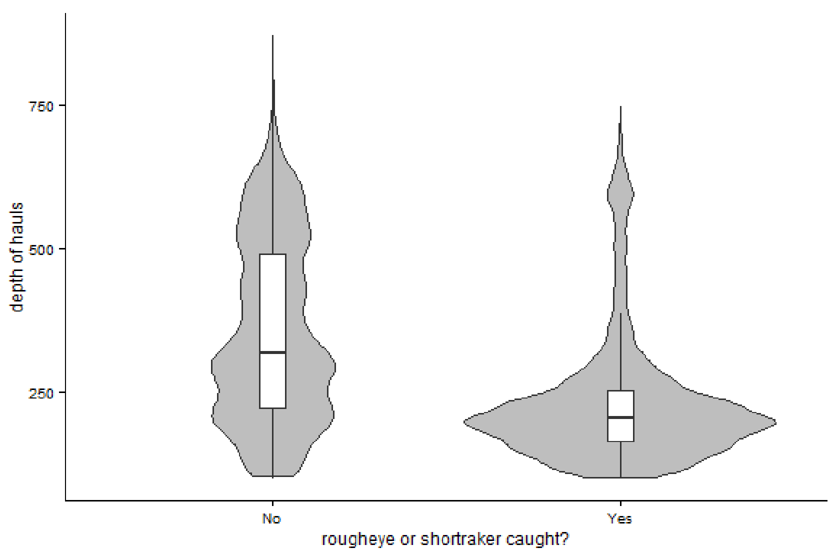

Figure B-35. Comparing trips by depth of sets in areas coastwide. See text above for explanation.

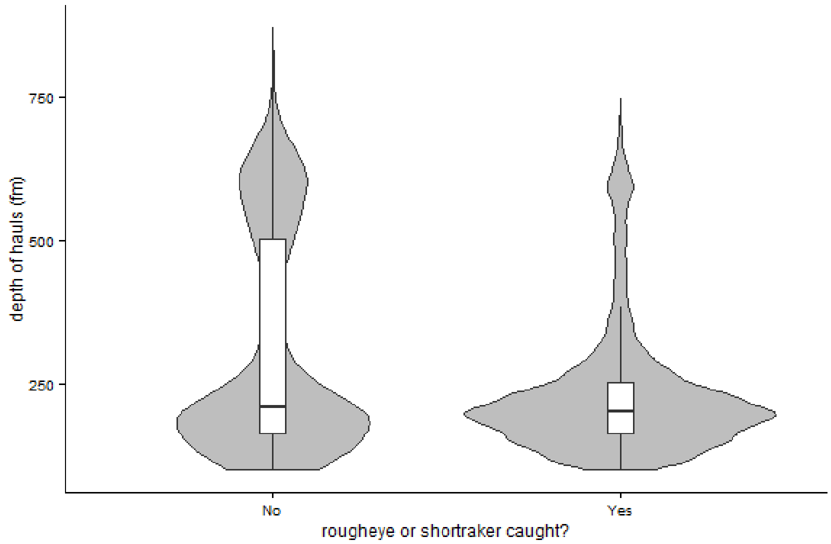

Figure B-36. Comparing trips by depth of sets in areas north of 40° 10' N. latitude. See text above for explanation.

B.7 *Non-Trawl: Lingcod Trip Limit Increases*

Need for Action

For 2013-2014 groundfish fisheries, lingcod has been managed, in part, by cumulative bi-monthly trip limits designed to keep catches within the respective ACLs. Trip limits may be adjusted inseason as a result of inseason tracking patterns (higher/lower than projected). This applies to lingcod taken in both the non-nearshore (all three states) and nearshore fisheries (Oregon and California only).

At its April 2014 meeting, the Council directed the GMT to complete an impact analysis of various lingcod trip limit and open season options for the west coast commercial non-trawl fixed-gear fishery to increase attainment of the non-trawl allocation. Current trip limits and open seasons are given in (No Action = Option 1a). The range of trip limit and open season configurations are summarized in Table B-65, with all trip limits reported in lb per vessel. **The preferred option is Option 2a, which would allow limited retention in Periods 1, 2, and December and increased trip limits in the remaining periods.**

Initial analyses were provided to the Council at the April meeting for trip limit options during the open season (Agenda Item C.4.b, REVISED GMT Report, April 2014; pages 39-52 and below in Section 4.3.3.5) and options for lingcod retention during the currently closed periods (Agenda Item C.4.b, REVISED GMT Report, April 2014; pages 52-63). This document combines results of those previous, separate analyses. Additional details can be found in that April 2014 GMT statement.

Table B-65. No Action Option (Option 1a) for the limited entry and open access non-trawl fixed-gear trip limits (in lb) in effect in 2014 that apply to both north and south of 40°10' N. latitude.

Fleet	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec[a]
Limited entry	Closed		800/2 months			400/month, Closed
Open access	Closed		400/1 month			400/month, Closed

[a/]The lingcod commercial fishery is closed from December 1 of a given year through April 30 of the subsequent year (five months total). Therefore, the Nov/Dec trip limit applies only to November.

A critical point in the analysis of lingcod trip limits is how proposed increases in the coastwide trip limit structure may affect the mortality of OFS – primarily the OFS rockfish species, in both the non-nearshore and nearshore fisheries. The approach to these proposed trip limit increases does assume that OFS mortality will not be affected in the non-nearshore fishery because any lingcod catch is mostly incidental to the targeting of sablefish; fishing behavior will likely not change because the main target will continue to be sablefish, the much more lucrative fishery. Therefore, it is assumed that any increase in lingcod mortality (landings) will only affect OFS mortality in the Oregon and California nearshore fisheries (Washington has not had a commercial nearshore fishery since 1995).

Additionally, it is prudent to point out that there is probably little to no chance of increased China rockfish impacts under Options 1b and 2a (below). Opening the closed season for lingcod retention will not cause increase catch of any rockfish species (OFS or China), because the proposed increases are nearly equal to or less than average encounter rates of lingcod during the closed season (based on WCGOP bycatch rates during December-April). Increasing the lingcod trip limit during the open season showed some increase in OFS for the 50 percent increase. On the other hand, the increase in canary rockfish was significant when lingcod was increased by 100 percent. It is expected that other Nearshore Rockfish mortality to also increase under that scenario (Option 2b).

Table B-66. Lingcod commercial coastwide trip limits (reported in lb per vessel) comparing the No Action Option (Option 1a) to options that increase the bi-monthly trip limit to 1,200 lb and 1,600 lb for the limited entry sector and increases to 600 lb per month and 800 lb per month for the open access sector (Options 1b, and 1c). Also presented are proposed trip limits that establish trip limits for periods 1 and 2 and December, with period 2 closed south of 40°10' N. latitude for both sectors (Options 2a and 2b). Option 2a is the Council-preferred Option.

Proposed lingcod trip limits based on the No Action Option (1a) and Options 1b and 1c						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 1a	closed	closed	800	800	800	400 (Nov only)
Option 1b	closed	closed	1,200	1,200	1,200	600 (Nov only)
Option 1c	closed	closed	1,600	1,600	1,600	800 (Nov only)
Open access						
Option 1a	closed	closed	400 lb/month (Dec closed)			
Option 1b	closed	closed	600 lb/month (Dec closed)			
Option 1c	closed	closed	800 lb/month (Dec closed)			
Proposed lingcod trip limits that apply to the area **NORTH** of 40°10' N. latitude with a year-long season structure						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 2a	200 lb/2 months	200 lb/2 months	1,200 lb	1,200 lb	1,200 lb	600 lb for Nov (200 lb for Dec)
Option 2b	200 lb/2 months	200 lb/2 months	1,600 lb	1,600 lb	1,600 lb	800 lb for Nov (200 lb for Dec)
Open access						
Option 2a	100 lb/month	100 lb/month	600 lb/month (100 lb for Dec)			
Option 2b	100 lb/month	100 lb/month	800 lb/month (100 lb for Dec)			
Proposed lingcod trip limits that apply to the area **SOUTH** of 40°10' N. latitude with March/April closed						
Limited entry	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sept/Oct	Nov/Dec
Option 2a	200 lb/2 months	closed	800 lb	800 lb	800 lb	400 lb for Nov (200 lb for Dec)
Option 2b	200 lb/2 months	closed	800 lb	800 lb	800 lb	400 lb for Nov (200 lb for Dec)
Open access						
Option 2a	100 lb/month	closed	400 lb/month (100 lb for Dec)			
Option 2b	100 lb/month	closed	400 lb/month (100 lb for Dec)			

Background

Lingcod was declared overfished in 1999. In 2005, the stock was designated as rebuilt and a coastwide trip limit structure was established that has essentially stayed the same since. Lingcod trip limits have not been modified since 2005 for the limited entry (LE) sector and since 2007 for the open access sector (OA). Since 2007, no inseason adjustments have been made due to fishing mortality concerns for lingcod. At least one industry request was made for an inseason trip limit increase but was not supported by the GMT (Agenda Item E.2.b, Supplemental GMT Report 2, April 2008). This was because the GMT was concerned that any increase in lingcod trip limits and subsequent targeting could have resulted in increased bycatch of canary and yelloweye rockfish. Regarding the OA sector, the GMT expressed concerns that since the number of participants in that fishery was unlimited (as is still the case), any increase in lingcod trip limits could have led to a rapid expansion in the fishery, without any corresponding accountability measures for bycatch of overfished species. And finally, since the trip limits at that time weren't being attained in either the LE or OA fisheries, the GMT did not support an increase.

Since 2008, the coastwide commercial non-trawl fixed-gear catch of lingcod averaged 82.9 mt (Figure B-37) with the majority of landings made by the OA sector. In 2011 and 2012, total mortality by the non-trawl fixed-gear fleet was 3.0 percent and 3.5 percent, respectively, of the non-trawl allocation. For the 2015-2016 biennial management cycle, the Council is considering increases in lingcod trip limits for both the LE and OA non-trawl fixed-gear sectors to provide more fishing opportunity to the fishing communities in the three states. Additionally, a request was made by industry to explore the possibility of allowing the fleet to land modest amounts during those periods, or months, that are currently closed. This analysis estimates the potential harvest mortality under the various trip limit scenarios and open seasons to assist the Council in its decision for a Preferred Alternative. It also provides estimated mortality amounts for overfished species that are taken in the nearshore commercial fisheries for Oregon and California when lingcod are also taken (Washington does not have a commercial nearshore fishery).

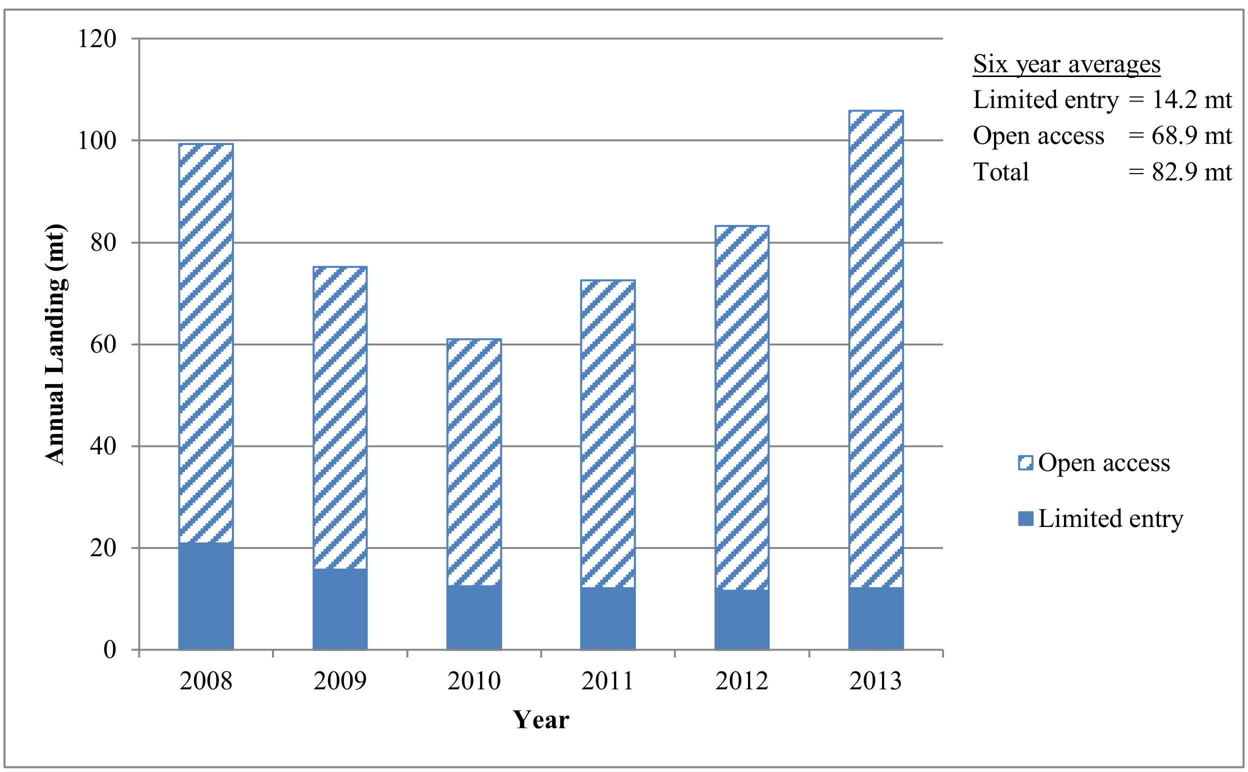

Figure B-37. Coastwide landings of lingcod by the commercial non-trawl fixed-gear fleet for both the limited entry and open access sectors from 2008 to 2013. The 2013 data are preliminary (data source: PacFIN vdrfd).

Methods

A catch-based fleet capacity trip limit model was used, and based on the years from 2008 to 2012. Commercial landings data from PacFIN's vdrfd table were extracted on April 22, 2014 for analysis. Filters were applied to only include: 1) landings made by non-IFQ, shorebased vessels (this applied to 2011 and 2012), 2) hook-and-line or trap gear, 3) Dahl sectors 5 to 10, 12, and 15[30], 4) for the nearshore bycatch model, only those Oregon and California lingcod landings that also showed nearshore species landings, and 5) port of landing north and south of 40°10' N. latitude to identify management area. The model uses a method that establishes a proportion for each participating vessel per period whereby that vessel's actual harvest mortality, as reported from the commercial dealer receipts, is compared to the theoretical maximum that that vessel could have taken. This proportion percentage is then applied to the proposed trip limit for each vessel for each period of allowable fishing. After completing this for all vessels for all periods, the estimated harvest for the fleet is summed for a final annual estimate which is then compared to the annual ACL and/or the non-trawl allocation portion of the ACL.

In addition to the above routine, a portion of the estimated landings under the various trip limit scenarios was identified as those made in conjunction with landings of nearshore species (above). These estimated lingcod landings then inputted into the GMT's nearshore bycatch model to provide estimates of the mortality of overfished species.

More details on methods can be found in Agenda Item C.4.b, REVISED GMT Report, April 2014 (pages 39-52).

Results

Lingcod mortality estimates are provided in Table B-67 and Table B-68 for the combined sector options under the different P* values for 2015 and 2016. A final LE and OA sector summary is presented in Table B-69, and last overfished species mortality estimates are provided in Table B-70. More detail regarding these estimates is provided below. Also, a comprehensive discussion about trip limits for periods 1 and 2 and December is included in Agenda Item C.4.b, REVISED GMT Report, April 2014, pages 52-63)**.**

[30] Dahl sectors are: 5 nearshore (limited entry), 6 nearshore (open access), 7 non-nearshore (limited entry), 8 non-nearshore (open access), 9 non-nearshore non-sablefish (limited entry), 10 non-nearshore non-sablefish (open access), 12 incidental open access, and 15 commercial non-groundfish.

Table B-67. Lingcod coastwide commercial mortality estimates using the status quo season structure (closed during periods 1, 2 and December coastwide) comparing No Action (Option 1a) to Options 1b and 1c. The limited entry bimonthly trip limits are shown, along with open access monthly trip limits in parentheses.

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.45						
	Proposed Bimonthly and Monthly Trip Limits (lb)	Estimated Take (mt)	2015		2016	
			Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 1a	800 (400)	88.9	1,950.7	4.6%	1,857.8	4.8%
Option 1b	1,200 (600)	122.3	1,950.7	6.3%	1,857.8	6.6%
Option 1c	1,600 (800)	155.1	1,950.7	8.0%	1,857.8	8.3%

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.25						
	Proposed Bimonthly and monthly Trip Limits (lb)	Estimated Take (mt)	2015		2016	
			Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 1a	800 (400)	88.9	1,444.1	6.2%	1,375.4	6.5%
Option 1b	1,200 (600)	122.3	1,444.1	8.5%	1,375.4	8.9%
Option 1c	1,600 (800)	155.1	1,444.1	10.7%	1,375.4	11.3%

Note: For the limited entry sector, the November trip limits are 400 lb under Option 1a, 600 lb under Option 1b, and 800 lb under Option 1c. The non-trawl allocations are a combination of those for north and south of 40°10' N. latitude as presented in Agenda Item C.4.a, Supplemental **REVISED** Attachment 2:, April 2014.

Table B-68. Lingcod coastwide commercial mortality estimates under Preferred Option 2a and Option 2b. Season structure modifications for each sector are shown in Table B-66.

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.45					
		2015		2016	
Option	Estimated Take (mt)	Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 2a - Preferred	135.1	1,950.7	6.9%	1,857.8	7.3%
Option 2b	173.4	1,950.7	8.9%	1,857.8	9.3%

LIMITED ENTRY + OPEN ACCESS (coastwide) at P* = 0.25					
		2015		2016	
Option	Estimated Take (mt)	Non-trawl Allocation (mt)	Percent of Allocation	Non-trawl Allocation (mt)	Percent of Allocation
Option 2a – Preferred	135.1	1,444.1	9.4%	1,375.4	9.8%
Option 2b	173.4	1,444.1	12.0%	1,375.4	12.6%

Notes: South of 40°10' N. latitude the fishery will continue to be closed. The non-trawl allocations are a combination of those for north and south of 40°10' N. latitude as presented in Agenda Item C.4.a Supplement REVISED Attachment 2, April 2014.

Table B-69. Summary of overall coastwide commercial lingcod mortality estimates for the limited entry and open access sectors for Options 1a, 1b, 1c, 2a, and 2b. Option 2a is the preferred option.

	Trip Limits		Mortality Estimates		
Option	Limited Entry (bi-monthly)	Open Access (monthly)	Limited Entry	Open Access	Total
1a (No Action)	800	400	16.9	72.0	88.9
1b	1,200	600	24.7	97.6	122.3
1c	1,600	800	31.8	123.3	155.1
2a – Preferred	1,200	600	30.2	104.9	135.1
2b	1,600	800	37.9	135.5	173.4

Note: These trip limit amounts in this table refer to the bi-monthly limited entry sector, whereas the OA sector trip limits are set on a per month basis at one-half the limited entry amount. Refer to Table B-66 for the detailed summary of the actual trip limit amounts.

Table B-70. Overfished species mortality estimates (mt) under the No Action Option (1a), Option 1b, and Option 1c (season structure maintained with periods 1 and 2 and December closed), and under the 2a and 2b options that reflect the season structure modification (i.e., open January – December). The preferred option is Option 2a. These values were calculated by using the five-year commercial averages (2008-2012) of the nearshore species inserted into the nearshore bycatch model.

	Estimated mortality under options with the current season structure in place		
	Option 1a – 800 lb	Option 1b – 1,200 lb	Option 1c – 1,600 lb
BOCACCIO	0.4	0.4	0.4
CANARY ROCKFISH	6.5	6.6	6.7
COWCOD	0.0	0.0	0.0
DARKBLOTCHED ROCKFISH	0.2	0.2	0.2
YELLOWEYE ROCKFISH	1.1	1.2	1.3

	Estimated mortality under options with an expanded season structure	
	Preferred Option 2a – 1,200 lb	Option 2b – 1,600 lb
BOCACCIOo	0.4	0.4
CANARY ROCKFISH	6.7	6.8
COWCOD	0.0	0.0
DARKBLOTCHED ROCKFISH	0.2	0.2
YELLOWEYE ROCKFISH	1.2	1.3

Comparison of Options (Options 1a, 1b, and 1c)

Under Options 1a, 1b and 1c, the coastwide bi-monthly trip limit structure would be maintained whereby commercial retention of lingcod is permitted during periods 3 (May/June), 4 (July/August), 5 (September/October) and November. Retention of lingcod would not be allowed during period 1 (January/February), period 2 (March/April) and in December. Under these three options, trip limit adjustments are considered only for the management area north of 40°10' N. latitude. South of 40°10' N. latitude, the status quo trip limits and season structure would remain in effect for all three options.

No Action (Option 1a)

For 2014, the lingcod commercial bi-monthly non-trawl fixed-gear trip limit for the LE sector is 800 lb per period with 400 lb for November. Fishing would continue to be closed during periods 1 and 2 and December. For the OA sector, trip limits are set at 400 lb per month. Again, periods 1 and 2 and December are closed. These amounts apply on a per vessel basis and apply to all three states. Under the No Action Option (Option 1a), the expected harvest mortality, for both the P* = 0.45 and P* = 0.25 approach, would be less than 10 percent of the non-trawl allocation (Table B-67). The total combined LE and OA mortality would be 88.9 mt.

Fishing Activity under Option 1a

Under the No Action Option, fishing activity is not expected to change. The number of vessels that will fish would be expected to be about the same as have participated in the fishery over the last few years (Table B-71). In addition, fishing effort per vessel and fishing area are expected to be similar under Option 1a.

Table B-71. Number of vessels in the non-nearshore and nearshore fisheries that made lingcod landings (regardless of the amount) for the three states from 2008 to 2012. Includes both LE and OA vessels.

State	2008	2009	2010	2011	2012	5-Year Avg.
Washington	44	32	37	31	41	37
Oregon	228	219	196	200	202	209
California	251	222	206	223	264	233

Biological Impacts under Option 1a

With no expected increase in mortality, there are no anticipated biological impacts.

Projected Overfished Species Mortality under Option 1a

A critical consideration in the lingcod fishery are those catches (landings) that are made in conjunction with nearshore species. These nearshore fishery landings are those that are applied to the nearshore bycatch model as a component necessary for the estimation of OFS mortality. With no expected increase in the take of lingcod and no expected change in fishing behavior under this option, it is also expected that no increase in OFS mortality will be experienced.

Stock Status

Currently, the coastwide lingcod stock is considered healthy. As of the last stock assessment, the point estimate for the depletion of the spawning output (= spawning biomass) at the start of 2009 was 61.9 percent for north of 40°10' N. latitude , 73.7 percent south of 40°10' N. latitude, and 67.0 percent coast wide (Hamel et al. 2009).

Socioeconomic Impacts under Option 1a

None are expected.

Option 1b

Option 1b maintains the closures during periods 1 and 2 and December. This option also increases the current LE sector trip limit from 800 lb per two months to 1,200 lb per two months and increases the

November trip limit from 400 lb to 600 lb. The OA sector trip limit would increase from 400 lb per month to 600 lb per month. The original management measure consideration for this option was to analyze trip limit increases only for the fishery north of 40°10' N. latitude. Trip limit amounts south of 40°10' N. latitude are to be left as is (i.e., remain status quo). Mortality would be expected to increase from 88.9 mt. Under No Action Option 1a to 122.3 mt (37.6 percent increase) under Option 1b, with the majority of this increase coming from the OA sector. Here too, the expected landings mortality would be less than 10 percent of the non-trawl allocation amount at both the P* = 0.45 and P* = 0.25 levels.

Fishing Activity under Option 1b

With larger trip limits (from 800 lb to 1,200 lb per period for the LE sector and from 400 lb to 600 lb per month for the OA sector) it is reasonable to expect an increase in overall mortality. Table B-69 shows mortality will increase from 88.9 mt (No Action) to 122.3 mt under Option 1b. Despite this expected increase, the total annual mortality will still be substantially less than the non-trawl allocation amount. It is speculated that this modest increase would not generate a surge in fishing activity.

Biological Impacts under Option 1b

Because the stock is considered very healthy, the 37.6 percent increase (33.4 mt) will have a relatively minor effect on the stock's status. A total mortality of 122.3 mt represents < 10 percent of the non-trawl fixed gear allocation. Projected mortality would not jeopardize the stock's status nor cause the fishery to exceed the non-trawl allocation portion of the annual ACL.

Projected Overfished Species Mortality under Option 1b

Two overfished species are of major concern: canary and yelloweye rockfish. These two species have been (and will continue to be) the most constraining component of the lingcod fishery and largest concern when considering lingcod trip limit increases. Under this option, both species will experience an approximate 0.1 mt increase from the No Action Option. As per the Preferred Alternative, canary rockfish has a directed nearshore allocation of 6.7 mt (2015) and 6.9 mt (2016) and yelloweye rockfish has a directed nearshore allocation of 1.2 mt (2015) and 1.3 mt (2016). The projected mortality under this option (6.6 mt for canary and 1.2 mt for yelloweye) are equal to or less than the Preferred Alternative nearshore allocations.

Stock Status

Similar to the No Action Option 1a, the stock is expected to remain healthy with no adverse effects from this modest increase in harvest mortality.

Socioeconomic Impacts under Option 1b

Under this option, the projected increase in total annual landings for both the non-nearshore and nearshore fisheries would be approximately 75,200 lb (34.1 mt). Using the most recent commercial landings data from 2013 as a benchmark, the average coastwide price is $2.50 per pound. Applied to the projected increase of 75,200 lb, the fishery could earn an additional $188,000 compared to the No Action status quo amount – all else being equal.

Option 1c

Option 1c maintains the closures during periods 1 and 2 and December. This option also increases the current LE sector trip limit from 800 lb per two months to 1,600 lb per two months and increases the OA sector trip limit from 400 lb per month to 800 lb per month. The original management measure consideration for this option was to analyze trip limit increases only for the fishery north of 40°10' N. latitude. Trip limit amounts south of 40°10' N. latitude are to remain status quo. Mortality would be expected to increase from 88.9 mt under No Action Option 1a to 155.1 mt (a 74.5 percent increase), with the majority of this increase, again coming from the OA sector. Under this option the projected landings mortality would be less than 10 percent of the non-trawl allocation amount at P* = 0.45 but would be just over 10 percent (for both 2015 and 2016) for P* = 0.25 (Table B-67).

Fishing Activity under Option 1c

With larger trip limits (from 800 lb to 1,600 lb per period for the LE sector and from 400 lb to 800 lb per month for the OA sector), it is reasonable to expect an increase in overall mortality. It is possible that there may be a change in fishing behavior with more participants participating in the fishery, but presently it is difficult to estimate what that number may be. Table B-69 shows mortality will increase from 88.9 mt (No Action) to 155.1 mt under Option 1c. Despite this expected increase, the total annual mortality will still be substantially less than the non-trawl allocation amount.

Biological Impacts under Option 1c

Because the stock is considered very healthy, the 74.5 percent increase (66 mt) compared to the No Action Option will have a relatively minor effect on the stock's status. A total mortality of 155.1 mt under this option represents 10.7 percent of the non-trawl allocation for 2015.

Projected Overfished Species Mortality under Option 1c

As is the case under Option 1b canary and yelloweye rockfish are the two species that have been (and will continue to be) the most constraining component of the lingcod fishery and largest concern when considering lingcod trip limit increases. Under this option, both species will experience an approximate 0.2 mt increase from the No Action option projection. As per the Preferred Alternative, canary rockfish has a directed nearshore allocation of 6.7 mt (2015) and 6.9 mt (2016) and yelloweye rockfish has a directed nearshore allocation of 1.2 mt (2015) and 1.3 mt (2016). The projected mortality of canary under this option is 6.7 mt, which is equal to the Preferred Alternative nearshore allocation (this mortality is 0.2 mt more than the nearshore allocation under than the No Action option estimate of 6.5 mt). For yelloweye, projected mortality under this option is 1.3 mt, which exceeds the Preferred Alternative nearshore allocation for 2015 by 0.1 and equals the Preferred Alternative nearshore allocation for 2016. A mortality of 1.3 mt exceeds the mortality under No Action estimated impact by 0.2 mt.

Stock Status

Similar to the No Action Option 1a, the stock is expected to remain healthy with no adverse effects from this increase in harvest mortality.

Socioeconomic Impacts under Option 1c

Under this option, the projected increase compared to the No Action Option in total annual coastwide landings would be approximately 146,000 lb (66 mt). Applying the $2.50 per pound value described above provides an estimate that the fishery could earn an additional $365,000 compared to the No Action status quo amount – all else being equal.

Options Overview (Options 2a and 2b)

Under Options 2a and 2b, the coastwide trip limit structure would be modified to accommodate modest trip limits for periods 1 and 2 and December for both the LE and OA sectors (Table B-65). Under these two options, the take of lingcod would be allowed during all periods and months during the year, but only for the management area north of 40°10' N. latitude. South of 40°10' N. latitude, retention of lingcod would continue to be prohibited for both sectors during March and April. Trip limits would also be increased from May-November under these options relative to No Action (Option 1). See Table B-66 for trip limit details.

Preferred - Option 2a

The intent of the Council-preferred Option 2a is to allow retention and landings of lingcod that would otherwise be discarded during the closed season, in addition to increasing trip limits during the currently open season to increase attainment of the non-trawl allocation. Under this option north of 40°10' N. latitude, the LE sector would have a 200 pound trip limit per two months for periods 1 and 2 and 200 lb for December. This sector would also have a 1,200 pound trip limit for periods 3 through 5 and 600 lb in November. South of 40°10' N. latitude, the LE sector would have a 200 lb per two-month limit for periods 1 and 200 pounds for December. The sector would continue to have an 800 lb per two-month limit for periods 3 through 5 and 400 lb for November. Period 2 would remain closed.

For the OA sector north of 40°10' N. latitude, the monthly trip limit would be 100 lb during periods 1 and 2 and 100 lb in December. Additionally, this sector would have a 600 pound monthly trip limit for periods 3 through 5 and November. For the OA sector south of 40°10' N. latitude, a 100 lb per month trip limit would apply for period 1 and for December. Period 2 would remain closed and all the other months would continue to have a 400 lb per month trip limit.

Under this option south of 40°10' N. latitude, March and April would continue to be closed to the retention of lingcod for both the LE and OA sectors. This is proposed because the additional opportunity to fish 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. See Table B-66 for a summary of trip limit details.

Fishing Activity under Option 2a

With larger trip limits compared to the No Action Option it is reasonable to expect a modest increase in overall annual lingcod mortality. Compared to the projection for the No Action Option (88.9 mt), the projected mortality would be 135.1 mt, an increase of 46.2 mt (52 percent). Despite this projected increase, the total annual mortality will still be substantially less than the non-trawl allocation amounts (Table B-68). For 2015 and 2016, with a P* = 0.45, the projected percent of the non-trawl allocation would be 6.9 percent and 7.3 percent, respectively. Under a P* = 0.25 scenario, the projected percent of the non-trawl allocation for 2015 and 2016 would be 9.4 percent and 9.8 percent, respectively.

Biological Impacts under Option 2a

Because the stock is considered very healthy, the 46.2 mt increase will have a relatively minor effect on the stock's status. 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 (with an estimated 7 percent mortality). For example, the increased trip limit during the open season is not expected to change fishing behavior (i.e., fishing effort or fishing area). Likewise, allowing retention during December-April at the amounts shown in Table B-66 is not expected to cause increased fishing effort or change in fishing locations (see Agenda Item C.4.b, REVISED GMT Report, April 2014; pages 52-63). Hence, there would be no expected increase in lingcod encounter rates under this option relative to the No Action Option.

Projected Overfished Species Mortality under Option 2a

With the combination of higher trip limits for the traditional fishing periods coupled with the modest trip limits for the periods that before were closed, projected mortality for canary rockfish is expected to increase. Under the No Action Option 1a, the projected canary rockfish mortality is 6.5 mt (Table B-70), whereas under Option 2a that mortality amount would be 6.7 mt. This projected canary rockfish mortality would equal the Preferred Alternative nearshore allocation of 6.7 mt in 2015 and not exceed the 6.9 mt in 2016~~)~~ but would exceed the No Action mortality estimate (6.5 mt). Yelloweye rockfish mortality under Option 2a is 1.2 mt, which is the same as shown under Option 1b and equal to the Preferred Alternative nearshore allocation for 2015, but 0.1 mt higher than expected under No Action (1a).

Should lingcod targeting occur as a result of the higher trip limits, there may be a slight increase in the projected mortality of some OFS. Despite this, however, it is anticipated that such a slight increase will not affect the overall projected mortality of OFS, which will still be managed to stay within the nearshore allocation share.

Stock Status

Under Option 2a, no adverse changes to lingcod stock status are expected compared to the No Action Option since lingcod mortality has been far below the non-trawl allocation and is expected to remain so under Option 2a. Estimated lingcod mortality under this option is expected to range between 7.8 percent and 11.0 percent of the non-trawl allocation (Table B-68). Given This level of increase in mortality is far below levels that would result in overfishing and are not expected to adversely affect stock status.

Socioeconomic Impacts under Option 2a

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 averaged $2.50 per pound. This amount, applied to the projected increase (approximately 102,000 lb) would result in a coastwide gross estimated ex-vessel increase of approximately $255,000. While 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 trip limits 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. However, it needs to be pointed out that some vessels do target lingcod on some trips, so any increase would benefit these participants.

Option 2b

The intent of Option 2b is also to allow retention and landings of lingcod that would otherwise be discarded during the closed season, in addition to increasing trip limits during the currently open season. Under this option north of 40°10' N. latitude the LE sector would have a 200 pound trip limit per 2 months periods 1 and 2 and 200 lb for December (the same as for Option 2a). However, this sector would also have a 1,600 pound trip limit for periods 3 through 5 and 800 lb in November. For the OA sector north of 40°10' N. latitude, the monthly trip limit would be 100 lb during periods 1 and 2 and 100 lb in December, but the sector would have an 800 pound monthly trip limit for periods 3 through 5 and November. For the OA sector south of 40°10' N. latitude, a 100 lb per month trip limit would apply for period 1 and for December. All the other months would continue to have a 400 lb per month trip limit. Again, as per Option 2a, south of 40°10' N. latitude, the retention of lingcod would be prohibited for both the LE and OA sectors during March and April to prevent the possibility of additional mortality of overfished rockfish as well as discarding of other healthy rockfish species while targeting lingcod. See Table B-66 for a summary of trip limit details.

Fishing Activity under Option 2b

With larger trip limits compared to the No Action (Option 1a) and Option 2a, it is reasonable to expect an increase in overall annual lingcod mortality. Compared to the projection for the No Action Option (88.9 mt), the projected mortality would be 173.4 mt for Option 2b, an increase of 84.5 mt. Despite this projected increase, the total annual mortality will be substantially less than the non-trawl allocation amounts (Table B-68). For 2015 and 2016, with a P* = 0.45, the projected percent of the non-trawl allocation would be 8.9 percent and 9.3 percent, respectively. Under a P* = 0.25 scenario, the projected percent of the non-trawl allocation for 2015 and 2016 would be 12.0 percent and 12.6 percent, respectively. This assumes that no new OA participants would enter the fishery. However, given that this trip limit option would provide a modest increase to potential OA participants, it is reasonable to assume that an increase in the number of participants could occur.

Biological Impacts under Option 2b

Because the stock is considered healthy, the 84.5 mt increase compared to the No Action Option will have a relatively minor effect on the stock's status. Lingcod mortality is expected to increase as participants in the fishery will retain some lingcod encountered (at 100 percent mortality) rather than discard all lingcod encountered (with an estimated 7 percent mortality), as occurs now during the closed season. There may be an increase in lingcod encounter rates under this option relative to the No Action Option, because trip limits during the currently open season would double (Table B-66). The likelihood and impact of this potential increase in effort would be very difficult to quantify. Despite this, however, it is probable that additional sets during a trip may occur to target lingcod (after catching trip limits for other species). This could increase impacts to OFS, as well as China rockfish.

Projected Overfished Species Mortality under Option 2b

With the combination of higher trip limits for the traditional fishing periods coupled with the modest trip limits for those periods that before were closed, projected mortality for canary is expected to increase. Under Option 1c, the projected canary rockfish mortality is 6.7 mt (Table B-70), whereas under Option 2b that projected mortality amount would also be 6.8 mt. This projected canary mortality is 0.3 mt higher than shown under No Action (Table B-70) and 0.4 mt higher than the Preferred Alternative allocation. For yelloweye rockfish, the projected mortality under this option will be 1.3 mt, whereas it is 1.2 mt for Option 2a. This projected yelloweye mortality is 0.2 mt higher than shown under No Action, exceeds the Preferred Alternative nearshore allocation for 2015 by 0.1, and equals the Preferred Alternative nearshore allocation for 2016.

Stock Status

Under Option 2b, no changes to lingcod stock status are expected compared to the No Action Option since lingcod mortality has been far below the non-trawl allocation and expected to remain so under Option 2b. Estimated lingcod mortality under this option is expected to range between 10.1 percent and 14.3 percent of the non-trawl allocation (Table B-68). Given the projected increase in mortality that is projected to occur, the level of increase is still expected to be far below levels that would result in overfishing and are not expected to adversely affect stock status.

Socioeconomic Impacts under Option 2b

Allowing fishery participants to retain more lingcod (some of which were incidentally caught and discarded under status quo) would increase revenue from current operations targeting other species within incidental lingcod encounters. This may also increase revenue by incentivizing increased targeting or change in behavior during the May-November period when trip limits double relative to No Action (Table B-66). In 2013, the average price per pound coast wide averaged $2.50 per pound. This amount, applied to the projected total (approximately 186,000 lbs.) compared to the No Action Option total would result in a coastwide gross estimated ex-vessel amount of approximately $465,000 more than the No Action Option total. While moderate trip limits make it feasible that fishery participants will choose to target lingcod, such targeting may become more worthwhile if an increase in the overall average price per pound makes the trip profitable. It is speculated that if trip limits 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 could be unlikely.

B.8 *Non-Trawl: Allow Lingcod retention in Periods 1, 2, and 6*

Need for Action

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 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 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 be 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, primarily shelf and nearshore species, 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, primarily yelloweye and canary rockfish, and the potential for the sector allocations to be exceeded if inseason management, including trip limit reductions, is slow to respond.

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:

Management Options

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 lb per month in the open access fishery and 800 lb 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 (pounds of lingcod per trip) 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 lb per trip, whereas the average lingcod catch for the non-nearshore fishery is 7.2 lb per trip during the same periods (WCGOP data from 2002-2011). Note that lingcod catch (discard + retained) during the open periods (May – November) are 39 lb per trip for nearshore fixed gear and 43.2 lb 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, therefore trip limit increases should not result in increased participation. 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-72.

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-72. 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.

Sector	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	
LE North	Closed		800 lb./ 2 months			400 lb.	Closed
LE South	Closed		800 lb./ 2 months			400 lb.	Closed
OA North	Closed		400 lb./ month				Closed
OA South	Closed		400 lb./ month				Closed

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. Some of the discarded species will survive, while others will not. At present a 7 percent discard mortality rate reflecting rod and reel gear is anticipated for released lingcod[31]. The landings of lingcod in the last five years for each sector from Washington, Oregon, and California are provided in the Table B-73. 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 Groundfish 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.

Table B-73. 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-74. 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-74. 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.

[31] http://www.pcouncil.org/groundfish/current-season-management/past-management-cycles/2009-2010-final-environmental-impact-statement/, pg. 307.

Table B-74. Projected mortality for OFS (in mt) 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	Oreg	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-75).

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-75. The intent of Option 2 is to allow retention and landings of lingcod that would otherwise be discarded during the closed season. Current regulations include a minimize size limit for retained lingcod of 22 inches north of 42° and 24 inches south of 42°, which can be modified or removed through routine inseason action. Information on the prevalence of high grading, the practice of retaining only larger fish, is unknown. To the extent fish are highgraded, it is assumed that 7 percent of the released fish will not survive (see the Groundfish SAFE). Given that the low lingcod HGs and ACLs attainment, high-grading is unlikely to result in overfishing. The encounter rates in the nearshore fishery were much higher than the non-nearshore fishery during the closed period (35 lb per trip versus 7 lb 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 lb 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-76).

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-38). 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-38, with a trip limit of 100 lb 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-75. Average lingcod discard rates from WCGOP (lbs per trip, 2002-2011), fishing effort from PacFIN (trips/vessel/month, 2007-2012), 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; lb)	35.0 lb
	Average Number of Trips/Vessel/Month	3.3
	Average Number of Vessels Making Landings / Month	82
	Average Expected Lingcod Catch/Vessel/Month =(35 lb) x (3.3 trips/vessel/month) [a]	117 lb / month, or 234 lb / 2 mos
	Average Expected Landings / Vessel / Month, assuming 32% discard rate = (68%) x (117 lb)[b]	80 lb / month or 160 lb / 2 mos

Table B-76. 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.

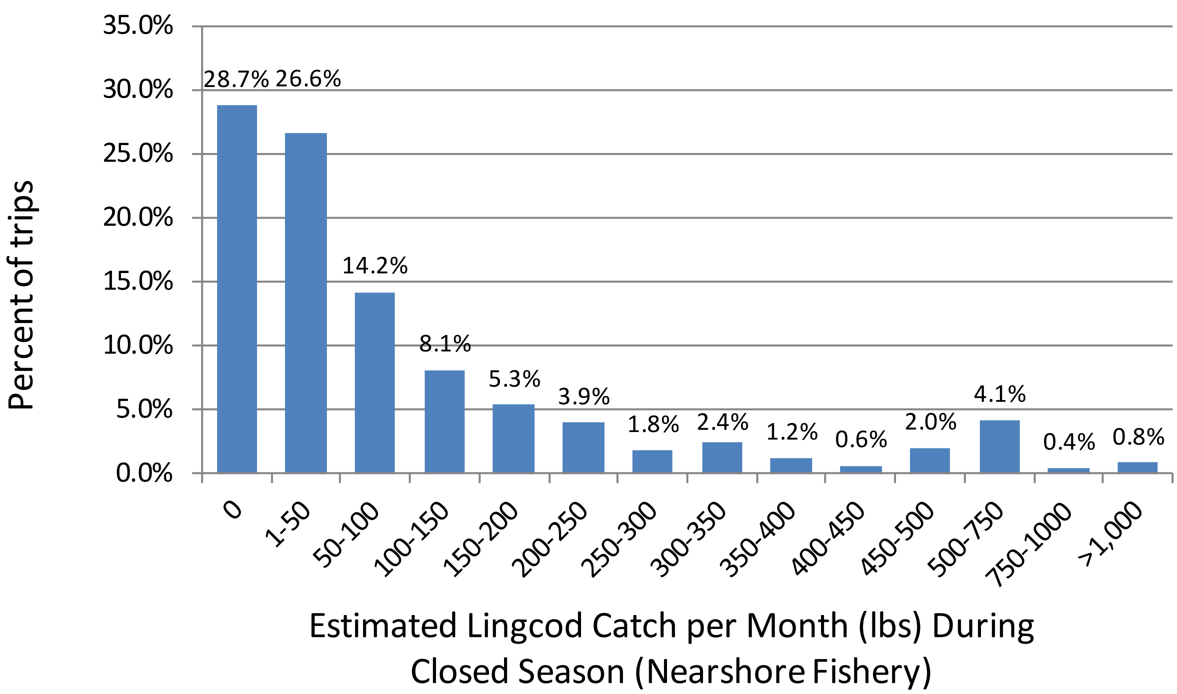

Figure B-38. Projected catch of lingcod per month during the closed season by individual vessels (percent) in the nearshore fixed gear fishery.

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-77.

Table B-77. 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 and are intended 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 all rockfish, primarily shelf and Nearshore Rockfishes, 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. In the event that effort does increase, routine inseason adjustments can occur to decrease trip limits and prevent overages. 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 limited entry and open access operations, primarily the nearshore fishery, 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 lb per month in the open access fishery and 800 lb 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-78). 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 8 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-38). 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-38). 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-78), 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-78. 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-79.

Table B-79. 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 mortality expected with trip limits shown in Table B-79. 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-80.

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-80 are negligible.

Table B-80. 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.9 *Non-Trawl: Trip Limit Adjustments for Shortspine Thornyhead N., Bocaccio S., and Shelf Rockfish S.*

Need for Action

For 2013-2014 commercial fixed gear fisheries, shortspine thornyhead (north of 34°27' N. latitude), bocaccio (south of 34°27' N. latitude) and the Shelf Rockfish complex (south of 34°27' N. latitude), have been managed, in part, by cumulative bi-monthly trip limits, designed to keep catches within the respective non-trawl HGs and ACLs. The intent of the trip limit increases for shortspine thornyhead and Shelf Rockfish is to reduce discarding (i.e., turn discards into landed catch) to increase attainment of the non-trawl HG. For bocaccio rockfish, the intent of the trip limit increases are to reduce discarding (i.e., turn discards into landed catch) while discouraging targeting since the stock is managed under a rebuilding plan. As a result of inseason tracking patterns (higher/lower than projected), trip limits may be adjusted inseason. For shortspine thornyheads, bocaccio, and the Shelf Rockfish complex, trip limit increases were implemented on August 13, 2013 as per the GMT's June 2013 Inseason Adjustment statement (http://www.pcouncil.org/wp-content/uploads/F9b_SUP_GMT_JUN2013BB.pdf). The following trip limit options are in addition to those increases seen in 2013. **The Council's preferred option is to increase the limits for bocaccio rockfish south of 34°27' N. latitude (Option 2a) and Shelf Rockfish 34°27' N. latitude (Option 2a) starting January 1, 2015 while maintaining the status quo limits for shortspine thornyhead north of 34°27' N. latitude.**

Methods

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 take for various trip limit amounts per vessel per period (bi-monthly or monthly); the sum of which represents the estimated annual catch or mortality. 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. However, with the OA fishery, that assumption may be in jeopardy if high enough trip limits prompt individuals to jump into what they perceive as a developing lucrative fishery. Another assumption 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 Groundfish Mortality Reports for 2011 and 2012 and factored into the final projected estimates.

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 Option (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 fixed-gear sectors under the harvest specifications action alternatives described in Chapter 2. Estimated mortality is provided that also incorporates discard mortality using estimated amounts derived from WCGOP Groundfish Mortality Reports. Trip limits under any option could be adjusted inseason as needed to attain, but not exceed, a given catch limit (non-trawl allocation portion of the annual ACL).

Generally speaking, bocaccio and Shelf Rockfish south of 34°27' N. latitude have been underutilized during recent years relative to non-trawl sector allocations, whereas shortspine thornyhead utilization north of 34°27' N. latitude has been much higher (Table B-81).

Table B-81. Comparison of estimated mortality (mt) and the non-trawl allocations (including the recreational sector) from 2011 through 2013 for the following non-trawl, fixed-gear fisheries: shortspine thornyheads (SSTH) – north of 34°27' N. latitude, bocaccio – south of 34°27' N. latitude, and the Shelf Rockfish complex – south of 34°27' N. latitude (Note: LE and OA sectors are combined and 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
SSTH	76	72.9	95.4%	76	63.2	83.2%	74	59.3	80.1%
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%

Table B-82. Expected mortality (mt) under No Action and under the Options for the non-trawl sector for 2015-2016 for the following non-trawl, fixed-gear fisheries: SSTH – north of 34°27' N. latitude, bocaccio – south of 40° 10' N. latitude, and the Shelf Rockfish complex – south of 40°10' N. latitude (Note: LE and OA sectors are combined and 2013 data are preliminary)

Species or Complex	No Action	Preferred Alternative (P*=0.45)		Preferred Alternative (P* = 0.25)	
		2015	2016	2015	2016
SSTH	77.3	84.3	83.3	61.4	60.8
BOCACCIO	4.5	258.8	268.7	258.8	268.7
Shelf RF	387	1,383.2	1,384.0	659.7	659.7

B.9.1 Shortspine Thornyhead North of 34°27' North Latitude Management Measures

For 2013-14 west coast groundfish fisheries, shortspine thornyhead have been managed to sector specific harvest guidelines (95 percent trawl and 5 percent 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 (Table B-82). The most recent assessment of shortspine thornyhead (Taylor 2013), indicates the stock is healthy with an estimated spawning stock biomass of 74.2 percent of its initial, unfished biomass. The 2014 commercial management measures for shortspine thornyhead are described in Table B-83. The Council requested analysis of higher LE trip limits for shortspine thornyhead north of 34°27' N., however ultimately decided to maintain the status quo limits starting January 1, 2015. Routine inseason adjustments may be expected as new information on fishery performance becomes available.

Table B-83. 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 the 2011-2013 non-trawl sector (which is allocated 5 percent of the annual take north of 34°27' N. latitude) catches were between 80 percent and approximately 90 percent of the allocation (Table B-81). The shortspine thornyhead non-trawl fixed-gear fishery north of 34°27' N. latitude is restricted to the LE entry sector. The open access sector is not allowed to retain shortspine thornyhead and the discard mortality is relatively small (e.g., 0.78 mt during 2012 WCGOP Groundfish Mortality Report). During the 2011-2012 management cycle, 116 LE vessels (85 percent of the LE fleet) landed less than 20 percent of the theoretical maximum amount they could have landed under the trip limits that were in place at the time.

Management Options

Option 1 – No Action (Preferred): Maintain current shortspine thornyhead trip limits for the limited entry sector north of 34°27' N. latitude. Under Option 1, the 2014 trip limits (Table B-84) would remain in place for the LE sector, and the OA sector would remain closed. Inseason adjustments could be recommended to attain the non-trawl HG.

Option 2a – Increase trip limits for the limited entry sector north of 34°27' N. latitude: Under Option 2a, increased bi-monthly trip limits north of 34°27' N. latitude were investigated to determine what the projected mortality would be compared to the No Action Option (Table B-84). Inseason adjustments could be recommended to attain the non-trawl HG.

Option 2b: Further trip limits for the limited entry sector north of 34°27' N. latitude: Under Option 2b moderate trip increases, compared to Option 2a, are explored (Table B-84). Inseason adjustments could be recommended to attain the non-trawl HG.

Biological Impacts 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 LE fixed-gear sector (with no open access fishery allowed). At this level of harvest, the projected mortality represents 92 percent of the 2015 HG (84.3 mt) and 93 percent of the 2016 HG (83.3 mt) at a P* value of 0.45 (Table B-82). At a P* value of 0.25 this exceeds the 2015 HG (61.4 mt) by 26 percent and exceeds the 2015 HG (60.8 mt) by 27 percent. This mortality is expected to be within the HG at the current level of vessel participation only at a P* value of 0.45. This assumes that the vast majority of vessels will continue to take less than 20 percent of their theoretical maximum allowable amount.

Stock Status

The shortspine thornyhead stock was determined to be healthy in the last stock assessment (Taylor 2013) and projections under status-quo catches showed little change in stock status.

Overfished Species Mortality

Overfished species (OFS) are encountered by non-nearshore fixed gear fisheries, which also catch shortspine thornyhead. For example in 2013, non-nearshore fixed gear fishery mortality for OFS was bocaccio rockfish south 40°10' N. latitude (2.62 mt), canary rockfish (0.12 mt), darkblotched rockfish (9.04 mt), Pacific ocean perch (0.41 mt), yelloweye rockfish (0.34 mt), and petrale sole (0.83 mt). It is expected that similar catches may be observed under Option 1 (No Action) during 2015 and 2016.

The non-nearshore fishery primarily targets sablefish. Other species, such as shortspine thornyhead, are incidentally caught (not targeted) and retained. In addition, many of the OFS (e.g., canary and yelloweye rockfish primarily live at shallower depths than shortspine thornyhead, and therefore largely do not co-occur.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

Other species are encountered by non-nearshore fixed gear fisheries, which also catch shortspine thornyhead. For example, rougheye rockfish was taken by the non-nearshore fixed gear fisheries (when shortspine thornyheads were also landed) as follows: 29.7 mt in 2011, 26.2 mt in 2012, and 19.4 mt in 2013. Shortraker rockfish was also taken as follows: 2.5 mt in 2011, 4.53 mt in 2012, and 0.16 mt in

2013. Last, blackspotted rockfish was taken as follows: 0.25 mt in 2011, 4.53 mt in 2012, and 0.16 mt in 2013. However, increases in shortspine thornyhead trip limits are not expected to have any additional impact on the mortality of these species because shortspine thornyhead are incidentally caught while fixed gear fishermen are targeting other higher-valued species. For example, Slope Rockfish and shortspine thornyhead catch is primarily incidental for fishermen targeting sablefish. Fishing effort and fishing behavior (i.e., selection of fishing locations) are not expected to change due to shortspine thornyhead trip limit increases. Therefore, mortality of these three species of rockfish is not expected to change.

Options 2a and 2b – 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 mortality would be compared to the No Action Option.

Individual vessel landings reported in PacFIN (table vdrfd) from 2011-2012 for the LE 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 (non-trawl allocation portion of the annual ACL).

Limited Entry Bi-monthly Trip Limit Options

The LE entry trip limit options for the shortspine thornyhead non-trawl fixed gear fishery north of 34°27' N. latitude are shown in Table B-84. Option 2a provides for an increase from 2,000 lb to 2,250 lb per bi-monthly period for periods 1 - 3, and does not change the trip limit for periods 4-6, which remain at No Action level of 2,500 lb per bi-monthly period. Option 2b provides for an increase from 2000 lb to 2,500 lb per bi-monthly period for periods 1-3, resulting in 2,500 lb per bi-monthly period for the entire year (Option 2b).

Table B-84. Comparison of projected landings of shortspine thornyhead in the LE non-trawl fixed-gear sector north of 34°27' N. latitude under No Action (Option 1) and increases for periods 1-3 only (Option 2a) and setting the trip limits to 2,500 lb per period for all six periods (Option 2b).

	Limited Entry Shortspine Thornyhead North 34°27' N. Latitude at a **P* of 0.45**					
Options	Bi-monthly Trip Limits (in lb)	Projected landings (mt)	HG (mt)		% of HG	
			2015	2016	2015	2016
Option 1 (No Action - Preferred)	2,000 for periods 1-3 and 2,500 for periods 4-5	77.3	84.3	83.3	91.7 %	92.8%
Option 2a	2,250 for periods 1-3 and 2,500 for periods 4-5	80.3	84.3	83.3	95.3 %	96.4%
Option 2b	2,500 for all six periods	83.4	84.3	83.3	98.9 %	100.1%

	Limited Entry Shortspine Thornyhead North 34°27' N. Latitude at a **P* of 0.25**					
Options	Bi-monthly Trip Limits (in lb)	Projected landings (mt)	HG (mt)		% of HG	
			2015	2016	2015	2016
Option 1 (No Action - Preferred)	2,000 for periods 1-3 and 2,500 for periods 4-5	77.3	61.4	60.8	126%	127%
Option 2a	2,250 for periods 1-3 and 2,500 for periods 4-5	80.3	61.4	60.8	131%	132%
Option 2b	2,500 for all six periods	83.4	61.4	60.8	136%	137%

Biological Impacts under Options 2a and 2b

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 (Option 2a) and exceeding it (Option 2b) under a P*=0.45 approach (Table B-82). Expected catches under these options are expected to exceed the HG using a P*=0.25 approach.

Stock Status

While the stock is considered healthy, no negative consequences would probably result from trip limit increases shown in Table B-84. 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 exceed the ACL.

Overfished Species Mortality

Details shown in Option 1 also apply to Options 2a and 2b. In addition, increases in shortspine thornyhead trip limits are not expected to have any additional impact on overfished species mortality, because shortspine thornyhead are incidentally caught while fixed gear fishermen are targeting other higher-valued species (i.e., sablefish). Fishing effort and fishing behavior (i.e., selection of fishing locations) are not expected to change due to shortspine thornyhead trip limit increases. Therefore, overfished species impacts are not expected to change.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

As was pointed out for Option 1, an increase in shortspine thornyhead trip limits are not expected to have any additional impact on the mortality of these species. If increases in catch of Slope Rockfish were to occur following increases to shortspine thornyhead trip limits, it is expected that such increases would be minimal because shortspine thornyheads are not the primary target species.

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. The latest anecdotal information received from the industry, regarding the 2014 sablefish fishery, indicates that demand may experience an upswing, which could result in an increased mortality of thornyheads.

B.9.2 Bocaccio South of 34°27' North Latitude Management Measures

For 2013-2014 California groundfish fisheries, bocaccio has been managed to sector specific harvest amounts (i.e., trawl, non-trawl, recreational). The HG for non-trawl fixed gear is expected to increase in 2015 and 2016 to 80.1 mt and 83.1 mt respectively (Table B-86). The 2014 commercial management measures for bocaccio rockfish are described in Table B-85. The 2011 update assessment (Field 2013) 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. This, combined with the information that recent mortality of this stock is far below the non-trawl harvest guideline (Table B-86), prompted the Council to request an analysis of higher trip limits for the LE and OA sectors south of 34°27' N. latitude. The intent of the trip limit increases are to reduce discarding (i.e., turn discards into landed catch) while discouraging targeting since the stock is under a rebuilding plan. The Council's preferred option is to increase the limits for bocaccio rockfish south of 34°27' N. latitude (Option 2a).

Table B-85. 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 landing this species is roughly twice as many. Total mortality estimates reported from WCGOP indicate that approximately six percent of the non-trawl fixed gear HG was attained in 2012 (Table B-86). Encounters are expected to increase as the bocaccio population continues to rebuild (i.e. rebuilding paradox). During the 2011-2012 management cycle, 5 LE vessels (83 percent of the six vessels that landed bocaccio) landed less than 20 percent of the theoretical maximum amount of bocaccio they could have landed south of 34°27' N. latitude. In the OA sector, 28 of 39 vessels (72 percent) that landed bocaccio south of 34°27' N. latitude landed less than 20 percent of their theoretical maximum amount of bocaccio.

Table B-86. Total bocaccio mortality (in mt) in the non-trawl fixed gear sector (LE and OA combined) south of 40°10' N. latitude from 2011-2012. (source: WCGOP)

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 (Table B-85) would remain in place for both LE and OA sectors.

Option 2a: Increase trip limits for LE and OA sectors south of 34°27' N. latitude (Preferred): Under Option 2a moderate trip increases, compared to Option 1- No Action, are explored (Table B-89).

Option 2b (Preferred): Further increase trip limits for LE and OA sectors south of 34°27' N. latitude: Under Option 2b moderate trip increases, compared to Option 2a, are explored (Table B-89).

Biological Impacts under Option 1: No Action

Projected Impacts

Under No Action, projected mortality for bocaccio south of 34°27' N. latitude is 1.0 mt and 3.5 mt for the LE and OA sectors, respectively (Table B-87). 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 therefore 5.4mt (Table B-86), which is well below the HGs for 2015 and 2016 (258.8 mt and 268.7 mt, respectively) for both P*=0.45 and P*=0.25 (Table B-86).

Table B-87. 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.	1.0	3.5
Total	5.4	

Stock Status

The bocaccio stock south of 40°10' N. latitude was formally designated as overfished in 1999. The current stock assessment (Field, 2013) indicates an increasing abundance trend and progress towards rebuilding (Field, 2011). Under Option 1, no changes in progress towards rebuilding are expected.

Overfished Species Mortality

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-88). 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-88. 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 WCGOP estimates, no discard mortality estimates are included.

A range of bocaccio trip limits and calculated projected mortality under three options for both the LE and OA sectors was analyzed (Table B-89). 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 effort since the intent is to turn discards into landings. In the event the assumptions are incorrect, inseason actions can be taken to reduce trip limits.

Table B-89 . Projected mortality for bocaccio under a range of options for the LE and OA fixed gear fisheries south of 34°27' N. latitude.

No Action Option 1							Total estimated mortality (mt)
Sector	Period and trip limit (lb)						
	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

Option 2a - Preferred							Total estimated mortality (mt)
Sector	Period and trip limit (lb)						
	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

Option 2b							Total estimated mortality (mt)
Sector	Period and trip limit (lb)						
	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 south of 40°10' N. latitude 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 projected pre-season or tracked inseason but is reconciled in the year end reporting by the WCGOP.

WCGOP data were examined for the area south of 36° N. latitude (data available) 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 amounts.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

Other species are encountered by non-nearshore fixed gear fisheries, which also catch bocaccio. However, this is not the case for rougheye, blackspotted, and shortraker rockfish as demonstrated by the 2011 and 2012 mortality estimates. During these years, no recorded landings of these three species of rockfish were made when landings of bocaccio were made. This is due primarily to the fact that these three species are infrequently taken south of 40°10' N. latitude.

Options 2a and 2b: 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 trip limits are assumed the same for each period. The years 2011 and 2012 were chosen as the basis for this model because they may be 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 - Preferred) to 1,000 lb/2 months (Option 2b; Table B-90). 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 - Preferred) to 500 lb/2 months (Option 2b; Table B-90). Participation in the OA sector has traditionally been more variable than LE, making it difficult to predict catch and fleet behavior; therefore it is possible that landings could be higher than projected.

Projected landings under each option for the LE and OA sectors are provided (Table B-90). These options are not mutually exclusive. , That is, the Council could recommend a different option for each sector.

Table B-90. Comparison of projected landings (mt) of bocaccio in the LE and OA sectors under No Action trip limits (Option 1), and two options with trip limit increases (Options 2a and 2b) to the 2015 non-trawl HG (258.8 mt) and the 2016 non-trawl (268.7 mt). Trip limit increases apply only to the open periods (currently period 2 (March/April) is closed). This applies to a P* of 0.45 and 0.25. Projected landings between 40°10' and 34° 27' N. latitude are based on average landings during 2011-2012.

2015							
	LE S. 34°27' N. lat.		OA S. 34°27' N. lat.		Projected Landings (mt) 40°10' -34°27' N. lat.	Total (mt)	% of Non-trawl Allocation
Option	Trip limit (lb.)	Projected Landings (mt)	Trip limit (lb.)	Projected Landings (mt)			
Option 1	300 for periods 1 and 3 500 for periods 4-6	1.0	100 for periods 1 and 3 and 200 for periods 4-6	3.5	0.9	5.4	2.0%
Option 2a - Preferred	750 – all open periods	1.7	250 - all open periods	6.2	0.9	8.8	3.4%
Option 2b	1,000 – all open periods	2.2	500 - all open periods	12.4	0.9	15.5	6.0%

2016							
	LE S. 34°27' N. lat.		OA S. 34°27' N. lat.		Projected Landings (mt) 40°10' -34°27' N. lat.	Total (mt)	% of Non-trawl Allocation
Option	Trip limit (lb.)	Projected Landings (mt)	Trip limit (lb.)	Projected Landings (mt)			
Option 1	300 for periods 1 and 3 500 for periods 4-6	1.0	100 for periods 1 and 3and 200 for periods 4-6	3.5	0.9	5.4	1.9%
Option 2a – Preferred	750 – all open periods	1.7	250 - all open periods	6.2	0.9	8.8	3.3%
Option 2b	1,000 – all open periods	2.2	500 - all open periods	12.4	0.9	15.5	5.8%

Note: Although status quo provides for differential trip limits by period (i.e. lower in Periods 1 and 3, and higher in Periods 4-6), for purposes of this analysis a constant trip limit amount was analyzed for all open periods.

Biological Impacts

Under Option 2a (Preferred), landings are projected to increase approximately 70 percent (0.7 mt) and 63 percent (3.4 mt) in the LE and OA sectors respectively compared to No Action (Option 1; Table B-90). While under Option 2b projected landings are expected to increase by 120 percent (1.2 mt) in the LE sector and 187 percent (10.1 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 HGs (i.e., 3.4 percent to 6.0 percent of the non-trawl harvest guideline; Table B-90).

Stock Status

Similar to Option 1, no changes to rebuilding progress are expected.

Overfished Species Mortality

Same as Option 1. In addition, increases in bocaccio limits relative to Option 1 are not expected to have any additional impact on overfished species mortality, because bocaccio are incidentally caught while fixed gear fishermen are targeting other higher-valued species (i.e., sablefish). Fishing effort and fishing behavior (i.e., selection of fishing locations) are not expected to change due to bocaccio trip limit increases. Therefore, overfished species impacts are not expected to change.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

Same as No Action Option 1: no impacts expected.

Impacts to Industry

Higher trip limits for bocaccio may convert discards into retained fish, thus increasing landings, 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.

B.9.3 Shelf Rockfish Complex South of 34°27' North Latitude Management Measures

Although the Shelf Rockfish complex is managed as a single stock south of 40°10′ N. latitude, trip limit options analyzed herein are for the management area 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-91. For 2013-14 California groundfish fisheries, the Shelf Rockfish complex south of 40°10′ N. latitude has been managed to sector specific allocations (i.e. trawl, 12.2 percent and non-trawl, 87.8 percent). 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 south of 40°10′ N. latitude is expected to increase substantially from 615 mt in 2014 to 1,383.2 mt in 2015 and 1,384.0 mt in 2016 at a P* = 0.45 (Table B-92). At P* = 0.25, the 2015 and 2016 allocations would be 659.7 mt for both years. 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 Council's preferred option is to increase the limits for Shelf Rockfish 34°27' N. latitude (Option 2a) starting January 1, 2015.

Table B-91. 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.

2015-2016 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 during 2011 and 2012. Total mortality estimates reported from WCGOP indicate that approximately 61 percent of the non-trawl allocation south of 40° 10´ N. latitude was attained in 2012 (Table B-91). If an intersector allocation (i.e. trawl, non-trawl allocations) had 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-92). During the 2011-2012 management cycle, nine LE vessels that made Shelf Rockfish landings (100 percent of LE vessels making Shelf Rockfish landings) landed less than 20 percent of the theoretical maximum amount of Shelf Rockfish they could have landed. In the OA sector, 42 vessels (84 percent) landed less than 20 percent of their theoretical maximum amount. Data indicate that few participants attained greater than half of the allowable limit, averaging approximately 240 lb/2mo and 280 lb/2mo in the LE and OA fleets respectively during 2011 and 2012.

Table B-92. Total Mortality (in mt) in the Shelf Rockfish complex non-trawl fixed gear sector (LE and OA combined) south of 40°10' N. latitude from 2009-2012. (source: WCGOP)

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.
Option 2a (Preferred): Increase trip limits for LE and OA sectors south of 34°27' N. latitude: Under Option 2a, increased, compared to Option 1, were investigated (Table B-94).

Option 2b: Further increase trip limits for LE and OA sectors south of 34°27' N. latitude: Under Option 2b moderate trip increases, compared to Option 2a, are explored (Table B-94).

Biological Impacts under Option 1

Projected Impacts
Under No Action, projected mortality for 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-93); 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 Groundfish Mortality Report, 2012); projected mortality of Shelf Rockfish south of 40° 10' N. latitude is 387 mt. This represents 28 percent of 2015 allocation of 1,383.2 mt under P* of 0.45, and 58.7 percent of the 2015 allocation of 659.7 mt under P* of 0.25. For 2016, this represents 28 percent of the 2016 allocation of 1,384.0 mt under P* of 0.45, and 58.7 percent of the 2016 allocation of 659.7 mt under P* = 0.25.

Table B-93. Summary of commercial 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 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, the Shelf Rockfish ACL is expected to increase in 2015-16, and only 31-67 percent of the non-trawl allocation has been caught during recent years (Table B-92), no changes to stock status are expected under No Action.

Overfished Species Mortality

Under the No Action Option, there is no anticipated increase to the mortality of OFS.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

Other species are encountered by non-nearshore fixed gear fisheries, which also catch Shelf Rockfishes. However, this is not the case for rougheye, blackspotted, and shortraker rockfish if we use the 2011 and 2012 mortality amounts as examples. During these years, no recorded landings of these three species of rockfish were made when landings of Shelf Rockfish were made. This is due primarily to the fact that these three species are infrequently taken south of 40°10' N. latitude.

<u>Options 2a and b: Increase trip limits for LE and OA sectors south of 34° 27' N. latitude</u>

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 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 may be 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 Shelf Rockfish complex south of 34° 27' N. latitude are shown in Table B-94. These options range from 4,000 lb/2 months (Option 2a - Preferred) 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. The proposed trip limit increases apply only to the existing open periods.

Open Access Bi-Monthly Trip Limit Options

The OA bi-monthly trip limit options for Shelf Rockfish complex south of 34° 27' N. latitude are shown in Table B-94. These options range from 1,500 lb/2 months (Option 2a - Preferred) to 2,500 lb/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 (Table B-94) could be higher than expected if the trip limit is increased sufficiently enough to encourage entry into the fishery by new participants.

Projected landings under each Option for the LE and OA sectors are provided (Table B-94). These Options are not mutually exclusive, that is, the Council could recommend a different option for each sector.

Table B-94. Comparison of Shelf Rockfish projected landings south of 40o 10´ N. latitude in the LE and OA sectors under No Action (Option 1), and two options with trip limit increases (Options 2a and 2b) to the 2015 and 2016 HGs under P*=0.45 (1,282.2 mt and 1,383.0 mt respectively) and the 2015 and 2016 HGs under P*=0.25 (659.7 mt). Projected landings between 40° 10' and 34° 27' N. latitude are based on average landings during 2011-2012. (Note: recreational catch were derived from the 2012 WCGOP Groundfish Mortality Report.)

Option	**P*=0.45** (2015 allocation = 1,382.2 mt and 2016 allocation = 1,384.0 mt)								
	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				2015	2016
Opt. 1	3,000	3.9	750	14.3	16.1	354	387	28%	28%
Opt. 2a - Preferred	4,000	4.3	1,500	24.0	16.1	354	399	29%	29%
Opt. 2b	5,000	5.4	2,500	39.9	16.4	354	416	30%	20%

Option	**P*=0.25** (2015 and 2016 allocations = 659.7 mt)							
	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 Allocations
	Trip limit	Projected Landings	Trip limit	Projected Landings				
Opt. 1	3,000	3.9	750	14.3	16.1	354	387	58.7%
Opt. 2a	4,000	4.3	1,500	24.0	16.1	354	399	60.5%
Opt. 2b	5,000	5.4	2,500	39.9	16.4	354	416	63.1%

Biological Impacts

Projected Mortality

Under Option 2a (Preferred), 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; Table B-94). 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 (Table B-94).

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 (Table B-94) and no changes to the current RCAs structure have been proposed (i.e. the RCA protections afforded under option 1 will remain in place).

Overfished Species Mortality

There may be a small increase in the bycatch of OFS, but at present, no quantifiable method has been explored to determine how much this may be. Any increase in trip limit is expected to increase fishing effort for Shelf Rockfish species. Likewise, increased catch of overfished species would likely occur. The amount of the increase is uncertain and cannot be estimated at this time. This could be an issue that would affect more the OA sector since this fishery is open-ended compared to the LE sector. It is difficult to estimate how many new participants that could enter the fishery as a result of increased trip limits, and thus the extent of increased OFS mortality.

Mortality of Rougheye, Blackspotted, and Shortraker Rockfish

Same as Option 1.

Impacts to Industry

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.9.4 Summary of Impacts for All Trip Limit Recommendations

The above sections analyze a range of trip limit options for shortspine thornyhead (north of 34°27' N. latitude), bocaccio (south of 34°27' N. latitude) and the Shelf Rockfish complex (south of 34°27' N. latitude). This section discusses the combined impact of such trip limit adjustments.

Biological Impacts: Increased trip limits shortspine thornyhead (north of 34°27' N. latitude), bocaccio (south of 34°27' N. latitude) and the Shelf Rockfish complex (south of 34°27' N. latitude) should result in increased landings for the target species. In the event that increased trip limits result in greater effort, inseason management would be taken to ensure catch stays within the ACL.

Socioeconomic Impacts: Under the action options, fishery participants would be expected to attain higher revenues than under No Action.

B.10 *Non-Trawl: Coastwide Sablefish Trip Limits*

Need for Action

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 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 the Preferred Alternative). Proposed trip limits for 2015 and 2016 in these fisheries were produced GMT landing forecast models (described briefly below, and in Appendix A) in order to attain but not exceed the sector-specific allocations and the preferred sablefish ACLs.

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".

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 Council. 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.

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, ODFW, National Oceanic and Atmospheric Administration (NOAA) Southwest Fisheries Science Center (SWFSC) and 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.

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 West Coast Region (WCR) 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.

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 WCGOP, 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.

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-95 and Figure B-39.

Table B-95. 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	352	483	393
Preferred Alternative 2015	236	388	531	432
Preferred Alternative 2016	258	425	581	472

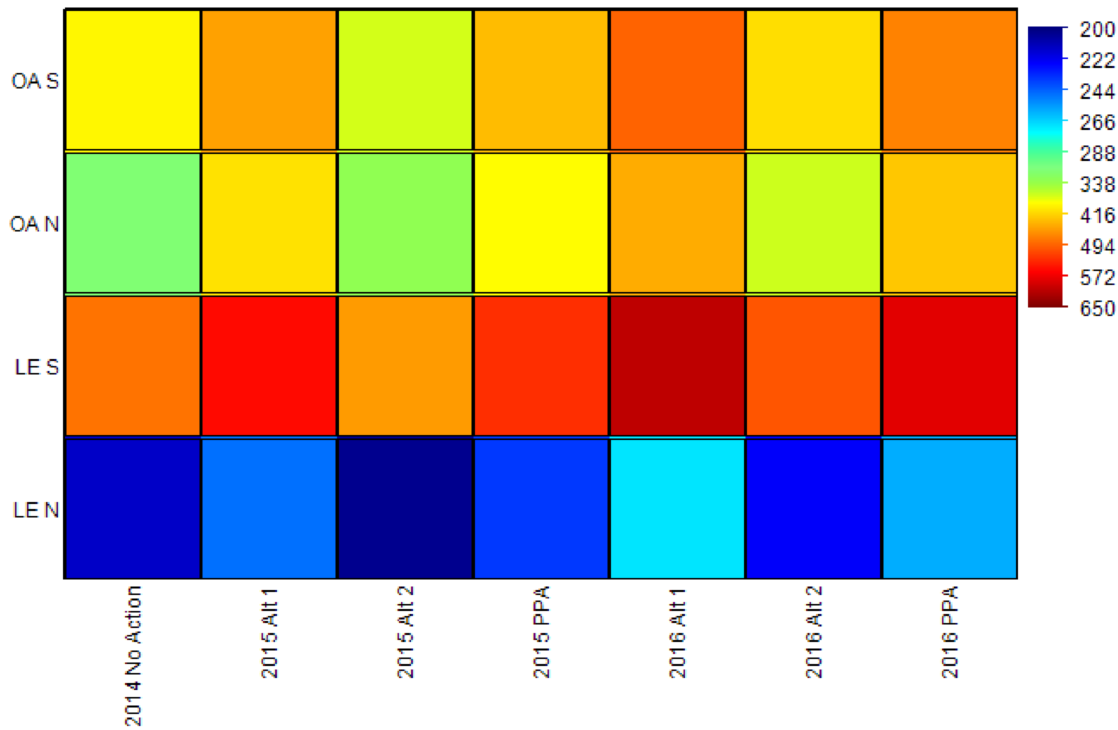

Figure B-39. Heatmap showing variation in potential landed shares used for making projections, for each of the fixed gear sablefish DTL fisheries, under each of the alternatives.

B.10.1 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-96, from Table 2 North, and South, to Part 660, Subpart E, Codified Federal Regulations).

Table B-96. 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-97. The No Action Alternative resulted in projected attainments ranging between 71 and 95 percent, using the best available data, and 2014 trip limits set in the November, 2013 council meeting (Table B-98). 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 Bnd temporally uniform structure, which was appreciated by the Groundfish Advisory Subpanel (GAP) in their statement at the November 2011 council meeting, and subsequent meetings.

Table B-97. 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 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-98).

Table B-98. 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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Difference	9.6	29.6	45.2	113.3	158.5

B.10.2 Preferred Alternative – Sablefish Trip Limits

Preferred Alternative for 2015

Trip limits and projected impacts under the Preferred Alternative for 2015

The trip limit structures for each fishery in 2015 under Preferred Alternative are presented in Table B-99. The RCA structure would be the same as under No Action (Table B-96). Differences between the Preferred Alternative and No Action limits also appear in the table. Trip limits in the north are generally higher under Preferred Alternative than for No Action. Higher limits were needed to influence similar attainment, under the higher shares. In the south, the Council recommended continuing with the No Action trip limits based on a recommendation from the Groundfish Advisory Subpanel (Agenda Item F.7.b, Supplemental GAP Report).

Table B-99. Trip limits under the Preferred Alternative, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in lb of landed catch per time period listed.

		2015 Preferred			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 the Preferred Alternative are presented in Table B-100. 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 the Preferred Alternative and No Action; 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 Preferred Alternative 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 the Preferred Alternative.

Table B-100. Model-projected landings under the Preferred Alternative, 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 Preferred	**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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Remainder	9.6	29.6	45.2	113.3	158.5
Difference					
Projected landings	15.4	35.9	58.4	30.5	88.9
Landed share	22.0	36.0	48.0	39.0	87.0
Percent attainment	-2%	1%	3%	1%	2%
Remainder	6.6	0.1	-10.4	8.5	-1.9

Preferred Alternative for 2016

Trip limits and projected impacts under Preferred Alternative for 2016

The trip limit structures in 2016 under the Preferred Alternative for each fishery are presented in Table B-101. The RCA structure would be the same as under No Action (Table B-96). Trip limits are generally higher under the Preferred Alternative 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-101. Trip limits under the Preferred Alternative, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2016. Limits are in lb of landed catch per time period listed.

		2016 Preferred			**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 the Preferred Alternative are presented in Table B-102. 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 the PPA and No Action, and are nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is consistently higher under the PPA 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 the PPA.

Table B-102. Model-projected landings under the Preferred Alternative, 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 Preferred	**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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Remainder	9.6	29.6	45.2	113.3	158.5
Difference					
Projected landings	36.7	80.1	105.5	64.5	170.0
Landed share	44.0	73.0	98.0	79.0	177.0
Percent attainment	-2%	3%	3%	2%	2%
Remainder	7.3	-7.1	-7.5	14.5	7.0

B.11 *Recreational: Canary Rockfish Sub-Bag Limit in Oregon Fisheries*

Need for Action

Although the canary rockfish stock is a category 1 stock, some unresolved problems and uncertainties have been identified in the stock assessment. The current stock abundance is relatively uncertain. In part this is 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. The last full assessment (Stewart 2009) indicated that historical and current relationship between canary rockfish distribution and habitat features should be investigated to provide more precise estimates of abundance from the surveys, and to guide survey augmentations that could better track rebuilding through targeted application of newly developed survey technologies.

Uncertainties of the current and future abundance of the canary rockfish stock could be improved if recreational groundfish fishery data were available. The recreational fishery occurs almost entirely over rocky reef habitats, therefore the recreational fishery catch rates could be used to provide an index of relative abundance (CPUE) of canary rockfish from their primary habitat. Additionally, since recreational fishery gears catch smaller and younger canary rockfish than trawls, biological data from the recreational fishery could be used to better detect recruitment events needed to better track rebuilding.

For recreational fishery catch to aid in the data used for future canary rockfish stock assessments, retention of canary rockfish would have to be permitted. Since anglers are currently required to discard all canary rockfish catch, biological samples are currently obtained from infrequent illegal landings. The number of canary rockfish reported to have been discarded by anglers is too uncertain to be used as a CPUE index in an assessment. Allowing retention so dockside creel samplers can verify the species and collect and biological samples could address some of the stock assessment uncertainty.

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 NWFSC bottom trawl 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-40), 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).

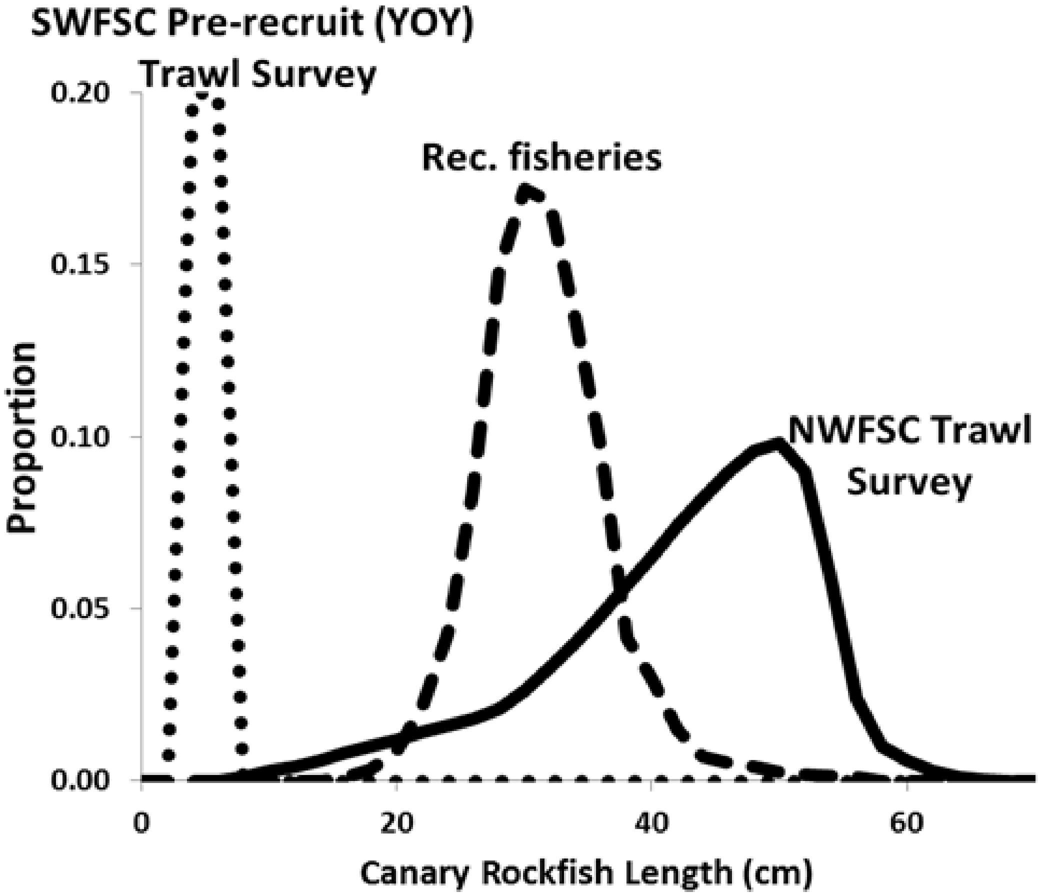

Figure B-40 Canary rockfish length frequency comparison for the trawl surveys and the recreational fisheries. NFWSC curve is an approximation for combined sexes from 2003-2010, from Figure 11 of the Canary rockfish assessment (Wallace and Cope 2011). Recreational data from RecFIN query, 2006-2013; OR, WA, and CA (pooled due to infrequency of (illegal) catches).

Increase accuracy of removals

Allowing retention of canary rockfish in the recreational 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.

Though canary rockfish has a coastwide OFL and ACL, each state's recreational fishery has its own HG. And each of the West Coast states manages their recreational groundfish fishery independently of each other (e.g. season length, bag limits) to stay within their HG. Therefore analysis of allowing canary rockfish retention was completed on a state by state basis. Under the Preferred Alternative, canary retention was selected only for the Oregon recreational fisheries. As such, the description of the Preferred

Alternative is described below whereas the analysis for Washington and Oregon is contained in the Considered but Rejected for Implementation Section, B.20.

Management options

Status Quo: Retention of canary rockfish will remain prohibited in the Oregon recreational fisheries.

Option 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) in the Oregon recreational fisheries.

Option 2: Up to ten canary rockfish per day, as part of the Federal miscellaneous groundfish daily bag limit, may be reduced under state regulations (currently seven fish) in the Oregon recreational fisheries.

Abundance index of canary rockfish from their primary habitat (rocky reef) off of Oregon

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-41).

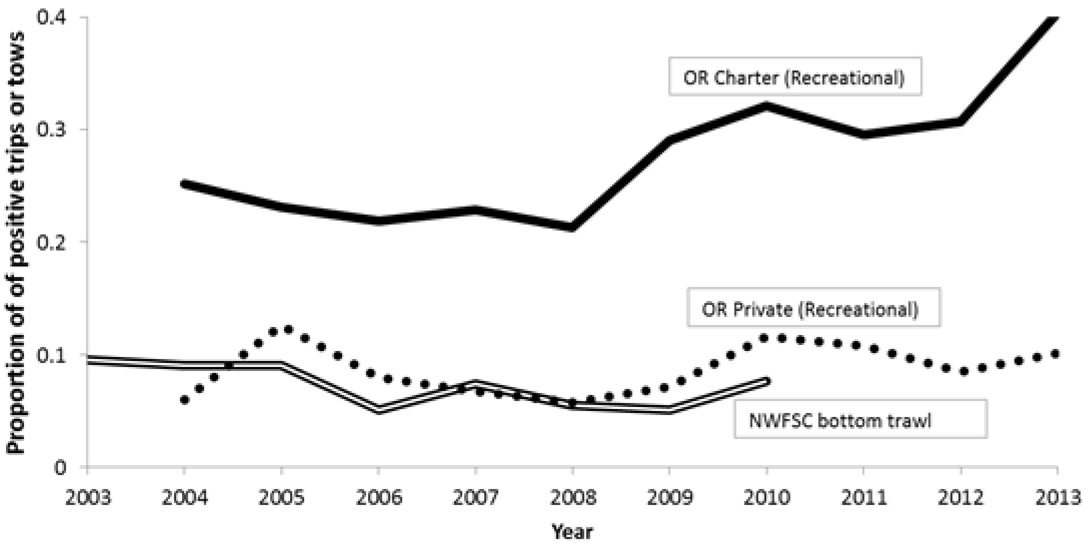

Figure B-41. Comparison of canary rockfish relative abundances from marginal habitat (sand and flat bottom; NWSFC bottom trawl survey) and primary habitat (rocky reef; OR charter and OR recreational groundfish fisheries).

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 management 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 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).

No increase to the projected rebuilding time

The Oregon recreational 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-103), 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 recreational anglers. Since 2009, 73 percent (13,536 of 18,703) of canary rockfish caught by recreational anglers has been from trips where the number of anglers outnumbered the canary rockfish catch (Figure B-42). 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[32] (8.1 mt vs. 9.5 mt, respectively) is projected to have much less effect on mortality (Table B-103); 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 (Figure B-42). 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 recreational 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 fm; Figure B-43), 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 recreational anglers tend to fish seaward of 30 fm (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.

[32] The current bag limit specified in Oregon state regulations, in Federal regulations the bag limit is ten.

Table B-103. Projected canary rockfish total (grey boxes), discard, and harvest mortality for each harvest option. Projected harvests (# of fish) are shown to demonstrate sample sizes of biological samples that may be attained by allowing retention. (The current bag limit of seven fish in Oregon state regulations was used for this analysis, rather than the ten fish bag limit in Federal regulations)

		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	

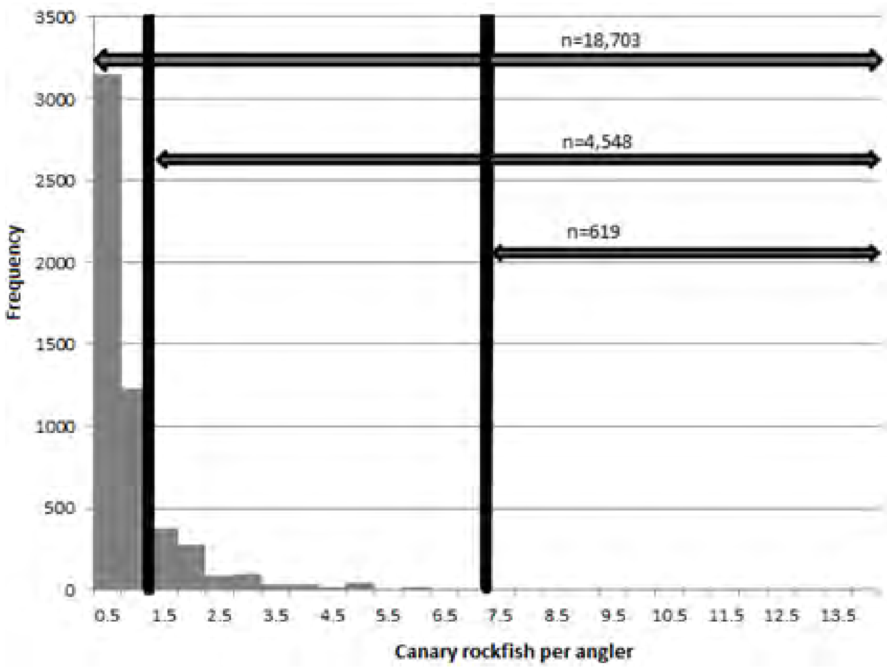

Figure B-42. Canary rockfish catch rate (bars) frequencies for trips that caught one or more and the corresponding quantity of canary rockfish associated with those trips (numbers by arrows), 2009-current.

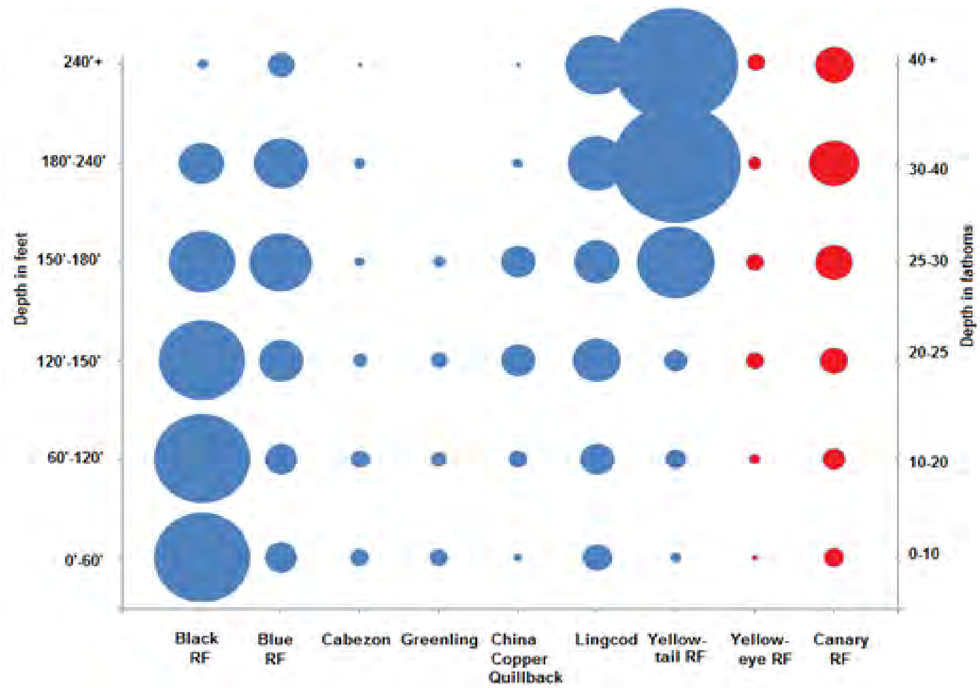

Figure B-43. Relative catch rates by depth of overfished species and harvestable species constituting the bulk of recreational fishery landings.

Projection methods

Canary rockfish mortality was projected for the harvest options 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.

$$M_{Baglimit(H)} = \underbrace{\text{Discard } M_{BagLimit=0}\left[\frac{\#Fish_{CR > Baglimit(H)}}{\#Fish_{Baglimit=0}}\right]}_{\textit{Reduces discarded catch due to harvest}} + \underbrace{\#Fish_{Baglimit=0}\left[\frac{\#Fish_{CR \leq Baglimit(H)}}{\#Fish_{Baglimit=0}}\right]\left[\frac{\text{FishWeight (kg)}}{.001\text{ (kg to mt)}}\right]}_{\textit{Converts discarded catch to harvest catch}}$$

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 (the current bag limit in Oregon state regulations). A sub-bag limit of one fish should prevent most targeting of canary rockfish, while allowing retention of those canary rockfish that are incidentally encountered. A bag limit of up to seven (state regulation) or ten (Federal regulation) could change angler behavior, such as targeting areas of canary rockfish. Additionally, allowing retention of incidentally encountered canary rockfish could aid anglers in filling their bag with less time on the water.

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-44) 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 reduction in catch from allowing canary retention would only apply to the 2.5 percent of trips that limit and have canary rockfish catch.

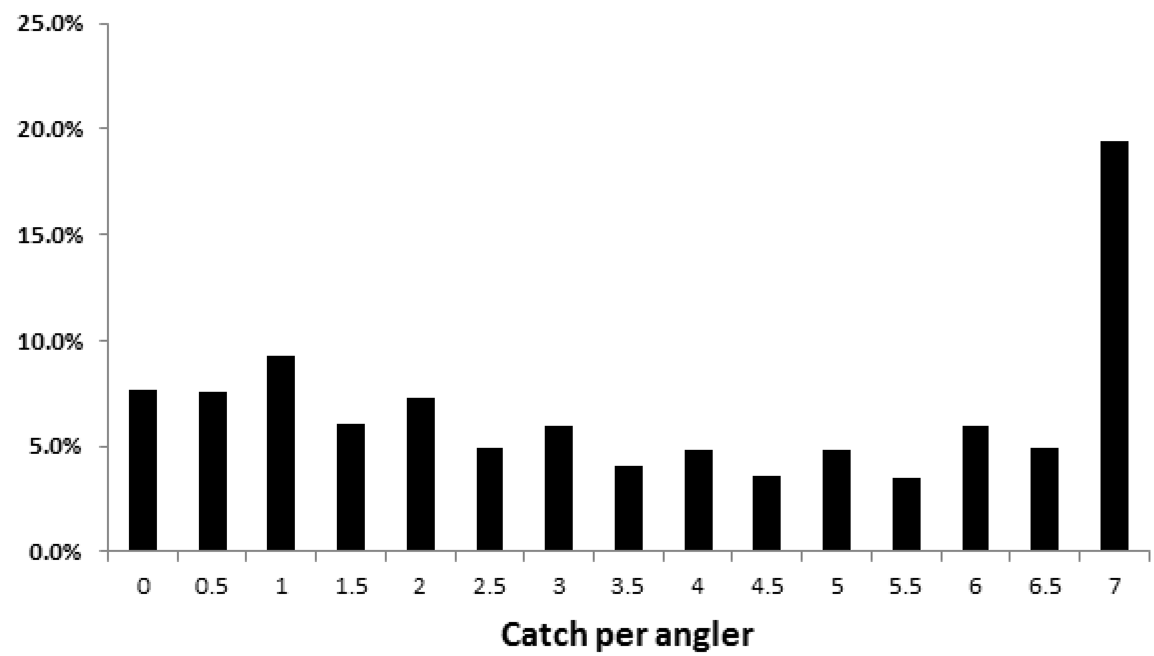

Figure B-44. Percentage of angler trips that caught 0-7 miscellaneous groundfish bag limit. Data is from 32,769 bottomfish trips that occurred from 2009-2013.

Discussion

The potential new recreational 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 recreational 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 recreational 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.

B.12 *Recreational: Lingcod Bag Limit Analysis for the California Recreational Fisheries*

Need for Action

For 2013-2014 recreational groundfish fisheries, lingcod have been managed within a non-trawl allocation of 1186 mt in 2014; lingcod does not have a recreational harvest guideline specified in regulation. In recent years mortality of lingcod south of 42° N. latitude has been far below the non-trawl allocation. In 2012, approximately 27 percent (314 mt) of the allocation was attained. Within the non-trawl sector, the recreational fishery comprised approximately 24 percent of the total mortality in 2012. WCGOP Groundfish Mortality Reports from the WCGOP indicate that the majority of mortality in the non-trawl sector is attributed to the recreational fishery (Table B-104).

Currently lingcod are subject to a two fish bag limit; other recreational management measures include the same season and depth restrictions as many other groundfish, as well as a minimum size limit of 22 inches. The current size limit was implemented in 2012 and access to higher lingcod abundance in deeper waters has been limited due to the need to protect overfished species. As a result, few management measures are available to increase the harvest of lingcod.

Table B-104. Total mortality (in metric tons) of lingcod south of 42° N. latitude in the non-trawl sectors, 2009-2012 (source: West Coast Groundfish Total Mortality Reports).

Year	Commercial (non-Trawl)	Recreational	Total non-Trawl
2009	37.7	129.6	167.3
2010	26.8	94.6	121.4
2011	29.8	225.2	255.0
2012	33.0	281.4	314.4

<u>2015-2016 Management Considerations</u>:

Lingcod south of 42° N. latitude is a healthy stock which has been underutilized in recent years. Utilization of the stock has been limited somewhat by restrictive depth constraints and season structures implemented to protect overfished stocks. In order to more fully utilize the non-trawl lingcod allocation, the Council requested analysis of increasing the lingcod bag limit from two fish to a three fish bag limit.

Range of Management Options for Consideration

Option 1- No Action: Maintain current two fish bag limit for lingcod

Under Option 1, the lingcod bag limit would remain two fish. Anglers will be forced to discard lingcod in excess of the bag limit, increasing the likelihood of encounters with overfished species.

Biological Impacts under Option 1

Projected Impacts

Under Option 1, the projected mortality to lingcod in the recreational fishery under a two fish bag limit is 244.4 mt. Table B-105 summarizes projected mortality to all overfished species.

Table B-105. 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 rebuilt in 2005 (Jagielo and Wallace, 2005) and the recent assessment indicates the sock remains above target biomass, with increasing abundance (Hamel et. al. 2009). Under Option 1, no change to stock status is expected.

Option 2: Increase the bag limit from two to three fish

Under Option 2, the lingcod bag limit would be increased statewide from two to three fish.

RecFIN data from 2011 to 2012 were used to analyze lingcod mortality as a result of increasing the bag limit. Using the RecFIN Hypothetical Bag Limit Analysis tool, estimates of increased mortality 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 fish discarded dead, and B2 fish includes mainly live discarded fish in excess of bag limits or undersized fish. Since the bag analysis tool does not estimate the proportion of fish that were undersized, this analysis assumes that all discarded fish were of legal size, biasing mortality estimates high. As the most conservative estimate, the analysis also assumes that all B2 fish would be available if the bag limit were increased.

Biological Impacts under Option 2

Projected Impacts

Under Option 2, projected mortality to lingcod is expected to increase by approximately 20 percent (399.7 mt) under a three fish bag limit and Preferred Alternative season structure[33]. The increase in projected mortality (155.3 mt) as a result of Option 2 can be accommodated within the non-trawl allocation, especially given historically low attainment.

[33] The Preferred Alternative season structure corresponds to Alternative 1 (Option1).

Additional changes to management measures related to lingcod in the non-trawl sector are also being considered – specifically modifications to the spawning closure for the commercial non-trawl sectors. The cumulative mortality of both proposed changes is not expected to exceed the non-trawl allocation let alone the ACL.

Impacts on Overfished Species

Table B-106 summarizes mortality of overfished species under Option 2. If anglers spend more time on the water fishing for an additional lingcod, the number of encounters with overfished species may increase, although any increase is difficult to quantify. While some increase in overfished species mortality can be expected over Option 1, sufficient buffer is available to accommodate the increased impacts (if realized) without exceeding the respective recreational HGs or the non-trawl allocation for cowcod.

Table B-106. 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 change to stock status is expected compared to Option 1.

Socioeconomic Impacts

Increasing the lingcod bag limit would provide anglers with increased opportunity, which may encourage anglers to take more trips. As a result, coastal communities and business that support recreational fishing could experience minor increases to revenue compared to No Action, though such increases are difficult to quantify or attribute solely to the increased bag limit.

B.13 *Retain groundfish, lingcod only, or flatfish only during the Pacific halibut fisheries*

Need for Action

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 fm (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 fm; 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

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 fm 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 fm 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-107). 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-107. 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 fm depth restriction on days open to the recreational halibut fishery. Prior to 2010, only Pacific cod and sablefish could be retained seaward of 30 fm 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 fm depth restriction was analyzed in the 2011-2012 Harvest Specification and Management Measures Environmental Impact Statement and implemented in 2011. Table B-108 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-108. 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-109). Allowing lingcod retention seaward of the 30 fm 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-109. 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 fm 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 fm 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-110). 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 fm compared to 83 percent in 2012, reducing the total mortality of yelloweye on recreational halibut trips.

Table B-110. 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-111). 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-112).

Recently, anglers have expressed interest in revising regulations to allow lingcod retention during the recreational halibut fishery in this area.

Table B-111. 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-112. 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-45). 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.

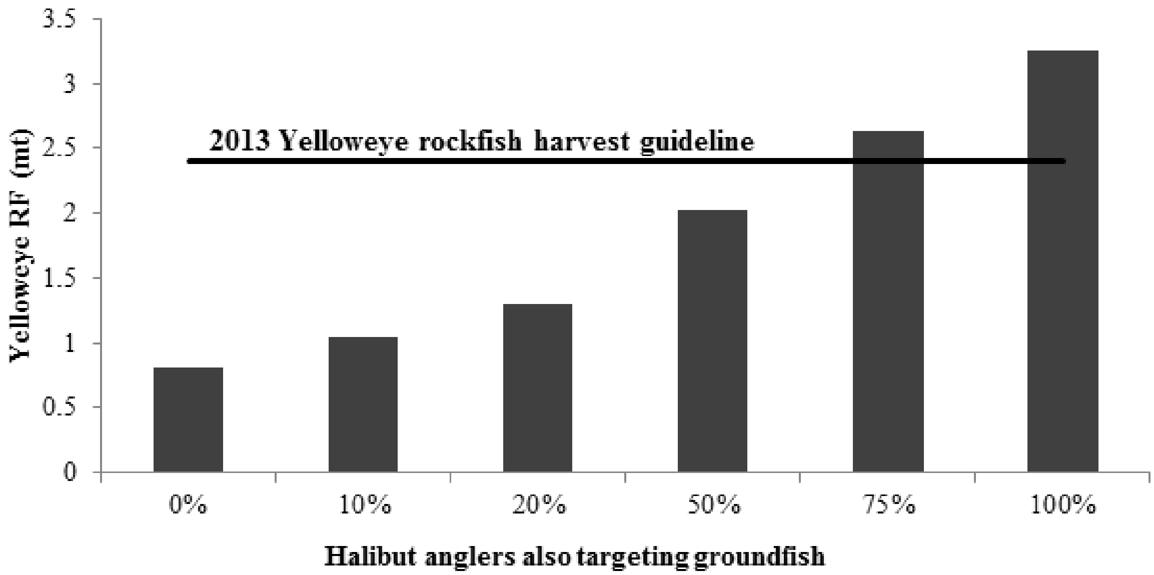

Figure B-45. Projected mortality of yelloweye rockfish from the Oregon recreational halibut fishery if halibut anglers were allowed to retain groundfish during halibut trips for various degrees of targeting of groundfish by halibut anglers. Since the percentage of anglers that would target groundfish 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-46). 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).

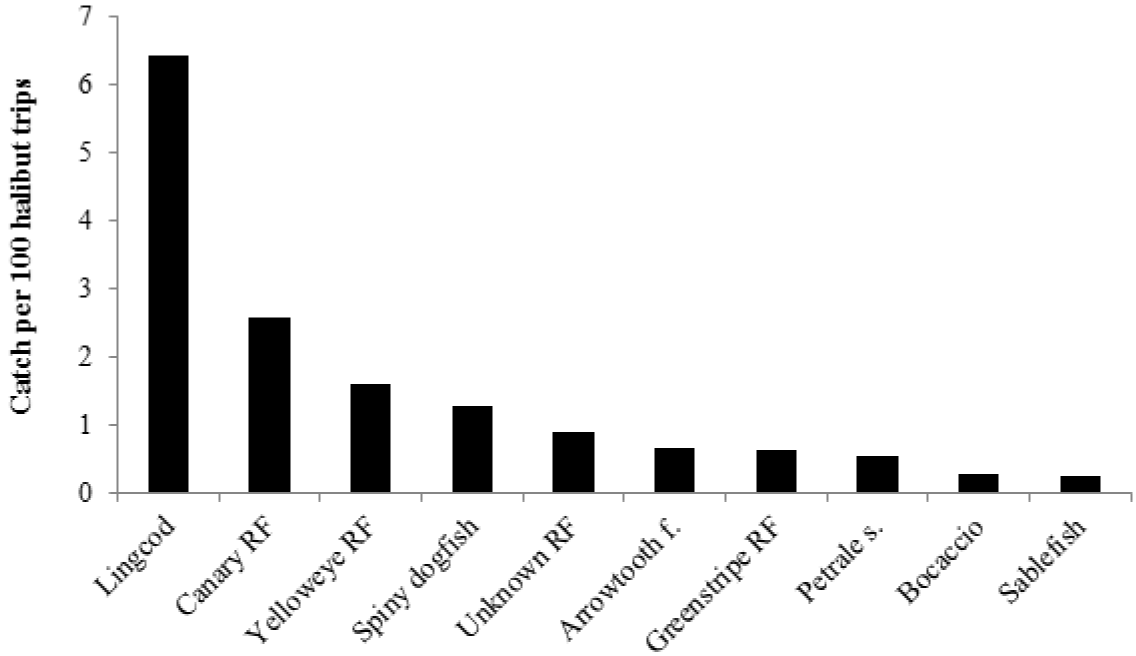

Figure B-46. Catch rates of the top ten most commonly encountered groundfish species by recreational halibut anglers in Oregon.

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.

Management Options

No action: No groundfish except for sablefish and Pacific cod can be retained during all-depth halibut season while in possession of a halibut

Option 1: All groundfish can be retained during all-depth halibut season
Option 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

Management Measures Considered but Rejected

The Council requested analysis of several new management measures which were rejected for implementation in the 2015-2016 harvest specifications and management measures process. Some of the management measures were forwarded for further consideration and prioritization within the Omnibus Regulation Changes while others were rejected all together. A summary of the analysis conducted to date is contained below.

B.14 *Groundfish Closure Areas for Rougheye Rockfish and Spiny Dogfish*

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 OFLs (and ACLs). For the 2015-16 Pacific Coast groundfish fisheries, GCAs for rougheye rockfish and/or spiny dogfish are being considered. The 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 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.14.1 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 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-47. 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-48. 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-49 and Figure B-50. 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-49 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-50 due to the occurrence of hot spots in this area.

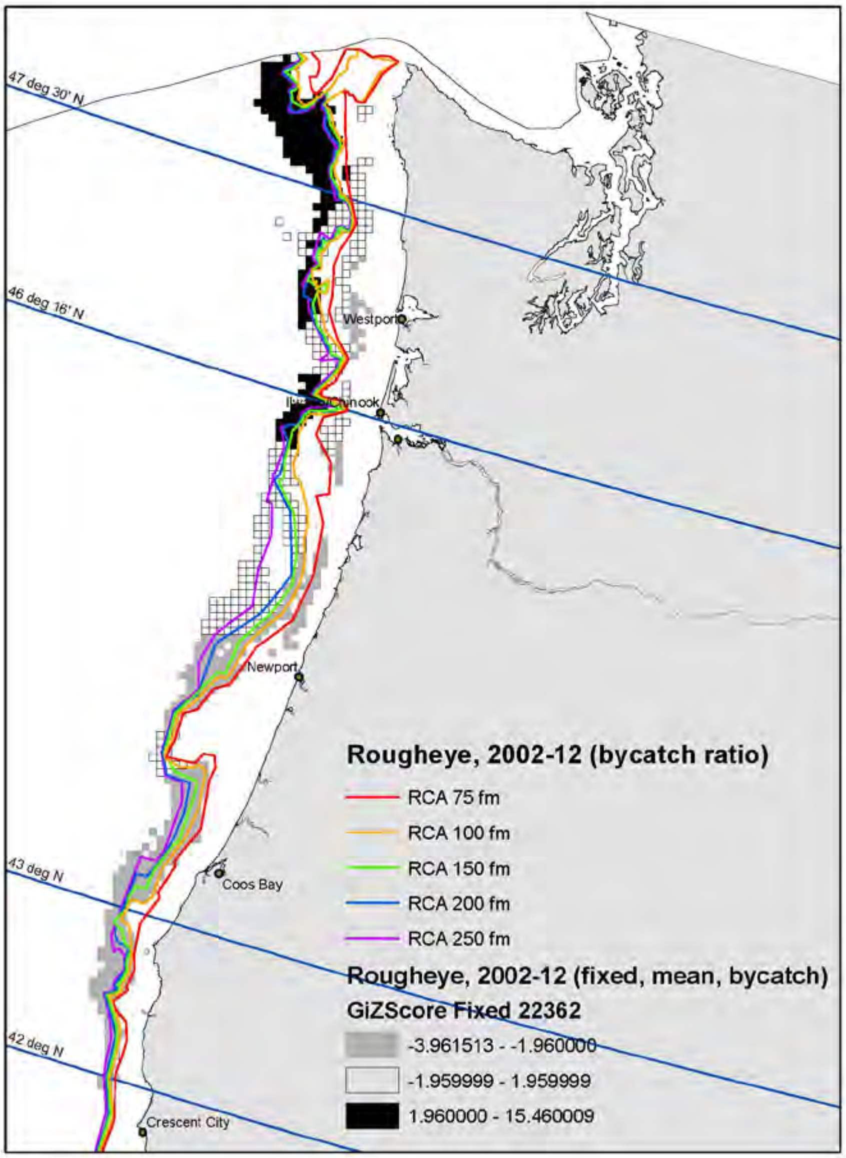

Figure B-47. Hot and cold spots of rougheye rockfish in the at-sea whiting sector, 2002-12.

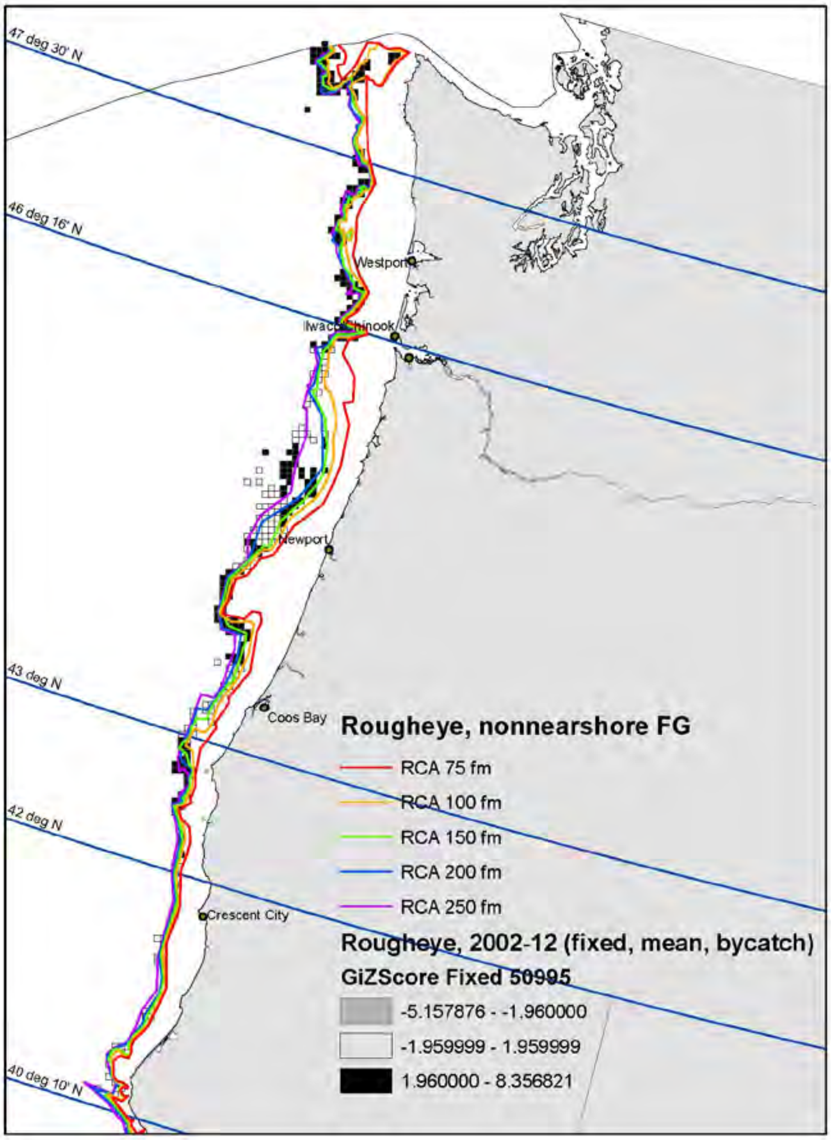

Figure B-48. Hot and cold spots of rougheye rockfish in the non-nearshore fixed gear sector, 2002-12.

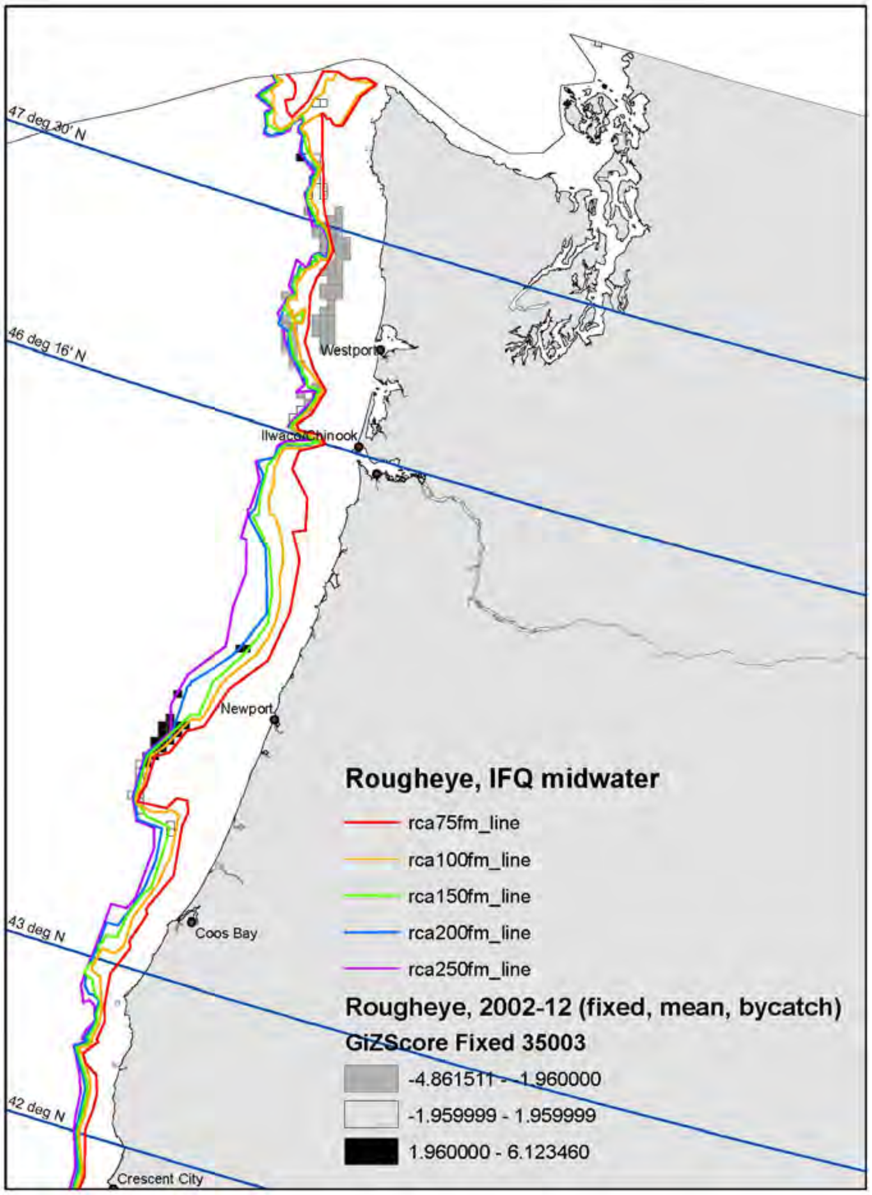

Figure B-49. Hot and cold spots of rougheye rockfish in the IFQ sector, midwater trawl, 2002-11.

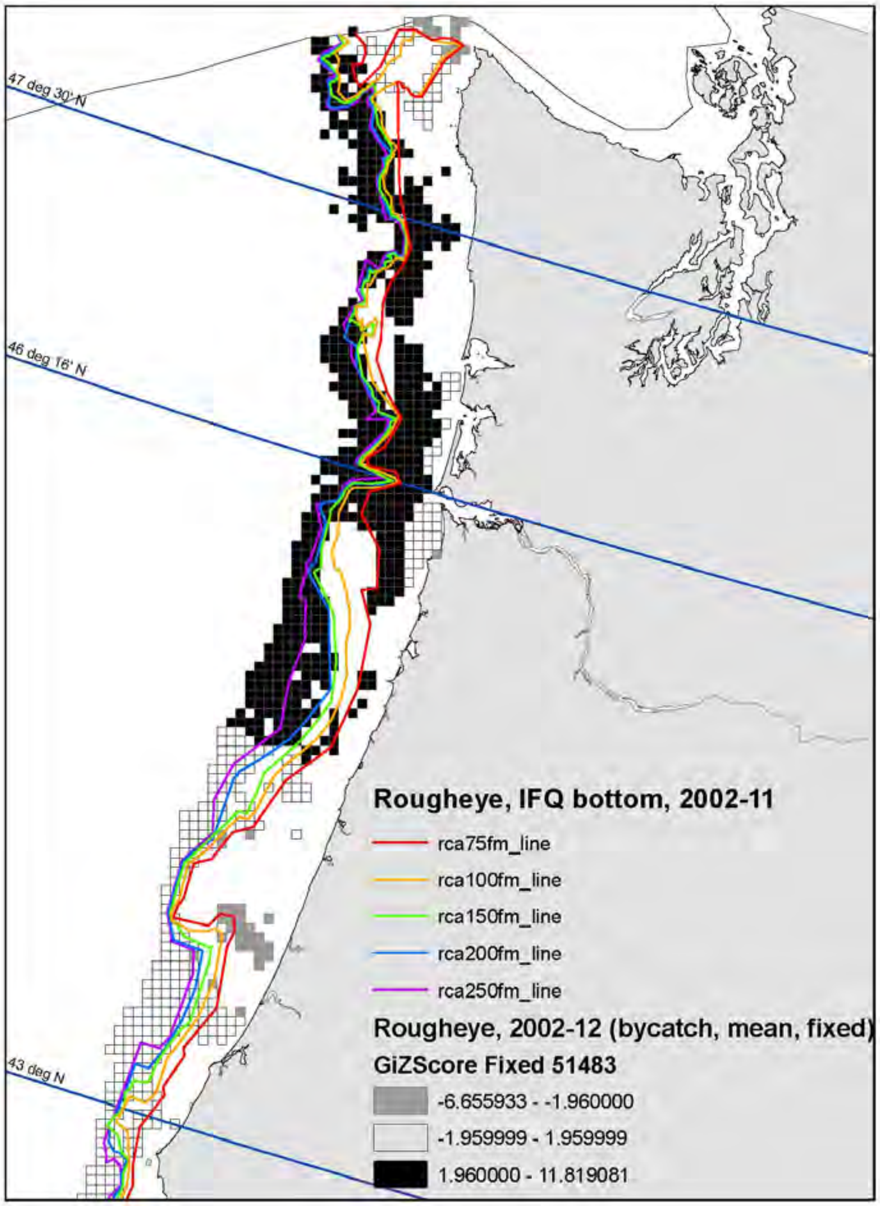

Figure B-50. Hot and cold spots of rougheye rockfish in the IFQ sector, bottom trawl, 2002-11.

B.14.2 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-51. 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-52. 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-53 and Figure B-54. 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-53 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-54 due to the occurrence of hot spots in this area.

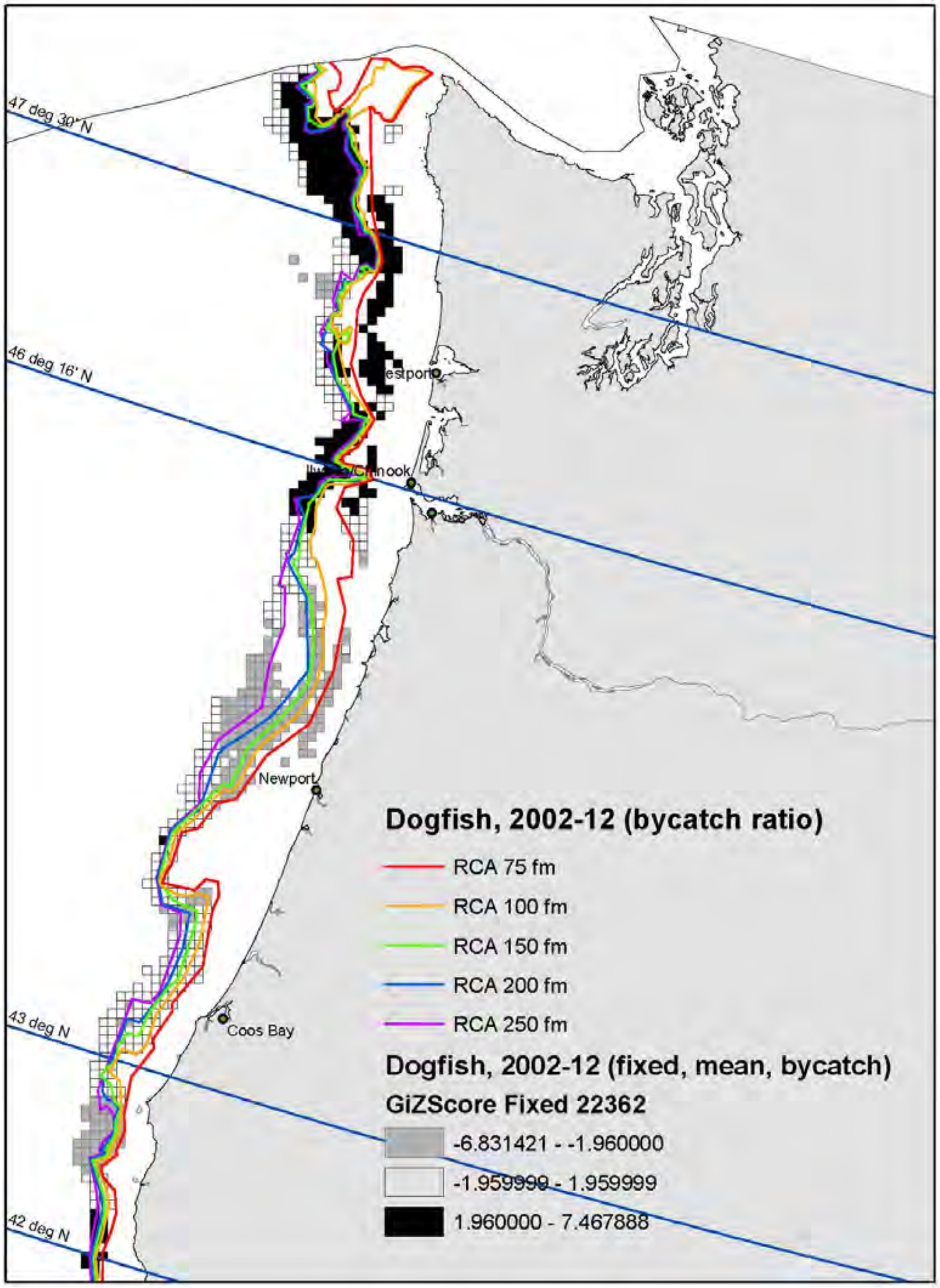

Figure B-51. Hot and cold spots of spiny dogfish in the at-sea whiting sector, 2002-12.

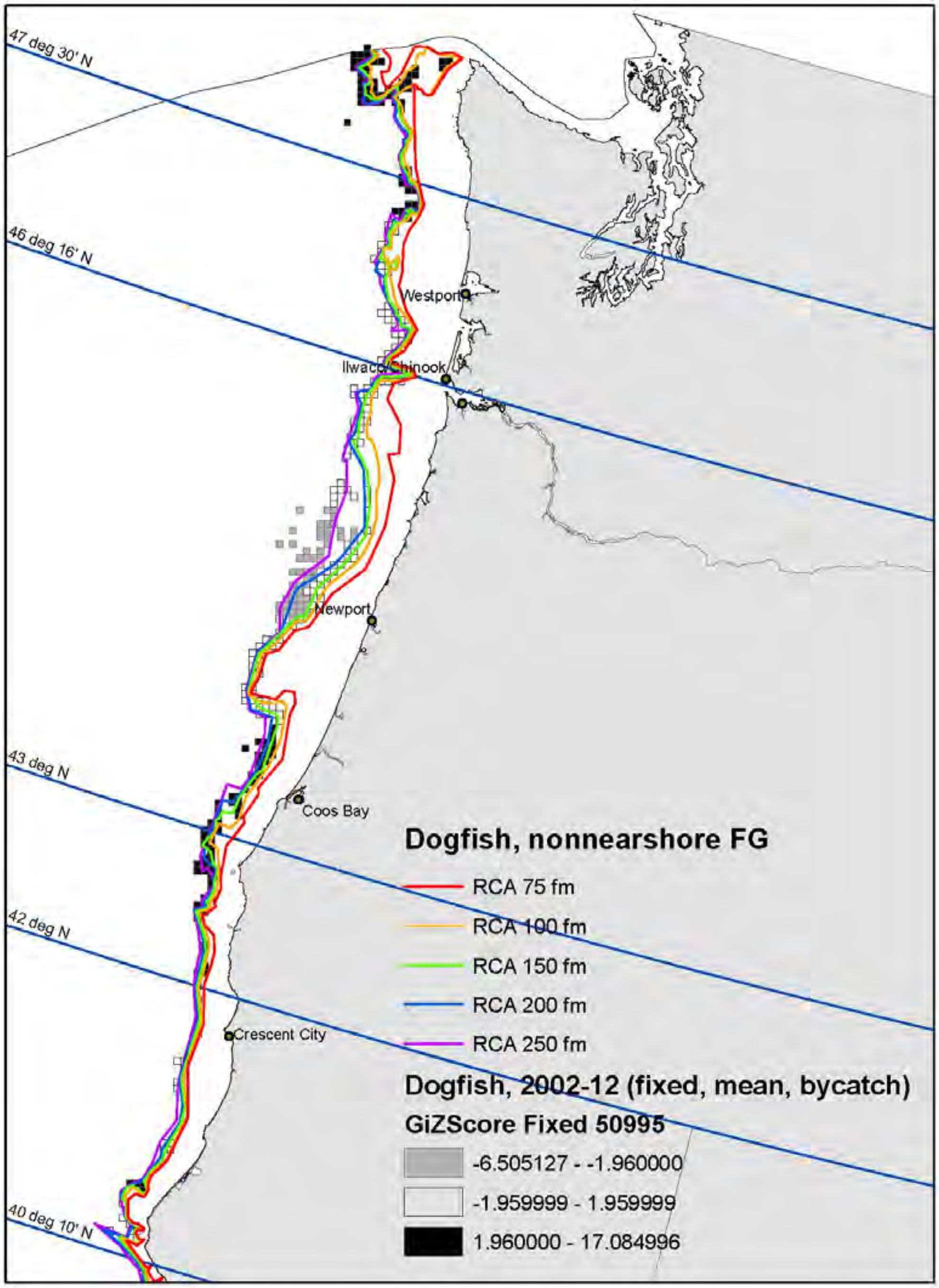

Figure B-52. Hot and cold spots of spiny dogfish in the non-nearshore fixed gear sector, 2002-12.

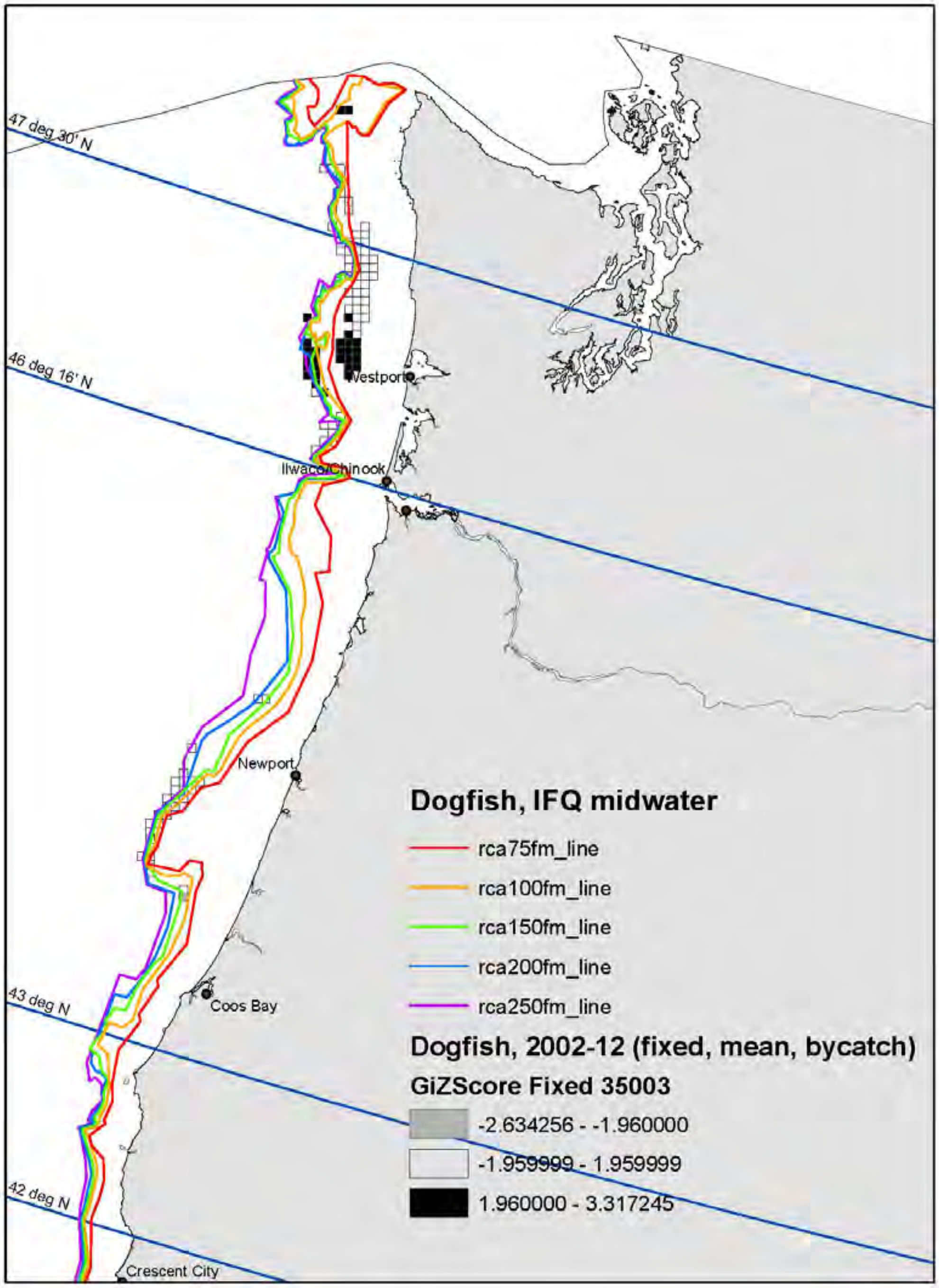

Figure B-53. Hot and cold spots of spiny dogfish in the IFQ sector, midwater trawl, 2002-11.

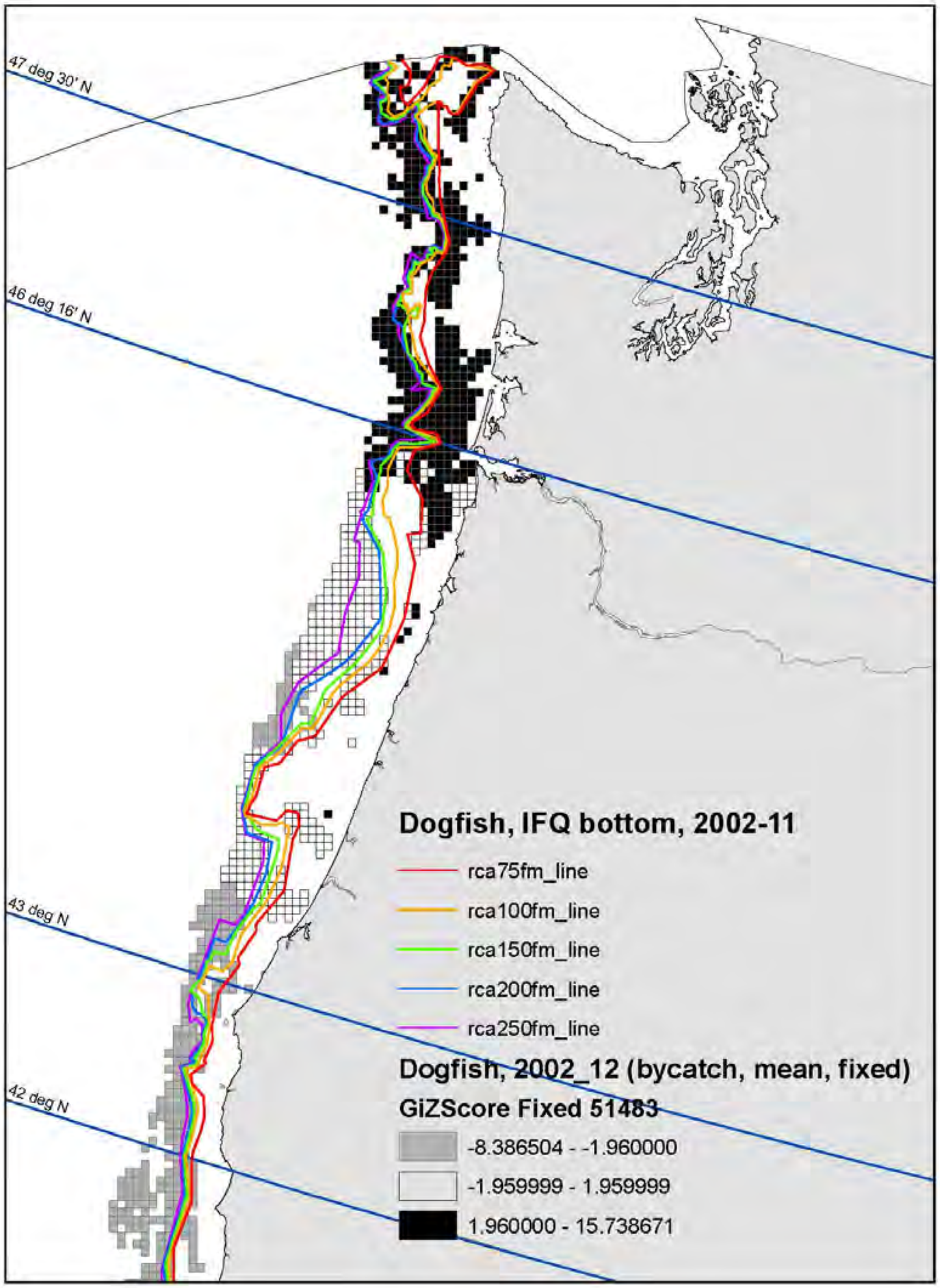

Figure B-54. Hot and cold spots of spiny dogfish in the IFQ sector, bottom trawl, 2002-11.

Description of hot and cold spot analysis: data and methods

Three datasets were made available for this analysis: a 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 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 (lb) 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-113 shows the number of observations (hauls) available for this analysis and the number of hauls where no bycatch was reported.

Table B-113. 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 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-55 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-47); 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-113. Figure B-52 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-47 through Figure B-54 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-57). This demonstrates that conclusions may be much different depending on the metric selected; Figure B-57 shows that highest catches of rougheye rockfish is off northern Washington, whereas Figure B-47 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.

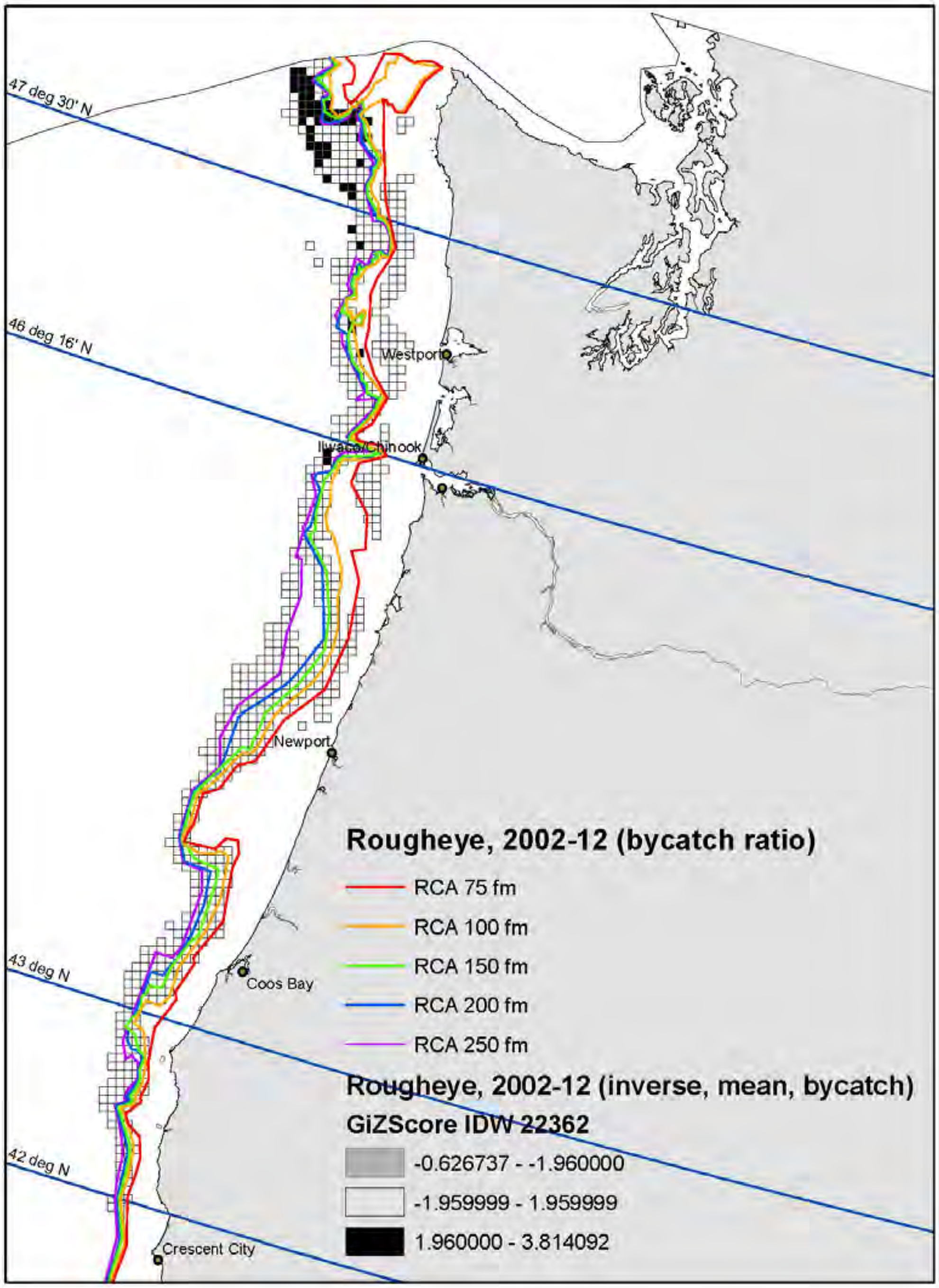

Figure B-55. Hot and colds spots of rougheye in the at-sea whiting sector, using the inverse distance method.

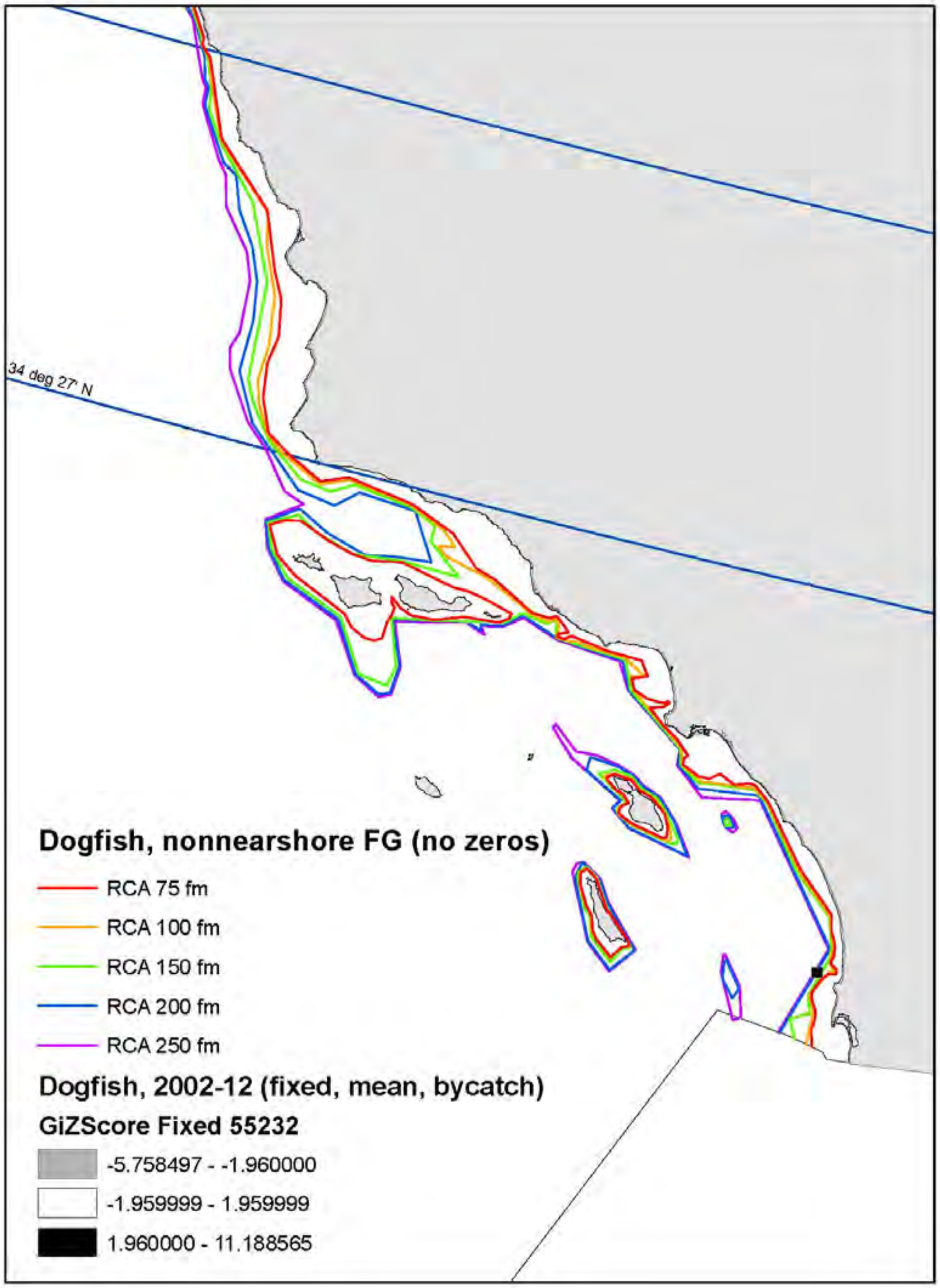

Figure B-56. Hot and colds spots of spiny dogfish in the non-nearshore fixed gear sector, using the fixed distance method and excluding hauls with zero bycatch; southern California only.

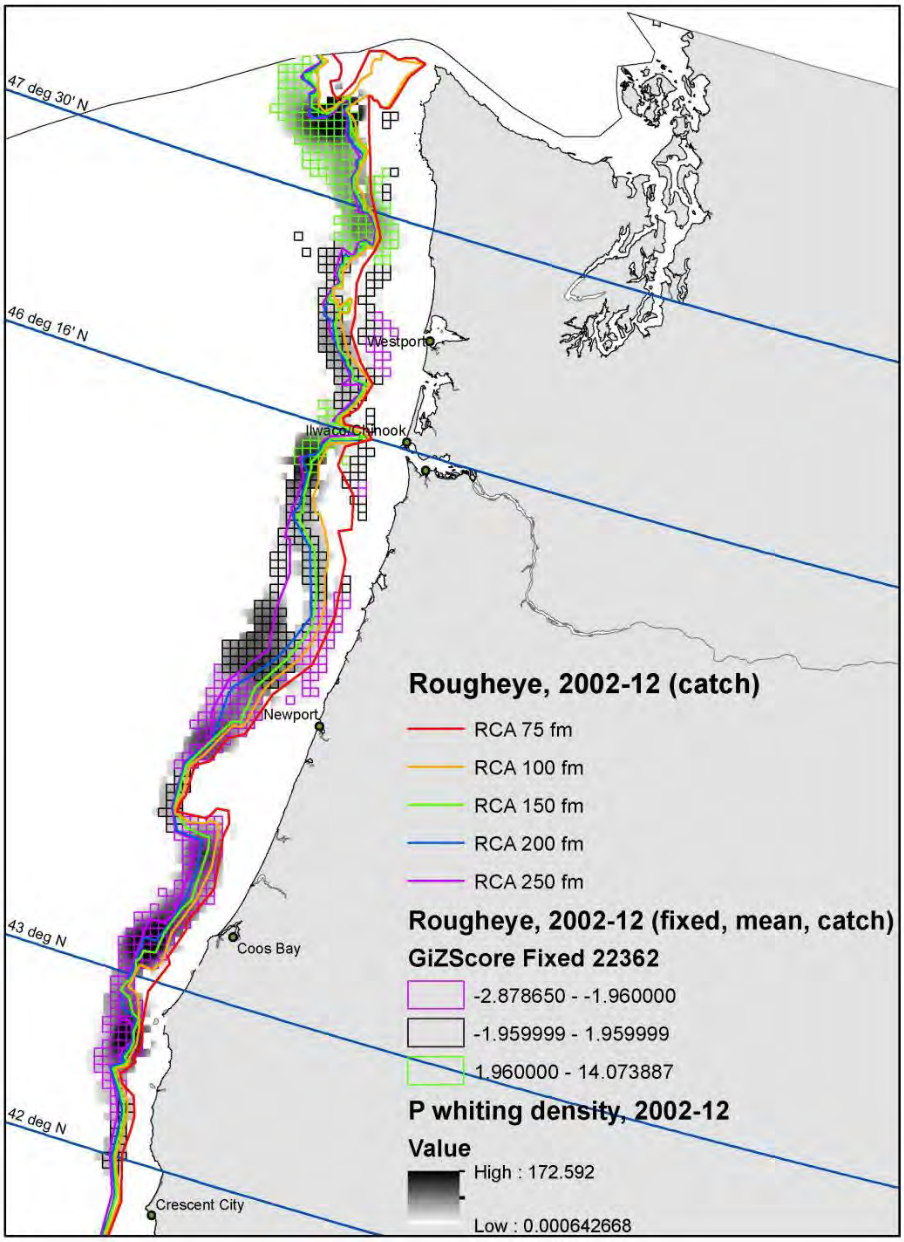

Figure B-57. Catch of rougheye rockfish north of 40° 10´ N. latitude by the non-Tribal at-sea whiting sector. Data were acquired from NORPAC (2002-2012). Areas where high levels of catch are clustered are shown by the green-shaded boxes (i.e., north of 47° 30´ N. latitude; z-scores greater than or equal 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).

B.15 *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) to increase attainment. Historical mortality by sector can be found in Table B-114. 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-114. 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.16 *Trawl: At-Sea Set-Asides for 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-115. To simplify the simulations, we focused only the lower of the Preferred Alternative ACLs (“Preferred Alternative 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 Preferred Alternative 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-115. 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
Preferred Alternative	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-116.

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-58). With such variability, point estimates and focus on single sectors is of limited value for forecasting. The reality is that Spiny Dogfish catch is unpredicable 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-116). 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.

Last, 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-116 and Table B-118. 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-118). 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-116. 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

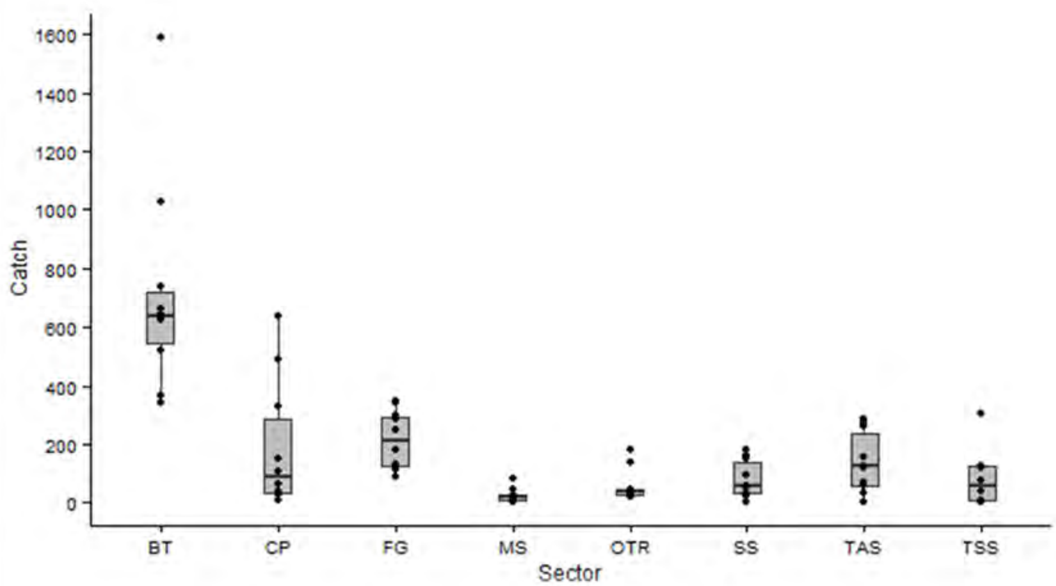

Figure B-58. Variation of annual catches (mt) of Spiny dogfish by sector over the ten year period 2003-2012. Boxplots are used to show location of 25th percentile, median, and 75th percentile catch levels by sector (corresponding to the lower edge, middle line, and upper edge of the box respectively) and outliers. Order of the sectors is alphabetical. See Table B-117 for abbreviations.

Table B-118. 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-116 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-119. 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.[34] For each sector, we took the natural logarithm of the annual Spiny Dogfish catch ratios shown in Table B-118, 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-120, 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-119.

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

[34] 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).

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-120.

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-59). 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).[35]

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.[36] 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.

[35] *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.

[36] *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-120. 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	

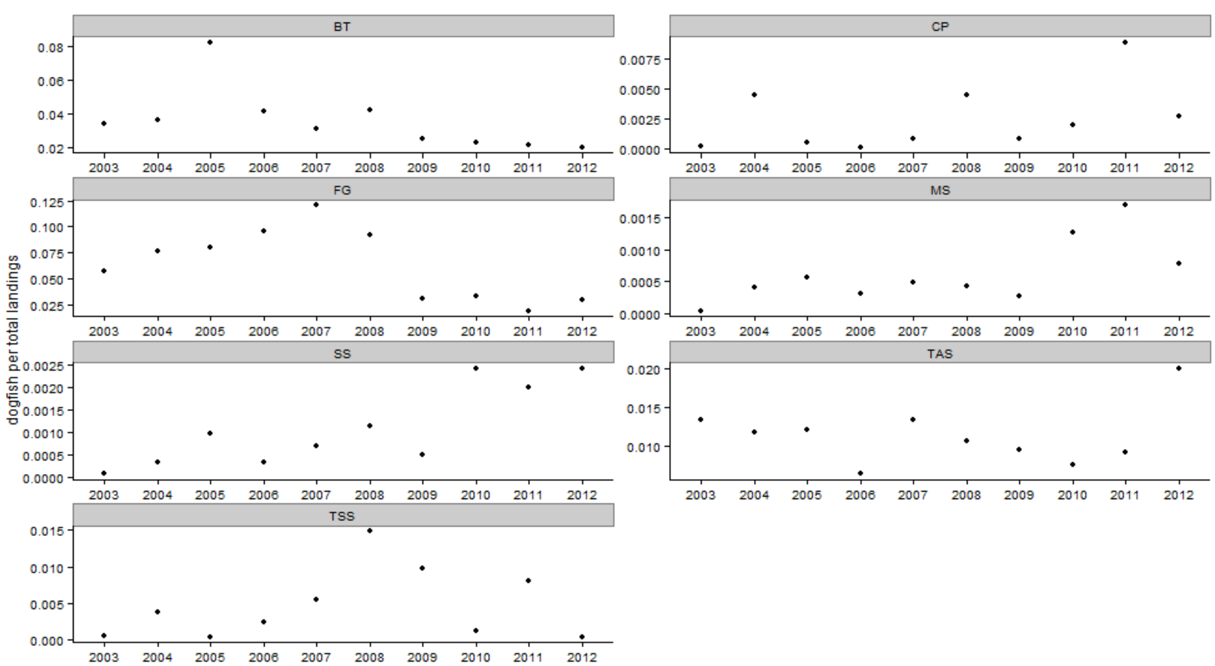

Figure B-59. Ratios of total Spiny Dogfish catch per landings of all stocks by year and sector, 2003-2012, displayed as time series. More recent years in the bottom trawl (2009-2012), non-nearshore fixed gear (2009-2012) and shoreside whiting sectors (2008-2012) show statistically significant differences 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-121. The performance metrics shown that table and the tables below include:

- *Avg. total catch (mt)*: the average annual total catch over all simulation runs.
- *Percent 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.
- *Percent 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 set-aside amount (e.g., 163, 300, 500, 725)
- *Percent 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-121. 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 Preferred Alternative 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-122 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-121, 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-123). 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.

Last, 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-122. 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-123. 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-60 and Figure B-61. Looking to the bottom trawl sector, the median simulated catch hardly shifts in Simulation 2 (Figure B-60) relative to Simulation 1 (Figure B-61).

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.

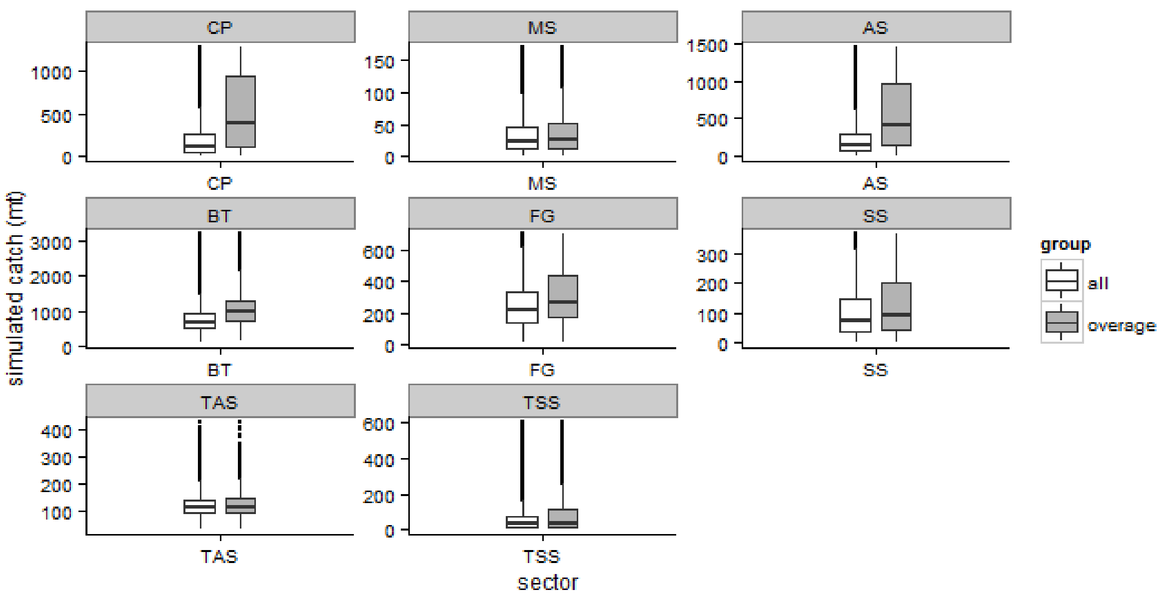

Figure B-60. Simulated catches by sector, including the At-Sea sectors combined, for Simulation 1. The shaded boxes include only the simulation runs where the total catch was over the proposed ACL. See Figure B-58 for explanation of boxplots.

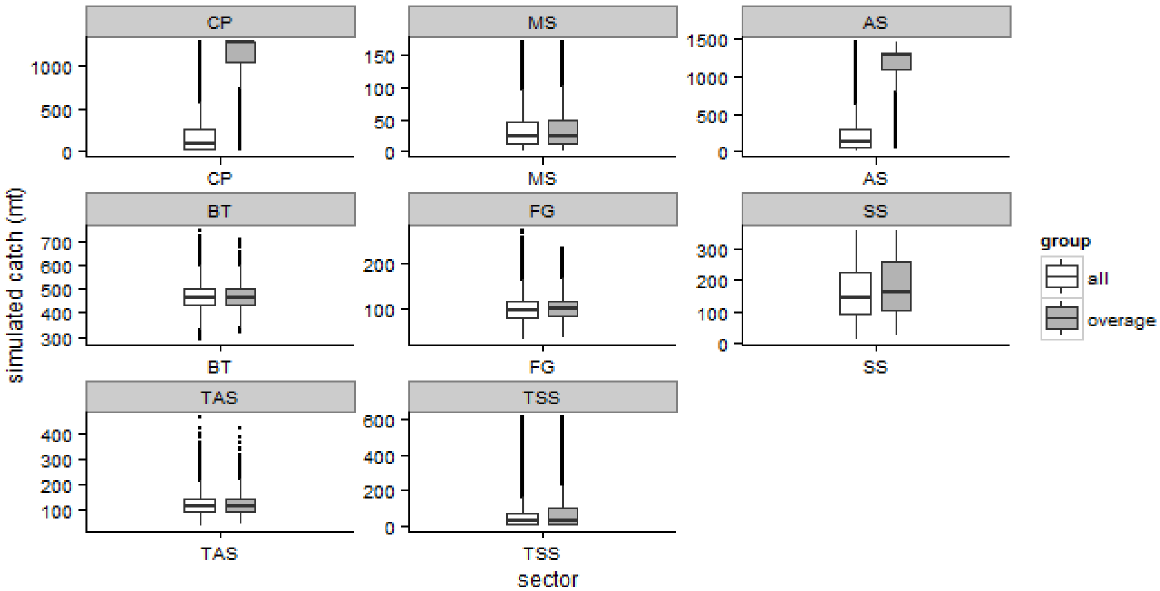

Figure B-61. Simulated catch by sector, including the At-Sea sectors combined, for Simulation 2. The shaded boxes include only the simulation runs where the total catch was over the proposed ACL. See Figure B-58 for explanation of boxplots.

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.[37] 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.

Last, 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-124 and displayed graphically in Figure B-62 and Figure B-63. The bootstraps and confidence intervals were computed using the boot package in R.[38] As in the simulations, the ratios were assumed to follow a lognormal distribution (i.e. the bootstrap replicates calculated the lognormal mean). The confidence

[37] Benjamin M. Bolker, Ecological Models and Data in R (2005).
[38] Angelo Canty and Brian Ripley (2013). boot: Bootstrap R (S-Plus) Functions. R package version 1.3-9.

intervals shown in Table B-124 were calculated with the BCa method.[39] 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-124. 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

[39] DiCiccio, Thomas J., and Bradley Efron. "Bootstrap confidence intervals." Statistical Science (1996).

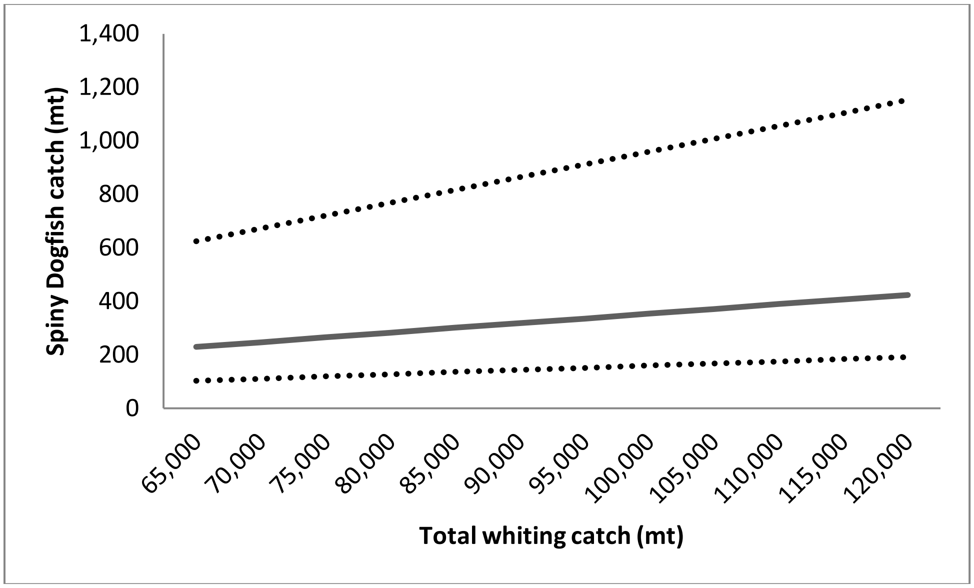

Figure B-62. Spiny Dogfish catch in the catcher processor sector at the mean and 95th percentile levels shown in Table B-123 applied to a range of possible total whiting catches.

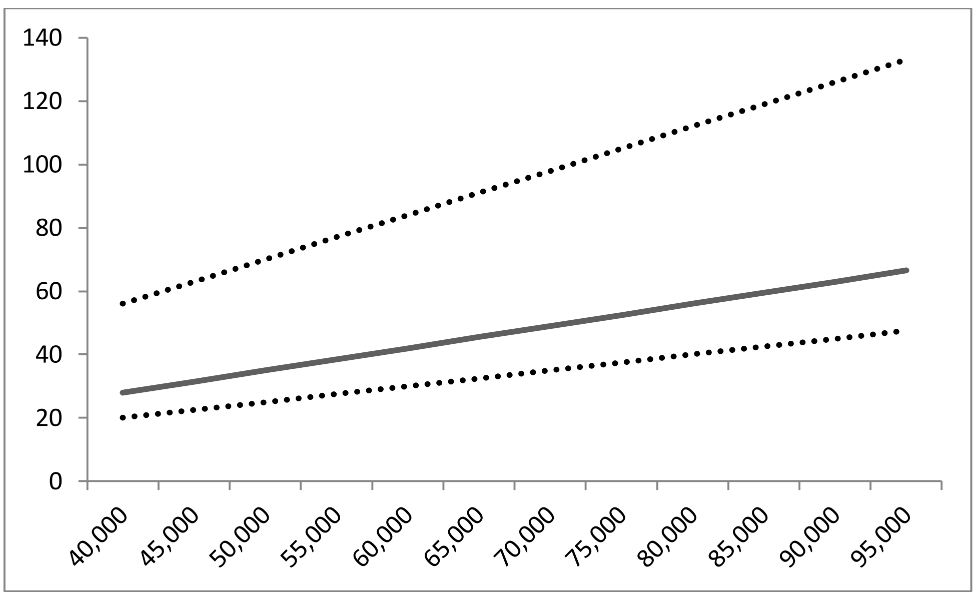

Figure B-63. Spiny Dogfish catch in the mothership sector at the mean and 95th percentile levels shown in Table B-123 applied to a range of possible total whiting catches.

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.17 *Trawl: Use of excluder devices to reduce catch of rougheye rockfish in non-tribal at-sea and shoreside Pacific whiting fisheries*

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

NMFS recommended that the Council analyze removing or reorganizing blackgill, rougheye, and shortraker rockfishes from the 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-125). 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-125).

Table B-125. 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-125 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.14 herein. In Figure B-64, 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-64 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° 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-64, 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.

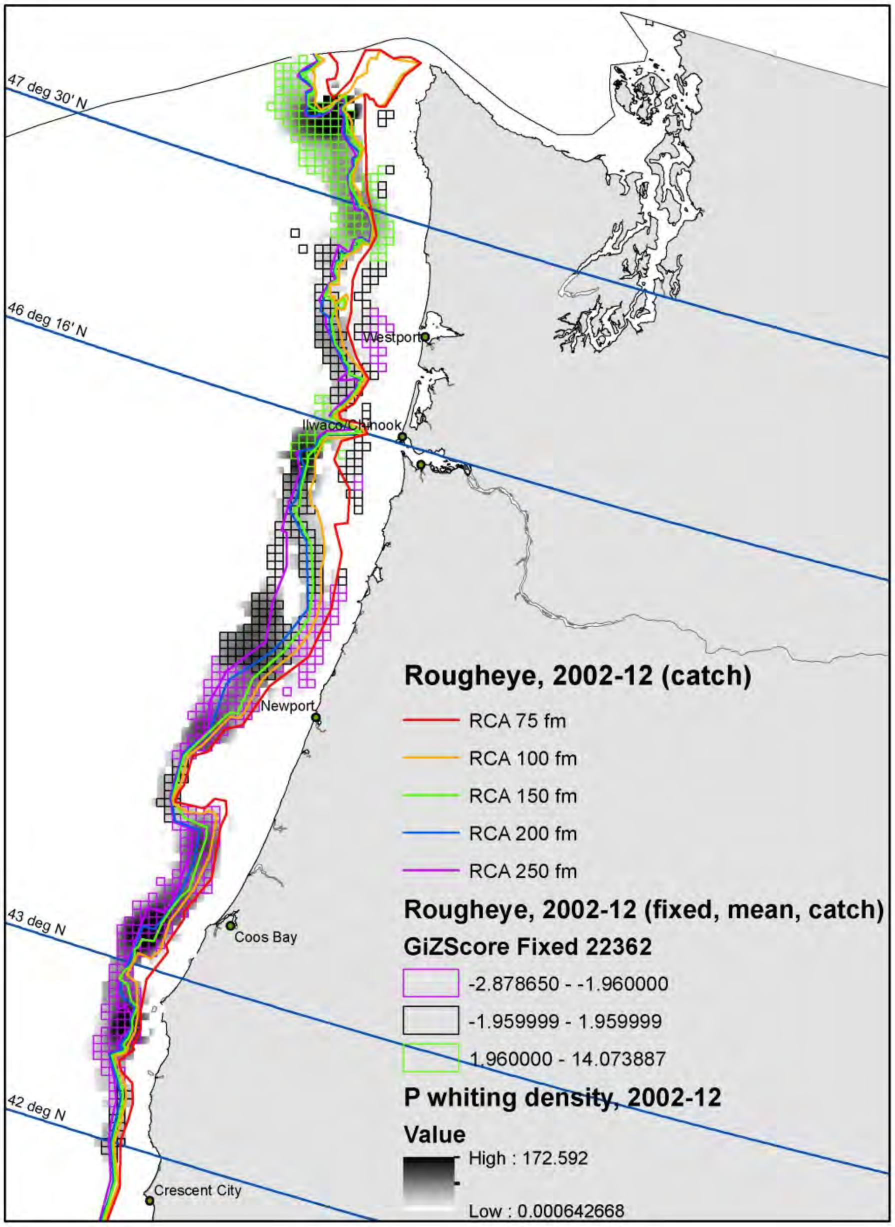

Figure B-64. Catch of rougheye rockfish north of 40° 10′ N. latitude by the non-Tribal at-sea whiting sector. Data were acquired from NORPAC (2002-2012). Areas where high levels of catch are clustered are shown by the boxes outlined in green (i.e., north of 47° 30′ N. latitude; z-scores greater than 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-126 and Table B-127, respectively. During these years, most rougheye rockfish were caught between 200 fm and 400 fm by the at-sea sectors (Table B-125). Conversely, most whiting catch was also caught over bottom depths ranging from 200 fm and 400 fm (Table B-127). Similar to that shown in Table B-125, although most rougheye rockfish catch by the non-Tribal at-sea whiting sectors occurred off the Washington coast (81.8 percent; Table B-126), whiting catches by these sectors were more evenly distributed between Washington (46.6 percent) and Oregon (51.5 percent; Table B-127).

Table B-126. 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 B-127. Percentage of Pacific whiting catch by area and depth (2008-2012) for non-Tribal at-sea Pacific whiting sectors, north of 40° 10′ N. latitude. Data were acquired from NORPAC. NoCAL = California north of north of 40° 10′ latitude; NoWA = Washington north of 47° 30′ N. latitude; SoWA = Washington between the Oregon-Washington border and 47° 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-125 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-126 B were then applied to both the non-Tribal shoreside whiting and at-sea whiting catches (Table B-125) 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-128).

Table B-128. 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 B-129).

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-129).

Table B-129. 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 40° 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 40° 10´ N. latitude, if any fishing occurs between the 200 fm RCA and 400 fm "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 fm – 400 fm "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 40° 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-130): 26.9 mt by the at-sea whiting sectors and 6.7 mt by the shoreside whiting trips (see Table B-126 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-127 shows that 69.6 percent of the Pacific whiting is caught between 200 and 400 fm. 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-130).

Table B-130. 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 40° 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 fm RCA and 400 fm GCA (to be specified at a later date) and north of 46° 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 fm – 400 fm "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 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 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-131): 30.4 mt by the at-sea whiting sectors and 7.6 mt by the shoreside whiting trips (see Table B-126 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-127 shows that 29 percent of the Pacific whiting is caught north of 46° 16′ N.

latitude and between 200 and 400 fm. 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° 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-131).

Table B-131. 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° 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° 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 B-132): 30.9 mt by the at-sea whiting sectors and 7.7 mt by the shoreside whiting trips (see Table B-126 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-127 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 B-132).

Table B-132. 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 B-133). 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 B-133) 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 B-133). 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 B-125) 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 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 B-133. 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 CP trawls will likely be higher, because the trawls are larger.

Relative impacts by alternative are shown in Table B-133. 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 CPs), 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-125). 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 CPs are much larger. The design, cost, and effectiveness may be much different for CPs. 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.

B.18 *Non-Trawl: Sablefish Trip Limits under the Harvest Specifications Alternatives*

As described in Section B.10, a range of sablefish trip limits for the limited entry and open access sectors were explored under the sablefish ACL alternatives (Preferred, Alternative 1, and Alternative 2). Section B.10 details the Preferred Alternative whereas the sections below detail the analysis for trip limits necessary to attain the landed shares under Alternatives 1 and 2 (
Table B-135).

Table B-134. 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	352	483	393
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

B.18.1 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-135. 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 lb 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-135. 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-136. 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, and 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-136. 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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Remainder	9.6	29.6	45.2	113.3	158.5
Difference					
Projected landings	25.9	57.7	73.8	47.3	121.1
Landed share	33.0	54.0	72.0	58.0	130.0
Percent attainment	-2%	2%	2%	1%	1%
Remainder	7.1	-3.7	-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-137 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 lb per day higher for the OA South, to 675 lb 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-137. Trip limits under Alternative 1, No Action Alternative, and comparison between them, for the fixed-gear, sablefish, DTL fisheries for 2015. Limits are in lb 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-138. 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-138. 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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Remainder	9.6	29.6	45.2	113.3	158.5
Difference					
Projected landings	47.6	91.5	121.8	82.2	204.0
Landed share	55.0	91.0	123.0	99.0	222.0
Percent attainment	-2%	2%	2%	2%	2%
Remainder	7.4	-0.5	1.2	16.8	18.0

B.18.2 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-139 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 lb 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-139. 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-140. 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 and nearly equal for each fishery, among the action alternatives by design. The amount of landed catch projected is slightly lower under Alternative 2 than No Action; between 11.5 and 28 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-140. 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	322.4	437.8	279.7	717.5
Landed share	214	352	483	393	876.0
Percent attainment	95%	92%	91%	71%	82%
Remainder	9.6	29.6	45.2	113.3	158.5
Difference					
Projected landings	-14.9	-5.7	-13.9	-17.2	-31.1
Landed share	-11.5	-18.5	-28.0	-23.0	-51.0
Percent attainment	-2%	3%	3%	0%	1%
Remainder	3.4	-12.8	-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-141 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 lb per two months for the OA South, to 100 lb 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-141. 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 lb 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-142. 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 , and 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-142. 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	322.4	437.8	279.7	204.4
Landed share	214	352	483	393	214
Percent attainment	95%	92%	91%	71%	95%
Remainder	9.6	29.6	45.2	113.3	9.6
Difference					
Projected landings	5.1	14.8	28.6	14.1	42.7
Landed share	9.0	15.0	20.0	16.0	36.0
Percent attainment	-2%	0%	2%	1%	1%
Remainder	3.9	0.2	-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-143 and Table B-144. 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-143 and Table B-144).

Table B-143. 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, Preferred Alternative			
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-144. 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, Preferred Alternative			
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.19 *Non-Trawl: Remove or Modify the Commercial Gear Restrictions for Flatfish*

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 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 GCA, which includes the CCAs, 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 GCA~~s~~.

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-145, 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. Last, the hooking and handling discard mortality rate for petrale sole is expected to be 7 percent when rod and reel is used[40], thus flatfish discarded due to prohibition on retention in the RCA are expected to experience relatively low mortality.

[40] http://www.pcouncil.org/groundfish/current-season-management/past-management-cycles/2009-2010-final-environmental-impact-statement/, pg. 307.

Table B-145. 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-146) 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.

Table B-146. 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-145, 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. Last, 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 lb 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-147). 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-147. 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

<u>Other Flatfish</u>

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.

<u>Overfished Species</u>

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 indicate~~s~~ 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

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

<u>Other Flatfish Mortality</u>

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.

<u>Overfished Species Mortality</u>

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

<u>Other Flatfish</u>

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.

<u>Overfished Species</u>

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.20 Within Non-Trawl: Analysis of Harvest Guidelines for Nearshore Rockfish North Complex with a P* of 0.25

This analysis provides the state harvest guideline allocations with three proposed methods reflected under Options 2, 3 and 4 when a P* of 0.25 under ACL Alternative 2 is applied to the Nearshore Rockfish complex. Management measures that may be used to keep mortality from exceeding the state harvest guidelines are also included. The preceding analysis was conducted applying the same allocation methods to the ACL resulting from a P* of 0.45, compared to the status quo and ACLs under the Preferred Alternative. Similar analyses are provided below to allow comparison of the implications of ACL Alternatives in terms of mortality, stock status and socio-economic impacts.

Review of Options

Option 1 (“No Action”): Continue to manage the Nearshore Rockfish complex, holding impacts to the complex level ACL in each region.

Option 2: Manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting apportionment based on the miles of coastline in each state.

Option 3: Manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting apportionment based on the historical recreational and commercial catch between 2004 and 2012.

Option 4: Manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. Lat. reflecting a hybrid method of apportionment based on miles of coastline for China, quillback and copper rockfish and the historical recreational and commercial catch between 2004 and 2012 for the remaining species.

B.20.1 Comparison of Options

Option 1 (“No Action”)

Same as analysis under P* of 0.45, see Section B.5.1.1.

B.20.1.1 **Option 2: Miles of Coastline (P* = 0.25)**

Option 2 is to manage the Nearshore Rockfish complex according to state-specific harvest guidelines stratified north and south of 40°10′ N. Lat., with apportionment north based on the miles of coastline in each state as reflected in Table B-148. The 3 nm state boundary was measured as the proxy for miles of coastline.

Table B-148. Allocations of Nearshore Rockfish north of 40°10′ N. Lat under Option 2 derived using miles of coastline in each state (at P* = 0.25).

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	*0.0*	0.26	0.49	0.25	0.00	0.00	0.00
Blue (CA)	*12.7*	NA	NA	1.00	0.00	0.00	12.71
Blue (OR & WA)	*12.2*	0.34	0.66	0.00	4.16	8.08	0.00
Brown	*1.2*	0.26	0.49	0.25	0.31	0.58	0.29
Calico	-	NA	NA	NA	-	-	-
China	*4.2*	0.26	0.49	0.25	1.09	2.05	1.05
Copper	*6.5*	0.26	0.49	0.25	1.70	3.21	1.64
Gopher	-	NA	NA	NA	-	-	-
Grass	*0.2*	0.26	0.49	0.25	0.06	0.12	0.06
Kelp	*0.0*	0.26	0.49	0.25	0.00	0.00	0.00
Olive	*0.1*	0.26	0.49	0.25	0.03	0.06	0.03
Quillback	*2.8*	0.26	0.49	0.25	0.73	1.37	0.70
Treefish	*0.1*	0.26	0.49	0.25	0.02	0.04	0.02
Total	*40.1*				8.1	15.5	16.5
							40.1

Option 2: Change in Fishing Activity Compared to Option 1

Washington

Recreational: The Washington HG under Option 2 is 8.1 mt which is lower than the projected impacts Under No Action (Option 1). The Washington recreational fishery would operate under season structure and management measures described under the Preferred Alternative. However because the Washington HG under Option 2 is lower than the historical catch, additional management measures would be needed to keep Nearshore Rockfish catch under the Washington HG for this alternative. To keep total mortality under the Washington HG, retention of Nearshore Rockfish would not be permitted for a portion of the year. Attainment of the Washington HG under this alternative is projected to occur in mid-August with retention of Nearshore Rockfish prohibited for 4.5 months from August 15 through December. Alternate combinations of months when Nearshore Rockfish would be prohibited may be explored.

Commercial: Closed

Oregon

Under Option 2, the Oregon Nearshore Rockfish complex harvest guideline is lower than the current combined commercial and recreational state-specified landing caps and average annual catches. We showed above that expected Nearshore Rockfish mortality for Oregon fisheries combined is 45.6 mt for No Action and 48.9 mt for Preferred Alternative. The Oregon harvest guideline under this option is 15.5 mt (Table B-148), or 66 percent lower than expected mortality under No Action and 68 percent lower than expected under Preferred Alternative. State landing caps for both commercial and recreational fisheries will have to be reduced dramatically to accommodate this lower target. The GMT understands that Oregon intends to develop the commercial-recreational split of the Oregon HG through subsequent state processes.

Recreational: Once the state determines the sector-specific allocation, management measures will need to be examined, and then implemented through state rules. A preliminary examination of possible management measures has begun. A bag limit analysis revealed that the majority of anglers encounter less than one Nearshore Rockfish per trip. Therefore changes in bag limit will likely not be a viable option. The likely measure will be non-retention for most or all of the fishing season, incorporating discard mortality for the non-retention months into the impact projections. Even though most anglers encounter less than one Nearshore Rockfish per angler trip and they are generally not targeted, prohibiting retention for most or all of the season, could influence the number of angler trips, how often, when or where anglers go fishing. Additionally, it may require anglers to be on the water longer to fill their daily bag limit. Since the majority of anglers do not fill their entire bag each day, this is anticipated to have minimal impacts in the short term, but there is the potential for long term or cumulative impacts.

Commercial: Under Option 2, the RCA depth restriction of 30 fm would remain in place because projected catch of overfished species would remain at or below the Oregon catch share. Measures other than depth management will have to be implemented to reduce the mortality of Nearshore Rockfish (including blue rockfish) under this option. For example, under No Action, the commercial fishery was projected to land 15 mt of Nearshore Rockfish (including blue rockfish), resulting in total mortality of 15.1 mt, including discard. Using proportions of current landing caps and average landings between Oregon recreational and commercial fisheries (see Preferred Alternative in the DEIS), the Oregon commercial fishery would receive 5.35 mt of Nearshore Rockfish (including blue rockfish), or a reduction of 65 percent relative to No Action and a 71 percent reduction relative to Preferred Alternative. If one assumes that catch of Nearshore Rockfish is incidental and unavoidable, then the No Action landings value (i.e., 15.0 mt) may be encountered, caught, and discarded under this scenario. Some of the discard will survive. The resulting mortality of Nearshore Rockfish under this assumption is estimated to be 6.49 mt, which would exceed the Oregon commercial allocation of 5.35 mt.

California

Recreational: Under Option 2, 16.5 mt would be allocated to California, of which, the recreational catch share is 9.18 mt, accommodating a May 1 to September 15 season with a 20 fm depth restriction in the Northern Management Area. This would provide one month less fishing opportunity relative to the status quo. The recreational fishing season would have to be reduced by five and a half months relative to the longest season under the Preferred Alternative of March 1 to December 31 to prevent the recreational share of Nearshore Rockfish complex from being exceeded. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish species during part of the season.

Commercial: Under Option 2 the RCA depth restriction of 20 fm would remain in place as well as the trip limit structure. Because the Nearshore Rockfish complex harvest has been at or below the ACLs in recent years (see), it is not anticipated that Option 2 will have an adverse effect on the northern Nearshore

Rockfish fishery; thus fishing activity is expected not to change. However, trip limit reductions could be implemented should the need arise, with possible decreases that may be nearly 50 percent less than the current trip limit amount. Another possibility to be considered is to have period closures. Additionally, California's northern management region is somewhat isolated from the adjacent region(s). Because of this, northern region participants tend not to fish in other management regions (for those holding a deeper Nearshore Rockfish permit), nor would they be likely to because the trip limits for the northern region are higher than any of the other regions. Also, it is not expected that holders of a deeper Nearshore Rockfish permit, who may also hold a shallow permit in any of the other southerly regions, would travel to the northern management region to fish because they would only be allowed to catch and land the deeper Nearshore Rockfishes – their shallow nearshore permit would not be valid north of 40°10' N. latitude. In effect, it would probably not be economically justifiable for them to fish north of 40°10' N. latitude.

Option 2: Biological Impacts Compared to Option 1

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 4 are summarized in Table B-149. Further description of the mortality in each state and sector is provided in the text below.

Table B-149. Projected Nearshore Rockfish mortality north of 40°10′ N. Lat. from each state and sector under Option 2 (at P* = 0.25).

State	**Washington**		**Oregon**		**California**		**Total**
Sector	Recreational	Commercial	Recreational	Commercial	Recreational	Commercial	
Mortality	8.1	Closed	5.6	9.9	9	7.32	39.92
State Total	8.1		15.5		16.32		
Allocation	8.1		15.5		16.5		40.1
Percent	100%		100%		98.9%		99.6%

Washington

Recreational: Under Option 2 the projected Washington recreational catch of Nearshore Rockfish would decrease by approximately 23 percent compared to Option 1. No negative biological impacts are expected.

Commercial: Closed

Oregon

Recreational: Under this option, impacts to Nearshore Rockfish will need to be reduced. Oregon intends to allocate between the commercial and recreational sectors, and take management measures to stay within those allocations, through subsequent state processes. The most likely management measure will be non-retention of Nearshore Rockfish (other Nearshore Rockfish and/or blue rockfish[41]) for most or all of the fishing season. Table B-150 below shows the projected landings for the other Nearshore Rockfish

[41] In Oregon state regulations, blue rockfish is managed and has a state-specified landing cap separate from the remaining or "other nearshore" rockfish.

and blue rockfish under the preferred season structure (Section 4.2.2.8) and the projected discard mortality from non-retention by month. Both are calculated on a month by month basis, as that is the smallest time unit currently available in the Oregon recreational model. To project total impacts, and determine which months might need to have non-retention, the landings for months open are added to the release mortality for non-retention months.

Table B-150. Oregon recreational fishery impacts (in mt) by month under preferred season structure and non-retention for the Nearshore Rockfish.

Projections	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Other Nearshore Rockfish												
Landings under SQ regulations	0.19	0.24	0.58	0.90	1.64	2.13	2.59	2.91	1.22	0.43	0.10	0.06
Non-retention release mortality	0.08	0.10	0.23	0.33	0.61	0.79	0.96	1.08	0.45	0.17	0.04	0.03
Blue Rockfish												
Landings under SQ regulations	0.27	0.34	0.82	1.25	2.24	2.90	3.54	3.98	1.66	0.61	0.14	0.09
Non-retention release mortality	0.27	0.11	0.27	0.39	0.70	0.91	1.10	1.24	0.52	0.21	0.05	0.03

As one example, non-retention for the entire year would reduce impacts of all Nearshore Rockfish species (including blue rockfish) from 30.5 mt to 10.6 mt, or a 65 percent reduction. The GMT understands that Oregon intends to go through their public process to get angler input on which months to have non-retention.

Commercial: Under this option, commercial management measures necessary to reduce Nearshore Rockfish mortality to near 5.35 mt (from No Action Mortality of 15.1 mt) would likely be non-retention, possibly year-around. Even with non-retention, estimated discard mortality (6.49 mt) would exceed the Oregon commercial allocation, if the recreational-commercial split remained the same as under No Action.

California

Recreational: The projected mortality on Nearshore Rockfish under Option 2 with a May 1 to September 15 season in the Northern Management Area with a 20 fm depth restriction is 9.0 mt of which 2.3 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 9.18 mt under this option.

Commercial: No anticipated negative biological impacts are expected for this option compared to Option 1. Because this option (as well as Options 3 and 4) could require reductions in harvest, biological impacts could actually be reduced to a small degree depending upon the amount of the reduction. Since California's northern fishery has taken less than 10 mt per year on average during the past five years, resultant decreases would be small. Nevertheless, under this option, commercial management measures will need to be applied to reduce Nearshore Rockfish mortality.

Projected Overfished Species Mortality

Washington

Recreational: Projected overfished species impacts under this Option are the same as for the season structure under the Washington recreational Preferred Alternative.

Commercial: Closed

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than a 1 percent increase in canary and yelloweye rockfish impacts, assuming no other changes to angler behavior.

Commercial: Under Option 2, if fishermen behavior remains the same as under No Action regarding fishing locations and fishing methods, but increased discarding of Nearshore Rockfish becomes necessary, then mortality of Overfished Species will remain unchanged relative to No Action. If, on the other hand, selection of fishing locations changes dramatically because of changes in trip limits or required non-retention of Nearshore Rockfish, then overfished species impacts may increase or decrease, depending on geographic locations selected. The direction or level of this potential change in catch of overfished species cannot be predicted in this analysis.

California

Recreational: Assuming season lengths under Option 1 of ACL Alternative 2 in Management Areas south of 40°10′ N. latitude and the May 1 to September 15 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 2 are 2.6 mt of yelloweye rockfish, 17.9 mt of canary rockfish, 116.8 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: Harvest of canary and yelloweye rockfish has been near the respective allocation amounts for these two species. As such, under Option 2, projected mortality may have to be reduced. Using the nearshore bycatch model as a predictor, decreases in the black rockfish component may need to be considered as a means to achieve the necessary projected mortality decreases for these two overfished species so as to not exceed their allocations.

Stock Status

<u>Nearshore Rockfish</u>

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 2.

<u>Overfished Species</u>

Under Option 2 (miles of coastline), the overfished species mortality is expected to be below the harvest limits/guidelines. Thus stock status and rebuilding plans would not be adversely affected management under Option 2.

<u>Socio-economic Impacts compared to Option 1</u>

<u>Washington</u>

Recreational: Socio-economic impacts would continue to be affected by management measures necessary to keep the Washington recreational fishery within the Washington HG for overfished species (yelloweye and canary rockfish). In addition, under Option 2, recreational fishing opportunity would be further reduced. Prohibiting retention of Nearshore Rockfish for a portion of the season on top of other management measures already in place to protect overfished species may discourage angler participation in recreational groundfish fisheries. While it's difficult to predict angler behavior, any reduction in angler fishing effort will have negative socioeconomic impacts. If these management measures resulted in 10 percent fewer anglers participating in recreational groundfish fisheries, effort would be reduced by approximately 2,400 angler trips targeting bottomfish. This reduction would have negative economic impacts to coastal communities that are dependent on recreational fishing.

Commercial: Closed

<u>Oregon</u>

Recreational: Since most anglers encounter less than one Nearshore Rockfish per angler trip and they are generally not targeted, non-retention for a few months to reduce mortality of Nearshore Rockfish species is not expected to impact angler behavior, angler trips, nor any other socio-economic indicators. Non-retention for most or all of the season has the potential to influence angler behavior, but to what extent is unknown. Additional outreach and education on species identification will likely be necessary to help anglers stay within retention/non-retention regulations. It is impossible to predict how the additive impact of adding this regulation to others already in place might impact anglers' decisions on fishing activities.

Commercial: It is uncertain whether fishing behavior (i.e., fishing location and fishing gear) will change under this option relative to No Action (see above). However, if allocations remain the same between Oregon recreational and commercial fisheries, then landings may have to be reduced from 15.0 mt (No Action) to 0 mt (i.e., non-retention). The 2013 average price for Other Nearshore Rockfish (weighted average including blue rockfish) was $3.80 per pound for Oregon nearshore fisheries (PacFIN). Under the potential scenario shown here, lost ex-vessel revenue may reach $125,662 relative to No Action (the loss is higher relative to Preferred Alternative).

California

Recreational: Under Option 2, the season length would decrease by a month (1,983 angler trips) relative to the status quo fishery in the Northern Management Area. The season would be reduced by five and a half months (6,362 angler trips) relative to the Preferred Alternative ACL with the Option 1 season resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: The northern commercial fishery is still recovering from the 2011 tsunami event and the loss of buyers during the past year or two. Currently, there is only one major active buyer in Crescent City. The economic structure of the northern area (essentially only Crescent City) is in a rebuilding phase with no expected time frame, at the present, that predicts when a return to status quo would be reestablished. This, however, is not a result of the options themselves, but an artifact of unavoidable events that have impacted this area. (See also the comments in the Change in Fishing Activity section, above.)

B.20.1.2 **Option 3: Historical Catch (P* = 0.25)**

Option 3 is to manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. latitude reflecting apportionment based on the historical catch between 2004 and 2012 reflected in Table B-151.

Table B-151. Allocations of Nearshore Rockfish north of 40°10′ N. Lat. under Option 3 (historical catch) derived using the historical recreational catch between 2004 and 2012.

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	*0.0*	0.00	0.21	0.79	0.00	0.00	0.00
Blue (CA)	*12.7*	NA	NA	1.00	0.00	0.00	12.71
Blue (OR & WA)	*12.2*	0.06	0.94	NA	0.76	11.48	0.00
Brown	*1.2*	0.00	0.08	0.92	0.00	0.09	1.08
Calico	-	NA	NA	NA	-	-	-
China	*4.2*	0.18	0.68	0.14	0.77	2.84	0.58
Copper	*6.5*	0.13	0.53	0.34	0.84	3.46	2.25
Gopher	-	0.00	0.29	0.71	-	-	-
Grass	*0.2*	0.00	0.49	0.51	0.00	0.12	0.13
Kelp	*0.0*	NA	NA	NA	0.00	0.00	0.00
Olive	*0.1*	0.00	0.03	0.97	0.00	0.00	0.12
Quillback	*2.8*	0.16	0.47	0.36	0.46	1.32	1.01
Treefish	*0.1*	0.00	0.00	1.00	0.00	0.00	0.08
Sum Total	40.1				2.82	19.33	17.97
							40.11

Option 3: Change in Fishing Activity Compared to Option 1

Washington

Recreational: The Washington recreational fishery would operate under season structure and management measures similar to those described under the Preferred Alternative. However because the Washington HG under Option 3 is not only lower than historical catch, it is lower than the discard mortality associated with non-retention of Nearshore Rockfish year-round in all recreational fisheries including salmon and halibut. To keep nearshore mortality under the Washington HG for this Option the recreational bottomfish fishery would need to be closed for a significant portion of the year. Different combinations of months that could remain open to the recreational bottomfish fishery while still prohibiting retention of Nearshore Rockfish could be considered with similar results. For example, bottomfishing could remain open during only one of the peak high effort summer months (May-August) again, with Nearshore Rockfish retention prohibited, but would require the bottomfish fishery to be closed the remainder of the year to keep Nearshore Rockfish mortality under the Option 3 Washington HG.

Commercial: Closed

Oregon

Under Option 3, the Oregon Nearshore Rockfish complex harvest guideline is lower than the current combined commercial and recreational state-specified landing caps and average annual catches, but higher than Option 2. We showed under No Action for Nearshore Rockfish that the expected mortality for recreational and commercial fisheries combined is 45.6 mt (the expected mortality under Preferred Alternative is 48.9 mt). The Oregon harvest guideline under this option is 19.3 mt (Table B-151), 58 percent lower than expected mortality under No Action, and 60 percent lower than expected mortality under Preferred Alternative. State landing caps for both commercial and recreational fisheries will have to be reduced to accommodate this lower target. As noted under Option 2, Oregon intends to develop or modify the commercial- recreational split of the Oregon HG through state processes.

Recreational: Similar to Option 2, most or all of the season will require non-retention of Nearshore Rockfish species to keep impacts within the Oregon recreational HG.

Commercial: Similar to Option 2. Using the same assumptions as shown under Option 2, non-retention would be required year around. As such, resulting mortality of Nearshore Rockfish under these assumptions is estimated to be 6.49 mt, exceeding the Oregon commercial allocation of 5.35 mt. Hence, non-retention may be required year around.

California

Recreational: Under Option 3, 17.97 mt would be allocated to California, of which, the recreational catch share established by the state Fish and Game Commission is 10.0 mt, accommodating a May 1 to December 31 season with a 20 fm depth restriction in the Northern Management Area. This would reduce fishing opportunity by a month relative to the status quo. The recreational fishing season would have to be reduced by five and a half months relative to the longest season under the Preferred Alternative ACL of March 1 to December 31st. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish Species during part of the season.

Commercial: The same as Option 2.

Biological Impacts Compared to Option 1

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 3 are summarized in Table B-152. Further description of the mortality in each state and sector is provided in the text below.

Table B-152. Projected Nearshore Rockfish mortality north of 40°10′ N. Lat. from each state and sector under Option 3 (P* = 0.25).

State	**Washington**		**Oregon**		**California**		**Total**
Sector	Recreational	Commercial	Recreational	Commercial	Recreational	Commercial	
Mortality	2.8	Closed	13.13	6.2	9.4	5.6	37.13
State Total	2.82		19.33		15		
Allocation	2.82		19.33		17.97		40.12
Percent	100%		100%		83.5%		92.5%

Washington

Recreational: Under Option 3, additional management measures will be implemented to reduce Nearshore Rockfish mortality in the Washington recreational fishery by 73 percent compared to the No Action Option 1.

Commercial: Closed

Oregon

Recreational: Under Option 3, similar to Option 2, non-retention will likely be required for most or all of the season to keep impacts within the Oregon recreational HG. Table B-150 has the projections by month for the Nearshore Rockfish complex minus blue rockfish for retention and non-retention.

Commercial: Similar to Option 2, under this option, commercial management measures necessary to reduce Nearshore Rockfish mortality to near 6.2 mt (from No Action Mortality of 15.1 mt) would likely be non-retention year-around. Even with non-retention, estimated discard mortality (6.49 mt) would exceed the Oregon commercial allocation, if the recreational-commercial split remained the same as under No Action.

California

Recreational: The projected mortality on Nearshore Rockfish under Option 3 with a May 15 to September 30 season with a 20 fm depth restriction in the Northern Management Area is 9.4 mt of which 2.2 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 10.0 mt under this option.

Commercial: The projected mortality on Nearshore Rockfish under Option 3 is estimated to be 5.6 mt with no other management changes implemented.

Projected Overfished Species Mortality

Washington

Recreational: No additional overfished species mortality are projected compared to the No Action Alternative. Overfished species impacts could be less than what is projected depending on the timing of the recreational bottomfish fishery closure necessary under this option.

Commercial: Closed

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than 1 percent increase in canary and yelloweye rockfish impacts. This assumes no other changes to angler behavior.

Commercial: Same as Option 2.

California

Recreational: Assuming season lengths under Option 1 of ACL Alternative 2 in Management Areas south of $40^{o}10'$ N. Lat. and the May 15 to September 30 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 2 are 2.6 mt of yelloweye rockfish, 17.9 mt of canary rockfish, 116.8 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: The same as Option 2.

Stock Status

Nearshore Rockfish

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 3.

Overfished Species

The projected mortality under Option 3 is the same as No Action (Option 1), which are below the respective harvest limits/guidelines. No adverse effects on stock status or rebuilding progress are expected under Option 3.

Option 3: Socio-economic Impacts compared to Option 1

Washington

Recreational: Socio-economic impacts would continue to be affected by management measures necessary to keep the Washington recreational fishery within the Washington HG for overfished species (yelloweye and canary rockfish). In addition, under Option 3, not only would recreational fishing opportunity be further reduced by requiring non retention of Nearshore Rockfish in all recreational fisheries year-round, it would also require the complete closure of the recreational bottomfish fishery for a significant portion of the year. Prohibiting retention of Nearshore Rockfish for a portion of the season on top of other management measures already in place to protect overfished species may discourage angler participation in recreational fisheries that remain open under Nearshore Rockfish retention restrictions. While it can be difficult to predict angler behavior when Nearshore Rockfish retention is prohibited, Option 3 will have direct and quantifiable reduction in the number of angler trips targeting bottomfish. Under Option 3, angler trips targeting bottomfish would be reduced by approximately 20,000 angler trips or 80 percent compared to the No Action Option resulting from closure of the bottomfish fishery. Closure of the recreational bottomfish fishery for a significant portion of the year will have significant negative socioeconomic impacts to coastal communities that are dependent on recreational fishing.

Commercial: NA

Oregon

Recreational: Same as under Option 2

Commercial: Same as under Option 2.

California

Recreational: Under Option 2, the season length would decrease by a month (787 angler trips) relative to the status quo fishery in the Northern Management Area. The season would be reduced by five and a half months (5,167 angler trips) relative to the Preferred Alternative ACL with the Option 1 season resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: The same as Option 2.

B.20.1.3 **Option 4: Hybrid Method (P* = 0.25)**

Option 4 is to manage the Nearshore Rockfish complex according to a state specific harvest guidelines stratified at 40°10′ N. latitude reflecting a hybrid method of apportionment based on miles of coastline for China, quillback and copper rockfish and the historical catch between 2004 and 2012 for the remaining species reflected in Table B-153.

Table B-153. Allocations of Nearshore Rockfish north of 40°10′ N. Lat. under Option 4 (P* = 0.25) derived using miles of coastline for China, quillback and copper rockfish and the historical commercial catch between 2004 and 2012 for the remaining species.

Species	Contribution	WA%	OR%	CA%	WA mt	OR mt	CA mt
Black and yellow	*0.0*	0.00	0.21	0.79	0.00	0.00	0.00
Blue (CA)	*12.7*	NA	NA	1.00	0.00	0.00	12.71
Blue (OR & WA)	*12.2*	0.06	0.94	NA	0.76	11.48	0.00
Brown	*1.2*	0.00	0.08	0.92	0.00	0.09	1.08
Calico	-	NA	NA	NA	-	-	-
China	*4.2*	0.26	0.49	0.25	1.08	2.07	1.04
Copper	*6.5*	0.26	0.49	0.25	1.69	3.23	1.62
Gopher	-	0.00	0.29	0.71	-	-	-
Grass	*0.2*	0.00	0.49	0.51	0.00	0.12	0.13
Kelp	*0.0*	NA	NA	NA	0.00	0.00	0.00
Olive	*0.1*	0.00	0.03	0.97	0.00	0.00	0.12
Quillback	*2.8*	0.26	0.49	0.25	0.72	1.38	0.69
Treefish	*0.1*	0.00	0.00	1.00	0.00	0.00	0.08
Sum Total	40.1				4.25	18.38	17.48
							40.11

Option 4: Change in Fishing Activity Compared to Option 1

Washington

Recreational: The Washington recreational fishery would operate under season structure and management measures similar to those described under the Preferred Alternative. However because the Washington HG under Option 4 is lower than the historical Nearshore Rockfish catch, additional management measures would be needed to keep Nearshore Rockfish catch under the Washington HG. To keep total mortality under the Washington HG, retention of Nearshore Rockfish would be prohibited in all recreational fisheries year-round. Projected impacts of Nearshore Rockfish under Option 4 are 4.3 mt, 0.05 mt higher than the Washington HG. If angler effort and fishing success result in catch estimates higher than what is projected, inseason action through state regulations such as closure of the recreational bottomfish fishery may be considered to keep Nearshore Rockfish catch under the Option 4 Washington HG.

Commercial: Closed

Oregon

Under Option 4, the Oregon harvest guideline is similar to that shown under Option 3; Option 4 provides a harvest guideline of 18.4 mt and Option 3 shows a harvest guideline of 19.3 mt. As such, overall impacts will be similar between Option 4 and Option 3. See Option 3 for more details.

Recreational: Similar to Options 2 and 3 above, non-retention will likely be required for most or all of the season to keep impacts within the Oregon recreational HG.

Commercial: Similar to Option 3. Using the same assumptions as shown under Option 3, non-retention may be required year around. As such, resulting mortality of Nearshore Rockfish under these assumptions is estimated to be 6.5 mt, exceeding the Oregon commercial allocation of 5.7 mt. Hence, non-retention would be required year around.

California

Recreational: Under Option 4, 17.48 mt would be allocated to California, of which, the recreational catch share established by the state Fish and Game Commission is 9.73 mt, accommodating a May 15 to September 30 season with a 20 fm depth restriction in the Northern Management Area. This would result in a one month reduction in fishing opportunity relative to the status quo. The recreational fishing season would have to be reduced by five and a half months relative to the longest season under the Preferred Alternative of March 1 to December 31st. Other alternatives to address overages relative to the catch share include a reduced bag limit or non-retention of Nearshore Rockfish Species during part of the season.

Commercial: The same as Option 2.

Option 4: Biological Impacts Compared to Option 1

Projected Nearshore Rockfish Mortality

The projected mortality in each state and sector under Option 4 are summarized in Table B-154. Further description of the mortality in each state and sector is provided in the text below.

Washington

Recreational: Under Option 4, additional management measures will be implemented to reduce Nearshore Rockfish mortality in the Washington recreational fishery by 59 percent compared to Option 1.

Commercial: NA

Oregon

Recreational: Similar to Options 2 and 3 above, a combination of months of retention and non-retention will be required. Projected impacts by month for allowing retention and requiring non-retention Ar eshown in Table B-154.

Commercial: Similar to Options 2 and 3 above. Non-retention will likely be required. Even with non-retention, estimated discard mortality (6.5 mt) would exceed the Oregon commercial allocation (5.7 mt) if the recreational-commercial split remained the same as under No Action.

California

Recreational: Recreational: The projected mortality on Nearshore Rockfish under Option 4 with a May 15 to September 30 season with a 20 fm depth restriction in the Northern Management Area is 9.4 mt of which 2.2 mt would be blue rockfish. These mortality projections are below the recreational catch share of the California allocation of 9.7 mt under this option.

Commercial: The same as Option 2.

Table B-154. Projected Nearshore Rockfish mortality north of 40°10′ N. Lat. from each state and sector under Option 4 (P* = 0.25).

State	Washington		Oregon		California		Total
Sector	Recreation al	Commercial	Recreational	Commercial	Recreational	Commercial	
Mortality	4.25	Closed	12.18	6.2	9.4	7.32	39.35
State Total	4.25		18.38		16.72		
Allocation	4.25		18.38		17.48		40.11
Percent	100%		100%		95.7%		98.1%

Option 4: Projected Overfished Species Mortality

Washington

Recreational: No additional overfished species mortality is projected compared to the No Action Alternative. Overfished species mortality could be lower than what is projected if angler effort is reduced or if closure of the recreational bottomfish fishery is needed to keep Nearshore Rockfish mortality within the Washington HG under Option 4.

Commercial: NA

Oregon

Recreational: A preliminary examination of overfished species impacts due to management measures that may be required under this option projects less than 1 percent increase in canary and yelloweye rockfish impacts.

Commercial: Same as Options 2 and 3.

California

Recreational: Assuming season lengths under Option 1 of ACL Alternative 2 in Management Areas south of 40°10′ N. latitude and the May 15 to September 30 season with a 20 fm depth restriction in the Northern Management Area, overfished species mortality projected to accrue under Option 2 are 2.6 mt of yelloweye rockfish, 17.9 mt of canary rockfish, 116.8 mt of bocaccio and 1.2 mt of cowcod. The projected impacts are within the respective harvest limits/guidelines.

Commercial: That which applies to Option 2 would also apply for Option 4.

Stock Status

Nearshore Rockfish

None of the stocks in the Nearshore Rockfish complex are currently deemed overfished. The proposed HG under this option will facilitate implementation of inseason actions to prevent the aggregate ACL from being exceeded, decreasing the risk of overfishing component stocks. Thus, the stock status would not be adversely affected by management measures under Option 4.

Overfished Species

The projected mortality under Option 4 is the same as No Action (Option 1), which are below the respective harvest limits/guidelines. No adverse effects on stock status or rebuilding progress are expected under Option 3.

Socio-economic Impacts compared to Option 1

Washington

Recreational: Socio-economic impacts would continue to be affected by management measures necessary to keep the Washington recreational fishery within the Washington HG for overfished species (yelloweye and canary rockfish). In addition, under Option 4, retention of Nearshore Rockfish in all recreational fisheries would be prohibited year-round. If inseason catch estimates show that Nearshore Rockfish catch is higher than projected, closure of the recreational bottomfish fishery may be necessary to keep Nearshore Rockfish mortality within the Washington HG under Option 4. Prohibiting retention of Nearshore Rockfish year-round on top of other management measures already in place to protect overfished species is likely to discourage angler participation in recreational groundfish fisheries. While it's difficult to predict angler behavior, any reduction in angler fishing effort will have negative socioeconomic impacts. If these management measures resulted in 10 percent fewer anglers participating in recreational groundfish fisheries, effort would be reduced by approximately 2,400 angler trips targeting bottomfish. This reduction would have negative economic impacts to coastal communities that are dependent on recreational fishing.

Commercial: Closed

Oregon

Recreational: Similar to Options 2 and 3 above.

Commercial: Similar to Options 2 and 3 above.

California

Recreational: Under Option 2, the season length would decrease by a month (787 angler trips) relative to the status quo fishery in the Northern Management Area. The season would be reduced by five and a half months (5,167 angler trips) relative to the Preferred Alternative ACL with the Option 1 season resulting in lost revenue from those in coastal communities dependent on recreational fishing for their livelihoods.

Commercial: That which applies to Option 2 would also apply for Option 4.

Discussion

More restrictive management measures are needed to keep Nearshore Rockfish complex mortality below the state HGs resulting from allocation of ACL Alternative 2 with a P* of 0.25 to HGs. For Oregon and Washington, this lower HG may result in non-retention (i.e., discard), in some cases year around. It was shown that under full year non-retention in both the commercial and recreational fisheries, discard mortality may still exceed the Oregon state HGs under Options 2-4. This would result in forgone fishing opportunity and in some cases potentially severe socio-economic consequences compared to the Preferred

Alternative ACL Alternative assuming a P* of 0.45 and the status quo ACL. The stock status is not expected to be greatly improved as a result of the ACLs from the lower P* and ACL Alternative 2. The Council may want to consider the trade-off between buffering against scientific uncertainty in the Nearshore Rockfish assessments and the socioeconomic consequences of lower ACLs for fishing communities in weighing the most appropriate P* value.

B.21 *Recreational: Washington and California Canary Sub-Bag Limits*

B.21.1 Washington

Retention of canary rockfish has been prohibited in Washington recreational fisheries since 2004 to keep mortality (including discard mortality) within the HG. 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.

Management options

No Action**:** Retention of canary rockfish would remain prohibited

> Under the No Action option, anglers would continue to be required to discard all canary rockfish encountered during all recreational fishing.

Option1**:** One canary rockfish per day as a sub-limit to the rockfish bag limit of ten and the total groundfish bag limit of twelve.

Option2**:** Up to ten canary rockfish per day as part of the rockfish sub-bag limit.

Analysis

Projected Impacts under the No Action option

Under the No Action option management measures would be the same as those analyzed under the Preferred Alternative harvest specifications for canary rockfish (Section 4.2.2.7). The projected canary rockfish mortality would be 0.75 mt. The Washington recreational HG of 3.4 mt (2015) and 3.5 mt (2016) would not be attained.

Under Option 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. All other management measures would be the same as those analyzed under the Preferred Alternative in Section 4.2.2.7.

Table B-155. Projected mortality (mt) of canary rockfish under canary sub-bag limit Option 1 and management measures under the Preferred Alternative (Section 4.2.2.7).

Washington CANARY HG 2015/2016	3.4 / 3.5
Projected Mortality	2.5

Under Option 2, anglers would be allowed to retain up to ten rockfish per day as part of the rockfish sub-bag limit of 10 and the total bottomfish bag limit of twelve. Management measures would be the same as those analyzed under the Preferred Alternative in Section 4.2.2.7.

Table B-156. Projected mortality (mt) of canary rockfish under canary sub-bag limit Option2 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 data as provided to RecFIN from 2009-2013 was used to project canary rockfish mortality for both sub-bag limit options. All canary rockfish encounters up to one (Option 1) or ten (Option 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 than 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.21.2 California

The California recreational fishery is currently managed to a canary 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 4-157). 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 [42], 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.

Management Options

Option 1-No Action: Maintain prohibition on retention of canary rockfish

Option 2: Increase the sub-bag limit to one fish within the rockfish-cabezon-greenling (RCG) complex bag limit under the Preferred Alternative season structure in Option 1

[42] Canary rockfish have a surface discard mortality of 100 percent in waters 30 fm or greater (Agenda Item D.5.b. GMT Report, April 2013)

Option 3: Increase the sub-bag limit to one fish within the RCG complex bag limit under a decreased season length

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.

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.

Under Option 2, anglers would be allowed a sub-bag limit of one canary rockfish within the RCG complex bag limit, with the Preferred Alternative season structure[43] in place (Figure 4-65). See Section 4.2.2.9 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		– Dec 31 <30 fm									
Central	Closed		Mar 1 – Dec 31<40 fm C									
Southern	Closed		Mar 1 – Dec 31 <60 fm									

Figure 4-65. Preferred Alternative Option season structure in 2015-2016 (Section 4.2.2.9).

Under Option 3, the season length was decreased to keep the projected mortality within the HG (Figure 4-66). 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				– Oct 30 <30fm						Closed	
Central	Closed				May 1 – Oct 30 <40fm						Closed	
Southern	Closed		Mar 1 – Dec 31 <60fm									

Figure 4-66. Season structure required to accommodate a one fish canary rockfish sub-bag limit within the 10 fish RCG complex bag limit in 2015-2016.

[43] The Preferred Alternative season structure corresponds to Alternative 1 (Option 1).

Analysis

Biological Impacts under No Action

Projected Impacts

The projected mortality to canary rockfish would be 16.4 mt under Option 1; Table 4-157 summarizes 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 4-157. 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).

Impacts under Option 1

Projected Impacts

No changes to stock status or rebuilding progress are expected.

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 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.

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 Preferred Alternative season structure and a one fish sub-bag limit (Table 4-158). 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 4-158. Projected mortality (in mt) 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 4-159 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 4-159. 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.

Impacts under Option 3

Projected Impacts

Under Option 3, mortality of canary rockfish is projected to increase by 20 percent (3.2 mt) compared to No Action (Table 4-160). 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 4-160. Projected mortality (in mt) 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 4-161 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 4-161. California recreational projected mortality of overfished species for 2015-2016 under Option 3.

Species	Projected Mortality (mt)
BOCCACIO	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. Preferred Alternative season structure Option1, Option 1).

B.22 *Recreational: 50 fm Recreational RCA*

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-162). Given the new mortality rate out to 50 fm, Oregon and Washington would like to have the management line at 50 fm, defined in regulation at 50 CFR §660.72(a), available for possible use in management.

Table B-162. 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%

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APPENDIX C: FMP AMENDMENT 24

PROPOSED GROUNDFISH FMP AMENDMENT LANGUAGE FOR DEFAULT HARVEST CONTROL RULES AND FOR DESIGNATION OF ECOSYSTEM COMPONENT SPECIES UNDER AMENDMENT 24

This document presents proposed Groundfish FMP amendment language proposed as Amendment 24 and reflecting the Council's Final Preferred Alternative selected in June 2014. The 2015-16 and Beyond Biennial Harvest Specifications EIS evaluates the three alternatives that were considered in addition to the alternative of No Action. Designation of Ecosystem Component Species and a number of technical changes and updates to the FMP are also proposed under Amendment 24.

- ~~Strikethrough~~ indicates text moved or deleted
- Underline indicates new text
- Double underline indicates moved text at its new location
-

Numbered headings are those from the FMP.
Under Final Preferred Alternative the Groundfish FMP is amended to describe the harvest control rule (HCR) framework 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.
Section 6.2 is amended to better describe routine and new management measures, and the Council processes used to develop and adopt these measures.

AMENDMENT LANGUAGE

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.

Notwithstanding the above, the harvest controls from the previous biennium (referred to as default harvest control rules, or default HCRs) are applied to the best available scientific information to determine the numerical values of the harvest specifications for the next biennial period. The default HCR would establish the harvest specifications based on the F_{MSY} (or proxy value) used in the previous biennium applied to the best current estimate of stock biomass to determine the OFL (as in bullet #1). The ABC is determined by applying the uncertainty buffer (as in bullet #2) used in the previous biennium. The ACL is determined as described in bullet #4 using the appropriate method for current stock status, if known. 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 P* value used in the previous biennium, if applicable. If the status has not changed or is unknown, the same method used in the previous cycle is used to compute the default HCR. This includes cases where a constant catch HCR was used in the previous cycle to set the ACL below the ABC, in which case the same constant catch numerical value is used as the default ACL for the next biennial cycle. In the case of a stock managed under a rebuilding plan, the default HCR is the one described in the current rebuilding plan (see Appendix F). The SSC will advise the Council on whether adequate progress toward ending overfishing and rebuilding the affected fish stock is being made.

For any stock (or other management units) the Council may take action to depart from the default harvest control rules described in the previous paragraph, after considering the harvest specifications or other relevant factors as long as such changes are consistent with the framework described in Chapter 4 of this FMP, the MSA, and other applicable law.

Current harvest control rules (and related harvest policies as applicable) will be listed in the SAFE document, which will be presented to the Council and the public (and in Appendix F for stocks managed under rebuilding plans).

6.2 General Procedures for Establishing and Adjusting Management Measures

…

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 management measures, which are those management measures where the impacts have not been previously analyzed and/or have not been previously implemented in regulations. 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 in Section 5.4, 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, 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*.

OTHER TECHNICAL CHANGES AND UPDATES

1.1 History of the FMP

…

Amendment 24 was approved in [insert date] to describe the use of default harvest control rules in the biennial harvest specifications process and to clarify the descriptions of new and routine management measures that may be implemented during the biennial process. Amendment 24 also designated some species as Ecosystem Component Species and incorporated a variety of technical changes to the FMP.

2.2 Operational Definition of Terms

…

Ecosystem Component Species are FMP species that are not actively managed in the fishery (i.e., no harvest specifications are specified for these species). Ecosystem component species are not targeted, are not generally retained for sale or personal use, are not subject to overfishing, and are not overfished or approaching an overfished condition (see section 4.4.4 for more detail).

$F_{SPR\ x\%}$ is the fishing mortality rate that will produce a given spawning potential ratio. The SPR is the average fecundity of a recruit over its lifetime when the stock is fished divided by the average fecundity of a recruit over its lifetime when the stock is unfished. The SPR is based on the principle that a certain biomass of fish has to survive in order to spawn and replenish the stock at a sustainable level.

Set-aside is the amount of yield of an actively managed stock or stock complex that is deducted from an ACL or sector allocation. A set-aside deducted from an ACL is designed to accommodate catch in Tribal fisheries, research fisheries, exempted fishing permit activities, and bycatch in non-groundfish fisheries. A set-aside deducted from a sector allocation is designed to accommodate catch for a portion of the sector where within-sector allocations are not specified (e.g., set-asides for the at-sea whiting sectors for many stocks are deducted from formal trawl allocations to accommodate expected bycatch).

3.1 Species Managed by this Fishery Management Plan

Table 3-1 in the FMP is proposed to be modified to remove those species designated as Ecosystem Component species and to include more of the actively managed rockfish explicitly in the table (e.g., blackspotted rockfish). Inclusion of text (see below) and a new Table 3-2 is added to list the Ecosystem Component species, including the endemic skates in the family *Arhynchobatidae* and the endemic grenadiers in the family *Macrouridae* as FMP species.

…

Table 3-1 is the listing of species actively managed under this FMP.

Table 3-1. Common and scientific names of species~~included~~ actively managed in this FMP.

Common Name	Scientific Name
SHARKS	
~~Big skate~~	~~*Raja binoculata*~~
~~California skate~~	~~*R. inornata*~~
Leopard shark	*Triakis semifasciata*
Longnose skate	~~*R.*~~ *Raja rhina*
~~Soupfin shark~~	~~*Galeorhinus zyopterus*~~
Spiny dogfish	*Squalus* ~~*acanthias*~~*suckleyi*
~~**RATFISH**~~	
~~Ratfish~~	~~*Hydrolagus colliei*~~
~~**MORIDS**~~	
~~Finescale codling (Pacific flatnose)~~	~~*Antimora microlepis*~~
~~**GRENADIERS**~~	
~~Pacific rattail (Pacific grenadier)~~	~~*Coryphaenoides acrolepis*~~
ROUNDFISH	
Cabezon	*Scorpaenichthys marmoratus*
Kelp greenling	*Hexagrammos decagrammus*
Lingcod	*Ophiodon elongatus*
Pacific cod	*Gadus macrocephalus*
Pacific whiting (hake)	*Merluccius productus*

Common Name	Scientific Name
Sablefish	*Anoplopoma fimbria*
ROCKFISH[a/]	
Aurora rockfish	*Sebastes aurora*
Bank rockfish	*S. rufus*
Black rockfish	*S. melanops*
Black and yellow rockfish	*S. chrysomelas*
Blackgill rockfish	*S. melanostomus*
Blackspotted rockfish	*S. melanostictus*
Blue rockfish	*S. mystinus*
Bocaccio	*S. paucispinis*
Bronzespotted rockfish	*S. gilli*
Brown rockfish	*S. auriculatus*
Calico rockfish	*S. dallii*
California scorpionfish	*Scorpaena gutatta*
Canary rockfish	*Sebastes pinniger*
Chameleon rockfish	*S. phillipsi*
Chilipepper rockfish	*S. goodei*
China rockfish	*S. nebulosus*
Copper rockfish	*S. caurinus*
Cowcod	*S. levis*
Darkblotched rockfish	*S. crameri*
Dusky rockfish	*S. ciliatus*
Dwarf-red rockfish	*S. rufinanus*
Flag rockfish	*S. rubrivinctus*
Freckled rockfish	*S lentiginosus*
Gopher rockfish	*S. carnatus*
Grass rockfish	*S. rastrelliger*
Greenblotched rockfish	*S. rosenblatti*
Greenspotted rockfish	*S. chlorostictus*
Greenstriped rockfish	*S. elongatus*
Halfbanded rockfish	*S. semicinctus*
Harlequin rockfish	*S. variegatus*
Honeycomb rockfish	*S. umbrosus*
Kelp rockfish	*S. atrovirens*
Longspine thornyhead	*Sebastolobus altivelis*
Mexican rockfish	*Sebastes macdonaldi*
Olive rockfish	*S. serranoides*
Pink rockfish	*S. eos*
Pinkrose rockfish	*S. simulator*
Pygmy rockfish	*S. wilsoni*
Pacific ocean perch	*S. alutus*
Quillback rockfish	*S. maliger*
Redbanded rockfish	*S. babcocki*
Redstripe rockfish	*S. proriger*
Rosethorn rockfish	*S. helvomaculatus*
Rosy rockfish	*S. rosaceus*
Rougheye rockfish	*S. aleutianus*
Sharpchin rockfish	*S. zacentrus*
Shortbelly rockfish	*S. jordani*
Shortraker rockfish	*S. borealis*
Shortspine thornyhead	*Sebastolobus alascanus*
Silvergray rockfish	*Sebastes brevispinis*
Speckled rockfish	*S. ovalis*
Splitnose rockfish	*S. diploproa*
Squarespot rockfish	*S. hopkinsi*
Sunset rockfish	*S. crocotulus*
Starry rockfish	*S. constellatus*
Stripetail rockfish	*S. saxicola*
Swordspine rockfish	*S. ensifer*
Tiger rockfish	*S. nigrocinctus*
Treefish	*S. serriceps*
Vermilion rockfish	*S. miniatus*
Widow rockfish	*S. entomelas*

Common Name	**Scientific Name**
Yelloweye rockfish	*S. ruberrimus*
Yellowmouth rockfish	*S. reedi*
Yellowtail rockfish	*S. flavidus*
FLATFISH	
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Butter sole	*Isopsetta isolepis*
Curlfin sole	*Pleuronichthys decurrens*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Flathead sole	*Hippoglossoides elassodon*
Pacific sanddab	*Citharichthys sordidus*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*

The species in Table 3-2 are designated Ecosystem Component Species (see section 4.4.4 for more details). The inclusion of all endemic skates and all endemic grenadiers will allow more precise catch monitoring without the need for a sorting requirement for these species since skates and grenadiers are generally landed in unidentified species market categories (e.g., Unidentified Skates).

Table 3-2. Groundfish species designated as Ecosystem Component Species.

Common Name	**Scientific Name**
Aleutian skate	*Bathyraja aleutica*
Bering/sandpaper skate	*B. interrupta*
Big skate	*Raja binoculata*
California skate	*R. inornata*
Roughtail/black skate	*Bathyraja trachura*
All other skates	Endemic species in the family *Arhynchobatidae*
Pacific grenadier	*Coryphaenoides acrolepis*
Giant grenadier	*Albatrossia pectoralis*
All other grenadiers	Endemic species in the family *Macrouridae*
Finescale codling (aka Pacific flatnose)	*Antimora microlepis*
Ratfish	*Hydrolagus colliei*
Soupfin shark	*Galeorhinus zyopterus*

4.3 Determination of MSY, or MSY Proxy and B_{MSY}

As a description of the current proxy F_{MSY} harvest rates by taxa used to calculate OFLs, the following language responsive to the SSC's and Council's decision to change the proxy F_{MSY} harvest rate for elasmobranchs is recommended in the second paragraph in section 4.3:

…

The problem with an F_{MSY} control rule is that it is tightly linked to an assumed level of density-dependence in recruitment, and there is insufficient information to determine the level of density-dependence in recruitment 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 will apply default MSY proxies. The 2015 ~~current (2011)~~default F_{MSY} proxies are: $F_{30\%}$ for flatfish, $F_{40\%}$ for whiting, $F_{50\%}$ for rockfish (including thornyheads), $F_{50\%}$ for elasmobranchs, and $F_{45\%}$ for all species such as sablefish and lingcod. ~~However,~~ The default F_{MSY} proxies ($F_{30\%}$, $F_{40\%}$, $F_{45\%}$, and $F_{50\%}$) are science-based values that are ~~provided here as examples only and are~~ expected to be modified from time to time as scientific knowledge improves. The default F_{MSY} proxies in use for the current biennial harvest specifications period can be found in the Groundfish Stock Assessment and Fishery Evaluation (SAFE) document. If available information is sufficient, values of F_{MSY}, B_{MSY}, and more appropriate harvest control rules may be developed for any species or species group.

APPENDIX D: LETTERS OF COMMENT ON DEIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ECOSYSTEMS, TRIBAL
AND PUBLIC AFFAIRS

December 8, 2014

Frank Lockart
Groundfish and Coastal Pelagic Species Program Director
NMFS West Coast Region
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE
Seattle, Washington 98115

Re: EPA Comments on the Draft Environmental Impact Statement for the proposed 2015-2016 Pacific Groundfish Harvest Specifications and Management Measures, Amendment 24, EPA Project #10-041-NOA.

Dear Mr. Lockart:

We have reviewed the above-referenced document in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Section 309 specifically directs EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Under our policies and procedures, we assign a rating to the Draft Environmental Impact Statement (EIS) based on the environmental impacts of the proposed action and the document's adequacy in meeting NEPA requirements.

The Draft EIS evaluates the potential impacts associated with proposed fishery specification for all Pacific Groundfish fisheries, including those fisheries that have been determined to be overfished. This amendment establishes default rules for harvest control and assesses the impacts of implementing these rules over the biennial management period. The management measures would supersede existing management and harvest regulation and result in the amendment of the current Pacific Coast Groundfish Fishery Management Plan.

While the document is profuse with highly technical and scientific information, we find it well-organized, and the tables and graphs are useful to the reader. The Executive Summary and Section 1.1 are particularly helpful in the process of navigating the analysis of the numerous options within each alternative. We commend the National Marine Fisheries Service for providing detailed explanation regarding the development of each alternative and understanding the rationale behind the development of each alternative. We also appreciate that the proposals continue to incorporate a long-term monitoring program that allows for changes in management decisions during the planning period and will be used to inform the future management decisions. Finally, we support the consideration of implications of climate change on the Groundfish fisheries in the document.

We have rated the Draft EIS "LO" (Lack of Objections) due to the protective approach of each preferred alternative identified for the management specifications, the stock complex reorganization and designation of ecosystem component species, and the default harvest control rules. We also support the proposed management measures which are primarily intended to improve fishery monitoring while controlling Groundfish catch. A copy of EPA's rating system criteria used in conducting our environmental review is enclosed. Our rating and our comments will be posted on the EPA Office of Federal Activities website at http://www.epa.gov/compliance/nepa/eisdata.html.

Thank you for the opportunity to review and provide written comments on this Draft EIS. If you have any questions regarding this letter, please contact Jennifer Curtis of my staff at (907) 271-6324 or by e-mail at curtis.jennifer@epa.gov .

Sincerely,

Christine B. Reichgott

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

Enclosure:

1. U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

ENCLOSURE 1

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026

9043.1
IN REPLY REFER TO:
ER14/0676

Electronically Filed

December 3, 2014

Frank Lockhart
Groundfish & Coastal Pelagic Species Program Director
NMFS West Coast Region
National Oceanic and Atmospheric Administration
7600 Sandpoint Way NE
Seattle, WA 98115

Dear Mr. Lockhart:

The Department of the Interior has reviewed the Draft Environmental Impact Statement for proposed Harvest Specifications and Management Measures for the Pacific Coast Groundfish Fishery and Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan. The Department has no comments on the document at this time.

We appreciate the opportunity to comment.

Sincerely

Allison O'Brien

Allison O'Brien
Regional Environmental Officer

725 Front Street
Suite 201
Santa Cruz, CA 95060

Ocean Conservancy

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December 8, 2014

Frank Lockhart
Groundfish & Coastal Pelagic Species Program Director
NMFS West Coast Region, NOAA
7600 Sandpoint Way NE
Seattle, WA 98115

RE: Draft Environmental Impact Statement for Harvest Specifications and Management Measures for 2015-16 and Biennial Periods Thereafter (Pacific Coast Groundfish Fishery Management Plan)

Dear Mr. Lockhart:

On behalf of Ocean Conservancy,[1] we submit the following comments regarding the Draft Environmental Impact Statement (DEIS) to analyze the impacts of the 2015-2016 harvest specification and management measures for the groundfish fishery management plan (FMP). We commend the Pacific Fishery Management Council (Council) and Groundfish Management Team (GMT) for acknowledging that long-term analysis of the proposed catch specification is needed; however, we have some questions and concerns regarding how the long-term analysis will be performed, how the requirements of the National Environmental Policy Act (NEPA) will be complied with in future years, and how optimum yield (OY) factors will be analyzed. We look forward to working with the Council and the National Marine Fisheries Service (NMFS) to better assess the long-term impacts of the groundfish fishery.

To reach the stated goals of the DEIS, the Council, requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and NEPA, we recommend the following:

Develop and maintain a clearly defined schedule and process for subsequent analysis and public engagement in future catch specifications processes. We support action by NMFS and the Council to make the management process more efficient and allow NMFS, the Council, and staff to focus on important policy analysis and decisions; however we have concerns about aspects of the proposed decision-making process that may weaken important touch points for policy discussion and public participation. In particular, we ask for confirmation that the harvest specifications will be published in the Federal Register every two years for the subsequent two year period, which is needed to maintain the public notice and comment requirements of the Administrative Procedure Act (APA), MSA, and NEPA. We also request that the duration of the DEIS analysis is clearly specified.

[1] Ocean Conservancy is a non-profit organization that educates and empowers citizens to take action on behalf of the ocean. From the Arctic to the Gulf of Mexico to the halls of Congress, Ocean Conservancy brings people together to find solutions for our water planet. Informed by science, our work guides policy and engages people in protecting the ocean and its wildlife for future generations.

Minimize the risk of overfishing in the Default Harvest Control Rules (HCRs). While we support the concept of default HCRs as an efficient process mechanism, we urge the Council and NMFS set the default HCRs at more precautionary levels to minimize risks to the ecosystem and economic health of fishing communities. In the future we recommend the Council undertake an analysis to generate robust, non-arbitrary levels of risk that recognizes the trade-offs between the consequences of overfishing and the short-term costs associated with more precautionary buffers. To this end, we also urge the Council to select a proposed Fishery Ecosystem Plan initiative to better consider stock structure and spatial range in the setting of HCRs to further strengthen them.[2]

Continue using additional decision-support tools like the Atlantis model to better assess cumulative impacts and management tradeoffs. We applaud the Council's use of the Atlantis model to analyze long-term impacts of potential management actions, and encourage its use by the Council as a step towards ecosystem based management and accounting for OY in management. Taken as part of a larger suite of tools and information, Atlantis can help elucidate the trade-offs associated with different management actions, and provide insights into future impacts of current decisions.

This DEIS contains three actions. The first action sets harvest specifications and management measures for the 2015-2016 biennial management period. The second involves a reorganization of several fish complexes and the designation of additional ecosystem component (EC) species. The third action is an FMP amendment—Amendment 24. It would amend the Groundfish FMP to describe default harvest control rules (HCRs) and management measures to be considered during subsequent biennial cycles. The new default HCR framework would be used to calculate default annual catch limits (ACLs), which the Council would use to set catch limits for subsequent biennial periods. Therefore, this third action (Amendment 24) would have far-reaching impacts and significant long-term effects. As such, the NEPA analysis for Amendment 24 must be broad and reach beyond the methods used to set ACLs; rather, it must consider the FMP as a whole and analyze how the FMP itself affects the marine ecosystem.[3] In order to analyze the long-term impacts of the FMP, the analysis must look beyond a baseline of the fishery's status quo. The third action also has implications for a key statutory requirement of the MSA — achieving OY. The Atlantis Model appears to be well suited to address OY, as Atlantis is an ecosystem model that can consider all parts of marine ecosystems, including ecological, economic, and social (the statutory OY factors).

This letter will provide recommendations on NEPA compliance, default Harvest Control Rules, and expanding the scope of analysis of fishery management targets and actions through the use of ecosystem models, or model ensembles, such as Atlantis, used in this DEIS.

I. Ensuring Compliance with NEPA in Future Catch Specification Processes

NMFS and the Council are preparing an Environmental Impact Statement (EIS) which will analyze the impacts of harvest specifications and management measures for groundfish for the 2015-2016 management period, as well as the long-term impacts for the foreseeable future. Rather than creating a

[2] FEP Initiative on the Potential Long-Term Effects of Council Harvest Policies on Age- and Size- Distribution in Managed Stocks. FEP Appendix A, pg A-13.
[3] *Greenpeace v. National Marine Fisheries Service*, 55 F.Supp.2d 1248, 1270-1274 (W.D. Wash. 1999).

new EIS every two years, it appears NMFS will instead tier from this EIS document. This process could create efficiencies and cost savings in subsequent years. This DEIS document, however, is unclear as to the nature and duration of the EIS and as to the decision-making process that will be followed in subsequent biennial cycles.

The purpose of NEPA is to ensure that the government effectively considers environmental and socioeconomic impacts of proposed actions and reasonable alternatives to those actions.[4] The agency uses the information gathered for the EIS to evaluate the benefits and disadvantages of the proposed action and all reasonable alternatives to the action. The DEIS explained that this EIS will evaluate the "impacts of the ongoing action over a longer time period than 2 years" as part of a NEPA "tiering" and "supplementing" process established by the Council on Environmental Quality (CEQ).[5] As such, it will evaluate the "long-term impacts of setting harvest specifications and related management measures for the foreseeable future . . . encompass[ing] the range of likely impacts that could occur in future biennial management periods, beyond 2015-16."[6] According to the GMT, this EIS (also referred to as the "Tier 1 EIS") will analyze "longer term (i.e., 10 years) projections of potential harvest levels to provide efficiency and workload relief in future National Environmental Policy Act analyses."[7]

We are in favor of tiering and supplementation as time and cost saving mechanisms, so long as it still fulfills all requirements of the law and regulations, public access to the process is maintained, and the environmental analysis remains of high quality and thorough. As currently written, this DEIS lacks an explanation of how NEPA will be complied with in the future. We request that the Council clarify whether and how subsequent biennial cycles will be supplemented or tiered from this document, and for what duration.

Furthermore, the full slate of public participation options must be maintained in each 2-year process for setting catch specifications. The biennial groundfish specifications are "regulations," and as such, NMFS is required by the MSA and APA to offer them for formal public notice and comment via the Federal Register, even if public access is also promoted via the Council process.[8] The April 2014 "preliminary draft" of the EIS, as published in the briefing book for the April 2014 council meeting, explained that the "harvest specifications will be published in Federal regulations every 2 years for the subsequent 2-year period" as is the status quo.[9] However, the DEIS is unclear on this point. Will biennial harvest specifications be published for formal notice and comment every two years? The final EIS must clarify how the public transparency aspects of the MSA, APA, and the NEPA will be complied with in subsequent biennial cycles including a commitment to biennial catch specifications that are subject to public notice and comment every two years.

II. Default Harvest Control Rules should be more risk averse

[4] 40 C.F.R. 1500.1–1500.2 (2013).

[5] National Marine Fisheries Service, Draft Environmental Impact Statement for Harvest Specifications and Management Measures for 2015-16 and Biennial Periods Thereafter (Pacific Coast Groundfish Fishery Management Plan) (October 2014), at pg 635 (hereinafter "Groundfish Harvest Specifications DEIS")

[6] Groundfish Harvest Specifications DEIS, at pg 4.

[7] Biennial Specifications For 2015-2016 Groundfish Fisheries, Situation Summary, Agenda Item H.6 (Nov. 2013), available at http://www.pcouncil.org/wp-content/uploads/H6_SITSUM_NOV2013BB.pdf.

[8] *Natural Resources Defense Council, Inc. v. Evans*, 168 F.Supp.2d 1149, 1156-57 (N.D. Cal., Aug. 20, 2001).

[9] Groundfish Harvest Specifications DEIS, Preliminary Draft (April 2014 Council Meeting), Agenda Item C.4.a, Attachment 6 at pg 3 (March 2014) (hereafter referred to as "April 2014 preliminary draft").

The preferred alternative for the third action (Amendment 24) would set the default HCRs as whatever HCRs are in place in the previous period. This means that the HCRs for the 2017-18 biennial cycle would be equal to the HCRs for the 2015-16 cycle (so long as the Council chooses not to take action to deviate from the default HCR). In other words, the HCRs chosen for 2015-16, in the first action at issue here, would set the baseline default HCRs for the future. While we support efficient decision-making processes, close attention must be paid to the first action (setting the HCRs for the 2015-16 period) given the precedential nature of this action.

Under the preferred alternative for the first action (2015-16 specifications), annual catch limits (ACLs) for most species would be determined based on the ACLs being set equal to the acceptable biological catches (ABCs) with a P* value of 0.45.[10] This P* value contains significant risks of overfishing and should be set lower in order to be more risk averse. By choosing a P* value of 0.45, the Council is taking a 45% chance of overfishing a stock in any given year (if the uncertainty was characterized properly). The consequence will be that on average, *45% of the stocks will experience overfishing in any given year* (if the uncertainty was characterized properly, and an even higher percentage if the uncertainty has been underestimated). Ultimately, an analysis that would generate a robust, non-arbitrary level of acceptable risk in the context of overfishing should assess the trade-offs between the consequences of overfishing (both economic and ecological) and the short-term costs associated with more precautionary buffers. Overfishing has major impacts on local economies and fishing communities across the country. The choice of P* should explicitly weigh, in part, the value of avoiding such impacts against the short-term costs of more precautionary buffers for scientific uncertainty. Therefore, setting a P*in the range of 0.40 and 0.45 implies a policy statement by NMFS and the Council that the very real risk of inadvertent overfishing is not important and the consequences of overfishing on ecosystems and fishing communities is not a concern.

Furthermore, there are additional aspects in designing a robust HCR. Long term health and resiliency of fish populations is dependent on many factors. While considerations of stock size and fishing rates are key, stock structure composition is an important element of a healthy and resilient fishery that can withstand environmental alteration such as warming waters or changing pH. A thorough analysis of these factors can help the Council set appropriate harvest control rules for the groundfish fishery. We applaud inclusion of an initiative on the "Potential Long-Term Effects of Council Harvest Policies on Age- and Size- Distribution in Managed Stocks" in the Council's list of potential future FEP initiatives and urge you to take action on this item in March.

A large body of evidence shows not only the impact of fishing on target stock population structure, but that accounting for this in management is possible.[11] The Council has the data and information available to make this happen, and we urge the Council to take advantage of the emerging science and tools to further increase stock stability and resilience in the face of a changing climate.

III. Specifying and Achieving Optimum Yield and Atlantis

[10] Groundfish Harvest Specifications DEIS, at ii ("ACLs for most species are determined based on the ACLs being set equal to the ABCs with a P* value of 0.45.").

[11] Hixon, Mark A., Darren W. Johnson, and Susan M. Sogard. (2013) BOFFFFs: on the importance of conserving old-growth age structure in fishery populations. *ICES Journal of Marine Science*.

National Standard One of the MSA mandates that fisheries be managed at optimum yield (OY).[12] It states:

> (1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.[13]

Optimum Yield is defined as "the amount of fish which . . . 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."[14] All fishery management plans are required to "assess and specify" optimum yield, and "include a summary of the information utilized in making such specification."[15] Optimum yield must be achieved "on a continuing basis."[16]

Optimum yield is prescribed relative to maximum sustainable yield (MSY)—the current paradigm for U.S. fishery management. MSY represents the highest possible annual catch that can be sustained over time.[17] MSY's goal is maximum fish production,[18] and typically involves fishing a population down to forty percent of its historic unfished biomass.[19] However, pure MSY-based management was not designed to incorporate social, ecological, and economic factors.[20] MSY critics point out that MSY-based management does not promote economic or social values, that MSY fails to account for dynamic ocean processes and the interactions between species,[21] and that MSY ignores economic factors such as the value of the catch and the cost of fishing.[22] The MSA's mandate for Optimum Yield (OY), however, is

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[12] 16 U.S.C. § 1851(a)(1).

[13] 16 U.S.C. § 1851(a)(1) (The words "*for the United States fishing industry*" were added at the end in 1984. Sec. 404(3), Public Law 98–623, Stat. 3394, H.R. 6342 (Nov. 8, 1984)).

[14] 16 U.S.C. § 1802(33)(A).

[15] 16 U.S.C. § 1853(a)(3).

[16] 16 U.S.C. § 1851(a)(1).

[17] THEODORE PANAYOTOU, FOOD & AGRIC. ORG., FISHERIES TECH. PAPER NO. 228, MANAGEMENT CONCEPTS FOR SMALL-SCALE FISHERIES: ECONOMIC AND SOCIAL ASPECTS (1982), http://www.fao.org/docrep/003/X6844E/X6844E02.HTM.

[18] *Id.*

[19] National Standard Guidelines, 74 Fed. Reg. 3,178, 3,187 (Jan. 16, 2009). *See also*, CHARLES J. KREBS, THE MESSAGE OF ECOLOGY 48 (Indo American Books 2007).

[20] Panayotou, *supra* note 24 , at *2 fn 7. *See also* Catherine M. Dichmont et al., *On Implementing Maximum Economic Yield in Commercial Fisheries*, 107 PROCEEDINGS NAT'L ACADS. SCIENCE 16, 19 (2010); TOM KOMPAS AND R. QUENTIN GRAFTON, AUSTL. BUREAU OF AGRIC. & RES. ECON. & SCIENCES, TECH. REPORT NO. 11.3, TARGET AND PATH: MAXIMUM ECONOMIC YIELD IN FISHERIES MANAGEMENT 5 (2011), http://data.daff.gov.au/brs/data/warehouse/pe_abares99010704/TR11.03MEYfish_hr.pdf ("[MSY] maximises the gross value of production for a fishery, it does not ensure that the fishery is maximising economic returns. Depending on the price of fish and the cost of fishing it is also possible that economic returns from fishing at MSY may be zero or negative.").

[21] *See, e.g.*, CARMEL FINLEY, ALL THE FISH IN THE SEA: MAXIMUM SUSTAINABLE YIELD AND THE FAILURE OF FISHERIES MANAGEMENT (The Univ. of Chicago Press 2011); Ray W. Hilborn, *The Dark Side of Reference Points*, 70 BULLETIN OF MARINE SCIENCE 403 (2002); Peter A. Larkin, *An Epitaph for the Concept of Maximum Sustained Yield*, 106 TRANSACTIONS AM. FISHERIES SOC'Y 1 (1977); Hiroyuki Matsuda & Peter A. Abrams, *Can We Say Goodbye to the Maximum Sustainable Yield Theory? Reflections on Trophic Level Fishing in Reconciling Fisheries with Conservation*, AM. FISHERIES SOC'Y SYMPOSIUM 587 (2007) (available at http://www.fisheriessociety.org/proofs/wfc/matsuda.pdf).

[22] Panayotou, *supra* note 24 at *2 fn 7. *See also* Catherine M. Dichmont et al., *On Implementing Maximum Economic Yield in Commercial Fisheries*, 107 PROCEEDINGS NAT'L ACADS. SCIENCE 16, 19 (2010); TOM KOMPAS AND R. QUENTIN GRAFTON, AUSTL. BUREAU OF AGRIC. & RES. ECON. & SCIENCES, TECH. REPORT NO. 11.3, TARGET AND PATH: MAXIMUM ECONOMIC YIELD IN FISHERIES MANAGEMENT 5 (2011),

designed to add those ecological, social, and economic factors into the equation. The MSA states that optimum yield is prescribed "on the basis of maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor."[23]

In addition to defining and mandating optimum yield, the MSA also directs the Secretary of Commerce to develop "advisory guidelines (which shall not have the force and effect of law), based on the national standards, to assist in the development of fishery management plans."[24] The National Standard One (NS1) Guidelines contain a description of the OY factors (economic, social, ecological) and guidance on how it should be specified.[25] For example, the NS1 Guidelines state that "[a] Council must identify those economic, social, and ecological factors relevant to management of a particular stock, stock complex, or fishery, and then evaluate them to determine the OY. The choice of a particular OY must be carefully documented to show that the OY selected will produce the greatest benefit to the Nation and prevent overfishing."[26] Further, the guidelines call for "periodic reassessment of the OY specification."[27]

The Pacific Council's optimum yield policy for groundfish is described in Chapter 4 of the Groundfish FMP.[28] The OY determination does not consider the necessary OY factors (economic, social, ecological) in any meaningful or explicit way. Instead, OY is simply the "long-term average of the stock or stock complex's ACL."[29]

On the whole, OY is not assessed or specified in the FMP; OY is not integrated into the ACL-setting process in any meaningful prospective way and the OY requirement is simply applied retrospectively, if at all. OY is described in one single paragraph in section 4.7 of the FMP,[30] and OY is not mentioned at all in the overview of the harvest specification and management process in section 5.1.[31] To the extent that there is explicit and a more than passing discussion of one or more OY factors, *post-hoc* rationalization is used to determine that status quo catch-level setting satisfies the OY requirements. While there is consideration of OY factors in the groundfish management process, the FMP falls short of MSA's requirement to "assess and specify" optimum yield sufficiently.[32]

There are many tools available to meet the statutory requirements of OY. Formal NMFS technical guidance was published in 1998,[33]and while not a highly refined instrument, can be used in the absence of other analysis and in low-information situations. On the U.S. West Coast, different approaches and

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http://data.daff.gov.au/brs/data/warehouse/pe_abares99010704/TR11.03MEYfish_hr.pdf ("[MSY] maximises the gross value of production for a fishery, it does not ensure that the fishery is maximising economic returns. Depending on the price of fish and the cost of fishing it is also possible that economic returns from fishing at MSY may be zero or negative.").

[23] 16 U.S.C. § 1802(33)(B).

[24] 16 U.S.C. § 1851(b).

[25] 50 C.F.R. 600.310(e)(3).

[26] 50 C.F.R. 600.310(e)(3)(ii).

[27] 50 C.F.R. 600.310(e)(3)(v)(G).

[28] Pacific Fishery Management Council, Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery 36 (May 2014).

[29] *Id.* at 19-20

[30] *Id.*

[31] *Id.* at 44-45.

[32] 16 U.S.C § 1853(a)(3).

[33] Restrepo, et al. NMFS: Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. July 1998.

models are available to help managers understand a wide range of fisheries, some of which incorporate multiple aspects of a fishery and represent the leading edge of modeling and analysis, such as the Atlantis model used in this DEIS.

We applaud the Council and NMFS for using the Atlantis model. We support the use of Atlantis to inform Amendment 24 analysis and the accompanying "long-term" EIS process. We believe analyzing cumulative impacts and running decadal simulations to compare management options is an appropriate usage of the Atlantis model, and an opportunity to analyze and assess OY elements for inclusion in management of groundfish stocks. At the November 2014 Council meeting, Dr. Isaac Kaplan presented on the use of Atlantis in fisheries management, with a focus on results from the methodology review in July 2014. The SSC, GMT, and the Habitat Committee all expressed support in using the model generally, and the Council endorsed the panel recommendation to further explore the use of Atlantis, especially in the context of Fishery Ecosystem Plan initiatives.

The panel report, and the SSC, also highlighted the limitations of Atlantis, reiterating concerns including its use as a qualitative tool rather than a quantitative one, the importance of using it as a strategic tool instead of tactical, and some areas of model performance that need improvement through better data and model calibration. For example, the analysis performed in this DEIS concludes, "Food web effects were evident but not common." "Overall, most ecosystem metrics responded by <5% regardless of the productivity assumed in the ecosystem model."[34] This information is very valuable, but should not be interpreted without recognizing the limitations of the model and its use as a blunt instrument. It is also important to note that this change is a relative when compared to status quo management, not as compared to an unfished state (as done in other work by Dr. Kaplan), or other alternatives. Ocean Conservancy urges the Council to analyze the impacts of the groundfish FMP on the CCE as compared to an unfished state.

In his presentation Dr. Kaplan highlighted the need for more diet data to improve the accuracy of food web interaction results.[35] Ocean Conservancy supports this request and hopes the Council's and NMFS's resources will increase to be able to fill this knowledge gap. Information such as this will make Atlantis, and other modeling tools like it, more accurate and better able to inform Council actions, especially as they pertain to decisions around the larger ecosystem. While Atlantis is a very powerful tool, it is one among many, and not capable of providing the Council with the information needed to assess and specify OY, thus the Council must seek other means to fulfill its legal mandate.

Conclusion

We appreciate the steps that the Council and NMFS have taken to implement ecosystem-based management and the use of novel tools and recent information to inform decision-making. By developing and maintaining a clearly defined schedule and process for subsequent analysis and public engagement in future catch specifications processes, minimizing the risk of overfishing in the Default Harvest Control Rules, and continuing the use of additional decision-support tools like the Atlantis model to better assess cumulative impacts and management tradeoffs, the Council and NMFS further develop a tradition of science-based and innovative fisheries management.

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[34] Groundfish Harvest Specifications DEIS, appendix A, at pg. 663.
[35] GMT meeting proceedings, November 2014 PFMC meeting.

Sincerely,

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