Agenda Item F.2
Attachment 1 (**Electronic Only**)
April 2018

Pacific Coast Groundfish Fishery 2019-2020 Harvest Specifications and Management Measures

Analytical Document Organized as a Preliminary Draft Environmental Assessment

DRAFT

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Chapter 1 Introduction

1.1 Proposed Action, Purpose and Need

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), National Marine Fisheries Service's (NMFS's) proposed actions consist of the following:

1. The adoption of 2019-2020 harvest specifications
2. Adjustments to existing (routine) management measures and implementation of new management measures

The purpose of these actions are to prevent overfishing, to rebuild overfished stocks, to ensure conservation, to facilitate long-term protection of essential fish habitat (EFH), and to realize the full potential of the nation's fishery resources (MSA §2(a)(6)). These actions are needed to respond to new scientific information and information about the needs of fishing communities, to provide additional tools to ensure that annual catch limits (ACLs) and other federal harvest guidelines are not exceeded, and to afford additional fishing opportunities where warranted.

The proposed action will be implemented through Federal rulemaking.

This document is an Environmental Assessment/MSA Analysis/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/MSA/RIR/IRFA). An EA/MSA/RIR/IRFA provides assessments of the environmental impacts of an action and its reasonable alternatives (the EA), how the action meets the requirements of the MSA (MSA analysis), the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), and the impacts of the action on directly regulated small entities (the IRFA). This EA/MSA analysis/RIR/IRFA addresses the statutory requirements of the MSA, the National Environmental Policy Act (NEPA), Presidential Executive Order 12866, and the Regulatory Flexibility Act. This EA/MSA analysis/RIR/IRFA is a document produced by the Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) West Coast Region to provide the analytical background for decision-making.

1.2 Tiered NEPA Analysis

NEPA regulations at 40 CFR 1508.28 define "tiering" as "the coverage of general matters in broad environmental impact statements (such as national program or policy documents) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussion and concentrating solely on the issues specific to the statement subsequently prepared." In 2015 NMFS published the Harvest Specifications and Management Measures for 2015-2016 and Biennial Periods Thereafter Final Environmental Impact Statement (EIS) (PFMC and NMFS 2015, hereafter, "the 2015 EIS"). This EIS analyzed the impacts of both the proposed action of implementing harvest specifications and management measures for the 2015-16 biennial period and the long-term impacts of the harvest policy framework used to set biennial harvest specifications and the range of management measures necessary to control catch consistent with harvest specifications. The proposed action included Amendment 24 to the Pacific Coast Groundfish Fishery Management Plan (PCGFMP), which articulates a decision framework around "default harvest specifications" intended to streamline decision making for future biennial periods. PCGMFP section 5.1 describes how biennial harvest specifications are set and defines default harvest specifications as the application of the best scientific information available to the harvest control rule from the previous biennial period. The default represents the continuation of the existing policy. Unless the Council takes deliberate action to adopt a new harvest control rule, the existing rule "rolls over" as the basis for harvest specifications in the subsequent biennial period. This decision making framework is intended to complement the tiering concept; the impacts of a range of policies (harvest control rules) were analyzed in the 2015 EIS (adopted 2015-16 harvest control rules represent defaults for future biennial periods). NEPA documents for subsequent biennial periods evaluate changes from default harvest policies and environmental impacts outside the range of impacts evaluated in the 2015 EIS. Since 2019-20 is the second biennial period since preparation of the 2015 EIS, this EA also takes into account the actions and related impact analyses in the EA prepared for the 2017-18 biennial period (NMFS 2016, hereafter, "the 2016 EA").[1]

1.2.1 Tiered Analysis of Harvest Specifications

The 2015 EIS evaluated the impacts of setting harvest specifications and management measures over the long term by modeling a range of harvest policies over a 10-year period to 2024. The long-term analysis in the 2015 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 harvest control rules and related harvest specifications.[2] In addition to alternative harvest control rules, the 2015 EIS analysis encompassed alternative states of nature that captured the key axes of uncertainty in the stock assessments used as the basis for projections. (Alternative states of nature represent a likelihood distribution centered on the base case as the most probable state of nature.) There are two scenarios under which information or an action is considered new or a departure from what is contained in the 2015 EIS (as updated by the 2016 EA) and is therefore analyzed in this document:

- The Council proposes changing a harvest control rule. This constitutes a change in the action and under NEPA, requires an analysis of alternatives. Such a change may or may not result in a catch level that is within the range analyzed in the 2015 EIS. If outside of the range, then the effects of the catch are disclosed in this tiered document.
- Updated harvest specifications result in the catch level of a stock that is outside of the range analyzed in the 2015 EIS (under the assumption that all of the ACL is caught). ACLs may fall outside the analyzed range because of a change in stock status or other new scientific information rather than a result of a change in the harvest control rule. This represents a change in baseline conditions anticipated in the 2015 EIS. The stock specific effects of these ACLs are discussed in Section 3.2.2.

1.2.2 Tiered Analysis of Management Measures

As discussed in the PCGFMP, management measures are classified as either "routine" or "new" and the accompanying level of analysis differs between these two categories. If the environmental impacts of changes to measures classified as routine were previously analyzed in the 2015 EIS then this EA tiers from that analysis. New management measures, by definition, have not been previously analyzed so this EA presents more detailed impact analysis in all cases.

PCGFMP sections 6.1 and 6.2 describe the processes for establishing and adjusting management measures including the classification of routine measures. Routine management measures are those that the Council determines are likely to be adjusted on an annual or more frequent basis. The Council may classify measures as routine through either the biennial management process or a rulemaking processes. In order

[1] The 2016 EA evaluated setting alternative harvest control rules and harvest specifications for big skate, widow rockfish, darkblotched rockfish, and Pacific ocean perch (POP), establishing five new management measures for the 2017-18 biennial period and beyond, revising Federal regulations at 50 CFR 660, Subparts C through G, accordingly, and implementing Amendment 27 to the Groundfish FMP.

[2] For the purposes of the 2015 EIS analysis it was assumed that the full projected annual catch limits (ACLs) were harvested so that ACLs were comparable to total catches over the projection period.

for a measure to be classified as routine, the Council must find that the measure is appropriate to address the issue at hand and may require further adjustment to achieve its purpose with accuracy and the need for the measures, their impacts, and the rationale for their use has been analyzed prior to their initial implementation as routine measures. Once a management measure has been classified as routine and it has been adequately analyzed consistent with applicable law prior to a decision to adjust it, the measure may be modified (or "adjusted") through a simplified rulemaking process. Routine measures are, in the main, mechanisms to control catch so that annual catch limits (ACLs) are not exceeded and include modifications to commercial and recreational trip limits, bag limits, and season dates. For this reason they require regular adjustment at the outset of the biennial period to align with ACL changes and during the biennial period (as "inseason actions"), because the conduct of the fishery and resulting harvest cannot be perfectly forecast.

By implication, new management measures are those that have not already been classified as routine including those that the Council does not intend to regularly adjust.

1.3 Description of the Management Area

The management area for this action is the Exclusive Economic Zone (EEZ) – defined as 3-200 nautical miles from state baselines along the coasts of Washington, Oregon, and California – and communities that engage in fishing in waters off these states. PCGFMP Figure 3-1 depicts this management area and is incorporated by reference.

Chapter 2 Alternatives

Two sets of alternatives are analyzed in this EA: 1) changes to harvest control rules and resulting harvest specifications, and 2) changes in management measures related to harvest specifications and for other purposes including changes to the composition of the nearshore and other fish stock complexes.

2.1 Harvest Specification Alternatives

At the national level National Standard 1 Guidelines at 50 CFR 600.310 define harvest specifications and what must be taken into account when specifying them. PCGFMP Chapter 4 describes the framework for biennial specifications. The overfishing limit (OFL), acceptable biological catch (ABC), and the annual catch limit (ACL) for each stock is re-estimated and specified. The best scientific information available for these specifications encompasses new stock assessments, changes in Scientific and Statistical Committee (SSC)-endorsed stock categories, or changes in SSC-endorsed sigma values (i.e., biomass variances used to estimate the uncertainty in estimating OFLs). Any revised or new harvest control rules adopted by the Council and used to determine specifications for the subject biennial period become the new default for future biennial management cycles.

Updated harvest specifications for 2019 and 2020 based on default harvest control rules (HCRs) reflect the application of the best scientific information available to current harvest management policies. These are termed default harvest specifications. The Council considered alternatives to the default HCRs for the following stocks:

1. Yelloweye rockfish
2. California Scorpionfish S. 34°27’ N. lat.
3. Lingcod N. of 40°10’ N lat.
4. Lingcod S. of 40°10’ N lat.

2.1.1 Default Harvest Specifications (No Action)

Default harvest specifications would be implemented. As discussed above, default harvest specifications are computed by applying the best scientific information available to current, default HCRs for all groundfish stocks. Table 2-1 lists the default harvest specifications for the 2019-20 biennial period and describes the default HCRs upon which they are based.

Table 2-1. 2019 and 2020 harvest specifications (overfishing limits (OFLs in mt), acceptable biological catches (ABCs in mt), and annual catch limits (ACLs in mt)) under default harvest control rules for determining these specifications, for West Coast groundfish stocks and stock complexes (overfished/rebuilding stocks in CAPS; stocks with new assessments in bold; component stocks in stock complexes in italics).

Stock or Stock Complex	**2019**			**2020**			**Harvest Control Rule**
	OFL	**ABC**	**ACL**	**OFL**	**ABC**	**ACL**	
REBUILDING STOCKS							
COWCOD S. of 40°10’	74	67	10	76	68	10	ABCs sum of Con. and Mont. area ABCs, ACLs projected from 2013 rebuilding analysis (SPR = 82.7% (F = 0.007)) + Mont. area ABC contrib., ACT = 4 mt
COWCOD (Conception)	*61*	*56*	*NA*	*62*	*57*	*NA*	*ABC (P* = 0.45)*
COWCOD (Monterey)	*13.3*	*11.1*	*NA*	*13.3*	*11.1*	*NA*	*ABC (P* = 0.45)*
YELLOWEYE ROCKFISH	**81**	**74**	**29**	**84**	**77**	**30**	**ABC (P* = 0.4), ACL (SPR = 76.0%)**
NON-OVERFISHED STOCKS							
Arrowtooth Flounder	**18,696**	**15,574**	**15,574**	**15,306**	**12,750**	**12,750**	**ACL = ABC (P* = 0.4)**
Big skate	541	494	494	541	494	494	ACL = ABC (P* = 0.45)
Black Rockfish (CA)	344	329	329	341	326	326	ACL = ABC (P* = 0.45)
Black Rockfish (OR)	565	516	516	561	512	512	ACL = ABC (P* = 0.45)
Black Rockfish (WA)	312	298	298	311	297	297	ACL = ABC (P* = 0.45)
Bocaccio S. of 40°10’	**2,194**	**2,097**	**2,097**	**2,104**	**2,011**	**2,011**	**ACL = ABC (P* = 0.45)**
Cabezon (CA)	154	147	147	153	146	146	ACL = ABC (P* = 0.45)
Cabezon (OR)	49	47	47	49	47	47	ACL = ABC (P* = 0.45)
California scorpionfish	**337**	**313**	**150**	**331**	**307**	**150**	**ABC (P* = 0.45); 150 mt constant catch ACL.**
Canary Rockfish	1,517	1,450	1,450	1,431	1,368	1,368	ACL = ABC (P* = 0.45)
Chilipepper S. of 40°10'	2,652	2,536	2,536	2,521	2,410	2,410	ACL = ABC (P* = 0.45)
Darkblotched Rockfish	**800**	**765**	**765**	**853**	**815**	**815**	**ACL = ABC (P* = 0.45)**
Dover Sole	91,102	87,094	50,000	92,048	87,998	50,000	ABC (P* 0.45), ACL = 50,000 mt annually
English Sole	11,052	10,090	10,090	11,101	10,135	10,135	ACL = ABC (P* = 0.45)
Lingcod N. of 40°10'	**5,110**	**4,872**	**4,859**	**4,770**	**4,549**	**4,533**	**ACL = ABC (P* = 0.45 in OR & WA; P* = 0.40 in CA) w/ 40-10 adj. for the CA contribution to the ABC and ACL. Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.**
Lingcod S. of 40°10'	**1,143**	**1,043**	**996**	**983**	**898**	**839**	**ACL = ABC (P* = 0.40) w/ 40-10 adj. Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.**
Longnose skate	2,499	2,389	2,000	2,474	2,365	2,000	ABC (P* = 0.45), ACL = 2,000 mt annually
Longspine Thornyhead N. of 34°27'	4,112	3,425	2,603	3,901	3,250	2,470	ACL = 76% of coastwide ABC (P* = 0.4)
Longspine Thornyhead S. of 34°27'			822			780	ACL = 24% of coastwide ABC (P* = 0.4)
Pacific Cod	3,200	2,221	1,600	3,200	2,221	1,600	ABC (P* = 0.4), ACL = 50% of OFL
Pacific Ocean Perch N. of 40°10’ N lat.	**4,753**	**4,340**	**4,340**	**4,632**	**4,229**	**4,229**	**ACL = ABC (P* = 0.45)**
Petrale Sole	3,042	2,908	2,908	2,976	2,845	2,845	ACL = ABC (P* = 0.45)
Sablefish N. of 36°	8,489	7,750	5,606	8,648	7,896	5,723	ACL: 40-10 rule applied to 73.8% of coastwide ABC (P* = 0.4)
Sablefish S. of 36°			1,990			2,032	ACL: 40-10 rule applied to 26.2% of coastwide ABC (P* = 0.4)
Shortbelly	6,950	5,789	500	6,950	5,789	500	ABC (P* = 0.4), ACL = 500 mt annually
Shortspine Thornyhead N. of 34°27'	3,089	2,573	1,683	3,063	2,551	1,669	ACL = 65.4% of coastwide ABC (P* = 0.4)
Shortspine Thornyhead S. of 34°27'			890			883	ACL = 34.6% of coastwide ABC (P* = 0.4)

Stock or Stock Complex	2019			2020			Harvest Control Rule
	OFL	ABC	ACL	OFL	ABC	ACL	
Spiny dogfish	2,486	2,071	2,071	2,472	2,059	2,059	ACL = ABC (P* = 0.4)
Splitnose S. of 40⁰10’	1,831	1,750	1,750	1,810	1,731	1,731	ACL = ABC (P* = 0.45)
Starry flounder	652	452	452	652	452	452	Est. MSY from E.J.'s DBSRA analysis
Widow Rockfish	12,375	11,831	11,831	11,714	11,199	11,199	ACL = ABC (P* = 0.45)
Yellowtail N. of 40⁰10’	**6,568**	**5,997**	**5,997**	**6,261**	**5,716**	**5,716**	**ACL = ABC (P* = 0.45)**
STOCK COMPLEXES							
Nearshore Rockfish North	203	183	183	200	180	180	Sum of component species specifications
Black and yellow	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Blue/Deacon (CA)	***31.0***	***28.1***	***28.1***	***32.4***	***29.3***	***29.3***	***ACL = ABC (P* = 0.45)***
Blue/Deacon (OR)	***112.3***	***101.5***	***101.5***	***108.8***	***98.4***	***98.4***	***ACL = ABC (P* = 0.45)***
Blue/Deacon (WA)	*8.7*	*7.3*	*7.3*	*8.4*	*7.0*	*7.0*	*ACL = ABC (P* = 0.45)*
Brown	*2.1*	*1.9*	*1.9*	*2.1*	*1.9*	*1.9*	*ACL = ABC (P* = 0.45)*
Calico	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
China	*28.6*	*26.1*	*26.1*	*27.9*	*25.5*	*25.5*	*ACL = ABC (P* = 0.45)*
Copper	*11.9*	*10.9*	*10.9*	*12.2*	*11.2*	*11.2*	*ACL = ABC (P* = 0.45)*
Gopher	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Grass	*0.7*	*0.5*	*0.5*	*0.7*	*0.5*	*0.5*	*ACL = ABC (P* = 0.45)*
Kelp	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Olive	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*ACL = ABC (P* = 0.45)*
Quillback	*7.4*	*6.2*	*6.2*	*7.4*	*6.2*	*6.2*	*ACL = ABC (P* = 0.45)*
Treefish	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*ACL = ABC (P* = 0.45)*
Shelf Rockfish North	2,309	2,054	2,054	2,302	2,048	2,048	Sum of component species specifications
Bronzespotted	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Bocaccio	*284.0*	*236.9*	*236.9*	*284.0*	*236.9*	*236.9*	*ACL = ABC (P* = 0.45)*
Chameleon	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Chilipepper	*199.6*	*190.9*	*190.9*	*189.8*	*181.4*	*181.4*	*ACL = ABC (P* = 0.45)*
Cowcod	*0.4*	*0.3*	*0.3*	*0.4*	*0.3*	*0.3*	*ACL = ABC (P* = 0.45)*
Flag	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*ACL = ABC (P* = 0.45)*
Freckled	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Greenblotched	*1.3*	*1.1*	*1.1*	*1.3*	*1.1*	*1.1*	*ACL = ABC (P* = 0.45)*
Greenspotted 40°10’ to 42° N. lat.	*9.3*	*8.5*	*8.2*	*9.3*	*8.5*	*8.2*	*ACL: 40-10 rule applied to 22.2% of northern model (CA N of 34°27’ N latitude) ABC (P* = 0.45)*
Greenspotted N. of 42 N. lat. (OR & WA)	*6.1*	*5.1*	*5.1*	*6.1*	*5.1*	*5.1*	*ACL = ABC (P* = 0.45)*
Greenstriped	*1,311.4*	*1,197.3*	*1,197.3*	*1,314.8*	*1,200.4*	*1,200.4*	*ACL = ABC (P* = 0.45)*
Halfbanded	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Harlequin	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Honeycomb	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Mexican	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*

Stock or Stock Complex	2019			2020			Harvest Control Rule
	OFL	ABC	ACL	OFL	ABC	ACL	
Pink	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Pinkrose	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Puget Sound	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Pygmy	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Redstripe	*269.9*	*225.1*	*225.1*	*269.9*	*225.1*	*225.1*	*ACL = ABC (P* = 0.45)*
Rosethorn	*12.9*	*10.8*	*10.8*	*12.9*	*10.8*	*10.8*	*ACL = ABC (P* = 0.45)*
Rosy	*3.0*	*2.5*	*2.5*	*3.0*	*2.5*	*2.5*	*ACL = ABC (P* = 0.45)*
Silvergray	*159.4*	*133.0*	*133.0*	*159.4*	*133.0*	*133.0*	*ACL = ABC (P* = 0.45)*
Speckled	*0.2*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*ACL = ABC (P* = 0.45)*
Squarespot	*0.2*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*ACL = ABC (P* = 0.45)*
Starry	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Stripetail	*40.4*	*33.7*	*33.7*	*40.4*	*33.7*	*33.7*	*ACL = ABC (P* = 0.45)*
Swordspine	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Tiger	*1.0*	*0.8*	*0.8*	*1.0*	*0.8*	*0.8*	*ACL = ABC (P* = 0.45)*
Vermilion	*9.7*	*8.1*	*8.1*	*9.7*	*8.1*	*8.1*	*ACL = ABC (P* = 0.45)*
Slope Rockfish North	1,887	1,746	1,746	1,873	1,732	1,732	Sum of component species specifications
Aurora (assuming sigma = 0.39)	*17.5*	*16.7*	*16.7*	*17.5*	*16.7*	*16.7*	*ACL = ABC (P* = 0.45)*
Bank	*17.2*	*14.4*	*14.4*	*17.2*	*14.4*	*14.4*	*ACL = ABC (P* = 0.45)*
Blackgill	*4.7*	*3.9*	*3.9*	*4.7*	*3.9*	*3.9*	*ACL = ABC (P* = 0.45)*
Redbanded	*45.3*	*37.7*	*37.7*	*45.3*	*37.7*	*37.7*	*ACL = ABC (P* = 0.45)*
Rougheye/Blackspotted	*217.6*	*198.6*	*198.6*	*219.5*	*200.4*	*200.4*	*ACL = ABC (P* = 0.45)*
Sharpchin	*352.8*	*322.1*	*322.1*	*348.0*	*317.7*	*317.7*	*ACL = ABC (P* = 0.45)*
Shortraker	*18.7*	*15.6*	*15.6*	*18.7*	*15.6*	*15.6*	*ACL = ABC (P* = 0.45)*
Splitnose	*1,021.0*	*976.1*	*976.1*	*1,009.6*	*965.1*	*965.1*	*ACL = ABC (P* = 0.45)*
Yellowmouth	*192.4*	*160.5*	*160.5*	*192.4*	*160.5*	*160.5*	*ACL = ABC (P* = 0.45)*
Nearshore Rockfish South	1,300	1,145	1,142	1,322	1,165	1,163	Sum of component species specifications
Shallow Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Black and yellow	*27.5*	*23.0*	*23.0*	*27.5*	*23.0*	*23.0*	*ACL = ABC (P* = 0.45)*
China	*14.3*	*13.1*	*10.8*	*14.8*	*13.5*	*11.5*	*ACL = ABC (P* = 0.45)*
Gopher (N of Pt. Conception)	*101.0*	*84.2*	*84.2*	*101.0*	*84.2*	*84.2*	*ACL = ABC (P* = 0.45)*
Gopher (S of Pt. Conception)	*25.6*	*21.4*	*21.4*	*25.6*	*21.4*	*21.4*	*ACL = ABC (P* = 0.45)*
Grass	*59.6*	*49.7*	*49.7*	*59.6*	*49.7*	*49.7*	*ACL = ABC (P* = 0.45)*
Kelp	*27.7*	*23.1*	*23.1*	*27.7*	*23.1*	*23.1*	*ACL = ABC (P* = 0.45)*
Deeper Nearshore Species	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Blue/Deacon (N. of 34°27' N lat.)	***278.8***	***252.6***	***252.6***	***291.5***	***264.1***	***264.1***	***ACL = ABC (P* = 0.45)***
Blue/Deacon (S. of 34°27' N lat.)	*21.8*	*18.2*	*18.2*	*21.8*	*18.2*	*18.2*	*ACL = ABC (P* = 0.45)*
Brown	*177.9*	*162.4*	*162.4*	*181.9*	*166.1*	*166.1*	*ACL = ABC (P* = 0.45)*
Calico	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*

Stock or Stock Complex	2019			2020			Harvest Control Rule
	OFL	ABC	ACL	OFL	ABC	ACL	
Copper	*322.1*	*294.1*	*294.1*	*327.3*	*298.8*	*298.8*	*ACL = ABC (P* = 0.45)*
Olive	*224.6*	*187.4*	*187.4*	*224.6*	*187.4*	*187.4*	*ACL = ABC (P* = 0.45)*
Quillback	*5.4*	*4.5*	*4.5*	*5.4*	*4.5*	*4.5*	*ACL = ABC (P* = 0.45)*
Treefish	*13.2*	*11.0*	*11.0*	*13.2*	*11.0*	*11.0*	*ACL = ABC (P* = 0.45)*
Shelf Rockfish South	1,919	1,625	1,625	1,919	1,626	1,625	Sum of component species specifications
Bronzespotted	*3.6*	*3.0*	*3.0*	*3.6*	*3.0*	*3.0*	*ACL = ABC (P* = 0.45)*
Chameleon	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Flag	*23.4*	*19.5*	*19.5*	*23.4*	*19.5*	*19.5*	*ACL = ABC (P* = 0.45)*
Freckled	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Greenblotched	*23.1*	*19.3*	*19.3*	*23.1*	*19.3*	*19.3*	*ACL = ABC (P* = 0.45)*
Greenspotted	*78.3*	*71.5*	*70.9*	*78.1*	*71.3*	*70.7*	*ACL: 40-10 rule applied to77.8% of northern model (CA N of 34°27' N latitude) ABC plus the southern model ABC (P* = 0.45)*
Greenstriped	*240.6*	*219.6*	*219.6*	*241.2*	*220.2*	*220.2*	*ACL = ABC (P* = 0.45)*
Halfbanded	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Harlequin	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Honeycomb	*9.9*	*8.2*	*8.2*	*9.9*	*8.2*	*8.2*	*ACL = ABC (P* = 0.45)*
Mexican	*5.1*	*4.2*	*4.2*	*5.1*	*4.2*	*4.2*	*ACL = ABC (P* = 0.45)*
Pink	*2.5*	*2.1*	*2.1*	*2.5*	*2.1*	*2.1*	*ACL = ABC (P* = 0.45)*
Pinkrose	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Pygmy	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Redstripe	*0.5*	*0.4*	*0.4*	*0.5*	*0.4*	*0.4*	*ACL = ABC (P* = 0.45)*
Rosethorn	*2.1*	*1.8*	*1.8*	*2.1*	*1.8*	*1.8*	*ACL = ABC (P* = 0.45)*
Rosy	*44.5*	*37.1*	*37.1*	*44.5*	*37.1*	*37.1*	*ACL = ABC (P* = 0.45)*
Silvergray	*0.5*	*0.4*	*0.4*	*0.5*	*0.4*	*0.4*	*ACL = ABC (P* = 0.45)*
Speckled	*39.4*	*32.8*	*32.8*	*39.4*	*32.8*	*32.8*	*ACL = ABC (P* = 0.45)*
Squarespot	*11.1*	*9.2*	*9.2*	*11.1*	*9.2*	*9.2*	*ACL = ABC (P* = 0.45)*
Starry	*62.6*	*52.2*	*52.2*	*62.6*	*52.2*	*52.2*	*ACL = ABC (P* = 0.45)*
Stripetail	*23.6*	*19.7*	*19.7*	*23.6*	*19.7*	*19.7*	*ACL = ABC (P* = 0.45)*
Swordspine	*14.2*	*11.9*	*11.9*	*14.2*	*11.9*	*11.9*	*ACL = ABC (P* = 0.45)*
Tiger	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*ACL = ABC (P* = 0.45)*
Vermilion	*269.3*	*224.6*	*224.6*	*269.3*	*224.6*	*224.6*	*ACL = ABC (P* = 0.45)*
Yellowtail	*1,064.4*	*887.7*	*887.7*	*1,064.4*	*887.7*	*887.7*	*ACL = ABC (P* = 0.45)*
Slope Rockfish South	856	744	744	855	743	743	Sum of component species specifications
Aurora	*74.6*	*71.0*	*71.0*	*74.6*	*71.0*	*71.0*	*ACL = ABC (P* = 0.45)*
Bank	*503.2*	*419.7*	*419.7*	*503.2*	*419.7*	*419.7*	*ACL = ABC (P* = 0.45)*
Blackgill	***174.0***	***158.9***	***158.9***	***174.0***	***158.9***	***158.9***	***ACL = ABC (P* = 0.45)***
Pacific ocean perch	-	-	-	-	-	-	*ACL = ABC (P* = 0.45)*
Redbanded	*10.4*	*8.7*	*8.7*	*10.4*	*8.7*	*8.7*	*ACL = ABC (P* = 0.45)*
Rougheye/Blackspotted	*4.4*	*4.1*	*4.1*	*4.5*	*4.1*	*4.1*	*ACL = ABC (P* = 0.45)*

Stock or Stock Complex	2019			2020			Harvest Control Rule
	OFL	ABC	ACL	OFL	ABC	ACL	
Sharpchin	*88.2*	*80.5*	*80.5*	*87.0*	*79.4*	*79.4*	*ACL = ABC (P* = 0.45)*
Shortraker	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*ACL = ABC (P* = 0.45)*
Yellowmouth	*0.8*	*0.7*	*0.7*	*0.8*	*0.7*	*0.7*	*ACL = ABC (P* = 0.45)*
Other Flatfish	8,750	6,498	6,498	8,202	6,041	6,041	Sum of component species specifications
Butter sole	*4.6*	*3.2*	*3.2*	*4.6*	*3.2*	*3.2*	*ACL = ABC (P* = 0.4)*
Curlfin sole	*8.2*	*5.7*	*5.7*	*8.2*	*5.7*	*5.7*	*ACL = ABC (P* = 0.4)*
Flathead sole	*35.0*	*24.3*	*24.3*	*35.0*	*24.3*	*24.3*	*ACL = ABC (P* = 0.4)*
Pacific sanddab	*4,801.0*	*3,331.9*	*3,331.9*	*4,801.0*	*3,331.9*	*3,331.9*	*ACL = ABC (P* = 0.4)*
Rex sole	*3,061*	*2,550*	*2,550*	*2,513*	*2,093*	*2,093*	*ACL = ABC (P* = 0.4)*
Rock sole	*66.7*	*46.3*	*46.3*	*66.7*	*46.3*	*46.3*	*ACL = ABC (P* = 0.4)*
Sand sole	*773.2*	*536.6*	*536.6*	*773.2*	*536.6*	*536.6*	*ACL = ABC (P* = 0.4)*
Other Fish	480	420	420	465	406	406	Sum of component species specifications
Cabezon (WA)	*5.5*	*4.6*	*4.6*	*5.4*	*4.5*	*4.5*	*ACL = ABC (P* = 0.45)*
Kelp greenling (CA)	*118.9*	*99.2*	*99.2*	*118.9*	*99.2*	*99.2*	*ACL = ABC (P* = 0.45)*
Kelp greenling (OR)	*180.9*	*171.1*	*171.1*	*166.5*	*157.5*	*157.5*	*ACL = ABC (P* = 0.45)*
Kelp greenling (WA)	*7.1*	*5.9*	*5.9*	*7.1*	*5.9*	*5.9*	*ACL = ABC (P* = 0.45)*
Leopard shark	*167.1*	*139.4*	*139.4*	*167.1*	*139.4*	*139.4*	*ACL = ABC (P* = 0.45)*

2.1.2 The Preferred Alternative

Default harvest specifications would be implemented for all stocks except for the four stocks discussed below in Sections 2.1.3 through 2.1.5. These alternative harvest specifications would be implemented:

1. Yelloweye rockfish: [Preferred alternative including rebuilding plan revisions as appropriate].
2. California Scorpionfish S. 34°27’ N. lat.: The ACL is set equal to the ABC using a P* value of 0.45. (The default HCR sets the ACL at a constant value rather than a rate-based value.)
3. Lingcod N. of 40°10’ N lat. and Lingcod S. of 40°10’ N lat.: The current HCRs apply except that the P* value is increased from 0.4 to 0.45 for the portion of the stock assessed in waters off California reflecting greater confidence in the current stock assessment. The current HCRs set the ACL equal to the ABC for both stocks but the 40-10 precautionary reduction is applied to the portion of the northern stock off California (i.e., between 42° and 40°10’ N lat.) and the whole of the southern stock.

The alternative harvest specifications for these four stocks relative to the No Action harvest specifications under default harvest control rules are shown in Table 2-2. The Council has yet to select a preferred alternative for yelloweye rockfish.

Table 2-2. Alternative 2019 and 2020 harvest specifications (in mt) for select groundfish stocks decided for detailed analysis.

Stock	Alternative	2019			2020			Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
CA Scorpionfish S. of 34°27' N lat.	No Action	337	313	150	331	307	150	150 mt constant catch ACL
	Alt. 1 (Preferred)	337	313	313	331	307	307	ACL = ABC (P* = 0.45)
Lingcod N. of 40°10' N lat.	No Action	5,110	4,872	4,859	4,770	4,549	4,533	ACL = ABC (P* = 0.45 in OR & WA; P* = 0.4 in CA) w/ 40-10 adj. for the CA contribution to the ABC and ACL Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod S. of 40°10' N lat.		1,143	1,043	996	983	898	839	ACL = ABC (P* = 0.4) w/ 40-10 adj. Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod N. of 40°10' N lat.	Alt. 1 (Preferred)	5,110	4,885	4,871	4,768	4,558	4,541	ACL = ABC (P* = 0.45) w/ 40-10 adj. for the CA contribution to the ABC and ACL Assumes 40% and 75% ACL attainment for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod S. of 40°10' N lat.		1,143	1,093	1,039	977	934	869	ACL = ABC (P* = 0.45) w/ 40-10 adj. Assumes 40% and 75% ACL attainment for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Yelloweye Rockfish	$T_{F=0}$	81	74	0	85	77	0	ABC (P* = 0.4), ACL (SPR = 100.0%); median time to rebuild = 2026
	No Action	81	74	29	84	77	30	ABC (P* = 0.4), ACL (SPR = 76.0%); median time to rebuild = 2027
	Alt. 1	81	74	39	84	77	40	ABC (P* = 0.4), ACL (SPR = 70.0%); median time to rebuild = 2028
	Alt 2	81	74	48	84	77	49	ABC (P* = 0.4), ACL (SPR = 65.0%); median time to rebuild = 2029

2.1.3 Alternative Harvest Specifications for Yelloweye Rockfish

Yelloweye rockfish was declared overfished in 2002 and has been managed under a stock rebuilding plan since that time. The Council considered three alternatives to the default HCR for yelloweye rockfish based on the most recent stock assessment and rebuilding analysis. For all alternative HCRs the P* value (a Council determined metric of risk tolerance used in calculating the reduction from the OFL to the ABC) remains 0.4 as under the default. Three alternative HCRs were considered (Table 2-2):

1. Change the spawning potential ratio (SPR) scaled exploitation rate to 70% from the current rate of 76%. This increases 2019-20 ACLs by 10 mt compared to ACLs under the default HCR.
2. Change the SPR harvest rate to 65%. This increases the 2019 ACL by 18 mt and the 2020 ACL by 19 mt compared to ACLs under the default HCR.

The Council considered whether adoption of a new HCR for the yelloweye stock or information in the latest stock assessment would trigger revision of elements of the stock rebuilding plan. The 2017 yelloweye stock assessment (Gertseva and Cope 2017b) reports that the maximum permissible rebuilding time (T_{MAX}) for yelloweye is earlier than the target rebuilding year (T_{TARGET}) adopted in the rebuilding plan by Amendment 16-5. In March 2018 NMFS provided guidance on the requirements for rebuilding plans, including guidance on when the Council is required to update or revise rebuilding plans, relative to the previously adopted target year and the recomputed T_{MAX} (Agenda Item H.7.a, Supplemental NMFS Report 2). This guidance is reproduced below.

> The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) only requires revisions to a rebuilding plan when NMFS determines that the rebuilding plan has not resulted in adequate progress towards rebuilding the stock. The National Standard One (NS1) Guidelines further explain this:
>
> > "While a stock or stock complex is rebuilding, revising rebuilding timeframes (*i.e.*, T_{target} and T_{max}) or $F_{rebuild}$ *is not necessary*, unless the Secretary finds adequate progress is not being made." 50 CFR § 600.310(j)(3)(v) (emphasis added).
>
> The rationale behind this provision of the NS1 guidelines was the 2013 NRC report that recommended focusing on maintaining F below $F_{rebuild}$ to avoid issues with updating timelines based on biomass milestones that are subject to uncertainty and changing environmental conditions.
>
> NMFS has not made a finding of inadequate progress in rebuilding yelloweye rockfish. In fact, the recent stock assessment information suggests that the stock is rebuilding more quickly than expected. As a result, there are no requirements under the Magnuson-Stevens Act or in the National Standard 1 guidelines that compel the Council to change the rebuilding timeframes or $F_{rebuild}$ for yelloweye rockfish as a result of the 2017 stock assessment.
>
> Furthermore, the Pacific Coast Groundfish Fishery Management Plan (FMP) allows—but does not require—the Council to update these parameters. Section 4.6.3.4 of the FMP, Updating Key Rebuilding Parameters, states that "…if a subsequent analysis identifies an earlier target year for the current fishing mortality rate (based on the harvest control rule), there is no obligation to change in regulations either the target year (to the computed earlier year) or the harvest control rule (to delay rebuilding to the original target year)." The section goes on to explain that "[f]or example, the Council *might* recommend that the target year be changed if, based on new information about the status and/or biology of the stock, they determine that the existing target year is later than the recomputed maximum rebuilding time (T_{max})." (emphasis added). Similar language is found in Appendix F, which states that "subsequent SAFE documents or NEPA

> documents analyzing new harvest specifications and rebuilding plans may include updated values for the parameters listed in Section 4.6.3.3 and Table F-1 in this appendix."
>
> Both the Magnuson-Stevens Act and the National Standard 1 Guidelines envision that rebuilding plans would not be changed and would remain in place unless either: 1) NMFS determines that a stock is not making adequate rebuilding progress; or 2) the Council makes a decision to adopt a new rebuilding plan. Absent an affirmative choice by the Council to revisit the existing rebuilding plan, no changes are required.

Based on this guidance, it is unnecessary to revise the yelloweye rebuilding plan if there is no change from the default HCR, the No Action alternative. Choosing either Alternative 1 or 2 would require revising the rebuilding plan, because the harvest control role is an essential element of the plan along with the target rebuilding year. The aforementioned NMFS Report provides guidance on the contents of a new rebuilding plan, noting that "the record must show why the new rebuilding plan selects a target time for rebuilding (T_{TARGET}) that is 'as short as possible' while giving consideration to 'the status and biology of the overfished species and the needs of the fishing communities.'" The shortest time to rebuild, T_{MIN}, would occur if there was no fishing mortality ($T_{F=0}$).

According to the yelloweye rebuilding analysis (Gertseva and Cope 2017a) the minimum time to rebuild ($T_{F=0}$ beginning in 2019) is 2026. The median year to rebuild (i.e., the year for which there is a 50% probability that the stock is rebuilt) under the Alternative 1 HCR is 2028 and under the Alternative 2 HCR is 2029. To revise the rebuilding plan the Council would need to demonstrate that the No Action ACL does not adequately meet "the needs of fishing communities" and that the increased yield under either Alternative 1 or Alternative 2 justifies the likelihood that achieving the biomass target would be delayed further than the median rebuilding year of 2027 under No Action. (The analysis in section 4.2.1.3 discusses uncertainties associated with these estimates and thus the risk that the rebuilding objective would not be met.)

2.1.4 Alternative Harvest Specifications for California Scorpionfish S. 34°27' N. Latitude

The default HCR sets the ACL at a constant value of 150 mt rather than a rate-based value. The Council chose an alternative HCR under which the ACL is set equal to the ABC using a P* value of 0.45 as its preliminary preferred alternative. The resulting 2019-20 ACLs would increase to 313 mt and 307 mt respectively (Table 2-2).

2.1.5 Alternative Harvest Specifications for Lingcod N. of 40°10' N Latitude and Lingcod S. of 40°10' N Latitude

The current HCRs apply except that the P* value is increased from 0.4 to 0.45 reflecting greater confidence in the current stock assessment. The current HCRs set the ACL equal to the ABC for both stocks but apply the 40-10 precautionary reduction to the portion of the northern stock off California (i.e., between 42° and 40°10' N lat.) and the whole of the southern stock. For the northern stock in 2019 the ACL would increase from 4,859 mt under to No Action to 4,885 mt under Alternative 1 (the alternative HCR, Table 2-2). For 2020 it would increase from 4,533 mt to 4,541 mt. For the southern stock the 2019 ACL would increase from 996 mt to 1,039 mt and the 2020 ACL would increase from 839 mt to 869 mt.

2.2 Management Measure Alternatives

PCGFMP section 6.2 describes management measure rulemaking stemming from the biennial harvest specifications process. "During the biennial specifications process the Council may propose: (1) management measures to be classified as routine the first time these measures are used; or (2) adjustments to measures previously classified as routine…; 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."

2.2.1 Integrated Alternatives

Integrated alternatives incorporate harvest specifications and management measures into discrete packages in order to facilitate evaluation of environmental impacts. Routine management measures include the allocation of harvest opportunity between commercial and recreational groundfish fisheries, among commercial fishery sectors, and, for the purpose of managing recreational fisheries, among the three West Coast states. Many of these allocations are specified in the PCGFMP, others are specified as part of the biennial management process. Before these allocations are made, amounts may be deducted from ACLs to account for tribal fishery catch, research catch, and catch under exempted fishing permits (EFPs). Routine management measures are mainly used to regulate catch in reference to the harvest specifications for each stock or stock complex. Four integrated alternatives are evaluated in this EA:

Default Harvest Specifications (No Action): Default harvest specifications Table 2-1) are implemented for all stocks and stock complexes. Routine management measures are adjusted accordingly.

Council-Preferred Alternative: Default harvest specifications would be implemented for all stocks except for the four stocks discussed in Sections 2.1.3 through 2.1.5. These alternative harvest specifications would be implemented:

1. Yelloweye rockfish: TBD.
2. California Scorpionfish S. 34°27' N. lat.: The ACL is set equal to the ABC using a P* value of 0.45. (The default HCR sets the ACL at a constant value rather than a rate-based value.)
3. Lingcod N. of 40°10' N lat. and Lingcod S. of 40°10' N lat.: The current HCRs apply except that the P* value is increased from 0.4 to 0.45 for the portion of the stock assessed in waters off California reflecting greater confidence in the current stock assessment. The current HCRs set the ACL equal to the ABC for both stocks but the 40-10 precautionary reduction is applied to the portion of the northern stock off California (i.e., between 42° and 40°10' N lat.) and the whole of the southern stock.

Action Alternative 1: Default harvest specifications would be implemented for all stocks except for the four stocks discussed in Sections 2.1.3 through 2.1.5. These alternative harvest specifications (see Table 2-2) would be implemented:

1. Yelloweye rockfish harvest specifications based on a SPR harvest rate of 70%.
2. California Scorpionfish S. 34°27' N. lat.: The ACL is set equal to the ABC using a P* value of 0.45.
3. Lingcod N. of 40°10' N lat. and Lingcod S. of 40°10' N lat.: The current HCRs apply except that the P* value is increased from 0.4 to 0.45 for the portion of the stock assessed in waters off California reflecting greater confidence in the current stock assessment. The current HCRs set the ACL equal to the ABC for both stocks but the 40-10 precautionary reduction is applied to the portion of the northern stock off California (i.e., between 42° and 40°10' N lat.) and the whole of the southern stock.

Action Alternative 2: Default harvest specifications would be implemented for all stocks except for the four stocks discussed in Sections 2.1.3 through 2.1.5. These alternative harvest specifications (see Table 2-2) would be implemented:

1. Yelloweye rockfish harvest specifications based on a SPR harvest rate of 65%.

2. California Scorpionfish S. 34°27' N. lat. (same as Alternative 1): The ACL is set equal to the ABC using a P* value of 0.45. (The default HCR sets the ACL at a constant value rather than a rate-based value.)
3. Lingcod N. of 40°10' N lat. and Lingcod S. of 40°10' N lat. (same as Alternative 1): The current HCRs apply except that the P* value is increased from 0.4 to 0.45 for the portion of the stock assessed in waters off California reflecting greater confidence in the current stock assessment. The current HCRs set the ACL equal to the ABC for both stocks but the 40-10 precautionary reduction is applied to the portion of the northern stock off California (i.e., between 42° and 40°10' N lat.) and the whole of the southern stock.

Under No Action, Alternative 1, and Alternative 2 routine management measures are adjusted according to harvest specifications. Under Alternative 1 and Alternative 2 new management measures are available for implementation.

The integrated alternatives are described in detail in Appendix A.

2.2.2 New Management Measures Analyzed in this EA

As noted above, all new management measures under consideration are incorporated into each of the action alternatives to facilitate analysis. After considering a long list of new management measures to implement as part of the rulemaking for this biennial process the Council decided to move forward with consideration of the measures described below. (A supplemental analysis of this action is provided in Appendix C.)

2.2.2.1 Salmon Incidental Take Statement: Mitigation Measures and Reserve Rule Analysis (Appendix C, section C.1)

The Council must address three reasonable and prudent measures specified in the Biological Opinion Incidental Take Statement (NMFS 2017, pages 182-193) for the take of ESA-listed salmon in fisheries managed under the PCGFMP that must be implemented through the 2019-20 biennial process:

- Term and Condition 2a requires the Council to review the existing mechanisms in the FMP and related regulations for avoiding and reducing salmon bycatch, including the effectiveness of the Ocean Salmon Conservation Zone and Bycatch Reduction Areas (BRAs). Based on this review the Council will make recommendations for increasing the effectiveness of these measures. (A supplemental analysis of this action is provided in Appendix C.)
- Term and Condition 3a requires NMFS and the Council to develop and implement initial regulations governing the Reserve of 3,500 Chinook. These regulations will be designed to, among other things, allow for inseason action to prevent any sector guideline plus the full amount of the Reserve from being exceeded and to minimize the chance that the Reserve is used in three out of any consecutive five years.
- Term and Condition 3c requires NMFS and the Council to develop and implement regulations governing closure of the fishery sector(s) when either the whiting or non-whiting fishery sector exceeds its Chinook bycatch guideline plus the Reserve.

The Council will adopt measures to address these terms and conditions at its April 2018 meeting. Detailed analysis of potential measures may be found in Appendix C, section C.1.

2.2.2.2 Stock Complex Composition Restructuring (Appendix C, section C.3.1)

Stock complex changes are treated as a management measure and, like new management measures, are analyzed as a component of the integrated alternatives. Changes in the composition of stock complexes do not affect the underlying harvest specifications, because the stock complex ACL is simply the sum of the constituent stocks' specifications. Changes to the Nearshore Rockfish Complex north of 40°10' N. lat. and the Other Fish Complex are considered as part of the proposed action. Appendix C includes a detailed evaluation of these proposed changes.

Stock Complex Proposal 1: Nearshore Rockfish Complex North of 40°10' N. lat.

Oregon blue/deacon rockfish (BDR) would either continue to be managed within the Nearshore Rockfish Complex North of 40°10' N. lat. (status quo) or be removed from the complex and paired with Oregon black rockfish to form a new Oregon Black/BDR Complex (Option 1). Note that blue and deacon rockfish are separate species, but are referred to collectively since they were assessed together and therefore have a joint harvest specification. Table 2-3 shows status quo harvest specifications and those resulting from the proposed reorganization.

Table 2-3. Harvest specifications under Stock Complex Proposal 1.

Option	Stock or Complex	2019			2020		
		OFL	ABC	ACL	OFL	ABC	ACL
Status Quo	Black RF (OR)	565	516	516	561	512	512
	Nearshore RF North Complex	203	183	183	200	180	180
	BDR (OR)[a/]	*112.3*	*101.5*	*101.5*	*108.8*	*98.4*	*98.4*
Option 1	New Black RF/BDR Complex (OR)	677	617	617	670	611	611
	Nearshore RF North Complex	91	81	81	92	82	82

[a/] Showing the BDR specifications that contribute to the Nearshore Rockfish North Complex specifications.

Stock Complex Proposal 2: Other Fish Complex

Three options (other than status quo) are considered for changing the Other Fish complex:

- Option 1 is the ODFW proposal to remove Oregon kelp greenling from the Other Fish Complex and pair it with Oregon cabezon to form a new Oregon Kelp Greenling/Cabezon Complex.
- Option 2 is the WDFW proposal to remove Washington kelp greenling and Washington cabezon from the Other Fish Complex and pair them to form a new Washington Kelp Greenling/Cabezon Complex.
- Option 3 is a combination of Option 1 and Option 2 where both Oregon and Washington kelp greenling and Washington cabezon are removed from the Other Fish Complex to form two new stock complexes: an Oregon Kelp Greenling/Cabezon Complex and a Washington Kelp Greenling/Cabezon Complex.

Table 2-4 shows the resulting harvest specifications resulting from each of the options.

Table 2-4. Harvest specifications under Stock Complex Proposal 2.

Option	Stock or Complex	2019			2020		
		OFL	ABC	ACL	OFL	ABC	ACL
Status Quo	Cabezon (OR)	49	47	47	49	47	47
	Other Fish	480	420	420	465	406	406
	Cabezon (WA)[a/]	*5.5*	*4.6*	*4.6*	*5.4*	*4.5*	*4.5*
	Kelp Greenling (CA)[a/]	*118.9*	*99.2*	*99.2*	*118.9*	*99.2*	*99.2*
	Kelp Greenling (OR [a/]	*180.9*	*171.1*	*171.1*	*166.5*	*157.5*	*157.5*
	Kelp Greenling (WA)[a/]	*7.1*	*5.9*	*5.9*	*7.1*	*5.9*	*5.9*
	Leopard Shark[a/]	*167.1*	*139.4*	*139.4*	*167.1*	*139.4*	*139.4*
Option 1	Other Fish	299	249	249	299	249	249
	Cabezon/K. Greenling (OR)	230	218	218	216	204	204
Option 2	Other Fish	467	410	410	453	3963	3963
	Cabezon/K. Greenling (WA)	13	11	11	13	10	10
Option 3	Other Fish	286	239	239	286	239	239
	Cabezon/K. Greenling (OR)	230	218	218	216	204	204
	Cabezon/K. Greenling (WA)	13	11	11	13	10	10

[a/] Showing specifications for the stocks contributing to the Other Fish complex specification.

2.2.2.3 Remove Automatic Authority Established in Conjunction with Amendment 21-3 for Darkblotched Rockfish and POP in the At-Sea Sector (Appendix C, section C.3.2)

This proposal would remove automatic action authority to close either or both sectors in the at-sea whiting fishery when either of the sector-specific (mothership, catcher-processor) darkblotched or POP set asides and the reserve for unforeseen catch events (aka "buffer") are attained or projected to be attained. The reserve amount is also eliminated so that the fishery is managed to set asides only. By removing the automatic action authority, action is only taken when there is a risk of a harvest specification being exceeded, an unforeseen impact to another fishery may occur, or if other conservation concerns are identified. In these cases inseason action may be taken.

2.2.2.4 Lingcod and Sablefish Discard Mortality Rates in the Shorebased IFQ Program (Appendix C, section C.3.3)

This management measure would, reduce the current 100% IFQ discard mortality rates (DMRs) used in quota pound (QP) catch accounting for lingcod and sablefish in the shoreside IFQ sector to lower DMRs based on the best available estimates of bycatch mortality for trawl and fixed gear types used in this sector. These "survival credits" result in a shift from total catch accounting to total estimated catch mortality accounting for these species as far as debiting vessel QP accounts.

2.2.2.5 Adjustments to the Non-Trawl Rockfish Conservation Area in California (Appendix C, section C.3.4)

This management measure would modify the seaward boundary of the non-trawl Rockfish Conservation Area (RCA) from the California/Oregon border (42° N. latitude) to about Cape Mendocino (40°10' N. latitude). The non-trawl RCAs are currently 30 fm to 100 fm; this action would modify the seaward boundary from 100 fm to 75 fm and would only apply to non-trawl commercial fisheries.

2.2.2.6 Modify Commercial Fixed Gear Depths and Recreational Fisheries inside the Western Cowcod Conservation Area (Appendix C, sections C.3.5 and C.3.6)

This management measure would modify the allowable fishing depths for the commercial fixed gear fishery and the recreational fishery inside the western Cowcod Conservation Area (CCA) from 20 fm to 30 fm or 40 fm and add new waypoints approximating 30 and 40 fm depth contours around Santa Barbara Island, San Nicolas Island, Tanner Bank, and Cortes Bank. Fisheries are allowed shallower than the depth limit. This action encompasses two sets of options: the depth increase (30 or 40 fm) and the fishery to which the depth change would apply (commercial fixed gear and/or recreational fisheries).

2.2.2.7 New Management Measures under Consideration by the Council but Not Further Analyzed in this EA

The following new management measures under consideration by the Council have been determined to have no environmental effects, or negligible effects, and are therefore not analyzed further in this EA. For each of these measures the rationale for determining no effects or negligible effects is provided below.

Pass Through of Quota Pounds Dedicated to the Adaptive Management Program Quota Share

Under the Amendment 20 trawl rationalization program, the shoreside IFQ program includes a set-aside of 10 percent of the non-whiting quota share (including halibut individual bycatch quota) for an adaptive management program. Each year, quota pounds are issued for the adaptive management program quota share. If the Council were to implement an adaptive management program, the associated quota pounds could be distributed to address adverse effects stemming from the catch share (IFQ) program including impacts to community stability, processor stability, conservation, or other as yet unidentified effects. These quota pounds could also be distributed in a way to help people not already in the fishery to participate. However, so far the Council hasn't set up an adaptive management program. Therefore, these quota pounds have been distributed ("passed through") to quota shareholders on a pro rata basis in proportion to their holdings.

The Council is recommending amending Federal regulations to clarify that the adaptive management pass through continues until an alternative use of adaptive management program quota pounds is implemented. This is an administrative measure that would not affect fishing opportunity and related catch and therefore would have no discernable environmental impacts.

Remove the IFQ Daily Quota Pound Limit

Unused QP vessel limits, also called ‘‘daily vessel limits,’’ apply to overfished species and cap the amount of overfished species QPs any vessel account can have sitting available in their account on a given day, which is lower than the annual QP vessel limit. The Council and NMFS established daily vessel limits to prevent hoarding of available overfished species QPs in any one vessel account, since the IFQ sector allocations of some overfished species are very low. Now that bocaccio, darkblotched rockfish, and POP are rebuilt, the Council recommends removeing the daily vessel limit, which was designed to apply to overfished species, through the 2019-2020 biennial specifications package.

Removing the daily limits would have no discernable biological impacts, because the total allocation remains unaffected. Therefore, the effects of this proposed change are not further analyzed in this EA.

Chapter 3 Affected Environment

3.1 Environmental Components Affected by the Proposed Action

CEQ regulations at 40 CFR 1502.15 state that the EA "shall succinctly describe" the environmental components potentially affected by the proposed action. The level of detail "shall be commensurate with the importance of the impact." Describing the affected environment establishes the baseline conditions to which the proposed action (including the alternative of No Action) may be compared. As discussed in Chapter 1, this EA tiers from the 2015 EIS incorporating by reference the description of the affected environment and only presenting information about subsequent changes in baseline conditions. Furthermore, the 2018 Groundfish Stock Assessment and Fishery Evaluation (SAFE) (PFMC 2018) details the status of groundfish stocks, the fisheries and fishing communities, essential fish habitat (EFH), and factors affecting safety of life at sea. Information from the SAFE is incorporated by reference and summarized here as necessary. The 2015 EIS described these environmental components:

- Groundfish
- The socioeconomic environment including fishing communities
- Essential fish habitat
- The California Current ecosystem
- Protected species
- Non-groundfish species (other than protected species) caught in groundfish fisheries

The 2018 California Current Integrated Ecosystem Assessment Team, California Current Integrated Ecosystem Assessment (CCIEA) State of the California Current Report (Agenda Item F.1.a, NMFS Report 1, March 2018) characterizes the current status of the CCE. The 2015 EIS evaluated the effect of groundfish fishery removals under different harvest polices on trophic composition and interactions (see section 4.5 in the 2015 EIS). Ongoing management of the fishery under biennial harvest specifications would not have discernable impacts different from those disclosed in that analysis given that the underlying harvest policies are within the range previously analyzed.

The species composition of non-groundfish species caught in groundfish fisheries is described in section 3.6 in the 2015 EIS. There have been no changes in harvest policies or fishery performance since that time that would be expected to result in a big change in the composition in incidentally caught nongroundfish.

Based on this information, scoping concluded that the proposed action will not engender substantially different effects on these two environmental components than what was disclosed in the 2015 EIS. Therefore, those environmental components are not further considered in this EA.

3.2 Groundfish Stocks

Section 3.2.2 describes the status and biology of the stocks – California scorpionfish south of 34°27' N. latitude, two lingcod stocks, and yelloweye rockfish – where the Council is considering changing the default HCR. Section 3.2.2 describes a change in the baseline condition of certain stocks whose future status under alternative harvest policies was evaluated in the 2015 EIS.

3.2.1 Stocks with Proposed Changes to the Default Harvest Control Rule

Section 1.1 in the 2018 Groundfish SAFE Document (PFMC 2018) describes the status and biology of stocks managed under the PCGFMP. Descriptions for stocks where the Council is considering changing the default HCR are incorporated by reference and summarized in the following sections.

3.2.1.1 California Scorpionfish S. 34°27' N. Latitude

California scorpionfish (*Scorpaena guttata*), also known locally as sculpin, is a generally benthic species found from central California to the Gulf of California in depths between the inter-tidal and about 170 m (Eschmeyer et al. 1983; Love et al. 1987). California scorpionfish generally inhabits rocky reefs, but in certain areas and seasons they aggregate over sandy or muddy substrate (Frey 1971; Love et al. 1987).

California scorpionfish were assessed in 2005 and 2017 (a catch only assessment update was conducted in 2015). The 2017 assessment (Monk et al. 2018) defined the stock as bounded at Pt. Conception in the north to the U.S./Mexico border in the south although a substantial but unknown portion of the stock occurs in Mexican waters.

Figure 3-1 shows the historic trend in spawning depletion. Spawning biomass declined between 2000 and 2015 but shows subsequent signs of increase. Estimated 2017 depletion (the ratio of current spawning stock biomass to unfished spawning stock biomass) is 54.3%, which is above the B_{MSY} proxy target of 40%.

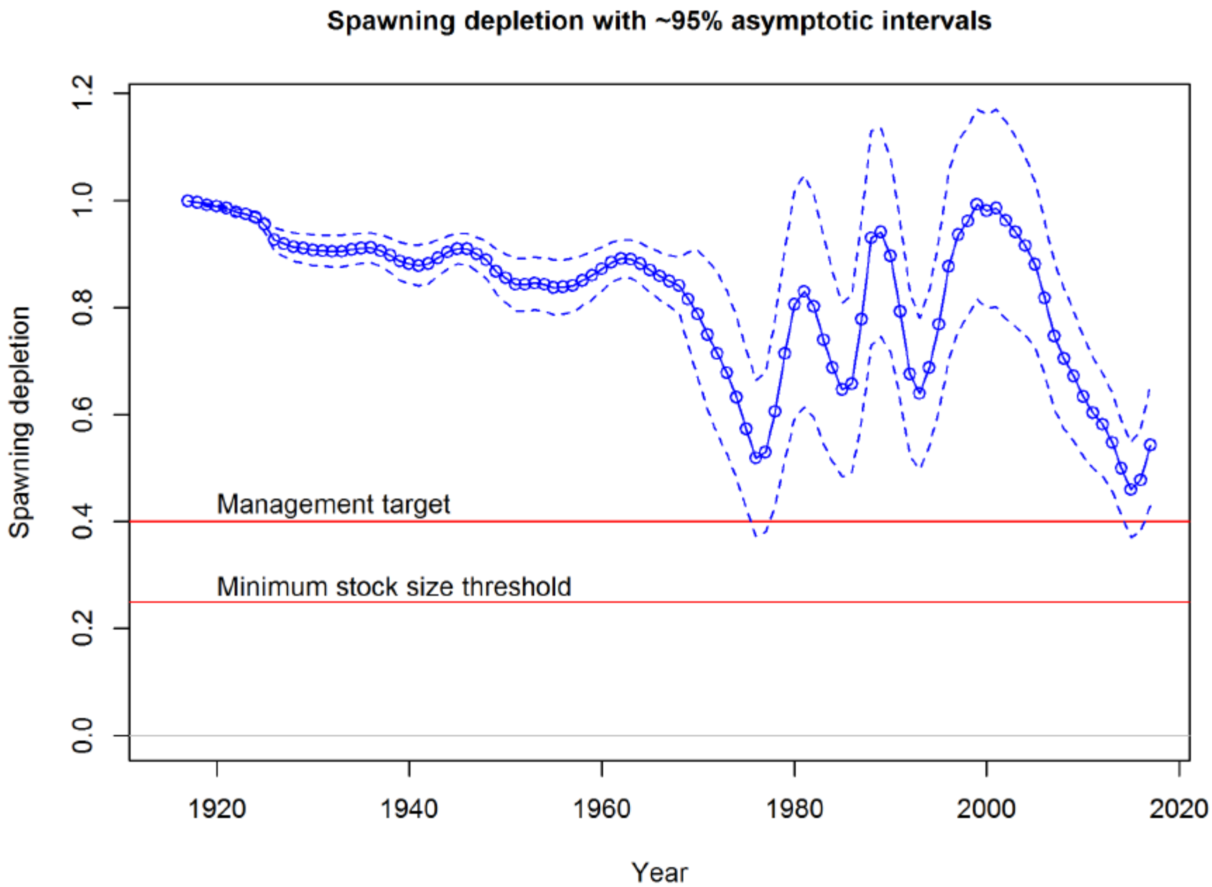

Figure 3-1. Estimated spawning depletion with approximate 95% asymptotic intervals. (Source: Monk et al. 2018, Figure 98)

Since 2000, annual total landings of California scorpionfish have ranged between 57 and 199 mt. California scorpionfish is not a major component of the commercial or recreational fisheries in southern California. Commercial fisheries usually retain California scorpionfish when caught and the bycatch mortality rate in recreational fisheries is fairly low. According to the 2017 stock assessment, harvest rates over the last decade have been well below the overfishing level. Based on the results of the productivity-susceptibility assessment conducted by the GMT, the stock is considered relatively productive and at low risk of overfishing.

3.2.1.2 Lingcod North of 40º10'N lat. and South of 40º10'N lat.

Lingcod (*Ophiodon elongatus*) is a top level predator living on the slopes of submerged banks 10 m to 70 m below the surface with seaweed, kelp, and eelgrass beds; they also favor channels with swift currents that flow around rocky reefs.

Lingcod range from Baja California, Mexico, to Kodiak Island in the Gulf of Alaska. The first two stock assessments, in 1997 and 1999 covered portions of the West Coast stock; based on these assessments, the lingcod stock was declared overfished in 1999. The rebuilding plan set a target year of 2009. Except for the first one, subsequent coastwide assessments (2000, 2003, 2005) modeled the population as two stocks north and south of the Columbia-Eureka INPFC area demarcation at 43° N. lat. until 2009 when they were assessed north and south of 42° N lat. at the California-Oregon border. The 2003 assessment indicated the northern stock was rebuilt but the southern stock was still below the target biomass. Based on the 2005 assessment, which indicated the stock was healthy in both assessment areas, the stock was declared rebuilt, ahead of the rebuilding plan target year of 2009. A catch-only update of the 2009 lingcod assessment was provided in 2015 (Agenda Item I.4, Attachment 6, November 2015) to inform harvest specifications in 2017 and beyond.

Separate ACLs are set for stocks north and south of 40°10' N. lat. Other management areas have been considered but determined too burdensome for the commercial groundfish fishery, because vessels must fish within one management area on any one trip[3].

3.2.1.3 Yelloweye Rockfish

The first yelloweye rockfish stock assessment on the U.S. West Coast, conducted in 2001, concluded that yelloweye rockfish was overfished. The yelloweye rockfish stock was subsequently fully assessed in 2002, 2006, 2009, and 2017 (update assessments were conducted in 2007 and 2011). The most recent full assessment estimated depletion at 28.4% at the start of 2017 (Gertseva and Cope 2017b). Figure 3-2 shows the historical trends in stock depletion based on the 2017 stock assessment.

Yelloweye rockfish prefer boulder areas in deep water (>180 m), steep cliffs, and offshore pinnacles while juveniles prefer shallow-zone broken-rock habitat. This habitat preference affects their vulnerability to different types of fishing gear. Yelloweye are particularly vulnerable to hook-and-line gears but less so to small-footrope trawl gear, which cannot be fished in rocky or high relief areas of the seafloor. Management measures intended to reduce incidental catch of yelloweye include the non-trawl RCA and recreational depth closures. Since yelloweye rockfish are mostly encountered north of 36° N. lat., fisheries in Southern California are less likely to encounter them.

Based on fishing mortality rates estimates in the 2011 assessment, the stock was subject to overfishing from 1976 through 1999. Since then the stock has been managed under a rebuilding plan. As shown in Figure 3-2 the stock has been recovering since rebuilding plan implementation and is no longer overfished in the sense that biomass is above minimum stock size threshold (MSST)[4]; rebuilding plan management will continue until the stock reaches the target biomass.

[3] Lingcod were managed north and south of 42° N lat. in 2011 and 2012 to comport with the 2009 assessment areas. The management line was changed back to 40°10' N lat. in 2013 to avoid these commercial fishery impacts.

[4] Stocks managed under rebuilding plans are classified as "overfished" when depletion is below the MSST and "rebuilding" when depletion is above the MSST.

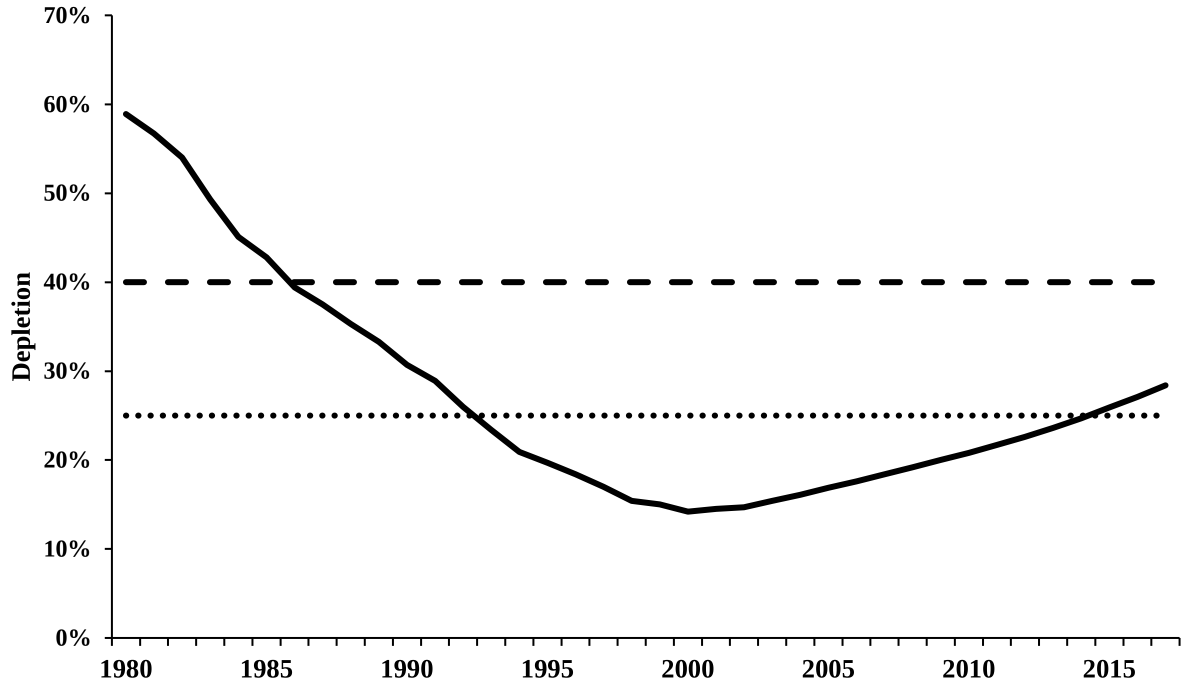

Figure 3-2. Relative depletion of yelloweye rockfish from 1980 to 2017 based on the 2017 stock assessment. (The dotted line represents the minimum stock size threshold and the dashed line represents the B_{MSY} proxy, the target biomass.)

3.2.2 Stocks where the Default ACL is Outside the Range Analyzed in the 2015 EIS

In the 2015 EIS (section 4.8) the biological impacts of alternative harvest specification policies were evaluated over a 10-year period based on projections from then current stock assessments. The purpose of these projections was to evaluate the long-term implications of pursuing a particular harvest policy. Projections were run under three alternative "states of nature," which capture the principal source of uncertainty in the relevant stock assessment. Generally, these alternative estimates of a key parameter in the stock assessment produce a range of outcomes based on their representation of stock productivity. The high state of nature scenario represents the belief that the stock is relatively more productive (and thus able to produce higher yields) while the low state of nature represents a less productive or more pessimistic view of productivity (with lower yields). The third state of nature is the base case representing the most likely estimate of the parameter being varied across the projection scenarios. As noted in Chapter 1, new information about these stocks represent a change in baseline conditions, which are described below.

Table 3-1 shows the four stocks where the 2019-20 ACLs are outside the range analyzed in the 2015 EIS. For all stocks the maximum catch was produced under the high state of nature and catches at the ABC level when $p^* = 0.45$. The minimum catch was produced under the low state of nature when catches are at a constant level based either on average recorded catch in the recent past or the ACL applicable in 2014. Canary rockfish was the exception; for that stock catch was based on a constant harvest rate of SPR = 88.7%.

Table 3-1. Stocks where the proposed 2019-20 ACLs are outside the range analyzed in the 2015 EIS.

Stock	Maximum value of 2019-2020 ACLs (mt)	Range of annual catches (mt) in the 2015-2024 projection period	
		Minimum	Maximum
Bocaccio	2,248	150	1,700
Canary rockfish	1,450	0	1,361
Pacific ocean perch	4,340	59	1,828
Widow rockfish	11,831	247	4,900

*Sum of ACLs for two stocks.

According to the best scientific information available none of these stocks are experiencing overfishing or below the overfished level, nor are any of these stocks managed under a rebuilding plan.

The default harvest control rule used to determine 2019-20 harvest specifications for all these stocks is setting the ACL equal to the ABC based on P* = 0.45. The 2019-20 ACLs are based on the best scientific information available and are not projected to result in overfishing or an appreciable long-term risk of the stocks becoming overfished. These ACLs fall outside the range analyzed in the 2015 EIS because subsequent assessments changed the status and therefore the projections for the stock.

3.2.2.1 Bocaccio South of 40°10’ N lat.

An update of the 2015 full bocaccio assessment was conducted in 2017 (He and Field 2018) indicating the stock was rebuilt with an estimated depletion of 48.6% at the start of 2017. The improved status of bocaccio is due to the low exploitation rates observed since 2000 that were specified to foster rebuilding and several strong year classes (1999, 2010, and 2013) recruiting to the spawning population.

The 2017 bocaccio update assessment modeled productivity as was done in the full 2015 assessment by fixing steepness and estimating natural mortality. The stock-recruitment relationship for bocaccio is highly uncertain given the very large recruitment variability exhibited by the stock. Assumed steepness is the axis of greatest uncertainty in the assessment and alternative assumptions on steepness form the basis for the decision table (Table 3-2). The stock is projected to remain healthy in the next ten years under the default harvest control rule (ACL = ABC (σ= 0.36, P* = 0.45)) assuming the most plausible steepness under the base case assessment model, as well as under the high state of nature (Table 3-2 and Figure 3-3). The stock remains healthy in the next four years under the more pessimistic low state of nature model before declining below the B_{MSY} threshold in 2023. The stock is predicted to be at a 34.6% depletion by 2028 under the low state of nature model (Table 3-2 and Figure 3-3).

Table 3-2. 10-year projections of bocaccio for alternate states of nature based on steepness (reproduced from He and Field (2018)).

			State of nature					
			Low state of nature (*h* = 0.545)		Base (*h*=0.718)		High state of nature (*h* = 0.845)	
Management decision	Year	Catch (mt)	Spawning output	Depletion	Spawning output	Depletion	Spawning output	Depletion
Average catch (2012-2016)	2017	790	3.27	40.1%	3.60	48.6%	3.82	53.6%
	2018	741	3.54	43.3%	3.93	53.1%	4.19	58.8%
	2019	142	3.65	44.7%	4.10	55.3%	4.38	61.4%

			State of nature					
			Low state of nature (*h* = 0.545)		Base (*h*=0.718)		High state of nature (*h* = 0.845)	
Management decision	**Year**	**Catch (mt)**	**Spawning output**	**Depletion**	**Spawning output**	**Depletion**	**Spawning output**	**Depletion**
	2020	142	3.83	46.9%	4.31	58.1%	4.60	64.5%
	2021	142	4.04	49.5%	4.53	61.1%	4.82	67.5%
	2022	142	4.26	52.2%	4.75	64.1%	5.03	70.5%
	2023	142	4.49	55.0%	4.97	67.1%	5.23	73.3%
	2024	142	4.71	57.8%	5.18	69.9%	5.41	75.9%
	2025	142	4.94	60.5%	5.37	72.5%	5.59	78.3%
	2026	142	5.15	63.2%	5.56	75.0%	5.74	80.5%
	2027	142	5.36	65.7%	5.73	77.3%	5.88	82.5%
	2028	142	5.56	68.2%	5.88	79.4%	6.01	84.2%
Base model rebuilding SPR (0.777) catches	2017	790	3.27	40.1%	3.60	48.6%	3.82	53.6%
	2018	741	3.54	43.3%	3.93	53.1%	4.19	58.8%
	2019	764	3.65	44.7%	4.10	55.3%	4.38	61.4%
	2020	781	3.74	45.8%	4.22	56.9%	4.50	63.2%
	2021	803	3.84	47.1%	4.33	58.5%	4.62	64.8%
	2022	824	3.95	48.4%	4.44	60.0%	4.72	66.2%
	2023	843	4.06	49.7%	4.54	61.3%	4.80	67.3%
	2024	860	4.16	51.0%	4.63	62.5%	4.87	68.3%
	2025	875	4.26	52.2%	4.71	63.5%	4.93	69.1%
	2026	888	4.36	53.4%	4.78	64.5%	4.97	69.7%
	2027	899	4.45	54.5%	4.84	65.3%	5.02	70.3%
	2028	910	4.53	55.5%	4.90	66.1%	5.05	70.7%
Base model ACL catch (SPR=0.5 with P*=0.45 and sigma=0.36)	2017	790	3.27	40.1%	3.60	48.6%	3.82	53.6%
	2018	741	3.54	43.3%	3.93	53.1%	4.19	58.8%
	2019	2,097	3.65	44.7%	4.10	55.3%	4.38	61.4%
	2020	2,011	3.54	43.5%	4.02	54.3%	4.31	60.4%
	2021	1,978	3.45	42.3%	3.93	53.1%	4.22	59.2%
	2022	1,957	3.35	41.1%	3.84	51.8%	4.11	57.7%
	2023	1,939	3.25	39.9%	3.73	50.4%	4.00	56.1%
	2024	1,923	3.16	38.7%	3.63	49.0%	3.88	54.4%
	2025	1,909	3.07	37.6%	3.53	47.7%	3.76	52.8%
	2026	1,897	2.98	36.5%	3.44	46.4%	3.66	51.3%
	2027	1,887	2.90	35.5%	3.36	45.3%	3.56	50.0%
	2028	1,878	2.82	34.6%	3.28	44.2%	3.47	48.7%

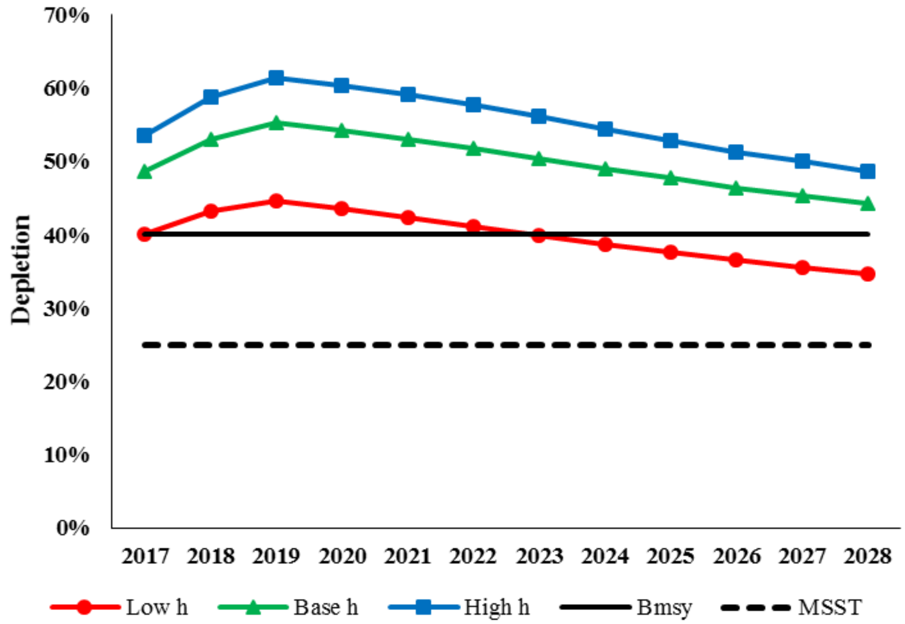

Figure 3-3. Predicted depletion trajectories of bocaccio assuming alternative catch streams applied to three states of nature where plausible values of steepness are assumed.

3.2.2.2 Canary Rockfish

A full assessment of canary rockfish was conducted in 2015 (Thorson and Wetzel 2015), which indicated the stock was rebuilt with a depletion of 56% at the start of 2015. A number of revisions were made to the data used for stock assessment, including: 1) a new method of index standardization for NWFSC trawl survey using a geo-statistical delta-GLMM model, 2) a new steepness value (0.773) based on an updated meta-analysis of steepness, 3) a re-estimated relationship for maturity, 4) new ageing error tables, and 5) a re-estimated length-weight relationship. The primary factors driving the improvement in stock status were the use of a higher steepness value, the reduction in harvest due to management restrictions specified in the rebuilding plan, and above average recruitments in 2001-2003, and in 2007 and 2010.

The sensitivity of the canary rockfish assessment model to assumed steepness is indicated in the decision table where plausible steepness values were assumed across a range of relatively low steepness (h = 0.6) to relatively high steepness (h = 0.946) (Table 3-3). The stock is predicted to remain healthy through 2026 assuming full ACL/ABC attainment (σ = 0.36, P* = 0.45) under the most probable base case model and the high state of nature, but is predicted to drop below the B_{MSY} target in 2019 declining to a 32.1% depletion by 2026 under the low state of nature (Table 3-3 and Figure 3-4). Removals modeled in the 2015 canary rockfish assessment ranged from a low of 216 mt (in 2018 under an ACL based on a 88.7% SPR harvest rate) to 1,714 mt (in 2017 under an ACL = ABC (σ = 0.36, P* = 0.45) harvest control rule) (Table 3-3).

Table 3-3. 10-year projections of canary rockfish for alternate states of nature based on steepness (reproduced from Thorson and Wetzel (2015)).

				State of nature					
				Low h = 0.60		Base case h = 0.773		High h = 0.946	
Relative probability of ln(SB_2015)				0.25		0.5		0.25	
Management decision	**Year**	**OFL**	**Catch (mt)**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**	**Spawning biomass (mt)**	**Depletion**
ACL = ABC (σ= 0.36, P* = 0.45)	2017	1793	1714	3259	42.8%	4261	56.9%	5019	67.7%
	2018	1596	1526	3135	41.2%	4152	55.4%	4901	66.1%
	2019	1480	1415	3017	39.6%	4041	53.9%	4784	64.6%
	2020	1408	1346	2895	38.0%	3918	52.3%	4653	62.8%
	2021	1357	1297	2771	36.4%	3788	50.6%	4510	60.9%
	2022	1318	1260	2656	34.9%	3661	48.9%	4367	58.9%
	2023	1288	1231	2565	33.7%	3553	47.4%	4242	57.2%
	2024	1266	1210	2501	32.8%	3471	46.3%	4143	55.9%
	2025	1249	1194	2462	32.3%	3414	45.6%	4071	54.9%
	2026	1234	1180	2445	32.1%	3379	45.1%	4021	54.3%
SPR = 88.7%	2017		217	3259	42.8%	4261	56.9%	5019	67.7%
	2018		216	3292	43.2%	4309	57.5%	5065	68.3%
	2019		218	3324	43.6%	4352	58.1%	5102	68.9%
	2020		223	3344	43.9%	4377	58.4%	5118	69.1%
	2021		229	3352	44.0%	4384	58.5%	5112	69.0%
	2022		236	3361	44.1%	4386	58.5%	5096	68.8%
	2023		242	3385	44.5%	4400	58.7%	5091	68.7%
	2024		248	3434	45.1%	4437	59.2%	5105	68.9%
	2025		253	3508	46.1%	4497	60.0%	5141	69.4%
	2026		258	3602	47.3%	4577	61.1%	5197	70.1%

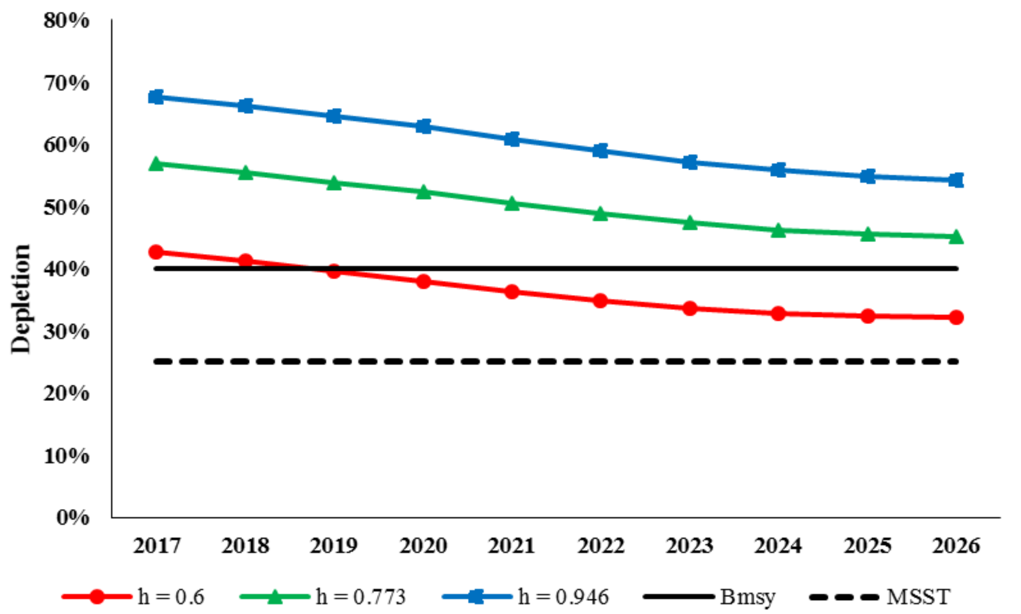

Figure 3-4. Predicted depletion trajectories of canary rockfish assuming full ABC/ACL attainment under the default harvest control rule (ACL = ABC (σ = 0.36; P* = 0.45)) applied to three states of nature where plausible values of steepness are assumed.

3.2.2.3 Pacific Ocean Perch North of 40°10' N lat.

A new Pacific ocean perch (POP) assessment indicated the West Coast stock was rebuilt with an estimated depletion of 76.6% at the start of 2017 (Wetzel et al. 2017). The significant upturn in POP stock status was driven by exceptionally low exploitation since 2000 and strong recent recruitment. The 2008 year class recruited at an unprecedented large size and there is evidence of a strong 2013 year class as well. The last POP assessment was conducted in 2011 and that assessment indicated stock biomass was at a depletion of 19.1% at the start of 2011 (Hamel and Ono 2011).

The main productivity parameters in the 2017 POP assessment were fixed with the natural mortality rate (M = 0.054) based on a maximum age of 100 years and steepness (h = 0.5) based on an arithmetic mean of derived spawning outputs from a range of steepness values from 0.25 to 0.95 in 0.05 increments (assuming each steepness value was equally plausible). The resulting mean value of spawning output corresponded to a steepness of 0.5. Typically, when fixing steepness, the mean of the prior value from a meta-analysis of category-1 rockfish species (h = 0.72) is used. However, in this case, fixing steepness at the mean of the prior distribution led to an unrealistically low survey catchability. In contrast, the 2011 POP assessment was able to estimate steepness (h = 0.4). However, the ability to estimate steepness has disappeared given the newest input data. The SSC categorized the 2017 POP assessment as a category 2 assessment based on the extreme sensitivity of the model outputs to changes in model specifications.

The main axis of uncertainty in the 2017 POP assessment was the natural mortality rate. Predicted depletions under the default harvest control rule (ACL = ABC (σ = 0.72; P* = 0.45)) indicate the stock will remain in a healthy state in the next 10 years across a plausible range of natural mortality rates (M = 0.04725 to 0.0595; Table 3-4, Figure 3-5). Annual catches modeled in the 2017 POP decision table ranged from 1,872 mt to 4,340 mt (Table 3-4).

Table 3-4. 10-year projections for alternate states of nature based on natural mortality of Pacific ocean perch (reproduced from Wetzel et al. (2017)).

Catch Basis	Year	Catch	States of Nature					
			M = 0.04725		M = 0.054		M = 0.0595	
			Spawning Output	Depletion	Spawning Output	Depletion	Spawning Output	Depletion
ABC	2019	4,340	3,944	62.9%	5,741	83.3%	7,505	96.8%
	2020	4,229	3,909	62.4%	5,745	83.4%	7,542	97.3%
	2021	4,108	3,858	61.6%	5,723	83.1%	7,546	97.3%
	2022	3,984	3,784	60.4%	5,666	82.2%	7,503	96.8%
	2023	3,862	3,695	59.0%	5,586	81.1%	7,427	95.8%
	2024	3,748	3,600	57.4%	5,494	79.7%	7,332	94.6%
	2025	3,644	3,502	55.9%	5,395	78.3%	7,226	93.2%
	2026	3,551	3,404	54.3%	5,292	76.8%	7,113	91.8%
	2027	3,467	3,308	52.8%	5,188	75.3%	6,996	90.3%
	2028	3,389	3,213	51.3%	5,084	73.8%	6,879	88.7%
SPR50%	2019	1,822	3,944	62.9%	5,741	83.3%	7,505	96.8%
	2020	1,822	4,022	64.2%	5,857	85.0%	7,654	98.7%
	2021	1,822	4,083	65.1%	5,946	86.3%	7,768	100.2%
	2022	1,822	4,117	65.7%	5,996	87.0%	7,830	101.0%
	2023	1,822	4,131	65.9%	6,016	87.3%	7,852	101.3%
	2024	1,822	4,133	65.9%	6,017	87.3%	7,848	101.2%
	2025	1,822	4,125	65.8%	6,004	87.1%	7,842	100.9%
	2026	1,822	4,110	65.6%	5,979	86.8%	7,786	100.4%
	2027	1,822	4,090	65.3%	5,947	86.3%	7,736	99.8%
	2028	1,822	4,067	64.9%	5,908	85.8%	7,679	99.1%

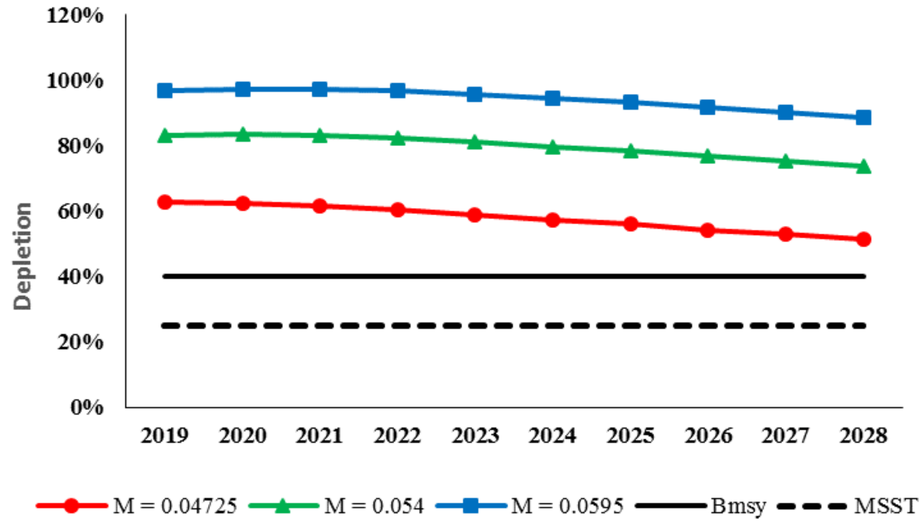

Figure 3-5. Predicted depletion trajectories of Pacific ocean perch assuming full ABC/ACL attainment under the default harvest control rule (ACL = ABC (σ = 0.72; P* = 0.45)) applied to three states of nature where plausible rates of natural mortality are assumed.

3.2.2.4 Widow Rockfish

A new full assessment of widow rockfish was conducted in 2015 (Hicks and Wetzel 2015), which indicated the stock was at 75.1% depletion at the start of 2015. A number of revisions were made to the data used for the 2015 stock assessment, including: 1) a new method of index standardization for the NWFSC trawl survey using a geo-statistical delta-GLMM model, 2) a new steepness value (0.798) based on an updated meta-analysis of steepness (the prior distribution on steepness in the meta-analysis was recalculated without the widow values), 3) a prior distribution developed for the natural mortality parameter from an analysis of a maximum age of 54 years, 4) updated methods of expanding fishery length and age composition, and survey conditional age at length, and 5) new ageing error tables. The SSC categorized the stock as a category 1 stock. The Council adopted a harvest control rule for widow rockfish where the ACL equals the ABC under a P* of 0.45.

The state of nature models in the decision table in the 2015 widow rockfish assessment were based on different scales of the 2013 spawning population (Table 3-5). Removal scenarios ranged from a low catch of 2,000 mt annually to as high as a 13,508 mt ACL under the default harvest control rule (ACL = ABC (σ = 0.36, P* = 0.45)). All three states of nature predicted the stock would remain healthy through 2026 under the high catch scenario with the low state of nature predicted to reach the 40% B_{MSY} target in 2026 (Table 3-5 and Figure 3-6).

Table 3-5. 10-year projections for alternate states of nature based on varying the scale of the 2013 spawning population of widow rockfish and under alternative harvest control rules (reproduced from Hicks and Wetzel (2015)).

				State of nature					
				Low		Base case		High	
Relative probability of ln(SB_2013)				0.25		0.5		0.25	
Management decision	Year	OFL	Catch (mt)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)
ACL = 2,000 mt	2017	14,130	2,000	53,178	64%	67,674	84%	79,081	98%
	2018	14,511	2,000	54,831	67%	69,856	87%	82,026	101%
	2019	14,746	2,000	56,417	68%	71,533	89%	83,858	103%
	2020	14,966	2,000	58,025	70%	72,892	90%	84,911	105%
	2021	15,132	2,000	59,510	72%	73,866	92%	85,270	105%
	2022	15,200	2,000	60,750	74%	74,413	92%	85,015	105%
	2023	15,179	2,000	61,745	75%	74,604	92%	84,317	104%
	2024	15,108	2,000	62,549	76%	74,556	92%	83,365	103%
	2025	15,017	2,000	63,222	77%	74,369	92%	82,306	101%
	2026	14,924	2,000	63,805	77%	74,110	92%	81,233	100%
ACL = ABC (σ = 0.36, P* = 0.45)	2017	14,130	13,508	53,178	64%	67,675	84%	79,081	98%
	2018	13,237	12,655	48,794	59%	63,900	79%	76,172	94%
	2019	12,375	11,830	45,047	55%	60,314	75%	72,826	90%
	2020	11,714	11,198	42,188	51%	57,284	71%	69,581	86%
	2021	11,181	10,689	39,951	48%	54,659	68%	66,465	82%
	2022	10,691	10,221	38,060	46%	52,260	65%	63,435	78%
	2023	10,235	9,784	36,431	44%	50,080	62%	60,578	75%
	2024	9,835	9,402	35,056	43%	48,173	60%	58,014	72%
	2025	9,502	9,083	33,908	41%	46,561	58%	55,803	69%
	2026	9,232	8,826	32,943	40%	45,225	56%	53,944	67%
ACL = ABC (σ = 0.36, P* = 0.25)	2017	14,130	11,078	53,178	64%	67,675	84%	79,081	98%
	2018	13,506	10,589	50,069	61%	65,158	81%	77,409	95%
	2019	12,855	10,078	47,348	57%	62,584	78%	75,058	93%
	2020	12,345	9,678	45,261	55%	60,313	75%	72,555	89%
	2021	11,918	9,344	43,598	53%	58,241	72%	69,970	86%
	2022	11,502	9,018	42,141	51%	56,241	70%	67,308	83%
	2023	11,096	8,699	40,839	50%	54,339	67%	64,692	80%
	2024	10,726	8,409	39,709	48%	52,615	65%	62,267	77%
	2025	10,409	8,160	38,752	47%	51,113	63%	60,117	74%
	2026	10,147	7,955	37,945	46%	49,838	62%	58,267	72%

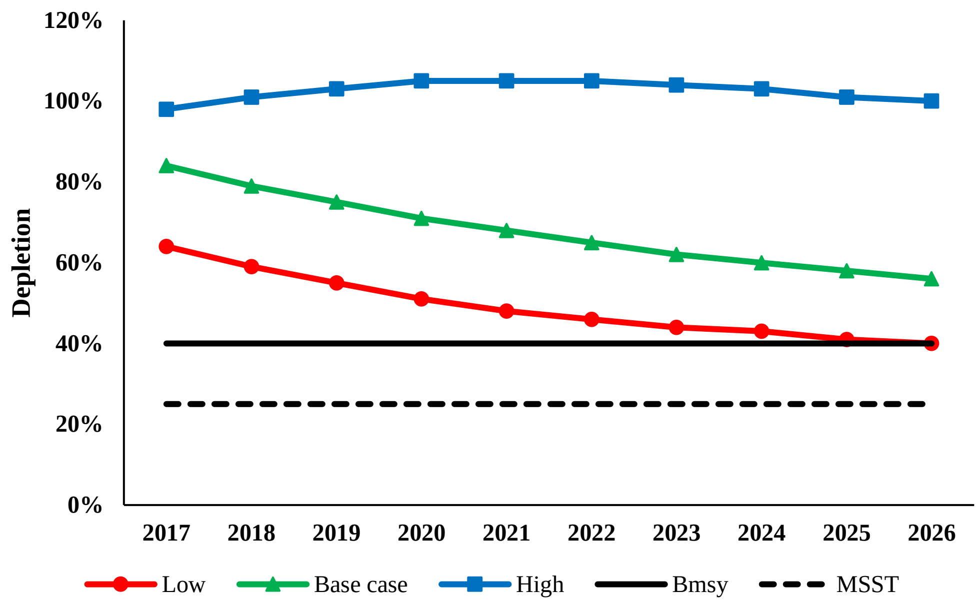

Figure 3-6. Predicted 10-year depletions for widow rockfish under three states of nature assuming full ACL attainment with the default harvest control rule (ACL = ABC (σ = 0.36, P* = 0.45)).

3.3 Essential Fish Habitat

The MSA (sec. 303(a)(7)) requires Councils to include in each FMP a description of essential fish habitat (EFH) for all managed species and measures to minimize to the extent practicable adverse effects on such habitat caused by fishing. Section 3.3 in the 2015 EIS describes baseline conditions for groundfish EFH. Groundfish EFH is described in the FMP as:

- Depths less than or equal to 3,500 m (1,914 fm) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.
- Seamounts in depths greater than 3,500 m as mapped in the EFH assessment geographic information system (GIS).
- Areas designated as Habitat Areas of Particular Concern (HAPC) not already identified by the above criteria. Groundfish HPACs cover estuaries, canopy kelp, seagrass, rocky reefs, and other areas of interest.

Chapter 7 in the PCGFMP describes groundfish EFH (Section 7.2) and HAPCs (Section 7.3).

The 2015 EIS describes impacts of fishing gear on groundfish EFH; effects vary by gear and benthic substrate type. Generally, bottom trawl gear has the largest effect on benthic habitat. Through Amendment 19 to the PCGFMP various measures to mitigate these adverse effects have been implemented. The principal measure has been to close sensitive areas to specified gear types. 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 PCGFMP 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).

The Council is expected to complete its review of its current groundfish EFH designation in 2018 including measures to mitigate adverse impacts to EFH. Final action is scheduled for the April 2018 Council meeting. This action will be considered further in Chapter 5, cumulative effects.

3.4 Protected Species

In accordance with section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) the responsible agency completes a biological opinion (BiOp) on the effects of the action on ESA-listed species. The following biological opinions address the take of ESA-listed species in the groundfish fishery:

- NMFS BiOp on Continuing Operation of the Pacific Coast Groundfish Fishery (NMFS 2012b). This BiOp indicated that the ongoing implementation of the groundfish fishery would not likely jeopardize non-salmonid marine species including eulachon, green sturgeon, humpback whales, Steller sea lions, and leatherback sea turtles. The BiOp also indicated that the Groundfish FMP fishery would not likely have an adverse effect on 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. The eastern distinct population segment (DPS) of Steller sea lions was delisted on November 4, 2013 (78 FR 66140); however, this delisting did not change the designation of the codified critical habitat for the eastern DPS of Steller sea lions. Section 3.5.2.2 in the 2015 EIS describes the Incidental Take Statement (ITS) from this BiOp. Pursuant to the terms and conditions in the incidental take statement attached to the BiOp the Council established the Endangered Species Act (ESA) Workgroup to evaluate the take of listed species (except for salmon) for each biennium and to make recommendations to the Council and NMFS on changes to groundfish management measures needed to address the take of listed species, as well as on reinitiation of ESA section 7 consultation. The ESA Workgroup met in February 2017 formulated recommendations based on its take evaluation. Workgroup recommendations are discussed below.
- United States Fish and Wildlife Service (USFWS) Biological Opinion Regarding the Effects of the Continued Operation of the Pacific Coast Groundfish Fishery as Governed by the Pacific Coast Groundfish Fishery Management Plan and Implementing Regulations at 50 CFR Part 660 by the National Marine Fisheries Service on California Least Tern (*Sterna antillaruin browni*), Southern Sea Otter (*Enhydra lutris nereis*), Bull trout (*Salvelinus cojifluentus*), Marbled Murrelet (*Brachyramphus marmoratus*), and Short-tailed Albatross (*Phoebastria albatrus*) (USFWS 2017). In its opinion, USFWS concurred with the determination NMFS made in its biological assessment that the proposed action is not likely to adversely affect the marbled murrelet, California least tern, southern sea otter, bull trout, nor bull trout critical habitat. USFWS also concluded that implementation of the activities as described in the NMFS biological assessment would not jeopardize the continued existence of short-tailed albatross. Pursuant to the terms and conditions the Council would propose and NMFS implement, within three years, regulations to employ streamer lines in the commercial longline fishery of the Pacific Coast Ground Fishery consistent with the Alaska streamer line regulations for Federal waters, including the use of single streamer lines on boats 26-55 feet in length, OR set longlines after civil sunset. Council action and associated rulemaking is not part of the proposed action but the regulations would become effective during the 2019-20 biennial period.
- In the NMFS biological opinion for impacts to ESA-listed salmon species under implementation of the Pacific Coast Groundfish Management Plan (NMFS 2017) NMFS concluded that the action as defined by the Council (Appendix 1 to the BiOp), if conducted consistent with the terms of the Incidental Take Statement, is not likely to jeopardize the continued existence of the listed species that are subject of the opinion. Critical habitat is not present within the action area. The Incidental Take Statement includes non-discretionary reasonable and prudent measures and related terms and conditions that must be applied to the proposed fisheries to provide an exemption from the

prohibited acts outlined in section 9 of the ESA. Some of these terms and conditions are addressed through the proposed action and supporting analyses in this EA.

- A section 7 consultation is currently underway for the southern Distinct Population Segment (DPS) of eulachon. The southern DPS of eulachon was listed as threatened under the ESA in 2010.

Marine mammal species that are not listed under the ESA occur in the action area. The taking of marine mammals (whether or not listed under the ESA) is subject to the requirements of the Marine Mammal Protection Act of 1972 as amended (MMPA). The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The MMPA was amended in 1994 to, among other things, establish a process for authorizing fisheries to incidentally take marine mammals. Under this Authorization Program all commercial fisheries must be categorized based on the relative frequency of incidental mortalities and serious injuries of marine mammals in the fishery:

- Category I designates fisheries with frequent mortalities and serious injuries incidental to commercial fishing;
- Category II designates fisheries with occasional mortalities and serious injuries;
- Category III designates fisheries with a remote likelihood or no known mortalities or serious injuries.

According to the 2018 List of Fisheries (83 FR 5349) the WA/OR/CA sablefish pot fishery is Category II because of takes of the CA/OR/WA humpback whale stock. All other Federally managed Pacific Coast groundfish fisheries are Category III. The List of Fisheries identifies the following marine mammal stocks taken in the groundfish trawl fishery: California sea lion, U.S. Dall's porpoise, CA/OR/WA harbor seal, OR/WA coast northern fur seal, Eastern Pacific white-sided dolphin, CA/OR/WA steller sea lion. The List of Fisheries identifies the following marine mammal stocks taken in the WA/OR/CA groundfish, bottomfish longline/set line fishery: CA/OR/WA offshore Bottlenose dolphin.

The Groundfish Endangered Species Workgroup (ESA Workgroup) met February 15-16, 2017 in Seattle, Washington. the Workgroup's objectives and duties are to recommend new analyses to improve bycatch estimates, consider whether Incidental Take Statement (ITS) amounts are appropriate, consider whether new information reveals effects not considered in the BiOps, and propose for Council consideration conservation and management measures to minimize bycatch of listed species, if needed, in the groundfish fishery. The ESA Workgroup made recommendations relative to the take of eulachon, short-tailed albatross (subsequently addressed through the USFWS BiOp), and humpback whale.

Based on the relevant BiOps and ESA Workgroup recommendations, this EA evaluates the impacts of the proposed action on eulachon, humpback whale, short-tailed albatross, and salmon. Information on status and biology is provided below.

3.4.1 Eulachon

The 2017 report on eulachon bycatch prepared by NMFS for review by the ESA Workgroup (Agenda Item F.5.a, NMFS Report 4, April 2017) summarizes life history and distribution. This information is incorporated by reference; in summary "Eulachon is an anadromous smelt (Family Osmeridae) that spawns in freshwater rivers, yet spends 95% of its life in the ocean over the continental shelf and most often at depths between 50 and 200 m. The southern Distinct Population Segment (DPS) of eulachon, which occurs in the northern California Current, is composed of numerous subpopulations that spawn from the Mad River in northern California to the Skeena River in British Columbia. The southern DPS of eulachon was listed as threatened under the ESA in 2010."

The following information comes from Agenda Item F.5.a, Groundfish Endangered Species Act Workgroup Report, April 2017.

Eulachon bycatch exceeded the ITS in 2011, 2013, and 2014. Bycatch in 2011 was 1,624 fish, with 1,268 fish caught in the catcher-processor sector, and the remaining take occurring in the bottom trawl, midwater trawl, shoreside whiting, and tribal and non-tribal mothership sectors. Bycatch in 2013 was 5,113 fish, with 4,139 fish caught in the shoreside whiting fishery, and the remaining fish caught in the bottom trawl, midwater trawl, non-tribal mothership, and catcher-processor sectors. Bycatch in 2014 was 3,075 fish, with 2,808 caught in the bottom trawl and non-whiting midwater groundfish fisheries, and 267 caught in the non-tribal mothership, and catcher-processor sectors. For 2015, bycatch of eulachon totaled 699 fish, with 643 of the total caught in the shoreside bottom and non-whiting midwater trawl fisheries.

The ITS level of 1,004 fish was based on bycatch estimates from 2002-2010, a time when eulachon abundance was severely depressed; abundance subsequently increased. This may be one reason the ITS level was exceeded in subsequent years. However, eulachon bycatch/take is small relative to the estimated population size. This may be partly due to current mesh size regulations allowing these fish to escape from trawl gear. However, the Council took final action on measures to relax these gear restrictions in 2016 and NMFS is likely to complete rulemaking in 2018. As part of the process of evaluating changes to gear requirements, NMFS has issued exempted fishing permits in 2017 and 2018 allowing multiple trawl vessels to fish with gear configuration currently prohibited by regulations. This may include the use of smaller mesh sizes in trawl nets. However, the intent is to only use smaller mesh size in certain parts of the net so it may have little effect on eulachon bycatch. Reporting on the 2017 EFP (Agenda Item H.8.a, Supplemental NMFS Report 1, March 2018) indicates that no eulachon were caught. These activities will be considered further in Chapter 5, Cumulative Effects.

With respect to eulachon the ESA Workgroup recommended the Council encourage NMFS to:

1. Complete the biological assessment as an initial step in developing a new BiOp.
2. Take into account the relative magnitude of fishery impacts on the eulachon resource when developing the [new] BiOp and associated ITS.
3. Consider a range in the ITS to account for considerable fluctuations in abundance while also recognizing recent increases.

In 2016 NMFS reinitiated ESA section 7 consultation for eulachon. NMFS intends to complete the BiOp in the first half of 2018. When completed the information from the BiOp will be incorporated into this section.

3.4.2 Humpback Whale

The2017 NMFS bycatch report provided to the ESA Workgroup (Agenda Item F.5.a, NMFS Report 2, April 2017) is incorporated by reference with a summary of the species status and biology. Internal citations have been omitted; for sources refer to the report.

Humpback whales were listed worldwide as endangered under the ESA in 1970, and classified as a strategic stock and considered depleted under the MMPA. Based on a 2009 ESA status review, NMFS revised the listing status of the species by identifying 14 DPSs (81 FR 62259). Four DPSs occur in the North Pacific, identified by breeding location: Hawaii, Central America, Mexico, and Western North Pacific. Humpback whales off the Oregon, Washington, and California coast are from the Central America, Mexico, and Hawaii DPSs. Only the Mexico DPS and Central America DPS are listed, as threatened and endangered, respectively.

Breeding locations in the North Pacific are more geographically separated than feeding areas and include regions offshore of Hawaii, Central America; the West Coast of Mexico, and the Ogasawara and Okinawa Islands and the Philippines. Feeding areas in the North Pacific range from California, USA to Hokkaido, Japan, with most feeding occurring in coastal waters. Humpback whales in the North Pacific rarely move between these breeding regions. Strong fidelity to both feeding and breeding sites has been observed but movements are complex. Recent humpback whale abundance estimates for the entire North Pacific basin have ranged from 18,302 to 21,808 individuals; the latter estimate may still be an underestimate of actual humpback whale abundance.

Humpback whales face a variety of threats, including entrapment and entanglement in fishing gear, collisions with ships, acoustic disturbance, habitat degradation, and competition for resources with humans. Humpback whales may break through, carry away, or become entangled in fishing gear. Whales carrying gear may later die, become debilitated or seriously injured, or have normal functions impaired. Most entanglements, and subsequent mortality, is probably not recorded. Preliminary studies suggest that entanglement may be responsible for 3-4% of total mortality, especially among juveniles. The Hawaii DPS experiences a high rate of interaction with fishing gear (20-71%), with the highest rates recorded in southeast Alaska and northern British Columbia. Vessel collisions and entanglement in fishing gear pose the greatest threat to the Central America DPS. For the Mexico DPS fishery interactions are the most likely source of serious injury and mortality, followed by ship strikes. Pot and trap fisheries in general are the most commonly documented source of serious injury and mortality of humpback whales in U.S. West Coast waters.

The 2012 BiOp ITS for humpback whales is a five year average of one humpback whale injury or mortality per year, and up to three humpback whale injuries or mortalities in any single year. The take of humpback whales did not exceeded the ITS during the 2011- 2015 time period under review by the ESA Workgroup. In fisheries managed under the PCGFMP, one humpback whale was observed taken in 2014 in the limited entry sablefish fishery on a vessel fishing with pot gear. Using observer data from the groundfish sector and a Bayesian approach to estimate bycatch, the bycatch rate calculated for the 2011-2015 period was 0.002 whales/year. The fleet-wide estimated 5-year annual average for 2011-2015 was 0.20 whales and the total estimated mean bycatch was 1.0 whale.

Based on its review of the bycatch/take estimate for the 2011-2015 period the ESA Workgroup did not make any management recommendations. However, it did express concern about the possibility that more entanglements occurred in 2016.

Although bycatch estimates are not available for 2016 and 2017, NMFS does report observed whale entanglements (NOAA Fisheries 2017). In 2016, 71 separate cases of entangled whales were reported off the coasts of Washington, Oregon, and California, as well as in neighboring countries with gear from U.S. fisheries. This is the highest annual total for the West Coast of the United States since NOAA Fisheries started keeping records in 1982. NMFS confirmed 48 of the 71 cases via the documentation submitted, follow-up sightings, and entanglement response information provided to NOAA Fisheries' West Coast Marine Mammal Stranding Network. The majority of these reports, 54, were of humpback whales. Of the 48 confirmed entanglement cases, 29 were identified as associated with specific fisheries or gear type. Two humpback whales were reported from the sablefish trap fishery, which is managed under the PCGFMP. Reported entanglements were concentrated in Central California from waters off San Francisco to Monterey Bay. Preliminary data suggest a decline in whale entanglements in 2017 but still higher than the years prior to 2015.

Information on whale entanglements is also discussed in the 2018 California Current Ecosystem Status Report (Agenda Item F.1.a, NMFS Report 1, March 2018). These whale entanglements are coincident with anomalous warming of the California Current ecosystem in 2014 to 2016. It is possible oceanographic conditions brought whales closer to shore in recent years where they fed on abundant shoals of anchovy. This brought them into an area where they would be more vulnerable to fixed gear. In addition, a major harmful algal bloom event delayed opening of the Dungeness crab pot fishery. This may have increased the deployment of pot gear during a time of the year when humpback whales are abundant in nearshore waters. In 2017-18 oceanographic conditions are trending to average conditions. Humpback whale takes were lower in 2017 than in 2016 (see Figure 4.6.2 in the 2018 Annual State of the California Current Ecosystem Report).

3.4.3 Short-Tailed Albatross

The 2017 NMFS bycatch report provided to the ESA Workgroup (Agenda Item F.5.a, NMFS Report 6, April 2017) is incorporated by reference with a summary of the species biology and life history given below. Section 3.2.5 in the 2016 EA also details the species' life history and status.

Short-tailed albatrosses are large, pelagic seabirds of the Order Procellariiformes with long narrow wings adapted for soaring just above the water surface. The largest of the three species of North Pacific albatrosses, they are continental shelf-edge specialists. Individuals breed at 5-6 years of age, laying a single egg, and chicks are fed by adults by surface feeding on squid, shrimp, fish, and fish eggs.

Short-tailed albatross were brought to the brink of extinction by the middle of the Twentieth Century. Since then the population has been steadily recovering but remains small. The total population estimate for breeding age short-tailed albatrosses as of the 2013-2014 nesting season is 1,928 individuals. Only two breeding populations are known, which nest on two volcanic islands off of Japan. As the population recovers it is reoccupying its range including waters off the U.S. West Coast where juveniles are more common than adults.

Because of its small population bycatch of short-tailed albatrosses in commercial fisheries continues to be a major conservation concern. Since 1983, 19 short-tailed albatross takes have been documented throughout the North Pacific. The only known short-tailed albatross take in a Pacific Coast Groundfish Fishery was reported in the limited entry sablefish longline fishery off the Oregon coast in 2011.

Based on a Council recommendation, Federal regulations currently require streamer lines be deployed during setting operations on commercial fixed gear vessels 55' (17 m) or greater in length.

The 2017 USFWS BiOp (USFWS 2017) incorporates a new method for estimating takes as reported in the NMFS Biological Assessment. Instead of using takes of more common black-footed albatross as a proxy for short-tailed albatross takes, a Bayesian statistical model, often used to estimate the frequency of rare events, was employed (see sections 6.3 and 6.4, pages 40-39, in the BiOp for a description of this method). Based on this method, the ITS estimates take of no more than one short-tailed albatrosses in two years or an average estimated take of no more than five birds per two-year period as a result of the operation of the groundfish fishery.

The ITS identifies five reasonable and prudent measures (RPMs) that are necessary and appropriate for NMFS to minimize take of short-tailed albatross, and lists associated terms and conditions necessary to implement the RPMs. These terms and conditions are non-discretionary. The Council may provide recommendations to NMFS on implementation of these terms and conditions. Specifically, as discussed above, the Council will make recommendations on regulations to extend the streamer line requirement to vessels that use the longline gear to boats 26-55 feet in length.

At its November 2017 meeting the Council decided not to develop a regulatory proposal as part of this proposed action but will take action so that regulations can be implemented by the 2020 deadline set out in the ITS. This separate action are considered in Chapter 5, cumulative effects.

The terms and conditions also direct NMFS to conduct research on the effect of floating gear on albatross bycatch and improved methods to minimize risk of bycatch. A recent research paper (Gladics et al. 2017) is relevant to this concern. The paper reports results on the sink rate for longline gear when floats are attached to the mainline, which is a common practice in the West Coast groundfish fixed gear fishery. Their results confirm that bird-scaring (streamer) line regulations from Alaska were sufficient to protect baits from bird attacks on longlines without floats, but not baits on longlines with floats.

3.4.4 Salmon

Bycatch (or take) of ESA-listed salmon – principally Chinook salmon – in the groundfish fishery – mainly by trawl vessels – has been subject to ESA section 7 consultations since 1990 (see Table 3-6, which lists salmon-related consultations for the PCGFMP).

Table 3-6. Salmon-related ESA section 7 consultation activities related to the Pacific Coast Groundfish FMP. (Excerpted from Table 1-1 in NMFS 2017.)

Date	ESU considered or circumstances
August 10, 1990	Sacramento River winter-run Chinook salmon, marine mammals, and turtles
November 26, 1991	Sacramento River winter-run Chinook salmon and Snake River sockeye salmon
August 28, 1992	Sacramento River winter-run Chinook salmon, Snake River sockeye salmon, Snake River spring/summer Chinook salmon, and Snake River fall Chinook salmon
September 27, 1993	High bycatch of pink salmon, ITS revised
May 14, 1996	Bycatch exceedance of take limit of Chinook in the 1995 whiting fishery (14,557)
December 15, 1999	Consultation on the effects of the FMP on 22 newly listed ESUs and Snake River fall Chinook
April 25, 2002	Bycatch exceedance of take limit of Chinook in the 2000 whiting fishery (11,513)
March 11, 2006	Bycatch exceedance of take limit of Chinook in the 2000 and 2004 trawl fishery and the 2005 whiting fishery; reconsideration of Puget Sound, LCR, Snake River fall, UWR Chinook; addition of Sacramento River winter-run, CC, and Central Valley spring-run Chinook

As summarized above, in December 2017 NMFS issued a BiOp (NMFS 2017) on the impacts to ESA-listed salmon species under implementation of the Pacific Coast Groundfish Management Plan. This BiOp is incorporated by reference. Elements of the BiOP directly relevant to implementation of management measures for the 2019-20 biennial period are summarized here. The BiOp considers impacts of the proposed action on seven listed Chinook Salmon Evolutionarily Significant Units (ESUs): Puget Sound Chinook, Snake River Fall Chinook, Lower Columbia River (LCR) Chinook, Upper Willamette River (UWR) Chinook, Snake River Spring/summer Chinook, California Coastal (CC) Chinook, LCR Coho, Oregon Coast Coho, Southern Oregon/Northern California Coho, and Central California Coast (CCC) Coho Salmon. Other listed species occurring in the action area and affected by the proposed action are covered under an existing, long-term ESA opinion or NMFS has determined that the proposed action is not likely to adversely affect the species (NMFS 2012a).

In 2016 and 2017 NMFS worked with the Council to develop a description of the proposed action on which the consultation would be based. Since most salmon bycatch occurs in the portion of the fishery using trawl gear, the description focuses on those sectors. Based on Council input, NMFS then provided a number of scenarios for the possible future operation of the fishery along with an analysis of likely take of salmon (Agenda Item I.1.a, NMFS Report 1). Based on these scenarios the Council characterized how it expected the fishery to operate in the future (see Table 1-2 and Appendix 1 in the BiOp). The Council's description of the proposed action includes the following elements:

- The whiting fishery will continue to operate as it has in the recent past, with the same geographic footprint and catch of the U.S. total allowable catch (TAC), which is expected to remain around 500,000 mt annually, consistent with sector allocations. The tribal whiting fishery will be larger in the future based on the assumed attainment of the 500,000 mt TAC.
- The non-whiting trawl fishery will operate similarly to its historical geographic distribution but with higher effort and attainment rates for groundfish and bycatch rates except that:
  - The trawl RCA off of Oregon and California will be eliminated in a separate action.
  - A non-whiting midwater trawl fishery targeting yellowtail and widow rockfish will continue to develop based on historical patterns that obtained before widow rockfish was declared overfished in 2001 and facilitated by anticipated regulatory changes.
- The Council would use Chinook management guidelines to consider ongoing action to mitigate bycatch and NMFS would use them as a basis for reinitiating consultation. These guidelines are take of 11,000 Chinook salmon per year for the whiting fishery, 5,500 Chinook salmon for all other sectors and a 3,500 Chinook salmon Reserve, which the Council could allocate to address unexpectedly high Chinook salmon bycatch in either of these sectors.
- The Council would evaluate and implement management measures to reduce salmon bycatch as part of the biennial process.

The BiOp presents the results of bycatch estimates based on this description of the fishery. (See section 2.5.1.1 in NMFS 2017 for description of the estimation methodology.)

For the at-sea whiting sectors NMFS evaluated two fishing patterns, a northern distribution characterized by the pattern in 2009-2011 and a southern distribution characterized by the pattern in 2012-2015. This variable distribution of fishing affects the mix of individual ESUs making up Chinook bycatch, and it is the effect of the proposed action on these individual ESUs that is the subject of NMFS's ESA jeopardy determination. Also, both full and partial whiting allocation scenarios were evaluated. If the at-sea fishery adheres to the northern distribution NMFS concludes that the likely range in potential bycatch falls below 11,000 Chinook guideline for the whiting fishery; however, if the at-sea fishery adheres to the southern distribution scenario it is likely the bycatch guideline would be exceeded. But to comply with the ITS terms and conditions the Council will set up a framework to prevent the threshold and Reserve amount from being exceeded by either sector by implementing depth based closures and closing the fishery entirely if necessary. Shoreside sector bycatch depends more on how much whiting it can and does catch (its level of attainment against allocation) rather than the latitudinal distribution of the fleet, which is less variable because these vessels must stay closer to their ports of landing.

Estimating Chinook bycatch in the non-whiting trawl fishery is complicated by anticipated changes in gear-related regulations intended to facilitate growth of the midwater trawl fishery targeting rockfish (see Section 3.5.3.3). These changes would both relax current restrictions on the configuration of trawl gear and their use during various times of the year and areas. Removing the trawl RCA also complicates estimating bycatch, because bottom trawl fishing within the current boundaries has not occurred since 2001. Also, observer coverage in the shoreside trawl fishery was minimal before about 2004 so there is little historical data upon which to base estimates of salmon bycatch within the trawl RCA. And the fishery has changed substantially since then both in the way it is managed and resulting operational characteristics. Based on these anticipated characteristics of the fishery and management regime NMFS estimated that Chinook salmon bycatch was unlikely to exceed the 5,500 Chinook salmon guideline for the non-whiting fishery.

Despite the conclusion that the Chinook bycatch guidelines are unlikely to be exceeded, "extreme catch events" (ECEs) may still occur. The 3,500 Chinook Reserve is identified to acknowledge that such events occur, albeit rarely, and little can be done operationally or through regulation to prevent them.

The ESA jeopardy analysis in the BiOp is at the level of ESUs. Stock composition of fishery catch is estimated using a coerced linear regression model based on the latitudinal distribution of bycatch. These estimates are applied to the Chinook salmon species level bycatch estimates to support the assessment of effects to stocks. While take of coho salmon at the species level is estimated, take at the ESU level is not quantitatively estimated in the BiOp as it is for Chinook salmon. Section 2.7 of the BiOp (NMFS 2017), integration and synthesis, considers the overall effect on the Oregon Coast Coho and Southern Oregon/Northern California Coho ESUs. For these coho ESUs the BiOP finds that the proposed action is not expected to have a measurable effect on species' structure or diversity. Abundance may be affected by the proposed action, because it would result in a small increase in mortality. But overall, as stated in the BiOp sections 2.7.8 and 2.7.9, the level of take expected for the proposed action is so small no deleterious effects are expected on these populations.

In the BiOP Incidental Take Statement (ITS) NMFS concludes that the amount or extent of anticipated take, coupled with other effects of the proposed actions, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. The ITS describes incidental take in numbers of salmon, both listed and non-listed, rather than the number of listed fish from individual ESUs. This approach is used because information needed to determine take at the ESU level is limited and practical mitigation measures would have to be applied at the species level. Given the description of the ESA consultation proposed action developed in concert with the Council and described in the BiOP, NMFS concluded incidental that in the whiting fishery take will not exceed 14,500 Chinook per year including a Reserve of 3,500 Chinook per year in the event that bycatch increases unexpectedly, and coho bycatch will not exceed 474 coho salmon per year. For all non-whiting fisheries combined (trawl, fixed gear, and recreational) take will not exceed 9,000 Chinook salmon per year, including a Reserve of 3,500 Chinook salmon per year in the event that bycatch increases unexpectedly, and coho bycatch will not exceed 560 coho per year. Exceeding these estimates of incidental take would be one reason for reinitiating consultation. Based on these estimates of take, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed actions, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

The ITS includes six reasonable and prudent measures and associated terms and conditions. These are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take. Some of these terms and conditions must be implemented through the 2019-20 biennial process as discussed in Section 2.2.2. The Council response to these terms and conditions is described in Appendix C, section C.

3.5 Socioeconomic Environment

Section 3.2 in 2015 EIS, previous EISs for the biennial harvest specifications and management measures, and the Groundfish SAFE (PFMC 2018) present detailed characterizations of the Pacific coast groundfish fishery. That information is incorporated by reference and updated here.

3.5.1 Groundfish Fishery Sectors

The commercial groundfish fishery comprises the following fishery sectors:

- **Pacific whiting trawl** is composed 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 catcher-processor vessels. The shoreside fishery delivers to processing plants on land; with Westport and Ilwaco, Washington; and Astoria, Oregon being the principal ports for shoreside landings.
- **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 individual fishing quota (IFQ) program. This fishery is now usually referred to as "shorebased IFQ," because an important feature of this management program is a relaxation on allowed gear types used by these permitted vessels. As a result, landings of sablefish by gear types other than trawl have emerged as an important part of the revenue earned by permitted vessels in this sector. In addition, midwater trawl is being used to target non-whiting species.
- **Fixed gear (longline and pot) fisheries** are divided between "limited entry" and "open access" from a regulatory standpoint, but fishery managers more commonly characterize the "non-nearshore" sector—primarily targeting sablefish—and a "nearshore" sector targeting various nearshore groundfish species.
- A variety of other sectors have been characterized for the purpose of management and data presentation, but in aggregate they account for a very small proportion of landings and revenue.

3.5.2 Revenue Trends for Commercially Important Groundfish

Although the PCGFMP includes many species, relatively few account for most of the revenue. For the period covered by Table 3-7, 2003-2017, the top three species ranked by revenue, sablefish, Pacific whiting (hake), and Dover sole, accounted for 72% of total inflation adjusted groundfish ex-vessel revenue. Although the 2017 data presented here are preliminary and therefore incomplete, total revenue is up substantially from the 2015-16 biennial period and comparable to annual average total revenue in the 2011-12 biennial period. Revenue from Pacific whiting doubled in 2017 compared to the 2015-2017 annual average.

Table 3-7. Average annual inflation adjusted ex-vessel revenue, $1,000s by groundfish species. (Source: PacFIN comprehensive_ft 1/2/2018)

	2003-2010		2011-2012		2013-2014	
	Revenue	Percent	Revenue	Percent	Revenue	Percent
Sablefish	$28,478	41%	$39,149	44%	$22,698	29%
P. Whiting	$12,536	18%	$23,647	27%	$26,664	34%
Dover Sole	$7,881	11%	$7,315	8%	$7,318	9%
Rockfish NEI	$4,676	7%	$5,885	7%	$5,960	8%
Petrale Sole	$5,260	8%	$3,464	4%	$6,294	8%
Thornyheads	$4,374	6%	$4,180	5%	$4,153	5%
Roundfish NEI	$2,306	3%	$2,764	3%	$2,554	3%
Flatfish NEI	$2,474	4%	$1,577	2%	$1,488	2%
Other	$896	1%	$1,191	1%	$1,190	2%
Total	$68,882	100%	$89,172	100%	$78,319	100%

	2015-2016		2017 (preliminary)	
	Revenue	Percent	Revenue	Percent
Sablefish	$30,146	42%	$31,876	36%
P. Whiting	$11,540	16%	$23,785	27%
Dover Sole	$6,647	9%	$6,998	8%
Rockfish NEI	$6,383	9%	$9,364	11%
Petrale Sole	$7,121	10%	$7,102	8%
Thornyheads	$3,813	5%	$5,025	6%
Roundfish NEI	$3,212	4%	$3,068	3%
Flatfish NEI	$1,301	2%	$1,007	1%
Other	$1,332	2%	$919	1%
Total	$71,494	100%	$89,143	100%

3.5.3 Landings and Revenue for Commercial Fishery Sector

3.5.3.1 Nonwhiting Fishery Sectors

Table 3-8 reports ex-vessel revenue for the main non-whiting fishery sectors. The IFQ trawl fishery has accounted for about three-fifths of ex-vessel revenue since 2013 followed by the nonnearshore fixed gear fishery (targeting sablefish) accounting for almost two-fifths. Ex-vessel revenue has increased in all sectors except nearshore fixed gear over this time period.

Table 3-8. Groundfish ex-vessel revenue in current (adjusted for inflation) dollars, $1,000s, by non-whiting commercial fishery sectors, 2013-2017. (Source: Groundfish SAFE Table 12b, 1/2/2018)

Year	Shoreside IFQ Trawl (Nonwhiting)	Shoreside IFQ Non-trawl	Non Nearshore Fixed Gear	Nearshore Fixed Gear	Grand Total	Pct. of Annual Average
2013	$26,113	$2,875	$12,646	$3,786	$45,421	87%
2014	$25,187	$4,610	$13,888	$3,722	$47,408	91%
2015	$26,997	$5,315	$16,373	$4,447	$53,133	102%
2016	$26,548	$6,572	$18,048	$3,563	$54,731	105%
*2017**	*$29,003*	*$6,472*	*$20,542*	*$3,512*	*$59,529*	*114%*

Grand Total	**$133,849**	**$25,845**	**$81,498**	**$19,030**	**$214,801**	
Pct. of Total	**62%**	**12%**	**38%**	**9%**	**100%**	

*2017 data is considered preliminary.

3.5.3.2 Whiting Fishery Sectors

Table 3-9 reports ex-vessel revenue for whiting sectors. While total revenue since 2013 is more than double that of the non-whiting commercial sectors reported above, it has been more variable year to year. Revenue declined in 2015 and 2016 but rebounded in 2017 to $62.3 million, although that is still less than revenue in 2013-14, which was more than $66 million annually.

Table 3-9. Groundfish ex-vessel revenue in current (adjusted for inflation), $1,000, by whiting commercial fishery sectors, 2013-2017. (Source: Groundfish SAFE Table 14b, 1/12/2018)

Year	Catcher-Processor Total	Mothership Total	Shoreside Whiting Trawl Total	Grand Total	Percent of Annual Average
2013	$23,168	$15,379	$27,706	$66,253	123%
2014	$25,823	$15,552	$24,895	$66,270	123%
2015	$11,265	$4,431	$10,509	$26,205	49%
2016	$21,315	$12,214	$13,815	$47,344	88%
*2017**	*$25,361*	*$11,848*	*$25,127*	*$62,336*	*116%*
Grand Total	**$191,929**	**$114,954**	**$178,748**	**485,630**	
Pct of Total	**40%**	**24%**	**37%**	**100%**	

*2017 data is considered preliminary.

3.5.3.3 Midwater Trawl Fishery for Rockfish

Rebuilding of widow rockfish has stimulated the reemergence of a fishery using midwater gear to target pelagic rockfish, principally widow and yellowtail. (Widow rockfish was declared overfished in 2001 and rebuilt in 2011.) Figure 3-7 shows revenue from landings of these species (and chilipepper rockfish) since 1981. From 2004 onward only landings from the non-whiting trawl fishery are included; prior to that year the available data do not allow distinguishing among fishery sectors but the domestic whiting fishery was negligible before then. Landings steadily declined from the late 1980s onward, except in 2000 and 2001. The fishery essentially ceased after 2001 when widow rockfish was declared overfished but shows notable growth since 2014. In 2017 and 2018 NMFS issued exempted fishing permits (EFPs) to assess the effects of changing gear requirements – especially with regard to the take of ESA-listed salmon – that also include elements that further facilitate the reestablishment of the midwater pelagic rockfish fishery.

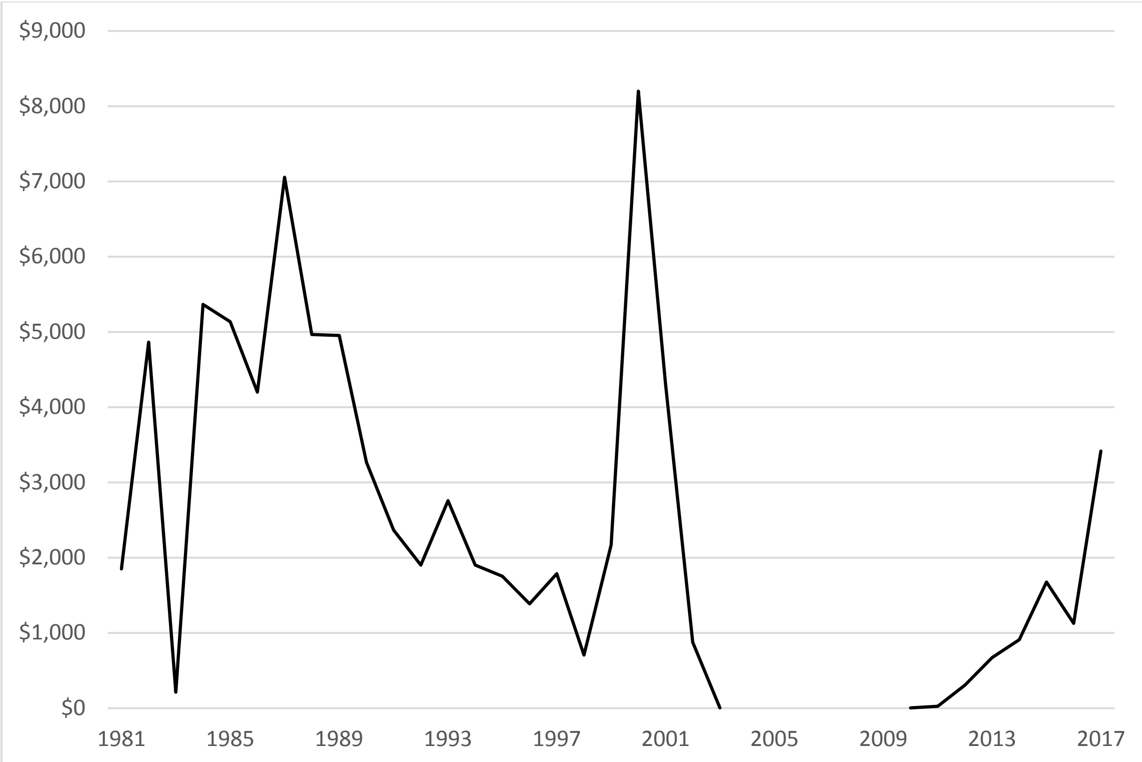

Figure 3-7. Inflation adjusted ex-vessel revenue ($1,000s) from landings of pelagic rockfish (widow, yellowtail, chilipepper), by midwater trawl gear in the non-whiting groundfish trawl sector, 1981-2017. Landings from 2004 to 2009 excluded due to data confidentiality requirements. Landings from 1994-2017 from the non-whiting trawl sector and EFPs. (Source: PacFIN comprehensive_ft, 1/11/2018)

In 2017 NMFS issued an EFP covering multiple non-whiting groundfish trawl vessels that relaxed requirements on minimum mesh size and the use of selective flatfish trawl shoreward of the RCAs north of 40° 10’ N. latitude. This allows vessels to target midwater pelagic rockfish using modified bottom trawl gear (but note that the data presented in Figure 3-7 and Table 3-10 below is only for midwater gear). EFP terms and conditions included harvest guidelines for Chinook and coho salmon catch in order to mitigate take of ESA-listed salmon stocks.

NMFS issued an EFP in 2018 for up to 60 vessels that expands on the exemptions in the 2017 EFP, consistent with changes in gear requirements proposed by the Council in 2016 (and maintains the salmon harvest guidelines). In addition to exemptions to gear requirements, the 2018 EFP allows the use of midwater trawl gear before May 15 to target pelagic rockfish, which is currently prohibited. (Targeting whiting with midwater gear would still be prohibited during that part of the year.) Currently, vessels using midwater gear may fish in the trawl RCA after May 15 north of 40°N latitude. The 2018 EFP also allows vessels using midwater gear to fish in the trawl RCA north of 40°N latitude throughout the year.

Table 3-10 provides a snapshot of the pelagic rockfish fishery over the past six years (2017 data should be considered preliminary). The data includes landings made under EFPs, which prior to 2017 would have been for purposes other than what is described above. Participation has increased almost four-fold and landings more than twenty times; ex-vessel revenue in 2017 was $3.4 million.

Table 3-10. Landings (mt), inflation adjusted ex-vessel revenue, and number of vessels making landings of pelagic rockfish (chilipepper, widow, and yellowtail rockfish) with midwater trawl gear, 2012-2017. (Source: PacFIN comprehensive_ft, 1/11/2018)

Values	2012	2013	2014	2015	2016	2017
Metric tons	249	606	836	1,674	1,133	5,210
Thousands of dollars	$305	$670	$908	$1,674	$1,126	$3,415
Number of vessels	17	12	24	37	22	66

Pending results of the EFPs discussed above, regulation changes consistent with the EFP exemptions are likely to be implemented in the 2019-20 biennial period. This is separate from the proposed action so the effects of these regulation changes will be evaluated in Chapter 5, Cumulative Effects.

3.5.4 Tribal Fishery

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. The Makah Tribe participates in whiting fisheries with both a mothership and shorebased component. Landings and revenue from this fishery cannot be reported due to data confidentiality restrictions.

The tribal non-whiting sector is defined by groundfish landings other than whiting and, thus, includes a variety of gear types. While all four coastal tribes have longline fleets, only the Makah Tribe currently has a trawl fleet. Table 3-11 shows ex-vessel revenue in tribal fisheries using hook-and-line and trawl gear. (Landings from net and pot gear cannot be reported due to data confidentiality restrictions. Landings from shrimp trawl is not reported, because this fishery does not target groundfish although it does land incidentally caught groundfish. Revenue from groundfish landings in these fisheries averaged slightly less than $70,000 annually for the period 2013-2016.) Hook-and-line gear accounted for two-thirds of average annual revenue. Excluding 2017, for which data is likely incomplete, revenue has increased since 2013, amounting to about $4.4 million in 2016.

Table 3-11. Treaty non-whiting groundfish ex-vessel revenue for hook-and-line and trawl gear (from groundfish only), current dollars, $1,000s, 2013-2017. (Source: Groundfish SAFE Table 13b, 1/12/2018)

Year	Hook-and-Line	Trawl	Total	Pct. of Annual Average
2013	$1,956	$1,608	**$3,564**	**92%**
2014	$3,056	$1,020	**$4,076**	**106%**
2015	$3,084	$1,672	**$4,755**	**123%**
2016	$3,011	$1,384	**$4,396**	**114%**
*2017**	*$1,800*	*$687*	***$2,487***	**64%**
Grand Total	**$12,907**	**$6,371**	**$19,278**	
Pct. of total	**67%**	**33%**	**100%**	

*2017 data is considered preliminary.

3.5.5 Recreational Groundfish Fishery

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 and employment impacts based on GMT estimates of 2017 landings as part of the integrated alternatives analysis (Appendix A) are reported in section 4.3.4.1.

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 3-12 shows bottomfish/halibut angler trips compared to trips targeting other species.[5] Overall, private and charter trips targeting bottomfish/halibut, comprised 22% of all trips and modes during the 2012-2016 period. Table 3-13 shows the annual averages of bottomfish/halibut marine angler trips by state and reporting area. California accounts for 84% of these angler trips, and southern California accounts for 47%, due to its large coastal population and milder year-round weather. Figure 3-8 shows bottomfish/halibut trips by state and year. The number of bottomfish/halibut marine angler trips have been increasing since 2008, peaking in 2014 at 980,569 trips but subsequently declined slightly. Nonetheless, in 2016 the number of trips, 879,988, exceeded the 10-year average by 15%.

[5] Because it is hard to distinguish between trips targeting bottomfish and those targeting Pacific halibut, these trip types are combined.

Table 3-12. Total Angler trips by type and mode, 2012-2016. (Source: Ed Waters, GMT state reps, RecFIN.)

Mode	Bottomfish+Halibut		Other Trip Types*		Total	
	Ann. Average	Percent	Ann. Average	Percent	Ann. Average	Percent
Beach/Bank	0	0%	1,058,929	28%	1,058,929	28%
Man-made	78,417	2%	1,035,946	28%	1,114,363	30%
Charter	575,190	15%	170,477	5%	745,667	20%
Private	311,538	8%	510,830	14%	822,367	22%
Total	965,145	26%	2,776,183	74%	3,741,327	100%

*Other trip types: Salmon, HMS, combo, other

Table 3-13. Bottomfish plus Pacific halibut average 2012-2016 annual marine angler boat trips (private and charter by reporting area, 2012 to 2016. (Source: Ed Waters, GMT state reps, RecFIN.)

Reporting Area	Ann. Average	Percent
Washington Subtotal	**36,521**	**4%**
La Push-Neah Bay	14,443	2%
Westport	19,205	2%
Ilwaco-Chinook	2,873	0%
Oregon Subtotal	**107,971**	**12%**
Astoria	539	0%
Tillamook	16,705	2%
Newport	52,637	6%
Coos Bay	16,209	2%
Brookings	21,882	2%
California Subtotal	**742,235**	**84%**
North Coast: Humboldt and Del Norte	31,775	4%
Wine District: Mendocino	16,395	2%
SF District: San Mateo through Sonoma*	67,052	8%
Central Coast: San Luis Obispo through Santa Cruz	114,786	13%
Channel: Ventura and Santa Barbara	91,453	10%
South Coast: San Diego, Orange and Los Angeles	420,774	47%
Total	**886,728**	**100%**

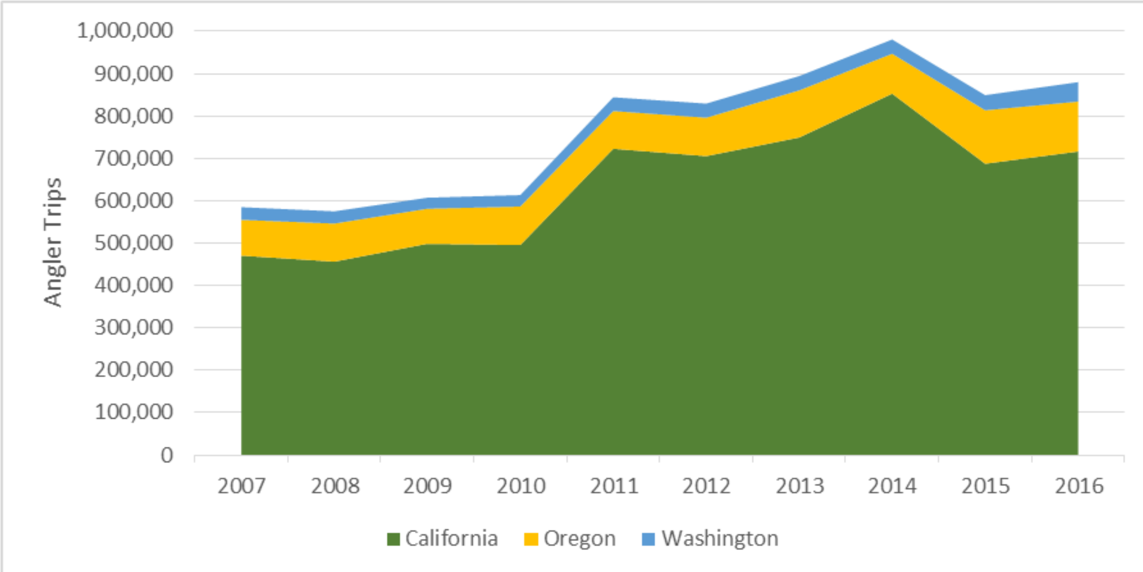

Figure 3-8. Bottomfish plus Pacific halibut marine angler boat trips (private and charter) by state, 2007 to 2016. (Source: Ed Waters, GMT state reps, RecFIN.)

3.5.6 Fishing Communities

As in the 2015 EIS and previous EISs, 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 (Leonard and Watson 2011) for ports included in these port groups. IOPAC is used to evaluate personal income and employment impacts of proposed management measures.

Table 3-14 shows nominal ex-vessel revenue from groundfish landings for the 2013-2017 period by port and groundfish fishery sector. Landings and revenue tends to be concentrated in relatively few ports. The nine top ranked ports (or half of the 18 shown) accounted for 88% of coastwide revenue. Astoria is the top-ranked port overall, accounting for 27% of coastwide revenue. Newport ranks second (21% of coastwide revenue) and the South and Central Washington Coast third (with confidential data included, percentage cannot be reported). The South and Central Washington Coast's rank is driven mainly by revenues from the shoreside whiting sector, because Westport and Ilwaco are major ports of landing for this fishery. (Because only two first receivers/processors are reported for this region, the revenue value cannot be reported.) Whiting landings occur in only three of these port areas, which are also the top three ranked ports overall. But Astoria and Newport also rank first and second, respectively, for revenue from the non-whiting IFQ sector (combining trawl and non-trawl IFQ landings) while Eureka ranks third. Newport ranks first for revenues from the nonnearshore (sablefish) fixed gear fishery followed by Santa Barbara and Puget Sound. Morro Bay is top ranked for the nearshore fixed fishery followed by Brookings and Crescent City.

Table 3-14. Nominal revenue ($1,000s) from groundfish landings, 2013-2017, by IOPAC port and fishery sector. Confidential data is excluded as indicated by "Conf." Totals and averages for those rows are for nonconfidential data only as indicated by shading

	Shoreside IFQ (Nonwhiting)*	Shoreside IFQ Trawl (Whiting)	Non Nearshore Fixed Gear	Nearshore Fixed Gear	Other	Grand Total	Annual Average
Puget Sound	Conf.		$7,142		$143	**$11,984**	$2,396.79
North WA coast					$39	**$3,066**	$613
South and central WA coast	$5,827	Conf.	$5,652		$204	**$11,682**	$2,336
Astoria	$55,874	$35,431	$3,199	$5	$2,376	**$96,885**	$19,377
Tillamook			$269	$867	$12	**$1,148**	$230
Newport	$23,463	$37,713	$11,284	$286	$1,777	**$74,523**	$14,905
Coos Bay	Conf.		$5,869	$385	$282	**$6,536**	$1,307
Brookings	$11,096		$4,054	$4,715	$116	**$19,981**	$3,996
Crescent City	Conf.		$1,194	$1,464	$9	**$2,667**	$533
Eureka	$19,025		$2,321	$133	$44	**$21,523**	$4,305
Fort Bragg	$11,526		$5,738	$969	$91	**$18,324**	$3,665
Bodega Bay			$2,836	$79	$32	**$2,947**	$589
San Francisco	$3,125		$2,493	$757	$344	**$6,719**	$1,344
Monterey	$1,892		$3,225	$1,380	$111	**$6,607**	$1,321
Morro Bay	$5,761		$5,866	$6,123	$359	**$18,109**	$3,622
Santa Barbara	Conf.		$10,397	$1,302	$510	**$12,210**	$2,442
Los Angeles			$2,520	$276	$117	**$2,914**	$583
San Diego			$3,423	$67	$90	**$3,580**	$716

*Includes non-trawl

Focusing on the shoreside IFQ sector, revenue from fixed gear landings accounted for 16% of the sector total during the 2013-2017 period. Newport was the top-ranked port for revenue from shoreside IFQ fixed gear landings followed by Astoria and Morro Bay. For data confidentiality reasons revenue from the IFQ fixed gear sector cannot be reported for many ports. Oregon recorded the highest revenue from this sector, averaging almost $3 million per year for the 2013-2017 period. Washington was next, averaging $1.5 million followed by California at $932,000.

Chapter 4 Direct and Indirect Effects

4.1 Methods used for the Impact Analysis

Section 4.2 evaluates harvest specifications affect the future status of managed groundfish stocks. Harvest specifications are by themselves management objectives with no direct effect on the environment. Harvest specifications indirectly affect managed groundfish stocks by setting limits on how much of each stock may be caught. For the analysis in section 4.2 of the effect of harvest specifications on groundfish stock status is considered. It is important to note that the stock assessments and projections underlying this evaluation assume that ACLs are fully attained; that is, realized catch equals the ACL. For most stocks, however, catch has historically been less than the ACL. If roughly similar patterns persist in the 2019-20 biennial period, the actual impact of fishing mortality on the future status of most stocks is likely to be less than is forecast in the assessment projections.

Section 4.3 describes the effects adjusting routine management measures and implementing new measures for the 2019-20 biennial period. Management measures control fishing behavior and resulting intensity of fishing effort through space and time. It is this fishing behavior that results in direct impacts on the environmental components other than managed groundfish stocks described in Chapter 3. Proposed adjustments to routine management measures, primarily to control catch, are within the range of management measure changes evaluated in the 2015 EIS; the analysis found in Appendix A demonstrates that these adjustments will prevent ACLs from being exceeded. Therefore, the evaluation in section 4.3 addresses the effects of new management measures, which were not analyzed in the 2015 EIS or 2016 EA.

4.2 Impacts of Harvest Specifications on Managed Groundfish Stocks

There are three stocks with preferred harvest control rules (HCRs) that depart from the default HCRs used for 2017-18 harvest specifications (California scorpionfish, lingcod north and south of 40°10’ N lat.) and one stock (yelloweye rockfish) with alternative HCRs under consideration without a preferred alternative yet specified. Stock-specific biological impacts associated with the alternatives analyzed for these four stocks are provided in Section 4.2.1.

4.2.1 Stocks with Alternative Harvest Control Rules under Consideration

4.2.1.1 California Scorpionfish South of 34°27’ N lat.

A new assessment of California scorpionfish south of 34°27’ N lat. was conducted in 2017 indicating the stock was healthy at a 54% depletion at the start of 2017 (Monk et al. 2018). The main productivity parameters, steepness and the natural mortality rate (M), were fixed in the assessment. The decision table in the 2017 assessment varied the natural mortality rate from the base case model used to develop 2019-2020 harvest specifications. The stock is projected to remain healthy (i.e., ≥40% depletion) for the next ten years under either the No Action alternative (150 mt constant catch ACL) or the Preferred Alternative (ACL = ABC (P* = 0.45)) under the base case model (M = 0.235) in the 2017 assessment (Figure 4-1). The less likely low state of nature model (M = 0.164; estimated to be half as likely as the base case model) indicates the stock starts at a 47% depletion in 2019 and is projected to decline to the B_{MSY} target of 40% depletion in ten years under the No Action alternative and a very low depletion of 9% under the preferred alternative.

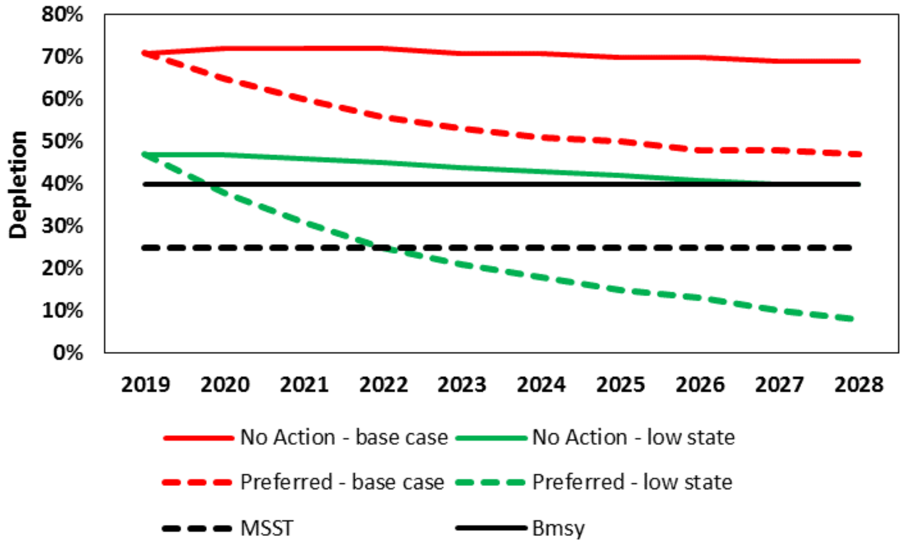

Figure 4-1. Predicted 10-year depletion trajectory of California scorpionfish south of 34°27' N lat. under two alternative harvest control rules and two states of nature from the decision table in the 2017 assessment.

4.2.1.2 Lingcod North and South of 40°10' N lat.

Lingcod was assessed in 2017 with two assessment models north and south of the California/Oregon border at 42° N lat. (Haltuch et al. 2018). Current spawning stock biomass is estimated to be 57.9% in the northern assessment area relative to unfished spawning biomass, and has continued to increase over the last five years as a result of high recruitment in 2008 and 2013. Current spawning stock biomass is estimated to be 32.1% in the southern assessment area relative to unfished, and is currently in the precautionary zone. Although spawning biomass in the southern region is estimated to have been increasing in recent years, and above the minimum stock size threshold by 2016 as a result of high recruitment in 2013, it remains a concern that recruitment is estimated to have been well below average over the last 10-15 years. The SSC endorsed the use of the 2017 north and south lingcod stock assessments as the best scientific information available for status determination and management as a category 1 assessment. While the 2009 south lingcod stock assessment (Hamel et al. 2009) was deemed a category 2 assessment, the additional eight years of data in the current assessment provided an adequate basis for a category 1 designation.

Since lingcod are managed north and south of 40°10' N lat., a reapportionment of the projected OFLs from the assessments was made. The relative biomass and OFLs were reapportioned north and south of 40°10' N lat. by using the most recent 5-year (2012-16) average percentage of swept area biomass estimates of lingcod from the NMFS Northwest Fisheries Science Center trawl survey in California waters occurring between 40°10' N lat. and 42° N lat., which was 21.3% of the California biomass. Therefore, 21.3% of the OFLs projected from the southern assessment model were added to the north of 40°10' N lat. OFLs and subtracted from the south of 40°10' N lat. OFLs. The 2019 and 2020 harvest specification alternatives are provided in Table 4-1.

Table 4-1. Alternative 2019 and 2020 lingcod harvest specifications (in mt) decided for detailed analysis.

Stock	Alternative	2019			2020			Harvest Control Rule
		OFL	ABC	ACL	OFL	ABC	ACL	
Lingcod N. of 40°10' N lat.	No Action	5,110	4,872	4,859	4,770	4,549	4,533	ACL = ABC (P* = 0.45 in OR & WA; P* = 0.4 in CA) w/ 40-10 adj. for the CA contribution to the ABC and ACL Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod S. of 40°10' N lat.		1,143	1,043	996	983	898	839	ACL = ABC (P* = 0.4) w/ 40-10 adj. Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod N. of 40°10' N lat.	Alt. 1 (Preferred)	5,110	4,885	4,871	4,768	4,558	4,541	ACL = ABC (P* = 0.45) w/ 40-10 adj. for the CA contribution to the ABC and ACL Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.
Lingcod S. of 40°10' N lat.		1,143	1,093	1,039	977	934	869	ACL = ABC (P* = 0.45) w/ 40-10 adj. Assumes 1,000 mt and 750 mt removals for 2017 and 2018 in the north and south, respectively and full ACL attainment thereafter.

There is very little difference in predicted biological impacts between the two lingcod harvest specification alternatives and impacts are solely expressed for the California subpopulation since the harvest control rule only varies for that subpopulation. Predicted starting (2017) and ending (2028) depletions for the northern subpopulation (the portion of the coastwide population occurring off Oregon and Washington) are 57.9% and 43.3%, respectively (Figure 4-2). The southern subpopulation is estimated to be below target biomass and in the precautionary zone. Both alternatives are predicted to slowly rebuild the stock under an average recruitment assumption in the next ten years. The predicted starting and ending depletions for the southern subpopulation (the portion of the coastwide population occurring off California) are 32.1% and 38.6%, respectively under the No Action alternative. The ending depletion in 2028 for the southern subpopulation under the Preferred Alternative is slightly less than under No Action at 37.7% (Figure 4-2).

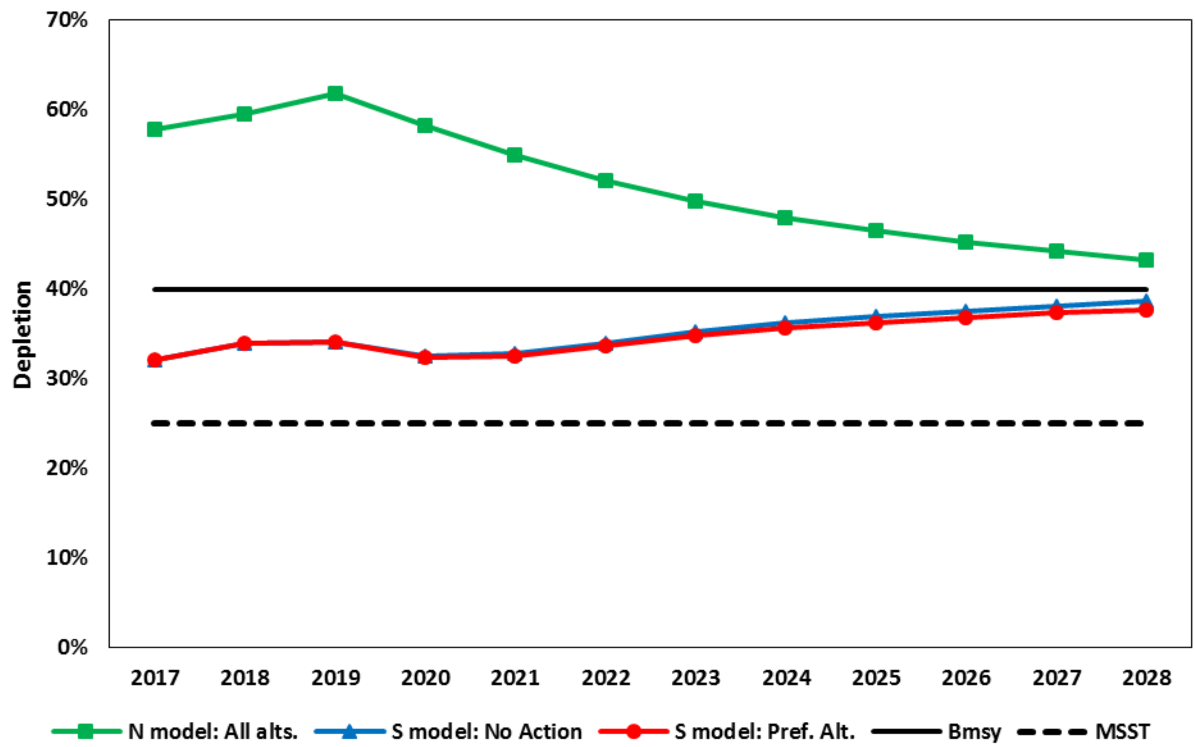

Figure 4-2. Projected depletion of lingcod by assessment area (N = OR + WA; S = CA) and by alternative through 2028.

4.2.1.3 Yelloweye Rockfish

4.2.1.3.1 Yelloweye ACL/Rebuilding Alternatives

A full yelloweye assessment was conducted in 2017 indicating the stock was at a 28.4% depletion at the start of 2017 (Gertseva and Cope 2017b). Yelloweye was again modeled as a single stock with a shared stock-recruitment relationship, but between two rather than three assessment areas. Oregon and Washington were combined in a single area due to difficulties separating the catch and compositional data of fish caught in one state but landed in the other, with California as a second area. A comparison to a single area assessment showed no appreciable differences in outcomes. A state-specific assessment with three areas was not evaluated, but the results from the two-area base model showed close correspondence to the results from the 2011 update assessment.

The current yelloweye rockfish rebuilding plan specifies a target year to rebuild of 2074 and a prescribed harvest rate in terms of spawning potential ratio (SPR) of 76%. The 2017 and 2018 ACLs projected from the previous (2011) rebuilding analysis are 20 mt in each year (Taylor 2011). The new rebuilding analysis (Gertseva and Cope 2017a) revises the maximum time to rebuild (T_{MAX}, which is calculated as the minimum time to rebuild (T_{MIN}) plus one mean generation time) of 2070 or four years sooner than the target year in the current rebuilding plan.

The yelloweye rockfish alternatives decided for detailed analysis vary the harvest rate under the rebuilding plan from an SPR of 76% under the No Action alternative to SPR harvest rates of 70% and 65%, which are progressively higher harvest rates than status quo. The median year to rebuild under these alternatives varies from 2027 under the No Action SPR of 76% to 2028 and 2029 under SPRs of 70% and 65%, respectively (Table 4-2 and Figure 4-3). This compares to the shortest time to rebuild the yelloweye stock of 2026 under a zero fishing mortality rate (i.e., SPR = 100%) starting in 2019 ($T_{F=0}$; Table 4-2). The 2019 and 2020 ACLs vary from 29 mt and 30 mt, respectively under the No Action alternative to 48 mt and 49 mt, respectively under an SPR harvest rate of 65% (Table 4-2 and Figure 4-3).

Table 4-2. The alternative 2019 and 2020 yelloweye rockfish harvest specifications (in mt), SPR harvest rates, and predicted times to rebuild decided for detailed analysis.

Stock	Alternative	2019			2020			SPR	Median Year to Rebuild
		OFL	ABC	ACL	OFL	ABC	ACL		
Yelloweye Rockfish	$T_{F=0}$	82	78	0	85	81	0	100%	2026
	No Action	82	78	29	84	80	30	76%	2027
	Alt. 1	82	78	39	84	80	40	70%	2028
	Alt 2	82	78	48	84	80	49	65%	2029

4.2.1.3.2 Critical Assessment Uncertainties Affecting an Understanding of Relative Productivity of Yelloweye

The yelloweye ACL/Rebuilding Alternatives are affected by the assumptions made in the 2017 assessment, especially the assumed productivity parameters, the recruitment compensation or steepness (h) of the Beverton-Holt stock recruit relationship and the natural mortality rate (M). Both M and h are often difficult to estimate in stock assessments and they are often confounded when there is an attempt to do so. Both parameters were estimated outside the 2017 assessment model and fixed in the base case model used to inform management in 2019 and beyond. Given the base case model in the 2017 assessment is the basis for the 2017 rebuilding analysis, the uncertainty associated with assuming M and h affect rebuilding projections upon which contemplated changes to harvest specifications and the current yelloweye rebuilding plan are based. This section explores the implications of assuming steepness and natural mortality in terms of management risk.

A significant change in the new yelloweye rockfish stock assessment is the assumed higher productivity as determined by a fixed value of steepness (h = 0.718). Higher steepness results in higher estimated yields and faster rates of rebuilding. The steepness value of 0.718 was derived from the mean of the prior distribution of 10 category-1 rockfish species in an updated meta-analysis (James Thorson, personal communication) and strong recent recruitment, which result in larger yield estimates. The previous assessments (the full 2009 and updated 2011 assessments) allowed natural mortality and steepness to be estimated, while the 2017 assessment fixed both of these key parameters, which allowed recruitment deviations to be estimated for this species. Estimating recruitment deviations means estimating relative year class strength. This change reduced the uncertainty in the yelloweye rockfish assessment resulting in upgrading this stock assessment from a category 2 to a category 1, which effectively reduces the ABC buffer. However, fixing steepness resulted in a new critical uncertainty relative to the stock's actual potential productivity.

The 2017 assessment was sensitive to steepness and whether selectivity was allowed to be estimated freely. Steepness values estimated in the 2009 and 2011 assessments were 0.417 and 0.441, respectively. Gertseva and Cope (2017a) provided alternative rebuilding projections assuming lower steepness values (i.e., h = 0.4 and 0.509) than under the base case model (h = 0.718). The assumed removals are full ACL attainment projected under the base case model in the 2017 assessment. These removals were assumed for the alternative steepness models to project long term status trends. While the base model steepness is predicted to attain the B_{MSY} target of 40% of unfished biomass by 2027, the 0.509 steepness fails to reach the target through the current target year of 2074 and the 0.4 steepness model projects the status to remain below the minimum stock size threshold through 2074, reaching a maximum depletion of 16.5% in 2027 before slowly declining to 13.5% in 2074 (Figure 4-4). If the 2017 yelloweye assessment assumes a significantly higher steepness (productivity) than is the actual state of nature for the stock, rebuilding objectives may not be met under the current rebuilding plan. Higher catches considered under the SPR alternatives of 70% and 65% would exacerbate this outcome if assumed steepness is too high.

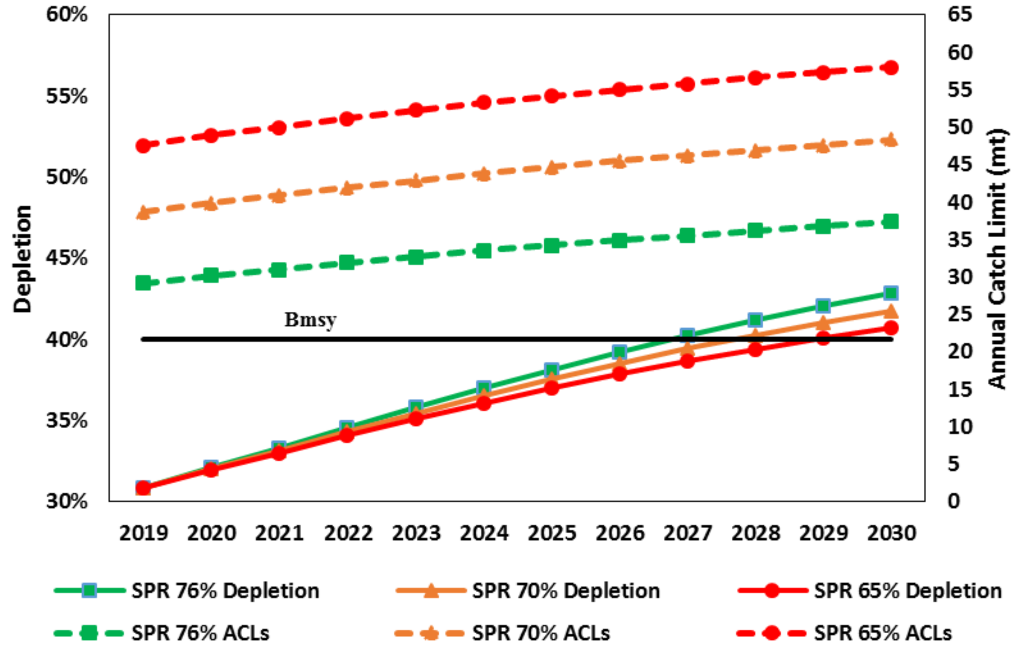

Figure 4-3. Projected depletions and annual catch limits of yelloweye rockfish under alternative harvest rates assuming the base case model in the 2017 assessment and rebuilding analysis.

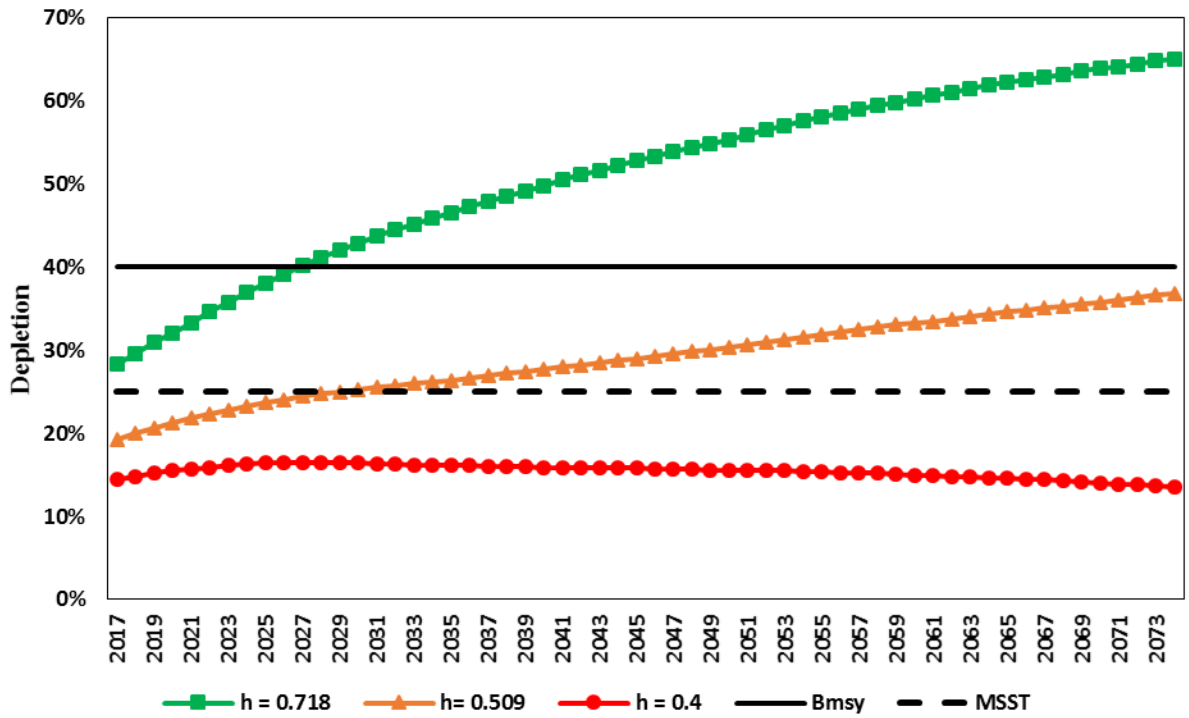

Figure 4-4. Projected depletion of yelloweye rockfish assuming catches from the current base case model (h = 0.718, SPR = 76%) under alternative steepness assumptions (h = 0.509 and 0.4).

Another critical uncertainty that affects our understanding of yelloweye productivity is ageing error, which directly affects estimation of the natural mortality rate. Gertseva and Cope (2017b) used a maximum age metric to determine the natural mortality rate for yelloweye based on the method developed by Hamel (2015). Application of this method results in lower estimates of natural mortality for fishes with higher maximum ages. A lower natural mortality rate translates into relatively lower potential productivity with the same effect of predicting lower estimates of spawning output, year class strength, and population rebuilding rates as lower estimates of steepness.

Ageing otoliths of longer lived rockfish is inherently uncertain with greater uncertainty in assigning ages for older individuals. Yelloweye is one of the longest lived rockfish on the U.S. West Coast with a maximum reported age of 147 years (Love 2011). In previous yelloweye assessments, all the ageing was done by the WDFW ageing lab. The 2017 assessment used age assignments from the WDFW and the NMFS Northwest Fisheries Science Center (NWFSC) ageing labs. The NWFSC began ageing yelloweye otoliths in 2017 using the same criteria used by WDFW age readers. Gertseva and Cope (2017b) report there was general agreement in age assignments by readers from both labs up to about age 30. However, after age 30, age assignments were systematically greater for readers in the WDFW lab compared to readers from the NWFSC lab, with up to a 20 year difference in age assignments for older yelloweye. This disagreement indicates greater uncertainty and bias in determining the ages of older individuals. A limited third party read of U.S. West Coast yelloweye otoliths by readers from the Alaska Department of Fish and Game (ADFG) was insufficient to better determine ageing precision or which lab was more biased.[6] Ages used in the 2017 yelloweye stock assessment were based on the WDFW age estimates for most fleets and surveys, except for the California recreational fleet, the most recent years of the Oregon recreational fleet, and the NWFSC trawl survey, of which age estimates from the NWFSC lab were used. Ageing error matrices were therefore developed from within-lab comparisons for each set of ageing data and bias in ageing older yelloweye was not determined.

The oldest individual in the age sample informing the 2017 yelloweye assessment was 137 years. Given the uncertainty in estimating the actual maximum age, 90% of the maximum age was assumed, which gave the value of 123 years resulting in an estimate of M = 0.044. Attempts to estimate natural mortality indicated there was no information in the model to do so, so M was fixed using this value in the base case model. Uncertainty in estimating M was not fully characterized in the 2017 assessment given ageing error and the inability to estimate M. Given the inability to determine bias and better estimate precision in ageing older yelloweye, one can conclude this is a critical uncertainty that should be considered when basing management decisions on rebuilding projections. If the actual state of nature is a lower natural mortality rate, then stock biomass, relative depletion, and rebuilding rates are lower than used to estimate these quantities under the most plausible base model[7]. The decision table in the 2017 assessment is reproduced in Table 4-3 to understand the effect of lower and higher natural mortality rates on these quantities. The lowest state of nature in the decision table (M = 0.037) is lower than used in the current and previous yelloweye assessments. For comparison, Taylor and Wetzel (2011) estimated natural mortality rates of females and males of 0.046 and 0.045, respectively in the 2011 update assessment. However, the decision table does illustrate the relative effect on productivity across a range of plausible natural mortality rates.

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[6] Evaluation of yelloweye ageing criteria and interlab reads, including those done by WDFW, NWFSC, ADFG, and DFO labs is ongoing. This will enable better determination of bias and precision in ageing yelloweye before the next assessment is conducted.

[7] The SSC recommended the base case model in the 2017 yelloweye assessment as the best scientific information available in their September 2017 statement to the Council.

Table 4-3. 12-year projections for alternate states of nature based on natural mortality of yelloweye rockfish (reproduced from Gertseva and Cope (2017b)).

			States of nature					
			Low: M =0.037		Base model: M =0.044		High: M =0.056	
Management decision	Year	Catch (mt)	Spawning output	Depletion	Spawning output	Depletion	Spawning output	Depletion
2017-2018 catches are 60% of ACLs. 2019-2028 are 60% of catches calculated using current rebuilding SPR of 76% applied to the base model.	2017	12	227	20%	323	28%	535	43%
	2018	12	238	21%	338	30%	556	44%
	2019	17	249	22%	353	31%	578	46%
	2020	18	260	23%	368	32%	599	48%
	2021	19	271	24%	384	34%	621	50%
	2022	20	282	25%	399	35%	643	51%
	2023	21	294	26%	415	36%	665	53%
	2024	22	304	27%	430	38%	687	55%
	2025	22	315	28%	444	39%	707	57%
	2026	23	325	29%	458	40%	726	58%
	2027	23	334	30%	471	41%	744	59%
	2028	24	343	31%	483	42%	760	61%
2017-2018 catches are full ACLs. 2019-2028 catches are calculated using current rebuilding SPR of 76% applied to the base model.	2017	20	227	20%	323	28%	535	43%
	2018	20	237	21%	337	30%	555	44%
	2019	29	247	22%	351	31%	576	46%
	2020	30	257	23%	365	32%	596	48%
	2021	31	267	24%	379	33%	617	49%
	2022	33	277	25%	394	35%	638	51%
	2023	34	286	26%	408	36%	659	53%
	2024	35	296	27%	421	37%	679	54%
	2025	36	304	27%	434	38%	698	56%
	2026	37	313	28%	446	39%	715	57%
	2027	38	320	29%	457	40%	731	58%
	2028	38	328	30%	468	41%	746	60%

4.3 Impacts of Implementing and Adjusting Management Measures

This section evaluates the combined effect of implementing new management measures based on the analysis in Appendix C, which contains detailed analyses of the impacts of new management measures. New management measures can be combined with the HCR alternatives and associated routine management measures described in Appendix A in the process of selecting the preferred alternatives.

Routine management measures are set to ensure that stock ACLs are not exceeded. All of the routine management measure adjustments (i.e., modifications to commercial and recreational trip limits, bag limits, and season dates) and their anticipated impacts for the 2019-2020 period were determined to be within the range analyzed in the 2015 EIS action. Appendix A contains a detailed evaluation of routine management measures with respect to projected catch of groundfish against the default and alternative harvest specifications. According to Appendix A, for each set of harvest specifications, adjustments to routine management measures are projected to prevent the proposed ACLs from being exceeded.

4.3.1 Effect of Management Measures on Groundfish Catch

In section 4.2 the impacts of proposed harvest specifications on future stock status is assessed. This section summarizes the risk of overfishing, if any, posed by the proposed new management measures (including the stock complex reorganization proposals).

4.3.1.1 Salmon Incidental Take Statement: Mitigation Measures and Reserve Rule Analysis

The measures implemented pursuant to the salmon BiOp are intended to limit the bycatch of salmon and do not directly control the catch of groundfish species.

4.3.1.2 Stock Complex Reorganization

The stock complex reorganization proposals described in section 2.2.2.2 present variable risks for overfishing. Stock complex harvest specifications are computed as the sum of the specifications for component stocks and catch is managed to the stock complex ACL. In some instances there is a risk that while the complex ACL (or OFL) is not exceeded the ACL (or OFL) for one of the component stocks could be exceeded. This is especially the case if the specifications for one of the component stocks is large relative to one or more of the other component stocks, and catch of that stock is well below its ACL. These higher ACL-low attainment stocks are referred to as “inflator stocks” by the GMT. Overharvest of a component stock with a lower ACL could be compensated by the unused harvest of the inflator stock such that the complex ACL is not exceeded. This kind of risk does not apply to stocks managed to their ACLs outside of a complex.

Stock complex reorganization proposal 1 would pair Oregon black rockfish, currently managed outside of a complex, with Oregon blue/deacon rockfish, currently part of the Nearshore Rockfish North Complex to create a new complex. This would increase the risk of overfishing for Oregon black rockfish, because it is a desirable target with catches close to the ACL. The blue/deacon contribution to the new complex could conceivably compensate for such an overage to the black rockfish component ACL in the new complex. (This is somewhat different from the inflator stock case described above, because the black rockfish ACL contribution, at 516 mt in 2019 for example, is much larger than the blue/deacon contribution of 101.5 mt in 2019.)

As discussed in Appendix C, ODFW proposes implementing several measures to lower the risk that the black rockfish ACL contribution would be exceeded. It would establish harvest guidelines for the component stocks and monitor catch against them. To make this measure more effective it would shorten the catch reporting time lag from one month to one week so that state management measures could be quickly adjusted in the event an overage appears imminent. Inseason catch projection methods will also be revised to better account for rapid periodic increases in fishing effort observed in the recreational fishery. It is reducing its aggregate recreational bag limit from seven to five fish per day, which could slow down the overall catch rate during the recreational season. Finally, the promotion of a new recreational fishing opportunity, the longleader fishery for underutilized stocks (primarily widow and yellowtail rockfish) could shift some effort away from targeting black rockfish.

Stock complex proposal 2 involves combining cabezon and kelp greenling stocks to form new complexes. Oregon cabezon is currently managed under its own harvest specifications while the two kelp greenling stocks and Washington cabezon are part of the Other Fish Complex.

Combining Oregon cabezon and Oregon kelp greenling in a new, two-stock complex (Option 1) would increase the risk of exceeding the Oregon cabezon component ACL, first because it would shift cabezon from single stock management to management in a stock complex. Second, Oregon kelp greenling would function as an inflator stock in the new complex, because its ACL contribution is much larger than that of Oregon cabezon. This may require some form of risk mitigation.

Removing the Washington stocks from the complex to create a new, two-species complex (Option 2) reduces the overfishing risk, because their ACL contributions are relatively small compared to the inflator stocks – Oregon Kelp greenling and leopard shark – in the Other Fish Complex. The new complex would combine relatively equivalent contributions; for example, in 2019 the Washington cabezon ACL contribution would be 4.6 mt and the Washington kelp contribution would be 5.9 mt.

Proposal 3 acknowledges that both proposal 1 and 2 could be adopted. The risks of this proposal are, therefore, the net of the risk described above.

4.3.1.3 Remove Automatic Authority Established in Conjunction with Amendment 21-3 for Darkblotched Rockfish and POP in the At-Sea Sector

Currently, NMFS has the automatic authority to close either at-sea sector if a sector were projected to exceed either the darkblotched rockfish or POP set-aside value plus the buffer. Set asides are amounts deducted from the trawl allocation to account for these incidentally-caught species. The buffer is an amount deducted from the ACL as part of the process of determining the fishery harvest guideline (which serves as the basis of allocating between trawl and nontrawl fisheries) and is intended to account for higher than expected incidental catch. The set asides and buffer essentially function as an accounting and monitoring method without establishing a formal allocation for these species. As part of the proposed action there would be no buffer amount for the 2019-2020 biennial period. In this instance, coupled with automatic action authority to close the fishery, the set asides alone would, in essence, function as allocations for the at-sea sectors. Under this new management measure, the Council is considering removing the automatic authority for these species so that they are managed like all other at-sea set-asides. Unlike other set asides that apply to the at-sea sector as a whole, separate set asides are established for the catcher-processer and mothership portion of the at-sea sector for these two species. Separate set asides help the at-sea sectors track catch for accountability. For management tracking the combined values for the sectors against the trawl allocations and the ACLs is more relevant.

The analysis in Appendix C finds, through bootstrap simulation, only a 1% chance that the combined set asides would be exceeded. Furthermore, shoreside IFQ catch of these two stocks historically has been well below its allocation. Catch projections for the 2019-20 biennial period estimate similarly low attainment. The risk of exceeding the set asides is further mitigated through available inseason management measures in the form of Bycatch Reduction Areas, which are closures of depths shallower than 75, 100, or 150 fathoms applicable to fisheries using midwater trawl gear.

The analysis in Appendix C (section C.3.2) finds:

- This measure may allow at-sea sectors to increase their attainment of whiting.
- The risk of overfishing on darkblotched rockfish and POP is low. Catch of these species in the at-sea sector may increase but attainment of allocations by other sectors has been low so there is little risk of exceeding the trawl allocation of the ACL.
- Catch of other co-occurring species may increase as well including other set-aside species and nongroundfish. While catches may vary with this management measure if vessels alter their fishing behavior, the impacts are likely to be within the normal range of bycatch of nongroundfish species.

4.3.1.4 Lingcod and Sablefish Discard Mortality Rates in the Shorebased IFQ Program

This management measure would reduce the current 100% IFQ discard mortality rates (DMRs) used in catch accounting of quota pounds (QPs) in the shoreside IFQ fishery to the lower DMRs for lingcod and sablefish shown in Table 4-4. These are the DMRs – endorsed by the Council's SSC – are used by the West Coast Groundfish Observer Program (WCGOP) for catch accounting and stock assessors to determine fishing mortality.

Table 4-4. Proposed DMRs for sablefish and lingcod for QP accounting.

Species	Gear	WCGOP DMRs ("survival credit")
Lingcod	Bottom Trawl	50%
	Fixed Gear	7% [a/]
Sablefish	Bottom Trawl	50%
	Fixed Gear	20% [b/]

[a/] Only for hook and line gear
[b/] Applies to both pot and hook and line gear

Using these DMRs represents a more risk prone management policy, because managing the IFQ fishery for total catch would, for these two species, shift to managing for total fishing mortality. The current policy creates an inherent buffer between the catch limit (or sector allocation) and actual fishing mortality, which is the direct impact on the stock. This would be eliminated in a shift to managing for fishing mortality. This risk could be greater if survival credits lead to higher discard rates due to high-grading.

In the case of sablefish there is a substantial price difference across different size grades so a harvester could be motivated to discard smaller, lower value sablefish in the expectation that some of the resulting survival credit could be realized in landings of larger, higher value sablefish. The analysis in Appendix C demonstrates that trawlers are unlikely to increase gross revenue through high-grading, even if discarding the smallest, lowest value grade. An equivalent analysis for the fixed gear portion of the IFQ fishery yields similar results except in the case of the smallest size grade. However, the contributions to gross revenue would be small and likely outweighed by the implicit cost of the discarding activity. Thus, if considering sablefish discarding by itself, the current low discard rates in the IFQ fishery are likely to continue.

However, the Appendix C analysis also considers the interaction between sablefish discard credits and the opportunity to land co-occurring species in the trawl fishery. Because of the difference in allocation amounts, sablefish acts as a constraint in realizing the allocations of these other species, Dover sole and thornyheads. Increased sablefish discarding to access these species is unlikely both because current market conditions are likely acting as a greater constraint on landing more of those species and, as with discarding low value sablefish for higher value sablefish, the gains would be too small to motivate a behavioral change.

In the IFQ fishery most lingcod are caught by trawl gear. (IFQ fixed gear vessels fish exclusively for sablefish, which usually occur at deeper depths than lingocod.) The potential for high-grading lingcod is much less than for sablefish, because there are no price-differentiated grades for this fish and catch is well below the sector allocation. Discarding of this fish is mainly driven by a regulated minimum size and this would continue to be the case if survival credits were implemented.

In conclusion, implementing survival credits is not expected to increase discarding in the IFQ fishery, because the costs of discarding likely would outweigh the benefits. Landings would likely increase by an amount roughly equivalent to the proportion of discard survival currently debited against QP. Since sablefish discards are currently low, this increase in landings (and consequent fishing mortality) would be modest – an additional 5-11 mt for trawl and 9-16 mt for fixed gear, which would be only about a one percent increase in total coastwide IFQ mortality. Although higher landings would increase IFQ attainments, the IFQ sector would still be managed to its individual (i.e., QP) and sector allocations, presenting a low risk that the ACL would be exceeded.

4.3.1.5 Adjustments to the Non-Trawl Rockfish Conservation Area in California

RCAs were originally established in the early 2000s to protect rockfish species, which had recently been declared overfished. The primary goal of the non-trawl RCA between 42° N. latitude and 40°10' N. latitude is to limit catches of widow, canary, and yelloweye rockfish by fixed gear vessels in the groundfish fishery. By closing depth zones encompassing areas of highest abundance, RCAs reduce catch in support of limits set according to management targets. Widow and canary rockfish have been declared rebuilt and catch limits have consequently increased and catches can be effectively managed to targets with measures other than RCA depth closures. Opening this area would present a risk to yelloweye rockfish, which is a rebuilding stock and subject to a relatively low ACL.

However, according to the analysis in Appendix C, the likelihood of this management measure increasing encounters of yelloweye rockfish is small, because only 0.3% (0.38 sq. miles out of 140.51 sq. miles) of the predicted seabed habitat type in the area to be opened is classified as "hard."[8] On the other hand, vessels are unlikely to distribute uniformly across different substrate types and may fish at higher rates over hard substrate, depending on targeting strategy. This could increase yelloweye rockfish catch, since they prefer hard substrate habitat. As described in Section 3.2.1.3, yelloweye rockfish prefer boulder areas in deep water (>180 m), steep cliffs, and offshore pinnacles while juveniles prefer shallow-zone broken-rock habitat, which suggests they are more likely to be found in areas classified as hard in the EFH data.

The risk of overfishing is also mitigated by the increase in harvest specification amounts that may be implemented in the 2019-20 biennial period. As shown in Table 2-1, the 2019 default ACL is 29 mt, an increase from the 2018 ACL of 20 mt. A large proportion of the 2019 mt default ACL (21.3 mt) is allocated to the non-trawl portion of the fishery, which covers limited entry and open access fixed gear. Shoreside IFQ vessels using fixed gear are also subject to the nontrawl RCA but operate under the allocation to that sector of the fishery. Since the IFQ fishery features vessel-level catch accountability and is fully observed, top-down catch controls such as area closures are less relevant.

4.3.1.6 Modify Commercial Fixed Gear and Recreational Fishery Depths inside the Western Cowcod Conservation Area

Two CCAs (Western and Eastern) were originally established in 2001 as an overfished species rebuilding measure for cowcod, which had been recently declared overfished. The CCAs close areas to fishing in the main portion of the species' depth range to reduce catch and consequent mortality, in order to meet rebuilding plan objectives. The western CCA encompasses 5,126 sq. miles and is located in the Southern California Bight.

[8] Substrate classifications are derived from maps prepared for the groundfish 5-year EFH review project NMFS. 2013. Groundfish Essential Fish Habitat Synthesis: A Report to the Pacific Fishery Management Council. NOAA NMFS Northwest Fisheries Science Center, Seattle..

This measure would increase fixed gear and recreational fishing opportunity within the Western CCA by increasing the permitted fishing depths around islands enclosed by the CCA. As discussed in Appendix C, this would lead to modest increases in catch of various target species. In the commercial fisheries these are principally shelf rockfish, bocaccio, nearshore rockfish, and lingcod. Recreational fishery targets include shelf rockfish, bocaccio, and deeper nearshore rockfish. Commercial fishery effort in the current open area within 20 fathoms has been modest, because the returns do not justify the cost of accessing these areas. Descending devices are required in the recreational fishery to reduce bycatch mortality of cowcod and canary and yelloweye rockfish.

As noted, the CCA were implemented as part of the rebuilding strategy for cowcod. Cowcod are found at the highest densities in depths of 100 fathoms to 130 fathoms (PFMC 2018). No cowcod catch was documented in WCGOP observed fixed gear sets made in the western CCA between 2002 and 2016. In 2014, the NFWSC hook and line survey for shelf rockfish was allowed to operate inside the CCA. In the two years that the survey has been allowed to operate inside the CCA, zero cowcod have been encountered inside 40 fathoms or outside the RCA in those depths over the entire 12-year survey period. The change in cowcod status is also a basis for making this management measure change. The depletion estimate in the most recent stock assessment (Dick and MacCall 2013) is 34% and the rebuilding plan target year is 2020. There is also evidence of strong recruitment. This assessment is much more optimistic than previous assessments and suggests that the risk that this measure would compromise stock rebuilding objectives is low.

An ancillary benefit of this closed area is a reduction of fishing mortality on bronzespotted rockfish, a shelf species that may have been depleted in the 1980s with a life history similar to cowcod. However, increased fishing mortality is unlikely, because bronzespotted rockfish occur deeper than 40 fathoms, the maximum depth proposed to be opened under this management measure change.

While catch of cowcod would increase, fishing mortality is expected to be well within the nontrawl allocation so the risk of overfishing would be negligible. Although this measure could increase catch of lingcod, a trip limit reduction proposed for 2019-2020 is expected to keep catches within the non-trawl allocation and harvest specifications.

4.3.2 Physical Environment including Essential Fish Habitat

Evaluation of impacts to the physical environment focuses on groundfish EFH, because this is the habitat principally affected by the groundfish fishery.

Of the six new management measures evaluated under the action alternatives (see section 2.2.2), only adjusting the seaward boundary of the Non-trawl RCA and the shoreward, depth-based boundary in the Western CCA for open access fixed gear and recreational fisheries would have discernable impacts on groundfish EFH beyond those previously disclosed in the 2015 EIS. These actions would open areas that have been previously closed to fishing to gear types other than trawl. Section 4.1.1 in the 2015 EIS evaluates the long-term impacts of groundfish fishery management on EFH. Effects on EFH are a function of the distribution of fishing effort by gear type. Generally, for a given habitat type dredge and trawl gear are likely to have a greater effect than other bottom contacting gear types (e.g., demersal longline and pot gear, recreational gear), because the contact is more extensive. Biogenic and hard bottom habitats may be substantially modified with relatively little fishing effort. These new measures apply to gear types that have the potential to result in moderate impacts (commercial pot and longline gear) to negligible impacts (recreational gear).

The area of the Non-trawl RCA proposed to be opened is 99.7% soft substrate with relatively few observations of habitat forming organisms according to information provided in Appendix C. Soft substrate within the area to be opened is unlikely to be materially affected by fixed gear while hard substrate may be moderately affected, for example by entanglement of line gear on outcrops or biogenic habitat and contact by fishpots.

Figures in Appendix C show that in the Western CCA hard substrate occurs shoreward of the proposed 40 and 30 fathom depth-based boundaries as well as the 20 fathom depth contour within which fishing is currently allowed in all proposed areas except around San Nicolas Island. Hard substrate is most extensive in the areas proposed to open around Tanner and Cortes Banks. Around Tanner Bank the area open to fishing would increase by a maximum of 8.2 sq. miles if the 40 fathom boundary is implemented; around Cortez Bank it would increase by at most 21.3 square miles. Around Santa Barbara Island, where hard substrate is less extensive, the maximum increase in the area open to fishing would be 2.7 sq. miles. Permitting fishing in these areas would have a modest adverse effect on groundfish EFH, because of the greater sensitivity of hard substrate to the effects of benthic fishing gear.

As stated in the analysis in Appendix C (sections C.3.4-C.3.6), the non-trawl RCA and Western CCA proposals are not expected to change fishing activity as to adversely affect Essential Fishing Habitat (EFH) compared to the current or baseline as analyzed in the 2015 EIS.

4.3.3 Protected Species

Eulachon

Eulachon are bycatch in groundfish trawl fisheries, and the distribution of total bycatch among fisheries varies from year to year. The current ITS amount has been exceeded and this has triggered reinitiation of section 7 consultation under the ESA. Three proposed new management measures applicable the trawl fishery are analyzed for environmental effects: 1) Salmon Incidental Take Statement: Mitigation Measures and Reserve Rule Analysis; 2) Remove Automatic Authority Established in Conjunction with Amendment 21-3 for Darkblotched Rockfish and POP in the At-Sea Sector; and 3) Lingcod and Sablefish Discard Mortality Rates in the Shorebased IFQ Program.

Complying with the RPMs in the salmon BiOp to be implemented as part of the biennial process could reduce operational flexibility, because of bycatch avoidance strategies adopted by harvesters, mitigation measures implemented by the Council and NMFS, and the risk of fishery closure if a sector-specific threshold amount plus the Reserve is exceeded.

According to Appendix C (section C.3.2), removing the automatic action authority for darkblotched rockfish and POP set asides is not likely to cause any adverse effects to eulachon because there is likely a relationship between bycatch and the abundance level. Re-consultation is still ongoing and the new threshold has yet to be determined. However, the Council's non-salmon ESA working group has stated that the current ITS take amount may not be appropriate and recommended that the threshold include a large variation to account for fluctuations in abundance (Agenda Item F.5.a, GESW Report, April 2017).

The analysis in Appendix C (section C.3.3) on lingcod and sablefish discard mortality rates for the shorebased IFQ program notes that the 2012 BiOp (NMFS 2012b) on non-salmonid ESA-listed species reached a no jeopardy conclusion.

The net effect of applying these measures on eulachon bycatch would be related to changes in the timing and location of fishing due to these management changes, if there is a correlation between the operation of the fishery and the rate of eulachon bycatch. As discussed above, two measures are likely to increase operational flexibility while one may reduce it so the net effect may be negligible to moderately adverse.

Humpback Whale

As discussed in section 3.4.2, humpback whales have been taken in the fixed gear fishery targeting sablefish. Observed entanglements increased substantially in 2016 and 2017 as humpback whales foraged closer to shore, especially in Central California, although most entanglements for which gear type could be documented were with crab pot gear.

Four new management apply to fixed gear fisheries: the salmon BiOp RPMs, QP accounting survival credits in the shoreside IFQ fishery, the Non-trawl RCA boundary change, and the Western CCA boundary change.

Under salmon BiOp RPM #3, closure of the non-whiting portion of the groundfish fishery (which includes fixed gear) would occur if the threshold amount and Reserve were exceeded in any one year. Closing the fishery sector is likely to occur infrequently, if at all, because the Council and NMFS would likely implement other measures to reduce salmon bycatch before the threshold and Reserve is exceeded. A closure would have a modest beneficial effect on the take of humpback whales, because the risk of takes would be eliminated during the closure period.

Lingcod and sablefish survival credits applicable to the fixed gear portion of the shoreside IFQ fishery could moderately increase landings of lingcod and sablefish according to the analysis in Appendix C. This could allow greater fishing opportunity, other things being equal. Neither the change in fishing opportunity nor the effect of such a change on the risk of humpback whale takes can be predicted. The analysis in Appendix C (section C.3.3) notes that the 2012 BiOp (NMFS 2012b) reached a no jeopardy conclusion, suggesting the operation of the fishery is unlikely to result in adverse effects on listed species.

The change in the Non-trawl RCA seaward boundary would reduce its extent by 243 sq. miles, 17% of the area between 40°10’N latitude and 42°N latitude; one entanglement was observed in that region during 2016. The analysis in Appendix C, section C.3.4, concludes that management measure is not expected to affect ESA-listed species and/or non-listed marine mammals and seabirds.

The proposed expansion of areas where fixed and recreational fishing gear would be allowed in the Western CCA would at the maximum result in an increase in fishing area of 140 sq. miles (if the depth restriction increases to 40 fathoms). Recreational fishing gear poses little risk for entanglement leading to serious injury or mortality because the gear is light weight and not likely to seriously impair an animal; furthermore it is unlikely that recreational fishers would be close enough to humpback whale so that their gear could become entangled. Commercial fixed poses a greater risk, because the float lines are heavier and affixed to the bottom. Seven humpback whales were observed entangled in commercial fixed gear in the Southern California Bight in 2016, the region where the Western CCA is located. This suggests an elevated risk of whale entanglements with groundfish fixed gear if the management measure is implemented. However, the Analysis in Appendix C, sections C.3.5 and C.3.6, concludes that there would be no effect of the measure on protected species.

Based on the analyses in Appendix C, the combined effect of these four measures applicable to the fixed gear fishery on the likelihood of humpback whale take is likely to be low.

Short-Tailed Albatross

Observed takes of short-tailed albatross have occurred in the fixed gear longline fishery. Although not observed in the trawl fishery, bird strikes on trawl gear cables, especially the third wire used for telemetry, entanglement in nets have been observed, and albatrosses are more vulnerable due to their large wingspan (USFWS 2017, page 37). The highest concentrations of short-tailed albatross are found in the Aleutian

Islands and Bering Sea (primarily outer shelf) regions of Alaska, but subadults appear to be distributed along the Pacific Coast of the U.S. more than has been previously reported (USFWS 2017, page 20).

Four new management apply to fixed gear fisheries: the salmon BiOp RPMs, QP accounting survival credits in the shoreside IFQ fishery, the Non-trawl RCA boundary change, and the Western CCA boundary change.

The salmon BiOp RPMs impose a remote risk of fishery closure while the remaining three measures may modestly increase operational flexibility. Given the distribution of short-tailed albatross is more concentrated in boreal regions, their occurrence in the region of the Western CCA is likely to be rare so any increased fixed gear fishing activity in the relatively small shoreward areas proposed to be opened is likely to pose a negligible risk with respect to takes. The Non-trawl RCA boundary change is in a more northerly region and opens 243 sq. miles previously closed to fishing. To the degree that the location and intensity of fishing effort changes, the risk of short-tailed albatross could increase. QP accounting survival credits may allow IFQ vessels to increase landings slightly, which could result in a marginal increase in fishing effort. This could result in a marginal increase in the risk of short-tailed albatross takes.

Similarly, measures affecting the trawl fishery have mixed effects. Three proposed new management measures applicable the trawl fishery are analyzed for environmental effects. None of these measures would directly affect take of short-tailed albatross but may have a modest effect on the operation of trawl fisheries, which could indirectly affect take. Two measures – changing POP and darkblotched set aside management and revising sablefish and lingcod bycatch mortality rates – provide greater operational flexibility and/or fishing opportunity for IFQ at-sea whiting or trawl sectors. Complying with the RPMs in the salmon BiOp to be implemented as part of the biennial process could reduce operational flexibility, because of bycatch avoidance strategies adopted by harvesters, mitigation measures implemented by the Council and NMFS, and the risk of fishery closure if a sector specific threshold amount plus the Reserve is exceeded.

It is impossible to predict the actual changes in the timing and location of fishing due to these management changes, nor is there a clear correlation between the operation of the fishery and the risk of short-tailed albatross take. The analyses of these measures in Appendix C concludes that these measures would not affect seabirds.

Salmon

As with the evaluation of impacts to other ESA-listed species above, the new management measures, other than measures implemented through the biennial process in response to the 2017 BiOp, would affect salmon bycatch indirectly to the extent that they change operational characteristics of the groundfish fishery. Historically, salmon bycatch has mostly comprised Chinook salmon with small amounts of coho salmon. Most of the bycatch has occurred in the groundfish trawl fishery and in particular fisheries targeting Pacific whiting with midwater gear. This is reflected in threshold values presented in the BiOp ITS as a guide for conditions that would trigger reinitiation of consultation. The take guideline for the whiting trawl fishery is 11,000 Chinook and 474 coho salmon and for the nonwhiting fishery sectors (including trawl, commercial fixed gear, and recreational) is 5,500 Chinook and 560 coho salmon. (These values exclude the Reserve amount considered for extreme bycatch events.)

Within the nontrawl fishery bycatch estimates for the nonwhiting nontrawl part of the fishery are 404 Chinook and 494 coho salmon. Given the small amount of bycatch involved, new management measures exclusively affecting the nonwtrawl fishery (changing the seaward boundary of the nontrawl RCA, modifying allowable fishing depths in the Western CCA) are likely to have a negligible impact on salmon bycatch.

As discussed in section 4.3.1.4, sablefish and lingcod survival credits for the shoreside IFQ fishery could result in a modest increase in landings of these species, because QP would apply only to landings plus estimated discard mortality rather than total catch. To the degree that this results in some increase in fishing opportunity and fishing effort the risk of increased salmon bycatch could increase. But the likelihood that this measure would substantially contribute to increased salmon bycatch in relation to the ITS thresholds in negligible.

Eliminating the buffer and automatic authority to close at-sea whiting sectors if set aside amounts are exceeded would result in a remote chance that the fishery would continue to operate in a situation where currently it would be closed, which could result in an increase in salmon bycatch that otherwise would not occur. As discussed in Appendix C analysis of measures in response to the ITS terms and conditions, this change, along with higher ACLs for darkblotched rockfish and POP, could result in a more northern distribution of fishing effort than what has occurred in the recent past. The salmon BiOp concluded that a northerly distribution is likely to result in lower salmon bycatch. Overall, it is not possible to predict the increase in bycatch directly attributable to this management measure change but it is likely negligible to modestly beneficial.

As described in sections 2.2.2 and 3.4.4, the proposed action includes addressing several terms and conditions in the salmon BiOp ITS (NMFS 2017). The Council will consider measures at its April meeting. Once proposed measures are adopted their effects will be described here. Appendix C contains a preliminary analysis and proposed alternatives for Council consideration.

4.3.4 Socioeconomic Environment

4.3.4.1 Estimated Ex-Vessel Revenue and Income and Employment Impact of the Integrated Alternatives

This section evaluates the effects of the alternatives on fishery participants and fishing communities. As described in Appendix A, the Status Quo scenario characterizes catch, landings, and recreational fishing effort in 2017 using the same GMT catch projection methods applied to the alternatives. (Section 3.5 supplements this characterization of the baseline with landings and ex-vessel revenue amounts recorded in the PacFIN database.)

Status Quo represents the environmental baseline using regulations in place towards the end of 2017. However, to better compare socioeconomic effects across the alternatives the assumption about whiting landings has been changed from the Appendix A description. The Appendix A environmental baseline includes the reapportionment of unused tribal fishery quota to the commercial fishery, which may occur late in the year and did in 2017. The other alternatives representing 2019-20 whiting catch use the 2017 allocations prior to any reapportionment. A comparison under these assumptions results in a decline in whiting ex-vessel revenue (and associated income and employment) that is only an artifact of the underlying assumption relative to reapportionment. Instead, the un-apportioned 2017 allocations are used across both the baseline scenario and the alternatives.

Various methods are used to estimate how conditions may change from the 2017 Status Quo baseline, either by applying harvest specifications based on default HCRs and compliant management measures (No Action Alternative) or under the action alternatives, which contain different ACLs for key stocks and default ACLs for the remaining stocks.

The most important driver for fishery impacts is the increases in the yelloweye rockfish ACL across the alternatives compared to the 2017 Status Quo baseline. Changes in stock rebuilding policies may be evaluated with respect to the admonition in the MSA to ‘rebuild in as short a time as possible while taking into account the needs of fishing communities.' Since rebuilding in as short a time as possible, would require no yelloweye fishing mortality, it is reasonable to conclude that the groundfish fishery would have to be closed entirely, because there is some risk of yelloweye catch no matter the management limits imposed. From a socioeconomic standpoint, the ex-vessel revenue and personal income estimates enumerated below would be foregone under this scenario. That loss in revenue and personal income is can be used to gauge the tradeoff between rebuilding rapidly and 'meeting the needs of fishing communities.'

The 2015 EIS describes the models and data used to project socioeconomic impacts. Updated documentation of the models may be found in Appendix D. Projection models include:

- GMT catch projection models for different commercial sectors of the groundfish fishery
- GMT fishing effort (angler trips) projection models for the recreational groundfish fishery
- The landings distribution model (LDM), which is used to estimate where landings are likely to occur and the resulting port-level ex-vessel revenue
- The IOPAC model used to evaluate the effect of the alternatives on coastal communities (ports where commercial groundfish landings and recreational groundfish effort occur) by estimating personal income generated ("income impacts") and associated employment
- Net revenue in commercial fishery operations based on projected landings and vessel cost earnings surveys.

The following sections assess socioeconomic impacts in terms of:

- Changes in commercial ex-vessel revenue by fishery sector
- Change in recreational angler trips by community
- Change in net revenue by fishery
- Change in income and employment impacts by community resulting from changes in commercial landings revenue and recreational effort.
- Change in Ex-Vessel Revenue and Angler Trips

Commercial Fisheries

Revenue estimates are based on projected landings estimates from the GMT models referenced above. Table 4-5, Table 4-6, and Table 4-7 compare ex-vessel revenue estimates under the alternatives to the Status Quo. Projections assume average ex-vessel prices observed in 2017. Effects are presented according to groundfish fishery "sectors," which are described in Section 3.5.1.

A number of caveats apply to modeling commercial fishery impacts presents. Effort displaced by management measures is assumed not to switch readily into another fishery sector or geographic region. Landings projection models and 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. Catch projections in the IFQ fishery may not reflect the leveraging effect of increases in ACLs for "choke" species (those with low ACLs/allocations). 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. Stock recruitment variability and catch monitoring uncertainty mean that actual catches may differ from the projections. Although actual ACL attainment may differ from projections, inseason management measures are applied to prevent ACLs from being exceeded. As noted above, the Pacific whiting TAC is determined annually, consistent with the Agreement with Canada on Pacific Hake/Whiting; 73.88% of the TAC is allocated to U.S. fisheries. Since the TAC and resulting allocation is not determined during the harvest specifications process, a historical TAC is used to estimate socioeconomic impacts. The actual TACs for 2019 and 2020 could be higher or lower than the assumed value.

Under the alternatives annual average coastwide ex-vessel revenue for the 2019-20 period increases from the 2017 baseline by slightly over $2 million to $141.5 million. There is a very slight difference in ex-vessel revenue of $13,000 between No Action and Alternatives 1and 2, which is likely with the range of error in these estimates; effectively there is no discernable difference in ex-vessel revenue across the alternatives. For comparison, rebuilding yelloweye rockfish in the shortest time possible would require eliminating all fishing mortality on the stock. To completely eliminate this risk, all groundfish fisheries would have to be closed resulting in having to forgo this ex-vessel revenue in 2019-20.

By fishery sector ex-vessel revenue estimates are as follows:

- The TAC for Pacific whiting is set annually outside of this harvest specifications process. Because the 2019-2020 TAC and allocations are assumed to be the same as in 2017 there is no difference from the baseline for the whiting fisheries. Shoreside whiting revenue is estimated to be 21 million, the commercial at-sea sectors at $35 million, and the tribal at-sea fishery at $7 million.
- Estimated shoreside IFQ fishery ex-vessel revenue averages $38.4 million annually in 2019-20, with a very slight difference of $13,000 between No Action and Alternatives 1 and 2. Across fishery sectors, this is the only difference among the alternatives and, as noted above, is like within the range of error for these estimates. Estimated average ex-vessel revenue is $526,000-$539,000 higher than the Status Quo baseline estimate, a 1.4% increase. As discussed in Appendix A, notable increases in catch and landings are projected for bocaccio, cowcod, lingcod, and yelloweye rockfish. Increases in yelloweye rockfish ACLs and allocations are an important driver as this is a key choke species for some fishing strategies, because low QP holdings at the vessel level contribute to risk averse fishing strategies.
- The limited entry fixed gear and nonnearshore open access sectors target sablefish with sablefish landings accounting for around 85% of ex-vessel revenue (see Groundfish SAFE Table 8b). Both these sectors show a 4.8% increase in average ex-vessel revenue under the alternatives compared to the baseline. The limited entry sector realizes greater revenues, estimated to average $19.8 million in 2019-20 compared to $3.8 million for the nonnearshore open access sector. These projected increases in ex-vessel revenue are mainly due to the increase in the sablefish ACL and resulting allocations under the default HCR.
- Nearshore open access sector primarily targets rockfish, cabezon, and lingcod with black rockfish accounting for the largest share of any one species (see Groundfish SAFE Table 9b). Average annual ex-vessel revenue is estimated to increase by $175,000 to $3.6 million in 2019-20, representing an almost 20% gain. Although a large percentage gain for this fishery sector, the nearshore sector is a small contribution to shoreside revenue coastwide, although it is important in Southern Oregon and Northern California fishing communities.

Table 4-5. Estimated ex-vessel revenues by groundfish harvest sector under the alternatives (2017 $million).

	Status Quo	No Action		Alternative 1		Alternative 2	
		2019	**2020**	**2019**	**2020**	**2019**	**2020**
Shoreside Sectors:							
Whiting	21.1	21.1	21.1	21.1	21.1	21.1	21.1
Non-whiting Trawl+Non-trawl IFQ	37.9	38.6	38.3	38.6	38.3	38.6	38.3
Limited Entry Fixed Gear	18.9	19.7	20.0	19.7	20.0	19.7	20.0
Nearshore Open Access	4.5	5.3	5.3	5.3	5.3	5.3	5.3
Non-nearshore Open Access	3.6	3.8	3.8	3.8	3.8	3.8	3.8
Incidental Open Access	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Tribal (incl. whiting)	11.7	11.3	11.4	11.3	11.4	11.3	11.4
Shoreside sectors' Totals	**97.9**	**99.9**	**100.0**	**99.9**	**100.0**	**99.9**	**100.0**
At-sea Sectors:							
Non Tribal Whiting	34.6	34.6	34.6	34.6	34.6	34.6	34.6
Tribal Whiting	6.9	6.9	6.9	6.9	6.9	6.9	6.9
At-sea sectors' Totals	**41.5**	**41.5**	**41.5**	**41.5**	**41.5**	**41.5**	**41.5**
TOTAL Groundfish Revenue	**139.4**	**141.4**	**141.5**	**141.4**	**141.5**	**141.4**	**141.5**

Table 4-6. Change in groundfish ex-vessel revenues from Status Quo by groundfish harvest sector under the action alternatives (2017 $million).

	Status Quo	No Action	Alternative 1	Alternative 2
		2019-20	**2019-20**	**2019-20**
Shoreside Sectors:				
Whiting	*21.1*	+0.000	+0.000	+0.000
Non-whiting Trawl+Non-trawl IFQ	*37.9*	+0.526	+0.539	+0.539
Limited Entry Fixed Gear	*18.9*	+0.905	+0.905	+0.905
Nearshore Open Access	*4.5*	+0.826	+0.826	+0.826
Non-nearshore Open Access	*3.6*	+0.175	+0.175	+0.175
Incidental Open Access	*0.2*	+0.000	+0.000	+0.000
Tribal (incl. whiting)	*11.7*	-0.403	-0.403	-0.403
Shoreside sectors' Totals	***97.9***	**+2.029**	**+2.043**	**+2.043**
At-sea Sectors:				
Non Tribal Whiting	*34.6*	+0.000	+0.000	+0.000
Tribal Whiting	*6.9*	+0.000	+0.000	+0.000
At-sea sectors' Totals	***41.5***	**+0.000**	**+0.000**	**+0.000**
TOTAL Groundfish Revenue	***139.4***	**+2.029**	**+2.043**	**+2.043**

Table 4-7. Change in groundfish ex-vessel revenues from Status Quo by groundfish harvest sector under the action alternatives (percent).

	Status Quo	No Action	Alternative 1	Alternative 2
		2019-20	**2019-20**	**2019-20**
Shoreside Sectors:				
Whiting	*21.1*	+0.0%	+0.0%	+0.0%
Non-whiting Trawl+Non-trawl IFQ	*37.9*	+1.4%	+1.4%	+1.4%
Limited Entry Fixed Gear	*18.9*	+4.8%	+4.8%	+4.8%
Nearshore Open Access	*4.5*	+18.6%	+18.6%	+18.6%
Non-nearshore Open Access	*3.6*	+4.8%	+4.8%	+4.8%
Incidental Open Access	*0.2*	+0.0%	+0.0%	+0.0%
Tribal (incl. whiting)	*11.7*	-3.4%	-3.4%	-3.4%
Shoreside sectors' Totals	***97.9***	**+2.1%**	**+2.1%**	**+2.1%**
At-sea Sectors:				
Non Tribal Whiting	*34.6*	*+0.0%*	*+0.0%*	*+0.0%*
Tribal Whiting	*6.9*	*+0.0%*	*+0.0%*	*+0.0%*
At-sea sectors' Totals	***41.5***	***+0.0%***	***+0.0%***	***+0.0%***
TOTAL Groundfish Revenue	*139.4*	***+1.5%***	***+1.5%***	***+1.5%***

Recreational Fisheries

For recreational fisheries, projected marine area angler boat trips taken in groundfish plus Pacific halibut recreational fisheries are compared to Status Quo fishing effort under the proposed management alternatives. Table 4-8, Table 4-9, and Table 4-10 compare average annual recreational angler trips under Status Quo to projected angler effort under the alternatives. Results are shown by coastal regions that are aggregated from statistical reporting regions.[9]

The Council wished to explore a number of recreational management options under each of the alternative ACLs and allocations. Most of these management variations have a modest effect on project angler fishing effort. To produce a tractable number of projections that cover the range of potential effort levels, the alternatives and these management options are presented in two alternatives in addition to No Action,. For more information about the proposed management options see Appendix A. Projected increases in recreational fishing effort are as follows:

- Coastwide recreational effort increases from the 2017 baseline marginally under No Action. Under Alternatives 1 and 2 recreational fishing effort is projected to increase by 26% overall. Changes in recreational fishing effort are mainly driven by increases in yelloweye allocations.
- Recreational fishing effort for the Washington Coast is projected to increase from the 2017 Status Quo baseline under the alternatives ranging from 3.6% to 12.6%. Washington accounts for 5% of coastwide fishing effort under the baseline. Increases in fishing effort across the alternatives is due to the relaxation of management restrictions associated with constraining the catch of yelloweye rockfish.

[9] The Puget Sound region is not shown in these tables because Council managed recreational fisheries do not occur in this region.

- The three coastal regions of Oregon together account for 14% of baseline effort. Recreational fishing effort in Oregon is not projected to change from the 2017 baseline under the alternatives. This results from the assumptions made in state's recreational projection model; although recreational management measures would change, a response in terms of increased effort is not modeled both because it is believed the management measure changes would not prompt increased effort or the fishery constraints due to species other than yelloweye rockfish would prevent effort increases.
- California recreational fishing effort would increase by the same amount under Alternatives 1 and 2 but no change is projected under No Action. Southern California accounts for the largest share of coastwide recreational angler trips, slightly more than half of the coastwide total, and the Santa Barbara to San Diego region also shows the largest absolute changes in effort, an increase of 148,000 trips or+35%. Equivalent relative increases are projected for the Crescent City-Eureka and Fort Bragg-Bodega Bay areas. The regions from San Francisco to Morro Bay are projected to increase recreational effort by 23% to 25%. The projected increase under No Action is due to allowing the fishery at deeper depth in some times and areas. Under Alternatives 1 and 2, fishing would be allowed at all depths and times of the year, resulting in the substantial increase in projected fishing effort.

Table 4-8. Estimated Recreational Effort (halibut+bottomfish) under Status Quo and 2019-20 Alternatives (thousands of angler trips).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	43.2	44.7	44.9	48.6
Astoria-Tillamook	17.5	17.5	17.5	17.5
Newport	54.8	54.8	54.8	54.8
Coos Bay-Brookings	40.4	40.4	40.4	40.4
Crescent City-Eureka	47.3	47.3	63.7	63.7
Fort Bragg - Bodega Bay	20.8	20.8	28.0	28.0
San Francisco Area	69.1	69.1	86.4	86.4
SC – Mo – MB*	106.4	106.4	130.6	130.6
SB – LA – SD*	425.9	425.9	574.0	574.0
Coastwide Total	**825.3**	**826.9**	**1,040.2**	**1,043.9**

Table 4-9. Estimated change from Status Quo Recreational Effort (halibut+bottomfish) under the 2019-20 Alternatives (thousands of angler trips).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	*43.2*	+1.6	+1.8	+5.4
Astoria-Tillamook	*17.5*	-	-	-
Newport	*54.8*	-	-	-
Coos Bay-Brookings	*40.4*	-	-	-
Crescent City-Eureka	*47.3*	-	+16.4	+16.4
Fort Bragg - Bodega Bay	*20.8*	-	+7.2	+7.2
San Francisco Area	*69.1*	-	+17.4	+17.4
SC – Mo – MB*	*106.4*	-	+24.2	+24.2
SB – LA – SD*	*425.9*	-	+148.0	+148.0
Coastwide Total	***825.3***	+1.6	+214.9	+218.5

Table 4-10. Estimated change from Status Quo Recreational Effort (halibut+bottomfish) under the 2019-20 Alternatives (percent).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound		-	-	-
Washington Coast	43.2	+3.6%	+4.1%	+12.6%
Astoria-Tillamook	17.5	-	-	-
Newport	54.8	-	-	-
Coos Bay-Brookings	40.4	-	-	-
Crescent City-Eureka	47.3	-	+34.6%	+34.6%
Fort Bragg - Bodega Bay	20.8	-	+34.6%	+34.6%
San Francisco Area	69.1	-	+25.1%	+25.1%
SC – Mo – MB*	106.4	-	+22.7%	+22.7%
SB – LA – SD*	425.9	-	+34.8%	+34.8%
Coastwide Total	**825.3**	+0.2%	+26.0%	+26.5%

*SC – Mo – MB = Santa Cruz, Monterey and Morro Bay; SB – LA – SD = Santa Barbara, Los Angeles and San Diego.

Communities: Change in Income and Employment Impacts by Community

Socioeconomic impacts to fishing communities engaged in groundfish fisheries are evaluated based on the change in personal income (income impacts) and employment-related measures under the alternatives. These effects are a function of the projected changes in commercial landings and recreational effort described above. Comparisons are with respect to the 2017 Status Quo baseline. Impacts were estimated using the NWFSC IOPAC input-output model, and convey combined direct, indirect, and induced economic effects resulting from projected changes in recreational angling, commercial fishing, fish processing, and related input supply and support activities.

For simplification and ease of combining and comparing impacts from commercial and recreational fishing activities, coastal ports are grouped regionally. For a description of the counties included in these regions see page 378 in the 2015 EIS.

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.

Income and employment impacts from Tribal fisheries and also from Pacific whiting caught in the at-sea catcher-processor and mothership sectors are not included in these totals. The reasons are:

1. Tribal groundfish harvesting and processing are not included in any of the cost-revenue data collected by NWFSC, so the Tribal fisheries' contributions to regional income and employment impacts are not estimated.
2. While overall estimators of income and employment impacts derived from the at-sea whiting fishery (CPs and motherships) have been developed, the detail required to attribute these impacts to particular port groups have not.

Regarding the at-sea whiting fishery, presumably most of the associated income and employment impacts would likely accrue in the Seattle region; while corresponding impacts of Tribal groundfish fisheries would mostly accrue in Washington Coast communities.

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.

Table 4-11 presents estimates of personal income by region due to projected commercial groundfish fishing activity under the Alternatives. Table 4-12 and Table 4-13 compare this information relative to the 2017 Status Quo baseline. Table 4-14 presents the estimated income impacts resulting from recreational groundfish fisheries with Table 4-15 and Table 4-16 presenting the estimates relative to Status Quo. The commercial and recreational impacts are presented under No Action and the three action alternatives.

<u>Commercial Fishery Income Impacts</u>

Coastwide estimated personal income impacts from commercial groundfish fishing are estimated to be $138 million under the 2017 baseline and projected to increase to $142 million under the alternatives. There is no difference in income impacts across the alternatives. All other port areas are projected to see some increases relative to Status Quo under the three alternatives.

- Puget Sound ports show an increase of $0.5 million from Status Quo or 7% under the three alternatives.
- Oregon and Washington Coast port areas together account for 70% of estimated coastwide 2017 Status Quo baseline personal income. In combination, personal income in these communities would increase by $1.2 million, or 1%. The Coos Bay-Brookings area shows the largest percentage increase in income impacts. Nearshore fisheries are dominant in these ports and the increase in ex-vessel revenue in that fishery translates into larger income impacts.
- California accounts for 25% of coastwide Status Quo income. All California port groups are projected to see increases from the 2017 baseline under the alternatives totaling $1.6 million, a 5%

increase. The largest relative increase in personal income impact compared to Status Quo is projected for the Santa Cruz to Morro Bay region at 11% under all three alternatives; in absolute terms a $700,000 difference. Fixed gear fisheries are more important in these ports and the increase in projected landings from these fisheries accounts for increases in income impacts.

Table 4-11. Commercial fishery income impacts under the alternatives by community group ($mil) in 2019-2020. Estimates are presented as the average annual value for the two-year management period.

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	7.3	7.8	7.8	7.8
Washington Coast	20.0	20.2	20.2	20.2
Astoria-Tillamook	43.7	44.0	44.0	44.0
Newport	22.0	22.1	22.1	22.1
Coos Bay-Brookings	11.1	11.6	11.6	11.6
Crescent City-Eureka	8.5	8.6	8.6	8.6
Fort Bragg–Bodega Bay	7.3	7.8	7.8	7.8
San Francisco Area	2.7	2.9	2.9	2.9
SC–Mo–MB	5.9	6.6	6.6	6.6
SB–LA–SD	10.0	10.1	10.1	10.1
Coastwide Total	138.3	141.5	141.6	141.6

Table 4-12. Change in commercial fishery income impacts (from Status Quo) under the alternatives by community group ($mil) in 2019-2020. Estimates are presented as the average annual value for the two-year management period.

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	*7.3*	+0.5	+0.5	+0.5
Washington Coast	*20.0*	+0.2	+0.2	+0.2
Astoria-Tillamook	*43.7*	+0.3	+0.3	+0.3
Newport	*22.0*	+0.1	+0.1	+0.1
Coos Bay-Brookings	*11.1*	+0.5	+0.5	+0.5
Crescent City-Eureka	*8.5*	+0.2	+0.2	+0.2
Fort Bragg – Bodega Bay	*7.3*	+0.5	+0.5	+0.5
San Francisco Area	*2.7*	+0.2	+0.2	+0.2
SC – Mo – MB	*5.9*	+0.7	+0.7	+0.7
SB – LA – SD	*10.0*	+0.1	+0.1	+0.1
Coastwide Total	*138.3*	+3.2	+3.3	+3.3

Table 4-13. Change in commercial fishery income impacts (from Status Quo) under the alternatives by community group (percent) in 2019-2020.

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	*7.3*	+7.1%	+7.1%	+7.1%
Washington Coast	*20.0*	+1.1%	+1.1%	+1.1%
Astoria-Tillamook	*43.7*	+0.6%	+0.7%	+0.7%
Newport	*22.0*	+0.6%	+0.6%	+0.6%
Coos Bay-Brookings	*11.1*	+4.5%	+4.5%	+4.5%
Crescent City-Eureka	*8.5*	+1.9%	+1.9%	+1.9%
Fort Bragg – Bodega Bay	*7.3*	+6.5%	+6.6%	+6.6%
San Francisco Area	*2.7*	+7.8%	+7.8%	+7.8%
SC – Mo – MB	*5.9*	+11.3%	+11.3%	+11.3%
SB – LA – SD	*10.0*	+0.8%	+0.8%	+0.8%
Coastwide Total	*138.3*	+2.3%	+2.4%	+2.4%

Recreational Fishery Income Impacts

Recreational income impacts are related directly to changes in recreational fishing effort (angler trips). See the discussion above for explanations for increases in fishing effort due to management changes. Table 4-20 shows recreational income impacts under the alternatives; Table 4-21 shows the incremental change; Table 4-22 shows the percentage change.

- Coastwide recreational fishing income impacts are projected to increase by 29% and 30% under Alternative 1 and Alternative 2, respectively, with increases on the Washington Coast and in all areas of California.
- Under No Action income impacts increase by $200,000 (3%) on the Washington Coast. The Washington Coast shows relative increases under Alternatives 1 and 2, ranging from 3% to 13%, representing increases of $0.2 million and $0.9 million in income impacts, respectively.
- Recreational fishing income impacts are projected to be the same as Status Quo in Oregon across all the alternatives.
- In California the Santa Barbara to San Diego region shows the largest absolute changes in income impacts, an increase of $43.5 million under Alternatives 1 and 2. This is also the largest relative increase in projected effort (35%) under the range of alternatives. The next largest relative increases in income impacts are shown in the Crescent City-Eureka and Fort Bragg-Bodega Bay areas (35%) under Alternatives 1 and 2.

Table 4-14. Recreational fishery income impacts under Status Quo and the alternatives by community group ($ mil.).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	6.9	7.1	7.1	7.8
Astoria-Tillamook	1.8	1.8	1.8	1.8
Newport	7.9	7.9	7.9	7.9
Coos Bay-Brookings	3.3	3.3	3.3	3.3
Crescent City-Eureka	5.4	5.4	7.2	7.2
Fort Bragg - Bodega Bay	3.4	3.4	4.5	4.5
San Francisco Area	14.6	14.6	18.3	18.3
SC – Mo – MB*	16.7	16.7	20.5	20.5
SB – LA – SD*	125.1	125.1	168.5	168.5
Coastwide Total	**185.0**	**185.2**	**239.2**	**239.9**

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-15. Change in recreational fishery income impacts from Status Quo under the alternatives by community group ($ mil.).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	*6.9*	+0.2	+0.2	+0.9
Astoria-Tillamook	*1.8*	-	-	-
Newport	*7.9*	-	-	-
Coos Bay-Brookings	*3.3*	-	-	-
Crescent City-Eureka	*5.4*	-	+1.9	+1.9
Fort Bragg - Bodega Bay	*3.4*	-	+1.2	+1.2
San Francisco Area	*14.6*	-	+3.7	+3.7
SC – Mo – MB*	*16.7*	-	+3.8	+3.8
SB – LA – SD*	*125.1*	-	+43.5	+43.5
Coastwide Total	*185.0*	+0.2	+54.2	+54.8

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-16. Change in recreational fishery income impacts from Status Quo under the alternatives by community group (percent).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	*6.9*	+3.0%	+3.3%	+13.2%
Astoria-Tillamook	*1.8*	-	-	-
Newport	*7.9*	-	-	-
Coos Bay-Brookings	*3.3*	-	-	-
Crescent City-Eureka	*5.4*	-	+34.6%	+34.6%
Fort Bragg - Bodega Bay	*3.4*	-	+34.6%	+34.6%
San Francisco Area	*14.6*	-	+25.1%	+25.1%
SC – Mo – MB*	*16.7*	-	+22.7%	+22.7%
SB – LA – SD*	*125.1*	-	+34.8%	+34.8%
Coastwide Total	*185.0*	+0.1%	+29.3%	+29.6%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Employment Impacts

Table 4-17 shows projected employment impacts due to the commercial groundfish fishery under the alternatives; Table 4-18 and Table 4-19 show the impacts relative to Status Quo. Table 4-20 shows projected employment impacts due to the recreational groundfish under the alternatives; Table 4-21 and Table 4-22 show the impacts relative to Status Quo.

<u>Commercial Fishery Employment Impacts</u>

Compared to the 2017 baseline coastwide estimated employment impacts from commercial groundfish fishing are estimated to increase by 103 jobs under the alternatives, and increase of 5%.

- Puget Sound ports show an increase of six jobs from the 2017 baseline and the Washington Coast is estimated to gain four jobs.
- Oregon ports show gains in jobs ranging from three in Newport to 23 in the Coos Bay-Brookings area.
- California ports show gains in jobs of between four and 32. The largest gain is estimated to occur in the Santa Cruz-Monterey-Morro Bay area.

Table 4-17. Commercial fishery employment impacts under Status Quo (the 2017 baseline) and the alternatives by community group (number of jobs).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	81	87	87	87
Washington Coast	285	289	289	289
Astoria-Tillamook	503	509	510	510
Newport	284	287	287	287
Coos Bay-Brookings	217	240	240	240
Crescent City-Eureka	125	128	128	128
Fort Bragg – Bodega Bay	186	200	200	200
San Francisco Area	71	78	78	78
SC – Mo – MB	216	249	249	249
SB – LA – SD	200	204	204	204
Coastwide Total	2,167	2,271	2,271	2,271

Table 4-18. Change in commercial fishery employment impacts from Status Quo under the alternatives by community group (number of jobs).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	*81*	+6	+6	+6
Washington Coast	*285*	+4	+4	+4
Astoria-Tillamook	*503*	+7	+7	+7
Newport	*284*	+3	+3	+3
Coos Bay-Brookings	*217*	+23	+23	+23
Crescent City-Eureka	*125*	+4	+4	+4
Fort Bragg – Bodega Bay	*186*	+14	+14	+14
San Francisco Area	*71*	+7	+7	+7
SC – Mo – MB	*216*	+32	+32	+32
SB – LA – SD	*200*	+4	+4	+4
Coastwide Total	*2,167*	+103	+103	+103

Table 4-19. Change in commercial fishery employment impacts from Status Quo under the alternatives by community group (percent).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	*81*	+7.0%	+7.1%	+7.1%
Washington Coast	*285*	+1.4%	+1.4%	+1.4%
Astoria-Tillamook	*503*	+1.3%	+1.4%	+1.4%
Newport	*284*	+1.1%	+1.1%	+1.1%
Coos Bay-Brookings	*217*	+10.5%	+10.5%	+10.5%
Crescent City-Eureka	*125*	+3.0%	+3.0%	+3.0%
Fort Bragg – Bodega Bay	*186*	+7.5%	+7.5%	+7.5%
San Francisco Area	*71*	+10.5%	+10.5%	+10.5%
SC – Mo – MB	*216*	+14.8%	+14.8%	+14.8%
SB – LA – SD	*200*	+1.8%	+1.8%	+1.8%
Coastwide Total	*2,167*	+4.8%	+4.8%	+4.8%

Recreational Fishery Employment Impacts

Employment impacts from recreational fishing effort are projected to increase by five jobs (3%) on the Washington Coast, but be the same as the 2017 baseline in all areas of Oregon and California.

Coastwide recreational fishing employment impacts are projected to increase by 27% and 28% under Alternative 1 and Alternative 2, respectively, with increases on the Washington Coast and in all areas of California. Recreational fishing employment impacts are projected to be the same as Status Quo in Oregon.

The Santa Barbara to San Diego region shows the largest absolute changes in employment impacts, an increase of 631 jobs (35%) under Alternatives 1 and 2. This is also the largest relative increase in projected effort under the range of alternatives.

Table 4-20. Recreational fishery employment impacts under Status Quo and the alternatives by community group (number of jobs).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	182	188	188	207
Astoria-Tillamook	49	49	49	49
Newport	196	196	196	196
Coos Bay-Brookings	84	84	84	84
Crescent City-Eureka	83	83	111	111
Fort Bragg - Bodega Bay	55	55	74	74
San Francisco Area	192	192	240	240
SC – Mo – MB*	273	273	335	335
SB – LA – SD*	1,815	1,815	2,446	2,446
Coastwide Total	2,929	2,935	3,724	3,742

Table 4-21. Change in recreational fishery employment impacts from Status Quo under the alternatives by community group (number of jobs).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	*182*	+5	+6	+25
Astoria-Tillamook	*49*	-	-	-
Newport	*196*	-	-	-
Coos Bay-Brookings	*84*	-	-	-
Crescent City-Eureka	*83*	-	+29	+29
Fort Bragg - Bodega Bay	*55*	-	+19	+19
San Francisco Area	*192*	-	+48	+48
SC – Mo – MB*	*273*	-	+62	+62
SB – LA – SD*	*1,815*	-	+631	+631
Coastwide Total	*2,929*	+5	+794	+813

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Table 4-22. Change in recreational fishery employment impacts from Status Quo under the alternatives by community group (percent).

Community Groups	Status Quo	No Action	Alternative 1	Alternative 2
Puget Sound	-	-	-	-
Washington Coast	*182*	+3.0%	+3.3%	+13.5%
Astoria-Tillamook	*49*	-	-	-
Newport	*196*	-	-	-
Coos Bay-Brookings	*84*	-	-	-
Crescent City-Eureka	*83*	-	+34.6%	+34.6%
Fort Bragg - Bodega Bay	*55*	-	+34.6%	+34.6%
San Francisco Area	*192*	-	+25.1%	+25.1%
SC – Mo – MB*	*273*	-	+22.7%	+22.7%
SB – LA – SD*	*1,815*	-	+34.8%	+34.8%
Coastwide Total	*2,929*	+0.2%	+27.1%	+27.8%

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

4.3.4.2 New Management Measures Considered Under Action Alternatives 1-3

Remove the Automatic Action Authority for Darkblotched Rockfish or POP Set Asides in the At-Sea Whiting Fishery

This management measure would not change the distribution of catch opportunity among user groups, but is intended to give the at-sea sectors increased opportunities to harvest their whiting allocation by eliminating the fear of automatic closure due to the exceedance of a set-aside value for an incidentally caught species, and allowing them to fish longer for whiting in spots that previously would have been vacated if one or two darkblotched rockfish or POP were caught.

This management measure would have modestly beneficial socioeconomic impacts.

Sablefish and Lingcod Catch Mortality QP Accounting in the Shoreside IFQ Sector ("Survival Credits")

This management measure is predicted to result in a small increase in sablefish landings on the order of 5-11 mt for the trawl portion of the IFQ fishery and 9-17 mt for the fixed gear portion. This represents less than 1% of projected landings in these sectors, representing a small socioeconomic benefit.

Change the Seaward Boundary of the Non-trawl RCA between 40°10'N latitude and 42°N Latitude

This measure is expected to increase catch opportunities in California ports between 42° N. latitude and 40°10' N. latitude, particularly in the ports of Crescent City and Eureka, which historically had a larger nontrawl shelf rockfish fishery. Based on WCGOP observer data, IFQ fixed gear vessels have not fished in the depths that would be opened under this management measure change. Vessels in the fixed gear open access sector, which target species other than sablefish, such yellowtail and widow rockfish, would benefit most. At the scale of the entire groundfish fishery this would represent a modest socioeconomic benefit, but could substantially benefit fishing communities engaged in the nonsablefish fixed gear fishery.

Modify Allowable Fishing Depths in the Western CCA for Commercial Fixed Gear and/or Recreational Fisheries

Although changes are proposed under separate actions for the recreational and fixed gear commercial fisheries, no change in distribution of catch is expected between user groups. Management measures for both fisheries are designed to ensure they remain within their respective allocations. This management measure is expected to provide a positive economic impact for vessels fishing inside the CCA. The magnitude cannot be predicted but this measure would likely result in modest socioeconomic benefit.

Address Certain Reasonable and Prudent Measures in the Salmon BiOp

Implementing mitigation measures is likely to increase operational costs for groundfish trawl fisheries. This is especially true of the whiting sectors, because they have historically caught more Chinook salmon.

Stock Complex Reorganization

These changes are not expected to have discernable socioeconomic impacts.

Chapter 5 Cumulative Effects

Chapter 6 Regulatory Impact Review

Chapter 7 Initial Regulatory Flexibility Analysis

Chapter 8 Magnuson-Stevens Act and FMP Considerations

Chapter 9 Persons and Agencies Consulted

Chapter 10 References

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