GEAR CHANGES FOR THE PACIFIC COAST GROUNDFISH FISHERY'S TRAWL CATCH SHARE PROGRAM

Preliminary Draft EIS

UNREVIEWED DRAFT

This draft has not been through full NMFS/Council staff review, including General Counsel and NEPA Coordinator review.

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EXECUTIVE SUMMARY

[to be drafted]

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ACRONYMS AND ABBREVIATIONS

ABC	Acceptable biological catch
ACL	Annual catch limit
AM	Accountability measure
BMSY	Biomass of maximum sustainable yield
CCE	California Current Ecosystem
CEBA1	Comprehensive Ecosystem-Based Amendment 1
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CP	Catcher/processor
CPUE	Catch per unit of effort
Council	Pacific Fishery Management Council
CPS	Coastal pelagic species
CV	Coefficient of variation
DPS	Distinct population segment
EA	Environmental Assessment
EC	Ecosystem component
EEZ	Exclusive Economic Zone
EFH	Essential fish habitat
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionary significant unit
FEIS	Final Environmental Impact Statement
FM	Fathom
FMP	Fishery Management Plan
FMU	Fishery Management Unit
GAP	Groundfish Advisory Subpanel
GMT	Groundfish Management Team
HA	Hectares
HAPC	Habitat Areas of Particular Concern

HMS	Highly Migratory Species
HSP	Habitat suitability probability
IBQ	Individual bycatch quota
IFQ	Individual fishing quota
IPHC	International Pacific Halibut Commission
lbs	Pounds
LE	Limited entry
m	Meter
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MS	Mothership
MSA	Magnuson-Stevens Fishery Conservation and Management Act, Magnuson-Stevens Act
MSST	Minimum stock size threshold
mt	Metric ton
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OY	Optimum yield
PacFIN	Pacific Fisheries Information Network
PCG	Pacific Coast Groundfish
POP	Pacific Ocean perch
QP	Quota pounds
QS	Quota share
RecFIN	Recreational Fisheries Information Network
RCA	Rockfish Conservation Area
ROV	Remotely operated vehicle
SFFT	Selective flatfish trawl gear
SPR	Spawning potential ratio
TRREC	Trawl Rationalization Regulation Evaluation Committee
USFWS	U.S. Fish and Wildlife Service
VMS	Vessel monitoring system
WCGOP	West Coast Groundfish Observer Program

1 INTRODUCTION

This chapter establishes the framework for the proposed action and its purpose and need. It provides the history behind the proposed action, as well as a discussion of the Pacific Fishery Management Council (Council) and its responsibilities. Section 5.1 describes the National Marine Fisheries Service's (NMFS's) procedures for issuing an environmental impact statement (EIS), including its scoping process, which is separate and distinct from the Council's scoping activities.

1.1 Document Organization

Chapter 1 introduces the Proposed Action and the Purpose and Need Statement. It also provides background information relevant to proposed regulatory changes and describes the scoping process.

Chapter 2 describes the alternatives for the actions analyzed in this document. A summary table details each alternative.

Chapter 3 describes the physical, biological, and socioeconomic environments potentially affected by the proposed alternatives. This chapter details physical and biological resources, including fishery resources, threatened and endangered species and marine mammals, and other relevant biological resources. It also characterizes the socioeconomic environment, including harvesters, tribes, first receivers/processors, fishing communities, enforcement, and management.

Chapter 4 details the potential environmental consequences of each alternative on the physical, biological, and socioeconomic environments. The chapter contains an analysis of the direct and indirect effects of each alternative on the human environment. Potential impacts resulting from each action alternative are compared with the No-action Alternative to help describe the environmental consequences. The analysis also addresses cumulative effects on affected resources as they occur within specified geographic and temporal boundaries. The cumulative effects analysis addresses actions other than the proposed action, summarizing the magnitude and direction of impacts resulting from past, present, and reasonably foreseeable future actions. It then assesses the incremental effects of the proposed action in addition to the past, present, and reasonably foreseeable future actions on all the affected resources.

Chapter 5 details consistency with NEPA), as well as addressing related NEPA documents. The chapter also lists persons and agencies consulted and people who contributed to the environmental impact statement (EIS).

Chapter 6 describes consistency with the Fishery Management Plan and other applicable laws. Each relevant law, Act, and Executive Order (EO) is discussed.

1.2 Description of the Proposed Action

The proposed action is to revise groundfish gear regulations for the trawl rationalization program, including trawl gear configuration and gear use. The proposed action may include the following gear regulation decision points:

- Loosening or eliminating the minimum mesh size requirement for bottom trawl
- Updating the procedure for measuring mesh sizes
- Loosening or eliminating cod-end regulations
- Loosening or eliminating selective flatfish trawl gear requirements and restrictions [Large and small footrope distinctions would remain.]
- Loosening or eliminating chafing gear regulations
- Allowing vessels to carry and/or use multiple gear types on a single trip
- Allowing a gear to be fished in multiple management areas on the same trip
- Allowing a vessel's next gear deployment to start before all fish from the previous deployment have been stowed

1.3 Purpose and Need for the Action

The subsections below describe the purpose and need for this action. Subsection 1.4 describes the background driving the proposed action.

1.3.1 Purpose

The purpose of this action is to provide more flexibility in the configuration and use of gear for participants in the trawl rationalization program, while at the same time ensuring that conservation objectives are met. Such flexibility is expected to foster innovation and allow for more optimal harvest operations. Benefits may include increased efficiency through reduced costs and increased revenues.

1.3.2 Need

The need for this action is to better use the individual accountability now in place for participants in the trawl rationalization program in order to more fully achieve the expected benefits of the program. Pre-trawl rationalization regulations that managed the fleet as a whole may need to be updated or may no longer be appropriate for managing individuals operating under the incentives provided in the rationalized portion of the Pacific groundfish fishery. With the resource allocated to individuals or cooperatives, with 100 percent monitoring, and with individuals or cooperatives held accountable for the consequences of their decisions, participants would be allowed some additional flexibility in

determining where to fish and with what gear, through relaxed restrictions on trawl gear configuration and gear use.

1.4 Background

The Pacific groundfish fishery consists of a number of sectors: recreational, tribal, and commercial. The proposed action affects the commercial sector, which is divided into an open access and a limited entry sector. The limited entry sector is further divided into trawl and fixed gear (longline and fish pot) sectors. This action addresses regulations that apply to vessels participating in the trawl sector.

The trawl sector, which has been managed under the trawl catch share program since 2011, is further divided into a shorebased component and an at-sea component. The at-sea component consists of a mothership sector and a catcher/processor sector, both of which only target Pacific whiting with midwater trawl gear and both of which are managed as cooperatives. In regulation, these sectors are formally called the Mothership (MS) Coop Program and the Catcher/Processor (C/P) Coop Program. In regulation, the shorebased sector is called the Shorebased Individual Fishing Quota (IFQ) Program, and it targets many groundfish species, including whiting. In the Shorebased IFQ Program, groundfish can be targeted with several gear types including bottom trawl (small or large footrope), midwater trawl, and fixed gear. Midwater trawl is a trawl in which the otter boards and footrope of the net are intended to remain above the seabed. Bottom trawl is a trawl in which the otter boards or the footrope of the net are in contact with the seabed.

In the Shorebased IFQ Program, fixed gear can be used in a traditionally trawl sector under a "gear switching" provision in regulation at § 660.130(k). This regulation allows vessels registered to a limited entry trawl permit to fish with legal groundfish nontrawl gear. Referring to the gear definitions in regulation at § 660.11, legal groundfish nontrawl gear includes nontrawl gear used by both the limited entry fixed gear and open access fisheries as follows: longline, trap or pot, set net (anchored gillnet or trammel net, which are permissible south of 38° N. latitude only), hook-and-line (fixed or mobile, including commercial vertical hook-and-line) and spear.

The proposed action may affect fishing in the trawl catch share program by any or all of these gear types (bottom trawl, midwater trawl, and legal groundfish nontrawl gear). Before implementation of the trawl catch share program in 2011, regulations governing the groundfish trawl fleet delivering non-whiting shoreside were built around monthly, bi-monthly, and per-vessel trip landing limits. Regulations governing the shoreside delivery of whiting were based on staggered season openings and closure upon attainment of the shoreside sector allocation. The regulations contained a variety of restrictions on fishing practices, including gear usage, area of catch, etc. The at-sea fleets (mothership

and catcher/processor sectors) were managed primarily by using a framework built around season openings and closure upon attainment of sector allocations. The trawl rationalization program replaced the need for some, but not all, of the trip-limit structure in the regulations, and it modified regulations for the at-sea fleets. Some of the remaining pre-trawl rationalization regulations may unnecessarily constrain harvest efficiency and effectiveness under a catch share framework. Under the current regime, individual accountability is ensured through program elements, including 100 percent monitoring, individual quota share (QS) ownership or cooperative allocations, and enforcement penalties.

The following information summarizes implementation of FMP Amendments 20 and 21, the Trawl Rationalization Program. NMFS implemented Amendments 20 and 21 to the Pacific Coast Groundfish FMP, which were partially approved by the Secretary on August 9, 2010. Amendment 20 established a trawl rationalization program for the Pacific Coast groundfish fishery. Amendment 20's trawl rationalization program consists of an IFQ program for the shorebased trawl fleet (including whiting and nonwhiting sectors) and cooperative (coop) programs for the at-sea (whiting only) mothership and catcher/processor trawl fleets. The trawl rationalization program is intended to increase net economic benefits, create individual economic stability, provide full utilization of the trawl sector allocation, consider environmental impacts, and achieve individual accountability of catch and bycatch (Amendment 20 EIS, 2010). Amendment 21 established fixed allocations for limited entry trawl participants. These allocations are intended to improve management under the rationalization program by streamlining its administration, providing stability to the fishery, and addressing halibut bycatch. The program was designed, in part, to reduce fleet capacity and economically rationalize the groundfish trawl fishery.

Under the catch share program, it is expected that the trawl fleet will likely consolidate so that fewer vessels would participate in the fishery. With fewer vessels in the fishery, fishery managers expect increased efficiency in the utilization of fishery resources and lower levels of incidental catch. Preliminary data indicate that the program has already shown substantial reductions in annual fleet discard levels (NMFS 2015). In addition, the trawl fleet may be able to gain additional efficiencies and operational flexibility by revising or removing some pre-trawl rationalization regulations.

The intent of this consideration and any resulting action is to further the goals of Amendment 20 and the trawl rationalization program consistent with MSA conservation and management requirements and other applicable laws. The consideration and any resulting action should particularly consider MSA National Standards 5 and 7. National Standard 5 requires the consideration of efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole

purpose. National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

1.5 General Scoping Process

The Council's scoping process for this issue began in September 2011. It is expected to continue through the March 2016 Council meeting when the Council is scheduled to select its final preferred alternative for recommendation to NMFS (Table 1-1). After the Council recommendation is forwarded to NMFS, the scoping process will continue as NMFS publishes a proposed rule and a draft EIS and considers whether to implement the Council's recommendation.

1.5.1 Council Role

The Council advises the National Marine Fisheries Service (NMFS) on fishery policy. It is one of eight regional fishery management councils established under MSA. Under MSA, state fishery regulations for adjacent waters may be more restrictive, but not more liberal, than those NMFS adopts through MSA-specified processes. See "Navigating the Council Process" (http://www.pcouncil.org/wp-content/uploads/Council_Guide.pdf; Council, 2007) for additional information on the Council role.

1.5.2 Council Process

With jurisdiction over the 317,690–square-mile exclusive economic zone (EEZ) off Washington, Oregon, and California, the Council advises NMFS on the management of fisheries for approximately 119 species of salmon, groundfish, coastal pelagic species (sardines, anchovies, and mackerel), and highly migratory species (tunas, sharks, and swordfish). The Council is also active in international fishery management organizations managing fish stocks that migrate through the Council's area of jurisdiction, including the International Pacific Halibut Commission (IPHC) (for Pacific halibut), the bilateral agreement between the United States and Canada, which is known as the Pacific Whiting Treaty (for Pacific whiting), the Western and Central Pacific Fisheries Commission (for albacore tuna and other highly migratory species), and the Inter-American Tropical Tuna Commission (for yellowfin tuna and other highly migratory species).

1.5.3 Council and Agency Scoping Results

The preliminary scoping process shows that the potential impacts of concern related to the biological and physical environment have to do with habitat and bycatch. The potential impacts of concern related to the socioeconomic environment have to do with economic efficiency and stability of harvesting and processing operations, as well as the communities and consumers benefiting from those operations. These potential impacts are discussed in detail in Chapter 4.

1.5.4 Rationale for Council FPA

Expected in March 2016, when Council may select FPA.

Table 1-1. Chronology of meetings and actions leading to gear regulation change proposal.

Date	Meeting	Action
September 14-19, 2011	Council meeting, San Mateo, CA	Council action is taken to prioritize future trailing actions including gear issues; Trawl Rationalization Regulation Evaluation Committee (TRREC) is tasked with providing comments on issues identified for implementation in 2013, including gear issues.
October 27, 2011	TRREC meeting, Portland, OR	The TRREC report provided recommendations pertaining to the use and possession of multiple gear types on the same trip (including different types of trawl and fixed gear) and the relaxation or elimination of restrictions on the configuration of trawl gear to increase efficiency and selectivity.
November 2-7, 2011	Council meeting, Costa Mesa, CA	The TRREC report was presented; the Council forwarded items related to use and possession of multiple gear types and trawl gear modifications intended to increase efficiency and selectivity to a gear workshop.
August 29-30, 2012	Gear workshop, Portland OR	The gear workshop report provided recommendations on carrying and use of multiple gears on the same trip, year-round use of midwater gear within the Rockfish Conservation Areas (RCAs) north of 40° 10' N. latitude, reduction of minimum mesh sizes, elimination of the selective flatfish trawl requirement, and allowing IFQ program vessels to move fixed gear across management lines.
September 13-18, 2012	Council meeting, Boise, ID	The Council rescheduled action on gear issues (other than midwater chafing gear) for September 2013.
September 11-17, 2013	Council meeting, Boise, ID	The Council decided to move forward with gear issues as part of a trawl flexibility rule, but it deferred any action on that rule until June 2014, at which time further prioritization would occur.
September 9-16, 2015	Council meeting, Sacramento, CA	A report (Agenda Item H.2, Attachment 1) containing a draft purpose and need statement and alternatives was provided for Council decision processes covering the issues listed in the June informational report. The Council added to the list of issues and alternatives identified in the GAP report (Agenda Item H.2.a, Supplemental GAP Report). The GAP report included issues regarding use of midwater gear in the RCAs south of 40° 10' N. latitude, definition of mesh size, fishing in multiple management areas, allowing the targeting of whiting with any trawl gear, allowing a tow to commence before the catch from the previous tow was stowed, and elimination of other restrictions contained in 660.130 (b) and (c). These restrictions included elimination

		of the distinction between bottom and midwater trawl gear, elimination of the large footrope specification, and elimination of the distinction between whiting and nonwhiting midwater gear. While adopting the GAP recommendations, the Council indicated that only those issues should move forward that would not delay the package.
November 13-19, 2015	Council meeting, Garden Grove, CA	Under the future agenda and workload planning agenda item, a staff report (Agenda Item F.6, Attachment 5) was presented that identified which of the gear issues could be moved forward without delaying 2017 implementation. The staff report indicated the following issues could not be moved forward in a timely manner: the use of midwater gear in the RCAs south of 40º 10' N. latitude, allowing the targeting of whiting with any gear, elimination of the distinction between bottom and midwater trawl gear, elimination of the large footrope specification, and elimination of the distinction between whiting and nonwhiting midwater gear. Another issue, elimination of seasonal restrictions on the use of midwater trawl gear, was also not included in the package moving forward.
March 9-14 2016	Council meeting, Sacramento, CA	Council is scheduled to select its final preferred alternative.

2 ALTERNATIVES

Chapter 2 describes the alternatives. The discussion includes the development process, alternatives for each gear issue, and alternatives considered but rejected.

The draft range of alternatives below builds off of those alternatives the TRREC recommended at the November 2011 Council meeting, which was further refined in the Gear Workshop Report from the November 2012 Council meeting (Agenda Item I.5.a, Attachment 4, November 2012). The alternatives also include input from the Council's groundfish advisory bodies at the June and September 2015 meetings. See Section 1.5 for a full description of the Council's scoping process. A summary of potential regulatory changes and their rationale is presented below.

Alternatives under each issue may benefit the fishery in a different manner. Minimum mesh size requirements would be relaxed to provide fishermen with more flexibility and to decrease the incidental violations that occur when net shrinkage reduces mesh size.

Selective flatfish trawl gear (SFFT) was designed and implemented in regulation to reduce the bycatch of round fish such as rockfish and salmon, while increasing the catch of flatfish species. However, the two-seam design of the net makes it difficult to include some types of bycatch excluders. Eliminating the SFFT requirement, reducing the areas where selective flatfish trawl is required, or eliminating the two-seam requirement would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using bycatch reduction devices of different types.

Chafing gear protects trawl nets from wear and damage from bottom contact and contact with the vessel during net retrieval. Restrictions on chafing gear are in place primarily to ensure that trawl gear does not retain excessive amounts of small fish. The full catch accounting for IFQs provided by the catch share program creates an incentive to reduce catch of unmarketable small fish and possibly the need for chafing gear restrictions. Chafing gear restrictions for midwater gear were recently modified. This action would modify chafing gear requirements for bottom trawl. Under Alternative 3, it would further modify the requirements for both bottom and midwater trawl.

In the past, restrictions on carrying multiple gears aided fishery enforcement. Allowing vessels to carry multiple gears on board at the same time may increase vessel operational efficiency. At-sea monitoring allows determination of what gear types are being used on a particular trip or in a particular location, reducing the need to limit the gear on board at any one time. At the same time this proposed action is being considered by the Council and NMFS, electronic monitoring is also being considered. Electronic monitoring may change what types of species and fishing activity can be monitored at sea. For more

information on how this proposed action relates to electronic monitoring, see the cumulative effects discussion in Section 4.9.

Trawl gear configuration and gear use changes are discussed for the No-action and the Action Alternatives under each issue. For example, the section on changes to the minimum mesh size for bottom trawl gear (section 2.1.1) describes the range of alternatives for that issue.

2.1 Minimum Mesh Size (A)

Mesh size requirements are intended to reduce the catch of juvenile and small unmarketable fish. This action would change the minimum mesh size for bottom trawl and midwater trawl. The mesh size changes for each alternative are described below and in Table 2-1.

2.1.1 Mesh Size Alternative A1 (No-action)

The minimum mesh size for bottom trawl nets would continue to be 4.5 inches under Alternative A1 and 3 inches for midwater trawl. For this alternative, mesh size would mean the opening between opposing knots. Minimum mesh size means the smallest distance between the inside of one knot to the inside of the opposing knot, regardless of twine size.

2.1.2 Mesh Size Alternative A2

The minimum mesh size under Alternative A2 would shift to 4 inches for bottom trawl only. This would represent a drop of 0.5-inch from the No-action Alternative measurement of 4.5 inches.

2.1.3 Mesh Size Alternative A3

There would be no minimum mesh size for bottom trawl or midwater trawl under Alternative 3.

2.2 Measuring Mesh Size (B)

Mesh size means the opening between opposing knots. Mesh-size measurements are described below for each of the alternatives in Table 2-1. The alternatives for measuring mesh size could apply to any of the mesh size alternatives above.

2.2.1 Measurement Alternative B1 (No-action)

Measuring trawl mesh size under Alternative B1 would remain the same. Mesh size would mean the opening between opposing knots. Minimum mesh size would continue to be the smallest distance allowed between the inside of the one knot to the inside of the opposing knot, regardless of twine size.

2.2.2 Measurement Alternative B2

Trawl mesh size would be modified to mean the opening between opposing knots or corners in knotless webbing. New text compared to the No-action Alternative is underlined. Mesh size would mean the opening between opposing knots or corners in knotless webbing. Minimum mesh size would mean the smallest distance allowed between the inside of one knot or corner to the inside of the opposing knot or corner, regardless of twine size.

2.3 Codend Regulations (C)

The codend is the terminal, closed end of a trawl net. The codend changes are described below for each of the alternatives and in Table 2-1.

2.3.1 Codend Alternative C1 (No-action)

The codend regulations would remain as only single-walled codends being permitted for use in any trawl. Double-walled codends would still be prohibited.

2.3.2 Codend Alternative C2

The codend regulations under Alternative C1 would be dropped. There would be no codend restrictions.

2.4 Selective Flatfish Trawl (D)

Selective flatfish trawl (SFFT) is a type of small footrope trawl. The changes for each alternative are described below and in Table 2-1.

2.4.1 SFFT Alternative D1

Under the No-action Alternative, SFFT would remain a two-seamed net with no more than two riblines, excluding the codend. The breastline would remain no longer than 3 feet. No floats along the center third of the headrope or attached to the top panel would be allowed, except on riblines. The footrope would be less than 105 feet long. The headrope would not be less than 30 percent longer than the footrope under this alternative.

Under the No-action Alternative, the areas fished with SFFT are as follows (§660.130(c)(2)(i)):

- North of 40°10′ N. latitude, selective flatfish gear is required shoreward of the Rockfish Conservation Area (RCA) defined in paragraph (e) of this section and at §§660.70, through 660.74.

- South of 40°10′ N. latitude, selective flatfish gear is permitted, but not required, shoreward of the RCA.
- The use of selective flatfish trawl gear is permitted seaward of the RCA coastwide.

2.4.2 SFFT Alternative D2

The SFFT definition would be modified to allow a two-seam or a four-seam net. Areas fished would remain as stated in the No-action Alternative.

2.4.3 SFFT Alternative D3

The SFFT definition would be modified to allow a two-seam or a four-seam net. The SSFT requirement shoreward of the RCA north of 40°10′ N. latitude would be eliminated. It would be replaced with a small footrope requirement (like the requirement south of 40°10’ N. latitude). Requirements shoreward of the RCA south of 40°10′ N. latitude and seaward of the RCA coastwide would remain as stated in the No-action Alternative.

2.5 Chafing Gear (E)

Chafing gear is webbing or other material attached to the codend to protect it from wear. The changes for each alternative are described below and in Table 2-1. The decision on codends under issue C (Alternatives C1 and C2) may affect the issue of chafing gear should Alternative C2 be chosen. Alternative C2 would allow double-walled codends, and chafing gear could be used to create a double-walled codend.

2.5.1 Chafing Gear Alternative E1 (No-action)

Chafing gear for bottom trawl gear under the No-action Alternative would continue to encircle no more than 50 percent of the net’s circumference and could be in one or more sections. It could be used on only the last 50 meshes, measured from the terminal edge (closed end) of the codend. Only the front edge (that closest to the open end of the codend) and sides of each section of chafing gear could be attached to the codend. Except at the corners, the terminal edge (that edge closest to the closed end of the codend) of each section of chafing gear could not be attached to the net. The chafing gear would have to be attached outside of any riblines and restraining straps.

2.5.2 Chafing Gear Alternative E2

Chafing gear regulations under Alternative E2 would align bottom trawl chafing gear restrictions with recent changes to midwater trawl chafing gear restrictions specified in regulation at 50 Code of Federal

Regulations (CFR) 660.130(b)(4)(i) and (ii). These changes would allow the chafing gear to cover more of the codend than the No-action Alternative.

Generally, the bottom trawl chafing gear restriction would be revised to read as follows:

> Chafing gear may cover the bottom and sides of the codend in either one or more sections. Only the front edge (edge closest to the open end of the codend) and sides of each section of chafing gear may be attached to the codend; except at the corners, the terminal edge (edge closest to the closed end of the codend) of each section of chafing gear must not be attached to the net. Chafing gear is not permitted on the top codend panel except that a band of mesh (a "skirt") may encircle the net under or over transfer cables, lifting or splitting straps (chokers), riblines, and restraining straps, but must be the same mesh size and coincide knot-to-knot with the net to which it is attached and be no wider than 16 meshes.

2.5.3 Chafing Gear Alternative E3

Under Alternative E3, chafing gear restrictions would be eliminated for bottom trawl and midwater trawl gear. Chafing gear could be used, but regulations would not restrict how much of the codend or net it covers nor where it is connected to the net.

2.6 Multiple Gears Onboard (F)

A vessel may carry a number of different gears while participating in the groundfish trawl sector. This issue considers allowing multiple types of fishing gear on the vessel during a single trip. Alternatives for allowing multiple gears onboard are described below, as well as in Table 2-1.

The term "fixed gear" as used in Issue F is shorthand for all legal groundfish non-trawl gear. Under the gear switching provision in the Shorebased IFQ Program, several fixed gears are permissible. As stated in the regulations at § 660.130(k) on gear switching, participants can also fish for IFQ species "using any legal groundfish non-trawl gear." Referring to the definitions section at §660.11 in Federal regulations, legal groundfish non-trawl gear includes non-trawl gear used by both the limited entry fixed gear and open access fisheries as follows:

- longline,
- trap or pot,
- set net (anchored gillnet or trammel net, which are permissible south of 38° N. lat. only),

- hook-and-line (fixed or mobile, including commercial vertical hook-and-line), and
- spear.

2.6.1 Multiple Gears Alternative F1 (No-action)

Use of multiple gears onboard would remain restricted to one type of trawl gear (bottom or midwater) per trip under the No-action Alternative. For bottom trawl gear, both small footrope and large footrope could be on the vessel and fished during a single fishing trip. Multiple fixed gear types would be allowed onboard each trip. Trawl gear and fixed gear would not be permitted onboard during the same trip. Only one type of gear can be fished per trip.

2.6.2 Multiple Gears Alternative F2

Multiple trawl gear types (bottom and midwater) would be allowed onboard on the same trip under Alternative F2. The same as under the No-action Alternative, multiple fixed gear types would be allowed onboard during each trip. Trawl vessels would not be allowed to have trawl and fixed gear onboard on the same trip. Vessel operators could use only one gear type per trip (bottom trawl, midwater trawl, or fixed gear). For bottom trawl gear, both small footrope and large footrope could be fished during a single fishing trip.

2.6.3 Multiple Gears Alternative F3

Multiple gear types would be allowed onboard on the same trip. In addition, they could be used on the same trip as follows:

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators must separate catch by gear type. Landings must be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

Under Alternative F3, gear type sub-options would be independent of sorting options.

2.7 Fishing in Multiple IFQ Management Areas (G)

The Shorebased IFQ Program includes IFQ management areas, specified in regulation at §660.140(c)(2), that are based on the stock information for select species, harvest allocations, and the corresponding QS for species. The IFQ management areas are as follows:

- Between the U.S./Canada border and 40°10′ N. latitude

- Between 40°10′ N. latitude and 36° N. latitude
- Between 36° N. latitude and 34°27′ N. latitude
- Between 34°27′ N. latitude and the U.S./Mexico border

Fishing in multiple IFQ management areas is discussed below for each Alternative and in Table 2-1.

2.7.1 Multiple Areas Alternative G1 (No-action)

Fishing in multiple IFQ management areas would remain restricted under the No-action Alternative. In the Shorebased IFQ Program, trawl vessels may not fish in more than one IFQ management area on the same trip.

2.7.2 Multiple Areas Alternative G2

Fishing in multiple IFQ management areas on the same trip would be allowed under Alternative G2. This would create opportunities to shift from one management area to another during a fishing trip, as opposed to Alternative G1, which would continue to restrict trawl vessels to one IFQ management area per trip. If retaining catch from multiple IFQ management areas on a single trip, then the catch would have to be sorted by IFQ management area and recorded on separate electronic fish tickets.

2.8 Fishing before Previous Catch is Stowed (H)

The Shorebased IFQ Program has 100 percent monitoring for most groundfish species. To track catch accurately to the haul level, regulations require previous catch to be stowed before a new haul is brought onboard the vessel. Options for stowing catch are described below and in Table 2-1.

2.8.1 Stowing Alternative H1 (No-action)

The No-action Alternative would continue to prohibit vessels in the Shorebased IFQ Program from bringing a haul on board before all catch from the previous haul had been stowed.

2.8.2 Stowing Alternative H2

In the Shorebased IFQ Program, a new haul could be brought onboard and dumped on deck before all catch from the previous haul had been stowed under Alternative H2. Catch from different hauls would have to be kept separate until the observers could complete their collection of catch for sampling.

Table 2-1. Alternative descriptions.

Minimum mesh size (A)	
Mesh Size Alternative A1	Minimum mesh size would be 4.5 inches for bottom trawl and 3 inches for midwater trawl.

Mesh Size Alternative A2	Minimum mesh size would be 4 inches for bottom trawl.
Mesh Size Alternative A3	There would be no minimum mesh size for bottom or midwater trawl.
Measuring mesh size (B)	
Measurement Alternative B1	Trawl mesh size measurements would be taken between knots.
Measurement Alternative B2	Trawl mesh size measurements would be taken between knots or, in knotless mesh, between corners.
Codend (C)	
Codend Alternative C1	Only single-walled cod-ends could be used in any trawl. Double-walled cod-ends would be prohibited. Chafing gear could not be used to create a double-walled cod-end.
Codend Alternative C2	There would be no cod-end restrictions.
Selective Flatfish Trawl (D)	
SFFT Alternative D1	SFFT would be a two-seamed net with no more than two riblines, excluding the cod-end. The breastline would be no longer than 3 feet. There could be no floats along the center third of the headrope or attached to the top panel except on riblines. The footrope would be less than 105 feet. The headrope would have to be at least 30% longer than the footrope. SFFT would be required shoreward of the RCA north of 40°10' N. latitude, and permitted, but not required, shoreward of the RCA south of 40°10' N. latitude. SFFT would be permitted seaward of the RCA coastwide.
SFFT Alternative D2	The SFFT definition would be modified to allow a two-seam or a four-seam net.
SFFT Alternative D3	The SFFT definition would be modified to allow two-seam or four-seam net AND would eliminate the SFFT requirement shoreward of the RCA north of 40°10' N. latitude and would replace it with small footrope (like south of 40°10').
Chafing Gear (E)	
Chafing Gear Alternative E1	Bottom trawl chafing gear would be used on only last 50 meshes, would be no more than 50% circumference, and only the front edge and sides of each section could be attached to the codend; the terminal edge (except at corners) could not be attached to the net, and chafing gear would be attached outside riblines and restraining straps.
Chafing Gear AlternativeE2	The alternative would align bottom trawl gear restrictions with recent midwater changes (see 660.130(b)(4)(i) – at the bottom of page 3 in Agenda Item H.2 Attachment 2).
Chafing Gear Alternative E3	The alternative would eliminate chafing gear restrictions for bottom trawl and midwater trawl.
Multiple Gears (F)	
Multiple Gears Alternative F1	The alternative would allow one type of trawl gear onboard per trip (bottom or midwater). For bottom trawl gear, both small footrope and large footrope could be on the vessel and fished during a single fishing trip. It would allow multiple fixed gear onboard per trip. It would not allow

	trawl and fixed gear onboard on the same trip. It would allow use of only one gear per trip.
Multiple Gears Alternative F2	The alternative would allow multiple trawl gear types (bottom and midwater) onboard on the same trip. It would not allow trawl and fixed gear onboard on the same trip. It would allow use of only one gear per trip (bottom trawl or midwater trawl or fixed gear). For bottom trawl gear, both small footrope and large footrope could be fished during a single fishing trip.
Multiple Gears Alternative F3	The alternative would allow multiple gear types to be onboard on the same trip as follows: Gear Type Sub-option A: Use any trawl gear. Gear Type Sub-option B: Use any legal IFQ groundfish gear. Sorting Sub-option A: Vessels must separate catch by gear type. Vessels would have to separate electronic fish ticket by gear type. Sorting Sub-option B: Catch by gear type could be co-mingled.
Fishing in Multiple IFQ Management Areas (G)	
Multiple Areas Alternative G1	The alternative would continue current Shorebased IFQ There would be a program prohibition against fishing in more than one IFQ management area on the same trip.
Multiple Areas Alternative G2	The alternative would allow fishing in multiple IFQ management areas on the same trip. The catch would have to be sorted by IFQ management area and recorded on separate electronic fish tickets.
Fishing before Previous Catch is Stowed (H)	
Stowing Alternative H1	The alternative would continue the current Shorebased IFQ Program prohibition against bringing a haul on board before all catch from the previous haul had been stowed.
Stowing Alternative H2	The alternative would allow a new haul to be brought onboard and dumped on deck before all catch from previous haul had been stowed. No mixing of hauls would be permitted until the observer had collected samples.

2.9 Alternatives Considered but Rejected

[Subsection will be drafted.]

3 AFFECTED ENVIRONMENT

Chapter 3 contains descriptions of the resources and issues the Council have identified as important when predicting the direct, indirect, and cumulative impacts that will accrue from the proposed action. The topics in this section are arranged in the following order: the physical environment (Pacific Coast Marine Ecosystem, essential fish habitat), the biological environment (target species, non-target species, protected species), and the socioeconomic environment (harvesters, first receivers/processors, fishing communities, as well as enforcement and management).

3.1 Physical Environment

A divergence in prevailing wind patterns causes the west wind drift (North Pacific Current) to split into two broad coastal currents when it reaches the North American Continent: the California Current to the south and the Alaska Current to the north (Figure 3-1). As there are several dominant currents in the California Current Region, all of which vary in geographical location, intensity, and direction with the seasons, this region is often referred to as the California Current System. A more detailed description of the physical and biological oceanography of Pacific Coast marine ecosystems can be found in Council 2013.

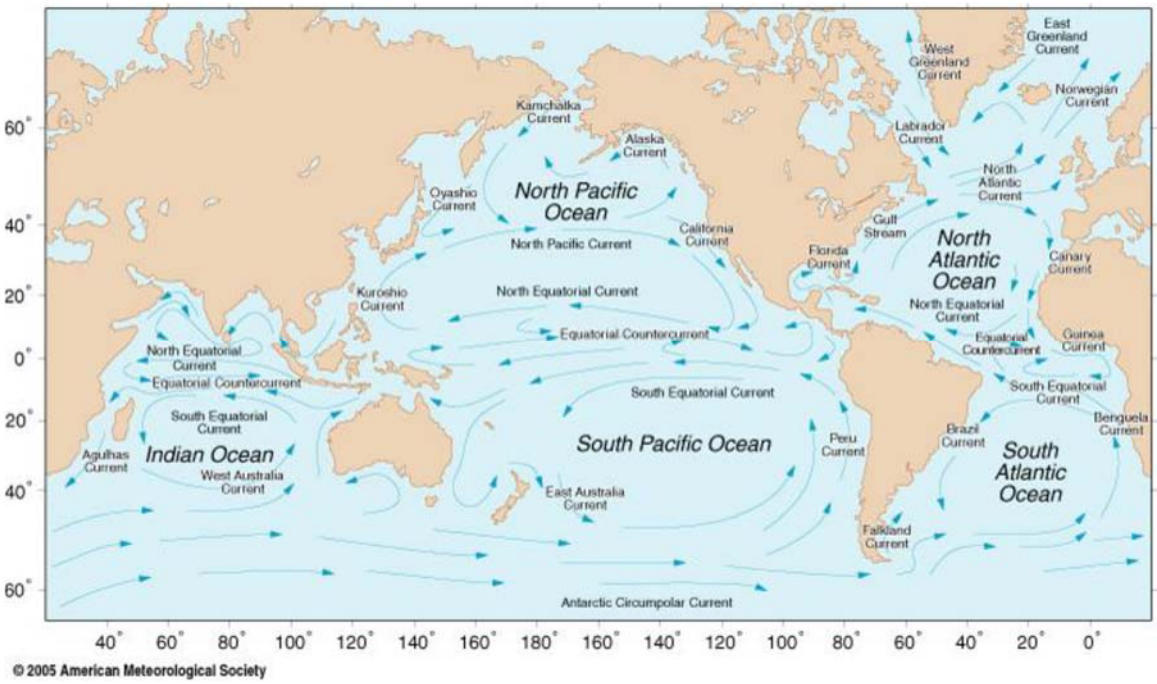

Figure 3-1. Location map of the major ocean currents of the world, including the California Current of the Council management area.

3.1.1 Pacific Coast Marine Ecosystem

Along the U.S. Pacific Coast, within the California Current System, various factors, including depth, ocean conditions, and latitude, have influenced spatial patterns of biological distribution (biogeography). Cape Mendocino (Mendocino Escapement) is one of the most noteworthy influences on the latitudinal distribution of rockfish species diversity in the action area. Most stock assessments for groundfish either tend to be coastwide assessments, or are relative to the stocks north or south of Cape Mendocino (occasionally Cape Blanco). Both Cape Mendocino and Point Conception are key management boundaries for the Council. The biogeography of the action area is discussed in detail in Council 2013 and is hereby incorporated by reference.

The California Current Ecosystem (CCE) is loosely defined as encompassing most of the U.S. and Canada west coasts, from the northern end of Vancouver Island, British Columbia, to Point Conception, California. The trophic interactions in the CCE are extremely complex, with large fluctuations over years and decades (PFMC 2013b).

To some degree, food webs are structured around coastal pelagic species (CPS) that exhibit boom-bust cycles over decadal time scales in response to low frequency climate variability, although this is a broad generalization of the trophic dynamics. Similarly, the top trophic levels of such ecosystems are often dominated by highly migratory species (HMS) such as salmon, albacore tuna, sooty shearwaters, fur seals, and baleen whales, whose dynamics may be partially or wholly driven by processes in entirely different ecosystems, even different hemispheres. For this description of the affected environment, the ecosystem is considered in terms of physical and biological oceanography, climate, biogeography, and essential fish habitat (EFH). A more detailed description of this ecosystem is found in Council 2013. The species of fish described in following sections are integral components of the Pacific Coast Marine Ecosystem.

3.1.2 Essential Fish Habitat

The most common and direct effect of fishing on groundfish habitat results from fishing gear coming in contact with bottom habitats. Fishing gears can cause physical harm to corals, sponges, rocky reefs, sandy ocean floor, eelgrass beds, and other components of seafloor habitats. Indirect effects on habitats include physical contact of the vessel with habitat while underway, or if sunk or abandoned, and chemical effects derived from paints or oils used on the vessel and bilge waste release. Bilge waste release can also introduce invasive species, which can cause a wide range of biological and environmental impacts. The action alternatives under consideration in this EIS have the potential to impact important groundfish habitats. This is because changes in mesh on trawl gear and cod-end restrictions and a chafing gear allowance on the codend of midwater nets could all affect how

fishermen use their trawl gear when fishing close to seafloor habitats, including rocky or hard surface habitats where pelagic rockfish are commonly found. The primary groundfish habitats of concern in this EIS include areas designated as EFH including habitat areas of particular concern (HAPCs), and RCAs.

EFH is defined in MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10)). Through the Council process, groundfish EFH has been deemed to include 1) all ocean and estuarine waters and substrates in depths less than or equal to 3,500 meters (m), to the upriver extent of saltwater intrusion, which is defined based on ocean salt content during low runoff periods, and 2) areas associated with seamounts in depths greater than 3,500 m. The groundfish EFH designation describes 59.2 percent of the EEZ, which equates to 48,719,109 hectares (ha) (142,042 square miles) in addition to state waters such as bays and estuaries (Figure 3-2) (NMFS 2005a).

The ocean area constituting 100 percent habitat suitability probability for all species and life stages of FMP groundfish was used to define the extent of EFH designation. This was a precautionary approach because it is based on the currently known maximum depth distribution of all life stages of fishery management unit (FMU) species. There is a lack of information on the value of seamounts to groundfish in depths greater than 3,500 m. Designating seamounts as EFH is precautionary because they may prove to be essential to certain life stages of fish in the groundfish fishery.

3.1.2.1 Benthic Habitat Types

Within the area designated as EFH, distinct, large-scale patterns of biological distribution along the Pacific Coast provide for a first-order characterization of habitat into two large zoogeographic provinces: the Oregonian Province and the San Diego Province. The Oregonian Province extends from the Strait of Juan de Fuca in the north to Point Conception in the south. The San Diego Province begins at Point Conception in the north and runs south past the terminus of the EEZ (NMFS 2004 OLO). The Pacific Coast habitat types that occur within these two provinces have been grouped under two major headings in the EFH final EIS (FEIS): nearshore, estuarine, and intertidal habitats and offshore habitats. While the target species of the groundfish fishery may inhabit nearshore and estuarine waters to some degree, the fisheries for marketable-size fish occur in offshore waters. Potential gear contacts with benthic habitats in this EIS focuses on the primary offshore benthic habitat types, which are described below.

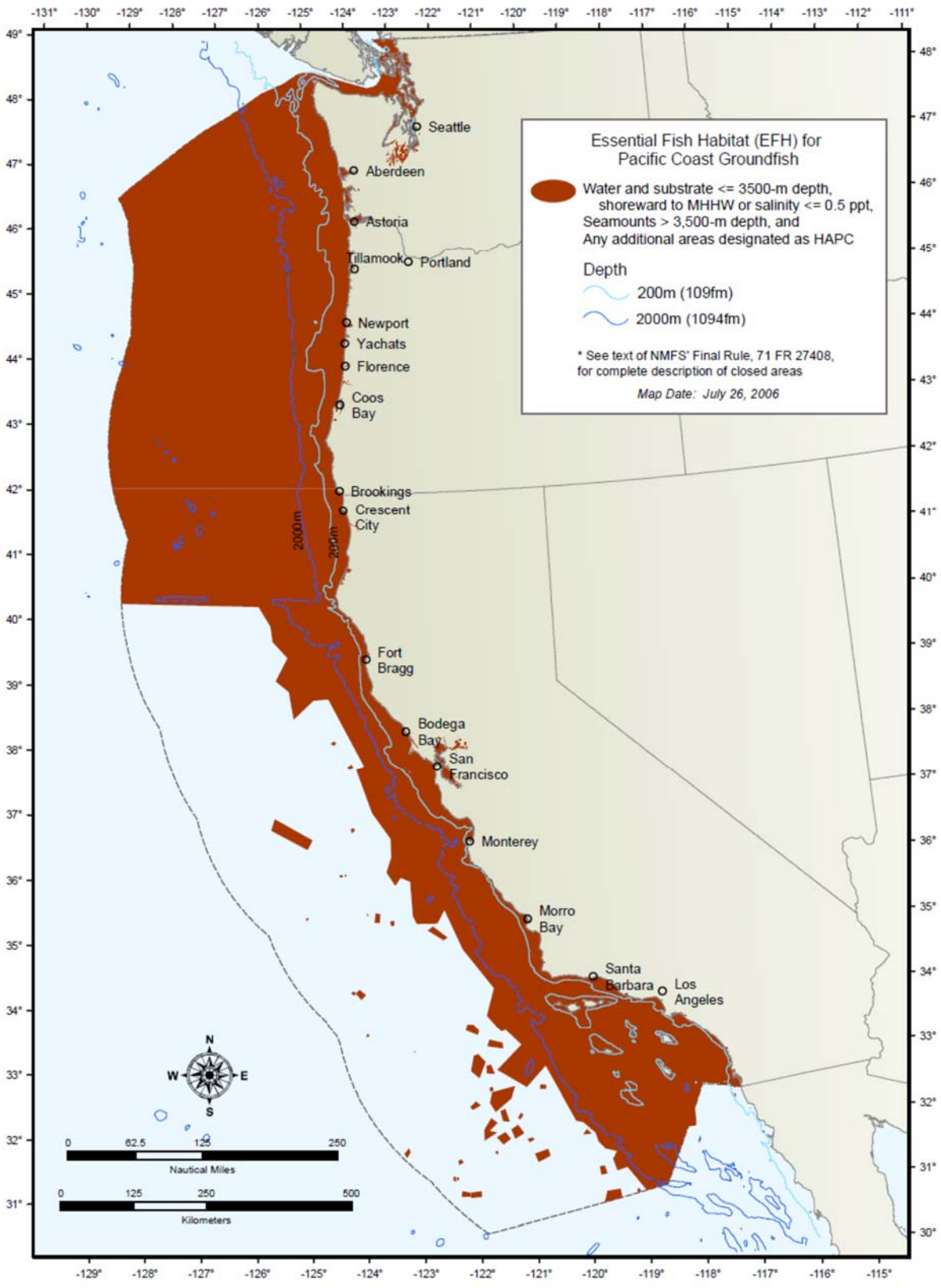

Figure 3-2. Map of EFH boundaries (NMFS 2005a).

3.1.2.1.1 Offshore Biogenic Habitats (corals, sponges, etc.)

Some groundfish species are associated with structure-forming invertebrates (such as corals, basketstars, brittlestars, demosponges, gooseneck barnacles, sea anemones, sea lilies, sea urchins, sea whips, tube worms, and vase sponges) that serve as biogenic habitat. They include the following: arrowtooth flounder, big skate, bocaccio rockfish, California skate, cowcod, Dover sole, flag rockfish, greenspotted rockfish, lingcod, longspine thornyhead, Pacific ocean perch, quillback rockfish, rosethorn rockfish, sablefish, sharpchin rockfish, shortspine thornyhead, spotted ratfish, starry rockfish, tiger rockfish, vermilion rockfish, yelloweye rockfish, and yellowtail rockfish (NMFS 2005a). Information on the location and abundance of these organisms comes primarily from trawl surveys, with additional data available from manned submersible and remotely operated vehicle (ROV) work. Corals, anemones, sponges, sea pens, and sea whips grow up from the ocean floor and increase the complexity of the benthic environment, a possibly unique ecological function. There are few data to support conclusions about the role of these organisms on the Pacific Coast; however, studies from other areas of the world demonstrate that corals in particular support complex ecological communities and increased biodiversity in comparison with areas without corals (citation in NMFS 2005a). Many of the locations of observations are included in a national database prepared under the auspices of the National Oceanic and Atmospheric Administration's (NOAA's) Deep-Sea Coral Research and Technology Program (Council 2012g). Although a number of records of additional observations have been recorded at various research institutes, this database is currently the most comprehensive source of electronically available records of coral and, to a lesser extent, sponge observations in the region (Council 2012g).

3.1.2.1.2 Offshore Unconsolidated Bottom (silt, mud, sand, gravel, or mixed)

Offshore, unconsolidated bottom habitats consist of small particles (i.e., gravel, sand, mud, silt, and various mixtures of these particles) and contain little to no vegetative growth due to the lack of stable surfaces for attachment. Benthic fauna often consist of infaunal organisms. Because offshore unconsolidated bottom habitats are subject to lower levels of natural and anthropogenic disturbance than their inshore counterparts, they generally take longer to recover when they are disturbed. A large number of managed groundfish species utilizes offshore unconsolidated bottom habitat during at least part of their life cycle. These species include arrowtooth flounder, aurora rockfish, bank rockfish, big skate, blackgill rockfish, bocaccio rockfish, butter sole, calico rockfish, California scorpionfish, California skate, chilipepper, cowcod, curlfin sole, darkblotched rockfish, Dover sole, English sole, flathead sole, gopher rockfish, greenspotted rockfish, greenstriped rockfish, honeycomb rockfish, leopard shark, lingcod, longnose skate, longspine thornyhead, Pacific cod, Pacific ocean perch, Pacific rattail (grenadier), Pacific sanddab, petrale sole, pink rockfish, quillback rockfish, redbanded rockfish,

rex sole, rock sole, rosethorn rockfish, rougheye rockfish, sablefish, sand sole, sharpchin rockfish, shortbelly rockfish, shortraker rockfish, shortspine thornyhead, soupfin shark, speckled rockfish, spiny dogfish, splitnose rockfish, spotted ratfish, starry flounder, stripetail rockfish, vermilion rockfish, widow rockfish, yelloweye rockfish, and yellowtail rockfish (NMFS 2005a).

3.1.2.1.3 Offshore Hard Bottom Habitats

Hard bottom habitats in the offshore zone may consist of bedrock, boulders, cobble, or gravel/cobble. Hard bottom habitat is associated with a variety of Continental mega habitat types, including the following: Rise, Basin, Slope, Ridge, and Shelf (Appendix C to NMFS 2005a). Many managed species depend on hard bottom habitat during some portion of their life cycle. Typically, deeper water hard bottom habitats are inhabited by large, mobile, nektobenthic fishes such as rockfish, sablefish, Pacific hake, spotted ratfish, and spiny dogfish (NMFS 2005a). The Final Groundfish EFH EIS (NMFS 2005a) estimates that about 30 percent of the fish species and 40 percent of fish families occur over hard substrates, based on published studies.

Many managed groundfish species use hard bottom habitats during one or more life stages. These species include aurora rockfish, bank rockfish, black rockfish, black-and-yellow rockfish, blackgill rockfish, blue rockfish, Boccaccio, bronzespotted rockfish, brown rockfish, cabezon, calico rockfish, California scorpionfish, canary rockfish, chilipepper, China rockfish, copper rockfish, cowcod, dusky rockfish, flag rockfish, gopher rockfish, grass rockfish, greenblotched rockfish, greenspotted rockfish, greenstriped rockfish, harlequin rockfish, honeycomb rockfish, kelp greenling, kelp rockfish, leopard shark, lingcod, Mexican rockfish, olive rockfish, Pacific cod, Pacific ocean perch, pink rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, rosy rockfish, rougheye rockfish, sharpchin rockfish, shortbelly rockfish, shortraker rockfish, silvergray rockfish, speckled rockfish, spotted ratfish, squarespot rockfish, starry rockfish, stripetail rockfish, tiger rockfish, treefish, vermilion rockfish, widow rockfish, yelloweye rockfish, yellowmouth rockfish, and yellowtail rockfish (NMFS 2005a).

3.1.2.1.4 Offshore Habitat Recovery Times

Offshore habitat recovery from the effects of trawl fishing varies by habitat type (Table 3-1). Offshore biogenic habitats generally have longer recovery times from trawl gear impact compared to offshore unconsolidated habitats. Offshore hard bottom habitats are intermediate and may take up to 3 years to recover to prefishing conditions.

Table 3-1. Summary of Habitat Sensitivity for habitat found in the RCAs Relative to Bottom Trawl Gear.

Habitat Category	Habitat Type	Sensitivity to Impact [a/]	Recovery from Impact (Years)
Offshore Biogenic	Macrophyte	1.0-3.0	1.5-4.5
	Shelf Shellfish	1.4-2.2	1.0-3.0
	Shelf Sponge	2.0-2.4	1.0-1.6
	Slope Sponge	2.5-3.0	3.5-10.5
	Shelf Coral	2.0-3.0	1.0-1.6
	Ridge	2.0-3.0	2.0-3.0
	Basin	2.0-3.0	3.5-10.5
	Continental Rise	2.0-3.0	3.5-10.5
Offshore Unconsolidated Bottom	Shelf Soft Bottom	0.5-1.0	0.2-0.6
	Shelf canyons, gullies, and ice formed features	0.5-1.0	0.2-0.6
	Ridge	0.5-1.0	0.5-1.0
	Slope canyons, gullies, and ice formed features	0.5-1.5	1.0-2.0
	Continental Rise canyons, gullies, and landslide	0.5-1.5	0.5-1.5
Offshore Hard Bottom	Canyon and ice formed features	2.0-3.0	1.0-2.0
	Exposure	2.0-3.0	1.0-2.0
	Slope canyons, gullies, landslides, and exposures	2.5-3.0	2.5-3.0
	Basin	0.5-1.5	2.5-3.0

Source: (2005 EFH FEIS Table 3-1)

[a/] 0 = No detectable adverse impacts on the seabed; i.e., no significant differences between impact and control areas in any metrics
1 = Minor impacts, such as shallow furrows on bottom; small differences between impact and control sites, less than 25 percent in most measured metrics
2 = Substantial changes, such as deep furrows on bottom; differences between impact and control sites 25 to 50 percent in most metrics measured
3 = Major changes in bottom structure, such as re-arranged boulders; large losses of many organisms

3.1.2.2 Habitat Areas of Particular Concern (HAPCs)

EFH guidelines published in the Federal Regulations (50 CFR 600.815(a)(8)) identify HAPCs as types or areas of habitat within EFH that are identified based on one or more considerations. The considerations are as follows: the importance of the ecological function provided by the habitat; the extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are or will be stressing the habitat type; and the rarity of the habitat type. HAPCs of greatest concern in this EIS are those that occur in the offshore area where the commercial groundfish fishery predominantly takes place. These habitat areas are described below.

3.1.2.2.1 Rocky Reefs

Rocky habitats are generally categorized as either nearshore or offshore in reference to the proximity of the habitat to the coastline. Rocky habitat may consist of bedrock, boulders, or smaller rocks, such as

cobble and gravel. Hard substrates are one of the least abundant benthic habitats, yet they are among the most important habitats for groundfish.

3.1.2.2.2 Areas of Interest

Areas of interest are discrete areas that are of special interest due to their unique geological and ecological characteristics. The following areas of interest are designated HAPCs (see the 2005 EFH EIS for a more detailed description of these areas of interest):

- Off of Washington: all waters and sea bottom in state waters shoreward from the three nautical mile boundary of the territorial sea shoreward to the Mean Higher High Water Mark
- Off of Oregon: Daisy Bank/Nelson Island, Thompson Seamount, President Jackson Seamount
- Off of California: all seamounts, including Gumdrop Seamount, Pioneer Seamount, Guide Seamount, Taney Seamount, Davidson Seamount, and San Juan Seamount; Mendocino Ridge; Cordell Bank; Monterey Canyon; specific areas in the Federal waters of the Channel Island National Marine Sanctuary; specific areas of the Cowcod Conservation Area

Given where midwater fishing has occurred in recent years, the midwater trawl fishery interactions with HAPCs are most likely to occur in areas identified as offshore rocky reef. These can occur within or outside of areas identified as Areas of Interest, which have specific boundaries identified in regulation. A map of coastwide HAPCs, including estuaries, nearshore habitats and offshore habitats, is shown below as Figure 3-3.

3.1.2.3 Rockfish Conservation Areas (RCAs)

RCAs, are large-scale closed areas that extend along the entire length of the U.S. Pacific Coast (Figure 3-4). RCA boundaries are lines that connect a series of latitude/longitude coordinates intended to approximate particular depth contours. RCA boundaries for particular gear types differ between the northern and southern areas of the coast. RCA boundaries change at different times of the year (Table 3-2). The locations of the RCA boundaries are set in order to minimize opportunities for vessels to incidentally take overfished rockfish by eliminating fishing in areas where, and times when, those overfished species are most likely to co-occur with more healthy stocks of groundfish. RCAs protect various benthic habitat types, hard bottom or rocky habitats in particular, where overfished rockfish are most abundant.

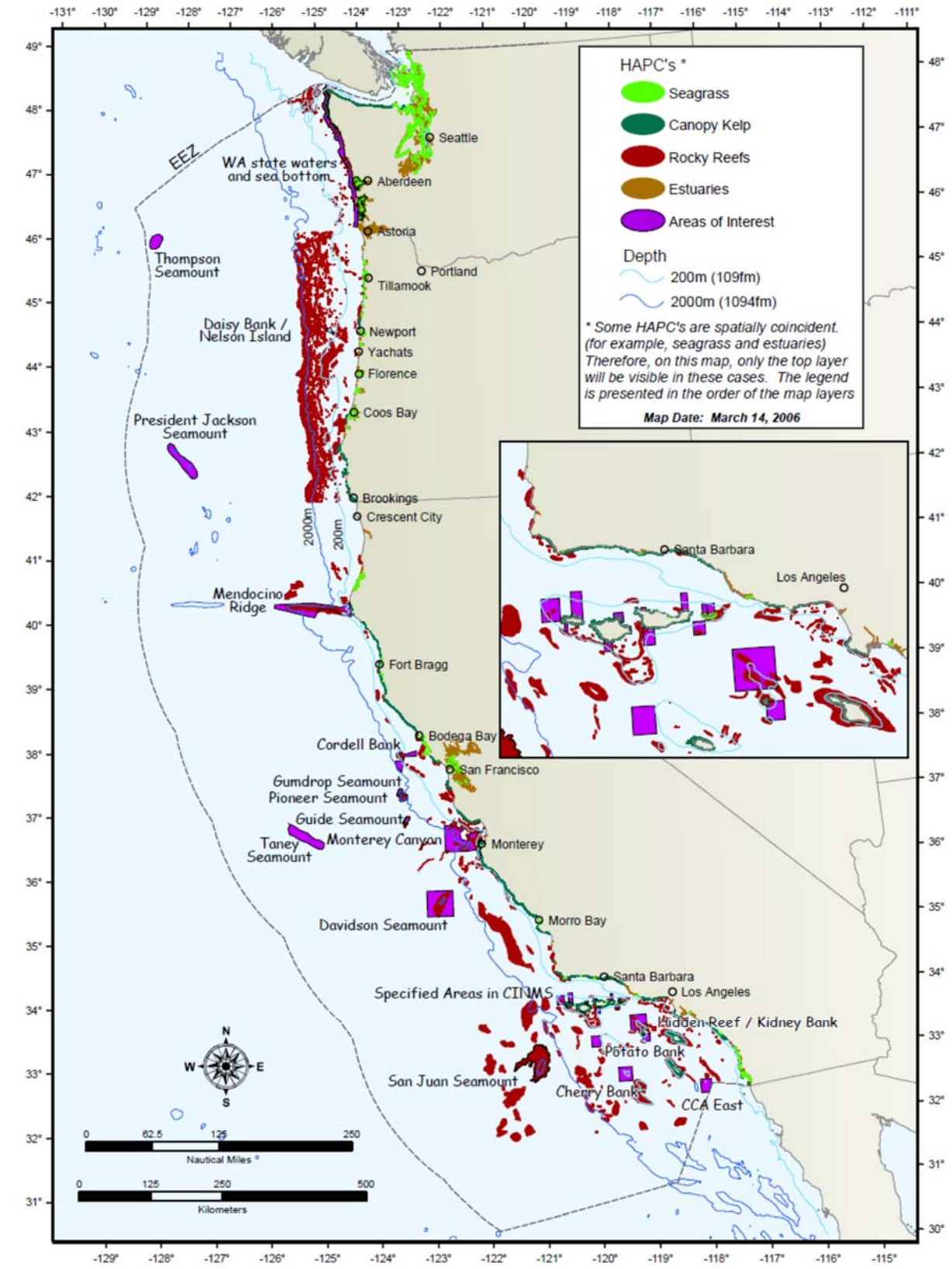

Figure 3-3. Map showing Habitat Areas of Particular Concern.

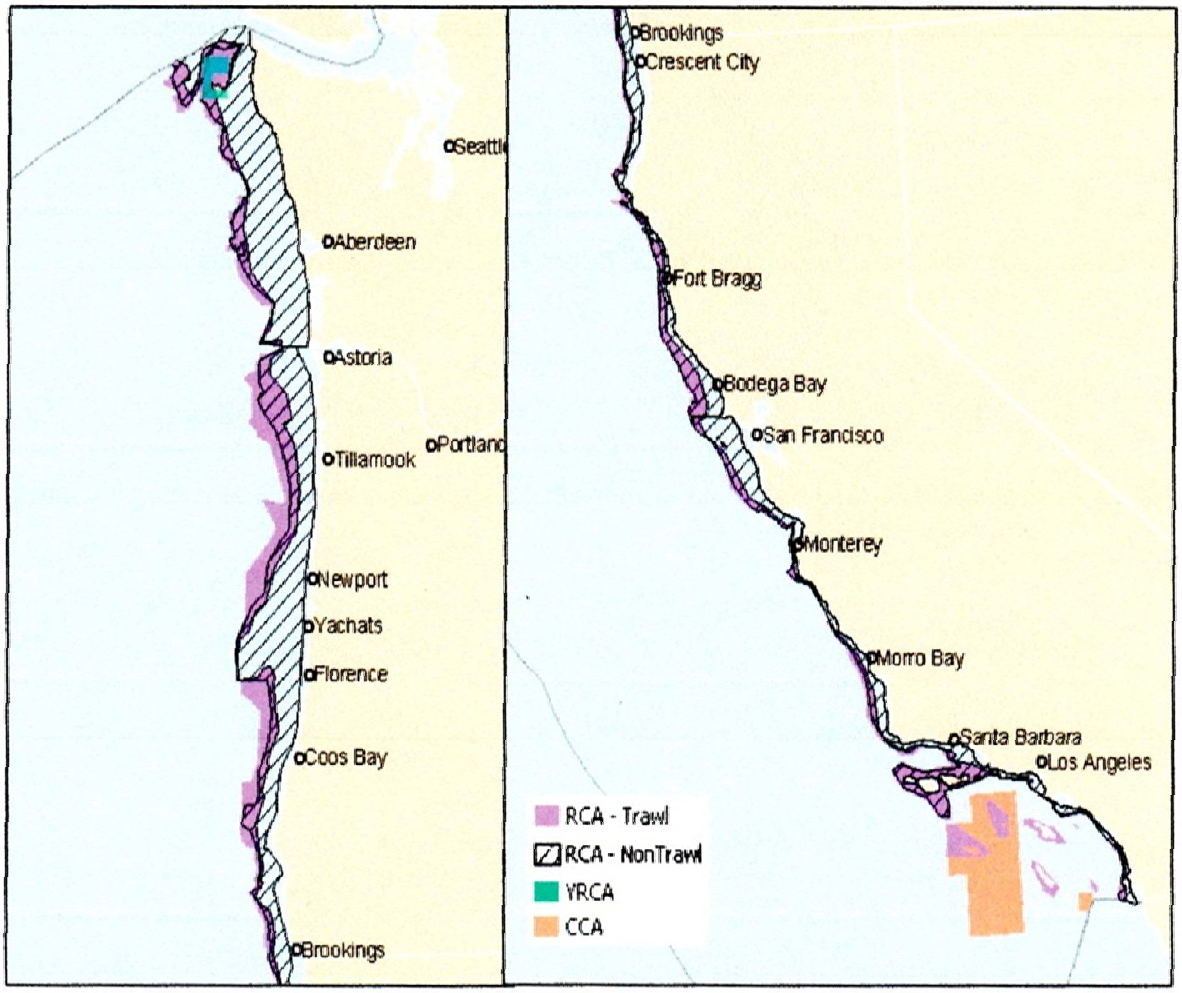

Figure 3-4. Example map showing trawl and non-trawl RCA boundaries.

Table 3-2. Changes in trawl RCAs depth restrictions over time (fathoms).

Year	Area (North of 40°10')	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2001	North of 40°10'	N/A, PFMC (Council) introduced Cowcod Conservation Areas south of 40°10'											
2002	North of 40°10'	N/A, PFMC (Council) retained Cowcod Conservation Areas south of 40°10'								Shore-250	100-250	100-250	100-250
2003	North of 40°10'	100-m250		100-250		50-200		75-200		50-200		0-m200	
2004	North of 40°10'	75-m200		60-200		60-150		75-150			0-250		
2005	North of 40°10'	75-m200		100-200							0-250		
2006	North of 40°10'	75-m200		75-200				100-250		75-250		75-m250	
2007	North of 48°10'	75 - m250		75 - 250		0 - 150				0 - 200	75 - 200	75 - m200	
	48°10' - 46°38'					75 - 150				75 - 200			
	46°38' - 46°16'					60 -150				60 -200			
	46°16' - 45°03'					75 - 150			75 - 200				
	45°03' - 43°20'					75 - 200							
	43°20' - 42°40'					0 - 200					75 - 200		
	42°40' -40°10'					75 - 200							
2008	North of 48°10'	0 - m200		0 - 200		0 - 150						0 - m200	
	48 10 - 46 38.17	75 - m200		60 - 200		60 - 150					75 - 150	75 - m200	
	46 38.17 - 46 16			60 - 200				60 - 150					
	46 16 - 45 46			75 - 200		75 - 150				75 - 200			
	45 46 - 43 20.83			75 - 200									
	43 20.83 - 42 40.50	0 - m200		0 - 200								0 - m200	
	42 40.5 - 40 10	75 - m200		75 - 200		60 - 200					75 - 200	75 - m200	
2009	North of 48°10'	0 - m200			0 - 200	0 - 150				0 - 200		0 - m200	
	48°10' - 45°46'	75 - m200			75 - 200	75 - 150		100 - 150		75 - 200		75 - m200	
	45°46' - 40°10'					75 - 200		100 - 200					
2010	North of 48°10'	0 - m200		0 - 200		0 - 150				0 - 200		0 - m200	0 - 250
	48°10' - 45°46'	75 - m200		75 - 200		75 - 150		100 - 150		75 - 200		75 - m200	75 - 250
	45°46' - 40°10'					75 - 200		100 - 200					
2011	North of 48°10'	0 - m200		0 - 200		0 - 150				0 - 200		0 - m200	
	48°10' - 45°46'	75 - m200		75 - 200		75 - 150		100 - 150		75 - 150			
	45°46' - 40°10'					75 - 200		100 - 200		75 - 200		75 - m200	
2012	North of 48°10'	0 - m200		0 - 200		0 - 150				0 - 200		0 - m200	
	48°10' - 45°46'	75 - m200		75 - 150		100 - 150						75 - 150	
	45°46' - 40°10'			75 - 200		100 - 200						75 - m200	

The Council introduced RCAs in 2002.

The trawl RCAs and related gear restrictions were established to reduce bycatch of overfished species, and they have been modified over the years (Table 3-2). Because of the long rebuilding periods for many of the overfished groundfish species, the RCAs were expected to be in place for many years, reducing the effects of trawl gear types on bottom habitat within the RCAs. Because the RCA restrictions on bottom trawling have been in place since 2002, a great deal of recovery to pre-fishing conditions has likely occurred in the baseline environment described in the 2005 EFH FEIS.

From 2002 to 2011, midwater trawl gear used to target Pacific whiting has been exempted from RCA restrictions in the area north of 40°10' N. latitude during the primary whiting season. Beginning in 2011, the groundfish midwater trawl fishery has expanded under the trawl rationalization program, and it includes targeting of pelagic rockfish complex species. Vessels have targeted pelagic rockfish within the RCAs north of 40°10' N. latitude during the primary whiting season. Since 2005, midwater trawling has been allowed in the area south of 40°10' N. latitude for all groundfish species when fishing seaward of the trawl RCA and within the trawl RCA by vessels targeting Pacific whiting during the primary whiting season (see the NMFS, West Coast Region web page at http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30284).

3.2 Biological Environment

Federal regulations (50 CFR 600.10) define FMUs to mean the following:

> "…a fishery or that portion of a fishery identified in an FMP relevant to the FMP's management objectives. The choice of an FMU depends on the focus of the FMP's objectives, and may be organized around biological, geographic, economic, technical, social, or ecological perspectives."

Fish stocks that are classified as FMU species are considered to be in the fishery, whether as target or non-target species. Federal regulations at 50 CFR 600.310(d)(3) and (4) provide the following definitions for "target stocks" and "non-target species," both of which are considered FMU species: "Target stocks" are stocks that fishers seek to catch for sale or personal use, including "economic discards" as defined under MSA 3(9). "Non-target species" and "non-target stocks" are fish caught incidentally during the pursuit of target stocks in a fishery, including "regulatory discards" as defined under MSA section 3(38). They may or may not be retained for sale or personal use. Non-target species

may be included in a fishery and, if so, they should be identified at the stock level. Some non-target species may be identified in an FMP as ecosystem component (EC) species or stocks.

More than 90 species are managed under the Groundfish FMP. These species include more than 60 rockfish, including all genera and species from the family Scorpaenidae (Sebastes, Scorpaena, Sebastolobus, and Scorpaenodes); 12 flatfish species; 6 roundfish species; and 6 miscellaneous fish species that include sharks, skates, grenadiers, rattails, and morids. The species managed under the FMP are distributed throughout the EEZ and occupy diverse habitats at all stages in their life history. In addition, many of the stocks have geographic ranges that extend beyond the U.S. EEZ into Canadian or Mexican waters. The life-history traits of the groundfish species have important implications for stock assessments and how the stocks are managed. This is because fishing changes population abundance of the target species, as well as affecting life-history traits and population dynamics. Fishing may also affect yield.

Rockfish vary in their morphological and behavioral traits, with some species being semi-pelagic and found in mid-water schools, and others leading solitary, sedentary, bottom-dwelling lives (Love et al. 2002). Rockfish inhabit varied depths, ranging from nearshore kelp forests and rock outcroppings to deepwater (more than 150 fm) habitats on the continental slope. Despite the range of behaviors and habitats, most rockfish share general life history characteristics, including slow growth rates, bearing live young, and having large infrequent recruitment events. These life history characteristics contribute to relatively low average productivity that may reduce their ability to withstand heavy exploitation (Parker et al. 2000), especially during periods of unfavorable environmental conditions.

Roundfish managed under the Groundfish FMP include lingcod, cabezon, kelp greenling, Pacific cod, sablefish, and Pacific whiting. In general, roundfish share similar morphology, are faster growing, have shorter life spans, and have external fertilization with some species having large and highly variable recruitment events. Adult lingcod are a relatively sedentary species found coastwide on the rocky shelf and in nearshore habitats. Lingcod grow rapidly, reaching 12 inches in the first year, and have a maximum lifespan of 20 years. Cabezon is a coastwide species primarily found nearshore in intertidal areas and jetty rocks (Love 1996; Miller and Lea 1972). The cabezon's lifespan may exceed 20 years (Wilson-Vandenberg 1992). Kelp greenling is relatively common. Adults are found in rocky reefs in shallow nearshore areas. The estimated maximum age for kelp greenling is 16 years (Howard 1992). Pacific cod are widely distributed from Alaska to Santa Monica, California (Hart 1988; Love 1996). Although Pacific cod prefer shallow, soft-bottom habitats in marine and estuarine environments (Garrison and Miller 1982), adults have been found associated with coarse sand and gravel substrates (Garrison and Miller 1982; Palsson 1990). Compared to the other roundfish, adult sablefish are a

longer-lived species. Adult sablefish commonly occur over sand and mud (McFarlane and Beamish 1983) in deep marine waters, but have also been found over hard-packed mud and clay bottoms in the vicinity of submarine canyons (MBC 1987). The coastal stock of Pacific whiting is semi-pelagic and is the most abundant single-species groundfish population in the California Current system (Stewart et al. 2011a). The stock is characterized by highly variable recruitment patterns and a relatively short lifespan.

Flatfish species (Pleuronectiformes) have asymmetrical skulls with both eyes on the same side of the head. The 12 flatfish species in the Groundfish FMP include assessed species, such as arrowtooth flounder, Dover sole, English sole, petrale sole, and starry flounder, and unassessed species within the Other Flatfish complex (i.e., butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole). Most of the flatfish species are distributed coastwide with the exception of arrowtooth flounder, butter sole, and flathead sole, which are found north of central California. Flatfish species are primarily found in waters of the continental shelf, but vary in depth distribution. Flatfish species primarily found in nearshore areas include starry flounder, Pacific sanddab, butter sole, curlfin sole, sand sole, and rock sole. Flatfish species found in deeper waters include Dover sole, flathead sole, and petrale sole. The remaining flatfish show more variation in depth distribution. Many flatfish migrate seasonally from shallow water summer feeding grounds on the continental shelf to deep water spawning grounds over the continental slope. Though there are variations between species, most of the flatfishes are found on soft bottom such as sand or sandy gravel substrates and mud; however, some are found in eelgrass habitats (Pearson and Owen 1992) and, in the case of arrowtooth flounder, occasionally are found over low-relief rock-sponge bottoms.

The final EIS titled, "Harvest Specifications and Management Measures for 2015-2016 and Biennial Periods Thereafter" (Council and NMFS 2015), provides more information on the distribution of groundfish by species in Section 3.1. Appendix B2 of the final EIS titled, "The Pacific Coast Groundfish FMP, EFH Designation and Minimization of Adverse Impacts" (NMFS 2005), provides more information on habitat utilization patterns, fisheries that harvest the species, geographic range, migrations and movements, reproduction, growth and development, and trophic interactions.

The 2014 Stock Assessment and Fishery Evaluation (SAFE) document (PFMC 2014a), available on the Council website at www.pcouncil.org, describes the distribution and life history, stock status and management history, stock productivity, and fishing mortality attributes of each assessed Groundfish FMP stock in detail. The SAFE also describes the stock assessment methods employed and the harvest specification framework, including methods used to determine these specifications.

The target and non-target stocks of the groundfish fishery's trawl catch share program, along with protected species caught incidentally, are described in the following sections. Table 3-3 provides a summary of the catch (including retained and discarded) of these species in the groundfish fishery's trawl catch share program. Data for Table 3-3 are from the West Coast Groundfish Observer Program (WCGOP) database maintained by NMFS. The WCGOP data for this EIS are from the years 2002 to 2014.

3.2.1 Target Species

Vessels in the trawl catch share program focus much of their effort on DTS species along the slope, flatfish species along the shelf, and Pacific whiting above the seafloor. Historically, much effort was focused on rockfish species, but regulatory requirements since 2002—such as RCAs and various cumulative limits—have curtailed rockfish opportunities to protect overfished stocks. In 2005, a specific small footrope trawl designed to avoid rockfish (the selective flatfish trawl) was adopted to enable further avoiding the catch of rockfish along the shelf, while increasing opportunities for flatfish north of 40º10' N latitude. Implementation of the trawl catch share program in 2011 substantially changed management of the trawl fishery with individual accountability (or in the at-sea whiting fisheries, with coop level accountability) for many groundfish species and Pacific halibut. In addition, the trawl catch share program brought all sectors to 100 percent monitoring for groundfish species and some protected species. In recent years, rebuilt rockfish species have created opportunity for some redeveloping fisheries, such as the midwater trawl fishery for widow rockfish, yellowtail rockfish, and chilipepper rockfish (also called the pelagic rockfish fishery).

The primary target species in the groundfish trawl catch share program are Pacific whiting, Dover sole, thornyheads (shortspine and longspine), sablefish, petrale sole, widow rockfish, yellowtail rockfish, and chilipepper rockfish. Target species differ based on the fishing strategy in the trawl catch share program. Generally, fishing strategies are grouped as follows:

- Pacific whiting fishery – This category targets Pacific whiting with midwater trawl and consists of both a shorebased and an at-sea component.
- Non-whiting trawl fisheries – This category includes three broad target strategies: DTS fishery, pelagic rockfish fishery, and flatfish fishery.
    - The DTS fishery targets Dover sole, thornyheads (shortspine and longspine), and sablefish with bottom trawl gear.
    - The pelagic rockfish fishery targets widow rockfish, yellowtail rockfish, and chilipepper rockfish are targeted with midwater trawl.

  - The flatfish fishery targets petrale sole with bottom trawl gear (including selective flatfish trawl).

- Fixed gear – Vessels using fixed gears to fish in the trawl catch share program (i.e., gear switching) predominately target sablefish.

Table 3-3 provides a summary of the catch (including retained and discarded species) of target, non-target, and protected species in the groundfish fishery's trawl catch share program from 2002 to 2014 by fishing strategy. For the biological environment (Section 3.2), non-whiting trawl fisheries catch is not subdivided by DTS fishery, pelagic rockfish fishery, and flatfish fishery. Chapter 3 of the FEIS for the Groundfish Harvest Specifications and Management Measures for 2015-2016 and Biennial Periods Thereafter provides more information on these target species and fisheries (NMFS 2015).

Table 3-3. Summary of the catch (including retained and discarded) of target, non-target, and protected species in the groundfish fishery's trawl catch share program from 2002-2014. (WCGOP data queried January 2016).

	At-sea Whiting (MS, C/P)				Shorebased Whiting (IFQ)				Non-whiting IFQ Trawl				IFQ Fixed Gear			
	2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014	
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max
Groundfish (mt)																
Arrowtooth flounder	2.77	7.89	18.80	45.29	2.45	9.32	12.32	24.82	3,016.49	5,311.10	2,279.46	2,511.08	--	--	2.95	5.60
Black rockfish (North of 46°16' N. lat.)	0.00	0.00	--	--	0.23	0.90	0.00	0.00	0.81	3.18	0.62	1.00	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	--	--	--	--	0.04	0.04	--	--	1.17	2.94	0.02	0.04	--	--	--	--
Bocaccio rockfish (South of 40°10' N. lat.)	--	--	--	--	0.25	0.74	--	--	15.94	47.40	8.92	12.99	--	--	0.00	0.00
Cabezon (California)	--	--	--	--	--	--	--	--	0.03	0.04	--	--	--	--	--	--
Cabezon (Oregon)	--	--	--	--	--	--	--	--	0.06	0.13	0.03	0.08	--	--	--	--
Canary rockfish	1.75	4.60	0.56	0.66	1.96	4.05	1.89	2.57	22.40	56.70	6.01	8.22	--	--	0.01	0.01
Chilipepper rockfish (South of 40°10' N. lat.)	--	--	--	--	8.55	31.51	--	--	155.90	348.41	328.44	396.45	--	--	0.01	0.01
Cowcod rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	0.82	2.70	0.12	0.19	--	--	--	--
Darkblotched rockfish	7.10	12.05	7.91	12.01	2.09	7.41	4.31	8.45	209.71	288.71	94.40	112.88	--	--	0.18	0.42
Dover sole	0.53	1.86	0.88	1.18	0.27	1.40	0.23	0.60	8,924.45	12,320.30	7,368.58	7,952.76	--	--	1.83	3.69
English sole	0.03	0.11	0.01	0.02	0.84	6.64	0.01	0.02	870.99	1,485.33	185.61	237.00	--	--	0.00	0.00
Lingcod (North of 40°10' N. lat.)	1.91	5.18	0.68	1.51	3.07	5.94	6.33	9.11	154.59	270.27	284.86	344.38	--	--	2.47	3.34
Lingcod (South of 40°10' N. lat.)	--	--	--	--	0.24	0.47	--	--	23.75	35.26	12.48	15.99	--	--	0.12	0.32
Longnose skate	0.35	0.63	0.38	0.75	0.12	0.15	0.20	0.30	410.06	1,108.95	865.68	921.96	--	--	6.87	14.98
Longspine Thornyhead (North of 34°27' N. lat.)	0.11	0.43	0.10	0.39	0.07	0.29	0.03	0.05	1,309.38	2,134.13	946.99	1,065.25	--	--	0.37	0.87
Longspine Thornyhead (South of 34°27' N. lat.)	--	--	--	--	0.05	0.05	--	--	0.30	0.30	0.40	0.40	--	--	0.23	0.39
Minor nearshore rockfish (North of 40°10' N. lat.)	0.01	0.01	--	--	0.02	0.07	--	--	0.75	2.54	0.13	0.18	--	--	--	--
Minor nearshore rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	0.22	0.83	0.08	0.24	--	--	--	--
Minor shelf rockfish (North of 40°10' N. lat.)	4.81	12.63	0.84	1.40	12.74	27.06	1.03	1.35	59.11	119.35	28.99	39.14	--	--	0.05	0.11
Minor shelf rockfish (South of 40°10' N. lat.)	--	--	--	--	0.05	0.05	--	--	34.71	184.46	11.07	19.38	--	--	0.04	0.12

Table 3-3, continued.

	At-sea Whiting (MS, C/P)				Shorebased Whiting (IFQ)				Non-whiting IFQ Trawl				IFQ Fixed Gear			
	2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014	
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max
Minor slope rockfish (North of 40°10' N. lat.)	33.06	74.28	58.97	90.86	9.40	47.37	32.28	71.95	259.32	357.30	140.65	180.68	--	--	13.25	25.74
Minor slope rockfish (South of 40°10' N. lat.)	--	--	--	--	7.69	22.67	--	--	173.30	374.38	90.90	116.44	--	--	6.83	15.45
Mixed thornyheads	0.59	1.42	1.06	2.56	0.00	0.00	--	--	134.58	461.37	3.09	5.83	--	--	0.01	0.02
Other flatfish	3.91	11.70	7.27	12.11	1.12	7.34	1.70	4.39	1,582.05	2,591.36	754.71	831.48	--	--	0.02	0.03
Other groundfish	141.95	513.24	266.17	727.06	54.47	154.49	124.09	182.64	2,478.55	4,012.88	850.77	963.61	--	--	26.21	34.05
Pacific cod	0.06	0.25	0.02	0.03	0.43	1.20	1.71	6.59	383.57	829.22	241.98	396.29	--	--	0.01	0.01
Pacific hake	102,819.07	165,527.35	127,886.95	165,304.58	67,568.14	97,627.84	87,994.73	98,476.51	1,467.32	2,766.76	253.90	306.96	--	--	0.10	0.16
Pacific Ocean Perch (North of 40°10' N. lat.)	5.73	16.44	5.26	7.19	5.46	23.28	7.47	12.36	119.86	158.23	39.98	46.45	--	--	0.05	0.09
Petrale sole	0.00	0.01	--	--	0.15	0.78	0.01	0.03	1,986.75	2,741.92	1,577.17	2,316.05	--	--	0.34	0.73
Sablefish (North of 36° N. lat.)	11.33	28.77	9.74	16.17	46.16	132.92	20.87	47.21	2,633.94	3,138.76	1,441.87	1,665.09	--	--	610.33	737.30
Sablefish (South of 36° N. lat.)	--	--	--	--	0.05	0.07	--	--	42.93	89.97	13.13	22.68	--	--	226.26	431.77
Shortbelly rockfish	2.19	11.55	0.34	0.73	0.11	0.33	0.55	2.12	9.82	60.19	10.85	19.03	--	--	--	--
Shortspine Thornyhead (North of 34°27' N. lat.)	5.89	15.80	14.32	21.74	1.43	11.10	4.00	8.32	922.73	1,441.43	731.15	833.84	--	--	8.94	13.66
Shortspine Thornyhead (South of 34°27' N. lat.)	--	--	--	--	0.17	0.17	--	--	0.19	0.19	0.59	0.59	--	--	3.79	8.45
Splitnose rockfish (South of 40°10' N. lat.)	--	--	--	--	4.82	10.72	--	--	171.28	246.39	52.80	64.79	--	--	0.00	0.00
Starry flounder	--	--	--	--	0.07	0.31	--	--	35.40	115.94	9.55	14.70	--	--	--	--
Widow rockfish	79.09	146.08	50.93	79.30	84.81	242.48	181.84	304.36	17.00	47.60	157.60	349.90	--	--	0.00	0.00
Yelloweye rockfish	0.01	0.04	--	--	0.04	0.07	0.00	0.00	0.61	1.72	0.05	0.08	--	--	0.01	0.01
Yellowtail rockfish (North of 40°10' N. lat.)	68.38	169.51	108.93	269.38	159.27	439.15	348.19	424.33	64.51	265.42	554.44	853.77	--	--	0.01	0.01
Non-Groundfish (mt)																
Pacific halibut ~	1.64	3.98	0.67	1.06	--	--	0.05	0.11	220.01	344.82	32.72	40.52	--	--	1.53	2.34
Non-FMP flatfish	0.04	0.14	0.02	0.03	--	--	--	--	86.02	231.01	52.97	67.13	--	--	0.01	0.02
Non-FMP skate	0.03	0.05	0.03	0.06	0.00	0.00	0.01	0.01	106.64	143.24	62.23	64.16	--	--	0.62	1.23
Other nongroundfish	1,220.17	3,910.02	314.82	398.69	667.78	3,730.24	226.57	425.10	1,667.34	3,076.40	662.99	739.56	--	--	28.71	42.53
Protected Species (number of fish)																
eulachon *	26	147	555	1,271	--	--	1,380	4,139	111	783	322	522	--	--	--	--
Chinook salmon ^	1,487	3,963	4,661	6,685	2,039	4,206	3,732	7,554	4,001	16,460	267	323	--	--	--	--
coho salmon ^	58	227	34	108	31	141	90	175	24	65	32	49	--	--	--	--

Table 3-3, continued.

	At-sea Whiting (MS, C/P)				Shorebased Whiting (IFQ)				Non-whiting IFQ Trawl				IFQ Fixed Gear			
	2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014		2002-2010		2011-2014	
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max
chum salmon ^	53	170	32	53	28	113	14	42	6	36	0	0	--	--	--	--
pink salmon ^	11	48	18	37	14	49	1,529	6,113	<1	2	<1	2	--	--	--	--
sockeye salmon ^	<1	2	0	0	0	0	<1	2	0	0	<1	1	--	--	--	--
Green sturgeon +	<1	2	0	0	--	--	--	--	10	31	23	38	--	--	--	--

Dashes (--) signify years when the fishery/sector did not occur, was not observed, data were not available, or data were not available by that sector/time period.

~ From total discard mortality section of Table 37 in Jannot et al. "Pacific halibut bycatch in the U.S. west coast fisheries (2002-2014)."

***** 2014 data not included. From Table 10 in Gustafson et al. "Observed and Estimated Bycatch of Eulachon in 2002-2013 US West Coast Groundfish Fisheries."

^ 2014 data preliminary. 2014 data not included for non-whiting trawl and fixed gear. From Table 10 in "Salmon Bycatch in the Pacific Coast Groundfish Fisheries" May 2015 Review draft (Council meeting document - Agenda Item D.3.a, NMFS Report 1, June 2015).

+ 2014 data not included. From Tables 3, 4, and 5 in Lee et al. "Observed and Estimated Bycatch of Green Sturgeon in 2002–2013 US West Coast Groundfish Fisheries."

3.2.1.1 Pacific Hake (Whiting)

The following information is from CDFG 2001a. Pacific hake are distributed from the Gulf of Alaska to the Gulf of California. Four major stocks have been identified within this area. The most abundant and widely distributed stock spawns between central California and northern Baja California. This stock is referred to as the "coastal stock." The oceanic coastal stock of adult Pacific hake is migratory, and it inhabits the continental slope and shelf within the California Current system from Baja California to British Columbia (Figure 3-5). It is often classified as a demersal species (living on or near the seabed), but its distribution and behavior suggest a pelagic existence. It exhibits extreme night and day movement during spring and summer feeding migrations as it feeds on a variety of pelagic fishes or zooplankton. It is commonly found at depths from 160 to 1,500 feet, but it has been found from the surface to 2,600 feet. Coastal Pacific hake are pelagic spawners that appear to spawn from January to March. The location of spawning appears to center on the Southern California Bight, but spawning may take place within an area from San Francisco to Baja California at depths from 660 to 1,600 feet and as far as 300 miles offshore. Active spawners aggregate in loose, stationary bands that can be up to 150 feet thick.

In late winter, following spawning, adult hake migrate north in deep water overlying the continental slope to the summer feeding grounds off northern California, Oregon, Washington, and Vancouver Island. The peak period of northward migration appears to be in March and April. The migration behavior of hake is strongly age-dependent, and it is influenced by oceanographic conditions. In warm years, a significant portion (up to 50 percent) of the stock may move into Canadian waters off Vancouver Island. Large adults may travel up to 1,100 miles, while newly mature hake may travel a maximum of 900 miles from southern California spawning grounds during the summer feeding period. Hake caught from Oregon to Vancouver Island range from 16 to 18 inches, fork length, and they are 4 to 10 years old.

When northward-migrating hake inhabit waters overlying the continental shelf and slope, they form schools that may be characterized as long, narrow bands usually oriented parallel to the depth contours. During the summer, when feeding adults are distributed over the continental shelf, schools exhibit pronounced movement into midwater associated with nighttime feeding activities. At dawn, coastal hake descend and begin to regroup into schools near the seabed (7 to 70 feet above the ocean floor), usually in the same area where they were the day before. The degree to which hake congregate during

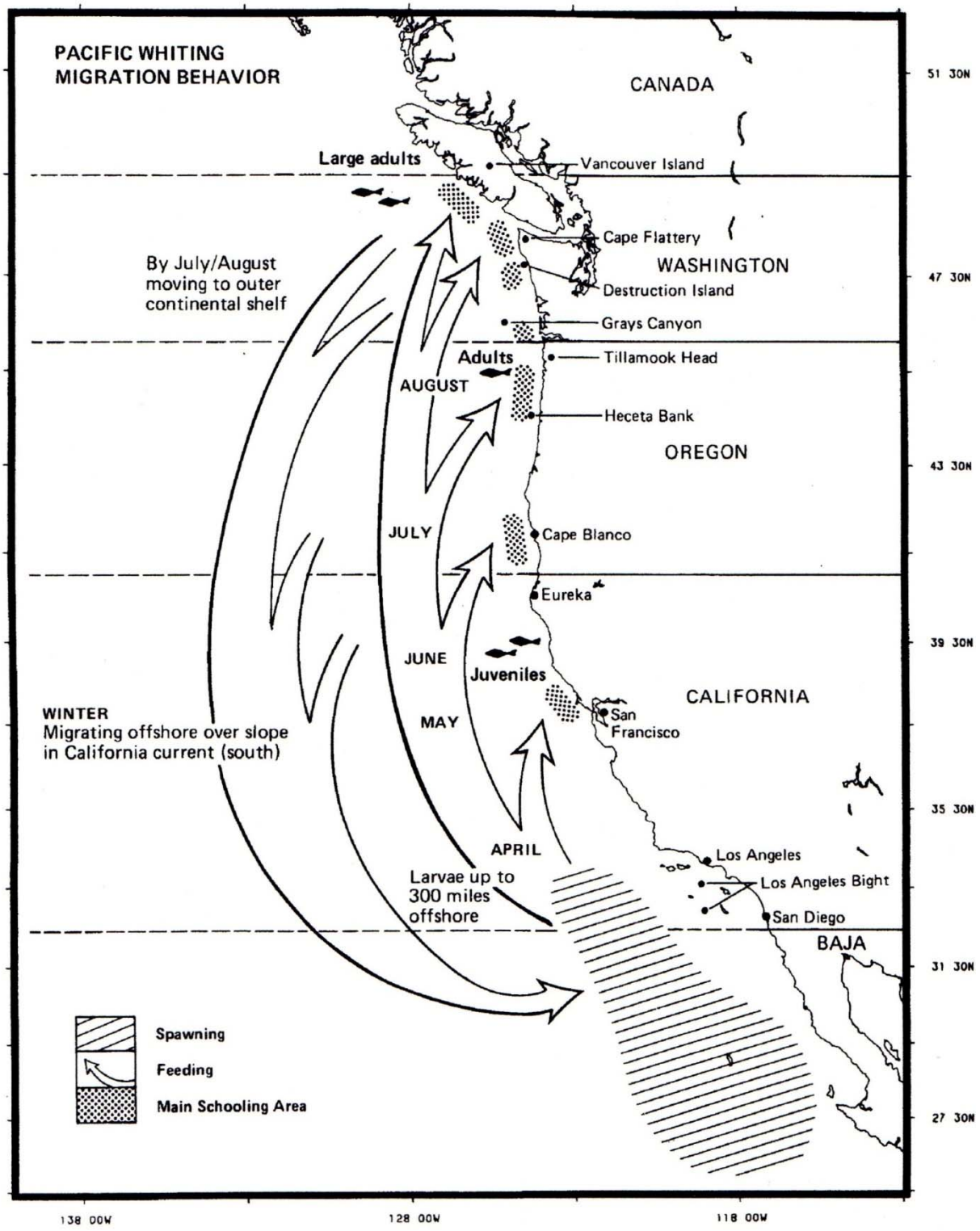

Figure 3-5. Migratory pattern of Pacific whiting (Bailey et al. 1982)

the day appears to be related to the type of food that was available during the feeding period. Schools are more dispersed when feeding on fish and other mobile nekton, but more compact when feeding on euphausiids.

The southward spawning migrations of the adults appears to occur in November and December, just prior to the spawning period. Availability of Pacific hake to bottom and midwater trawls off Oregon, Washington, and Vancouver Island drops sharply in November, and it is practically nil during winter.

The most recent stock assessment for whiting was in 2011 (IJTCPH 2012). The base-case stock assessment model indicated that the Pacific hake female spawning biomass was well below the average unfished equilibrium in the 1960s and 1970s. The current median posterior spawning biomass is estimated to be 32.6 percent of the average unfished equilibrium level. However, this estimate is quite uncertain, with 95 percent posterior credibility intervals ranging from historical lows to above the average unfished equilibrium levels. The estimate for 2012 is 0.62 million metric tons (mt), much smaller than the two estimates in the 2011 assessment (1.87 and 2.18 million mt). This change is largely driven by the very low 2011 acoustic survey biomass index.

3.2.1.2 Widow Rockfish

The widow rockfish *(Sebastes entomelas)* was an untargeted species in northern California prior to 1979. Before that it had been taken primarily with bottom trawl from widely spaced aggregations in 40-140 fathoms. These aggregations produced high catch rates during the fall and spring, which are the mating and spawning seasons for the species. In 1979 a highly directed midwater trawl fishery developed for widow rockfish. New technology, incorporating the use of electronic navigation, fish finding equipment, and midwater nets, extended fishing operations into previously unfished areas and enabled vessels to follow shifts in widow rockfish concentrations throughout the year (Quirollo 1987, Demory 1987). Schooling behavior of widow rockfish allows them to be targeted easily by fishermen, and catches (when the fishery was active) were often 100 percent widow rockfish. Midwater trawling for widow rockfish historically occurred at night when they formed dense off-bottom schools (Tagart 1987). Species most commonly caught incidental to widow rockfish include yellowtail rockfish and Pacific whiting. Other *Sebastes* landed with widow rockfish include Pacific Ocean perch, bocaccio rockfish, canary rockfish, and sharpchin rockfish (Tagart 1987).

The following is from CDFG 2001b. Widow rockfish are found from Todos Santos Bay, Baja California, to Kodiak Island, Alaska. Peak abundance is off northern Oregon and southern Washington, with significant aggregations occurring south to central California. While many commercial catches occur at bottom depths between 450 and 750 feet, young fish occur near the surface in shallow waters, and adults have been caught over bottom depths to 1,200 feet. Widow rockfish often form midwater

schools, usually at night, over bottom features such as ridges or large mounds near the shelf break. The schooling behavior of widow rockfish is dynamic, and it is probably related to feeding and oceanographic conditions. There appears to be some seasonal movement of fish among adjacent grounds, and there is evidence that fish move from area to area as they age, with fish of the same size tending to stay together. The maximum recorded age for widow rockfish is 59 years, but fish older than 20 years are now uncommon. Most are less than 21 inches long, corresponding to a weight just under 5 pounds. The maximum size is 24 inches or about 7.3 pounds. At first, growth is rapid; by age 5, widow rockfish average 13.5 inches. By age 15, growth slows greatly, when the average size is about 19 inches for females and 17.5 inches for males. Widow rockfish do not become reproductive until years after birth. For example, only 50 percent are mature by age 5, but almost all are mature by age 8 when they are 16.5 inches long. Off California, fecundity ranged from 55,600 eggs for a 12.8-inch female to 915,200 eggs for an 18.8-inch fish. The release of larvae by widow rockfish peaks in January and February and appears to occur in the same areas where they are caught during that season. The larvae are about 0.2-inch when released. The young fish lead a pelagic existence until they are about 5 months old. During the latter part of the pelagic stage, the 2-inch fish feed mostly on copepods and small stages of euphausiids. Adult widow rockfish feed on midwater prey such as lantern fish, small Pacific whiting euphausiids, sergestid (deep-water) shrimp, and salps. Juvenile rockfish, including widow rockfish, are important prey items for sea birds and Chinook salmon in May and June. Little is known about predation of adult widow rockfish.

The most recent widow rockfish assessment in 2011 applied to widow rockfish (*Sebastes entomelas*) located in the territorial waters of the U.S., including the Vancouver B.C., Columbia, Eureka, Monterey, and Conception areas. The stock is assumed to be a single mixed stock and subject to five major fisheries (He et al. 2011). Stock spawning biomass of widow rockfish showed a steady decline between 1980 and 2001, soon after major commercial fisheries for widow rockfish began. The stock was declared overfished in 2001. A stock that has declined to less than 25 percent of its unfished spawning biomass is considered "overfished" until it rebuilds to 40 percent of its unfished spawning biomass. The most recent stock assessment showed that the stock had rebuilt to a depletion level of 51 percent and a spawning stock size of 36,342 mt. The assessment showed that the stock has rebuilt (He et al. 2011). For this analysis, widow rockfish is treated as a target species because QP was available to cover widow rockfish catches in the Shorebased IFQ Program beginning in 2011 and because the stock is rebuilt.

3.2.1.3 Yellowtail Rockfish

The following is from CDFG 2001c. Yellowtail rockfish are found from Kodiak Island, Alaska to San Diego, although they are rare south of Point Conception. They are wide-ranging and are reported to

occur from the surface to 1,800 feet. They are known to form large schools, either alone or in association with other rockfish, including widow rockfish, canary rockfish, redstripe rockfish, and silvergray rockfish. They are primarily distributed over deep reefs on the continental shelf, especially near the shelf break, where they feed on krill and other micronekton. Some allozyme and parasitological evidence supports the view that multiple stocks exist, whereas other genetic data indicate one single coastal stock. Like many other species of rockfish, yellowtail is long lived. The age distribution of fish sampled in commercial fisheries off Oregon and Washington can span six decades, with the oldest known specimen a 64-year-old male. They typically reach their maximum size at about 15 years of age, and the largest recorded specimen was a 28-inch female. Females begin to mature at 10 to 15 inches, with half reaching maturity by a size of 15 to 18 inches; males do not grow quite as large as females.

The most recent stock assessment for yellowtail rockfish showed the following. The estimated age of the 4+year-old biomass in 2004 for the stock north of 40° 10’ N. latitude was estimated to be 72,152 mt with a 26 percent CV, an increase from 58,025 mt in 2003. The spawning biomass has remained above 40 percent of unfished spawning biomass since 1995. Annual fishing mortalities have been less than FMSY since 1997, due to more restrictive regulations put in place to rebuild other overfished rockfishes (Wallace and Lai 2005).

3.2.1.4 Chilipepper Rockfish

Chilipepper rockfish range from Queen Charlotte Sound, British Columbia to Magdalena Bay, Baja California. The area of greatest abundance is found between Point Conception and Cape

Mendocino, California (Field 2007). Adults are found on deep rocky reefs, as well as on sand and mud bottoms, from 150 to 1,400 feet; juveniles school and are frequently found in shallow nearshore waters, particularly in kelp beds. Spawning occurs from September to April with a peak occurring in December and January. About 50 percent of female chilipepper are sexually mature at 4 years when they are between 11 and 12 inches, while males mature at 2 years and between 8 and 9 inches. Chilipepper attain a maximum age of 35 years and a size of up to 23 inches, with females growing substantially larger than males. Adults feed on krill and other small crustaceans, squid, and a variety of small fishes. Probable predators of chilipepper include marine birds and mammals, Chinook salmon, lingcod, Pacific hake, sablefish, and other rockfish (CDFG 2001d).

The last stock assessment of chilipepper in 2007 indicated the stock was in good condition. The base model in that assessment suggested a spawning biomass of 23,889 tons in 2006, corresponding to approximately 70 percent of the unfished spawning biomass of 33,390 tons and representing a near tripling of spawning biomass from the estimated low of 8,696 tons (26 percent of unfished) in 1999

(Field 2007). Although chilipepper rockfish have been a commercially important species in California waters since well before the World War II, the exploitation rate has rarely exceeded the current target exploitation rate (spawning potential ratio [SPR] 50 percent). The highest exploitation rates occurred from the late 1980s through the mid-1990s, when they were above target levels, and the stock was approaching its lowest estimated historical levels. From the late 1990s through the present, exploitation rates have been declining significantly, as a result of management measures implemented to rebuild other depleted rockfish species (Field 2007).

3.2.1.5 Petrale sole

Full assessments of petrale sole were conducted in 2009, 2011, and 2013. The 2009 assessment found the stock to be overfished, while the 2011 and 2013 assessments indicated that the stock was above the minimum stock size threshold (MSST), but had not yet been rebuilt to the biomass of maximum sustainable yield (BMSY). The 2013 assessment indicated that petrale sole would be rebuilt to 26.3 percent of the unfished spawning biomass at the beginning of 2014.

The 2013 coastwide stock assessment was restructured to summarize petrale sole landings by the port of landing. It also combined Washington and Oregon into a single fleet. The down-weighting of the trawl catch per unit of effort (CPUE) index used in the 2011 assessment was largely responsible for the more pessimistic result and the 1-year lag in rebuilding relative to the previous assessment. However, the estimate of recent recruitments indicated two very strong year classes (2007 and 2008) recruiting into the spawning population, and this increases the likelihood of imminent success in rebuilding this stock.

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

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

Petrale sole exhibit distinct seasonal depth migrations with higher abundance on the shelf during summer months and higher abundance in distinct spawning areas during winter months. RCA

structures for petrale sole could vary seasonally if RCA management is needed to control fishing mortality. The general pattern for petrale sole is a shallower depth distribution during summer months and a deeper depth distribution during winter months. Petrale sole are typically in transition as they migrate between shallow and deeper depths during the spring and fall. Catch monitoring uncertainty is low for petrale sole, since it is a trawl-dominant species, and the trawl fishery is subject to 100 percent observer coverage under trawl rationalization.

3.2.1.6 Dover sole

The 2011 Dover sole assessment indicated the stock was healthy with an increasing abundance trend. Spawning stock biomass depletion was estimated to be 83.7 percent of unfished biomass at the start of 2011 (Hicks and Wetzel 2011). The 2011 assessment indicates that Dover sole have been lightly exploited, and the spawning biomass has remained well above target levels; however, recent low recruitment, coupled with a slight increase in catch, has caused the trend in spawning biomass to level. The 2011 Dover sole assessment is data-rich, and the species is readily tracked in the NMFS trawl survey.

The spawning biomass of Dover sole reached a low in the mid-1990s before beginning to increase throughout the last decade. The estimated depletion has remained above the 25 percent biomass target, and it is unlikely that the stock has ever fallen below this threshold. Throughout the 1970s, 1980s, and 1990s, the exploitation rate and SPR generally increased, but never exceeded the SPR 30 percent FMSY target. Recent exploitation rates on Dover sole have been much lower than FMSY, even with increased catch levels since 2007. Estimates of recruitment appear to oscillate between periods of low and high recruitment.

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

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

3.2.1.7 Sablefish

The 2011 sablefish (*Anoplopoma fimbria*) assessment estimated spawning stock biomass to be at 33 percent of its unfished biomass at the beginning of 2011 (Stewart et al. 2011). The resource was modeled as a single stock; however, there is some dispersal to and from offshore seamounts and along the coastal waters of the continental U.S., Canada, Alaska, and across the Aleutian Islands to the western Pacific that was not explicitly accounted for in this analysis. Sablefish are found in waters from 27 to 1,000 fm, but they are most common in 110 to 550 fm.

Sablefish is a major target species in offshore fixed gear and bottom trawl fisheries. With the exception of some live fish fisheries, sablefish is the most valuable commercial groundfish stock on a per-pound basis. While the assessment is coastwide, and coastwide OFLs and ABCs are specified for the stock, ACLs are apportioned north and south of 36º N. latitude, since long-term formal allocations have been decided for the portion of the population north of 36º N. latitude. Only the population north of 36º N. latitude has experienced catches with high attainment rates relative to specified ACLs/optimum yields (OYs).

Because sablefish is a precautionary zone species that is usually fished to a high level of attainment, inseason monitoring and management are especially important when managers try to make decisions that may result in exceeding or attaining sector ACLs. Accurate and timely data are needed to prevent overfishing. Since implementation of the limited entry fixed gear sablefish permit stacking program in 2002, inseason management of the primary and daily trip-limit (DTL) fishery sablefish fixed-gear fisheries has been based on two types of information: (1) paper landing receipts that typically have a 2-month time lag between the date of landing and when the landing data are available in PacFIN, and (2) the Quota Species Monitoring (QSM) Best Estimate Report, which fills in the 3-month time lag based on estimates from the previous years' landings. Both of these data sources estimate which landings are attributed to the primary (tier) fishery and which are attributed to the DTL fishery. Thus, the current catch accounting system is subject to inaccuracy and time delays that are being addressed through a separate rulemaking that would implement electronic fish tickets for limited entry primary and DTL fisheries and open access fisheries, similar to what is used in the trawl Shorebased IFQ Program. More information on the sablefish rulemaking and this proposed action for trawl gear changes is described in Chapter 4.9, Cumulative Effects.

3.2.1.8 Thornyheads (Shortspine and Longspine)

Shortspine and longspine thornyheads are distinct species of thornyheads. They are discussed below.

The 2013 shortspine thornyhead assessment indicated a stock depletion of 74.2 percent at the start of 2013 (Taylor and Stephans 2013). This is a slow-growing species, with continuous length increases on the order of 1 cm/year. Shortspine thornyhead has been managed with separate ACLs/OYs north and south of Point Conception at 34º27' N. latitude since 2007 and has not come close to reaching full attainment in recent years. Management uncertainty is low for shortspine in the north, since most of the catch is in the trawl fishery, which is observed at a 100 percent rate. In the south, shortspine are mostly targeted in the limited entry fixed gear fishery, which is observed at a 20 to 25 percent rate.

The most recent stock assessment (Fay 2006) indicated that the longspine thornyhead stock was healthy with an estimated spawning stock biomass at 71 percent of its initial, unfished biomass in 2005. The impact of recruitment variability on the biomass for longspine thornyhead is low due to the long-lived nature of the species. The bulk of the biomass for this stock is contained in a large number of old age-classes. Longspine are distributed in depths from 167 fm to greater than 833 fm (PFMC 2014). The bottom trawl fishery is prohibited from operating in waters deeper than 700 fm, which is shallower than the distribution of longspine. This substantially reduces any biological risk to the stock resulting from fishing pressure. Longspine thornyhead is not targeted in the Conception area and is caught in incidental amounts that are well below ACLs. Longspine thornyhead has been managed with separate ACLs/OYs north and south of at 34º27' N. latitude since 2007. Attainment has not come close to the ACL in recent years. Longspine thornyhead is a trawl-dominant species in the north. Catch monitoring uncertainty is low, given the level of observer monitoring in the trawl fisheries.

3.2.2 Non-target Species

The biological resources covered in this section include those species that share the same marine environment, both temporally and spatially, with the species targeted in the trawl catch share program (target species are listed in Section 3.2.1). There are often more types of non-target species caught in trawl fisheries than target species. The non-target species are discussed below in subsections grouped by target fishery. Table 3-3 provides a summary of the catch (including retained and discarded) of target, non-target, and protected species in the groundfish fishery's trawl catch share program from 2002-2014. Table 3-3 groups catch by the following fishing strategies: Pacific whiting fishery (at-sea and shorebased), non-whiting trawl fishery, and Shorebased IFQ Program fixed gear fishery. Chapter 3 of the FEIS for the Groundfish Harvest Specifications and Management Measures for 2015-2016 and Biennial Periods Thereafter provides more information on non-target species and fisheries (NMFS 2015).

3.2.2.1 Incidence of Non-target Species in Pacific Whiting Fisheries

At-sea whiting fishery (non-tribal) observer data from 2002 to 2014 were examined to determine the species and relative abundance by species or species group impacted in the fishery. The at-sea fisheries, catcher/processors, and motherships had 100 percent observer coverage (nearly all hauls were sampled) during this period. The data show that the at-sea whiting vessels incidentally catch a wide variety of species and species groups, in addition to whiting. By weight, the following species or species groups made up most of the non-target species catch, with an average of more than 50 mt each from 2011 to 2014: minor slope rockfish north of 40°10' N. latitude, other groundfish, widow rockfish, yellowtail rockfish, and other non-groundfish (Table 3-3).

3.2.2.2 Incidence of Non-target Species in the Non-whiting Trawl Fisheries

Non-whiting trawl fisheries include three broad fishing strategies: DTS fishery, pelagic rockfish fishery, and flatfish fishery. The DTS fishery targets Dover sole, thornyheads (shortspine and longspine), and sablefish with bottom trawl gear. The pelagic rockfish fishery targets widow rockfish and yellowtail rockfish, and chilipepper rockfish are targeted with midwater trawl. The flatfish fishery targets petrale sole with bottom trawl gear (including selective flatfish trawl). Many species of non-target groundfish (including overfished species), and non-groundfish species are caught incidentally in these fisheries.

For the biological environment (Section 3.2), non-whiting trawl fisheries catch is not subdivided by DTS fishery, pelagic rockfish fishery, and flatfish fishery. Non-target species caught incidentally in non-whiting trawl fisheries from 2002 to 2014 are listed in Table 3-3 By weight, the following species or species groups made up most of the non-target species catch, with an average of between 50 mt and 500 mt each from 2011 to 2014: chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (Table 3-3).

3.2.2.3 Incidence of Non-target Species in the Fixed Gear Fishery

Vessels using fixed gear in the Shorebased IFQ Program under the gear switching provision generally target sablefish with pot or longline gear. Non-target species caught incidentally in fixed gear fisheries from 2002 to 2014 are listed in Table 3-3. By weight, the following species or species groups made up most of the non-target species catch, with an average of more than 5 mt each from 2011 to 2014: longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (Table 3-3).

3.2.2.4 Non-target Groundfish

Based on the non-target species caught in the trawl catch share program as described in Sections 3.2.2.1 through 3.2.2.3 and in Table 3-3, this section describes the biological information on those species. Starting in 2011, groundfish have been managed with species-specific IFQ, species-complex IFQs, trip limits (for non-IFQ groundfish species and non-groundfish species), sector allocations, and set-asides. Each of these harvest management objectives has different levels of accountability (individual versus trawl fleet versus entire groundfish fishery).

3.2.2.4.1 Overfished Groundfish

Several groundfish species are considered to be overfished or are overfished stocks. Overfished stocks are those with spawning biomasses that have dropped below the MSST. The Groundfish FMP requires overfished stock to be rebuilt to BMSY through harvest restrictions and conservation measures. Furthermore, MSA requires that the rebuilding periods be the shortest time possible while considering the status and biology of the stock, the needs of fishing communities, and the interaction of the stock within the marine ecosystem. A rebuilding analysis that considers alternate harvest levels and rebuilding times is prepared for each overfished species. As of January 2016, the following groundfish stocks are considered overfished:

- Bocaccio (south of 40°10’ N. latitude)
- Cowcod rockfish (south of 40°10’ N. latitude)
- Darkblotched rockfish
- Pacific ocean perch (north of 40°10’ N. latitude)
- Yelloweye rockfish

Based on recent stock assessment information and updates, canary rockfish and Petrale sole are no longer overfished, but they will continue to be managed under rebuilding plans until 2017.

All species of overfished groundfish are actively managed in all ocean management areas and fisheries. They occur as incidental catch in all trawl catch share fisheries. Habitat preference and latitudinal and depth distributions vary between the species (NMFS 2005a, Appendix I).

Of the overfished species, only darkblotched rockfish show up in the trawl catch share fisheries in amounts greater than 50 mt on average between 2011 to 2014 (Table 3-3). The non-whiting trawl fishery has an average of 94 mt during 2011 to 2014 with a maximum of 112 mt, less than half the volume before the trawl catch share program. The most recent stock assessments for overfished

groundfish species have shown improving recovery trends (measured as a percent of unfished stock) for darkblotched rockfish (from 10 percent to 30.2 percent).

3.2.2.4.2 Other Non-target Groundfish Species

Other groundfish species (other than overfished groundfish) are frequently caught in the trawl catch share program. Those noted because of their relatively large tonnages, as shown in Table 3-3, are chilipepper rockfish, English sole, lingcod (north of 40°10' N. latitude), longnose skate, minor slope rockfish (north and south of 40°10' N. latitude), other groundfish, Pacific cod, Pacific whiting, shortspine thornyhead (north of 34°27' N. latitude), splitnose rockfish (south of 40°10' N. latitude), widow rockfish, yellowtail rockfish, non-FMP flatfish, and non-FMP skates.

3.2.2.5 Pacific Halibut

Pacific halibut (*Hippoglossus stenolepis*) belong to a family of flounders called Pleuronectidae. Pacific halibut are managed by the bilateral (U.S./Canada) IPHC with implementing regulations set by Canada and the U.S. in their own waters. The Pacific Halibut Catch Sharing Plan for waters off Washington, Oregon, and California (Area 2A) specifies IPHC management measures for Pacific halibut on the Pacific Coast. Pacific halibut mortality in the groundfish trawl fishery is managed with individual bycatch quotas (IBQ). Pacific halibut are occasionally caught in the whiting fishery. All trawl catch share program fisheries averaged under 2 mt of halibut caught, except for the non-whiting trawl fishery (Table 3-3). From 2002 to 2010, before the trawl catch share program, the non-whiting trawl fishery took an average of 220 mt of halibut. After implementation of the trawl catch share program (2011 to 2014), the non-whiting trawl fishery took an average of 33 mt of halibut (Table 3-3).

3.2.2.6 Coastal Pelagic Species

Coastal pelagic species (CPS), such as Pacific sardine, Pacific mackerel, jack mackerel, northern anchovy, and market squid, are taken incidentally in the groundfish fishery. They are believed to be more vulnerable to midwater trawl gear compared to other groundfish gear types. Their vulnerability is because of their off-bottom schooling behavior.

3.2.2.7 Highly Migratory Species

Highly migratory species are not commonly caught in the trawl catch share program.

3.2.3 Protected Species

The term “protected species” refers to organisms for which killing, capture, or harm is prohibited under several Federal laws, unless authorized. Incidental take of these species in the course of operations may be allowed under provisions of applicable law. The laws, listed below, include procedures to determine

whether these impacts are of sufficient magnitude to require regulatory action to reduce the impact. This section describes protected species that may be encountered in groundfish fisheries in the context of actions and standards pursuant to these laws.

Protected species are species listed under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA), and EO 13186. These three acts are described below.

ESA protects species in danger of extinction throughout all or a significant part of their range, and it mandates the conservation of critical habitat. ESA defines "species" as a species, a subspecies, or for vertebrates a distinct population. A species is listed as "endangered" if it is in danger of extinction throughout a significant portion of its range, It is defined as "threatened" if it is likely to become an endangered species within the foreseeable future throughout all, or a significant part, of its range.

MMPA guides marine mammal protection and conservation. Annual stock assessments are conducted for strategic stocks and every 3 years for non-strategic stocks. "Strategic stocks" are those with a human-caused mortality and injury level that exceeds the potential biological removal level (defined as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population…"). Marine mammal populations with an abundance that falls below its optimum sustainable level are listed as "depleted." All marine mammal species are protected under MMPA, regardless of species or stock listings under ESA.

MBTA implements treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under MBTA, it is unlawful to take, kill, or possess migratory birds. In addition, EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, directs Federal agencies to negotiate Memoranda of Understanding with the U.S. Fish and Wildlife Service (USFWS) that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. All migratory seabird species are protected under MBTA and EO 13186, regardless of species or stock listings under ESA.

3.2.3.1 ESA-listed Salmon and Steelhead

Salmon caught in Pacific Coast groundfish fisheries are anadromous, spending part of their life in freshwater streams and rivers from central California to Alaska and part of their life in marine waters (NMFS 2006). During their marine phase, they occur along the U.S. and Canada coasts, seaward into the north central Pacific Ocean, including Canadian territorial waters and the high seas. Critical portions of these ranges include the freshwater spawning grounds and migration routes. There are

31 Pacific Coast salmon and Steelhead evolutionarily significant units (ESUs) or distinct population segments (DPSs) in the action area. NMFS uses the concept of ESUs and DPSs in applying ESA to salmon and steelhead. Of the ESA-listed species, Chinook are most likely to be encountered in the groundfish fisheries. The Chinook ESUs that NMFS has concluded to be affected by the groundfish fisheries are Snake River fall Chinook, Upper Willamette River Chinook, Lower Columbia River Chinook, Puget Sound Chinook, Sacramento River winter-run Chinook, California coastal Chinook, and Central Valley spring-run Chinook (NMFS 2006).

Table 3-3 shows the estimated annual catch of salmonids in all sectors of the trawl catch share program from 2002 to 2014. Annual temporal and spatial variations in the catch of salmon are associated with the behavior and biology of Chinook salmon and Pacific whiting. Salmon bycatch rates tend to be higher closer to shore and earlier in the season. The Shorebased IFQ Program tends to fish closer to shore where salmon are more abundant. However, no such factors adequately account for inter-annual variation in bycatch. Previous work found no "obvious or consistent correlation" between annual Chinook abundance and bycatch. Ocean conditions may play a role, but specific causative factors, at least any that can be used predicatively, have not been identified (NMFS 2006). Ocean conditions may play a role, but specific causative factors, at least any that can be used predicatively, cannot be identified.

3.2.3.2 ESA-listed Green Sturgeon

The southern DPS of North American green sturgeon was listed as threatened under ESA in 2006 (71 FR 17757), and critical habitat was designated in 2009 (74 FR 52300). The North American green sturgeon southern DPS is defined as coastal and Central Valley populations, south of the Eel River in California. Green sturgeon critical habitat is designated from 0 to 60 fm (74 FR 52300). The depth distribution of all observed tows encountering green sturgeon bycatch was similar, with 60 percent of tows in the depth range of 5 to 15 fathoms (fm) and 75 percent from 5 to 20 fm (Al-Humaidhi et al. 2011). Incidental take of adult and subadult Southern DPS green sturgeon is anticipated to occur as a result of fishing under the Pacific Coast Groundfish FMP. Injury or mortality may occur as a result of encounters with fishing gear. Green sturgeon bycatch in the at-sea whiting fishery has been very low (zero catch in most years). Most catch of green sturgeon in groundfish fisheries is from the bottom trawl fishery in Oregon, with an average catch from 2002 to 2010 of 10 mt and from 2011 to 2013 of 23 mt (Table 3-3).

3.2.3.3 ESA-listed Eulachon

GE ¶ 4hon are found in the eastern North Pacific Ocean from northern California to southwest Alaska and into the southeastern Bering Sea. The southern DPS of eulachon was listed as threatened under ESA in 2010 (75 FR 13012). The eulachon southern DPS is defined as extending from the Mad River

in northern California north to the Skeena River in British Columbia. Eulachon is an anadromous smelt. Adults migrate from the ocean to freshwater creeks and rivers where they spawn from late winter through early summer. The offspring hatch and migrate back to the ocean to forage until maturity. Once juvenile eulachon enter the ocean, they move from shallow nearshore areas to deeper areas over the continental shelf. Little information is available about eulachon movements in nearshore marine areas and the open ocean. Eulachon are incidentally caught in the groundfish trawl fisheries.

The take of threatened southern DPS eulachon is anticipated to occur as a result of fishing under the FMP. Take of southern DPS eulachon occurs as incidental catch in the groundfish bottom trawl and at-sea hake fisheries, and mortalities result from encounters with fishing gear. Table 3-3 shows estimates of the number of eulachon caught by trawl fisheries from 2002 to 2013. Eulachon have been encountered in the at-sea whiting fishery, the shorebased whiting fishery, and non-whiting trawl fishery. Recently, the amount of eulachon listed in the incidental take statement (1,004 fish) was exceeded in both the at-sea and shorebased whiting fisheries.

3.2.3.4 ESA and MMPA-listed Marine Mammals

U.S. Pacific Coast waters support a variety of marine mammals. Approximately 30 species, including seals, sea lions, sea otters, whales, dolphins, and porpoise, occur within the EEZ. Many species seasonally migrate through Pacific Coast waters, while others are year-round residents (Council 2012d). Two of nine ESA-listed marine mammal species that occur in the action area have a higher probability of encounter in groundfish fisheries: humpback whales (endangered) and Stellar sea lions (threatened).

Among the catches of marine mammals in groundfish trawl fisheries, bycatch estimates have been highest for California sea lions, which were caught primarily in trawl nets in the limited-entry trawl fishery (bottom and whiting). The next highest were Steller sea lions which were also caught in the limited-entry trawl (bottom trawl and whiting) and California halibut trawl fisheries. Steller sea lions taken on the Pacific Coast are from the eastern stock (east of 140° W. longitude). It is estimated that an average of 14 Steller sea lions per year will be caught, with a maximum of 45 Steller sea lions caught in a single year. Most of the elephant seals that were caught were taken in the at-sea whiting fishery (Jannot et al. 2011).

3.2.3.5 Seabirds

The California Current system supports a diverse array of seabird species. Species found on the Pacific Coast include resident species and transitory species (migrating or foraging). All the California Current system seabirds are highly mobile and require an abundant food source to support their high metabolic

rates. Ten species or species groups of seabird interactions with the groundfish fishery were documented from 2002 to 2009.

Two of the seabird species with documented interactions with the Pacific Coast groundfish fishery (short-tailed albatross and marbled murlette) are ESA-listed. The California least tern (*Sterna antillarum browni*), which is found on the Pacific Coast, is also ESA-listed. California least terns forage primarily in nearshore ocean waters and in shallow estuaries and lagoons, although some adults also feed close to shore in ocean waters. Fisheries are unlikely to impact California least tern populations directly through bycatch of individuals, and there have been no reported lethal takes of California least tern in Pacific Coast groundfish fisheries.

Short-tailed albatrosses (*Phoebastria albatrus*) are large, pelagic seabirds with long, narrow wings adapted for soaring just above the water surface. Short-tailed albatross forage extensively along continental shelf margins, spending the most time within national EEZs, particularly the U.S., off Alaska, as well as Russia and Japan, rather than over international waters (Suryan, et al. 2007a; Suryan, et al. 2007b). Juveniles and sub-adults are prevalent off the west coasts of Canada and the U.S. (Environment Canada 2008). Short-tailed albatross may also interact with trawl fisheries. Seabirds, including other albatrosses, fly behind vessels, or float in offal plumes that trail beyond vessels. In these areas, they can strike the trawl cables (warps) or the sonar cable (third wire) attached to the net (NMFS 2006a), or they can become entangled on the outside of nets towed at or near the surface. Those striking cables are very unlikely to show up on the vessel's deck to be sampled (USFWS 2008).

The marbled murrelet is a small seabird. In the Pacific Northwest and California, murrelets tend to forage within 2 km of the coast during the breeding season, with somewhat greater dispersal during the non-breeding season. The WCGOP reported single interactions with marbled murrelets in 2001 and 2002 in northern California. Both of these occurred in the limited entry trawl sector, and they were reported as "boarded vessel only" (Jannot et al. 2011).

3.2.3.6 Sea Turtles

Major threats to sea turtles in the U.S. include, but are not limited to, destruction and alteration of nesting and foraging habitats, incidental capture in commercial and recreational fisheries, entanglement in marine debris, and vessel strikes. Leatherback turtles are present and potentially vulnerable as bycatch in the Pacific Coast groundfish fishery during the summer-fall period (June through November) (Jannot, et al. 2011). Upwelling associated with the California Current system is most intense north of Point Conception, California (Bakun, et al. 1974), but decreases considerably north of Cape Blanco, Oregon, due to inconsistent wind patterns and changes in localized surface currents

(Barth, et al. 2000). Although green and loggerhead turtles occur in the area, there are no known interactions with the groundfish fisheries.

Leatherbacks primarily forage on cnidarians (jellyfish and siphonophores) and, to a lesser extent, on tunicates (pyrosomas and salps) (NMFS and USFWS 1998). Foraging occurs in temperate waters where leatherbacks appear to use convergence zones and upwelling areas in the open ocean along continental margins and in archipelagic waters (Morreale et al. 1994; Eckert 1998, 1999). Foraging is also likely aggregated in productive coastal areas where jellyfish prey is abundant (NWFSC 2011). Also based on available information, use of the California Current by leatherbacks appears highly seasonal, with turtles arriving along the U.S. West Coast during summer and fall months when large aggregations of jellyfish form (Bowlby 1994; Starbird et al. 1993; Benson et al. 2007b; Graham 2009).

3.3 Socioeconomic Environment

The socioeconomic environment covers the primary and secondary businesses that are involved in the fishery, both at sea and on land. The Pacific coast groundfish fishery is varied, and it consists of many sectors, including commercial, recreational, and tribal. This EIS focuses on the trawl catch share program, a part of the commercial fishery, and on the harvesters, processors/first receivers, fishing communities, and government entities involved. Section 3.2 in the harvest specifications and management measures for the 2015-2016 Pacific Coast Groundfish Fishery FEIS (Council 2015a) describes commercial fisheries targeting groundfish. Associated with that description are tables summarizing landings and exvessel revenues in the groundfish fisheries, landings, and revenue by port, as well as indicators of fishery participation. The FEIS, associated tables, and data developed by Council staff using Pacific Fisheries Information Network (PacFIN) and North Pacific Database Program (NorPac) data are sources of information for this section. The document also provides information on tribal and recreational groundfish fisheries and fishing communities.

3.3.1 Harvesters

West Coast limited entry trawl vessels use midwater trawl gear and small and large footrope bottom trawl gear (defined at 50 CFR 660.302 and 660.322(b)). Midwater trawl gear is not designed to touch the ocean bottom; it is, therefore, used to target groundfish species, such as Pacific whiting and yellowtail rockfish, which reside above the ocean floor. Small and large footrope trawl gear types are designed to remain in contact with the ocean floor and are used to target species that reside along the bottom such as flatfish on the continental shelf and slope, or Dover sole, thornyhead, and sablefish complex (DTS) species (in deep water). Fishers generally use small footrope trawl gear in areas that have a regular substrate (few rocks or outcroppings) and more widely on the continental shelf than on the continental slope; this is due, in large part, to regulatory requirements. Traditionally, fishers use

large footrope trawl gear most commonly in areas that may have an irregular substrate, as well as along the continental slope and in deeper water. The limited entry shore-based trawl vessels primarily deliver their catch to processors and buyers located along the coasts of Washington, Oregon, and California, and they tend to have their home ports located in towns within the same general area where they make deliveries. Larger vessels in the shorebased limited entry trawl sector focus more heavily on the DTS complex in deep water, while smaller trawl vessels focus more heavily on the shelf. Large trawl vessels also tend to participate in the trawl fishery for more months of the year than small trawl vessels. The shore-based vessels range in size from less than 40 feet to more than 90 feet long.

Vessels participating in the limited entry trawl IFQ program can also use fixed gear, primarily deploying longlines and traps (pots) for catching groundfish, particularly sablefish. Groundfish longline activities involve anchoring to the ocean floor a stationary line (groundline) with multiple baited hooks attached to it. A buoy line attaches the groundline to a surface float, usually a buoy and pole. Fishers leave the longline in the water for several hours to a day. The vessel crew returns to the gear, retrieves the buoy, and hauls the line to the surface to retrieve the gear and fish.

Fish pots or traps used to harvest groundfish are generally square, and they have mesh or twine encompassing the exterior. Baited traps connected to a surface pole or buoy by a vertical line are dropped to the ocean floor. The fish enter the trap through a door, but they cannot exit the trap unless they can back out the door or are small enough to escape through the mesh. These pots are retrieved by the vessel crew several hours after being set. Both longlines and fish pots can be set across diverse ocean bottom types, though longlines can get hooked on rocky areas or reefs, causing some gear loss. Limited entry fixed gear fishers typically use shore-based vessels that range in size from 30 to 65 feet long, but some vessels exceed 100 feet, and some are as small as 23 feet.

From the 1960s through 1990, foreign vessels processed most of the relatively small amount of Pacific whiting harvested off the West Coast. The U.S. outlawed the use of foreign vessels in 1990, and domestic catcher/processor and mothership vessels entered the fishery between Alaska pollock fishing seasons. The Pacific whiting sector grew rapidly in the 1990s with the development of a production process to transform Pacific whiting into surimi, a product popular in Asia. Surimi is also used as an ingredient in imitation crab. The whiting fishery subsequently transformed into one of the largest fisheries by volume in the United States. In recent years, the market for fillets has also grown.

Under the groundfish FMP, midwater trawls are used to harvest Pacific whiting. The whiting fishery is subdivided into four components. The shorebased sector, called the Shorebased IFQ Program in Federal regulation, delivers its catch to processing facilities on land, and the vessels are similar in size and configuration (with the exception of the type of net used) to the non-whiting fishery. The

mothership sector, called the Mothership (MS) Coop Program in Federal regulation, depends on catcher vessels to deliver product to them. The catcher/processor (C/P) sector, called the C/P Coop Program in Federal regulation, consists of vessels that both catch Pacific whiting and process it on board the ship. The tribal fishery includes both an at-sea component and a shorebased component. The Pacific whiting fishery is managed within the Pacific groundfish limited entry program. This program restricts the number of vessels that may use specified gear types to catch allocated groundfish. Limited entry permits define the groundfish trawl sector (further subdivided among vessels delivering catch shoreside, catcher vessels delivering Pacific whiting to at-sea mothership processors, and at-sea Pacific whiting catcher/processors) and the limited-entry, fixed-gear sector, which uses longline and pot gear mainly to catch sablefish.

The at-sea Pacific whiting season is open from May 15 through December. Fishing takes place primarily between May and November, with fishing sometimes continuing through December. Each sector of the Pacific whiting fishery receives an annual allocation, and the fishery is managed under a primary season structure where vessels harvest Pacific whiting until the sector allocation is reached, and the fishery is closed. The at-sea sectors receive annual allocations, at levels determined each year by international treaty, and set-asides (based on historical landings) to cover certain overfished groundfish species impacts. Regulations provide for the automatic closure of the commercial (nontribal) portion of the Pacific whiting fishery upon attainment of an overfished species allocation. Set-asides are reconsidered within each cycle of the biennial specifications process.

Incidental take of endangered or threatened salmon is a concern for the Pacific whiting fishery. Endangered Chinook salmon are the most likely species to be affected by incidental take because of the spatial/temporal overlap between the Pacific whiting fishery and Chinook distribution. The season start dates are meant, in part, to prohibit fishing when incidental take of listed Chinook salmon is most likely to occur. NMFS also has the option of closing inshore areas to fishing if too many salmon are caught or are projected to be caught.

Prior to 2011, the fishery was managed with a system that included harvest guidelines, trip and landings limits, area restrictions, seasonal closures, and gear restrictions. Many of these measures were developed to assist in rebuilding seven species caught as targets or as bycatch in the groundfish fishery and declared overfished in 2003.

The trawl catch-share program was designed to alleviate the inflexible nature of trip and landings limits, which restricted landing groundfish species by trip and by 2-month period. Landings limits tend to encourage discarding, which can be detrimental to rebuilding overfished species. Under the trawl catch share program, vessels holding a limited entry permit were allocated individual QSs. Quotas for

30 different groundfish species and rockfish complexes were allocated to permit owners based on their historical participation. The catcher/processor fishery was managed via an industry-sponsored fishing cooperative (coop). Starting in 2011 under the Trawl Rationalization Program, the catch control rules now include Pacific whiting IFQs for the shorebased whiting sector (allocated to both processors and limited-entry permit holders), coops for the at-sea sectors, catch-history endorsements for mothership catcher vessels, and limited-entry permits for the mothership processors. Observers on the vessels monitor the Shorebased IFQ Program's catch. Two observers on board each mothership processor and catcher/processor monitor the catch in the at-sea fisheries. Shorebased processors or landing stations that receive whiting from trawlers that deliver to shore have to meet certain monitoring requirements that include using catch monitors to observe offloading the catcher vessels and to double-check the accuracy of fish tickets associated with the offload.

An industry-led development after the implementation of the trawl catch share program was formation of voluntary risk pools. Just as all quotas for target species are allocated to individuals, so are quotas for overfished species. Individuals unable to cover catch of overfished species with quotas are prohibited from fishing. By pooling the quota of both target species and overfished species with other quota owners, the risk pools mitigate prematurely ending the fishing season. The participants in some risk pools are contractually obligated to follow a set of fishing guidelines. If these guidelines are followed, any catch of overfished species is covered by the risk pool quota, and individuals can continue fishing.

The vessels participating in the Pacific whiting fishery deliver shoreside to buyers and processors holding first-receiver site licenses, and at-sea to mothership vessels.

About fifteen to eighteen vessels have participated in the at-sea Pacific whiting fishery off the coast of Washington and Oregon since the beginning of the mothership coop in 2011, slightly lower than the twenty vessels that typically participated in the five years following the buyback in (2005-2010), the at-sea fishery has fewer vessels than the shoreside fishery, but both have experienced declines over the past decade. For historical trends of participation in the at-sea and shoreside fishery, see Figure 3-6.

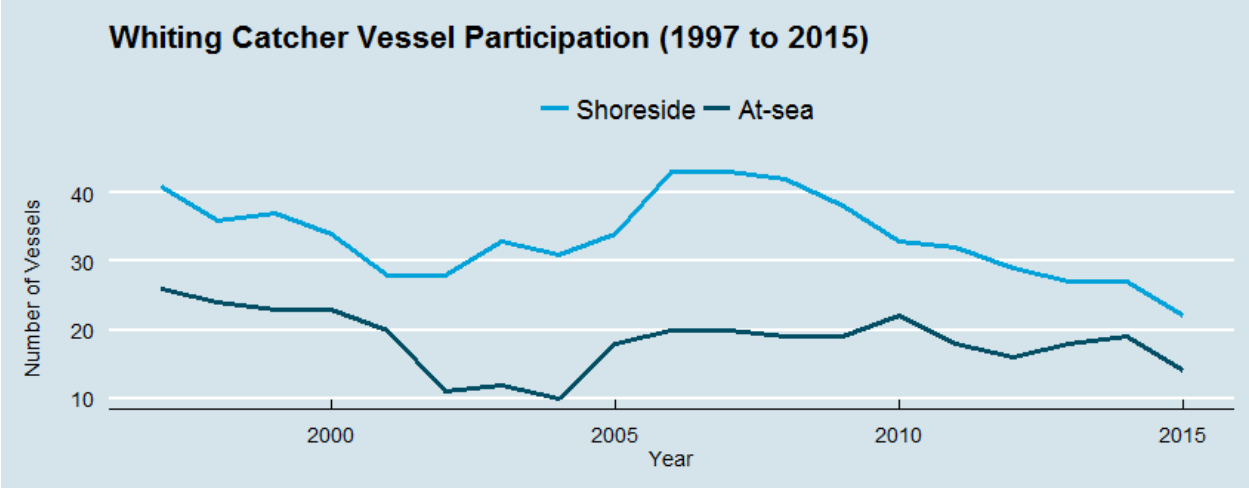

Figure 3-6. Whiting Catcher Vessel Participation (1997 to 2015).

These vessels delivered to five motherships as part of a single fishing cooperative. This fishery targets Pacific whiting (99.8 percent of the total landings by weight), and it has very low bycatch. Although the bycatch rate is extremely low, the total weight of bycatch was 1.25 million pounds in 2012. Most of this bycatch consisted of rockfish, sharks, skates and rays, and squid. This fishery is not managed with IFQ but does have allocations; of the allocated species, the most common bycatch species caught were widow rockfish (175,000 pounds), rougheye rockfish (119,000 pounds), and yellowtail rockfish (95,300 pounds).

Participation in the at-sea Pacific whiting fishery resulted in $9.3 million in ex-vessel revenue in 2012. Vessels that participated in the at-sea Pacific whiting fishery also earned revenue fishing in the shorebased Pacific whiting fishery (20.9 percent of the total revenue) and fishing in Alaska (61.1 percent of the total revenue). Nearly all of the participants in the at-sea Pacific whiting fishery also fished in Alaska.

Some vessels also fished in the bottom trawl fisheries (DTS trawl with trawl endorsement and non-whiting, non-DTS trawl with trawl endorsement fisheries) in 2009 and 2010, but none of the at-sea Pacific whiting vessels participated in these fisheries in 2012. Total revenue increased in 2011 and 2012, mainly due to an increase in the catch limit for Pacific whiting and Alaska pollock (for those vessels that fish in Alaska). Average revenue for participants in the at-sea Pacific whiting fishery was $580,412, average variable cost net revenue was $259,210, and average total cost net revenue was $81,468 in 2012. The revenue and net revenue correlate closely with the volume of Pacific whiting allocated to the mothership sector. Average variable cost net revenue for 2011 was higher than the two years prior to the trawl catch share program. Higher variable costs contributed to a decrease in average total cost net revenue in 2012.

Costs on fishing gear in the at-sea whiting fishery averaged $65,980 per vessel. The single largest cost in 2012 was crew compensation ($117,000) per vessel, on average, followed by fuel ($115,000) and equipment ($86,700). The total amount spent on fuel, crew compensation, and captain compensation nearly doubled between 2009 and 2012. On a per-unit basis, crew compensation increased from $1.59 per hundred pounds delivered in 2009 to $2.29 per hundred pounds in 2012, and captain compensation increased from $0.92 per hundred pounds delivered in 2009 to $1.46 per hundred pounds in 2012. The expenses for fuel also increased from $1.17 per hundred pounds delivered in 2009 to $2.10 per hundred pounds in 2012. The increase in fuel costs can be attributed partly to increases in fuel prices.

A comprehensive report on catcher vessels participating in the trawl program is available in the Economic Data Collection Program Catcher Vessel Report (2009-2012) (NMFS 2015b). Twenty-five vessels participated in the shorebased Pacific whiting fishery in 2012. This fishery targets mainly Pacific whiting (98.7 percent of the total landings by weight). Like the at-sea fishery, the bycatch rate is low; in 2012, the total weight of bycatch was 1.96 million pounds. Most of the bycatch consisted of rockfish, sharks, skates and rays, and shad. The most common bycatch quota species were yellowtail rockfish (441,000 pounds), widow rockfish (227,000 pounds), and sablefish (103,000 pounds). Participation in the shorebased Pacific whiting fishery resulted in $20.3 million in total ex-vessel revenue in 2012. Vessels that participated in the shorebased Pacific whiting fishery also earned revenue from fishing in the at-sea Pacific whiting fishery (12.1 percent of the total revenue) and fishing in Alaska (43.5 percent of the total revenue). Total revenue has risen, mainly due to an increase in the catch limit for Pacific whiting and Alaska pollock (for those vessels that fish in Alaska). Most shorebased Pacific whiting vessels fished either in Alaska or in the at-sea Pacific whiting fishery. The number of vessels participating in the shorebased Pacific whiting fishery decreased from 35 vessels in 2009 to 25 vessels in 2012. The number of vessels that participated in the DTS trawl and the non-whiting, non-DTS trawl fisheries also declined over this period.

Average variable cost net revenue was $399,649 in 2012, and average total cost net revenue was $51,000 the same year. Average revenue, average variable cost net revenue, and average total cost net revenue increased from 2009 to 2010 levels, even with a decrease in 2015 from historic highs from 2011 to 2014 (Figure 3-7). The increase was partially due to an increase in the catch limit for Pacific whiting, especially in 2011, steadily increasing ex-vessel prices paid to the shorebased fleet by first receivers (Figure 3-8) , and a reduction in the fleet size.

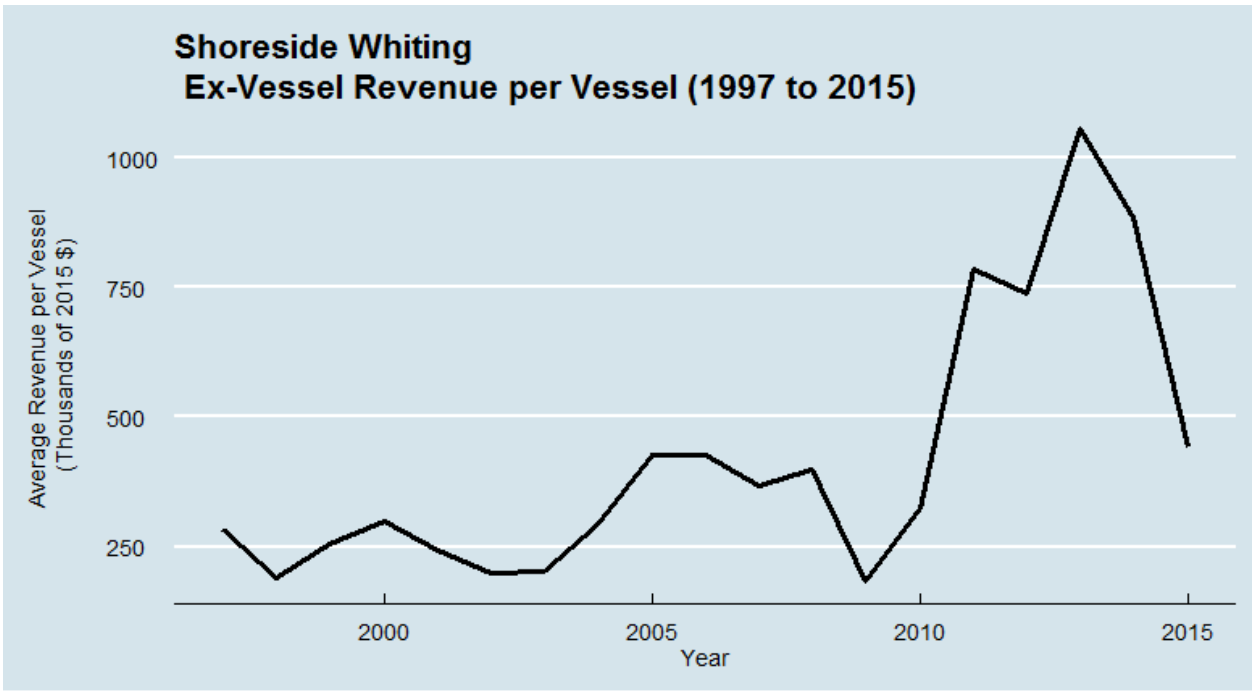

Figure 3-7. Shoreside whiting ex-vessel revenue per vessel (1998 to 2015).

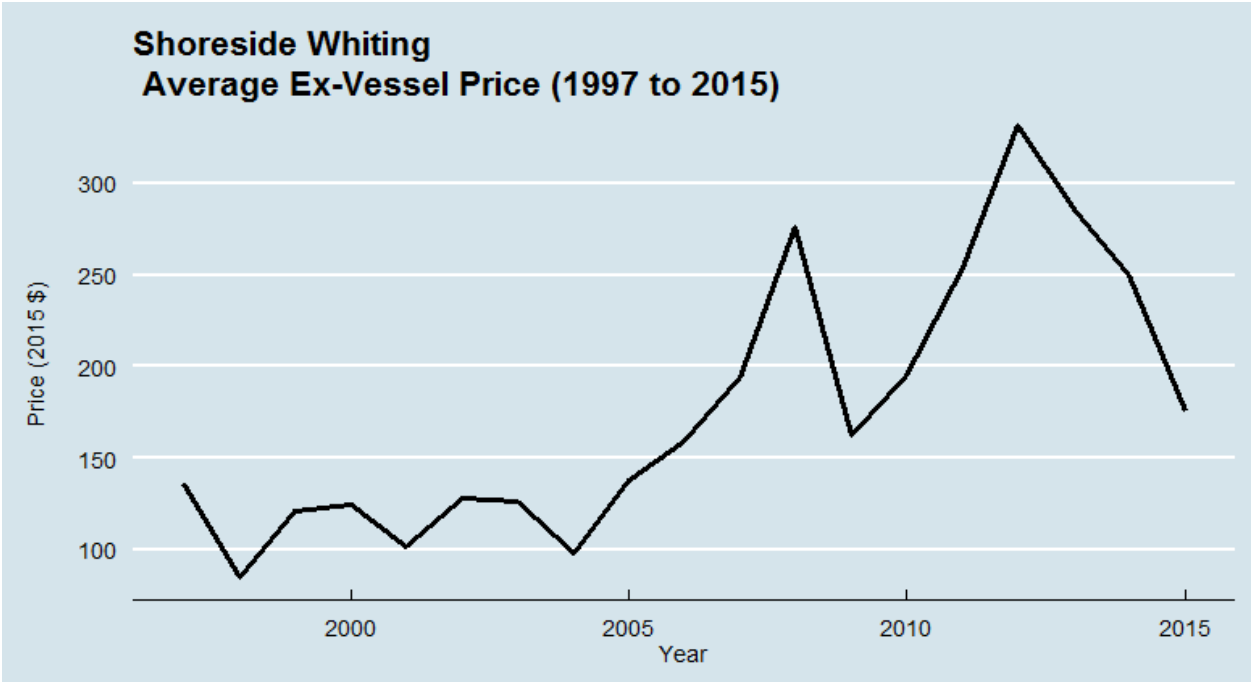

Figure 3-8. Average shoreside whiting ex-vessel value (1997 to 2015).

Vessels paid an average of $97,000 for fishing gear in the shoreside whiting fishery in 2012 (Figure 3-8). The single largest cost in 2012 was for vessel and on-board equipment ($222,000 per vessel), followed by crew compensation ($175,000), and captain compensation ($116,000). The average amount spent on vessel and onboard equipment nearly quadrupled between 2009 and 2012,

and fuel, crew compensation, and captain compensation in 2012 were five times the amount spent in 2009 and 2010. On a per unit basis, crew compensation increased from $1.30 per hundred pounds delivered in 2009 to $3.01 per hundred pounds in 2012. Captain compensation increased from $0.94 per hundred pounds delivered in 2009 to $2.04 per hundred pounds in 2012.

Expenses for fuel also increased from $1.25 per hundred pounds delivered in 2009 to $2.36 per hundred pounds in 2012.

Catcher/processors are vessels that both catch and process fish on board. The at-sea Pacific whiting fishery also includes motherships, which are factory vessels that process fish only at sea, and catcher vessels that catch fish and then deliver them to motherships. The West Coast catcher/processor fleet has operated as a cooperative since 1997, when the Pacific Whiting Conservation Cooperative (PWCC) was formed. The PWCC consists of three companies and all the catcher/processor vessels that currently participate in the Pacific whiting fishery on the West Coast. The primary function of the PWCC is to coordinate harvesting efforts of the catcher/processor vessels. While the 2011 trawl catch share program dramatically changed the structure of the shoreside Pacific whiting and mothership fisheries, the catcher/processor sector experienced fewer changes, and has continued to operate as a single cooperative.

Because of high variability in recruitment and other sources of uncertainty in stock assessment, catch limits vary substantially. In addition to coordinating harvesting efforts among the catcher/processor vessels, the PWCC engages in voluntary bycatch avoidance initiatives as part of an effort to reduce the incidental catch of species of concern, such as ESA-listed Pacific salmon and overfished rockfish. The catcher/processor fleet also caught approximately four prohibited and protected species per every 100 metric tons of Pacific whiting in 2012, mostly Chinook salmon, but also chum salmon, coho salmon, pink salmon, eulachon, and Pacific halibut. Since 2005, NMFS has established mandatory bycatch limits in the at-sea Pacific whiting fishery for species of rockfish designated as overfished. Levels of rockfish bycatch allowed vary by year and species. In 2012, the catcher/processor sector was allocated 10.2 metric tons of Pacific ocean perch, 86.7 metric tons of widow rockfish, 8.5 metric tons of dark blotched rockfish, and 5.0 metric tons of canary rockfish. The vessels caught less than 30 percent of the allocated Pacific Ocean perch, 50 percent of the widow rockfish, less than 30 percent of the allocated darkblotched. In 2012, nine catcher-processor vessels spent an average of 33 days fishing, processing, and steaming along the West Coast, primarily from June to November. Bycatch rates remain relatively low through the spring and summer, and with occasional increases in the fall as seen in 2011 and 2015 (Figure 3-9), which can lead to premature voluntary or forced season closures. This season accommodates participation in the Alaskan pollock fishery. Most of the fleet's time (about

80 percent) is spent fishing Alaska pollock in the Bering Sea and Aleutian Islands off Alaska. The at-sea Pacific whiting fishery on the Coast has an average bycatch rate of less than 1 percent of the total Pacific whiting catch.

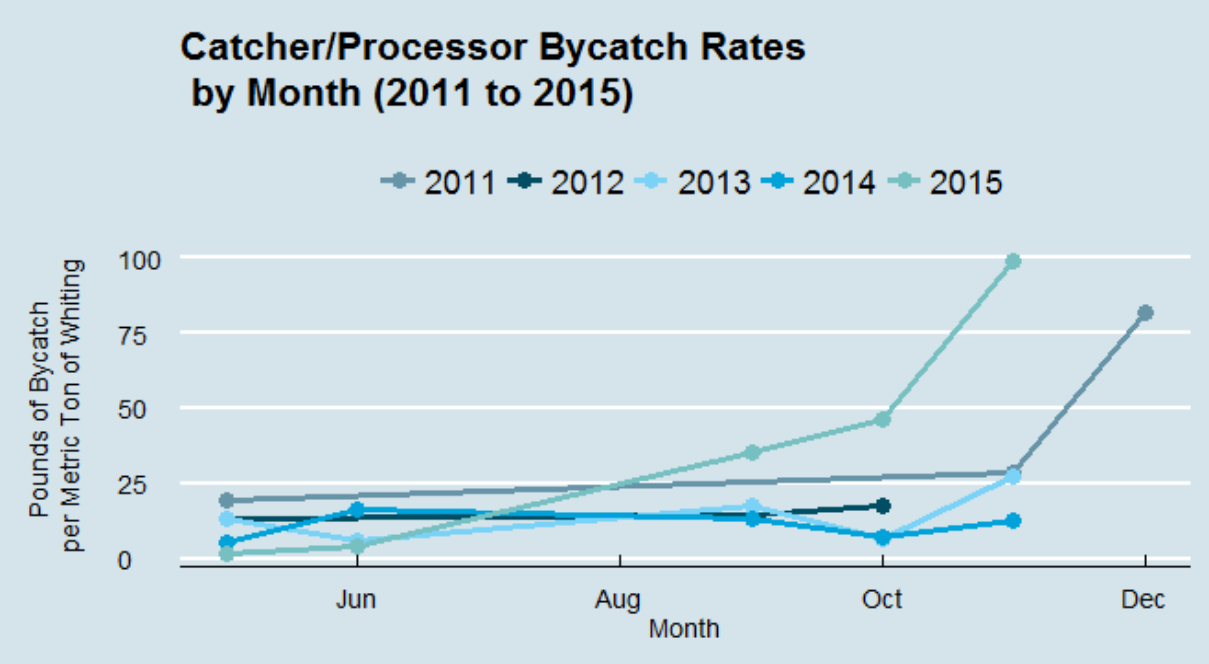

Figure 3-9. Catcher processor bycatch rates (2011 to 2015).

West Coast catcher/processors deliver to three ports: Bellingham, Seattle, and Tacoma. All nine vessels listed Seattle as their home port. The average first-wholesale revenue per vessel was close to $5.65 million. Fillet and surimi production made up 87 percent of the total production value. Close to an average of 100 processing and 23 non-processing crewmembers worked on each catcher/processor vessel. Average compensation for each processing and non-processing crewmember was approximately $9,400 and $17,800, respectively. Average variable cost net revenue (revenue minus variable costs) was $2.98 million in 2012, a decrease from $3.47 million in 2011 and $3.84 million in 2009. Average total cost net revenue (revenue minus both variable and fixed costs) per vessel was $1.8 million in 2012. Average total cost net revenue per metric ton produced was $670 in 2012, a decrease of 7 percent from 2011 to 2012. In 2012, the catcher/processor sector generated $75 million in income and 1,431 jobs from Pacific whiting caught in the trawl catch share program.

Unlike the whiting catcher vessels, implementation of the 2011 trawl catch share program has not had a clear impact on the timing of the fishery or the number of vessels participating in the catcher/processor sector. Catcher/processor variable costs include fuel, crew compensation, food, packaging and materials, and observer coverage, among other costs, and they vary with the level of fishery participation. Variable costs make up most of a vessel's total expenditures. The average variable cost

on the West Coast was approximately $2.67 million in 2012. The three largest categories of variable costs are processing crew compensation (33 percent), fuel and lubrication (30 percent), and non-processing crew compensation (14 percent).

Catcher-processors spent an average of $905,000 on fishing gear shared between the West Coast and other fisheries in 2012. No catcher/processors reported expenditures on fishing gear used only on the West Coast. Variable costs for the catcher/processor fleet as a whole decreased from 2010 to 2012, but remained higher in 2012 than in 2009. Fixed costs remained constant from 2009 to 2012, with a dip in 2010, which contributed to the relatively high total cost net revenue during 2010. Total cost net revenue declined from 2010 to 2012, but remained higher than in the 2009 season. The number of vessels increased from six to nine from 2010 to 2011; therefore, even though average revenue decreased over that period, the total net revenue for the fleet increased. The catcher/processors had a fleet-wide total revenue of $51 million in 2012, and the fleet spent about $35 million in fixed and variable costs on the West Coast. A comprehensive report on catcher vessels participating in the trawl program is available in the Economic Data Collection Program Catcher Vessel Report (2009-2012) (NMFS 2015d).

There were more limited entry trawl vessels targeting the Dover, thornyhead, and sablefish (DTS) complex than any other fishery in 2012, with 59 vessels. Vessels in this fishery target mainly Dover sole (53 percent of catch in 2012), thornyhead (12 percent of catch), and sablefish (11 percent of catch) using trawl gear. Sablefish constituted the largest revenue source (33 percent of revenue in 2012). This fishery catches smaller amounts of other quota species (including rockfish, which is 16 percent of the catch), and marginal amounts of other non-quota groundfish and other species. The relative share of landings and revenue of Dover sole increased slightly from 2009 to 2012. The relative share of revenue of sablefish decreased from 2011 to 2012, mainly due to a decrease in price from 2011 to 2012.

Trawl vessels that participated in the DTS fishery also earned revenue from other fisheries (primarily crab and shrimp), and to a much smaller extent, the shorebased Pacific whiting fishery, and the non-whiting, non-DTS trawl fishery. Participation in crab, shrimp, and non-whiting, non-DTS trawl makes up around 50 percent of total revenue. Of the vessels that participated in the DTS trawl fishery, 40 vessels also participated in the other fisheries category. Although some of these vessels fished in Alaska from 2009 to 2011, no vessels in this fishery went to Alaska in 2012. Total revenue decreased from 2011 to 2012, mainly due to decreasing participation in the at-sea and shorebased Pacific whiting fisheries and Alaska fishing.

Average revenue for vessels participating in the DTS trawl fishery was $269,284, average variable cost net revenue was $116,641, and average total cost net revenue was $33,738 in 2012. Average variable

cost net revenue for both years' post-catch shares was higher than the years prior to the trawl catch shares program.

The single largest cost in 2012 was for crew compensation ($56,300 per vessel, on average), followed by vessel and on-board equipment ($46,500), and captain compensation ($41,300). Unlike the at-sea and shorebased Pacific whiting fisheries, the DTS trawl fishery has not experienced the same rise in total and per-unit costs since the implementation of the trawl catch share program. On a per-unit basis, the one cost category that experienced a large relative increase was expenses on vessel and on-board equipment. This cost increased from $9.49 per hundred pounds in 2009 to $16.25 per hundred pounds in 2012.

Fifty vessels participated in the nonwhiting, non-DTS trawl with trawl endorsement fishery in 2012. The non-whiting, non-DTS trawl with trawl endorsement fishery is a significantly lower volume groundfish fishery than the other catch share fisheries. This fishery catches mostly petrale sole (13 percent of catch) and other quota species, primarily rockfish (57 percent of catch). Non-quota groundfish are also caught in relatively large volumes. Participation in the non-whiting, non-DTS trawl with trawl endorsement fishery makes up a minor portion of total revenue for participants in that fishery. Vessels also participate in the shoreside Pacific whiting, DTS trawl with trawl endorsement, as well as other fisheries. A few vessels fish in Alaska. Average revenue for vessels participating in the non-whiting, non-DTS trawl with trawl endorsement fishery was $154,312, average variable cost net revenue was $66,760, and average total cost net revenue was $34,335 in 2012. Both net revenue measures were greater in the post-catch share years.

The main species harvested with midwater trawl nets historically have included Pacific whiting and the following rockfish species: widow rockfish, yellowtail rockfish, and chilipepper rockfish (pelagic rockfish species complex). The midwater trawl fishery in the action area has taken place primarily north of 40˚ 10' N. latitude (Northern Management Area). From 1994 to 2011, the northern fishery landed an average of 73,674 mt of pelagic rockfish, which represented over 99 percent of the northern and southern management area (i.e., south of 40˚ 10' N. latitude) catches combined. Only chilipepper rockfish showed a higher average catch in the Southern Management Area from 1994 to 2011 (12 mt) compared to the Northern Management Area (7 mt).

The midwater rockfish fishery fell off steeply, starting with the 2003 season. The decline in the fishery corresponded to implementation of the RCA and reduced trip limits for widow rockfish, which had been declared overfished. With widow rockfish now rebuilt, NMFS expects to have a growing pelagic rockfish midwater fishery. The 2015 fishery was expected to exceed 2014. Catches of yellowtail rockfish rebounded somewhat in 2011, the first year of the IFQ program.

Pelagic rockfish in midwater trawl landings have been relatively small in comparison to whiting, based on the weight of fish landed, but have been significant in terms of ex-vessel revenues. Prior to 2003, the combined midwater rockfish landings from 1994 to 2002 averaged 24 percent of the total midwater revenues and ranged from 14 percent to 45 percent of the total annual midwater revenues. The number of vessels landing pelagic rockfish dropped off starting in 2002 and reached a low of 28 in 2004. The average number of vessels landing rockfish shoreside from 1994 to 2002 averaged 74.1 coastwide, ranging from 51 to 130 vessels. The 2003 to 2011 average was 33.8 vessels with a range of 28 to 41.

Selective flatfish trawls have been mandated for the limited entry trawl fishery operating shoreward of the trawl RCA north of 40° 10' N. latitude since 2005. The selective flatfish trawl, configured with a cut-back headrope, a low rise, and a small (approximately 8 inches in diameter) footrope, is designed to reduce rockfish bycatch, while efficiently catching flatfish. The selective flatfish trawl works by allowing rockfish to escape by swimming upward when they encounter the trawl. Flatfish tend to dive down when disturbed, which accounts for the differential selectivity of these trawls to rockfish and flatfish.

Scottish seine gear is exempted from RCA trawl closures in the area between 38° N. latitude and 36° N. latitude, where low bycatch rates of overfished species were previously demonstrated through an exempted fishing permit (EFP). The exemption is also limited to depths of less than 100 fm. This encompasses the primary flatfish target areas, but it reduces risk associated with the exemption. A vessel monitoring system (VMS) must be used, and the operator must adhere to declaration requirements to provide for enforcement of this exemption.

Unlike the other IFQ fisheries, the trawl catch share program allows the use of fixed gear (generally fish pots. longlines, or other legal groundfish non-trawl gear), called "gear switching." To fish with fixed gear in the trawl catch share program, the vessels must be registered to a Pacific coast groundfish, limited entry, trawl-endorsed permit. In the first year of the trawl catch-share program, 25 vessels using fixed gear caught sablefish allocated to the trawl fishery. In 2014, there were 11 vessels. This fishery targets sablefish almost exclusively. The number of vessels fishing with pots decreased from 23 to 14 between 2011 and 2014, while the number of vessels fishing with longlines decreased from 15 to 5 vessels over the same period.

In general, the vessels fishing with fish pots have historically fished with trawl gear and have switched to using fish pots to harvest groundfish. The vessels fishing with longline gear participate primarily in the limited entry, sablefish-endorsed fishery, and they have acquired limited-entry trawl permits and quota to target sablefish allocated to the trawl fishery.

Vessels that used fixed gear in the trawl catch share program also earned revenue from fishing in Alaska and in other fisheries. Participation in other fisheries (particularly crab, shrimp, and non-whiting, non-DTS trawl fisheries) makes up approximately 50 percent of the total revenue. Average revenue for vessels participating with fixed gear in the trawl catch share program was $199,601, average variable cost net revenue was $93,185, and average total cost net revenue was $25,499 in 2012. Average revenue was highest in 2011 due to high sablefish prices, but higher fixed and variable costs resulted in a decrease in average net revenue in 2012. The greatest cost in 2012 was crew compensation ($41,200 per vessel, on average), followed by vessel and on-board equipment ($29,800), and fishing gear ($27,000). Unlike the trawl fisheries, fixed gear vessels have the additional cost of bait. In 2012, the average expense on bait was $11,200 per vessel. Average expenses across nearly all cost categories decreased from 2011 to 2012.

3.3.2 First Receivers/Processors

Shorebased processors serve a groundfish fishery that historically consisted of two separately managed sectors: a seasonal fishery targeting Pacific whiting with midwater trawl gear and a year-round trawl sector targeting other groundfish species. Under trawl rationalization, these two fisheries merged beginning in 2011 in terms of management through the IFQ program. The Shorebased IFQ Program allocated 20 percent of the shoreside Pacific whiting to eligible shorebased processors. Eligibility and initial allocation percentage were determined by historical deliveries to shorebased processors during a set of control dates (1994 to 2004). No quota allocation was given to processors for non-whiting IFQ groundfish.

In the first receiver and shorebased processor sector in 2012, 39 companies held 55 first-receiver site licenses. Of these companies, 26 used their first-receiver site licenses by purchasing groundfish caught in the trawl catch share program. The first receiver and shorebased processor sector generated $72 million in income and 1,460 jobs from purchases of fish caught in the trawl catch share program in 2012.

First receiver and shorebased processor operations range from independent catcher-vessel owners who unload and truck their own fish, to large, multi-facility, processing companies with a wide range of product offerings. These Shorebased IFQ first receivers offloaded approximately 44 percent by volume of all fish caught commercially on the West Coast in 2012, accounting for approximately one third of the value of all fish purchased that year. Processors and non-processors also purchase fish from non-vessel sources, which can include other first receivers, processors, wholesale dealers, brokers, tribes, and aquaculture producers. In 2012, 10 percent of all fish purchased, 7 percent of groundfish purchased, and 13 percent of other species purchased were from non-vessel sources.

There are facilities that receive fish in all three states on the West Coast. In 2012, California had the most facilities (23), while 12 facilities were located in Oregon and 5 in Washington. The two ports with the highest IFQ landings in 2012 were Astoria and Newport, both in Oregon. Both ports received approximately 60 million pounds of IFQ fish, worth $17 and $10 million, respectively. Washington received 43.2 million pounds, worth $9.7 million.

Processors employed the most production workers in the month of August, with an average of 124 production workers per company. The fewest production workers were employed in March, with an average of 65 per company. Processors on average had 11 non-production employees per company. Processor annual compensation per position for production workers was $22,354, and it was $65,865 for non-production employees. In 2012, processor average revenue per company was approximately $20.8 million, 99 percent of which was from fish product sales. Processor average total cost net revenue (revenue minus variable costs and fixed costs) was $2.5 million. Average variable cost net revenue was $3.5 million. For a comprehensive description of the first-receiver and shorebased processors see the Economic Data Collection Program First Receiver and Shorebased Processor Report (2009-2012) (NMFS 2015e).

Mothership factory vessels process fish delivered at sea by catcher vessels. In 2012, five motherships, owned by four companies, processed Pacific whiting on the West Coast. In the at-sea, non-tribal whiting mothership sector, a single cooperative manages fishing activity. The mothership catcher vessel cooperative is allocated a portion of the Pacific whiting total allowable catch (TAC), along with selected bycatch species. In 2012, the mothership fleet generated $34 million in income and 755 jobs on the West Coast from purchases of Pacific whiting caught in the trawl catch share program. The fleet spends most of its time (70 percent) processing Alaska pollock in the Bering Sea and Aleutian Islands off Alaska.

A little more than 70 processing and 32 non-processing crewmembers, on average, worked on each mothership vessel; average compensation for each processing and non-processing crewmember was approximately $10,000 and $13,500 for the season, respectively. The fleet's annual price paid to catcher vessels increased from $177 per metric ton in 2009 to $246 in 2012 (2012 inflation adjusted dollars). The average first-wholesale revenue per vessel was approximately $6.06 million. Surimi made up the greatest share of the total production value of any product type. Average variable cost net revenue (revenue minus variable costs) was approximately $1.47 million in 2012. More information on the mothership sector is available in the Economic Data Collection Program Mothership Report (2009 to 2012) (NMFS 2015d).

3.3.3 Fishing Communities

West Coast communities participating in the trawl catch share program are combined into 18 port groups to preserve confidentiality within ports and to evaluate personal income impacts of proposed management measures. A detailed description of these communities and their dependence and engagement in groundfish fisheries can be found in the 2015-2016 Groundfish Specification FEIS (Council 2015a).

Table 3-4, taken from the 2014 Groundfish SAFE document (PFMC 2014), presents values for community engagement and dependence on commercial groundfish fisheries. Engagement is defined as groundfish ex-vessel revenue in the port as a percent of coastwide groundfish ex-vessel revenue for the 2003-2012 baseline period. Similarly, dependence is defined as groundfish ex-vessel revenue in the port as percent of total ex-vessel revenue in port during the baseline period. [For these calculations, revenues are inflation-adjusted to 2012 dollar values.]

Engagement and dependence values can be developed for recreational fisheries using a similar methodology. For recreational fisheries, the metric is the number of angler trips. Engagement is measured by dividing the number of groundfish-directed angler trips in the port by the coastwide number of groundfish angler trips during the baseline period. Dependence is measured by dividing the number of groundfish-directed angler trips in the port by the total number of angler trips in the port during the baseline period.

South and central Washington, Astoria, and Newport have the highest engagement in the fishery in terms of a share of coastwide groundfish ex-vessel revenue. In contrast, ports with high dependence values, defined as groundfish ex-vessel revenue in the port as a percent of the total ex-vessel revenue, are more geographically dispersed, with Morro Bay at the top of the rankings, followed by Puget Sound and the north Washington Coast. Southern California ports (Santa Barbara, Los Angeles, and San Diego) are neither highly engaged, nor dependent on commercial groundfish fisheries. Trawl fisheries (counting both the whiting and non-whiting segments) dominate the coast from the south and central Washington port group to Fort Bragg, California. The non-nearshore, fixed-gear fishery is important in central and southern California and in the Puget Sound region.

Table 3-4. Commercial fishery engagement and dependence scores and rank, primary and secondary fisheries, for the 2003 to 2012 baseline period for each port group. Data are based on 2012 inflation-adjusted, ex-vessel revenue.

Port Group	Engagement	Engagement Rank	Dependence	Dependence Rank	Primary Fishery	Secondary Fishery
Puget Sound	4.8%	9	43.6%	3	Non-nearshore Fixed Gear	Shoreside Non-whiting Trawl*
North WA coast	6.6%	5	44.7%	2	Non-nearshore Fixed Gear	Shoreside Non-whiting Trawl*
South and central WA coast	14.0%	3	14.2%	11	Shoreside Whiting Trawl	Non-Nearshore Fixed Gear
Astoria	18.0%	1	37.2%	4	Shoreside Non-whiting Trawl*	Shoreside Whiting Trawl
Tillamook	0.3%	18	5.3%	15	Nearshore Fixed Gear	Shoreside Non-whiting Trawl*
Newport	15.0%	2	30.1%	7	Shoreside Whiting Trawl	Shoreside Non-whiting Trawl*
Coos Bay	8.4%	4	21.8%	9	Shoreside Non-whiting Trawl*	Non-nearshore Fixed Gear
Brookings	5.3%	7	32.1%	6	Shoreside Non-whiting Trawl*	Non-nearshore Fixed Gear
Crescent City	2.4%	13	10.0%	13	Shoreside Non-whiting Trawl*	Nearshore Fixed Gear
Eureka	6.0%	6	26.2%	8	Shoreside Non-whiting Trawl*	Non-nearshore Fixed Gear
Fort Bragg	5.1%	8	36.4%	5	Shoreside Non-whiting Trawl*	Non-nearshore Fixed Gear
Bodega Bay	0.4%	17	3.7%	16	Non-nearshore Fixed Gear	Shoreside Non-whiting Trawl*
San Francisco	2.5%	12	9.2%	14	Shoreside Non-whiting Trawl*	Non-Nearshore Fixed Gear
Monterey	2.7%	11	16.0%	10	Non-nearshore Fixed Gear	Shoreside Non-whiting Trawl*
Morro Bay	4.5%	10	64.7%	1	Non-nearshore Fixed Gear	Nearshore Fixed Gear
Santa Barbara	1.4%	15	2.7%	18	Non-Nearshore Fixed Gear	Nearshore Fixed Gear
Los Angeles	1.5%	14	3.2%	17	Non-nearshore Fixed Gear	Nearshore Fixed Gear
San Diego	1.0%	16	10.1%	12	Non-nearshore Fixed Gear	Nearshore Fixed Gear

*Shoreside non-whiting trawl includes non-trawl IFQ in 2011-2012.

There is a trend towards increasing concentration of ex-vessel revenue in major fishing ports, particularly in southern coastal Washington and northern Oregon (Figure 3.10). For all groundfish fisheries, the share of coastwide revenue flowing to the top -ranked ports in the northern Oregon coast (includes Astoria and Newport), and Washington (namely Ilwaco) Figure 3.10 shows the percent change in ex-vessel revenues, by region, for ports that remained active in the IFQ fishery in 2015. All the aggregated regions in Figure 3-10 have experienced declines in ex-vessel revenue associated with limited entry trawl permit groundfish with the exception of the northern Oregon Coast (Astoria/Newport) and Washington (aggregated to preserve confidentiality).

In conjunction with decreases in trawl-groundfish permit revenue, ports in California and southern Oregon have had increases in ex-vessel revenues from crab and shrimp, as well as from other fisheries (largely coastal pelagic species). Fishermen's flexibility regarding quota use in the IFQ program may encourage the optimization of a multifishery portfolio, buoying overall port ex-vessel revenues despite the decline in groundfish landings across much of the coast.

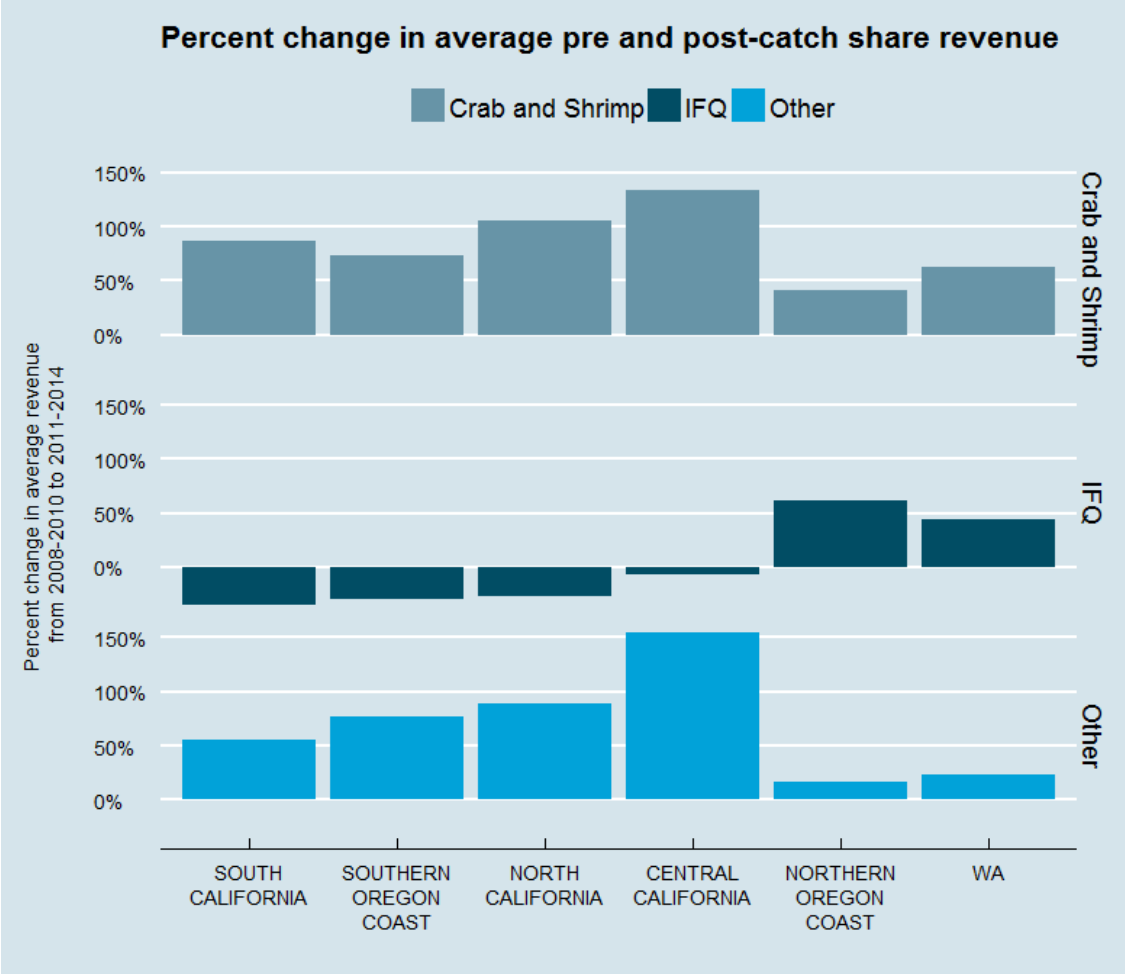

Figure 3-10. Percent change in pre and post-IFQ ex-vessel revenue by fishery and port-region (1995-2015).

3.3.4 Management Entities

[to be drafted]

3.3.5 Other Entities

The subsections below describe other entities engaged in the groundfish fishery.

3.3.5.1 Tribal Fishery

Several coastal tribes in Washington are involved in the Pacific Coast groundfish fishery; they include the Makah, Hoh, Quileutte, and Quinault Tribes. However, none of them is directly involved in the trawl catch share program. Pacific Coast treaty Indian tribal allocations, set-asides, and regulations are specified during the biennial harvest specifications process. Tribal allocations and regulations are developed in consultation with the affected tribe(s). Fishing regulations such as fishing seasons and gear restrictions apply equally to tribal and nontribal fishers, except that tribal fishers are not subject to groundfish-plan, limited-entry provisions (50 CFR § 660.50 Pacific Coast treaty Indian fisheries).

3.3.5.2 Observer Providers and Other Support Sectors

Participants in the trawl rationalization program must have observers on their vessels during all fishing activities, and a catch monitor must be present to observe offloading at first receivers. Observers and catch monitors are generally provided on contract through observer companies. In recent years, two companies have provided most of these services.

In addition to observer providers, numerous other companies provide materials and labor for both harvesting and processing operations. At least nine entities provide sites at which other businesses locate their fish receiving operations (based on an analysis of license and ownership records provided by the NMFS West Coast Region Limited Entry Office, February 2015).

4 IMPACTS ON THE AFFECTED ENVIRONMENT

This chapter is organized into nine sections. Sections 4.1 through 4.8 evaluate the impacts of alternatives for each issue. For example, Section 4.1 evaluates the impacts of each of the alternatives for minimum mesh size for trawl. These sections are organized by environmental component, similar to Chapter 3. Each section covers the impacts of the alternatives on the physical, biological, and socioeconomic environments. Section 4.9 evaluates cumulative impacts.

4.1 Minimum Mesh Size (A)

Section 4.1 evaluates the impacts of the alternatives resulting from changing trawl gear minimum mesh size requirements. As noted in the section title, this is also labeled as issue A to help the reader differentiate the issues in Section 4.1 through 4.8. The alternatives are analyzed by environmental component: physical (Section 4.1.1), biological (Section 4.1.2), and socioeconomic (Section 4.1.3). A summary table of impacts for these environmental components is included in this Section (Table 4-1). As described in Section 2.1, there are three alternatives for changing the minimum mesh size for trawl gear. These are labeled Mesh Size Alternatives A1 through A3 to help the reader differentiate these alternatives from alternatives for other gear-related issues in this EIS.

- **Mesh Size Alternative A1 (No-action)** – The minimum mesh size for bottom trawl would remain at 4.5 inches and at 3 inches for midwater trawl.
- **Mesh Size Alternative A2** – The minimum mesh size would be reduced to 4 inches for bottom trawl.
- **Mesh Size Alternative A3** – There would be no minimum mesh size specified in regulation for bottom or midwater trawl.

Table 4-1. Summary of physical, biological, and socioeconomic impacts of changes in minimum mesh size (A).

Minimum mesh size (A)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Mesh Size **Alternative A1** (No-action)	Minimum mesh size: 4.5 inches for bottom trawl; 3 inches for midwater.	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low negative impact on salmon and eulachon.	*Harvesters*: Low negative impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Neutral impact.
Mesh Size **Alternative A2**	Minimum mesh size would be 4 inches for bottom trawl.	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest. Low, negative impact on stock productivity. --- *Non-target species:* Low negative impact on overall harvest for some species like CPS. Low negative impact on stock productivity. --- *Protected species:* Low negative impact, particularly on salmon and eulachon.	*Harvesters*: Low positive impact. --- *Processors*: Low positive impact. --- *Fishing Communities*: Low positive impact throughout, medium positive impact in bottom trawl dominant areas. --- *Management entities*: Neutral impact.
Mesh Size **Alternative A3**	There would be no minimum mesh size for bottom or midwater trawl.	*Ecosystem:* Uncertainty. Medium negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest. Medium negative impact on stock productivity. --- *Non-target species:* Uncertainty. Medium negative impact on overall harvest for some species like CPS. Medium negative impact on stock productivity. --- *Protected species:* Uncertainty. High negative impact, particularly on salmon and eulachon.	*Harvesters*: Medium positive impact. --- *Processors*: Low positive impact. --- *Fishing Communities*: Low positive throughout, medium positive in bottom trawl dominant areas. --- *Management entities*: Low negative impact.

Note: Impacts of Alternatives A2 and A3 are in comparison to the No-action Alternative, A1.

4.1.1 Physical Environment

This section evaluates the physical impacts of the alternatives for changing trawl gear minimum mesh size requirements. Section 4.1.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.1.1.2 considers impacts on essential fish habitat or EFH. Physical impacts are summarized in Table 4-1.

4.1.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.1.1.1.1 Mesh Size Alternative A1 (No-action)

The No-action Alternative, Mesh Size Alternative A1, would maintain a 4.5-inch minimum mesh requirement for bottom trawl gear and a 3-inch minimum mesh size requirement for midwater trawl. This mesh size was decided based on groundfish mesh size studies from the late 1980s, which looked at codend mesh sizes of 3 inches, 4.5 inches, and 5 inches (Pikitch et al. 1990). The No-action Alternative (A1) would have an ongoing low negative impact on the ecosystem from removal of a portion of the stock for various marine species.

4.1.1.1.2 Mesh Size Alternative A2

Mesh Size Alternative A2 would reduce the minimum mesh size restriction for bottom trawl to 4 inches, 0.5-inch smaller than the No-action Alternative A1. This change is within the mesh sizes studied in Pikitch et al. (1990). This alternative would provide fishermen with increased flexibility and would potentially increase catch compared to Alternative A1. It would increase catch of smaller fish that could not escape the smaller sized mesh. This might impact the Pacific Coast Marine Ecosystem by removing smaller fish from the biomass and shifting the predator-prey availability. Because the change in mesh size would be only 0.5-inch, the impact on the Pacific Coast Marine Ecosystem would likely be the same as Alternative A1 (No-action), which would be a low negative impact.

4.1.1.1.3 Mesh Size Alternative A3

Removing the minimum mesh size restrictions from Federal regulation for bottom and midwater trawl (Mesh Size Alternative A3) might have a medium, negative impact on the Pacific Coast Marine Ecosystem compared to Alternative A1 (No-action), and there would be some uncertainty regarding ecosystem impacts. In general, impacts on marine species increase with a decrease in mesh size.

While not all bottom trawl fishermen would likely invest in new gear to reduce mesh size below 4.5 inches, some might choose to do so, especially over time as they replaced their gear. This alternative

would provide trawl fishermen with the flexibility to set their mesh size for the size of fish they would intend to target. Because small fish are generally less marketable, few fishermen would likely create a minimum mesh size so small that they would increase their catch of small fish. For the fishermen who would choose to use a mesh size smaller than 4.5 or 4 inches, there would be increased impacts on the Pacific Coast Marine Ecosystem from larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species and younger individuals could shift the ecosystem functioning over time.

4.1.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.1.1.2.1 Mesh Size Alternative A1 (No-action)

The No-action Alternative, Mesh Size Alternative A1, would maintain a 4.5-inch minimum mesh requirement for bottom trawl gear and a 3-inch mesh size for midwater. Under the No-action Alternative, EFH protections would prohibit bottom contact gear, including bottom trawl from specific areas designated as EFH. The No-action Alternative (A1) would have a neutral impact on EFH because those areas would remain protected.

4.1.1.2.2 Mesh Size Alternative A2

Mesh Size Alternative A2 would reduce the minimum mesh size restriction for bottom trawl to 4 inches, 0.5-inch smaller than No-action Alternative A1. Alternative A2 would have the same (neutral) impacts on EFH as Alternative A1 (No-action) because the EFH protections for bottom contact gear, including bottom trawl, would remain in place.

4.1.1.2.3 Mesh Size Alternative A3

Removing the minimum mesh size restrictions from Federal regulation for bottom and midwater trawl (Mesh Size Alternative A3) would have the same (neutral) impact as Alternative A1 (No-action) because EFH protections for bottom contact gear, including bottom trawl, would remain in place. While there may be some redistribution of impacts on the seafloor and habitat, Alternative A3 would not change the areas that could be fished.

4.1.2 Biological Environment

This section evaluates the biological impacts of the alternatives for changing trawl gear minimum mesh size requirements. Section 4.1.2.1 considers the impacts on groundfish target species. Section 4.1.2.2 considers impacts on non-target species. Section 4.1.2.3 considers impacts on protected species. A summary of the biological impacts is found in Table 4-1.

4.1.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.1.2.1.1 Mesh Size Alternative A1 (No-action)

The No-action Alternative, Mesh Size Alternative A1, would maintain a 4.5-inch minimum mesh requirement for bottom trawl gear and a 3-inch mesh size requirement for midwater trawl. This mesh size was decided based on groundfish mesh size studies from the late 1980s, which looked at codend mesh sizes of 3 inches, 4.5 inches, and 5 inches (Pikitch et al. 1990). Under No-action Alternative A1, target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and, in the Shorebased IFQ Program, quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch.

Under No-action Alternative A1, there would be a low risk of catch exceeding the trawl allocations. The No-action Alternative would not be likely to jeopardize the sustainability of any target species because it would not increase the harvest of available target species over what is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. No-action Alternative A1 would likely have a neutral impact on overall harvest and stock productivity.

4.1.2.1.2 Mesh Size Alternative A2

Mesh Size Alternative A2 would reduce the minimum mesh size restriction for bottom trawl to 4 inches, 0.5-inch smaller than No-action Alternative A1. This change would be within the mesh sizes studied in

Pikitch et al. (1990). While Mesh Size Alternative A2 would likely catch fish faster and would take smaller size fish than Alternative A1 (No-action) due to the smaller mesh size, it would not change the overall amount of fish harvested. Target species would continue to be managed to sustainable levels with 100 percent monitoring and accountability under the trawl catch share program.

Over time, there could be a change in the stock productivity if removals of smaller fish changed the stock structure. Compared to No-action Alternative A1, Mesh Size Alternative A2 would not be likely to jeopardize the sustainability of any target species because it would not increase the harvest of available target species over what is currently available for the trawl catch share program. However, Mesh Size Alternative A2 might slightly change stock productivity over time by removing smaller size fish. Compared to No-action Alternative A1, Mesh Size Alternative A2 would have a neutral impact on overall harvest and a low negative impact on stock productivity.

4.1.2.1.3 Mesh Size Alternative A3

While not all trawl fishermen would be likely to invest in new gear to reduce their mesh size below 4.5 inches for bottom trawl and 3 inches for midwater, some might choose to do so, especially over time as they replaced their gear. This alternative would provide trawl fishermen with the flexibility to set their mesh size for the size fish they intended to target. Because small fish are generally less marketable, few fishermen would likely create a minimum mesh size so small that they would increase their catch of small, unmarketable fish. For the fishermen who choose to use a mesh size smaller than 4 or 4.5 inches, there would be increased impacts on target species from larger removals of small, undersized species, as well as differences in species composition of their catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species and younger individuals could negatively impact the species productivity over time, although the magnitude of impact could be adjusted with responsive management in the fishery.

While Mesh Size Alternative A3 may have a medium, negative impact on stock productivity over time compared to No-action Alternative A1, the overall amount of target species that could be caught would not change (neutral impact). Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.1.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) might be a non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery).

The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.1.2.2.1 Mesh Size Alternative A1 (No-action)

No-action Alternative, Mesh Size Alternative A1would maintain a 4.5-inch minimum mesh requirement for bottom trawl gear and a 3-inch minimum mesh size for midwater trawl. This mesh size was decided based on groundfish mesh size studies from the late 1980s, which looked at codend mesh sizes of 3 inches, 4.5 inches, and 5 inches (Pikitch et al. 1990). Total catch of non-target species, including overfished groundfish species, would likely remain comparable to recent years and within acceptable harvest levels.

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, regulations would remain in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts on these species would be sustainable. These regulations include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure no one stock's sustainability would be jeopardized.

For non-groundfish species, regulations would remain in place for HMS and CPS that establish harvest limits and account for other sources of mortality. Under the No-action Alternative (A1), there would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored, and they would be managed within sustainable harvest limits (ABCs).

Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. The No-action Alternative would not be likely to jeopardize the sustainability of any non-target species and would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure it would remain at sustainable levels. The No-action Alternative (A1) would have an ongoing neutral impact on stock productivity for non-target species from removal of a portion of the stock with trawl gear.

4.1.2.2.2 Mesh Size Alternative A2

Mesh Size Alternative A2 would reduce the minimum mesh size restriction for bottom trawl to 4 inches, 0.5-inch smaller than No-action Alternative A1. This change would be within the mesh sizes studied in Pikitch et al. (1990). Compared to No-action Alternative A1, Mesh Size Alternative A2 would likely catch fish faster and catch smaller size fish than Alternative A1 (No-action) due to the smaller mesh size. Mesh Size Alternative A2 would have a low negative impact on overall harvest compared to Alternative A1 because more non-target species might be caught. For non-target species without harvest limits in the trawl catch share program, catches might increase, especially of smaller species like CPS. However, non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends. Over time, there could be a low negative impact on stock productivity from Mesh Size Alternative A2 if removals of smaller fish changed the stock structure for non-target species.

4.1.2.2.3 Mesh Size Alternative A3

Removing the minimum mesh size restrictions from Federal regulation for bottom and midwater trawl (Mesh Size Alternative A3) would have medium negative impacts compared to Alternative A1 (No-action) and uncertainty for non-target species. In general, impacts on marine species would increase with a decrease in mesh size.

While not all trawl fishermen would be likely to invest in new gear to reduce their mesh size below 4.5 inches for bottom trawl and 3 inches for midwater trawl, some may choose to do so, especially over time as they replaced their gear. This alternative would provide trawl fishermen the flexibility to set their mesh size for the size of fish they would intend to target. Because small fish are generally less marketable, few fishermen would be likely to create a minimum mesh size so small that they would increase their catch of small, unmarketable fish. For the fishermen who choose to use a mesh size smaller than 4.5 or 4 inches, there would be negative impacts on non-target species from larger removals of small,

undersized species, as well as differences in species composition of catch from reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species, like forage fish and CPS, or younger individuals could shift species productivity over time.

Mesh Size Alternative A3 would be likely to have a medium negative impact on overall harvest of non-target species and on their stock productivity over time compared to No-action Alternative A1 because more and smaller non-target species might be caught, particularly for non-target species without harvest limits in the trawl catch share program. Because of the uncertainty associated with Alternative A3, adequate monitoring would be especially important. Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.1.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would be most likely to be affected by the proposed action for trawl catch share program gear changes.

4.1.2.3.1 Mesh Size Alternative A1 (No-action)

The No-action Alternative, Mesh Size Alternative A1, would maintain a 4.5-inch minimum mesh requirement for bottom trawl gear and a 3-inch minimum mesh size for midwater trawl gear. This mesh size was decided based on groundfish mesh size studies from the late 1980s, which looked at codend mesh sizes of 3 inches, 4.5 inches, and 5 inches (Pikitch et al. 1990). Total catch of protected species would likely remain comparable to recent years, which have had a low negative impact. In recent years, catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation.

NMFS reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. In 2014, the Pacific whiting fishery exceeded its incidental take of Chinook salmon, triggering a reinitiation for salmon take in the groundfish fishery. Patterns of incidental catch of Chinook in groundfish fisheries show interannual variability. High years are generally followed by several lower years. On average, the groundfish fishery has remained well below amounts allowed in the incidental take statement.

At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The increased

bycatch may be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing on eulachon under the FMP to determine if reinitiation or a modification to the incidental take statement is necessary.

No-action Alternative A1 would continue to have 100 percent monitoring of protected species. The WCGOP Mortality Report provides annual information and trends in fishery interactions with protected species.

4.1.2.3.2 Mesh Size Alternative A2

Mesh Size Alternative A2 would reduce the minimum mesh size restriction for bottom trawl to 4 inches, 0.5-inch smaller than No-action Alternative A1. This change is within the mesh sizes studied in Pikitch et al. (1990). Compared to No-action Alternative A1, Mesh Size Alternative A2 would likely catch smaller-size marine species faster than under Alternative A1 (No-action) due to the slightly smaller mesh size. Because of the minimal difference, Mesh Size Alternative A2 would likely have the same impact (low negative) compared to Alternative A1. Over time, there could be a low negative impact on stock productivity from Mesh Size Alternative A2 if removals of more protected species changed their stock structure. Monitoring of protected species would remain the same as No-action Alternative A1.

4.1.2.3.3 Mesh Size Alternative A3

Removing the minimum mesh size restrictions from Federal regulation for bottom and midwater trawl (Mesh Size Alternative A3) would have a high negative impact compared to Alternative A1 (No-action), as well as uncertainty for protected species. In general, impacts on marine species would increase with a decrease in mesh size.

While not all trawl fishermen would be likely to invest in new gear to reduce their mesh size below 4.5 inches for bottom trawl and 3 inches for midwater trawl, some might choose to do so, especially over time as they replaced their gear. This alternative would provide trawl fishermen the flexibility to set their mesh size for the size of fish they intended to target. Because small fish are generally less marketable, few fishermen would be likely to create a minimum mesh size so small that they would increase their catch of small, unmarketable fish. For fishermen who would choose to use a mesh size smaller than 4.5 or 4 inches, there would be increased impacts on protected species from larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Removals of these smaller, younger species could shift the species productivity over time.

Mesh Size Alternative A3 would likely have a high negative impact on protected species and their stock productivity over time compared to No-action Alternative A1, because more and smaller protected

species, including salmon and eulachon, might be caught. For protected species, the magnitude of impact would likely be high compared to target and non-target species, because these species are not tracked inseason, and effective management measures to respond to overages in protected species are generally lacking. In addition, the risk to these species would be higher, because they are already in protected status. Protected species would continue to be monitored under the trawl catch share program as described under No-action Alternative A1. Because of the uncertainty associated with Alternative A3, adequate monitoring would be especially important.

4.1.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for changing trawl gear minimum mesh size requirements. Section 4.1.3.1 considers the impacts to harvesters. Section 4.1.3.2 considers impacts to first receivers/processors. Section 4.1.3.3 considers impacts to fishing communities. Section 4.1.3.4 considers impacts to management entities. A summary of the socioeconomic impacts is available in Table 4-1.

4.1.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.1.3.1.1 Mesh Size Alternative A1 (No-action)

The minimum mesh size for bottom trawl nets would continue to be 4.5 inches under Alternative A1 (No-action). Low negative impacts would be expected for harvesters under this alternative due to restrictions on the ability of fishermen to optimize gear configuration. Lack of flexibility for gear configuration would restrict the ability of harvesters to maximize quota attainment of target species and to minimize their bycatch, potentially dampening net revenues.

4.1.3.1.2 Mesh Size Alternative A2

The minimum mesh size under Alternative A2 would shift to 4 inches. Current rules include bottom trawl net and midwater trawl net. This alternative would change the minimum mesh size for bottom trawl only. Under No-action Alternative A1, because of standard net shrinkage, vessels deploying the industry-standard, 4.5-inch mesh might end up violating the minimum mesh size regulation. Mesh size under Alternative A2 may lead to decreased industry concerns about potential violations, and it would potentially save on financial costs related to fines and legal fees resulting from infractions.

Relaxing the mesh size to 4 inches might help decrease costs of compliance with regulations. Fishermen could potentially increase the efficiency of their gear with more flexibility with mesh size, perhaps by

using smaller mesh size around stress and wear points to lengthen the life of the net, particular around fish excluders. As discussed in Chapter 3.3, expenses for fishing gear are not a major factor in overall variable expenses for the average vessel, because fuel and crew payments drive the bulk of trip costs. However, net revenue is estimated to be low for bottom trawlers, so a small improvement in costs might have a greater proportional effect on net income than it would on total costs This alternative would result in a low positive impact for bottom trawlers.

4.1.3.1.3 Mesh Size Alternative A3

There would be no minimum mesh size measuring for bottom trawl under Alternative 3. Current rules include bottom trawl net and midwater trawl net. This alternative would change the minimum mesh size for bottom trawl only. Alternative A3 would provide fishermen with maximum flexibility when choosing mesh size to optimize the life span and functionality of their nets, a low positive impact for bottom trawlers. This action should lead to decreased industry concerns about potential violations, and it would potentially save on financial costs related to fines and legal fees resulting from infractions.

Relaxing the mesh size to 4 inches might help decrease costs of compliance with regulations. Fishermen could potentially increase the efficiency of their gear with more flexibility with mesh size, perhaps using smaller mesh size around stress and wear points to lengthen the life of the net, particular around fish excluders. As discussed in Chapter 3.3, expenses on fishing gear are not a major factor in overall variable expenses for the average vessel, because fuel and crew payments drive the bulk of trip costs. However, net revenue is estimated to be low for bottom trawlers, so a small improvement in costs might have a greater proportional effect on net income than it would on total costs This alternative would result in a low medium positive impact for bottom trawlers.

Smaller meshes might lead to an increased catch of juvenile fish, which would be counted against the operator's quota and could have negative implications for the profitability of the vessel, a low negative potential outcome for bottom trawlers.

4.1.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.1.3.2.1 Mesh Size Alternative A1 (No-action)

The minimum mesh size for bottom trawl nets would continue to be 4.5 inches under Alternative A1 (No-action). Neutral economic impacts on first receivers/processors would be anticipated this alternative.

4.1.3.2.2 Mesh Size Alternative A2

Alternative A2 would result in potential increased flexibility for bottom trawlers to prosecute non-whiting groundfish fisheries, which could be beneficial to processors. More than half of West Coast processors receive some sort of non-whiting trawl fish, with more than 15 processors receiving trawl-caught DTS and 18 receiving lingcod and rockfish from LE trawl vessels (Table 4-2). These processors would likely experience low positive impacts from any increase in gear efficiency of the catcher-vessels that deliver to them, potentially resulting in better timing of deliveries throughout the season, or higher quality input.

Payments to the vessel are highest for sablefish across the coast, with Dover, thornyheads, petrale, and rockfish also having over a million dollars each in purchase costs for processors.

The fresh non-whiting groundfish species, particularly sablefish, are generally hand-filleted by skilled laborers. Any opportunity for the vessel to improve quality of these high-value fish landed, or to time fishing activity better to accommodate processing capacity would likely be a low positive impact on processors.

If gear changes were to result in an increased catch of smaller fish, processors would likely have lower product recovery rates and would receive lower value per purchased pound. In 2012, West Coast processors had a total non-whiting groundfish production value of $73,047,600 (this included fish from LE trawl, fixed gear, open access, and fish transferred from non-vessel sources).

4.1.3.2.3 Mesh Size Alternative A3

The average variable cost net revenue (revenue less variable costs) from non-whiting groundfish was approximately $450,000 in 2012 (Table 4-3). While most of this fish is processed fresh or frozen currently, a shift to smaller fish might lead to a decrease in product value, as smaller fish would potentially be more likely to wind up as low-value fishmeal. Fishmeal processing equipment is expensive, and only a handful of West Coast first receivers/processors currently produce fishmeal. Many facilities, particularly those that do not processing whiting, likely do not currently have fishmeal plants and, thus, would have to discard smaller fish. Fishmeal production is more common in high-volume product recovery focused at-sea whiting fishery where it received a first-wholesale price of about $0.95/pound (lb) (NMFS 2015d). With the exception of arrowtooth flounder, most non-whiting ex-vessel prices are 20 to 40 cents/lb higher than whiting. Sablefish and petrale typically fetch between $1 and $3/lb at the dock; thus, it is unlikely that first receivers could earn a profit by turning an influx of smaller non-whiting groundfish into fishmeal. Fishermen would probably not want to use their QP on fish that would only bring a fishmeal price, so this problem would likely be minimal. The most likely scenario would be a small decrease in average size of fish caught, with some decrease in product recovery rates.

Table 4-2. Processor weight and cost from LE vessels.

Total Processor Purchase Weight and Cost From Le Trawl Vessels by Species												
	2009			2010			2011			2012		
	Weight	Cost	N	Weight	Cost	N	Weight	Cost	N	Weight	Cost	N
Dover sole	23,430,300	$8,204,400	14	21,160,200	$6,803,400	13	15,364,800	$6,572,000	14	14,445,000	$6,399,000	13
Sablefish	5,749,000	$12,005,900	15	4,423,600	$9,710,900	16	2,790,500	$8,341,700	15	3,609,400	$8,595,600	17
Thornyheads	4,804,200	$2,458,900	13	4,308,200	$2,334,000	13	2,637,300	$1,565,400	16	2,981,100	$1,772,000	15
English sole	505,400	$159,100	11	301,400	$96,200	11	145,200	$69,000	10	241,500	$86,200	14
Petrale sole	3,779,600	$3,002,800	11	1,439,600	$1,659,100	13	1,371,100	$1,985,600	12	2,114,100	$3,227,900	13
Rex sole	1,070,700	$367,400	14	924,900	$306,400	12	733,700	$271,400	13	811,800	$391,700	14
Arrowtooth flounder							4,110,700	$420,200	11	4,210,200	$529,800	14
Lingcod	236,100	$152,400	15	136,100	$92,400	14	456,600	$357,400	17	610,600	$455,800	18
Rockfish	2,062,800	$1,426,500	18	1,709,800	$884,700	15	2,819,300	$1,516,900	19	3,615,000	$2,020,100	18
Sanddab							284,500	$165,200	8	230,000	$135,700	9
Sharks, skates, and rays	2,527,500	$495,000	12	2,833,100	$732,100	11	2,589,200	$803,200	13	2,286,100	$944,800	14

N=number of LE vessels.

Table 4.3. Total non-whiting production weight and value in 2012 (including trawl, fixed gear, and non-vessel sources).

	Fresh			Frozen			Unprocessed				
	% Species Production Value	Price	N	% Species Production Value	Price	N	% Species Production Value	Price	N	Total Weight	Total Value
Dover sole	81%	$3.49	12	16%	$2.51	10	3%	$0.21	10	6,542,600	$15,590,900
Sablefish	11%	$5.10	13	83%	$5.56	13	6%	$2.68	10	6,102,200	$31,538,900
Thornyheads	0%			89%	$3.64	9	11%	$0.90	10	2,066,700	$5,664,600
English sole	79%	$3.39	9	17%	$1.10	8	4%	$0.43	9	186,400	$390,600
Petrale sole	64%	$5.24	10	7%	$4.15	7	29%	$2.42	13	1,564,100	$6,048,900
Rex sole	50%	$2.48	8	43%	$1.90	8	7%	$0.64	7	480,600	$900,000
Arrowtooth flounder	32%	$1.05	9	64%	$0.87	9	4%	$0.15	7	2,493,700	$1,880,600
Lingcod	79%	$3.91	10	9%	$3.51	6	12%	$2.19	12	434,500	$1,535,700
Rockfish	68%	$3.15	11	13%	$1.95	10	19%	$0.96	14	3,051,400	$6,331,900
Sanddab	30%	$5.14	6	46%	$4.65	7	25%	$1.27	9	144,600	$412,700
Sharks, skates and rays	3%	$0.64	5	85%	$2.65	9	13%	$0.57	10	1,593,300	$2,752,800

N=Number of vessels.

With no minimum mesh size, the concerns about an increase in smaller fish landed documented above would be applicable and possibly amplified. Because this option would provide fishermen with the most flexibility to use mesh size to improve the functionality and efficiency of their nets, processors might realize improved quality and quantity of fish deliveries. Fishermen would likely use increased flexibility to choose a mesh size that would optimize their ex-vessel revenue while minimizing quota costs, resulting in a low positive impact on processors.

4.1.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.1.3.3.1 Mesh Size Alternative A1 (No-action)

The minimum mesh size for bottom trawl nets would continue to be 4.5 inches under Alternative A1. Neutral impacts to fishing communities would be anticipated under No-action Alternative A1.

4.1.3.3.2 Mesh Size Alternative A2

The areas where shoreside non-whiting trawl is the primary fishery would most likely be impacted by potential changes in bottom trawl nets (Table 3-4). The areas expected to experience medium positive impacts would be Astoria, Coos Bay, and Brookings in Oregon, and Crescent City, Eureka, Fort Bragg, and San Francisco in California. Also likely to experience low positive impacts would be areas where the secondary fishery is predominantly shoreside non-whiting trawl. These areas are Puget Sound and the North Washington coast, as well as Tillamook and Newport in Oregon, and Bodega Bay and Monterey in California.

4.1.3.3.3 Mesh Size Alternative A3

With no minimum mesh size, the concerns about an increase in smaller fish landed documented above would be applicable and possibly amplified. Having increased flexibility to configure gear would have the greatest impact on port communities with a greater concentration of bottom trawlers, as described above. Compared to No action Alternative A1, the positive impacts on the fleet from increased gear flexibility would be medium positive under Alternative A3, compared to low positive under Alternative A2 and low negative under Alternative A1. Any negative potential impacts on the fleet from an increase in catch of juvenile fish with smaller mesh size would be low negative in these same areas.

4.1.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.1.3.4.1 Mesh Size Alternative A1 (No-action)

Neutral impacts on management entities would be anticipated under the Alternative A1 (No-action).

4.1.3.4.2 Mesh Size Alternative A2

Neutral impacts on management entities would be anticipated under Alternative A2.

4.1.3.4.3 Mesh Size Alternative A3

Without any minimum mesh size to measure or regulate, management might experience a low positive impact from decreased enforcement costs; however, not knowing the mesh size might have a low negative impact on data quality. Knowing the mesh size would feed into selectivity analyses, and these data would be highly influential on stock assessments. This alternative could necessitate a mesh size line on fish tickets, or, at a minimum, a survey of the fleet to define mesh sizes being used to determine gear selectivity for stock assessment models. Another approach would be to require a 3-inch minimum mesh size. This approach would provide more flexibility than the 4-inch minimum mesh size, but it might simplify regulations and enforcement, as well as maintaining stock assessment data quality, by providing a single minimum mesh size for all trawl gears.

4.2 Measuring Mesh Size (B)

Section 4.2 evaluates the impacts of the alternatives for changing how trawl mesh size is measured. As noted in the section title, this is also labeled as issue B to help the reader differentiate the topics discussed in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component, physical component (Section 4.2.1), biological component (Section 4.2.2), and socioeconomic component (Section 4.2.3). A summary table of impacts for these environmental components is included in this section (Table 4-4).

Table 4-4. Summary of physical, biological, and socioeconomic impacts for changes in measuring trawl mesh size (B).

Measuring Mesh Size (B)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Measurement **Alternative B1** (No-action)	Trawl mesh size measurements taken between knots.	*Ecosystem*: Neutral impact. ---------- *EFH:* Neutral impact.	*Target species:* Neutral impact. ---------- *Non-target species:* Neutral impact. ---------- *Protected species:* Neutral impact.	*Harvesters*: Neutral impact. ---------- *Processors*: Neutral impact. ---------- *Fishing Communities*: Neutral impact. ---------- *Management entities*: Low negative impact.
Measurement **Alternative B2**	Trawl mesh size measurements taken between knots or, in knotless mesh, between corners.	*Ecosystem*: Neutral impact. ---------- *EFH:* Neutral impact.	*Target species:* Neutral impact. ---------- *Non-target species:* Neutral impact. ---------- *Protected species:* Neutral impact.	*Harvesters*: Low positive impact. ---------- *Processors*: Neutral impact. ---------- *Fishing Communities*: Neutral impact. ---------- *Management entities*: Low positive impact.

Note: Impacts of Alternative B2 are in comparison to Alternative 1 (No-action) and Alternative B1.

As described in Section 2.2, there are two alternatives for measuring mesh size for trawl gear. These are labeled Measurement Alternatives B1 and B2 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **Measurement Alternative B1 (No-action)** – Trawl mesh size measurements would be taken between knots. Mesh size would mean the opening between opposing knots. Minimum mesh size would mean the smallest distance allowed between the inside of one knot to the inside of the opposing knot, regardless of twine size.
- **Measurement Alternative B2** – Trawl mesh size measurements would be taken between knots or, in knotless mesh, between corners. New text compared to Alternative B1 (No-action) is underlined. Mesh size would mean the opening between opposing knots or corners in knotless webbing. Minimum mesh size would mean the smallest distance allowed between the inside of one knot or corner to the inside of the opposing knot or corner, regardless of twine size.

4.2.1 Physical Environment

This section evaluates the physical impacts of the alternatives for changing how trawl mesh size is measured. Section 4.2.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.2.1.2 considers impacts on EFH. A summary of the physical impacts is in Table 4-4.

4.2.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.2.1.1.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on the Pacific Coast Marine Ecosystem. Alternative B1 would have no direct impact on the physical environment, and it would be an administrative action to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.1.1.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on the Pacific Coast Marine Ecosystem compared to Alternative B1. Because not all trawl nets have knots between each mesh, Measurement Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternatives B1 nor B2 would have a direct

impact on the physical environment. They would be administrative actions to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.2.1.2.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on EFH. Alternative B1 would have no direct impact on the physical environment, and it would be an administrative action to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.1.2.2 Measurement Alternative B2

Measurement Alternative B2 would have the same (neutral) impact on EFH compared to Alternative B1. Because not all trawl nets have knots between each mesh, Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternatives B1 nor B2 would have a direct impact on the physical environment. They would be administrative actions to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2 Biological Environment

This section evaluates the biological impacts of the alternatives for changing how trawl mesh size would be measured. Section 4.2.2.1 considers the impacts on groundfish target species. Section 4.2.2.2 considers impacts on non-target species. Section 4.2.2.3 considers impacts on protected species. A summary of the biological impacts is in Table 4-4.

4.2.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.2.2.1.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on target species. Alternative B1 would have no direct impact on the biological environment, and it would be an administrative action to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2.1.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on the target species as Alternative B1. Because not all trawl nets have knots between each mesh, Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternative B1 nor B2 would have a direct impact on the biological environment. They would be administrative actions to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) may be a non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.2.2.2.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on non-target species. The No-action Alternative would have no direct impact on the biological environment. It would be an administrative action to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2.2.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on the non-target species as Alternative B1. Because not all trawl nets have knots between each mesh, Measurement Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternative B1 nor B2 would have a direct impact on the biological environment. They would be administrative actions to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon are most likely to be affected by the proposed action for trawl catch share program gear changes.

4.2.2.3.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on protected species. Alternative B1 would have no direct impact on the biological environment. It would be an administrative action to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.2.3.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on the protected species as Alternative B1. Because not all trawl nets have knots between each mesh, Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternative B1 nor B2 would have a direct impact on the biological environment. They would be administrative actions to enforce regulations on minimum mesh size. This action is related to Issue A in this EIS, minimum mesh size.

4.2.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives regarding changing how trawl mesh size is measured. Section 4.2.3.1 considers the impacts on harvesters. Section 4.2.3.2 considers impacts on first receivers/processors. Section 4.2.3.3 considers impacts on fishing communities. Section 4.2.3.4 considers impacts on management entities. A summary of the socioeconomic impacts is available in Table 4-4.

4.2.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.2.3.1.1 Measurement Alternative B1 (No-action)

Alternative B1 (No-action) would have a low-negative impact on harvesters. Alternative B1 might cause some confusion or concern for fishermen who use knotless webbing in their nets regarding compliance with regulations. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.1.2 Measurement Alternative B2

Minimum mesh size under Alternative B1 would remain the same. Minimum mesh size would continue to be the smallest distance allowed between the inside of the one knot to the inside of the opposing knot, regardless of twine size. This alternative would have no impact on harvesters. Measurement Alternative B2 would have a low positive impact on harvesters compared to Alternative B1. Because not all trawl nets have knots between each mesh, Measurement Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. This would reduce uncertainty regarding compliance with regulations, which would benefit harvesters. This administrative action would bring regulations on minimum mesh size in line with advances in net design and configuration. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.2.3.2.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on first receivers/processors. Alternative B1 would have no direct impact on first receivers/processors. It would be an administrative action to enforce regulations on minimum mesh size. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.2.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on first receivers/processors compared to Alternative B1. Because not all trawl nets have knots between each mesh, Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternative B1 nor B2 would have a direct impact on first

receivers/processors. They would be administrative actions to enforce regulations on minimum mesh size. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.2.3.3.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a neutral impact on fishing communities. Alternative B1 would have no direct impact on fishing communities. It would be an administrative action to enforce regulations on minimum mesh size. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.3.2 Measurement Alternative B2

Alternative B2 would have the same (neutral) impact on fishing communities as Alternative B1. Because not all trawl nets have knots between each mesh, Alternative B2 would modify regulations to specify that trawl mesh size could be measured between opposing knots, or, in knotless webbing, between opposing corners. Neither Alternative B1 nor B2 would have a direct impact on fishing communities. They would be administrative actions to enforce regulations on minimum mesh size. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.2.3.4.1 Measurement Alternative B1 (No-action)

Alternative B1 would have a low negative impact on management entities. Alternative B1 is out of date with current net usage, which obscures enforcement and regulations on minimum mesh size. This alternative is related to Issue A in this EIS, minimum mesh size.

4.2.3.4.2 Measurement Alternative B2

Alternative B2 would have a low positive impact on management entities. It would improve enforcement's ability to regulate minimum mesh size for increasingly common knotless webbing nets. This alternative is related to Issue A in this EIS, minimum mesh size.

4.3 Codend Regulations (C)

Section 4.3 evaluates the impacts of the alternatives for changing codend restrictions for bottom trawl gear. As noted in the section title, this is also labeled as issue C to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component, physical component (Section 4.3.1), biological component (Section 4.3.2), and socioeconomic component (Section 4.3.3). A summary table of impacts for these environmental components is included in this Section (Table 4-5).

As described in Section 2.3, there are two alternatives for codend restrictions for bottom trawl gear. These are labeled Codend Alternatives C1 and C2 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **Codend Alternative C1 (No-action)** – Only single-walled codends could be used in any trawl. Double-walled codends would be prohibited. Chafing gear could not be used to create a double-walled codend.
- **Codend Alternative C2** – There would be no codend restrictions.

Table 4-5. Summary of physical, biological, socioeconomic impacts for changes in codend (C).

Codend (C)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Codend **Alternative C1** (No-action)	Only single-walled. Double-walled prohibited. Chafing gear not used as double-walled codend.	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low negative impact, particularly on salmon and eulachon.	*Harvesters*: Low negative impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Neutral impact.
Codend **Alternative C2**	No codend restrictions.	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest. Medium negative impact on stock productivity. --- *Non-target species:* Uncertainty. Medium negative impact on overall harvest for some species like CPS. Medium negative impact on stock productivity. --- *Protected species:* Uncertainty. High negative impact, particularly on salmon and eulachon.	*Harvesters*: Low positive impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Neutral impact.

Note: Impacts of Alternative C2 are in comparison to Alternative C1 (No-action).

4.3.1 Physical Environment

This section evaluates the physical impacts of the alternatives regarding changing codend restrictions for bottom trawl gear. Section 4.3.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.3.1.2 considers impacts on EFH. A summary of the physical impacts is in Table 4-5.

4.3.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.3.1.1.1 Codend Alternative C1 (No-action)

Alternative C1 would have an ongoing low negative impact on the Pacific Coast Marine Ecosystem from fishing activity and removal of a portion of the stocks for various marine species.

4.3.1.1.2 Codend Alternative C2

Alternative C2 would remove codend restrictions, including the prohibition on double walled codends. Alternative C2 might have a medium, negative impact on the Pacific Coast Marine Ecosystem compared to Alternative C1 No-action, and uncertainty would exist regarding ecosystem impacts. In general, impacts on marine species increases with a decrease in mesh size. The layering effect of allowing a double-walled codend would decrease mesh size.

While not all bottom and midwater trawl fishermen would be likely to invest in new codends or move to double-walled codends, some might choose to do so, especially over time. This alternative would provide trawl fishermen with flexibility to set up a single- or double-walled codend, based on how they wanted to fish. A double-walled codend would effectively create a smaller mesh size in the codend, making it more difficult for marine species to escape. It would also increase catch of smaller fish. Because small fish are generally less marketable, few fishermen would be likely to use a double-walled codend. For the fishermen who would choose to use a double-walled codend, there would be increased impacts on the Pacific Coast Marine Ecosystem from larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species and younger individuals could shift ecosystem functioning over time.

4.3.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.3.1.2.1 Codend Alternative C1 (No-action)

Alternative C1 (No-action), EFH protections would continue to prohibit bottom contact gear, including bottom trawl from specific areas designated as EFH. Alternative C1 would likely have a neutral impact on EFH because those areas would remain protected.

4.3.1.2.2 Codend Alternative C2

Removing codend restrictions, including the prohibition on double walled codends (Alternative C2), would have the same (neutral) impact as Alternative C1 (No-action) because EFH protections for bottom contact gear, including bottom trawl, would remain in place. While there might be some redistribution of impacts on the seafloor and habitat, Alternative C2 would not change the areas that could be fished.

4.3.2 Biological Environment

This section evaluates the biological impacts of the alternatives for changing codend restrictions for bottom trawl gear. Section 4.3.2.1 considers the impacts to groundfish target species. Section 4.3.2.2 considers impacts on non-target species. Section 4.3.2.3 considers impacts on protected species. A summary of the biological impacts is in Table 4-5.

4.3.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.3.2.1.1 Codend Alternative C1 (No-action)

Under Alternative C1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species and, in the Shorebased IFQ Program, quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch.

Under Alternative C1 (No-action), there would be a low risk of catch exceeding the trawl allocations. The No-action Alternative would not likely jeopardize the sustainability of any target species because it would not increase the harvest of available target species over that currently available for the trawl catch share

program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative C1 would likely have a neutral impact on overall harvest and stock productivity.

4.3.2.1.2 Codend Alternative C2

In general, impacts on marine species increases with a decrease in mesh size. The layering effect of allowing a double-walled codend would create a decrease in mesh size.

While not all bottom and midwater trawl fishermen would be likely to invest in new codends or move to double-walled codends, some might choose to do so, especially over time. This alternative would provide trawl fishermen with flexibility to set up a single- or double-walled codend based on how they wanted to fish. A double-walled codend would effectively create a smaller mesh size in the codend, making it more difficult for marine species to escape. It would also increase catch of smaller fish. Because small fish are generally less marketable, few fishermen would be likely to use a double-walled codend. For the fishermen who would choose to use a double-walled codend, there would be increased impacts on target species from larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species and younger individuals could negatively impact species productivity over time, although the magnitude of impact could be adjusted with responsive management in the fishery.

While Alternative C2 may have a medium negative impact on stock productivity over time when compared to Alternative C1 (No-action), the overall amount of target species that could be caught would not change (neutral impact). Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.3.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) might be a non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.3.2.2.1 Codend Alternative C1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, regulations are in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts on these species are sustainable. These regulations include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure that no one stock's sustainability is jeopardized. For non-groundfish species, regulations in place for HMS and CPS establish harvest limits and account for other sources of mortality.

Under Alternative C1 (No-action), total catch of non-target species, including overfished groundfish species, would be likely to remain comparable to recent years and within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and managed within sustainable harvest limits (ABCs). Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. The No-action Alternative would not

be likely to jeopardize the sustainability of any non-target species, and it would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure it would remain at sustainable levels. Alternative C1 would have a neutral impact on stock productivity for non-target species from removal of a portion of the stock with trawl gear.

4.3.2.2.2 Codend Alternative C2

Removing codend restrictions under Alternative C2, including the prohibition on double walled codends, would have medium, negative impacts compared to Alternative C1 (No-action) and would result in uncertainty for non-target species. In general, impacts on marine species increases with a decrease in mesh size. The layering effect of allowing a double-walled codend would create a decrease in mesh size. While not all bottom and midwater trawl fishermen would be likely to invest in new codends or move to double-walled codends, some might choose to do so, especially over time. This alternative would provide trawl fishermen with the flexibility to set up a single- or double-walled codend, based on how they wanted to fish. A double-walled codend would effectively create a smaller mesh size in the codend, making it more difficult for marine species to escape. It would also increase the catch of smaller fish. Because small fish are generally less marketable, few fishermen would be likely to use a double-walled codend. For the fishermen who choose to use a double-walled codend, there would be increased impacts on non-target species from larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species, like forage fish and CPS, and younger individuals could shift species productivity over time.

Alternative C2 would be likely to have a medium negative impact on overall harvest of non-target species and on their stock productivity over time compared to Alternative C1, because more and smaller non-target species might be caught, particularly for non-target species without harvest limits in the trawl catch share program. Because of the uncertainty associated with this alternative, adequate monitoring would be especially important. Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.3.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would be most likely to be affected by the proposed action for trawl catch share program gear changes.

4.3.2.3.1 Codend Alternative C1 (No-action)

Under Alternative C1 (No-action), total catch of protected species would be likely to remain comparable to recent years, which have displayed a low negative impact. In recent years, catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation. In addition, Alternative C1 has had an ongoing low negative impact on stock productivity for protected species from removal of a portion of the stock with trawl gear.

NMFS reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. In 2014, the Pacific whiting fishery exceeded its incidental take of Chinook salmon, triggering a reinitiation of Section 7 consultation for salmon take in the groundfish fishery. Patterns of incidental catch of Chinook in groundfish fisheries show interannual variability. High years are generally followed by several lower years. On average, the groundfish fishery has remained well below amounts allowed in the incidental take statement.

At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The increased bycatch might be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing on eulachon under the FMP to determine if reinitiation or a modification to the incidental take statement is necessary.

Alternative C1 would have 100 percent monitoring of protected species. The WCGOP Mortality Report provides annual information and trends in fishery interactions with protected species.

4.3.2.3.2 Codend Alternative C2

Removing codend restrictions under Alternative C2, including the prohibition on double walled codends, would have high negative impacts compared to Alternative C1 (No-action), as well as uncertainty for protected species. In general, impacts on marine species increases with a decrease in mesh size. The layering effect of allowing a double-walled codend would create a decrease in mesh size.

While not all bottom and midwater trawl fishermen would be likely to invest in new codends or move to double-walled codends, some might choose to do so, especially over time. This alternative would provide trawl fishermen with flexibility to set up a single- or double-walled codend based on how they wanted to fish. A double-walled codend would effectively create a smaller mesh size in the codend, making it more difficult for marine species to escape. It would also increase catch of smaller fish. Because small fish are generally less marketable, few fishermen are expected to use a double-walled codend. For fishermen who would choose to use a double-walled codend, there would be increased impacts on protected species from

larger removals of small, undersized species, as well as differences in species composition of catch from the reduced selectivity. Smaller sizes within a species generally mean they are younger individuals. Removals of these smaller species and younger individuals could shift species productivity over time.

Codend Alternative C2 would likely have a high negative impact on overall harvest of protected species and on their stock productivity over time compared to Alternative C1. This would occur because more and smaller protected species, including salmon and eulachon, might be caught. For protected species, the magnitude of impact would likely be high compared to target and non-target species because these species are not tracked inseason, and effective management measures to respond to overages in protected species are generally lacking. In addition, the risk to these species would be higher because they are already in a protected status. Protected species would continue to be monitored under the trawl catch share program, as described under Alternative C1. Because of the uncertainty associated with this alternative, adequate monitoring would be especially important.

4.3.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for changing codend restrictions for bottom trawl gear. Section 4.3.3.1 considers the impacts on harvesters. Section 4.3.3.2 considers impacts on first receivers/processors. Section 4.4.3.3 considers impacts on fishing communities. Section 4.3.3.4 considers impacts on management entities. Table 4-5 contains a summary of the socioeconomic impacts.

4.3.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.3.3.1.1 Codend Alternative C1 (No-action)

Alternative C1 (No-action) would have an ongoing low negative impact on harvesters by restricting the ability of fishermen to optimize gear configuration. Lack of flexibility for gear configuration would restrict the ability of harvesters to maximize quota attainment of target species and to minimize their bycatch, potentially dampening net revenues.

4.3.3.1.2 Codend Alternative C2

Removing codend restrictions under Alternative C2, including the prohibition on double walled codends, might have a low positive impact on harvesters compared to Alternative C1 (No-action). Increased flexibility for gear configuration would increase the ability of harvesters to maximize quota attainment of target species and to minimize their bycatch, potentially increasing net revenues over time.

While not all bottom and midwater trawl fishermen would be likely to invest in new codends or move to double-walled codends, some might choose to do so, especially over time. This alternative would provide trawl fishermen with flexibility to set up a single- or double-walled codend, based on how they wanted to fish. The layering effect of allowing a double-walled codend would create a decrease in mesh size, which might result in increased catch of juvenile fish and a lower ex-vessel value for catch. Continued, widespread removal of juveniles could decrease overall stock health and lead to declining fleet revenues over time. Given market incentives to land larger fish, and quota costs, as well as the program disincentive to land smaller fish, fishermen would not be likely to implement gear changes that would result in a dramatic increase of catch of juvenile fish.

Harvesters might benefit from relaxed restrictions, as they would no longer be in violation of codend regulations by using chafing gear that created double walled cod-ends. Eliminating this restriction would reduce the rare potential compliance issues, as well as those possible with Chafing Gear Alternative E2 or E3, so Alternative C2 would result in a low positive impact for harvesters.

4.3.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.3.3.2.1 Codend Alternative C1 (No-action)

It is assumed that vessels would fish to maximize revenue from target species under Alternative C1 (No-action) and would use double-walled codends to help avoid certain types of bycatch. Thus, the expected direct impact on first receivers/processors from Alternative C1 would be neutral.

4.3.3.2.2 Codend Alternative C2

IFQ management makes every holder of quota pounds accountable for their overfished species catch. At-sea sectors (catcher/processor and mothership) have allowable catch levels that cover their overfished species needs, based on their historical maximum catches. With no codend restrictions under Alternative C2, a low negative result might occur if there were an increase in the retention of nonmarketable or lower value small fish, which would have to be covered with IFQ, displacing the opportunity to catch larger, more valuable fish with that same quota. If the double-walled codends were to result in a vessel having to use valuable quota pounds to cover unmarketable groundfish, it is assumed that the vessel would self-adjust the configuration before the change in net revenue was substantial; thus, the expected direct impact on first receivers/processors from Alternative C1 would be neutral.

4.3.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.3.3.3.1 Codend Alternative C1 (No-action)

Alternative C1 (No-action) would address gear configuration on the vessel and would not be likely to have any direct effect on fishing communities. Alternative C1 would have a neutral impact on fishing communities.

4.3.3.3.2 Codend Alternative C2

Alternative C2 would have the same neutral impact on fishing communities as the Alternative C1.

4.3.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.3.3.4.1 Codend Alternative C1 (No-action)

The impacts under any of the alternatives on the enforcement and management entities would be relatively similar. This is because the number, scope, and complexity of regulations that have to be enforced and monitored are relatively similar under all alternatives.

Under Alternative C1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species and, in the Shorebased IFQ Program, quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch. Under Alternative C1 (No-action), there would be a low risk of catch exceeding the trawl allocations. The No-action Alternative would not be likely to jeopardize the sustainability of any target species, because it would not increase the harvest of available target species over that which is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative C1 would likely have a neutral impact on management entities.

4.3.3.4.2 Codend Alternative C2

Eliminating or removing both bottom trawl and midwater trawl changing gear restrictions (Alternative C2) would result in a low-positive impact for management. Under Alternative C2, fishermen would have more flexibility regarding whether to use double-walled codends, or to create a double-walled codend using chafing gear, which would not have to be monitored by enforcement, potentially saving on enforcement training and other costs.

4.4 Selective Flatfish Trawl (D)

Section 4.4 evaluates the impacts of the alternatives for changing the selective flatfish trawl (SFFT) requirements. As noted in the section title, this is also labeled as issue D to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component: physical component (Section 4.4.1), biological component (Section 4.4.2), and socioeconomic component (Section 4.4.3). Table 4-6 summarizes the impacts for these environmental components.

Selective flatfish trawls have been mandated for the LE trawl fishery operating shoreward of the trawl RCA north of 40°10' N latitude since 2005. The selective flatfish trawl, configured with a cut-back headrope, a low rise, a small (≤ 8-inch-diameter) footrope, and two seams in the net, is designed to reduce rockfish bycatch while efficiently catching flatfish. The selective flatfish trawl works by allowing rockfish to escape by swimming upward when they encounter the trawl. Flatfish tend to dive down when disturbed, which accounts for the differential selectivity of these trawls to rockfish and flatfish.

As described in Section 2.4, there are three alternatives for changes to selective flatfish trawl gear requirements. These are labeled SFFT Alternatives D1 through D3 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **SFFT Alternative D1 (No-action)** – SFFT would be a two-seam net with no more than two riblines, excluding the cod-end. The breastline would be no longer than 3 feet. There could be no floats along the center third of headrope or attached to the top panel except on riblines. The footrope would be less than 105 feet. The headrope would have to be at least 30 percent longer than the footrope. SFFT would be required shoreward of the RCA north of 40°10’ N. latitude, and permitted but not required shoreward of the RCA south of 40°10’ N. latitude. SFFT would be permitted seaward of the RCA coastwide.
- **SFFT Alternative D2** – The SFFT definition would be modified to allow a two-seam or a four-seam net.

- **SFFT Alternative D3** – The SFFT definition would be modified to allow a two-seam or a four-seam net, and it would eliminate the SFFT requirement shoreward of the RCA north of 40°10’ N. latitude and would replace it with small footrope (like south of 40°10’ N. latitude).

Table 4-6. Summary of the physical, biological, and socioeconomic impacts for changes to selective flatfish trawl requirements (D).

SFFT (D)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
SFFT **Alternative D1** (No-action)	Two-seam net and required shoreward of RCA north of 40°10’	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low positive impact, particularly on salmon.	*Harvesters*: Low negative impact. --- *Processors*: Low negative impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Neutral impact.
SFFT **Alternative D2**	Two-seam or four-seam net	*Ecosystem*: Low positive impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Low positive impact on overall harvest or stock productivity. --- *Protected species:* Low positive impact, particularly on salmon.	*Harvesters*: Low positive impact. --- *Processors*: Low positive impact. --- *Fishing Communities*: Low positive impact. --- *Management entities*: Neutral impact.
SFFT **Alternative D3**	Two-seam or four-seam net and remove requirement shoreward of RCA north of 40°10’	*Ecosystem*: Neutral impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Medium negative impact, particularly on salmon and green sturgeon.	*Harvesters*: Medium positive impact. --- *Processors*: Medium positive impact. --- *Fishing Communities*: Medium positive impact. --- *Management entities*: Neutral impact.

Note: Impacts of Alternatives D2 and D3 are in comparison to Alternative D1 (No-action).

4.4.1 Physical Environment

This section evaluates the physical impacts of the alternatives that would change the selective flatfish trawl gear requirements. Section 4.4.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.4.1.2 considers impacts to essential fish habitat or EFH. Table 4-6 summarizes the physical impacts of the alternatives.

4.4.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.4.1.1.1 SFFT Alternative D1 (No-action)

Alternative D1 (No-action) would have an ongoing low negative impact on the Pacific Coast Marine Ecosystem. Effects would be due to fishing activity and removal of a portion of the stocks for various marine species.

4.4.1.1.2 SFFT Alternative D2

Allowing two-seam or four-seam nets under Alternative D2 would have a low positive impact on the Pacific Coast Marine Ecosystem compared to Alternative D1 (No-action). The two-seam net restriction makes it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, possibly including some important ecosystem species. This could have a positive impact on the Pacific Coast Marine Ecosystem by reducing the incidental catch of some species.

4.4.1.1.3 SFFT Alternative D3

Allowing two-seam or four-seam nets and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10’ N. latitude, (Alternative D3) would have a neutral impact on the Pacific Coast Marine Ecosystem compared to the Alternative D1 (No-action).

The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, possibly

including some important ecosystem species. This could have a low positive impact on the Pacific Coast Marine Ecosystem by reducing the incidental catch of some species.

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude and replacing it with a small footrope requirement (like south of 40°10') would provide fishermen with more flexibility in the types of small footrope trawl gear they use shoreward of the RCA coastwide. Fishermen could still use selective flatfish trawl gear shoreward of the RCA coastwide; however, regulations would not require it shoreward of the RCA north of 40°10' N. latitude. In other words, it would remain a fishing gear available for use by fishermen, but its use would not be required. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear, or they could target other groundfish species with small footrope trawl gear that did not have a cut-back headrope.

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude might increase catch of some important ecosystem species compared to Alternative D1 (N-action) if small footrope gear were more widely used. This could have a low, negative impact on the Pacific Coast Marine Ecosystem. Combining the impacts from the two parts of this alternative, allowing two-seam or four-seam nets (low positive) and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude (low negative), would result in the Alternative D3 having a neutral impact on the Pacific Coast Marine Ecosystem compared to Alternative D1 (No-action).

4.4.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.4.1.2.1 SFFT Alternative D1 (No-action)

Under Alternative D1 (No-action), EFH protections would continue to prohibit bottom contact gear, including bottom trawl from specific areas designated as EFH. Alternative D1 would likely have a neutral impact on EFH because those areas would remain protected.

4.4.1.2.2 SFFT Alternative D2

Allowing two-seam or four-seam nets under Alternative D2 would have the same (neutral) impact as Alternative D1 (No-action) because EFH protections for bottom contact gear, including bottom trawl, would remain in place. While there might be some redistribution of impacts on the seafloor and habitat, Alternative D2 would not change the areas that could be fished.

4.4.1.2.3 SFFT Alternative D3

Allowing two-seam or four-seam nets and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude under Alternative D3 would have the same (neutral) impact as Alternative D1 (No-action) because EFH protections for bottom contact gear, including bottom trawl, would remain in place. While there might be some redistribution of impacts on the seafloor and habitat, Alternative D3 would not change the areas that could be fished.

4.4.2 Biological Environment

This section evaluates the biological impacts of the alternatives for changing the selective flatfish trawl gear requirements. Section 4.4.2.1 considers the impacts to groundfish target species. Section 4.4.2.2 considers impacts to non-target species. Section 4.4.2.3 considers impacts to protected species. A summary of the biological impacts is in Table 4-6.

4.4.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.4.2.1.1 SFFT Alternative D1 (No-action)

Under Alternative D1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species and, in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch.

There would be a low risk of catch exceeding the trawl allocations under Alternative D1 (No-action). Alternative D1 would not likely jeopardize the sustainability of any target species, because it would not increase the harvest of available target species over that currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative D1 would likely have a neutral impact on overall harvest and stock productivity.

4.4.2.1.2 SFFT Alternative D2

Allowing two-seam or four-seam nets under Alternative D2 would have a neutral impact on target species compared to Alternative D1 (No-action). The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species and, ideally, would increase the catch of target species. However, the overall amount of target species that could be caught would not change (neutral impact), and stock productivity would not be affected (neutral impact). Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.4.2.1.3 SFFT Alternative D3

Allowing two-seam or four-seam nets and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude under Alternative D3 would have a neutral impact on target species compared to Alternative D1 (No-action). The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, possibly including some important ecosystem species. Ideally, the flexibility to use two-seam or four-seam nets and possibly bycatch excluders of the fisherman's choice would increase catch of target species.

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude and replacing it with a small footrope requirement (like south of 40°10') would provide fishermen with more flexibility in the types of small footrope trawl gear they could use shoreward of the RCA coastwide. Fishermen could still use selective flatfish trawl gear shoreward of the RCA coastwide; however, regulations would not require its use shoreward of the RCA north of 40°10' N. latitude. In other words, it would remain a fishing gear available for use by fishermen, but it would not be required. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear or target other groundfish species with small footrope trawl gear that did not have a cut-back headrope.

Under SFFT Alternative D3, the overall amount of target species that could be caught would not change (neutral impact) compared to Alternative D1 (No-action). Likewise, stock productivity would not be

affected (neutral impact). Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.4.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) may be a non-target species in another fishery (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.4.2.2.1 SFFT Alternative D1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut under Alternative D1 (No-action), regulations in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan would limit incidental catch of halibut and groundfish to ensure that impacts on these species would remain sustainable. These regulations include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure that no one stock's sustainability would be jeopardized. For non-groundfish species, regulations would remain in place for HMS and CPS. These regulations establish harvest limits and account for other sources of mortality.

Under Alternative D1 would likely remain comparable to recent years and within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and would be managed within sustainable harvest limits (ABCs). Non-groundfish species would continue to be

monitored to varying degrees by fishing strategy through WCGOP and reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. The No-action Alternative would not be likely to jeopardize the sustainability of any non-target species and would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure that remained at sustainable levels. Alternative D1 would have a neutral impact on stock productivity for non-target species.

4.4.2.2.2 SFFT Alternative D2

The two principal gear measures that were implemented to reduce bycatch of depleted rockfish species are as follows: 1) a requirement to use small footrope trawl gear on the continental shelf (i.e., shoreward of the RCA) and 2) a selective flatfish trawl gear requirement shoreward of the RCA north of 40°10’ N latitude (Council and NMFS 2009). The use of small footrope gear prevents trawling in rocky areas where some depleted species are more abundant. This requirement has an additional benefit of rocky habitat protection. Selective flatfish trawl gear has a lower bycatch rate for some depleted rockfish species because they can more easily escape from the top of the net. The requirement of selective flatfish trawl gear north of 40°10' N latitude and shoreward of the RCA and small footrope gear south of this management line have reduced bycatch of canary and yelloweye rockfish in the bottom trawl sector (Council and NMFS 2009).

Allowing two-seam or four-seam nets in selective flatfish trawl gear under Alternative D2 would have a low positive impact on non-target species compared to Alternative D1 (No-action) by further reducing bycatch. The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, including non-target species like overfished rockfish. This could have a low, positive impact on overall harvest and stock productivity for non-target species by reducing the incidental catch of some species.

Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.4.2.2.3 SFFT Alternative D3

SFFT Alternative D3 would allow two-seam or four-seam nets and would remove the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10’ N. latitude. As described in 4.4.2.2.2 SFFT Alternative D2, the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10’ N

latitude was implemented in 2005 to reduce incidental catch of non-target species, specifically, depleted rockfish species.

The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted non-target species, particularly rockfish species. This could have a low positive impact on non-target species by reducing the incidental catch of some species. Reduced incidental catch of non-target species would have a low positive impact on stock productivity by keeping more of those fish in the ecosystem.

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude and replacing it with a small footrope requirement (like south of 40°10') would provide fishermen with more flexibility in the types of small footrope trawl gear they could use shoreward of the RCA coastwide. Fishermen could still use selective flatfish trawl gear shoreward of the RCA coastwide; however, regulations would not require it shoreward of the RCA north of 40°10' N. latitude. In other words, it would remain a fishing gear available for use by fishermen but would not be required. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear, or they could target other groundfish species with small footrope trawl gear that did not have a cut-back headrope. Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude under Alternative D3 might increase catch of non-target species compared to Alternative D1 (No-action) if small footrope gear were more widely used and might result in higher catch of species such as canary rockfish and yelloweye rockfish. This could have a low negative impact on the overall harvest of non-target species, as well as on stock productivity. The magnitude of impact would be low rather than medium because overfished species and many non-target groundfish species would continue to be managed under quotas and allocations.

When combining the impacts from the two parts of this alternative, allowing two-seam or four-seam nets (low, positive) and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude (low, negative), Alternative D3 would have a neutral impact on non-target species compared to Alternative D1 (No-action).

Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.4.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would most likely be affected by the proposed action for trawl catch share program gear changes.

4.4.2.3.1 SFFT Alternative D1 (No-action)

Under No-action Alternative D1 (No-action), total catch of protected species would likely remain comparable to recent years, with data showing a low positive impact. While catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation in recent years, the use of selective flatfish trawl gear shoreward of the RCA north of 40°10' N. latitude has reduced catch of protected Chinook salmon (Council and NMFS 2009, p.381). In addition, Alternative D1 (No-action) would have an ongoing low positive impact on stock productivity for protected species from reduced incidental catch.

Alternative D1 would have 100 percent monitoring of protected species. The WCGOP Mortality Report would provide annual information and trends in fishery interactions with protected species.

4.4.2.3.2 SFFT Alternative D2

Implementation of the selective flatfish trawl gear requirement shoreward of the RCA, beginning in 2005, may have reduced Chinook salmon incidental catch in the area shoreward of 125 fm (Council and NMFS 2009, p.381). Allowing two-seam or four-seam nets in selective flatfish trawl gear under Alternative D2 would have a low positive impact on protected species (the same as Alternative D1 [No-action]) by further reducing incidental catch.

The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, including protected species. This could have a low, positive impact on overall harvest and stock productivity for protected species by further reducing the incidental catch of some species. Protected species would continue to be monitored under the trawl catch share program as described under Alternative D1 (No-action).

4.4.2.3.3 SFFT Alternative D3

Alternative D3 would allow two-seam or four-seam nets and would remove the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude. Implementation of the selective

flatfish trawl gear requirement shoreward of the RCA beginning in 2005 may have reduced Chinook salmon incidental catch in the area shoreward of 125 fm (Council and NMFS 2009, p.381).

Allowing two-seam or four-seam nets in selective flatfish trawl gear would have a low positive impact on protected species (same as under Alternative D1 [No-action]) by further reducing incidental catch. The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the catch of certain unwanted species, including protected species. This could have a low positive impact on overall harvest and stock productivity for protected species by further reducing the incidental catch of some species.

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10’ N. latitude and replacing it with a small footrope requirement (like south of 40°10’) would provide fishermen with more flexibility in the types of small footrope trawl gear they could use shoreward of the RCA coastwide. Fishermen could still use selective flatfish trawl gear shoreward of the RCA coastwide; however, regulations would not require it shoreward of the RCA north of 40°10’ N. latitude. In other words, it would remain a fishing gear available for use by fishermen but would not be required. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear, or they could target other groundfish species with small footrope trawl gear that did not have a cut-back headrope. Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10’ N. latitude under Alternative D3 would likely increase catch of protected species compared to Alternative D1 (No-action) if small footrope gear were more widely used and resulted in a higher catch of those species, such as Chinook salmon and green sturgeon. This could have a high negative impact on overall harvest of protected species, as well as on stock productivity. For protected species, the magnitude of impact would likely be high compared to target and non-target species, because these species are not tracked inseason, and effective management measures applied to respond to overages in protected species are generally lacking. In addition, the risk to these species would be higher, because they are already in a protected status.

Combining the impacts from the two parts of this alternative, allowing two-seam or four-seam nets (low positive) and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10’ N. latitude (high, negative), Alternative D3 would have a medium negative impact on protected species compared to Alternative D1 (No-action). Protected species would continue to be monitored under the trawl catch share program as described under Alternative D1 (No-action).

4.4.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for changing the selective flatfish trawl gear requirements. Section 4.4.3.1 considers the impacts on harvesters. Section 4.4.3.2 considers impacts on first receivers/processors. Section 4.4.3.3 considers impacts on fishing communities. Section 4.4.3.4 considers impacts on management entities. A summary of the socioeconomic impacts is available in Table 4-6.

4.4.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.4.3.1.1 SFFT Alternative D1 (No-action)

Alternative D1 (No-action) would have an ongoing low negative impact on harvesters by restricting the ability of fishermen to optimize gear configuration. The two-seam net restriction would make it difficult to include some types of bycatch excluders. Lack of flexibility for gear configuration would restrict the ability of harvesters to maximize quota attainment of target species and to minimize their bycatch, potentially dampening net revenues.

4.4.3.1.2 SFFT Alternative D2

Allowing two-seam or four-seam nets under Alternative D2 would have a low positive impact on harvesters compared to Alternative D1 (No-action). Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity to use different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the cost of quota for overfished species.

The two-seam net restriction would make it difficult to include some types of bycatch excluders. Allowing two-seam or four-seam nets would provide fishermen with more flexibility in designing their gear and would increase the opportunity for using different types of bycatch reduction devices. Increasing the options for bycatch reduction devices would reduce the cost of quota for overfished species, which, according to NMFS quota transfer data, can be as high as $1.49 per pound for canary rockfish, and $21.76 per pound for yelloweye rockfish (NMFS 2015e). In 2012, 62 catcher vessels reported spending $3,236,280 on the purchase or lease of quota pounds (including target species), or approximately $52,000 per vessel (NMFS 2015a). As older fishermen retire and new entrants acquire quota, expenses would likely increase over time, and fishermen would likely experience a high positive impact from flexibility to use either two-seam or four-seam nets to reduce expenses on bycatch quota.

4.4.3.1.3 SFFT Alternative D3

Allowing two-seam or four-seam nets and removing the selective flatfish trawl gear requirement shoreward of the RCA north of 40°10' N. latitude, (SFFT Alternative D3) would have a medium-positive impact on harvesters compared to Alternative D1 (No-action). Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude and replacing it with a small footrope requirement (like south of 40°10') would provide fishermen with more flexibility in the types of small footrope trawl gear they use shoreward of the RCA coastwide. Fishermen could still use selective flatfish trawl gear shoreward of the RCA coastwide; however, regulations would not require it shoreward of the RCA north of 40°10' N. latitude. In other words, it would remain a fishing gear available for use by fishermen but would not be required. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear or target other groundfish species with small footrope trawl gear that did not have a cut-back headrope.

4.4.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.4.3.2.1 SFFT Alternative D1 (No-action)

SFFT Alternative D1 is expected to have a low-negative direct impact on first receivers/processors, as harvester bycatch concerns and costs limit the quantity of fish harvesters are able to supply buyers, and closures and "hot spot" events may disrupt the ability of harvesters to provide a steady supply of fish, negatively impacting processors distribution relationships.

However, both target species and bycatch in the program will still be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations and personal accountability for most target species, and in the Shorebased IFQ Program, quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch.

4.4.3.2.2 SFFT Alternative D2

Alternative D1 (No-action) would likely have a low positive direct impact on first receivers/processors, as improved harvester bycatch avoidance should result in a smoother supply for harvesters. As harvesters minimized bycatch, attainment of other species would be likely to increase. Harvesters would likely take

more trips and would extend the length of their fishing season, which now may be prematurely truncated by bycatch concerns. These changes would enable first receivers/processors to provide more steady employment to workers, likely increasing the quality of their processing skilled laborers, as well as building relationships with wholesalers and retailers that would place a premium on a constant supply of particular species for consumers.

4.4.3.2.3 SFFT Alternative D3

Removing the selective flatfish trawl requirement shoreward of the RCA north of 40°10' N. latitude and replacing it with a small footrope requirement (like south of 40°10') under Alternative D3 would provide fishermen with more options regarding the types of small footrope trawl gear they could use shoreward of the RCA coastwide. This would give fishermen more flexibility in their fishing strategies shoreward of the RCA. They could target flatfish and reduce rockfish bycatch with selective flatfish trawl gear, or they could target other groundfish species with small footrope trawl gear that did not have a cut-back headrope. SFFT Alternative D3 would be likely to have a medium positive direct impact on first receivers/processors, as improved harvester bycatch avoidance should result in a smoother supply for harvesters. As harvesters minimized bycatch, attainment of other species would be likely to increase, and harvesters would likely take more trips and would extend the length of their fishing season, which now may be prematurely truncated by bycatch concerns.

4.4.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.4.3.3.1 SFFT Alternative D1 (No-action)

Alternative D1 would address gear configuration on the vessel. It would not be likely to have any direct effect on fishing communities. The No-action Alternative (D1) would have a neutral impact on fishing communities.

4.4.3.3.2 SFFT Alternative D2

Alternative D2 would likely accrue low positive impacts for processors and harvesters. Thus, by extension, Alternative D2 would have a low positive impact on fishing communities compared to Alternative D1 (No-action).

4.4.3.3.3 SFFT Alternative D3

Alternative D3 would likely accrue medium positive impacts for processors and harvesters. Thus, by extension, Alternative D3 would have a medium positive impact on fishing communities compared to the Alternative D1 (No-action).

4.4.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.4.3.4.1 SFFT Alternative D1 (No-action)

Alternative D1 would likely have a neutral direct impact on management entities, as both target species and bycatch in the program would still be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations and personal accountability for most target species and, in the Shorebased IFQ Program, by quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would be 100 percent monitoring and accountability for target species catch.

4.4.3.4.2 SFFT Alternative D2

Alternative D2 would have the same (neutral) direct impact on management entities as Alternative D1 (No-action).

4.4.3.4.3 SFFT Alternative D3

Alternative D3 would have the same (neutral) direct impact on management entities as Alternative D1 (No-action).

4.5 Chafing Gear (E)

Section 4.5 evaluates the impacts of the alternatives for changing the chafing gear requirements for bottom trawl and midwater trawl gear. As noted in the section title, this is labeled as issue E to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component: physical component (Section 4.5.1), biological component (Section 4.5.2), and socioeconomic component (Section 4.5.3). Table 4-7 summarizes the impacts for these environmental components in this section.

Chafing gear is webbing or other material attached to the codend to protect it from wear. The decision on codends under issue C (Alternatives C1 and C2) might affect chafing gear if Alternative C2 is chosen. Alternative C2 would allow double-walled codends, and chafing gear could be used to create a double-walled codend.

As described in Section 2.5, there are three alternatives for changing the chafing gear requirements for bottom trawl and midwater trawl gear. These are labeled Chafing Gear Alternatives E1 through E3 to help the reader differentiate these alternatives from alternatives for other gear-related issues in this EIS.

- **Chafing Gear Alternative E1 (No-action)** – Chafing gear for bottom trawl gear under Alternative E1 would continue to encircle no more than 50 percent of the net's circumference and could be in one or more sections. It could be used on only the last 50 meshes, measured from the terminal edge (closed end) of the codend. Only the front edge (that closest to the open end of the codend) and sides of each section of chafing gear could be attached to the codend. Except at the corners, the terminal zedge (that edge closest to the closed end of the codend) of each section of chafing gear could not be attached to the net. The chafing gear would have to be attached outside of any riblines and restraining straps. Chafing gear for midwater trawl could not cover the top of the codend, but might cover the bottom and sides.
- **Chafing Gear Alternative E2** – Chafing gear restrictions would align bottom -trawl chafing gear restrictions with recent changes to midwater trawl chafing gear restrictions specified in regulation at 50 Code of Federal Regulations (CFR) 660.130(b)(4)(i) and (ii). These changes would allow the chafing gear to cover more of the codend than Alternative E1 (No-action). Generally, the bottom trawl chafing gear restriction would be revised to read as follows:

  > Chafing gear may cover the bottom and sides of the codend in either one or more sections. Only the front edge (edge closest to the open end of the codend) and sides of each section of chafing gear may be attached to the codend; except at the corners, the terminal edge (edge closest to the closed end of the codend) of each section of chafing gear must not be attached to the net. Chafing gear is not permitted on the top codend panel except that a band of mesh (a "skirt") may encircle the net under or over transfer cables, lifting or splitting straps (chokers), riblines, and restraining straps, but must be the same mesh size and coincide knot-to-knot with the net to which it is attached and be no wider than 16 meshes.

- **Chafing Gear Alternative E3** – Chafing gear restrictions would be eliminated for bottom trawl and midwater trawl gear. Chafing gear could be used, but regulations would not restrict how much of the codend or net it would cover nor where it would be connected to the net.

Table 4-7. Summary of physical, biological, socioeconomic impacts for changes in chafing gear (E).

Chafing Gear (E)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Chafing Gear **Alternative E1** (No-action)	Bottom trawl chafing gear last 50 meshes, less than 50 percent circumference, etc. Midwater trawl chafing gear may not cover top of codend, etc.	*Ecosystem*: Low negative impact. ---------- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. ---------- *Non-target species:* Neutral impact on overall harvest or stock productivity. ---------- *Protected species:* Low negative impact, particularly on salmon and eulachon.	*Harvesters*: Low negative impact. ---------- *Processors*: Neutral impact. ---------- *Fishing Communities*: Neutral impact. ---------- *Management entities*: Neutral impact.
Chafing Gear **Alternative E2**	Bottom trawl chafing gear revised to match midwater trawl chafing gear requirements	*Ecosystem*: Low negative impact. ---------- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. ---------- *Non-target species:* Neutral impact on overall harvest or stock productivity. ---------- *Protected species:* Low negative impact, particularly on salmon and eulachon.	*Harvesters*: Low positive impact. ---------- *Processors*: Neutral impact. ---------- *Fishing Communities*: Neutral impact. ---------- *Management entities*: Neutral impact.
Chafing Gear **Alternative E3**	Eliminate chafing gear restrictions for bottom trawl and midwater trawl	*Ecosystem:* Uncertainty. Medium negative impact. ---------- *EFH:* Low negative impact.	*Target species:* Neutral impact on overall harvest or stock productivity. ---------- *Non-target species:* Uncertainty. Low negative impact on overall harvest or stock productivity. ---------- *Protected species:* Uncertainty. Medium negative impact, particularly on salmon and eulachon.	*Harvesters*: Medium positive impact. ---------- *Processors*: Neutral impact. ---------- *Fishing Communities*: Neutral impact. ---------- *Management entities*: Neutral impact.

Note: Impacts of Alternatives E2 and E3 are compared to Alternative E1 (No-action).

4.5.1 Physical Environment

This section evaluates the physical impacts of the alternatives for changing chafing gear requirements for bottom trawl and midwater trawl. Section 4.5.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.5.1.2 considers impacts on essential fish habitat or EFH. Table 4-7 summarizes the physical impacts of the alternatives.

4.5.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.5.1.1.1 Chafing Gear Alternative E1 (No-action)

Alternative E1 (No-action) would have an ongoing low negative impact on the Pacific Coast Marine Ecosystem from fishing activity and removal of a portion of the stocks for various marine species. In addition to other restrictions, bottom trawl chafing gear would cover the last 50 meshes of the codend and would be less than 50 percent circumference of the codend. Midwater trawl chafing gear would cover more of the codend than bottom trawl. Midwater chafing gear would not cover the top of codend, but might cover the bottom and sides. While the chafing gear is designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] While chafing gear could not be used to create a double-walled codend, which would effectively reduce the mesh size, Alternative E1 would continue to have a negative impact on the ecosystem from fishing activity. The magnitude of impact would be low.

4.5.1.1.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have the same (low negative) impact on the Pacific Coast Marine Ecosystem as Alternative E1 (No-action). Under Alternative E2, bottom trawl chafing gear restrictions would be reduced. Both midwater and bottom trawl chafing gear could not cover the top of codend, but might cover the bottom and sides. While the chafing gear is designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] Chafing Gear Alternative E2 would be similar to, although more liberal than, Alternative E1.

4.5.1.1.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a medium negative impact on the Pacific Coast Marine Ecosystem compared to Alternative E1 (No-action), as well as some uncertainty regarding ecosystem impacts. Under Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations on where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] While the requirement that chafing gear could be used to create a double-walled codend, which would effectively reduce the mesh size, would remain, there would be both uncertainty and unknown issues about how fishermen would configure chafing gear. Because of the uncertainty regarding how these changes might impact the ecosystem even with the prohibition on chafing gear being used to create a double-walled codend, Alternative E3 might have a medium negative impact on the ecosystem.

4.5.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.5.1.2.1 Chafing Gear Alternative E1 (No-action)

Under the No-action Alternative, EFH protections would continue to prohibit bottom contact gear, including bottom trawl from specific areas designated as EFH. Midwater trawl would be allowed in EFH closed areas. Alternative E1 (No-action) would likely have a neutral impact on EFH because those areas would remain protected.

4.5.1.2.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have the same (neutral) impact as Alternative E1 (No-action) because EFH protections for bottom contact gear, including bottom trawl, would remain in place. Midwater trawl would be allowed in EFH closed areas. While there might be some redistribution of impacts on the seafloor and habitat, Alternative E2 would not change the areas that could be fished.

4.5.1.2.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a low negative impact compared to Alternative E1 (No-action), because there might be increased bottom contact by midwater trawl in EFH closed areas. Midwater trawl would be allowed in EFH closed areas, and it would occasionally come into contact with the seafloor. Eliminating the chafing gear requirements would allow midwater trawl vessels to use more chafing gear should they choose. Increased chafing gear coverage, while intended to protect the codend from the wear and tear of pulling the net onboard the vessel, would also protect the codend if it happened to come in contact with the seafloor. Eliminating the chafing gear requirements for midwater trawl could potentially increase bottom contact by midwater trawl in EFH protected areas, a low negative impact. This could particularly increase impacts in rocky, high-relief habitats important to overfished rockfish. Bottom trawl gear would remain prohibited from EFH closed areas and would have a neutral impact on EFH. While there may be some redistribution of impacts on the seafloor and habitat, Alternative E3 would not change the areas that could be fished.

4.5.2 Biological Environment

This section evaluates the biological impacts of the alternatives for changing trawl gear minimum mesh size requirements. Section 4.5.2.1 considers the impacts on groundfish target species. Section 4.5.2.2 considers impacts on non-target species. Section 4.5.2.3 considers impacts on protected species. Table 4-7 summarizes the biological impacts of the alternatives.

4.5.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.5.2.1.1 Chafing Gear Alternative E1 (No-action)

Under Alternative E1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program

(Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

Under Alternative E1 (No-action), there would be a low risk of catch exceeding the trawl allocations. Alternative E1 would not be likely to jeopardize the sustainability of any target species, because it would not increase the harvest of available target species over what is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative E1 would likely have a neutral impact on overall harvest and stock productivity.

4.5.2.1.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have a neutral impact compared to Alternative E1 (No-action). Under Alternative E2, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations on where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] The overall amount of target species that could be caught would not change (neutral impact) nor would stock productivity change. Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.5.2.1.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a neutral impact compared to Alternative E1 (No-action). Under Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations on where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] The overall amount of target species that could be caught would not change (neutral impact) nor would stock productivity change. Target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species.

4.5.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) may be a non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery).

The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.5.2.2.1 Chafing Gear Alternative E1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, regulations would remain in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts to these species would be sustainable. These regulations would continue to include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure no one stock's sustainability is jeopardized. For non-groundfish species, regulations would remain in place for HMS and CPS that establish harvest limits and account for other sources of mortality.

Under Alternative E1 (No-action), total catch of non-target species, including overfished groundfish species, would likely remain comparable to recent years and within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and managed within sustainable harvest limits (ABCs). Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and reported through the Groundfish Mortality Reports. Any increased

catch could be addressed with appropriate management adjustments. Alternative E1 would not be likely to jeopardize the sustainability of any non-target species and would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure it is at sustainable levels. Alternative E1 (No-action) would have a neutral impact on stock productivity for non-target species.

4.5.2.2.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have neutral impacts compared to Alternative E1 (No-action) for both overall harvest and stock productivity. Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.5.2.2.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a low negative impact on overall harvest of non-target species and on their stock productivity over time compared to Alternative E1 (No-action) and some uncertainty regarding non-target impacts. Under Chafing Gear Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations on where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] While the requirement that chafing gear could not be used to create a double-walled codend, which would effectively reduce the mesh size, would remain, there would be uncertainty and unknowns about how fishermen would configure chafing gear. This alternative could also increase impacts in rocky, high-relief habitats important to overfished rockfish. Because of the uncertainty regarding how these changes might impact non-target species even with the prohibition on chafing gear being used to create a double-walled codend, Alternative E3 may have a low negative impact on non-target species.

Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.5.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would be most likely to be affected by the proposed action for trawl catch share program gear changes.

4.5.2.3.1 Chafing Gear Alternative E1 (No-action)

Under Alternative E1 (No-action), total catch of protected species would be likely to remain comparable to recent years which have had a low negative impact. In recent years, catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation. In addition, Alternative E1 (No-action) has had an ongoing low negative impact on stock productivity for protected species from removal of a portion of the stock with trawl gear.

NMFS reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. In 2014, the Pacific whiting fishery exceeded its incidental take of Chinook salmon, triggering a reinitiation for salmon take in the groundfish fishery. Patterns of incidental catch of Chinook in groundfish fisheries have shown interannual variability. High years have generally been followed by several lower years. On average, the groundfish fishery has remained well below the amounts allowed in the incidental take statement.

At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The rise in bycatch may be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing on eulachon under the FMP to determine if reinitiation of Section 7 consultation or a modification to the incidental take statement is necessary. Alternative E1 (No-action) would continue to have 100 percent monitoring of protected species. The WCGOP Mortality Report would provide annual information and trends in fishery interactions with protected species.

4.5.2.3.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have the same (low negative) impact as Alternative E1 (No-action) for both overall harvest and stock productivity. Protected species would continue to be monitored under the trawl catch share program, as described under Alternative E1 (No-action).

4.5.2.3.3 Chafing Gear Alternative E3

Eliminating or removing bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a medium negative impact on overall harvest of protected species and on their stock productivity over time compared to Alternative E1 (No-action), and there would be some uncertainty regarding protected species impacts. Under Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations regarding where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] While the requirement that chafing gear could not be used to create a double-walled codend, which would effectively reduce the mesh size, would remain, there would be uncertainty and unknowns about how fishermen would configure chafing gear.

For protected species, the magnitude of impact would likely be medium compared to target and non-target species, because of the uncertainty and because these species are not tracked inseason. In addition, effective management measures to respond to overages in protected species are generally lacking. The risk to these species would be higher, because they are already in a protected status. Protected species would continue to be monitored under the trawl catch share program, as described under Alternative E1 (No-action).

4.5.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for changing chafing gear requirements for bottom trawl and midwater trawl. Section 4.5.3.1 considers the impacts on harvesters. Section 4.5.3.2 considers impacts to first receivers/processors. Section 4.5.3.3 considers impacts on fishing communities. Section 4.5.3.4 considers impacts on management entities. Table 4-7 summarizes the socioeconomic impacts of the alternatives.

4.5.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.5.3.1.1 Chafing Gear Alternative E1 (No-action)

Alternative E1 (No-action) would have an ongoing low, negative impact on bottom trawl harvesters by restricting the ability of fishermen to optimize gear configuration. Lack of flexibility for gear

configuration would restrict the ability of harvesters to maximize quota attainment of target species and to minimize their bycatch, potentially dampening net revenues. In addition to other restrictions, bottom trawl chafing gear would cover the last 50 meshes of the codend and would be less than a 50 percent circumference of the codend. Midwater trawl chafing gear would cover more of the codend than bottom trawl. Midwater chafing gear could not cover the top of codend, but could cover the bottom and sides. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. The double-walled codend is related to alternatives under Issue C on codends.

The effect of the chafing gear alternatives on ex-vessel revenue would depend primarily on changes in the proportion of small groundfish caught. Any whiting or other groundfish species caught would count against the quota, whether or not they are marketable (provided the species were one for which quota would be required under the trawl rationalization program). If additional chafing gear coverage were to increase the catch of small unmarketable whiting, that catch would not only bring no revenue but it would also reduce revenue because the vessel would have to use quota to cover the catch, forcing it to forgo the opportunity to catch that amount of marketable size fish. To the degree that increased chafing gear coverage would result in retention of more small fish, fishermen's ex-vessel revenue would decline Alternative E1 (No-action) would likely result in the least retention of small fish.

4.5.3.1.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have a low positive impact on harvesters. Under Alternative E2, bottom trawl chafing gear restrictions would be reduced. Both midwater and bottom trawl chafing gear could not cover the top of codend, but might cover the bottom and sides. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] Alternative E2 would be similar to, although more liberal than, Alternative E1 (No-action).

The chafer coverage is reportedly needed based on net builder survey to protect the codends, which are very expensive to build and repair, from onboard abrasion sources. Three trawl net builders were surveyed for the Chafing Gear EA (NMFS 2015) with regard to various trawl net construction and modification costs. The estimated minimum cost to remove and reapply chafer panels to the codend ranged from $5,000 to $10,000. Two builders estimated the cost to build a midwater net with codend to be as high as $400,000. Estimates for building a codend ranged from $10,000 to $200,000, with a midpoint of approximately $95,000. The life of a codend with chafer coverage on bottom and sides is

reported to be approximately 5 to 15 years, with life without the chafer only 2 to 5 years. A replacement chafer replacement after 2 to 5 years would add 3 to 4 years to the life of the codend. Net builders report that codend useful chronological life depends highly on the amount of fish caught. Big-year classes with associated large catches cause codends to wear out rapidly. Depending on cost structure, product quality issues, and bycatch risks, greater or lesser size tows may occur. Quota consolidation and reduced time pressures to fish may change fisher behavior in ways that change wear rates on the nets. Quota consolidation onto fewer vessels may mean that gear on remaining vessels is used more intensely (more tows), increasing the rate of wear for a given net, measured on a calendar basis. Thus, wear and tear on codends due to increased intensity in the use of gear and greater haul sizes might increase, regardless of the alternative selected. Fishermen would likely pay to upgrade their chafing gear only if the expected benefits outweighed initial costs, thus Alternative E2 would be likely to have a low positive impact on bottom trawl harvesters.

4.5.3.1.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl chafing gear restrictions under Alternative E3 would have a medium positive impact on the Pacific Coast Marine Ecosystem compared to Alternative E1 (No-action). Under Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations on where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover. While the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend. [Note: the double-walled codend is related to alternatives under Issue C on codends.] While the requirement that chafing gear could not be used to create a double-walled codend, which would effectively reduce the mesh size, would remain, there would be uncertainty and unknowns regarding how fishermen would configure chafing gear. Because of this uncertainty, even with the prohibition on chafing gear being used to create a double-walled codend, Chafing Gear Alternative E3 might have a medium positive impact on harvesters.

Due the high cost of gear modification, and the increased net drag and reduced fuel efficiency, many vessels might elect not to change their chafing gear configuration under the eased restrictions, which would lessen any potential positive impacts. Fishermen would be likely to pay to upgrade their chafing gear only if the expected benefits outweighed initial costs. As Alternative E3 would have the maximum flexibility for harvesters, this alternative would be likely to have a medium positive impact on bottom trawl harvesters. Adoption of either of the action alternatives would result in a decline in operation costs corresponding to increased codend useful life, relative to Alternative E1 (No-action), due to greater

codend protection from onboard abrasion sources and some wear reduction on those occasions when seafloor contact would occur.

4.5.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.5.3.2.1 Chafing Gear Alternative E1 (No-action)

None of the Chafing Gear Alternatives would be expected to affect the catch and landing of target species, as no change is proposed in minimum trawl gear net mesh size (see Mesh Size Alternatives above), which is the primary tool for affecting escape of unmarketable size fish and other smaller size organisms from codend meshes. Thus, the expected direct impact on first receivers/processors would be neutral.

4.5.3.2.2 Chafing Gear Alternative E2

IFQ management makes every holder of quota pounds accountable for their overfished species catch. With increased chafing gear coverage, a low negative result might occur if there were an increase in the retention of nonmarketable or lower value small fish that would have to be covered with IFQ, displacing the opportunity to catch larger, more valuable fish with that same quota. If the added chafing gear were to result in a vessel having to use valuable quota pounds to cover unmarketable groundfish, the vessel would reduce chafing gear before the change in revenue was substantial; thus, the expected direct impact on first receivers/processors from Alternative E2 would be neutral.

4.5.3.2.3 Chafing Gear Alternative E3

At-sea sectors (catcher/processor and mothership) have allowable catch levels that cover their overfished species needs based on their historical maximum catches. IFQ management makes vessel operators and quota owners responsible for overages. As described Alternative E2, a low negative result might occur from increased chafing gear coverage if there were an increase in the retention of nonmarketable or lower value small fish that would have to be covered with IFQ, displacing the opportunity to catch larger, more valuable fish with that same quota. As with Alternative E2, if the added chafing gear were to result in a vessel having to use valuable quota pounds to cover unmarketable groundfish, the vessel would likely reduce chafing gear before the change in revenue were substantial, indicating a neutral impact for receivers/processors.

4.5.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.5.3.3.1 Chafing Gear Alternative E1 (No-action)

Alternative E1 (No-action) would address gear configuration on the vessel and would not be likely to have any direct effect on fishing communities. Alternative E1 (No-action) would have a neutral impact on fishing communities.

4.5.3.3.2 Chafing Gear Alternative E2

Alternative E2 would have the same (neutral) impact on fishing communities as Alternative E1 (No-action).

4.5.3.3.3 Chafing Gear Alternative E3

Alternative E3 would have the same (neutral) impact on fishing communities as Alternative E1 (No-action).

4.5.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.5.3.4.1 Chafing Gear Alternative E1 (No-action)

Under Alternative E1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

Under Alternative E1 (No-action), there would be a low risk of catch exceeding the trawl allocations. Alternative E1 would not be likely to jeopardize the sustainability of any target species, because it would not increase the harvest of available target species over that which is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative E1 (No-action), would likely have a neutral impact on management entities.

4.5.3.4.2 Chafing Gear Alternative E2

Revising the bottom trawl chafing gear restrictions to match the midwater trawl under Alternative E2 would have a neutral impact on management. Enforcement might be easier with the midwater trawl and bottom trawl chafing gear restrictions in alignment; however, some monitoring would continue to be required to ensure that chafing gear could not be used to create a double-walled codend. Without performance measures to mitigate the potential for more bottom contact, further management action might be required in both the near term and the long term.

4.5.3.4.3 Chafing Gear Alternative E3

Eliminating or removing both bottom trawl and midwater trawl changing gear restrictions under Alternative E3 would result in a neutral impact for management. Under Alternative E3, fishermen would have more flexibility regarding whether to use chafing gear and, if so, how to configure it. In other words, there would not be Federal regulations regarding where to tie the chafing gear, how long it could be, and how much of the codend circumference it could cover, which could lower enforcement costs. However, while the chafing gear would be designed to protect the codend, neither bottom trawl nor midwater trawl chafing gear could be used to create a double-walled codend, thus chafing gear would still require monitoring by enforcement. [Note: the double-walled codend is related to alternatives under Issue C on codends.] Lacking performance measures to mitigate the potential for more bottom contact might require further management action in both the near term and the long term.

4.6 Multiple Gears Onboard (F)

Section 4.6 evaluates the impacts of the alternatives allowing multiple gears on a vessel during a single fishing trip in the trawl catch share program. As noted in the section title, this is also labeled as issue F to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component: physical component (Section 4.6.1), biological component (Section 4.6.2), and socioeconomic component (Section 4.6.3). Table 4-8 summarizes the impacts for these environmental components.

As described in Section 2.6, there are three alternatives for allowing multiple gears on a vessel during a single fishing trip. These are labeled Multiple Gears Alternatives F1 through F3 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **Multiple Gears Alternative F1 (No-action)** – Use of multiple gears onboard would remain restricted to one type of trawl gear (bottom or midwater) per trip under Alternative F1 (No-action). For bottom trawl gear, both small footrope and large footrope could be on the vessel

and could be fished during a single fishing trip. Multiple fixed gear types would be allowed onboard during each trip. Trawl gear and fixed gear would not be permitted onboard during the same trip. Only one type of gear could be fished per trip.

Under the gear switching provision in the Shorebased IFQ Program, several gears are permissible. The term "fixed gear" as used in Issue F is shorthand for all legal groundfish non-trawl gear. As stated in the regulations at § 660.130(k) on gear switching, participants can also fish for IFQ species "using any legal groundfish non-trawl gear." Referring to the definitions section at § 660.11 in Federal regulations, legal groundfish non-trawl gear includes non-trawl gear used by both the limited entry fixed gear and open access fisheries as follows:

- longline
- trap or pot
- set net (anchored gillnet or trammel net, which are permissible south of 38° N. lat. only)
- hook-and-line (fixed or mobile, including commercial vertical hook-and-line)
- spear

- **Multiple Gears Alternative F2** – Multiple trawl gear types (bottom and midwater) would be allowed onboard on the same trip under Alternative F2. The same as under Alternative F1 (No-action), multiple fixed gear types would be allowed onboard during each trip. Trawl vessels would not be allowed to have trawl and fixed gear onboard on the same trip. Vessel operators could use only one gear type per trip (bottom trawl or midwater trawl or fixed gear). For bottom trawl gear, both small footrope and large footrope could be fished during a single fishing trip.
- **Multiple Gears Alternative F3** – Multiple gear types would be allowed onboard on the same trip. In addition, they could be used on the same trip as follows:
    - *Gear Type Sub-option A*: Any trawl gear could be used (bottom and midwater).
    - *Gear Type Sub-option B*: Any legal IFQ groundfish gear could be used.
    - *Sorting Sub-option A*: Vessel operators would have to separate catch by gear type. Landings would have to be recorded on a separate electronic fish ticket by gear type.
    - *Sorting Sub-option B*: Catch by gear type could be comingled.

  Under Alternative F3, gear type sub-options would be independent of sorting options.

Table 4-8. Summary of physical, biological, socioeconomic impacts for allowing multiple gears during a single fishing trip (F).

Multiple Gears (F)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Multiple Gears **Alternative F1** (No-action)	On vessel: bottom (small/large footrope) or midwater or fixed gear Fished on trip: only 1 gear	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low negative impact, particularly on salmon and eulachon.	*Harvesters*: Low negative impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Low positive impact.
Multiple Gears **Alternative F2**	On vessel: bottom (small/large footrope) and midwater; or fixed gear Fished on trip: only 1 gear	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low, negative impact, particularly on salmon and eulachon.	*Harvesters*: Low positive impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Neutral impact.
Multiple Gears **Alternative F3**	On vessel: various gear and sorting sub-options (see text in Sections 2.6 or 4.6) Fished on trip: more than 1 gear	*Ecosystem:* Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Uncertainty. Neutral impact on overall harvest. Neutral to medium negative impact on stock productivity. --- *Non-target species:* Uncertainty. Neutral impact on overall harvest. Neutral to medium negative impact on stock productivity. --- *Protected species:* Uncertainty. Low negative impact on overall harvest. Low, negative to high, negative impact on stock productivity.	*Harvesters*: Low positive impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Low positive impact in areas where harvesters historically fish with multiple gear types in a year. --- *Management entities*: Low negative impact with sorting sub-option A. Medium negative impact with sorting sub-option B. High negative impact with Gear Type sub-option B and sorting sub-option B.

Note: Impacts of Alternatives F2 and F3 are compared to Alternative F1 (No-action).

4.6.1 Physical Environment

This section evaluates the physical impacts of the alternatives for allowing multiple gears on a vessel during a single fishing trip. Section 4.6.1.1 considers the impacts to the Pacific Coast Marine Ecosystem. Section 4.6.1.2 considers impacts to essential fish habitat or EFH. Table 4-8 summarizes the physical impacts of Alternative F1, Alternative F2, and Alternative F3.

4.6.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.6.1.1.1 Multiple Gears Alternative F1 (No-action)

Alternative F1 (No-action) would have an ongoing low, negative impact on the Pacific Coast Marine Ecosystem from fishing activity and removal of a portion of the stocks for various marine species. While allowing multiple gears on a vessel during a fishing trip would have a neutral impact on the ecosystem, the fishing activity from the one gear fished per trip would have a low negative impact.

4.6.1.1.2 Multiple Gears Alternative F2

Alternative F2 would have the same (low negative) impact on the Pacific Coast Marine Ecosystem as the Alternative F1 (No-action). While allowing multiple gears on a vessel during a fishing trip would have a neutral impact on the ecosystem, the fishing activity from the one gear fished per trip would have a low negative impact from removal of a portion of the stocks for various marine species.

4.6.1.1.3 Multiple Gears Alternative F3

Alternative F3 would have the same (low negative) impact on the Pacific Coast Marine Ecosystem as the Alternative F1 (No-action). While allowing multiple gears on a vessel during a fishing trip would have a neutral impact on the ecosystem, the fishing activity from one or more gear types fished per trip would have a low negative impact from removal of a portion of the stocks for various marine species.

4.6.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.6.1.2.1 Multiple Gears Alternative F1 (No-action)

Under Alternative F1 (No-action), EFH protections would continue to prohibit bottom contact gear, including bottom trawl and fixed gear, from specific areas designated as EFH. Alternative F1 would be likely to have a neutral impact on EFH, because those areas would remain protected.

4.6.1.2.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have the same (neutral) impact as Alternative F1 (No-action) because EFH protections for bottom contact gear, including bottom trawl and fixed gear, would remain in place. While there may be some redistribution of impacts on the seafloor and habitat, Alternative F2 would not change the areas that could be fished.

4.6.1.2.3 Multiple Gears Alternative F3

The various gear and sorting options under Alternative F3 would have the same (neutral) impact as Alternative F1 (No-action), because EFH protections for bottom contact gear, including bottom trawl and fixed gear, would remain in place. While there might be some redistribution of impacts on the seafloor and habitat, Alternative F3 would not change the areas that could be fished.

4.6.2 Biological Environment

This section evaluates the biological impacts of the alternatives for allowing multiple gears on a vessel during a single fishing trip. Section 4.6.2.1 considers the impacts to groundfish target species. Section 4.6.2.2 considers impacts to non-target species. Section 4.6.2.3 considers impacts to protected species. Table 4-8 summarizes the biological impacts of the alternatives.

4.6.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.6.2.1.1 Multiple Gears Alternative F1 (No-action)

Under Alternative F1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ

Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

In the Shorebased IFQ Program, retained and discarded catch of all species (groundfish (target and non-target species), non-groundfish (non-target species), and protected species) is tracked by 100 percent monitoring using at-sea observers and shorebased catch monitors. Landings of IFQ species, including target species, are reported on electronic fish tickets by first receivers. The electronic fish ticket also records what gear type was fished on the trip. In addition, the catch monitor tracks and records landed catch during the offload and reports landed catch in the online IFQ vessel account system. The higher of the two catch values is deducted from the vessel's quota pounds for IFQ species.

There would be a low risk of catch exceeding the trawl allocations under Alternative F1 (No-action). Alternative F1 would not be likely to jeopardize the sustainability of any target species, because it would not increase the harvest of available target species over what is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative F1 (No-action) would be likely to have a neutral impact on overall harvest and stock productivity.

4.6.2.1.2 Multiple Gears Alternative F2

As described under Alternative F1 (No-action), target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species. Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have the same (neutral) impact on overall harvest and stock productivity for target species as Alternative F1 (No-action).

4.6.2.1.3 Multiple Gears Alternative F3

As described under Alternative F1 (No-action), target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species. The various gear and sorting options under Alternative F3 would have the same (neutral) impact on overall harvest of target species as Alternative F1 (No-action). However, impacts might vary for stock productivity compared to Alternative F1.

Under Alternative F3, not only would multiple gear types be allowed to be onboard a vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for issue F).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators would have to separate catch by gear type. Landings would have to be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

The electronic fish ticket would have to capture which gears caught which fish for stock assessment data. Gear selectivity data on species and sizes caught with each type of gear contribute to stock assessments, in part, to determine stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for groundfish species. If multiple electronic fish tickets are employed to capture use of multiple gears on a trip, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing time and assumptions managers sometimes have to make to reconstruct trip level data.

This alternative would reduce the data quality for stock assessments and economic analyses to some extent if the catch were not sorted by the gear that caught it (bottom trawl versus midwater trawl versus fixed gear) and recorded on the electronic fish tickets as such. Not many trawlers are expected to carry and fish with both midwater and bottom trawl on the same fishing trip or all IFQ gear on a fishing trip. Gear sub-options A or B would not impact stock productivity by themselves. The impact would be which sorting sub-option (A or B) combined with the Gear sub-options that might impact stock productivity.

For example, Gear sub-option A (any trawl gear [bottom and midwater] OR any fixed gear onboard and fished) combined with Sorting sub-option A (vessel separates catch by gear type and records on separate electronic fish tickets) and 100 percent monitoring at-sea and shoreside would have a neutral impact on stock productivity. On the other end of the spectrum for these sub-options, Gear sub-option B (any IFQ gear onboard and fished), combined with Sorting sub-option B (co-mingling of catch) and 100 percent monitoring at-sea and shoreside, would have medium negative impact on stock productivity and some uncertainty regarding the extent of impacts on target species. The magnitude would be medium because while there would be overall catch tracked and managed to sustainable levels, there would be uncertainty regarding the impacts of reduced data quality and impacts on stock assessments and stock productivity

over time. The other combinations of gear sub-options and sorting sub-options would have impacts between these two examples.

If stock productivity were affected from a reduced quality of stock assessment data, the various gear and sorting options under Multiple Gears Alternative F3 would have a between neutral and medium negative impact on stock productivity for target species compared to the Alternative F1 (No-action).

4.6.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) may be non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3.
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.6.2.2.1 Multiple Gears Alternative F1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, under Alternative F1 (No-action), regulations would remain in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts to these species would be sustainable. These regulations would include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure that no one stock's sustainability would be jeopardized. For non-groundfish species, regulations would remain in place for HMS and CPS that would establish harvest limits and account for other sources of mortality.

Under Alternative F1 (No-action), total catch of non-target species, including overfished groundfish species, would likely remain comparable to recent years and would be within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and managed within sustainable harvest limits (ABCs). Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and would be reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. The No-action Alternative would not be likely to jeopardize the sustainability of any non-target species, and it would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure that it would be at sustainable levels. Alternative F1 (No-action) would have a neutral impact on stock productivity for non-target species.

4.6.2.2.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative FF2 would have the same (neutral) impact on overall harvest and stock productivity for non-target species as Alternative F1 (No-action). Alternative F2 would have the same effect as Alternative F1 (No-action) except that all types of trawl gear (bottom (small and large footrope) and midwater) could be onboard the vessel at the same time. Only one type of gear could be fished per trip (bottom trawl or midwater trawl or fixed gear). Because Alternative F2 is very similar to Alternative F1, the impacts would likely be the same.

Non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends.

4.6.2.2.3 Multiple Gears Alternative F3

As described under Alternative F1 (No-action), under Alternative F3, non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends. The various gear and sorting options under Alternative F3 would have the same (neutral) impact on overall harvest of non-target species as Alternative F1; however, impacts might vary for stock productivity under Alternative F3, compared to Alternative F1 (No-action).

Under Alternative F3, not only would multiple gear types be allowed to be onboard the vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for this Issue F).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators must separate catch by gear type. Landings must be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

The electronic fish ticket would have to capture which gears caught which fish for stock assessment data. Gear selectivity data on species and sizes caught with each type of gear contribute to stock assessments, in part, to determine stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for non-target groundfish species and for many non-target, non-groundfish species, like salmon, CPS, and HMS. If multiple electronic fish tickets were used to capture use of multiple gears on a trip, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing time and assumptions managers sometimes have to make to reconstruct trip level data.

This alternative would reduce the data quality for stock assessments and economic analyses to some extent if the catch were not sorted by the gear that caught it (bottom trawl versus midwater trawl versus fixed gear) and recorded on the electronic fish tickets as such. Not many trawlers would be likely to carry and fish with both midwater and bottom trawl on the same fishing trip or all IFQ gear on a fishing trip. Gear sub-options A or B would not impact stock productivity by themselves. It would be which sorting sub-option (A or B) would be used, combined with the Gear sub-options that might impact stock productivity.

For example, Gear sub-option A (any trawl gear [bottom and midwater] OR any fixed gear onboard and fished) combined with Sorting sub-option A (vessel separates catch by gear type and records on separate electronic fish tickets) and 100 percent monitoring at-sea and shoreside would have a neutral impact on stock productivity. On the other end of the spectrum for these sub-options, Gear sub-option B (any IFQ gear onboard and fished) combined with Sorting sub-option B (co-mingling of catch) and 100 percent monitoring at-sea and shoreside would have a medium negative impact on stock productivity and would result in some uncertainty regarding the extent of impacts on non-target species. The magnitude would be medium because while overall catch would be tracked and managed to sustainable levels, there would be

uncertainty regarding the effects of reduced data quality and impacts on stock assessments and stock productivity over time. The other combinations of gear sub-options and sorting sub-options would have impacts between these two examples.

If stock productivity were affected from a reduced quality of stock assessment data, the various gear and sorting options under Alternative F3 would have between a neutral and a medium negative impact on stock productivity for non-target species compared to Alternative F1 (No-action).

4.6.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would be most likely to be affected by the proposed action for trawl catch share program gear changes.

4.6.2.3.1 Multiple Gears Alternative F1 (No-action)

Under Alternative F1 (No-action), total catch of protected species would be likely to remain comparable to recent years, which have had a low negative impact. In recent years, catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation.

NMFS reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. In 2014, the Pacific whiting fishery exceeded its incidental take of Chinook salmon, triggering a reinitiation for salmon take in the groundfish fishery. Patterns of incidental catch of Chinook in groundfish fisheries show interannual variability. High years are generally followed by several lower years. On average, the groundfish fishery has remained well below amounts allowed in the incidental take statement.

At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The increased bycatch might be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing under the FMP on eulachon to determine if reinitiation or a modification to the incidental take statement is necessary.

Alternative F1 (No-action) would continue to have 100 percent monitoring of protected species. The WCGOP Mortality Report would continue to provide annual information and trends in fishery interactions with protected species.

4.6.2.3.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have the same (low negative) impact on overall harvest and stock productivity for protected species as Alternative F1 (No-action). Alternative F2 would be the same as the No-action Alternative (F1) except that all types of trawl gear (bottom (small and large footrope) and midwater) could be onboard the vessel at the same time. Only one type of gear could be fished per trip (bottom trawl or midwater trawl or fixed gear). Because Alternative F2 is very similar to Alternative F1 (No-action), the impacts would likely be the same. Monitoring of protected species would be the same as under Alternative F1.

4.6.2.3.3 Multiple Gears Alternative F3

As described under Alternative F1 (No-action), protected species, including salmon and eulachon, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends. The various gear and sorting options under Alternative F3 would have the same (low negative) impact on overall harvest of protected species as Alternative F1 (No-action). However, impacts might vary for stock productivity compared to Alternative F1.

Under Alternative F3, not only would multiple gear types be allowed onboard the vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for this Issue F).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators would have to separate catch by gear type. Landings would have to be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

The electronic fish ticket would have to capture which gears caught which fish for stock assessment data and protected species management. Gear selectivity data on species and sizes caught with each type of gear contribute to stock assessments and ESA consultations, in part, to determine stock productivity and, ultimately, incidental take levels for protected species. If multiple electronic fish tickets were used to capture use of multiple gears on a trip, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing time and assumptions managers sometimes have to make to reconstruct trip level data.

Alternative F3 would reduce the data quality for stock assessments, economic analyses, and protected species management to some extent if the catch were not sorted by the gear that caught it (bottom trawl versus midwater trawl versus fixed gear) and recorded on the electronic fish tickets, as such. Not many trawlers would be expected to carry and fish with both midwater and bottom trawl on the same fishing trip, or with all IFQ gear on a fishing trip. Gear sub-options A or B would not impact stock productivity by themselves. It is which sorting sub-option (A or B) combined with the Gear sub-options that may impact stock productivity.

For example, Gear sub-option A (any trawl gear (bottom and midwater), OR any fixed gear onboard and fished) combined with Sorting sub-option A (vessel would separate catch by gear type and records on separate electronic fish tickets) and 100 percent monitoring at-sea and shoreside would have a low negative impact on stock productivity, like Alternatives F1 and F2. On the other end of the spectrum for these sub-options, Gear sub-option B (any IFQ gear onboard and fished) combined with Sorting sub-option B (co-mingling of catch) and 100 percent monitoring at-sea and shoreside would have high negative impact on stock productivity, and there would be some uncertainty regarding the extent of impacts on protected species. For protected species, the magnitude of impact would likely be high compared to target and non-target species, because these species are not tracked inseason, and effective management measures to respond to overages in protected species are generally lacking. In addition, the risk to these species would be higher, because they are already in a protected status. In addition, there would be uncertainty regarding the impacts of reduced data quality and impacts on stock assessments and stock productivity over time. The other combinations of gear sub-options and sorting sub-options would have impacts between these two examples.

If stock productivity were affected from a reduced quality of stock assessment data, the various gear and sorting options Alternative F3 would have between a low negative and high negative impact on stock productivity for protected species compared to Alternative F1 (No-action), along with uncertainty.

4.6.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for allowing multiple gears on a vessel during a single fishing trip. Section 4.6.3.1 considers the impacts on harvesters. Section 4.6.3.2 considers impacts on first receivers/processors. Section 4.6.3.3 considers impacts on fishing communities. Section 4.6.3.4 considers impacts on management entities. A summary of the socioeconomic impacts is available in Table 4-8.

4.6.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.6.3.1.1 Multiple Gears Alternative F1 (No-action)

Alternative F1 (No-action) has an ongoing low negative impact on harvesters by restricting the ability of fishermen to optimize fishing effort. Lack of flexibility for gear use and deployment would restrict the ability of harvesters to maximize quota attainment of target species, to achieve optimal prices for catch, and to minimize their bycatch, potentially dampening net revenues.

4.6.3.1.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have a low positive impact on harvesters compared to Alternative F1 (No-action). Alternative F2 is the similar to Alternative F1 (No-action) except that all types of trawl gear (bottom (small and large footrope) and midwater) could be onboard the vessel at the same time. This would likely save vessels time and labor expenses in swapping out nets for different trips, and it would potentially save wear and tear on the nets, which could stay stowed on board when not being used. Only one type of gear could be fished per trip (bottom trawl or midwater trawl or fixed gear).

4.6.3.1.3 Multiple Gears Alternative F3

Under Alternative F3, not only would multiple gear types be allowed to be onboard the vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A*: Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for Issue F).
- *Gear Type Sub-option B*: Any legal IFQ groundfish gear could be used.

Gear Type Sub-option B would provide the maximum flexibility for vessels to benefit from the gear switching provision of the IFQ program. Discussion at the GAP in September 2015 indicates there would be some interest in the ability to set pots for sablefish while steaming home from a trawl trip. However, as shown in Table 4-9, a declining number of vessels have chosen to fish with both fixed gear and trawl gear during the same year (but during different trips) since the implementation of the program, with a peak of six vessels in 2012, possibly a reaction to unusually high sablefish prices at the end of 2011.

Table 4-9. Number of vessels that used one or multiple gears in the Shorebased IFQ Program by year.

	Trawl Only	Longline Only	Pot Only	Longline and Pot	Pot and Trawl	Longline and Pot and Trawl
2011	65	9	14	4	3	2
2012	60	6	14	3	6	0
2013	66	5	9	1	1	0
2014	62	4	11	1	2	0

Most participants fish with trawl gear only, and those using fixed gear tend to use either pots or longline using fixed gear exclusively, with a handful fishing with either gear type at some point during the year. While this provision would likely provide a medium positive benefit for vessels currently restricted by the single-gear type provision, the benefits would likely accrue only to the one or two vessels already fishing with both trawl and pots or longline and pots each year, on the whole resulting in a low positive benefit to harvesters.

- *Sorting Sub-option A*: Vessel operators would have to separate catch by gear type. Landings would be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B*: Catch by gear type could be comingled.

Sorting Sub-option A might require increased effort on the part of the harvester in comparison to Sub-option B, both onboard the vessel and working with the processor to submit separate fish tickets for different gear types. Vessels fishing with different gear types on the same trip would likely want to separate the catch anyway, as vessels currently do so when prosecuting different target species on a similar trip. This requires less time and effort when sorting at the dock with the buyer. In particular, if enacted with Gear Type sub-option B, it is unlikely that vessels would wish to comingle catch from fixed As shown in Table 4-10, prices for pot-caught sablefish in the IFQ program are generally about $0.50 to $0.80 higher per pound than for trawl, with hook and line receiving a premium price. Once comingled, processors would likely pay the lowest price, as separating out the higher-value, gear-caught fish would be extremely difficult dockside.

Table 4-10. Prices for IFQ sablefish by year and gear.

	2011	2012	2013	2014	2015
Hook and Line	$3.80	$3.44	$3.35	$4.01	$4.80
Pot	$3.01	$2.59	$2.74	$3.01	$2.96
Trawl	$2.61	$1.82	$1.62	$2.07	$2.09

4.6.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.6.3.2.1 Multiple Gears Alternative F1 (No-action)

Under Alternative F1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species and, in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch. Thus, the no-action alternative would not be likely to impact the quantity or quality of fish landed. Thus, first receivers/processors would experience a neutral impact from Alternative F1 (No-action).

4.6.3.2.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have the same neutral impact on as first receivers/processors as Alternative F1 (No-action). Alternative F2 would not affect the quality or quantity of fish delivered, the same as Alternative F1, except that all types of trawl gear (bottom (small and large footrope) and midwater) could be onboard the vessel at the same time. Only one type of gear could be fished per trip (bottom trawl, midwater trawl, or fixed gear). Because Alternative F2 is similar to Alternative F1 (No-action), the impacts would likely be the same (neutral impact).

4.6.3.2.3 Multiple Gears Alternative F3

Under Multiple Gear Alternative F3, not only would multiple gear types be allowed to be onboard the vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for Issue F).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators would have to separate catch by gear type. Landings would have to be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

Alternative F3 would likely have some low negative impact on first receivers in the form of increased paperwork burden, as they would have to fill out additional fish tickets for trips with multiple gear types. Despite this minor operational burden, the overall impact would likely be neutral, as this alternative would not change the areas open for fishing, or the gear configurations allowed for removal. Thus, anticipated size and species of catch would not be expected to change.

4.6.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.6.3.3.1 Multiple Gears Alternative F1 (No-action)

Alternative F1 (No-action) addresses gear configuration on the vessel and would not be likely to have any direct effect on fishing communities. Alternative F1 would have a neutral impact on fishing communities.

4.6.3.3.2 Multiple Gears Alternative F2

Alternative F2 would have the same (neutral) impact on fishing communities as Alternative F1 (No-action).

4.6.3.3.3 Multiple Gears Alternative F3

Alternative F3 would likely have the same (neutral) impact on fishing communities as Alternative F1(No-action). To the extent that harvesters would realize an increase in net revenue from use of fixed gear and trawl on the same trip, those benefits would likely be localized to areas with established trawl and fixed gear fisheries: Puget Sound, north Washington coast, and south and central Washington coast; Tillamook and Coos Bay, Oregon; and Brookings, Crescent City, Eureka, Fort Bragg, Bodega Bay, San Francisco, and Morro Bay, California (Table 3-4). Of these, as seen in Table 3-4, Eureka and Fort Bragg, California, Coos Bay, Oregon, and the north Washington coast have the highest dependence on and engagement in the groundfish fishery.

4.6.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.6.3.4.1 Multiple Gears Alternative F1 (No-action)

Restricting vessels to fishing one gear per trip under Alternative F1 (No-action) would have a low positive impact on management entities. The selectivity of the gear with which fish were caught would contribute to stock assessments, in part, by determining removals from particular stocks for stock

productivity and, ultimately, annual overfishing levels and acceptable biological catches for groundfish species.

4.6.3.4.2 Multiple Gears Alternative F2

Allowing both midwater and bottom trawl to be on the vessel during a fishing trip under Alternative F2 would have the same low positive impact on management as Alternative F1 (No-action). Alternative F2 is essentially the same as Alternative F1, except that all types of trawl gear (bottom (small and large footrope and midwater) could be onboard the vessel at the same time. Only one type of gear could be fished per trip (bottom trawl, midwater trawl, or fixed gear).

4.6.3.4.3 Multiple Gears Alternative F3

Under Alternative F3, not only would multiple gear types be allowed to be onboard the vessel during a single fishing trip, but they could also be fished on the same trip as follows (gear type sub-options are independent of sorting sub-options):

- *Gear Type Sub-option A:* Any trawl gear could be used (bottom and midwater) or any fixed gear (see Section 2.6 for a description on the use of the term 'fixed gear' for this Issue F).
- *Gear Type Sub-option B:* Any legal IFQ groundfish gear could be used.
- *Sorting Sub-option A:* Vessel operators would have to separate catch by gear type. Landings would have to be recorded on a separate electronic fish ticket by gear type.
- *Sorting Sub-option B:* Catch by gear type could be comingled.

The electronic fish ticket would have to capture which gears caught which fish for stock assessment data and other management analysis and reports. Gear selectivity data contribute to stock assessments and ESA consultations, in part, to determine stock productivity and, ultimately, incidental-take levels for protected species. If multiple electronic fish tickets were used to capture use of multiple gears on a trip, it would be important to include a new field on the fish ticket with the trip identifier to estimate trip-level fishing effort by gear type. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing the time and the assumptions managers sometimes have to make to reconstruct trip level data.

This alternative would reduce the data quality for stock assessments and protected species management to some extent if the catch were not sorted by the gear that caught it (bottom trawl versus midwater trawl versus fixed gear) and recorded on the electronic fish tickets as such. Not many trawlers would be likely to carry and fish with both midwater and bottom trawl on the same fishing trip or all IFQ gear on a fishing

trip. Gear sub-options A or B would not impact stock productivity by themselves. Which sorting sub-option (A or B) would be selected, combined with gear sub-options, could potentially impact data quality.

For example, Gear sub-option A (any trawl gear (bottom and midwater) OR any fixed gear onboard and fished) combined with Sorting sub-option A (vessel separates catch by gear type and records on separate electronic fish tickets) and 100 percent monitoring at-sea and shoreside would have a low negative impact on management entities, the same as under Alternatives F1 and F2. On the other end of the spectrum for these sub-options, Gear sub-option B (any IFQ gear onboard and fished) combined with Sorting sub-option B (co-mingling of catch) and 100 percent monitoring at-sea and shoreside would have a high negative impact on stock productivity and would create some uncertainty as to the extent of impacts on protected species. There would be uncertainty as to the impacts of reduced data quality and impacts on stock assessments and stock productivity over time. The other combinations of gear sub-options and sorting sub-options would have impacts between these two examples.

As stated in the harvester discussion above, it is unlikely fishermen would want to comingle catch from fixed gear and trawl trips, as the fixed gear species would be likely to have a much higher ex-vessel value. Once mingled, the buyer would likely pay the lower price for the entire catch, as it would be difficult to impossible to sort the fixed-gear-caught fish out once comingled, so impacts from this sub-option might be limited by reactions to market forces.

If stock productivity were affected from a reduced quality of stock assessment data, the various gear and sorting options under Alternative F3 would have between a low negative and a high negative impact on management compared to Alternative F1 (No-action).

4.7 Fishing in Multiple IFQ Management Areas (G)

Section 4.7 evaluates the impacts of the alternatives on fishing in multiple IFQ management areas during a single fishing trip in the trawl catch share program. As noted in the section title, this is labeled issue G to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component: physical component (Section 4.7.1), biological component (Section 4.7.2), and socioeconomic component (Section 4.7.3). Table 4-11 summarizes the impacts for these environmental components.

The Shorebased IFQ Program includes IFQ management areas, specified in regulation at §660.140(c)(2), that are based on the stock information for select species, harvest allocations, and the corresponding QS for species. The IFQ management areas are as follows:

- Between the U.S./Canada border and 40°10′ N. latitude

- Between 40°10′ N. latitude and 36° N. latitude
- Between 36° N. latitude and 34°27′ N. latitude
- Between 34°27′ N. latitude and the U.S./Mexico border

As described in Section 2.7, there are two alternatives for fishing in multiple IFQ management areas on a single fishing trip. These are labeled Alternatives G1 and G2 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **Multiple Areas Alternative G1 (No-action)** – Fishing in multiple IFQ management areas would remain restricted under Alternative G1 (No-action). In the Shorebased IFQ Program, trawl vessels could not fish in more than one IFQ management area on the same trip.
- **Multiple Areas Alternative G2** – Fishing in multiple IFQ management areas on the same trip would be allowed. If retaining catch from multiple IFQ management areas on a single trip, then catch would have to be sorted by IFQ management area and recorded on separate electronic fish tickets.

Table 4-11. Summary of physical, biological, and socioeconomic impacts for fishing in multiple IFQ management areas (G).

Multiple IFQ Management Areas (G)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Multiple Areas **Alternative G1** (No-action)	Only fish in one area per trip	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low negative impact on salmon and eulachon.	*Harvesters*: Low negative impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Low to medium negative impact with magnitude dependent on proximity to management lines. --- *Management entities*: Low positive impact.
Multiple Areas **Alternative G2**	Fish in multiple areas per trip. Sort catch by area. Record on separate electronic fish tickets.	*Ecosystem*: Low negative impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Low negative impact on salmon and eulachon.	*Harvesters*: Medium positive impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Low to medium positive impact with magnitude dependent on proximity to management lines. --- *Management entities*: Low negative impact.

Note: Impacts of Alternative G2 are compared to Alternative G1 (No-action).

4.7.1 Physical Environment

This section evaluates the physical impacts of the alternatives for fishing in multiple IFQ management areas on a single fishing trip. Section 4.7.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.7.1.2 considers impacts on essential fish habitat or EFH. Table 4-11 summarizes the physical impacts of the alternatives.

4.7.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.7.1.1.1 Multiple Areas Alternative G1 (No-action)

Alternative G1 (no-action) would have an ongoing low negative impact on the Pacific Coast Marine Ecosystem. This impact would result from fishing activity and removal of a portion of the stocks for various marine species.

4.7.1.1.2 Multiple Areas Alternative G2

Alternative G2 would have the same (low negative) impact on the Pacific Coast Marine Ecosystem as Alternative G1 (No-action).

4.7.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.7.1.2.1 Multiple Areas Alternative G1 (No-action)

Under Alternative G1 (No-action), EFH protections would continue to prohibit bottom contact gear, including bottom trawl and fixed gear, from specific areas designated as EFH. Alternative G1 (No-action) would likely have a neutral impact on EFH because those areas remain protected.

4.7.1.2.2 Multiple Areas Alternative G2

Alternative G2 would have the same (neutral) impact as Alternative G1 (No-action) because EFH protections for bottom contact gear, including bottom trawl and fixed gear, would remain in place. While there might be some redistribution of impacts on the seafloor and habitat, Alternative G2 would not change the areas that could be fished.

4.7.2 Biological Environment

This section evaluates the biological impacts of the alternatives for fishing in multiple IFQ management areas on a single fishing trip. Section 4.7.2.1 considers the impacts on groundfish target species. Section 4.7.2.2 considers impacts on non-target species. Section 4.7.2.3 considers impacts on protected species. Table 4-11 summarizes the biological impacts of the alternatives.

4.7.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.7.2.1.1 Multiple Areas Alternative G1 (No-action)

Under Alternative G1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

The IFQ management areas were established with implementation of the trawl catch share program in 2011. They were based on species' areas, as specified in the harvest limit tables for all IFQ species combined. Groupings and area subdivisions for IFQ species are those groupings and area subdivisions for which annual catch limits or annual catch targets are specified in Tables 1a and 2d in 50 CFR Part 660, Subpart C in Federal regulation, and those for which there is an area-specific, precautionary harvest policy. For example, some IFQ species are managed as either a single species with different QSs by area (e.g., shortspine thornyhead north and south of 34° 27' N. latitude), or as a single species in one area and as a component of a species group in another area (e.g., Pacific ocean perch north of 40°10′ N. latitude and minor slope rockfish south of 40°10′ N. latitude). To address the different quota pounds for species in the different IFQ management areas, vessels were prohibited from fishing in different areas during the same trip. Because landings in the Shorebased IFQ Program would include a mix of all hauls taken during a single trip, a vessel would be required to fish entirely in one IFQ management area during any trip to address sorting requirements, at-sea observation, and enforcement of IFQ limits.

In the Shorebased IFQ Program, retained and discarded catch of all species (groundfish (target and non-target species), non-groundfish (non-target species), and protected species) is tracked by 100 percent monitoring using at-sea observers and shorebased catch monitors. Landings of IFQ species, including target species, are reported on electronic fish tickets by first receivers. The electronic fish ticket also records what gear type was fished on the trip in what IFQ management area. In addition, the catch monitor tracks and records landed catch during the offload and reports landed catch in the online IFQ vessel account system. The higher of the two catch values is then deducted from the vessel's quota pounds for IFQ species.

There is a low risk of catch exceeding the trawl allocations under Alternative G1 (No-action). Fish is tracked by the IFQ management area in which it is caught, and it is counted against the appropriate allocations. The No-action Alternative would not be likely to jeopardize the sustainability of any target species because it would not increase the harvest of available target species over that which is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels. Alternative G1 (No-action) would likely have a neutral impact on overall harvest and stock productivity.

4.7.2.1.2 Multiple Areas Alternative G2

As described under Alternative G1 (No-action), target species would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species under Alternative G2. Catch would continue to be sorted and stored on the vessels by IFQ management area. Allowing vessels to fish in multiple IFQ management areas on a single fishing trip under Alternative G2 would have the same (neutral) impact on overall harvest of target species and stock productivity as Alternative G1 (No-action).

The electronic fish ticket would have to capture which fish were caught in what IFQ management area for catch accounting. Data on the management area where fish were caught contribute to stock assessments, in part, to determine removals from particular stocks for stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for groundfish species. If catch were sorted on the vessel by IFQ management areas, 100 percent at-sea monitoring would remain, and multiple electronic fish tickets would be used to capture which fish were caught in what management areas on a trip, enabling tracking species retained for catch accounting and stock assessment data. If multiple fish tickets were used, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing the time and the assumptions managers sometimes would have to make to reconstruct trip level data.

4.7.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) may be a non-target species in another (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.7.2.2.1 Multiple Areas Alternative G1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, regulations are in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts on these species are sustainable. These regulations include quotas, trip/possession limits, size limits, and time/area closures. For non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure that no one stock's sustainability is jeopardized. For non-groundfish species, regulations in place for HMS and CPS establish harvest limits and account for other sources of mortality.

Under Alternative G1 (No-action), total catch of non-target species, including overfished groundfish species, would be likely to remain comparable to recent years and within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and managed within sustainable harvest limits (ABCs). Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and would be reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. The No-action Alternative

would not be likely to jeopardize the sustainability of any non-target species, and it would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure that it would be at sustainable levels. Alternative G1 (No-action) would have a neutral impact on stock productivity for non-target species.

4.7.2.2.2 Multiple Areas Alternative G2

As described under Alternative G1 (No-action), non-target species, including overfished species and most non-target, non-groundfish species, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends. Allowing vessels to fish in multiple IFQ management areas on a single fishing trip under Alternative G2 would have the same (neutral) impact on overall harvest of non-target species and stock productivity as Alternative G1 (No-action).

The electronic fish ticket would have to capture which fish were caught in what IFQ management area for catch accounting. Data on the management area where fish were caught contribute to stock assessments, in part, to determine removals from particular stocks for stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for non-target groundfish species and for many non-target, non-groundfish species, like salmon, CPS, and HMS. If catch were sorted on the vessel by IFQ management areas, 100 percent at-sea monitoring would remain, and multiple electronic fish tickets would be used to capture which fish were caught in what management areas on a trip, then species retained could be tracked for catch accounting and for stock assessment data. If multiple fish tickets were used, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing the time and the assumptions managers would sometimes have to make to reconstruct trip level data.

There would be an increased chance of misreporting under Alternative G2 compared to Alternative G1 (No-action). Certain species are more affected by misreporting than others. For example, bocaccio rockfish, which is under a rebuilding plan south of 40°10’ N. latitude (i.e., overfished) and part of the minor shelf complex north of 40°10’ N. latitude, could be fished on both sides of the 40°10’ N. latitude management line, with most fish caught to the south. If the catch were misreported as minor shelf rockfish north of 40°10’ N. latitude, it would, over time, impact the overfished stock. Using 100 percent monitoring and sorting/storing catch by management area would reduce incidences of misreporting.

4.7.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would most be the most likely species to be affected by the proposed action for trawl catch share program gear changes.

4.7.2.3.1 Multiple Areas Alternative G1 (No-action)

Under Alternative G1No-action), total catch of protected species would be likely to remain comparable to recent years which have had a low negative impact. In recent years, catch of both salmon and eulachon has exceeded levels specified in the incidental take statements, triggering reinitiation.
NMFS reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. In 2014, the Pacific whiting fishery exceeded its incidental take of Chinook salmon, triggering a reinitiation for salmon take in the groundfish fishery. Patterns of incidental catch of Chinook in groundfish fisheries show interannual variability. High years are generally followed by several lower years. On average, the groundfish fishery has remained well below amounts allowed in the incidental take statement.

At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The increased bycatch may be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing under the FMP on eulachon to determine if reinitiation or modification of the incidental take statement will be necessary.

Alternative G1 (No-action) would continue to have 100 percent monitoring of protected species. The WCGOP Mortality Report would continue to provide annual information and trends in fishery interactions with protected species.

4.7.2.3.2 Multiple Areas Alternative G2

Under Alternative G2, similar to Alternative G1 (No-action), protected species, including salmon and eulachon, would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Mortality Report would continue to provide annual information and catch trends. Allowing vessels to fish in multiple IFQ management areas on a single fishing trip under Alternative G2 would have the same (low negative) impact on overall harvest of protected species and stock productivity as Alternative G1(No-action).

The electronic fish ticket would have to capture which fish were caught in what IFQ management area to enable catch accounting and protected species management. Data on the management area where fish

were caught contribute to stock assessments and ESA consultations, in part, by determining stock productivity and, ultimately, incidental take levels for protected species. If catch were sorted on the vessel by IFQ management areas, 100 percent at-sea monitoring and multiple electronic fish tickets used to capture which fish were caught in what management areas on a trip would enable tracking species retained for catch accounting and for protected species management. If multiple fish tickets were used, it would be beneficial to include a new field on the fish ticket with the trip identifier. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing the time and the assumptions managers sometimes would have to make to reconstruct trip-level data.

There would be an increased chance of misreporting under Alternative G2 compared to Alternative G1 (No-action). Certain species are more affected by misreporting than others. For example, Pacific halibut, which has an individual bycatch quota (IBQ) north of 40°10. N. latitude, but not south of 40°10. N. latitude, could be fished on both sides of the 40°10. N. latitude management line, with most fish being caught to the south. If the catch were misreported as halibut caught south of 40°10. N. latitude, it might, over time, impact the stock. Applying 100 percent monitoring and sorting/storing catch by management area would reduce incidences of misreporting.

4.7.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for fishing in multiple IFQ management areas on a single fishing trip. Section 4.7.3.1 considers the impacts on harvesters. Section 4.7.3.2 considers impacts on first receivers/processors. Section 4.7.3.3 considers impacts on fishing communities. Section 4.7.3.4 considers impacts on management entities. Table 4-11 summarizes the socioeconomic impacts of the alternatives.

4.7.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.7.3.1.1 Multiple Areas Alternative G1 (No-action)

Under Alternative G1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

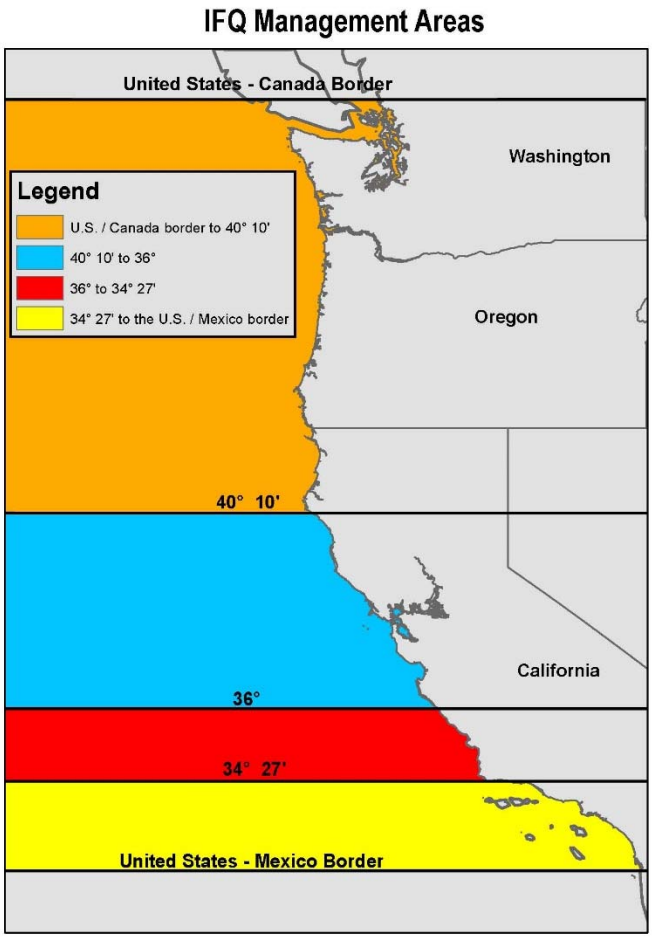

Figure 4-1. IFQ Management Areas.

Alternative G1 (No-action) would have an ongoing low negative impact on harvesters by restricting the ability of fishermen to optimize fishing effort. Fishermen might have to expend extra fuel and pay for additional observer days at sea for steaming back to port in order to begin a new trip in an adjacent management area.

4.7.3.1.2 Multiple Areas Alternative G2

As described under Alternative G1 (No-action), target species under Alternative G2 would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species. Under Alternative G2, catch would be sorted and stored on the vessels by IFQ management area. Allowing vessels to fish in multiple IFQ management areas on a single fishing trip under Alternative G2 would likely have a medium positive impact on harvesters, particularly those having home ports near management area boundaries (Figure 4-1). The number of vessels participating and the average days at sea (Table 4-12) indicate that the greatest benefit would be for DTS and non-whiting, non-DTS trawlers in Coos Bay, Oregon, Crescent City, Eureka, and Fort Bragg, California, and for trawl-endorsed groundfish fixed gear vessels Morro Bay, California. At-sea Pacific whiting vessels might also benefit from not having to return to port to fish across management lines, as these vessels would deliver at-sea and, thus, would make fewer trips back to port than shoreside vessels.

Table 4-12. Average days at sea and (number of vessels) by fishery and home port (2012).

	At-Sea Pacific Whiting	Shoreside Pacific Whiting	DTS Trawl	Non-whiting, non-DTS Trawl	Groundfish Fixed Gear with Trawl Endorsement
Astoria	**	44.9 (3)	58.3 (16)	24.7 (15)	41.2 (5)
Brookings		**	45.6 (6)	1.9 (3)	**
Coos Bay		**	51.5 (9)	15.3 (7)	**
Crescent City			22 (3)	**	
Eureka			45.4 (8)	3.3 (3)	
Fort Bragg			35.4 (4)	13.2 (4)	**
Morro Bay					36.2 (6)
Newport	29.6 (9)	47.9 (15)	21.7 (8)	7.8 (5)	31.4 (3)
Puget Sound	34.8 (7)	58.2 (4)	34.3 (3)	25.0 (3)	34.2 (4)
San Francisco	**		**	19.8 (3)	**
South and central WA coast		**	**	**	
Tillamook			**	**	**

** Suppressed to maintain confidentiality.

4.7.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.7.3.2.1 Multiple Areas Alternative G1 (No-action)

While Alternative G1 (No-action) might inhibit optimal fishing opportunities for harvesters, it would not be likely to have any direct effect on processors, as it would not change the areas open for fishing or the gear configurations allowed for removal. Thus, expected size and species of catch would not be likely to change, and ex-vessel prices should remain the same under either alternative. Alternative G1 (No-action) would have a neutral impact on processors.

4.7.3.2.2 Multiple Areas Alternative G2

While Alternative G2 would likely be a cost savings measure for harvesters, it would likely have a low negative impact on first receivers in the form of an increased paperwork burden, as they would have to fill out additional fish tickets for trips that took place in multiple management areas. Despite this minor operational burden, the overall impact would likely be neutral, as Alternative G2 would not change the areas open for fishing, or the gear configurations allowed for removal. Thus, expected size and species of

catch would not be likely to change. Similar to G1 (No-action), Alternative G2 would have a neutral impact on processors.

4.7.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.7.3.3.1 Multiple Areas Alternative G1 (No-action)

The Multiple Areas Alternative G1 has a medium- negative impact on vessels from home ports near the management area dividing lines, or that frequently fish in multiple management areas throughout a season. As shown on the map in Figure 4.1, management area lines bisect the Washington coast, southern Oregon, the Eureka area, and the Central California coast.

4.7.3.3.2 Multiple Areas Alternative G2

The Multiple Areas Alternative G2 likely has the greatest positive impact on vessels coming from home ports near the management area dividing lines. As shown on the map in Figure 4.1, management area lines bisect the Washington coast, southern Oregon, the Eureka area, and the Central California coast. Vessels that regularly fish north and south of the management lines are likely to most benefit from Alternative G2, experiencing a high-positive impact, while vessels that typically fish in one management area or do not frequently change the management area they are targeting are likely to experience low-positive impacts, thus the Multiple Areas Alternative G2 will likely have a medium-positive impact on fishing communities near the dividing lines. This includes essentially all the ports described in Chapter 3.3.4, with the exception of Newport, Astoria, and Ilwaco which all fall solidly within the Columbia area.

4.7.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.7.3.4.1 Multiple Areas Alternative G1 (No-action)

Restricting vessels to fishing, within one management area under Alternative G1 (No-action) would have a low positive impact on management entities. Data on the management area where fish were caught would continue to contribute to stock assessments, in part, to determine removals from particular stocks for stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for groundfish species.

4.7.3.4.2 Multiple Areas Alternative G2

Opening up fishing in multiple management areas under Alternative G2 would require an update to electronic fish tickets and, correspondingly, to the fish ticket database. This would enable capturing which fish were caught in what IFQ management area for catch accounting, as well maintaining a distinct trip identification number to identify landings from the same trip regardless of management area. For trips recorded on multiple fish tickets, this would improve the accuracy of the trip data by reducing the time and the assumptions managers would sometimes have to make to reconstruct trip level data. If catch were sorted on the vessel by IFQ management areas, 100 percent at-sea monitoring would remain, and multiple electronic fish tickets would be used to capture which fish were caught in what management areas on a trip. Thus, species retained could be tracked for catch accounting and for stock assessment data. Data on the management area where fish were caught contribute to stock assessments, in part, to determine removals from particular stocks for stock productivity and, ultimately, annual overfishing levels and acceptable biological catches for groundfish species. The costs associated with implementing fish ticket updates would impose low negative impacts on management entities.

4.8 Fishing before Previous Catch is Stowed (H)

Section 4.8 evaluates the impacts of alternatives for stowing catch on a fishing trip in the Shorebased IFQ Program. As noted in the section title, this is labeled as issue H to help the reader differentiate the issues in Sections 4.1 through 4.8. The alternatives are analyzed by environmental component: physical component (Section 4.8.1), biological component (Section 4.8.2), and socioeconomic component (Section 4.8.3). Table 4-13 summarizes the effects of the environmental components included in this section.

As described in Section 2.8, there are two alternatives for stowing catch on a fishing trip. These are labeled Stowing Alternatives H1 and H2 to help the reader differentiate the alternatives from alternatives for other gear-related issues in this EIS.

- **Stowing Alternative H1 (No-action)** – Alternative H1 (No-action) would continue to prohibit vessels in the Shorebased IFQ Program from bringing a haul on board before all catch from the previous haul had been stowed.
- **Stowing Alternative H2** – In the Shorebased IFQ Program, a new haul could be brought onboard and dumped on deck before all catch from the previous haul has been stowed. Catch from different hauls would have to be kept separate until the observers could complete their collection of catch for sampling.

Table 4-13. Summary of physical, biological, socioeconomic impacts for stowing catch on a fishing trip (H).

Fishing before Previous Catch is Stowed (H)				
		Physical Impacts	**Biological Impacts**	**Socioeconomic Impacts**
Stowing **Alternative H1** (No-action)	Prohibited to bring a haul on board before all catch from previous haul has been stowed.	*Ecosystem*: Neutral impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Neutral impact on overall harvest or stock productivity.	*Harvesters*: Low negative impact. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Medium positive impact.
Stowing **Alternative H2**	New haul could be brought onboard and dumped on deck before all catch stowed. No mixing of hauls until observer has collected samples.	*Ecosystem*: Neutral impact. --- *EFH:* Neutral impact.	*Target species:* Neutral impact on overall harvest or stock productivity. --- *Non-target species:* Neutral impact on overall harvest or stock productivity. --- *Protected species:* Neutral impact on overall harvest or stock productivity.	*Harvesters*: Neutral impact for smaller vessels, low positive for larger vessels and catcher/processors. --- *Processors*: Neutral impact. --- *Fishing Communities*: Neutral impact. --- *Management entities*: Low negative impact.

Note: Impacts of Alternative H2 compared to Alternative H1 (No-action).

4.8.1 Physical Environment

This section evaluates the physical impacts of the alternatives for stowing catch on a fishing trip in the Shorebased IFQ Program. Section 4.8.1.1 considers the impacts on the Pacific Coast Marine Ecosystem. Section 4.8.1.2 considers impacts on essential fish habitat or EFH. Table 4-13 summarizes the physical impacts of the alternatives.

4.8.1.1 Pacific Coast Marine Ecosystem

Section 3.1.1 provides background on the Pacific Coast Marine Ecosystem. This section uses that information to evaluate the impacts of the alternatives on the Pacific Coast Marine Ecosystem.

4.8.1.1.1 Stowing Alternative H1 (No-action)

Alternative H1 (No-action) would have a neutral impact on the Pacific Coast Marine Ecosystem. Alternative H1 (No-action) would have no direct impact on the physical environment. It would address how catch would be handled on the vessel.

4.8.1.1.2 Stowing Alternative H2

Alternative H2 would have the same (neutral) impact on the Pacific Coast Marine Ecosystem as Alternative H1 (No-action).

4.8.1.2 Essential Fish Habitat

Section 3.1.2 provides background on EFH. This section uses that information to evaluate the impacts of the alternatives on EFH.

4.8.1.2.1 Stowing Alternative H1 (No-action)

Alternative H1 (No-action) would address how catch would be handled on the vessel. It would have no direct impact on EFH. Alternative H1 (No-action) would have a neutral impact on EFH.

4.8.1.2.2 Stowing Alternative H2

Alternative H2 would have the same (neutral) impact on EFH as Alternative H1 (No-action).

4.8.2 Biological Environment

This section evaluates the biological impacts of the alternatives for stowing catch on a fishing trip in the Shorebased IFQ Program. Section 4.8.2.1 considers the impacts on groundfish target species. Section 4.8.2.2 considers impacts on non-target species. Section 4.8.2.3 considers impacts on protected species. Table 4-13 summarizes the biological impacts of the alternatives.

4.8.2.1 Target Species

Groundfish target species are described in Section 3.2.1. The primary target species in the groundfish trawl catch share program are as follows: Pacific whiting (with midwater trawl), Dover sole (with bottom trawl), thornyheads (shortspine and longspine with bottom trawl), sablefish (with bottom trawl and fixed gear), petrale sole (with bottom trawl), widow rockfish (with midwater trawl), yellowtail rockfish (with midwater trawl), and chilipepper rockfish (with midwater trawl).

4.8.2.1.1 Stowing Alternative H1 (No-action)

Under Alternative H1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

In the Shorebased IFQ Program, vessels would continue to be prohibited from bringing catch from another haul onboard before all catch from the previous haul has been stowed under Alternative H1 (No-action). This would ensure that the observer would sample the catch at the haul-by-haul level. Observer sampling at the haul level provides data on stock composition by gear, location, and tow. This provides valuable information and improves the accuracy of data available for fisheries management. While Alternative H1 would provide valuable information on the fishery, it would be likely to have a neutral impact on overall harvest and stock productivity.

There would be a low risk of catch exceeding the trawl allocations under Alternative H1 (No-action). Alternative H1 would not be likely to jeopardize the sustainability of any target species because it would not increase the harvest of available target species over that which is currently available for the trawl catch share program established under the biennial harvest specifications and management measures. Total mortality (catch and discard) would continue to be set at sustainable levels.

4.8.2.1.2 Stowing Alternative H2

As described under Alternative H1 (No-action), target species under Alternative H2 would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species. Under Alternative H2 in the Shorebased IFQ Program, catch from a new haul could be brought onboard and dumped on deck before all catch from the previous haul has been stowed. While Alternative H2 would allow catch from multiple hauls to be on the deck, it would maintain the observer's ability to

collect information on a haul-by-haul level by requiring that catch from different hauls be kept separate until the observers could complete their collection of catch for sampling. Thus, Alternative H2 would maintain data integrity and would have the same (neutral) impact on overall harvest of target species and stock productivity as Alternative H1 (No-action).

4.8.2.2 Non-target Species

Non-target species caught in the trawl catch share program are described in Section 3.2.2. Depending on the fishing strategy, target species in one fishery (e.g., sablefish caught in the DTS fishery) might be a non-target species in another fishery (e.g., sablefish caught in the pelagic rockfish fishery). The primary non-target species in the groundfish trawl catch share program by fishery are as follows:

- Pacific whiting fisheries – minor slope rockfish north of 40°10' N. latitude, other groundfish , widow rockfish, yellowtail rockfish, and other non-groundfish (greater than 50 mt on average from 2011 to 2014, see Table 3-3).
- Non-whiting trawl fisheries – chilipepper rockfish, darkblotched rockfish, English sole, lingcod north of 40°10' N. latitude, minor slope rockfish north and south of 40°10' N. latitude, Pacific cod, Pacific whiting, splitnose rockfish south of 40°10' N. latitude, widow rockfish, non-FMP flatfish, and non-FMP skates (between 50 mt and 500 mt on average from 2011 to 2014, Table 3-3).
- Fixed gear fisheries – longnose skate, minor slope rockfish north and south of 40°10' N. latitude, other groundfish, shortspine thornyhead north of 34°27' N. latitude, and other non-groundfish (greater than 5 mt on average from 2011 to 2014, Table 3-3).

4.8.2.2.1 Stowing Alternative H1 (No-action)

For non-target groundfish species (including overfished species and spiny dogfish) and Pacific halibut, regulations would remain in place under the Pacific Coast Groundfish FMP and the Halibut Act and Area 2A Catch Sharing Plan to limit incidental catch of halibut and groundfish to ensure that impacts to these species would be sustainable under Alternative H1 (No-action). These regulations would continue to include quotas, trip/possession limits, size limits, and time/area closures. Under Alternative H1 (No-action), for non-target groundfish species that are part of a stock complex, a group of different groundfish species managed as a unit, component stocks should also be monitored to ensure that no one stock's sustainability would be jeopardized. For non-groundfish species, regulations would remain in place for HMS and CPS that establish harvest limits and account for other sources of mortality under Alternative H1 (No-action).

Under Alternative H1 (No-action), total catch of non-target species, including overfished groundfish species, would be likely to remain comparable to recent years and within acceptable harvest levels. There would be a low risk of non-target species catch exceeding acceptable incidental harvest amounts. Non-target groundfish species would continue to be 100 percent monitored and would be managed within sustainable harvest limits (ABCs). In the Shorebased IFQ Program, vessels would continue to be prohibited from bringing catch from another haul onboard before all catch from the previous haul had been stowed (Alternative H1 [No-action]). This would ensure that the observer could sample the catch at the haul-by-haul level. Observer sampling at the haul level provides data on stock composition by gear, location, and tow. This provides valuable information and improves the accuracy of data available for fisheries management. Non-groundfish species would continue to be monitored to varying degrees by fishing strategy through WCGOP and would be reported through the Groundfish Mortality Reports. Any increased catch could be addressed with appropriate management adjustments. Alternative H1 (No-action) would not be likely to jeopardize the sustainability of any non-target species and would have a neutral impact on overall harvest of non-target species. Total mortality (catch and discard) would continue to be monitored to ensure that it would remain at sustainable levels. The Alternative H1 (No-action) would have a neutral impact on stock productivity for non-target species.

4.8.2.2.2 Stowing Alternative H2

Alternative H2 would have the same effect as Alternative H1 (No-action) on non-target species, including overfished species and most non-target, non-groundfish species. Under Alternative H2, these species would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Groundfish Mortality Report would provide annual information and catch trends. In the Shorebased IFQ Program under Alternative H2, catch from a new haul could be brought onboard and dumped on deck before all catch from the previous haul had been stowed. While Alternative H2 would allow catch from multiple hauls to be on the deck, it would maintain the observer's ability to collect information on a haul-by-haul level by requiring that catch from different hauls be kept separate until the observers could complete their collection of catch for sampling. Thus, Alternative H2 would maintain data integrity and would have the same (neutral) impact on overall harvest of target species and stock productivity as Alternative H1 (No-action).

4.8.2.3 Protected Species

Protected species that interact with the Pacific coast groundfish fishery are described in Section 3.2.3. Of these protected species, ESA-listed salmon and eulachon would be most likely to be affected by the proposed action for trawl catch share program gear changes.

4.8.2.3.1 Stowing Alternative H1 (No-action)

In the Shorebased IFQ Program, vessels would continue to be prohibited from bringing catch from another haul onboard before all catch from the previous haul had been stowed under Alternative H1 (No-action). This would ensure that the observer could sample the catch at the haul-by-haul level. Observer sampling at the haul level would provide data on stock composition by gear, location, and tow. This would provide valuable information and would improve the accuracy of data available for fisheries management. While Alternative H1 (No-action) would provide for valuable information on the fishery, it would be likely to have a neutral impact on overall harvest and stock productivity.

Alternative H1 (No-action) would continue to have 100 percent monitoring of protected species. The WCGOP Mortality Report would continue to provide annual information and trends in fishery interactions with protected species.

4.8.2.3.2 Stowing Alternative H2

Alternative H2 would have the same effect as Alternative H1 (No-action) for protected species, which would continue to be 100 percent monitored under the trawl catch share program. In addition, the WCGOP Mortality Report would continue to provide annual information and catch trends. Under Alternative H2 in the Shorebased IFQ Program, catch from a new haul could be brought onboard and dumped on deck before all catch from the previous haul had been stowed. While Stowing Alternative H2 would allow catch from multiple hauls to be on the deck, it would maintain the observer's ability to collect information on a haul-by-haul level by requiring that catch from different hauls would be kept separate until the observers could complete their collection of catch for sampling, including for protected species. With protected species, the observer would also return them to sea as soon as possible after sampling. Thus, Alternative H2 would maintain data integrity and would have the same (neutral) impact on overall harvest of protected species and stock productivity as Alternative H1 (No-action).

4.8.3 Socioeconomic Environment

This section evaluates the socioeconomic impacts of the alternatives for stowing catch on a fishing trip in the Shorebased IFQ Program. Section 4.8.3.1 considers the impacts on harvesters. Section 4.8.3.2 considers impacts on first receivers/processors. Section 4.8.3.3 considers impacts on fishing communities. Section 4.8.3.4 considers impacts on management entities. Table 4-13 summarizes the socioeconomic impacts of the alternatives.

4.8.3.1 Harvesters

Section 3.3.1 provides background on harvesters. This section uses that information to evaluate the impacts of the alternatives on the harvesters.

4.8.3.1.1 Stowing Alternative H1 (No-action)

Alternative H1 (No-action) would have a low negative impact on harvesters, as it would continue to prohibit vessels in the Shorebased IFQ Program from bringing a haul on board before all catch from the previous haul had been stowed. This could prevent fishermen from optimizing fishing effort on the water, or it could lead to lower-value fish being left in the net longer before being stowed.

4.8.3.1.2 Stowing Alternative H2

In this section, both catcher vessels and catcher/processors are discussed. Effects of Alternative H2 are presented for each category.

Catcher Vessels:

Under Alternative H2 in the Shorebased IFQ Program, catch from a new haul could be brought onboard and dumped on deck before all catch from the previous haul had been stowed. This could help fishermen optimize time on the water, and it could enable them to catch and stow their quota more efficiently. Less time on the water could translate to decreased annual costs for fuel, food, observer coverage, and other variable expenses. The requirement under Alternative H2 maintaining the observer's ability to collect information on a haul-by-haul level by requiring that catch from different hauls be kept separate until the observers could complete their collection of catch for sampling might exclude smaller vessels from realizing any benefits from this increased regulatory flexibility. Limited deck space on smaller vessels might restrict the ability of the observer to sample each haul effectively. As shown in Table 4.14, most vessels longer than 80 feet participate in the Pacific whiting fishery, and these vessels have the highest average daily fuel use at 880 gallons per day. Most non-whiting groundfish trawl vessels range from 60 to 80 feet long, and they would likely still be large enough to benefit from the Alternative H2 provision. Vessels less than 60 feet long primarily fish with fixed gear, and these vessels might not have enough space on board to allow observers the needed space to maneuver for sampling.

Large vessels that have space on board to store a new haul before the previous haul has been sampled and stored would likely have higher variable expenses per hour on the water, as shown by the fuel use in Table 4.14. Thus, these large vessels would be most likely to benefit from timesaving on the water. Alternative H2 would have a low positive impact on harvesters with vessels large enough to keep catch separate for observer processing.

Table 4.14. Fuel use based on vessel size.

Average gallons per day of fuel used (number of vessels) by fishery and vessel length.			
Type of fishery	Small vessel (< 60 ft)	Medium vessel (> 60 ft, <= 80 ft)	Large vessel (> 80 ft)
Pacific whiting fishery fuel use	(0)	481 (5)	880 (25)
Groundfish with trawl gear fishery fuel use	208 (19)	304 (42)	541 (12)
Groundfish with fixed gear fishery fuel use	102 (14)	231 (8)	**

**Suppressed to protect confidentiality.

Catcher/processors:

Under Stowing Alternative H2 in the Shorebased IFQ Program, catch from a new haul could be brought onboard catcher vessels and dumped on deck before all catch from the previous haul had been stowed. Catcher/processors had an average of 4.4 hauls per day in the at-sea fishery in 2014 and an average haul-weight of 61 metric tons (NPAC data). The large volume in this fishery means that vessels would be as likely to be restricted by processing capacity as by regulations regarding stowing. Thus, Alternative H2 would likely have only a low positive effect on catcher-processing harvesters.

The overall impact of Alternative H2 on harvesters, including catcher vessels and catcher/processors, would be low positive.

4.8.3.2 First Receivers/Processors

Section 3.3.2 provides background on first receivers/processors. This section uses that information to evaluate the impacts of the alternatives on the first receivers/processors.

4.8.3.2.1 Stowing Alternative H1 (No-action)

Alternative H1 (No-action) would address how catch would be handled on the vessel, and it would not be likely to have any direct effect on processors. Alternative H1 (No-action) would have a neutral impact on processors.

4.8.3.2.2 Stowing Alternative H2

Alternative H2 would have the same (neutral) impact on the first receivers/processors as Alternative H1 (No-action).

4.8.3.3 Fishing Communities

Section 3.3.3 provides background on fishing communities. This section uses that information to evaluate the impacts of the alternatives on the fishing communities.

4.8.3.3.1 Stowing Alternative H1 (No-action)

The No-action Alternative would address how catch would be handled on the vessel, and it would not be likely to have any direct effect on fishing communities. Alternative H1 (No-action) would have a neutral impact on fishing communities.

4.8.3.3.2 Stowing Alternative H2

Alternative H2 would have the same (neutral) impact on fishing communities as Alternative H1 (No-action).

4.8.3.4 Management Entities

Section 3.3.4 provides background on management entities. This section uses that information to evaluate the impacts of the alternatives on management entities.

4.8.3.4.1 Stowing Alternative H1 (No-action)

Under Alternative H1 (No-action), target species would continue to be managed to sustainable levels under provisions of the Groundfish FMP. Within the trawl catch share program, the target species catch would continue to be managed with allocations for most target species, and in the Shorebased IFQ Program, with quota pounds for all target species. In addition, all sectors of the trawl catch share program (Shorebased IFQ, MS Coop, and C/P Coop) would continue to be fully monitored. There would continue to be 100 percent monitoring and accountability for target species catch.

In the Shorebased IFQ Program under Alternative H1 (No-action), vessels would continue to be prohibited from bringing catch from another haul onboard before all catch from the previous haul had been stowed. This would ensure that the observer could sample the catch at the haul-by-haul level. Observer sampling at the haul level would provide data on stock composition by gear, location, and tow. This would provide valuable information and would improve the accuracy of data available for fisheries management. Thus, Alternative H1 (No-action) would have a low positive impact on fisheries management.

4.8.3.4.2 Stowing Alternative H2

As described under Alternative H1 (No-action), target species under Alternative H2 would continue to be managed to sustainable levels with individual accountability and 100 percent monitoring of target species. Under Alternative H2 in the Shorebased IFQ Program, catch from a new haul could be brought onboard and dumped on deck before all catch from the previous haul had been stowed. While Alternative H2 would allow catch from multiple hauls to be on the deck, it would maintain the observer's ability to collect information on a haul-by-haul level by requiring that catch from different hauls be kept separate

until the observers could complete their collection of catch for sampling. Thus, Alternative H2 should maintain data integrity; however sampling might become more difficult with different hauls on board at once; thus, Alternative H2 would be likely to have a low negative impact on management.

4.9 Cumulative Effects

The CEQ requires a cumulative effects analysis (40 CFR part 1508.7). The purpose of a cumulative effects analysis is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the intent is to focus on those effects that are truly meaningful. This section of the EIS addresses the significance of the expected cumulative impacts as they relate to the federally managed groundfish fishery.

4.9.1 Consideration of the Affected Resources

In Chapter 3, Description of the Affected Environment, the environmental components affected by the proposed action are identified and described. Therefore, the significance of the cumulative effects will be discussed in relation to those affected environmental components, as grouped below:

- Physical environment (Section 3.1), including the Pacific Coast Marine Ecosystem and EFH
- Biological environment (Section 3.2), including target, non-target, and protected species
- Socioeconomic environment (Section 3.3), including harvesters, first receivers/processors, fishing communities, and management entities.

4.9.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the management unit of species in the Groundfish FMP. The geographic scope of the affected resources listed above is the EEZ of the states of Washington, Oregon, and California.

4.9.3 Temporal Boundaries

The temporal scope of past and present actions for the affected resources encompasses actions that occurred after FMP implementation (1982) and more specifically, since implementation of the trawl rationalization program in 2011. For endangered species and other protected resources, the scope of past and present actions is determined by analysis pursuant to ESA and MMPA, including biological opinions for the groundfish fishery and marine mammal stock assessment reports. The temporal scope of future actions for all affected resources extends approximately 3 years into the future. This period was chosen because the dynamic nature of resource management for this species and the lack of information on

projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty.

4.9.4 Actions Other than the Proposed Action

This section describes other past, present, or reasonably foreseeable future actions other than the proposed action. In addition to fishery management actions, other past, present, and reasonably foreseeable future actions are also considered (e.g., water pollution and climate change). The cumulative effects result from the combination of the effects of these past and present actions, reasonably foreseeable future actions, and the proposed action. Ongoing and reasonably foreseeable actions with detectable effects are summarized below.

Fishery Related Actions:

- *Electronic monitoring as a replacement for the 100 percent observer coverage requirement.* Electronic monitoring is being considered for the trawl catch share program. This may change how the fishery is monitored, moving from human observers to cameras. This proposal is under preliminary study through exempted fishing permits. Retention requirements will be evaluated and further specified. Maximized retention may be allowed on a broader range of vessels to land most catch, but discard some non-target species and most protected species, as well as some target species that can be identified on camera. This action is expected to be implemented in the at-sea whiting, shorebased whiting, and fixed gear sectors of the groundfish fishery in 2017 and the bottom trawl sector in 2018.
- *Groundfish essential fish habitat and rockfish conservation area changes.* The Council has completed two phases of a three-phase review process. Phase 1 consisted of compiling available information on Pacific Coast groundfish habitat associations, fishing activities, prey species, and many other elements of groundfish EFH. During Phase 2, proposals for revised designations of groundfish EFH and additional mitigation measures were solicited, and eight proposals were reviewed and reported on to the Council in November 2013. In Phase 3, the Council will consider action to amend the components of groundfish EFH. Along with consideration of changes to groundfish EFH, the Council is considering changes to RCAs. RCAs, first implemented in 2003, are areas closed to fishing by certain gear types. This package includes consideration of whether or not to reduce or eliminate the areas closed to trawl gears by the trawl RCA. The Council considered, but rejected early in the process, the option of allowing the use of large footrope gear in nearshore areas, shoreward of the current RCAs. The Council selected a range of alternatives at

its September 2015 meeting, and it is scheduled to take action on a preliminary preferred alternative at its September 2016 meeting.

- *Vessel Movement Monitoring*. The Council is considering a package of possible actions related to the monitoring of vessel movements, including modifying the satellite vessel monitoring system (VMS) ping rate or allowing the use of other technologies to monitor continuous transit across restricted areas; allowing vessels declared into the whiting mothership fishery to change their declaration at-sea in order to switch into the Shorebased IFQ Program without first returning to shore; adding provisions to facilitate the retrieval of derelict crab gear from RCAs; creating a declaration for testing gear that would allow vessels under such declaration to have gear deployed without an observer on board; and adding a provision to allow a vessel on a trawl sector IFQ trip to move fixed gear across management lines without returning to shore. A list of all issues to be included in this package is provided in Agenda Item I.6.a, Supplemental Joint Council/NMFS Staff Report, from the September 2014 Council meeting. The Council selected a preliminary preferred alternatives at its November 2015 meeting and final preferred alternatives at its April 2016 meeting.
- *Past, present, and future groundfish harvest specifications and management measures*. Harvest specifications contribute to the current status of managed stocks. Management measures directly or indirectly control catch, affecting stock status, fishing opportunity, harvester costs and net revenue, and personal income and employment in fishing communities. The groundfish fishery is managed under a biennial cycle, with the current cycle being the 2015-2016 groundfish harvest specifications and management measures.
- *ESA consultations on take of salmon and eulachon in groundfish fisheries*. NMFS has reinitiated ESA Section 7 consultation on the FMP with respect to its effects on listed salmonids. At the Council's June 2015 meeting, new estimates of eulachon take from fishing activity under the FMP indicated that the incidental take threshold in the 2012 biological opinion was exceeded. The increased bycatch may be due to increased eulachon abundance. In light of the new fishery and abundance information, NMFS is evaluating the impacts of fishing on eulachon under the FMP to determine if reinitiation or a modification to the incidental take statement is necessary.
- *Sablefish Permit Stacking Program changes*. This action contains several provisions including, but not limited to, joint registration and requiring electronic fish tickets for the sablefish permit stacking program. Joint registration would allow both a limited entry fixed gear and a limited entry trawl permit to be registered to the vessel at the same time. These changes are being implemented over 2016 to early 2017.

- *Fishery Ecosystem Plan*. The Council is developing measures to protect unfished and unmanaged forage fish species pursuant to an initiative identified in the FEP. Comprehensive Ecosystem-Based Amendment 1 (CEBA 1) would bring new ecosystem component species (collectively, "Shared EC Species") into each of the Council's four FMPs (CPS, groundfish, HMS, and salmon) through amendments to those FMPs, and it would prohibit the future development of new directed commercial fisheries for Shared EC Species within the U.S. West Coast EEZ. The Shared EC Species include a suite of unfished and unmanaged forage fish species such herrings, sand lance, smelt, and squid. These protections could benefit both currently unmanaged fish stocks and managed stocks that depend on forage fish. These changes are being implemented over 2016.

Other Actions:

- *Water pollution*. Various activities introduce chemical pollutants and sewage and cause changes in water temperature, salinity, dissolved oxygen, and suspended sediment in the marine environment. Although these activities tend to affect nearshore waters, they adversely impact identified affected biological resources if a substantial part of their life cycle occurs in these waters. Examples of these activities include, but are not limited to, agriculture, port maintenance, coastal development, marine transportation, marine mining, dredging, and disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality, and they indirectly may constrain the sustainability of the managed resources, non-target species, and protected species.
- *Climate change*. Section 3.1.1 broadly describes the Pacific Coast Marine Ecosystem. The Council's Fishery Ecosystem Plan provides more detailed information on climate change and the effects of climate on ecosystem components (http://www.pcouncil.org/wp-content/uploads/FEP_FINAL.pdf). Range shifts of target species may cause the biggest climate change-related impact on fisheries.

4.9.5 Magnitude and Direction of Past, Present, and Reasonably Foreseeable Future Actions

The following section presents the effects of past, present, and reasonably foreseeable future actions on the physical, biological, and socioeconomic environments (Sections 4.9.5.1 to 4.9.5.3, respectively). Each section ends with a summary table (Tables 4-15, 4-16, and 4-17) of the respective physical, biological, and socioeconomic impacts.

4.9.5.1 Physical Environment

Electronic monitoring as a replacement for the 100 percent observer coverage requirement. Electronic monitoring would change how the fishery would be monitored, moving from human observers to cameras. Fishery monitoring tracks catch and discards at-sea, on land, or both, and it would not have a direct effect on the physical environment. Electronic monitoring would have a neutral impact on the physical environment, including the Pacific Coast Marine Ecosystem and EFH.

Groundfish essential fish habitat and rockfish conservation area changes. EFH and RCAs may have recovered from the adverse impacts of fishing in areas continuously closed to fishing for enough time. Groundfish EFH is also habitat for other benthic biota, ranging from interstitial microorganisms to sponges and corals. Past EFH and RCA actions have had a high, positive impact on the physical environment from protection of habitat and species through closed areas. To the extent that EFH and RCA changes would continue to protect an adequate amount of EFH and overfished species, and these changes would have low positive impacts to the physical environment.

Vessel Movement Monitoring. The vessel movement monitoring, or VMM, action includes several changes related to monitoring vessel movements. Vessel monitoring tracks the location of a fishing vessel's activities for compliance with closed areas. Past implementation of vessel monitoring systems in groundfish fisheries has had a high positive impact. This action would incrementally improve vessel monitoring and would have a low positive impact on compliance with EFH restrictions. The vessel movement monitoring action would have a low positive impact on the Pacific Coast Marine Ecosystem due to the general habitat protections and ecosystem functioning from monitoring compliance with closed areas.

Past, present, and future groundfish harvest specifications and management measures. Past groundfish harvests have had substantial positive and negative direct effects on managed groundfish stocks, but they have had modest indirect effects on other components of the ecosystem. While past harvests have had substantial effects, present and future groundfish harvests are within, or would be expected to be within, sustainable levels, given improvements in science and monitoring. Harvest specification would continue to protect EFH and to consider impacts on the ecosystem, resulting in a low positive impact.

ESA consultations on take of salmon and eulachon in groundfish fisheries. Consultations on the fishery would have a low positive impact on the physical environment in their support for ecosystem functioning and the important niche these species fill.

Sablefish Permit Stacking Program changes. The suite of changes for the sablefish permit stacking program would include provisions that would also affect the Trawl Catch Share Program. The requirement for electronic fish tickets would provide better data for management of the sablefish fishery and for non-target species caught in this fishery. Allowing joint registration of limited entry fixed gear permits and limited entry trawl permits would provide more flexibility and efficiency for fishermen to participate in both fisheries. Neither of these changes would have a direct effect on the physical environment. This action would have a neutral impact.

Fishery Ecosystem Plan. The Fishery Ecosystem Plan is intended to enhance the Council's species-specific management programs with more ecosystem science, broader ecosystem considerations, and management policies that coordinate Council management across its FMPs. To the degree that this purpose would be met, the Fishery Ecosystem Plan might have a low positive effect on the Pacific Coast Marine Ecosystem. One of the initiatives identified in the FEP is a cross-FMP EFH initiative. The concept is to "identify habitat areas that are considered highly productive or biodiverse under more than one FMP" and to coordinate mitigation measures.

Water pollution. Water pollution has localized low, negative impacts on groundfish EFH. An example would be estuaries (designated as a habitat area of particular concern).

Climate change. Climate change would likely have medium to high negative impacts on the Pacific Coast Marine Ecosystem. The way in which climate forcing will affect EFH is not well understood. Effects would depend on the location of EFH and changes in climate forcing vectors such as water temperature and chemistry, currents, and upwelling.

Table 4-15. Summary of impacts of past, present, and reasonably foreseeable future actions on the physical environment.

Action	Past to Present Impacts	Reasonably Foreseeable Future Impacts
Electronic monitoring	--	**Neutral**
EFH/RCA	**High Positive**	**Low Positive**
VMM	**High Positive**	**Low Positive**
Groundfish harvest specifications and management measures	**Low Positive**	
ESA consultations	**Low Positive**	
Sablefish Program	**Neutral**	
Fishery Ecosystem Plan	**Low Positive**	
Water pollution	**Low Negative**	
Climate change	**Uncertain – likely medium to high negative impacts**	
Summary of past, present, and future actions excluding the proposed action	**Overall, actions have had, or will have, low positive impacts on the physical environment.**	

4.9.5.2 Biological Environment

The following subsections detail the effects of future actions on the biological environment. Table 4-16 summarizes the effects discussed below.

Electronic monitoring as a replacement for the 100 percent observer coverage requirement. Electronic monitoring is being considered for the trawl catch share program. This would change how the fishery is monitored, moving from human observers to cameras. Vessels choosing not to use electronic monitoring would be subject to 100 percent monitoring by observers, who would continue to track discards of target species, non-target species, and protected species. For vessels subject to electronic monitoring, cameras would not estimate discards of most non-target species and protected species, and observers would not be on every fishing trip. Human observers would only be on vessels using electronic monitoring, should that vessel be randomly selected for observer coverage according to sampling protocols for scientific purposes, including gathering information on protected species interactions.

Generally, electronic monitoring would track and record discards of marine species at sea by using cameras to audit logbooks, while retained catch would be tracked and recorded dockside. Many vessels would be retaining most, if not all, of their catch, called "maximized retention," and some vessels may be able to discard some non-target species that can be identified on the camera, called "optimized retention." Under either option, an electronic monitoring program would fully track at-sea discards of IFQ species (target and non-target species, including overfished species), but not necessarily other non-target and protected species. Information on bycatch of non-target and protected species would continue to be collected by some level of scientific observer coverage.

Under electronic monitoring, the gears listed below might discard the species listed. Of these discards, only target species and Pacific halibut would be tracked with electronic monitoring. For all gears using electronic monitoring, all salmon would have to be retained and brought to shore for genetic sampling.

- Midwater whiting trawl (at-sea and shorebased): status quo
- Non-whiting midwater trawl, bottom trawl, fixed gear: Dungeness crab, Pacific halibut, marine mammals, eulachon, seabirds, mutilated and depredated fish, debris, invertebrates
- Bottom trawl optimized retention: whiting, arrowtooth flounder, Dover sole, English sole, recognizable non-IFQ species, Dungeness crab, Pacific halibut, marine mammals, eulachon, seabirds, mutilated fish, debris, invertebrates

Electronic monitoring would change the percent coverage of monitoring for some species, in particular, non-groundfish species, some groundfish without individual or coop allocations, and protected species.

Monitoring of protected species would be limited. Monitoring of non-target species, including overfished groundfish and other non-groundfish species, would continue to be monitored to varying degrees. Monitoring of IFQ species or allocated at-sea species, including some non-target groundfish species, would continue to have 100 percent monitoring.

Information is currently being gathered through EFPs for electronic monitoring in the trawl catch share program, in part, to better understand the differences in protected species monitoring by 100 percent human observers versus 100 percent cameras with some scientific sampling by human observers.

Electronic monitoring would have a neutral impact on target species, because they would continue to be 100 percent monitored and accounted for. Because there would not be 100 percent monitoring for many non-target species and protected species, electronic monitoring would have a low negative impact on those species categories.

Groundfish essential fish habitat and rockfish conservation area changes. Since 2003, EFH and RCA protections for habitat and overfished species have had high, positive impacts for biological resources (target, non-target, and protected species) from the protections of closed areas. Mitigation measures that reduce adverse impacts on EFH may result in increased stock productivity. RCA reductions may result in increased harvest (fishing mortality). EFH or RCA changes that restrict fishing by area would reduce the likelihood of fishery interactions with protected species in those areas, but might be expected to increase interactions with protected species in areas bordering/surrounding these restricted areas. If areas were reduced, then negative impacts would increase. However, EFH and RCA protections would still exist and would have a low positive impact from some protections through closed areas.

Vessel Movement Monitoring. The vessel movement monitoring action includes several changes related to monitoring of vessel movements. Vessel monitoring tracks the location of a fishing vessel's activities for compliance with closed areas. Past implementation of vessel monitoring systems in groundfish fisheries have had a high positive impact. This action would incrementally improve vessel monitoring, and it would have a low, positive impact on target species and protected species due to general habitat protections and any correlated stock productivity from monitoring compliance with closed areas. Similarly, this action would have a low positive impact on overfished species (non-target species) for improved monitoring of and compliance with RCAs that were designed to rebuild overfished species.

Past, present, and future groundfish harvest specifications and management measures. Specification of catch limits and management measures consider stock productivity and overall harvest (fishing mortality). Improvements in stock assessment methods and the management system have been effective at ending and preventing overfishing since the beginning of this century. It is unknown how past fishing practices

changed the genetic structure of the groundfish populations. In the past (1980 to 1990s), differences in science, management of the fishery, and ocean conditions resulted in the decline of multiple groundfish species and led to the implementation of rebuilding plans. Rebuilding plans have been implemented, and overfished stocks' numbers are increasing. The overfishing level has been exceeded occasionally for some stocks, but not persistently enough (e.g., more than once in 4 years) to require broad reevaluation of the management system. The overfishing level contribution for some stocks managed in complexes might have been exceeded. For non-target, non-groundfish species, biennial specifications and management measures generally have not regulated their catch, except for Pacific halibut, but have affected fishing opportunity and behavior, which might indirectly affect bycatch of these species. Catch of these species would be monitored, and the effect on population abundance would be neutral. For protected species, past fishery management actions taken through the FMP process have had a low positive cumulative effect on ESA-listed and MMPA-protected species through the reduction of fishing effort (potential interactions) and implementation of gear requirements.

ESA consultations on take of salmon and eulachon in groundfish fisheries. Measures implemented to reduce take of protected species could also affect fishing opportunity and catch. Decreased fishing mortality would have a low positive impact on target species, on non-target species, and on protected species.

Sablefish Permit Stacking Program changes. The suite of changes for the sablefish permit stacking program would include provisions that would also affect the Trawl Catch Share Program. Allowing joint registration of limited entry fixed gear permits and limited entry trawl permits would provide more flexibility and efficiency for fishermen participating in both fisheries. The requirement for electronic fish tickets would provide better data for management of the sablefish fishery and for non-target species caught in this fishery. This would have low positive impacts on target, non-target, and protected species from improved tracking.

Fishery Ecosystem Plan. The Fishery Ecosystem Plan considers prey availability of groundfish species that are prey, as well as species that are groundfish prey. Forage fish protection measures might have a low positive effect on maintaining stock abundance of prey species for piscivorous groundfish. The Council's Annual State of the Ecosystem reports provide more information to inform management decisions.

Water pollution. Impacts are localized in nearshore areas and marine project areas where they occur. Water pollution would have low negative impacts on target species, non-target species, and protected species that spend part of their life cycle in nearshore marine areas. However, it is expected to have a neutral impact over the life cycle of these marine species. Of the ESA-listed species likely to be adversely affected by the proposed action, Chinook salmon, eulachon, and green sturgeon reside or transit coastal

and estuarine waters where pollution from terrestrial sources might be locally concentrated. These species might be negatively affected. The 2012 biological opinion (NMFS 2012a) identifies the adverse impact of water pollution on green sturgeon prey resources.

Climate change. Warm-water phases in cyclical climate phenomena decrease the productivity of many groundfish stocks. Climate change might lead to range shifts, decreasing local abundance of groundfish. For protected species, effects depend on the species and its requirements. The net effect of climate change on protected species cannot be predicted but would likely be negative.

Table 4-16. Summary of impacts of past, present, and reasonably foreseeable future actions on the biological environment.

Action	Past to Present Impacts	Reasonably Foreseeable Future Impacts
Electronic monitoring	--	**Mixed (Neutral to Low Negative)**
EFH/RCA	**High Positive**	**Low Positive**
VMM	**High Positive**	**Low Positive**
Groundfish harvest specifications and management measures	**Low Positive**	
ESA consultations	**Low Positive**	
Sablefish Program	**Low Positive**	
Fishery Ecosystem Plan	**Low Positive**	
Water pollution	**Low Negative**	
Climate change	**Uncertain – likely negative impacts**	
Summary of past, present, and future actions excluding the proposed action	**Overall, actions have had, or would have, low positive impacts on the biological environment.**	

4.9.5.3 Socioeconomic Environment

The following subsections detail the effects of future actions on the socioeconomic environment. Table 4-17 summarizes the effects discussed below.

Electronic monitoring as a replacement for the 100 percent observer coverage requirement. Electronic monitoring would change how the fishery could be monitored, with some vessels choosing to move from human observers to cameras. Fishery monitoring tracks catch and discards at-sea, on land, or both. Electronic monitoring may provide increased flexibility and decreased costs for vessels that choose to adopt it, resulting in a medium positive impact on the socioeconomic environment.

Groundfish essential fish habitat and rockfish conservation area changes. If EFH measures were to reduce catch indirectly by restricting access to traditional fishing grounds, there would be a medium to high negative impact. If access to fishing grounds increased as a result of modifying the EFH and RCA

areas, there would be a low to medium positive impact from increased harvest opportunity and decreased costs of avoiding fishing in prohibited areas.

Vessel Movement Monitoring. The vessel movement monitoring, or VMM, action includes several changes related to monitoring vessel movements. Vessel monitoring tracks the location of a fishing vessel's activities for compliance with closed areas. Costs to the fleet for a more frequent ping rate would increase slightly, a low negative impact on the socioeconomic environment; however, the benefit to management of increased monitoring compliance would be medium positive, resulting in a cumulative low positive impact on the socioeconomic environment.

Past, present, and future groundfish harvest specifications and management measures. Implementation of stock rebuilding measures in the late 1990s caused a substantial decline in fishing opportunity and ex-vessel revenue. The cumulative impacts of past, present, and reasonably foreseeable future actions on the affected resources are generally associated with positive long-term outcomes. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. However, the same regulatory actions are generally necessary for long-term sustainability, which should, in the long-term, promote medium-positive effects on communities, especially those that are economically dependent on fishing.

ESA consultations on take of salmon and eulachon in groundfish fisheries. Measures to reduce take of protected species might have negative impacts on groundfish ex-vessel revenue and could result in increased costs for protected species avoidance. This would cause a low negative impact on the socioeconomic environment; however, overall impacts are uncertain and are likely to vary by sector.

Sablefish Permit Stacking Program changes. The suite of changes for the sablefish permit stacking program would include provisions that would also affect the trawl catch share program. The requirement for electronic fish tickets would provide better data for management of the sablefish fishery and for non-target species caught in this fishery. Allowing joint registration of limited entry fixed gear permits and limited entry trawl permits would provide more flexibility and efficiency for fishermen to participate in both fisheries. These changes would likely result in a medium positive impact on the socioeconomic environment. The combination of electronic monitoring and joint registration will make it easier (less costly) for fixed gear fishermen to enter the Shorebased IFQ Program. The primary target of these vessels is sablefish, a constraining species in the IFQ fishery. If more fixed gear fishermen use more sablefish quota, the harvest of other species may go down, with a corresponding decrease in benefits to fisheries and coastal communities dependent on the presence of an active multispecies trawl fishery.

Fishery Ecosystem Plan. Reasonably foreseeable future actions under the Fishery Ecosystem Plan include management of forage fish, defining trophic associations and ecological roles of unmanaged species not included in any FMP, and potential processes for their management. This initiative could potentially have low negative short-term socioeconomic impacts if actions taken to protect forage species and unmanaged species result in reduced harvest opportunity for managed species.

Water pollution. While nearshore water quality might have a low negative impact on target, non-target, and protected species that spend part of their life cycle in nearshore areas, it would be likely to have a neutral impact over the life cycle of these marine species. Therefore, it would be unlikely to affect ex-vessel revenue, a neutral impact on the socioeconomic environment.

Climate change. Over the long term (more than 10 years), sea level rise and changes in storm activity could increase costs for maintaining or replacing fishery-related infrastructure in fishing communities. If infrastructure were not maintained or replaced in a port, fishery landings would be made elsewhere, reducing income for the affected port. Shifts in distribution of economically important groundfish resulting in less stock being available to the fishery would have medium to high negative impacts.

Table 4-17. Summary of impacts of past, present, and reasonably foreseeable future actions on the socioeconomic environment.

Action	Past to Present Impacts	Reasonably Foreseeable Future Impacts
Electronic monitoring	--	**Low positive**
EFH/RCA	**Uncertain—likely low negative or low positive**	
VMM	**Low positive**	
Groundfish harvest specifications and management measures	**Medium positive**	
ESA consultations	**Uncertain—varies by sector**	
Sablefish Program	**Medium positive**	
Fishery Ecosystem Plan	**Uncertain; likely neutral to low negative**	
Water pollution	**Neutral**	
Climate change	**Uncertain; likely low negative**	**Uncertain; likely medium to high negative**
Summary of past, present, and future actions excluding the proposed action	**Overall, actions have had, or will have, low positive impacts on the socioeconomic environment.**	

4.9.6 Proposed Action on All of the Affected Resources

In determining the magnitude and significance of the cumulative effects, the additive and synergistic effects of the proposed action, as well as past, present, and future actions, must be taken into account. This analysis of total cumulative effects considers the following: (1) impacts past, present, and

reasonably foreseeable future actions, plus (2) impacts from the proposed action and alternatives for each issue (A-H).

Table 4-18 summarizes the conclusions found in Sections 4.9.3 through 4.9.5 on the impacts of past, present, and reasonably foreseeable actions when combined with the impacts of the proposed action alternatives for each issue (A to H). Based on these assessments, the magnitude and significance of cumulative effects are determined.

Table 4-18. Summary of the cumulative effects of the proposed action combined for all issues and the impacts of past, present, and reasonably foreseeable actions.

Affected Environment		**Effect of Past, Present, and Reasonably Foreseeable Future Actions on Affected Environment (4.9.5)**	**Issues**								**Cumulative Effects of Past, Present, and Reasonably Foreseeable Future Actions combined with Effects of Combined Issues**
			Minimum Mesh Size (4.1)	**Measure Mesh Size (4.2)**	**Codend (4.3)**	**SFFT (4.4)**	**Chafing Gear (4.5)**	**Multiple Gears (4.6)**	**Multiple IFQ Areas (4.7)**	**Stowing (4.8)**	
Physical Impacts	Ecosystem	Low Positive	A1: Low Negative A2: Low Negative A3: Uncertain. Medium Negative	B1: Neutral B2: Neutral	C1: Low Negative C2: Low Negative	D1: Low Negative D2: Low Negative D3: Neutral	E1: Low Negative E2: Low Negative E3: Uncertain. Medium Negative	F1: Low Negative F2: Low Negative F3: Low Negative	G1: Low Negative G2: Low Negative	H1: Neutral H2: Neutral	Overall low negative with the exception of A3 and E3, which are uncertain and medium, negative.
	EFH	Low Positive	A1: Neutral A2: Neutral A3: Neutral	B1: Neutral B2: Neutral	C1: Neutral C2: Neutral	D1: Neutral D2: Neutral D3: Neutral	E1: Neutral E2: Neutral E3: Low Negative	F1: Neutral F2: Neutral F3: Neutral	G1: Neutral G2: Neutral	H1: Neutral H2: Neutral	Overall low positive
Biological Impacts	Target species	Low Positive	A1: Neutral A2: Mixed (Neutral to Low Negative) A3: Mixed (Neutral to Medium Negative)	B1: Neutral B2: Neutral	C1: Neutral C2: Mixed (Neutral to Medium Negative)	D1: Neutral D2: Neutral D3: Neutral	E1: Neutral E2: Neutral E3: Neutral	F1: Neutral F2: Neutral F3: Uncertain. Mixed (Neutral to Medium Negative)	G1: Neutral G2: Neutral	H1: Neutral H2: Neutral	Overall low positive with the exception of A2, A3, C2, and F3, which are neutral to medium negative. F3 also contains uncertainty.

Table 4-18, continued.

Affected Environment		Effect of Past, Present, and Reasonably Foreseeable Future Actions on Affected Environment (4.9.5)	Issues								Cumulative Effects of Past, Present, and Reasonably Foreseeable Future Actions combined with Effects of Combined Issues
			Minimum Mesh Size (4.1)	Measure Mesh Size (4.2)	Codend (4.3)	SFFT (4.4)	Chafing Gear (4.5)	Multiple Gears (4.6)	Multiple IFQ Areas (4.7)	Stowing (4.8)	
Biological Impacts (continued)	Non-target species	Low Positive	A1: Neutral A2: Low Negative A3: Uncertain. Medium Negative	B1: Neutral B2: Neutral	C1: Neutral C2: Uncertain. Medium Negative	D1: Neutral D2: Low Positive D3: Neutral	E1: Neutral E2: Neutral E3: Uncertain. Low Negative	F1: Neutral F2: Neutral F3: Uncertain. Mixed (Neutral to Medium Negative)	G1: Neutral G2: Neutral	H1: Neutral H2: Neutral	Overall low positive with the exception of A2, A3, C2, E3, and F3, which are neutral to medium negative. E3 and F3 also contain uncertainty.
	Protected species	Low Positive	A1: Low Negative A2: Low Negative A3: Uncertain. High Negative	B1: Neutral B2: Neutral	C1: Low Negative C2: Uncertain. High Negative	D1: Low Positive D2: Low Positive D3: Medium Negative	E1: Low Negative E2: Low Negative E3: Uncertain. Medium Negative	F1: Low Negative F2: Low Negative F3: Uncertain. Mixed (Low to High Negative)	G1: Low Negative G2: Low Negative	H1: Neutral H2: Neutral	Overall low negative except for A3, C2, D3, E3, and F3, which are medium to high negative. A3, C2, E3, and F3 also contain uncertainty.
Socio-economic Impacts	Harvesters	Low Positive	A1: Low Negative A2: Low Positive A3: Medium Positive	B1: Neutral B2: Low Positive	C1: Low Negative C2: Low Positive	D1: Low Negative D2: Low Positive D3: Medium Positive	E1: Low Negative E2: Low Positive E3:Medium positive	F1: Low Negative F2: Low Positive F3:Low positive	G1: Low Negative G2: Medium Positive	H1: Low Negative H2: Neutral to Low Positive	Overall low positive
	Processors	Neutral	A1: Neutral A2: Low	B1: Neutral B2:	C1: Neutral C2:	D1: Low Negative D2: Low	E1: Neutral E2: Neutral	F1: Neutral F2: Neutral	G1: Neutral G2:	H1: Neutral H2:	Overall neutral, except for A2-3, D2-3 which are low positive

			Positive A3: Low Positive	Neutral	Neutral	Positive D3: Medium Positive	E3: Neutral	F3: Neutral	Neutral	Neutral	
	Fishing Communities	Low Positive	A1: Neutral A2: Low Positive A3: Low Positive	B1: Neutral B2: Neutral	C1: Neutral C2: Neutral	D1: Neutral D2: Low Positive D3: Medium Positive	E1: Neutral E2: Neutral E3: Neutral	F1: Neutral F2: Neutral F3: Low Positive	G1: Low to Medium Negative G2: Low to Medium Positive	H1: Neutral H2: Neutral	Overall low positive, except G1 which is low to medium negative
	Management Entities	Low Positive	A1: Neutral A2: Neutral A3: Low Negative	B1: Low Negative B2: Low Positive	C1: Neutral C2: Neutral	D1: Neutral D2: Neutral D3: Neutral	E1: Neutral E2: Neutral E3: Neutral	F1: Low Positive F2: Neutral F3: Low to Medium Negative	G1: Low Positive G2: Low Negative	H1: Medium Positive H2: Low Negative	Overall neutral/mixed, with B1, G2,and H2 low negative, F3 low to medium negative, B2, F1, G1, H1 low positive

4.9.7 Cumulative Effects

[Text in this section will be drafted to further describe the cumulative effects from Table 4-18.]

5 CONSISTENCY WITH THE FMP AND OTHER APPLICABLE LAWS

This chapter describes state and Federal government acts, regulations, and fishery management plans developed to support the nation's fisheries.

5.1 Pacific Coast Groundfish FMP

5.2 Magnuson-Stevens Conservation and Management Act

MSA was enacted to promote the U.S. fishing industry's optimal exploitation of coastal fisheries by "consolidating control over territorial waters" and establishing eight regional councils to manage fish stocks see Chapter 6, Consistency with the Fishery Management Plan [FMP] and Other Applicable Laws, for a detailed discussion of MSA). MSA has been amended several times in response to continued overfishing of major stocks. The most recent version, authorized in 2007, includes seven purposes:

1. Acting to conserve fishery resources
2. Supporting enforcement of international fishing agreements
3. Promoting fishing in line with conservation principles
4. Providing for the implementation of fishery management plans (FMPs) that achieve optimal yield
5. Establishing Regional Fishery Management Councils to steward fishery resources through the preparation, monitoring, and revising of plans which (A) enable stake holders to participate in the administration of fisheries and (B) consider social and economic needs of states
6. Developing underutilized fisheries
7. Protecting essential fish habitats

Additionally, the law calls for reducing bycatch and establishing fishery information monitoring systems.

Regional Fishery Management Councils are charged with developing and recommending fishery management plans, both to restore depleted stocks and manage healthy stocks. NMFS aids the Secretary of Commerce, who evaluates, approves, and implements the Councils' FMPs. Regional Fishery Management Council members are nominated by the governors of their respective states, and they are appointed by the Secretary of Commerce.

An FMP must specify the criteria that determine when a stock is overfished and the measures needed to rebuild it. Regional councils regulate fishers with mechanisms, including annual catch limits, individual catch limits, community development quotas, and others. The Marine Fish Conservation Network highlighted the most significant changes in the mechanisms used in a 2010 report:

> "To achieve the goal of ending overfishing … Congress strengthened the role of science in the fishery management process and required fishery managers to establish science based annual catch limits (ACLs) and accountability measures (AMs) for all US fisheries with a deadline of 2010 for all stocks subject to overfishing… The new fisheries law requires the councils' science advisors, the scientific and statistical committees to make recommendations for 'acceptable biological catch' (ABC) which managers may not exceed…."

The ACL is the centerpiece of the report, which is supplemented by other mechanisms regulating the types of gear used, licensing vessels, and using of observers on fishing boats. In section 303 b, the Act enumerates the types of actions authorized for use by councils to achieve optimal catch goals, including the following:

1. Permitting vessels or operators
2. Designating zones and periods where fishing is limited
3. Limiting sale, catch, or transport of certain fish
4. Regulating types of fishing equipment
5. Requiring observers onboard vessels

5.3 Endangered Species Act

5.4 Marine Mammal Protection Act

5.5 Migratory Bird Treaty Act and Executive Order 13186

5.6 Coastal Zone Management Act

5.7 Paperwork Reduction Act

5.8 Executive Order 12866

5.9 Executive Order 12898 (Environmental Justice)

5.10 Executive Order 13175 (Tribal government)

5.11 Executive Order 13132 (Federalism)

5.12 Administrative Procedure Act

5.13 Regulatory Flexibility Act

5.14 National Environmental Policy Act

The National Environmental Policy Act (NEPA) provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with Federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. An environmental impact statement (EIS) provides a detailed statement of the environmental impacts of the action, reasonable alternatives, and measures to mitigate adverse effects of the proposed actions. The EIS requirement implements NEPA's policy goals by ensuring that agencies take a hard look at environmental consequences and by guaranteeing broad public dissemination of relevant information. An EIS culminates in a Record of Decision (ROD). The ROD will document the alternative selected for implementation or recommend for further review, as well as any conditions that the agency may require, and will summarize the impacts expected to result from the action.

As preliminary step in drafting an EIS is publishing a notice of intent (NOI). The NOI for this EIS was published in the Federal Register (citation) on February __, 2016. The NOI sets up a series of activities to initiate NMFS's public scoping process for an EIS. Comments on issues may be submitted in writing

until [*insert date 30+ days from the date of publication of this notice in the Federal Register*]. The date(s) and location(s) of any scoping meetings will be announced at least __ days in advance through local media, newspapers, and the NMFS web site at [*insert web site URL*]. In order to be included in the Draft EIS (DEIS), all comments must be received prior to the close of the scoping period or 15 days after the last public meeting, whichever is later. NMFS will provide additional opportunities for public participation upon publication of the DEIS.

5.14.1 Related NEPA Documents

5.15 List of Persons and Agencies Consulted

6 REFERENCES

Al-Humaidhi, A.W. [1], M.A. Bellman [2], J. Jannot [2], and J. Majewski [2]. 2012. Observed and estimated total bycatch of green sturgeon and Pacific eulachon in 2002-2010 U.S. west coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/GreenSturgeonEulachon_0210Rpt_Final.pdf.

Benson, S.R., Forney, K.A., Harvey, J.T., Caretta, J.V., and Dutton, P.H. 2007b. Abundance, distribution, and habitat of leatherback turtles (*Dermochelys coriacea*) off California 1990-2003. Fisheries Bulletin. Volume 105(3), pages 337 to 347.

Bowlby, C. E. 1994. Observations of leatherback turtles offshore of Washington and Oregon. Northwestern Naturalist. Volume 75, pages 33to 35.

CDFG (California Department of Fish and Game) 2001a. Pacific hake in California's Living Marine Resources: A Status Report. Calif. Dept. Fish and Game, Sacramento, CA 95610. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=34316&inline=true

CDFG (California Department of Fish and Game) 2001b. Widow Rockfish *in* California's Living Marine Resources: A Status Report. Calif. Dept. Fish and Game, Sacramento, CA 95610. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=34316&inline=true

CDFG (California Department of Fish and Game). 2001c. Yellowtail rockfish *in* California's Living Marine Resources: A Status Report. Calif. Dept. Fish and Game. Sacramento CA 95610 http://www.dfg.ca.gov/marine/status/status2001.asp

CDFG (California Department of Fish and Game) 2001d. Chilipepper rockfish *in* California's Living Marine Resources: A Status Report. Calif. Dept. Fish and Game. 1Sacramento CA 95610 http://www.dfg.ca.gov/marine/status/status2001.asp

Council (Pacific Fishery Management Council). 1999. Proposed 2000 groundfish acceptable biological catch and optimum yield specifications for the Pacific Coast groundfish fishery and implementing management measures for 2000. Pac. Fish. Mgmt Coun, Portland OR 97220.

Council (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2009. Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific Coast Groundfish Fishery Final Environmental Impact

Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. January 2009. (http://www.pcouncil.org/wp-content/uploads/0910GF_SpexFEIS.pdf)

Council (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2010. Rationalization of the Pacific Coast Groundfish Limited Entry Trawl Fishery; Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. June 2010.

Council (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2015. Harvest Specifications and Management Measures for the 2015-2016 and Biennial Periods Thereafter Final Environmental Impact Statement. Pacific Fishery Management Council, Portland, OR. January 2015. (http://www.pcouncil.org/wp-content/uploads/GF15_16_SpexFEISJanuary2015.pdf)

Council (Pacific Fishery Management Council). 2012d. Proposed harvest specifications and management measures for the 2013-2014 Pacific Coast groundfish fishery and Amendment 21-2 to the Pacific Coast fishery management plan. Pac. Fish. Mgmt. Coun., Portland OR 97220. (http://www.pcouncil.org/wp-content/uploads/September_2012_Main_Document_13-14_FEIS_SPEX.pdf).

Council (Pacific Fishery Management Council) 2012g. Pacific Coast Groundfish 5-Year Review of Essential Fish Habitat Report to the Pacific Fishery Management Council. Phase 1: New Information. Agenda Item H.6.b EFHRC Report 1 September 2012. Pac. Fish Mgmt Coun, Portland OR 97220. http://www.pcouncil.org/wpcontent/uploads/H6b_EFHRC_RPT_1_SEP2012BB.pdf

Council (Pacific Fishery Management Council). 2013. Pacific Fishery Ecosystem Plan for the U.S. Portion of the California Current Large Marine Ecosystem. Pacific Fishery Management Council, Portland (OR), July 2013.

Demory, R. 1987. The widow rockfish fishery in Oregon 1963-80. *In* Widow Rockfish: Proceedings of a workshop, Tiburon, California, December 11-12. NOAA technical report 48.

Eckert, S. A. 1998. Perspectives on the use of satellite telemetry and other electronic technologies for the study of marine turtles, with reference to the first year long tracking of leatherback sea turtles. *In*: Proc. Of the 17th Annual Sea Turtle Symposium. NOAA Tech. Mem. NMFS-SEFSC-415. page 44.

Eckert, S.A. 1999. Habitats and migratory pathways of the Pacific leatherback sea turtle. Hubbs Sea World Research Institute Technical Report 99-290.

Environment Canada. 2008. Recovery Strategy for the Short-tailed Albatross (*Phoebastria albatrus*) and the Pink-footed Shearwater (*Puffinus creatopus*) in Canada [Final]. Environment Canada, Ottawa.

Field, J. 2007. Status of the Chilipepper rockfish, *Sebastes goodei*, in 2007. Pac. Fish. Mgmt. Coun. Portland OR http://www.pcouncil.org/wp-content/uploads/ChilipepperJan2009final.pdf (http://www.fakr.noaa.gov/npfmc/PDFdocuments/fmp/GOA/GOA.pdf.

Field, J. C., E. J. Dick, and A.D. MacCall. 2007. Stock assessment model for the shortbelly rockfish, *Sebastes jordani*, in the California current. NOAA-TM-NMFS-SWFSC-405. National Marine Fisheries Service, NOAA Southwest Fisheries Science Center 110 Shaffer Road Santa Cruz, California 95060. http://swfsc.noaa.gov/uploadedFiles/Operating_units/FED/Groundfish_Analysis/Shortbelly%20Assessment%20-%20Tech%20Memo.pdf

Graham, T. 2009. Scyphozoan jellies as prey for leatherback turtles off central California. Master's thesis, San Jose State University, San Jose, CA.

Gustafson, R., Lee, Y.-W., Ward, E., Somers, K., Tuttle, V., and Jannot, J. 2015. Observed and Estimated Bycatch of Eulachon in 2002-2013 US West Coast Groundfish Fisheries. NMFS. http://www.pcouncil.org/wp-content/uploads/2015/06/D4_Sup_Att3_GF_BiOp_EulachonBycatchDoc_E-ONLY_JUN2015BB.pdf

He, X., Pearson, D., Dick, E., Field, S., Ralston, J., and A. MacCall. 2011. Status of the widow rockfish resource in 2011. Pac. Fish. Mgmt. Counc., Portland OR (http://www.pcouncil.org/wp-content/uploads/Widow_2011_Assessment.pdf).

IJTCPH (International Joint Technical Committee for Pacific Hake) 2012. Status of the Pacific hake (Whiting) stock in U.S. and Canadian Waters in 2012. Pac. Fish. Mgmt Coun. Portland OR (http://www.pcouncil.org/wp-content/uploads/Hake_2012_Assessment.pdf).

Jannot, J., E. Heery, M. Bellman, and J. Majewski. 2011. Estimated bycatch of marine mammals, seabirds, and sea turtles in the US west coast commercial groundfish fishery, 2002-2009. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd. E., Seattle, WA 98112.

Jannot, J.E., K. Somers, J. McVeigh, N.B. Riley. 2015. Pacific halibut bycatch in the U.S. west coast fisheries (2002-2014). NOAA Fisheries, NWFSC Observer Program, 2725 Montlake Blvd E., Seattle, WA 98112.

Lee, Y.-W., Gustafson, R., Jannot, J., McVeigh, J., Riley, N., Somers, K., Tuttle, V., Wang, S., Ward, E. 2015. Observed and Estimated Bycatch of Green Sturgeon in 2002–2013 US West Coast Groundfish Fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Morreale, S., E. Standora, F. Paladino, and J. Spotila. 1994. Leatherback migrations along deepwater bathymetric contours. *In*: Proc. 13th Annual Symposium Sea Turtle Biology and Conservation. NOAA Tech. Memo NMFS-SEFSC-341, page 109.

NMFS (National Marine Fisheries Service). 2005 to 2013 Annual Reports. Pacific Whiting Fishery Summary. (http://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/whiting_reports_and_rulemakings.html).

NMFS (National Marine Fisheries Service). 2005a. Final groundfish essential fish habitat (EFH) environmental impact statement. Nat. Mar. Fish Serv., NWR. Seattle WA. 98115 (http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/EFH-Final-EIS.cfm).

NMFS (National Marine Fisheries Service). 2006. Supplemental biological opinion on the Pacific Coast groundfish fishery management plan (consultation #2006/00754). NMFS Northwest Region, Sustainable Fisheries Division, Seattle, WA.

NMFS. 2012a. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination; Continuing Operation of the Pacific Coast Groundfish Fishery. National Marine Fisheries Service Northwest Region, Seattle, December 7, 2012, PCTS Number: NWR-2012-876.

NMFS Pacific Whiting Fishery Summary. Annual reports available from 2005-2013. http://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/whiting_reports_and_rulemakings.html.

NMFS, May 2015. Salmon Bycatch in the Pacific Coast Groundfish Fisheries, Review draft. (Council meeting document - Agenda Item D.3.a, NMFS Report 1, June 2015).

http://www.pcouncil.org/wp-content/uploads/2015/05/D3a_NMFS_Rpt1_SalmonBycatch_JUN2015BB.pdf

NMFS, November 2015. 2015 Update for the West Coast Catch Shares Program. (http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/trawl_program/analytical%20docs/final_2012-2013_summary_report.pdf), including the economic Data Collection insert found at the following website: http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/trawl_program/analytical%20docs/final_economic_data_collection_insert.pdf

NMFS and USFWS. 1998. Recovery Plan for U.S. Pacific populations of the leatherback turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring MD. 65 pages.

NWFSC (Northwest Fisheries Science Center). 2011. Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species. Northwest Fisheries Science Center, National Marine Fisheries Service. 2725 Montlake Blvd E, Seattle, WA. : http://www.pcouncil.org/wp-content/uploads/F3b_ATT2_RISK_ASSMT_MAR2012BB.pdf

Pikitch, E.K., Bergh, M.O., Erickson, D.L., Wallace, J.R. and J.R. Skalski. 1990. Final Report on the Results of the 1988 West Coast Groundfish Mesh Size Study. Fish. Res. Inst., Univ. of Wash., Seattle WA 98195. Saltonstall-Kennedy Grant NA88-ABH-00017.

Quirollo, L. 1987. Historical catches of widow rockfish in northern California. NOAA Technical Report 48.

Starbird, C.H., Baldridge, A., and Harvey, J.T. 1993. Seasonal occurrence of leatherback sea turtles (*Dermochelys coriacea*) in the Monterey Bay region, with notes on other sea turtles 1986-1991. California Fish and Game. Volume 79(2), pages 54 to 62.

Suryan, R. M., G. R. Balogh, and K. N. Fischer. 2007a. Marine Habitat Use of North Pacific Albatross During the Non-breeding Season and Their Spatial and Temporal Interactions with Commercial Fisheries in Alaska. North Pacific Research Board.

Suryan, R. M., K. S. Dietrich, E. F. Melvin, G. R. Balogh, F. Sato, and K. Ozaki. 2007b. Migratory routes of short-tailed albatross: use of exclusive economic zones of North Pacific Rim countries and spatial overlap with commercial fisheries in Alaska. Biological Conservation 137:450-460.

Tagart, J. 1987. Description of the Washington state fishery for widow rockfish. NOAA Technical Report 48. P 11-12.

Wallace, J. and H. Lai. 2005. Status of the Yellowtail Rockfish in 2004. Pac. Fish. Mgmt. Counc., Portland OR 97220. (http://www.pcouncil.org/wp-content/uploads/Yellowtail_Rockfish_Final_0506.pdf.