

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion
Continuing Operation of the Pacific Coast Groundfish Fishery
(Reinitiation 2018)

NMFS Consultation Number: WCR-2018-8635
ARN: 151422WCR2018PR00004
Action Agency: National Marine Fisheries Service (NMFS)

Affected Species and NMFS' Determinations:

ESA- Listed Species	Status	Is Action Likely to Adversely Affect Species/?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Eulachon (<i>Thaleichthys pacificus</i>)	Threatened	Yes	No	No	No

Consultation conducted by National Marine Fisheries Service, West Coast Region.

Issued by: Chu E Yab
 For Barry A. Thom
 Regional Administrator

Date: October 12, 2018

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LIST OF ACRONYMS

ACL	Annual catch limits
BRT	Biological Review Team
BRD	Bycatch reduction device
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPFVs	Commercial passenger fishing vessels
CRSCZ	Columbia River Salmon Conservation Zone
DFO	Department of Fisheries and Oceans, Canada
DPS	Distinct population segment
DQA	Data Quality Act
EEZ	Exclusive Economic Zone
EFH	Essential fish habitat
EFHCA	Essential Fish Habitat Conservation Area
EFP	Exempted fishing permit
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
fm	Fathom
FMP	Fishery Management Plan
GCA	Groundfish Conservation Area
IFQ	Individual fishing quota
ISAB	Independent Scientific Advisory Board
ITS	Incidental take statement
JCRMS	Joint Columbia River Management Staff
lb	Pound

List of Acronyms

LEFG	LE fixed gear
MSA	Magnuson-Stevens Fishery Conservation and Management Act
mt	Metric ton
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWFSC	Northwest Fisheries Science Center
OA	Open access
ODFW	Oregon Department of Fish and Wildlife
Opinion	Biological opinion
PCGF	Pacific Coast Groundfish Fishery
PFMC	Pacific Fishery Management Council
POP	Pacific Ocean perch
PRD	Protected Resources Division
PSMFC	Pacific States Marine Fisheries Commission
PWCC	Pacific Whiting Conservation Cooperative
RCA	Rockfish Conservation Area
SARA	Species At Risk Act
SDPS	Southern Distinct Population Segment (of eulachon)
SFD	Sustainable Fisheries Division
TAC	Total allowable catch
VMS	Vessel monitoring system
WDFW	Washington Department of Fish and Wildlife
WCGOP	West Coast Groundfish Observer Program
WCR	National Marine Fisheries Service West Coast Region
Workgroup	Endangered Species Workgroup

1 INTRODUCTION

This section provides information relevant to the other sections of this document. The information is incorporated by reference into Sections 2 and 3, below.

This document considers the continuing operation of the Pacific Coast groundfish fishery. This is a reinitiation of consultation due to impacts on eulachon, and focuses on the effects on eulachon.

1.1 Background

The biological opinion (Opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402.

NMFS also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

NMFS completed a predissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System. A complete record of this consultation is on file at the NMFS-West Coast Region (WCR) Protected Resource Division office in Seattle, Washington.

1.2 Consultation History

In NMFS' 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, (2012 Opinion; NMFS 2012), it was determined that the Pacific Coast Groundfish Fishery is likely to have an adverse effect on the following listed species and critical habitat:

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

NMFS Sustainable Fisheries Division (SFD) also determined that the fishery is not likely to have an adverse effect on the following listed species and their critical habitat:

- Green sea turtles (*Chelonia mydas*)

- Olive ridley sea turtles (*Lepidochelys olivacea*)
- Loggerhead sea turtles (*Caretta caretta*)
- Sei whales (*Balaenoptera borealis*)
- North Pacific right whales (*Eubalaena japonica*)
- Blue whales (*Balaenoptera musculus*)
- Fin whales (*Balaenoptera physalus*)
- Sperm whales (*Physeter macrocephalus*)
- Southern Resident killer whales (*Orcinus orca*)
- Guadalupe fur seals (*Arctocephalus townsendi*)
- Steller sea lions (*Eumetopias jubatus*) (critical habitat only)

A complete record of that consultation is also on file at NMFS WCR in Seattle, Washington.

This is a reinitiation for the eulachon portion of the 2012 Opinion (NMFS 2012). The reasonable and prudent measures in the 2012 Opinion (NMFS 2012) state that exceeding the amount or extent of take described in the incidental take statement (ITS) will result in a reinitiation.

Previous biological opinion determinations on the other species in the 2012 Opinion (NMFS 2012) are not revisited in this reinitiation. This is because the amount or extent of take has not been exceeded for any of these species.

The reasonable and prudent measures in the 2012 Opinion required establishment of an Endangered Species Workgroup (Workgroup) to conduct a periodic review of new information, analyze results, evaluate whether reinitiation is warranted, and report to NMFS and the Pacific Fishery Management Council (Council). Reports on eulachon bycatch in the groundfish fishery are now available approximately 9 to 12 months following each fishing season. The first Workgroup report in June of 2015 indicated that eulachon bycatch had exceeded the ITS in 2011 and 2013. Eulachon bycatch again exceeded the ITS in 2014. The NMFS WCR Sustainable Fisheries Division requested reinitiation with the NMFS WCR Protected Resources Division on April 5, 2016. The second Workgroup report in April 2017 recommended that in developing a new biological opinion, NMFS should consider the relative magnitude of fishery impacts on the eulachon resource, and a range of eulachon bycatch in the ITS to account for fluctuations in eulachon abundance, while also recognizing recent increases in eulachon biomass.

Historical Estimates of Eulachon Bycatch in the Pacific Coast Groundfish Fishery—Since 2002, eulachon bycatch within the Pacific coast groundfish fishery has been estimated fleetwide. After the eulachon ESA listing in 2010 (75 FR 13012), NMFS consulted on the effect to eulachon from the continuing operation of the Pacific coast groundfish fishery. The Opinion was completed in 2012. For the 2012 Opinion, NMFS used the highest estimated annual bycatch

from 2002 through 2010 from the midwater and bottom trawl fisheries that are known to interact with eulachon, to estimate the amount of eulachon take likely to occur as the result of implementation of the groundfish FMP. That total was 1,004 eulachon. Since this fixed total was based on bycatch estimates from the period when eulachon abundance was at historic lows, this total was likely to be exceeded when eulachon abundance increased, even though there might be no additional adverse effect on the Southern Distinct Population Segment (SDPS) of eulachon (when impact is measured as a percentage).

The Pacific coast groundfish fishery exceeded the take estimate of 1,004 eulachon authorized in the 2012 Opinion in 2011 (1,621 eulachon), 2013 (5,113 eulachon), and 2014 (3,075 eulachon). Since eulachon bycatch estimates for the groundfish fishery are not calculated until 9 to 12 months after the end of the fishery season, the 2011 exceedance was not known until after the 2012 Opinion was approved. Due to wide fluctuations in eulachon abundance, keeping eulachon bycatch under the extent of take described in the 2012 Opinion became difficult when abundance increased, even though impact remained low. Therefore, this new Opinion will consider the effects of the groundfish fishery in terms of eulachon bycatch in light of current information about the fluctuating abundance of eulachon.

1.3 Proposed Federal Action

“Action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The proposed action is the continued operation of the Pacific coast groundfish fishery as implemented under the Fishery Management Plan (FMP). The groundfish FMP is implemented through regulations that are generally recommended by the Council and adopted by NMFS.

The Pacific Coast groundfish fishery is a year-round, multi-species fishery occurring off the coasts of Washington, Oregon, and California. The groundfish fishery includes vessels that use a variety of gear types to harvest groundfish directly or to land groundfish incidentally caught while targeting non-groundfish species. These gears have a potential for direct interaction with ESA listed species. The seasonality and geographic extent, including fishing depth and north/south distribution of the different target strategies and gears, result in different direct effects on ESA listed species.

“Interrelated actions” are those that are part of a larger action and depend on the larger action for their justification. “Interdependent actions” are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interrelated or interdependent actions for the proposed action.

For EFH consultation, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

1.3.1 Groundfish Species

The groundfish FMP includes more than 90 species: 60-plus rockfish species, including all genera and species from the family Scorpaenidae (genera *Sebastes*, *Scorpaena*, *Sebastolobus*, and *Scorpaenodes*) occurring in waters off Washington, Oregon, and California (Figure 1-1); 12 flatfish species; 6 roundfish species; and miscellaneous fish species that include sharks, skates,

grenadiers, rattails, and morids. Commercial and recreational fisheries also target Pacific whiting, sablefish, lingcod, rockfish, and flatfish species.

1.3.1.1 Current Management Structure and Fishing Gear

Multiple groundfish fisheries operate under the groundfish FMP. A limited entry (LE) permit program for a commercial non-tribal fishery was established in 1994 for trawl, longline, and trap (or pot) gears. The majority of commercial groundfish harvest is caught by the LE fleet. An open access fishery also catches groundfish incidentally or in small amounts. Open access fishery participants may use, but are not limited to, longline, vertical hook-and-line, pot, setnet, trammel net, and non-groundfish trawl. In addition, there is a commercial tribal fishery off Washington. Participants in the tribal fishery use gear similar to that used in the non-tribal fisheries. Of these fisheries, eulachon are only caught in the trawl fisheries.

The groundfish fisheries can be divided into the groups described below, based on permitting requirements, gear, and target strategy:

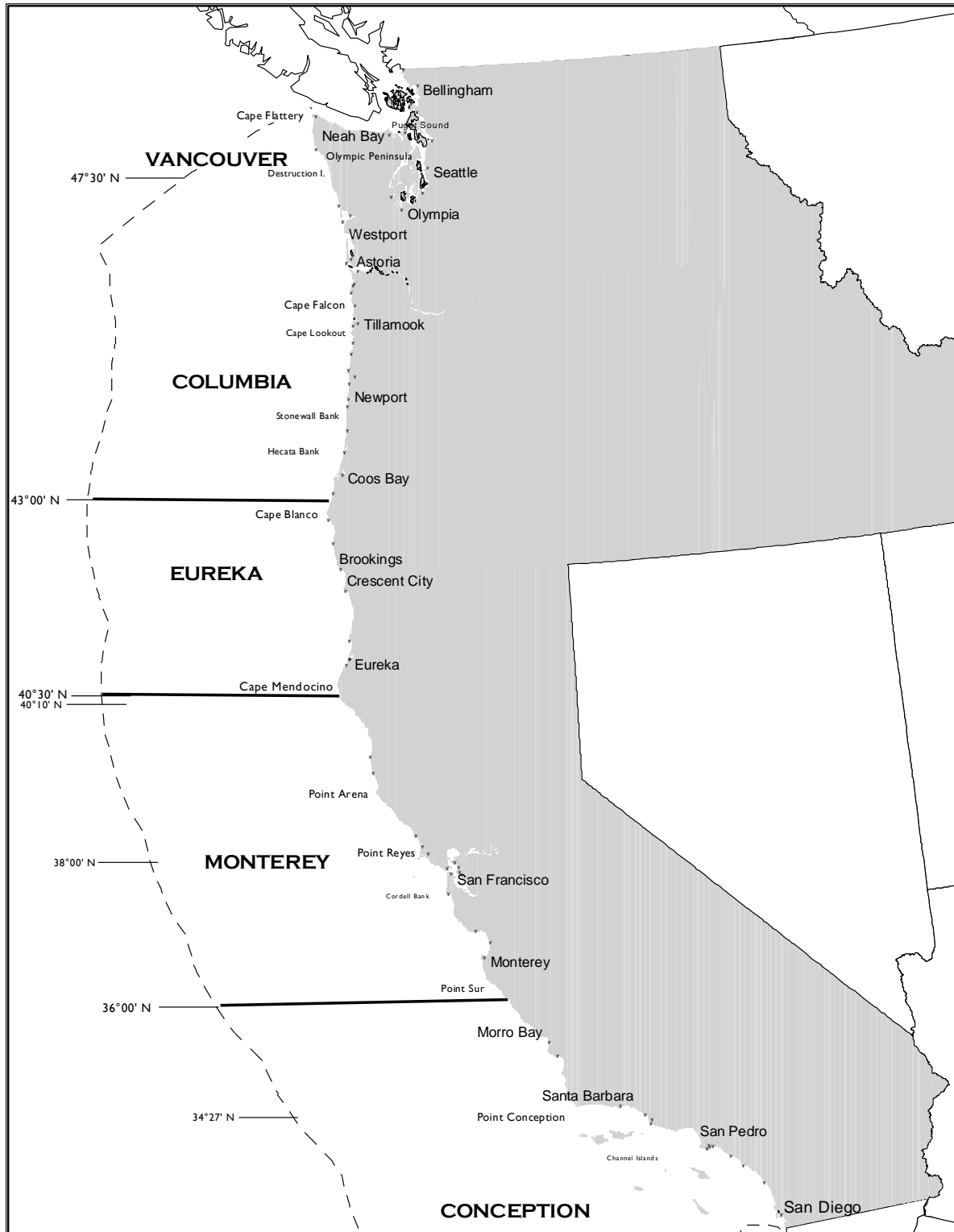


Figure 1-1. The fishery management area, showing major communities and groundfish management areas (PFMC 2015).

Table 1-1. Groundfish mortality (metric tons [mt]) by species and species groups, commercial and recreational fisheries (Bellman et al. 2008, Bellman et al. 2009, Bellman et al. 2010, Bellman et al. 2011, Bellman et al. 2012, Bellman et al. 2013, Somers et al. 2014, Somers et al. 2015, Somers et al. 2016).^{a/}

Species & Species Groups		Fishing Year											
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Roundfish	Cabazon ^{b/}	--	133	106	42	39	105	108	98	121	103	109	118
	California Scorpionfish	--	--	--	68	65	70	67	104	120	115	125	84
	Lingcod	588	890	952	706	574	581	450	852	1,068	1,294	1,298	1,489
	Pacific Cod	--	864	385	101	39	248	347	607	634	391	440	775
	Pacific Whiting	226,615	261,212	267,707	215,340	250,205	122,165	165,717	231,996	160,706	234,499	265,120	155,559
Flatfish	Sablefish	6,235	6,543	6,470	5,545	6,078	7,400	7,205	6,582	5,406	4,193	4,518	5,183
	Arrowtooth	5,668	3,706	3,105	3,099	3,409	5,443	4,090	2,666	2,508	2,510	1,844	1,771
	Dover Sole	7,213	7,507	7,730	10,227	11,820	12,546	10,952	7,927	7,175	8,081	6,566	6,328
	English Sole	1,229	1,222	1,336	914	436	501	311	205	224	357	306	386
	Petrale Sole	2,119	2,766	2,723	2,340	2,260	1,978	936	953	1,111	2,265	2,439	2,670
	Starry Flounder	--	--	--	30	21	28	38	24	17	9	28	29
	All other Flatfish	1,889	1,965	1,962	1,649	1,040	1,565	1,144	921	897	1,080	1,106	1,087
	Bocaccio	105	97	61	67	47	70.6	72	112	140	149	119	138
	Canary	48	49	57	46	41	38	43	52	45	43	46	79
	Chilipepper	153	97	126	128	151	311	376	329	302	404	334	199
Rockfish	Cowcod	2	2	1	3	1	1	1	1	1	2	1	1
	Darkbloched	231	124	193	285	253	301	332	133	105	133	140	117
	POP	152	76	80	157	131	181	159	62	56	58	56	41
	Thornyheads	1,562	1,546	1,707	2,114	2,972	3,377	3,263	2,001	1,861	2,171	1,822	1,654
	Widow	119	199	214	259	238	195	173	216	278	499	748	375
	Yelloweye	16	16	12	19	12	11	8	9	12	11	9	11
	Yellowtail	739	935	493	389	476	751	955	1,352	1,570	1,424	1,462	1,386
	Nearshore unspecified ^{b/}	--	1,527	1,703	1,436	1,240	1,442	1,308	1,266	1,353	1,667	655	739
	Shelf, unspecified ^{b/}	--	501	230	519	296	352	335	433	499	521	513	608
	Slope, unspecified ^{b/}	1,754	672	701	814	850	951	884	574	772	552	508	337
	Other	Kelp Greenling	--	35	48	53	57	63	59	75	65	70	54
Grenadiers, unspecified		--	--	--	414	379	248	365	240	201	318	156	303
Spiny dogfish		--	2,044	1,407	1,504	2,497	1,207	1,215	1,662	831	652	625	457
Skates,unspecified		--	1,920	1,029	2,192	2,314	2,186	1,723	1,555	1,396	1,178	1,414	1,406
All other groundfish ^{c/}		--	2,425	1,015	414	277	212	215	122	209	145	125	123

^{a/}Included small amounts of research catch.

^{b/}Columns 2007 to 2008 include only California catch; columns 2009 to 2013 include both California and Oregon catch.

^{c/}These are an aggregation of species specific to this report and combined species managed individually with species managed in complexes.

1.3.2 Overview of Trawl Fisheries

In 2011, a major change occurred in the management of the trawl fishery when a catch share program was implemented. Catch shares consist of an IFQ program for the shorebased trawl fleet and harvester cooperatives for the at-sea and catcher-processor fleets. The catch share system divides the portion of the annual catch limit (ACL) allocated to the trawl fishery into shares controlled by individual fishermen or groups of fishermen (coops). The shares can be harvested largely at the fishermen's discretion. IFQ species and Pacific halibut catch are deducted from the fisherman's personal quota or the pooled quota (coops). Under catch shares, some management measures from the previous management structure remain in place. These measures include trip limits for non-IFQ species, size limits, and area restrictions. The groundfish trawl fisheries most likely to encounter eulachon and, thus, are the primary focus of this biological opinion.

Eulachon bycatch in U.S. west coast groundfish fisheries appears to be driven by both eulachon distribution and cyclic abundance. Evidence from some surveys (NWFSC-EW 2012) indicates that the latitudinal and longitudinal range of eulachon likely expands in years of high abundance, perhaps leading to an increase in bycatch. In addition, point estimates of bycatch might fluctuate due to a number of non-biological factors, including annual variation in observer coverage rates, trawl duration, trawl depth, trawl location, seasonality, and haul volume coupled with trawl-net mesh size.

Current trawl regulations define the following trawl gear types: large footrope trawl, small footrope trawl, selective flatfish trawl (SFFT), and midwater trawl. Regulations at 50 CFR 660.130(c)(4) state that a vessel fishing north of 40°10' N. latitude may not have both bottom trawl gear and midwater trawl gear onboard simultaneously, nor may a vessel may have more than one type of LE bottom trawl gear on board, either simultaneously or successively, during a cumulative limit period.

In June 2016, the Council recommended a suite of regulatory changes to the bottom and midwater trawl fishing gear restrictions that may affect how the fisheries are operated in coming years. These changes may have an impact on eulachon. The Council-recommended changes include the following:

1. Removing all mesh size restrictions on bottom and midwater trawl nets;
2. Updating methods for measuring minimum mesh size;
3. Removing restrictions requiring the use of single walled codends;
4. Removing the prohibition on using chafing gear to create the effect of a double-walled codend;
5. Removing chafing gear restrictions;
6. Removing the required use of selective flatfish trawl requirement north of 40°10' N. latitude and allowing any type of small footrope trawl to be used shoreward of the RCAs;
7. Removing restrictions that prohibit the use of multiple types of trawl gear on a single trip;
8. Removing restrictions that prohibit fishing in multiple IFQ management areas on a single trip; and
9. Removing restrictions on bring more than a single haul on board at a time.

In September 2018, NMFS issued a proposed rule (83 FR 45396) revising Federal regulations that restrict the use and configuration of bottom and midwater trawl gear for vessels fishing under the Pacific Coast Groundfish Fishery's Trawl Rationalization Program. The gear restrictions were originally implemented to limit discarding and protect overfished rockfish species. These restrictions are no longer necessary because of changes to the fishery, including implementation of the Trawl Rationalization Program in 2011, and improved status of a number of overfished rockfish stocks. By eliminating these regulations, the proposed action could increase flexibility in how vessels can use and configure gear to increase access to target stocks and efficiency of fishing practices, while still limiting the catch of target and non-target discards to meet the conservation objectives of the Trawl Rationalization Program.

Current Federal regulations in the commercial groundfish fishery mandate minimum trawl mesh sizes of 4.5 inches and 3.0 inches in the bottom and midwater trawl fisheries, respectively. One of the actions recommended by NMFS in the 2018 proposed rule is to remove the requirement for minimum mesh size on bottom trawl and midwater trawl nets. Reducing the mesh size of the midwater and bottom trawl codends to something smaller than 3 inches could increase catch and discard of small fish (including non-groundfish species). However, it is unlikely that participants in the catch share program would construct and use complete codends with meshes smaller than 3 inches. Most fishermen would likely continue using codends (and other large sections of their trawl) with mesh sizes similar to those currently used, with the exception of strategically placed small meshes that may benefit the installation and functionality of selective devices. Use of smaller meshes may allow for development of selective devices that could reduce the catch of small fish, including eulachon. Thomsen (1993), Rose (1996), and Ryer (2008) demonstrated behavior differences between roundfish (e.g., cod) and flatfish that allow for their separation within bottom trawls. Roundfish typically rise as they fall back into the trawl, whereas flatfish remain in the lower part. Sorting devices, such as horizontal separator panels made of small mesh (O'Neil and Mutch 2017) have been used to separate roundfish from flatfish in trawls based on these behavioral differences (Ryer 2008). This type of small-mesh selective device may also be effective for promoting escapement of small pelagic fishes (such as eulachon) from flatfish in nearshore flatfish trawls. Small-mesh ramps or tubes designed to guide fish out of trawls through top or side-escape panels (O'Neil and Mutch 2017) could further promote escapement of eulachon from these flatfish trawls before reaching the codend (e.g., through top-side escape panels). Escape mortality of fish is likely lower when escapement occurs far in front of the codend through escape panels (rather than through net meshes) (Suuronen and Erickson 2010).

Reducing codend and intermediate mesh sizes would increase fuel consumption and decrease efficiency of the trawl nets to unacceptable levels. However, some individuals may use complete 3-inch mesh codends on bottom trawls while targeting widow rockfish and yellowtail rockfish to avoid gilling.

To test some of these proposed gear changes that would allow greater access to midwater rockfish species, exempted fishing permits (EFP) were issued in both 2017 and 2018, and are anticipated to occur in 2019 as well. This was done to enable better understanding of some of these proposed changes and their effects on target and ESA-listed species. The results of the 2017 and 2018 EFPs were incorporated, where possible, into the environmental assessment for

the proposed gear changes. Additional information collected through these EFPs in subsequent years will be used to inform further Council action.

1.3.2.1 At-Sea Pacific Whiting Cooperatives

During specified dates referred to as the primary season, May 15 to December 31, midwater trawl gear is used to target Pacific whiting in the at-sea sectors (mothership and catcher-processor cooperatives). Catcher-processors both harvest and process catch, while mothership vessels process catch received from catcher vessels. Catch of non-whiting species during this period has largely consisted of spiny dogfish, yellowtail rockfish, widow rockfish, minor slope rockfish, thornyheads, sablefish, darkblotched rockfish, Pacific Ocean perch (POP), and arrowtooth flounder. Annual set-asides of the overall trawl allocations are established for most incidentally caught groundfish.

In 2017, there were 10 catcher-processor permits (9 of which are registered to vessels), 6 permitted mothership vessels, and 34 LE catcher permits with mothership endorsements (mothership/catcher-processor vessel permits, 31 of which are registered to vessels). The at-sea fleet has the mobility to follow the movement of Pacific whiting. The catcher-processors are large vessels with the capacity to target Pacific whiting at deeper depths than some of the smaller catcher vessels that harvest in the mothership or shoreside IFQ sectors. At times, the at-sea fleet has fished at depths greater than 200 fm. Since 1992, the at-sea fleet has been restricted from harvesting south of 42° N. latitude (57 FR 14663).

Prior to 2009, the sectors (including shoreside) operated without bycatch limits (1990 to 2006) for overfished species, or a whiting sector combined bycatch limit for overfished species (2007 to 2008). This led to a race for Pacific whiting until the allocation was reached, or a bycatch cap for an overfished species shut down the sectors from fishing. In 2009, sector-specific bycatch caps for overfished species were established, which led to sectors being able to manage their fishing activity individually. From 1997 to 2010, the catcher-processor fleet operated under a voluntary coop program through the Pacific Whiting Conservation Cooperative (PWCC). In 2011, the mothership sector began operating under a single coop agreement under the new catch share program.

With the implementation of the catch share program under Amendment 20 to the groundfish FMP, there were few changes to the management of PWCC. The catch share program secured the position of the PWCC by continuing the closed class of catcher-processor permits established as an interim measure through Amendment 15 to the groundfish FMP. Regulations at 50 CFR 660.160(h) require that if the coop dissolves, the coop's quota would be apportioned equally among the vessels who are current members. For the mothership sector, the catch share program provided the opportunity for the owners of mothership catcher vessels permits to form harvester coops. Each year, owners of such permits must choose whether to participate in a catcher vessel coop; if they decide to participate, they have to identify the mothership to which they are committing their deliveries. To date, the mothership catcher vessel permit holders have chosen to form a single coop, and they have all elected to join that coop. If a catcher vessel does not choose a coop, it can participate in a non-coop fishery and receive the respective allocations. However, a vessel with a mothership catcher vessel endorsed permit may not fish in both the coop and non-coop fisheries in the same year.

Under the typical coop agreements, the primary goal is to minimize bycatch with each fleet using real time monitoring to track location and catch amounts. For the mothership coop, there are specific measures for avoiding high bycatch, including area restrictions and moving protocols, when specific base rates are exceeded. All vessels participating in the mothership coop must carry NMFS observers.

For the catcher-processor sector, there are fewer vessels and companies participating within the coop; therefore, no specific base rates are stated explicitly within the coop agreement. However, fishery participants review vessel reports frequently (hourly to daily); if bycatch rates are above acceptable levels, PWCC discusses what actions should be taken with the vessels.

Both the mothership and catcher-processor sectors use a private contracting service called Seastate. Seastate uses electronically submitted observer data to calculate bycatch rates and provides the data back to the fleet within 24 hours to be used for bycatch avoidance. The Seastate service allows for quick turnaround of information, provides an avenue for vessels to work together to reduce bycatch, and enables sharing of otherwise confidential data.

1.3.2.2 Shorebased IFQ Trawl Fishery

The IFQ fishery consists of permit owners who are issued quota pounds for most groundfish stocks and stock complexes; vessels registered to LE trawl permits; and shorebased IFQ first receivers. The fishery includes vessels using midwater trawl gear to target Pacific whiting, vessels using bottom trawl gear to harvest non-whiting and minor levels of Pacific whiting, vessels using mid-water trawl to target non-whiting groundfish, and vessels using fixed gears (gear switching) to harvest trawl IFQ. In 2017, 175 LE trawl permits were issued for the shorebased IFQ fishery (all gears). Vessels fished throughout the year in a wide range of depths and delivered catch to shoreside processors in Washington, Oregon, and California ports.

1.3.2.3 Pacific Whiting Shoreside Fishery

Vessels participating in the Pacific whiting shoreside fishery use midwater trawl gear during the primary whiting season, May 15 to December 31. These vessels land their catch on shore. When compared to the at-sea fleet they tend to fish in waters closer to the ports where first receivers are located. Since implementation of the shorebased IFQ program in 2011, the number of vessels has decreased from 36 vessels in 2010 to 23 vessels in 2016. These vessels may also deliver catch to the mothership sector if they have a mothership catcher vessel endorsement permit. Most shoreside Pacific whiting vessels also fish in Alaska fisheries.

1.3.2.4 Bottom Trawl Fishery

Bottom trawlers often target species assemblages, which can result in diverse catch. A single groundfish bottom-trawl tow often includes 15 to 20 groundfish species. The following species account for the bulk of non-whiting landings, by weight: Dover sole, arrowtooth flounder, petrale sole, sablefish, longspine thornyhead and shortspine thornyhead, yellowtail rockfish, and skates/rays. Bottom trawl gear includes small footrope (less than 8-inch diameter) and large footrope (more than 8-inch diameter and no larger than 19 inches in diameter) gear designed to remain in contact with the ocean floor and used to target species that reside along the ocean bottom. Fishermen generally use small footrope trawl gear in areas that have few rocks or

outcroppings and more widely on the continental shelf than on the continental slope; in large part, this is due to regulatory requirements. Only small footrope gear is allowed in areas shallower than 100 fm. In nearshore areas, selective flatfish trawl gear, a type of small footrope trawl, has been required north of 40°10' N. latitude. Fishermen most commonly use large footrope trawl gear in areas that have an irregular substrate, along the continental slope and in deeper water.

Most bycatch of eulachon by the bottom trawl fishery occurs shoreward of the rockfish conservation areas (RCA) and north of 42° N. latitude. Ninety percent of the eulachon encounters by bottom trawls north of 40°10' N. latitude occur at bottom depths less than 100 fathoms. Almost no eulachon encounters are reported in the West Coast Groundfish Observer Program database for bottom trawl sets made between 42° and 40°10' N latitude.

1.3.2.5 Non-whiting Midwater Trawl

Since 2011, midwater trawl vessels have increased targeting of widow and yellowtail rockfish with midwater trawl gear. In the 1980s and 1990s, midwater trawl gear was used to harvest large volumes of widow, yellowtail, and chilipepper rockfish. In 2001, widow rockfish was declared overfished, and targeting opportunities for widow and yellowtail rockfish were eliminated in 2002. Retention was restricted to the Pacific whiting trips with greater than 10,000 lbs of whiting. Trip limits for widow and yellowtail rockfish were reduced to accommodate incidental catch and prevent targeting on widow rockfish while fishing for Pacific whiting. Targeting opportunities for chilipepper rockfish with midwater gear were eliminated in 2003, but larger limits (large enough to allow targeting) were reinstated seaward of the RCAs in 2005. With implementation of the shorebased individual fishing quota (IFQ) program in 2011, in which catch of all IFQ species, including discards, is accounted for with quota pounds, the restrictive trip limits that allowed widow and yellowtail rockfish retention only by vessels harvesting Pacific whiting during the primary fishery were eliminated. Widow rockfish was determined to be rebuilt in 2012; canary rockfish, a co-occurring species that can constrain midwater trawl activity, was declared rebuilt in 2015. With the ACLs for these midwater species increased, an increase in the targeting of rockfish such as yellowtail rockfish, widow, and chilipepper is expected to occur. The current midwater non-whiting trawl fishery occurs during the dates of the Pacific whiting primary season north of 40°10' N. latitude and seaward of the trawl RCA south of 40°10' N. latitude. The Council recommended EFP work to examine the effects of a year-round, coastwide midwater non-whiting trawl fishery in 2018, which will likely continue in 2019.

1.3.3 Tribal Groundfish Fisheries

Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have fishing rights off the Washington Coast under treaties with the United States. Tribal treaty fishing is restricted to each tribe's usual and accustomed fishing grounds and stations. Under treaty arrangements, each tribe manages the fisheries prosecuted by their members. Tribal allocations of several species are set by NMFS in coordination with the Council. Washington state treaty tribes have formal allocations for sablefish, black rockfish, and Pacific whiting. For other groundfish species without formal allocations, the tribes propose trip limits to the Council, which the Council accommodates while ensuring that catch limits for all groundfish species are not exceeded.

All four tribes have longline vessels in their fleets, but only the Makah Tribe has trawlers. The Makah trawl vessels use both midwater and bottom trawl gear to target groundfish. The Makah Tribe also has the majority of longline vessels, followed by Quinault, Quileute, and Hoh Tribes. Since 1996, a portion of the United States Pacific whiting total allowable catch (TAC) has been allocated to the West Coast treaty tribes. Tribal allocations for whiting have been based on discussions with the tribes regarding their intent for a specific fishing year, and scientific information regarding the amount of the whiting TAC that passes through the combined usual and accustomed fishing grounds. From 2007 to 2016, the tribal allocation has ranged from 13 to 37 percent of the United States Pacific whiting TAC. Although the Quinault, Quileute, and Makah Tribes have expressed interest in the whiting fishery, to date, only the Makah Tribe has participated in the Pacific whiting fishery. In addition, the Makah Tribe has a midwater trawl fishery that primarily targets yellowtail rockfish and a bottom trawl fishery that targets petrale sole.

In developing its trawl fisheries, the Makah Tribe has implemented management practices that include test fishing to show tribal managers that the fishery can be conducted with gear and in areas without harming existing tribal fisheries. In the Makah bottom trawl fishery, the tribe adopted small footrope restrictions as a means to reduce rockfish bycatch and avoid areas where higher incidences of rockfish occur. In addition, the bottom trawl fishery is limited by overall footrope length as a means to conduct a more controlled fishery. Harvest is restricted by time and area to focus on harvestable species while avoiding bycatch of other species. If bycatch of rockfish is above a set amount, the fishery is modified to stay within the bycatch limit. The midwater trawl fishery has similar control measures. A trawl area must first be tested to determine the incidence of overfished rockfish species prior to opening the area to harvest. Vessels are provided guidelines for fishing techniques and operation of their nets. Fishing effort is monitored by observers, and changes or restrictions are implemented as needed to stay within the bycatch limits.

The tribe also conduct a longline fishery for sablefish. Approximately one-third of the tribal sablefish allocation is caught during an open competition fishery, where vessels from all four tribes have access to the overall tribal sablefish allocation. The open competition portion tends to be taken during the same period as the main tribal commercial Pacific halibut fisheries conducted in March and April. The remaining two-thirds of the tribal sablefish allocation are split between the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual tribes. Participants in the halibut and sablefish fisheries tend to use hook and line gear, as required by the International Pacific Halibut Commission. The tribes use snap-line gear in the fully competitive sablefish fishery. Eulachon are encountered in the trawl fishery conducted by the Makah tribe.

1.3.4 Fixed Gear Fisheries

1.3.4.1 Limited Entry Fixed Gear

The Limited Entry fixed gear groundfish fishery consists of vessels fishing in the sablefish-endorsement tier fishery and the trip limit fishery targeting nearshore species and non-nearshore species, including the daily trip limit fishery for sablefish. Limited Entry fixed gear (LEFG) fishing is constrained by measures needed to reduce catch of overfished species, including

yelloweye rockfish north of 40°10' N, latitude, and cowcod south of 40°10' N. latitude. The Limited Entry fixed gear fishery has no history of interactions with eulachon and, therefore, are not analyzed further in this biological opinion.

1.3.4.2 Open Access Fixed Gear

The open access (OA) sector consists of vessels that do not hold a federal groundfish Limited Entry permit. They target groundfish (OA directed fisheries) or catch them incidentally (OA incidental fisheries) using a variety of gears. Vessels in this sector may hold Federal or State permits for nongroundfish fisheries. OA vessels must comply with cumulative trip limits established for the OA sector and are subject to the other operational restrictions imposed in the regulations, including general compliance with the RCA restrictions.

Fishermen use various non-trawl gears (including: longline, trap or pot, setnet, and stationary hook-and line, vertical hook-and-line, troll) to target particular groundfish species or species groups. Longline and hook and line gear are the most common open access gear types used by vessels directly targeting groundfish and are generally used to target sablefish, rockfish, and lingcod. Pot gear is used for targeting sablefish, thornyheads, and rockfish. The directed open access fishery is further grouped into the “dead” and/or “live” fish fisheries. In the live-fish fishery, groundfish are primarily caught with hook-and-line gear (rod-and-reel), limited entry longline gear, and a variety of other hook gears (e.g., stick gear). The fish are kept alive in a seawater tank on board the vessel.

The open access fixed gear fisheries have no history of interactions with eulachon and, therefore, are not analyzed further in this biological opinion.

1.3.5 Recreational Groundfish Fisheries

Recreational groundfish fisheries are primarily managed by the states, with a distinction made between charter vessels (commercial passenger fishing vessels [CPFVs]) and private-party recreational vessels (individuals fishing from their own or rented boats). Management measures are designed to limit catch of overfished species and to provide fishing opportunity for anglers targeting nearshore groundfish species. The recreational groundfish fisheries have no interactions with eulachon and, therefore, are not analyzed further in this biological opinion.

1.3.6 Fishing Seasons

This section describes the different fishing seasons for gear types in the groundfish fishery. Each of the fisheries described in the sections below has a history of interactions with eulachon.

1.3.6.1 At-sea Pacific Whiting Cooperative Fishery Season

The Pacific whiting primary season for the at-sea sectors begins on May 15 and continues until the sector allocations are caught or their fishing concludes. Because many of the vessels are also used in the Alaska groundfish fishery and participate in the pollock B-season (June to October), much of the participation in the Pacific whiting fishery has occurred before the Alaska pollock fishery and then again after the Alaska fishery. Since 2011, most of the catcher-processor activity has occurred from mid-May to early June and late September to late November, and most of the

mothership activity has occurred from mid May to early June and from mid-September to mid-November. Generally, there is little or no fishing activity in the Pacific whiting at-sea fishery during July and August.

1.3.6.2 Shorebased IFQ Trawl Fishery Season

Like the at-sea sectors, the Pacific whiting shorebased IFQ fishery has a specified start date for the primary season. Since 1997, a framework has been used for setting Pacific whiting fishery season dates for the area north of 40°30' N. latitude. Under the framework, the fishery opens north of 42° N. latitude on June 15; between 42° and 40°30' N. latitude, the season opens April 1; south of 40°30' N. latitude, the season opens April 15. The Pacific whiting shorebased IFQ fishery primary season start dates changed in 2015 to allow the midwater fishery north of 40°30' N. latitude to open coastwide on May 15. Since 2011, the Pacific whiting shorebased IFQ fishery has harvested most of its Pacific whiting from mid-June through September, with smaller amounts being taken after September. Changing the season start date aligned the Pacific whiting shorebased IFQ fishery with the at-sea sector start data to allow access to non-whiting species one month earlier.

The bottom trawl fishery is a year-round fishery in which vessels fish in a wide range of depths and deliver catch to shoreside processors. These vessels primarily target Dover sole, thornyheads, sablefish, shelf flatfish, and mixed rockfish. Since 2011, the peak of non-whiting groundfish catch (all gears) has occurred in the spring, in either March or April; with a secondary, lower peak happening in October. Two important and valuable species in this fishery are sablefish and petrale sole. Sablefish catch peaks in the fall, during September and October, and petrale sole catch peaks in the winter during December and January. January catch of petrale sole has been rising each year since 2011. Some trawlers report that petrale sole has been a good alternative to Dungeness crab fishing in January.

The non-whiting midwater trawl fishery currently has the same season start date as the Pacific whiting shorebased IFQ fishery. To date, the non-whiting midwater trawl fishery has not yet established a clear seasonality. The Council is considering removing the season restrictions for midwater non-whiting IFQ and allowing the fishery to operate year-round either north of 40°10' N. latitude or coastwide. IFQ vessels also use non-trawl gears (gear switching). Non-trawl gears are primarily used to target sablefish. Gear switching is allowed year-round. Given the gear switching provision, most fish landed with fixed gear and attributed to the shorebased trawl IFQ program are sablefish, and the seasonality is the same as IFQ in general.

1.3.6.3 Tribal Fisheries

The tribal non-whiting groundfish fishery shows a dome-shaped seasonal pattern from 2011 through 2014, generally peaking in the summer months between May and September. The main groundfish species landings include sablefish, yellowtail rockfish, Pacific cod, petrale sole, and Dover sole. Historically, the Pacific whiting tribal fishery tended to occur between June and September.

1.3.7 Essential Fish Habitat Conservation Areas (EFHCAs)

In March 2006, NMFS approved a plan to establish and protect more than 130,000 square miles off the United States West Coast as EFH for groundfish (72 FR 27408; Amendment 19 to the Pacific Coast Groundfish FMP). EFHCAs are geographic areas defined by coordinates expressed in degrees of latitude and longitude, wherein fishing by a particular gear type or types may be prohibited. EFHCAs are created and enforced to contribute to protection of West Coast groundfish essential fish habitat. NMFS works with the Council to review EFH components of the fishery management plans periodically and to revise these provisions based on available information.

In April 2018, the Council took final action on EFHCAs to recommend addition of, modification to, or removal of, certain area management restrictions in Amendment 28 to the Pacific Coast Groundfish FMP. In Amendment 28, the Council recommended revisions to EFHCAs, and elimination of the trawl RCA off Oregon and California. EFHCA changes include closure of most of the Southern California Bight to bottom trawl gear, as well as other changes, including re-opening of areas off Washington, Oregon and California. Areas that would be re-opened would no longer have EFHCA or trawl RCA-related prohibitions, but may be closed by other restrictions (e.g. state rules, other groundfish conservation areas). EFHCAs that are closed prohibit bottom trawling (except demersal seine gear in areas off California). Nearshore areas (inside a boundary line approximating the 100 fm depth contour, formerly “shoreward of the trawl RCA”) would remain closed to large footrope trawl gear.

The Council’s final preferred alternative would add new protections for deep sea coral areas, modify areas that protect priority bottom habitat for groundfish, and reopen some areas that have been closed to bottom trawling. The Council will transmit these to NMFS for consideration. NMFS anticipates implementing the final action by January 1, 2020.

1.3.8 Closed Areas that Apply to Trawl Fisheries

The groundfish fisheries operate coastwide in state and Federal waters. Groundfish fisheries managed under the FMP occur in the EEZ. Area closures have been a primary tool used in management of the fisheries and have varied in number and size as management objectives evolve. Although most of the closed areas do not have non-groundfish bycatch reduction as an objective, an ancillary effect may be that they mitigate some adverse effects including bycatch reduction. This section describes the various types of closed areas that apply to all of the groundfish fisheries, followed by fishery-specific closed areas.

Closed areas that apply to the trawl fisheries differ for bottom trawl and midwater trawl. Midwater trawl is generally less restricted than bottom trawl. In addition, vessels targeting Pacific whiting have specific area restrictions.

1.3.8.1 Trawl Rockfish Conservation Areas

Vessels with bottom trawl gear onboard can transit through trawl RCAs, but are prohibited from fishing in these areas. Fishing with midwater trawl gear is allowed within the RCAs north of 40°10’ N. latitude during the Pacific whiting season. From 2002 to 2011, midwater trawl gear used to target Pacific whiting (trips with more than 10,000 lbs of whiting) was exempt from

RCA restrictions north of 40°10' N. latitude during the primary whiting season. Beginning in 2011, all midwater trawl fishing (Pacific whiting and non-whiting) has been allowed within the RCAs 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.

1.3.8.2 Bycatch Reduction Areas

Federal regulations at 50 CFR § 660.60(d) for the Pacific whiting fishery include a fishery management mechanism referred to as bycatch reduction areas (BRAs). BRAs may be implemented inseason under automatic action authority when NMFS projects that a whiting sector will exceed an allocation for a non-whiting groundfish species specified for that sector before the sector reaches its projected whiting allocation. The BRAs are depth closures that can close the waters shoreward of the 75 fm, 100 fm, or 150 fm depth contours to shift the Pacific whiting fishery into deeper waters. Because the Pacific whiting fishery is exempt from the RCA restrictions north of 40°10' N. latitude, the BRAs allow depth-based management when needed in the Pacific whiting fishery.

In response to the 2007 whiting fishery closure, sector-specific bycatch limits and BRAs were implemented for the Pacific whiting fishery with the 2009-2010 Groundfish Harvest Specification and Management Measures. The Council recommended that a regulatory provision be added to allow NMFS to impose depth-specific closures using the specified depth-based management lines in the 75 fm to 150 fm zone in the non-tribal whiting fishery by sector, if a sector is projected to attain a bycatch limit prior to attaining its whiting quota. Pacific whiting fishery bycatch limits were removed from regulation with implementation of the trawl rationalization program. The use of BRAs was further refined in 2011 and in 2013 (76 FR 53833, August 30, 2011, and 78 FR 580, January 3, 2013). Since implementation of the shorebased trawl IFQ program, individuals cease fishing when they catch their allocations. Therefore, the authority to close the Pacific whiting shorebased fishery through an automatic action has been removed. The BRAs have also been modified such that they are now considered to be a type of groundfish conservation area (GCA) (50 CFR § 660.11). Like RCAs, the BRAs are areas closed to fishing by particular gear types, bounded by lines approximating particular depth contours (50 CFR § 660.11). Federal regulations at 50 CFR §660.55 (c)(3)(i) continue to allow BRAs to be implemented through automatic action to prevent a Pacific whiting sector allocation from being exceeded. BRAs can also be implemented through routine inseason action to address broader conservation concerns. The use of BRAs to address any conservation concerns with eulachon has not been considered to date.

1.3.8.3 Salmon Conservation Zone Closed Areas Specific to the Pacific Whiting Fisheries

Vessels fishing in the Pacific whiting primary seasons for the shorebased IFQ program, mothership cooperative program, or catcher-processor cooperative program are prohibited from targeting Pacific whiting in numerous areas to reduce salmon bycatch.

Vessels targeting Pacific whiting with midwater trawl gear are prohibited from fishing in the ocean area known as the Columbia River Salmon Conservation Zone (CRSCZ) (50 CFR §

660.131(c)(2)). The CRSCZ was established in 1993 because of the concentrations of Chinook salmon in the area. This prohibition is likely to provide some additional protection for eulachon.

The proposed groundfish harvest specifications and management measures for 2019-2020 also include some changes to the CRSCZ. The proposed harvest specifications and management measures would also close the CRSCZ to all midwater trawling and to bottom trawling, unless vessels are using a selective flatfish trawl (SFFT). This action is a term and condition of the most recent biological opinion regarding salmon bycatch in the groundfish fishery (NMFS 2017a). Under current regulations, vessels using midwater trawl gear in the Pacific whiting primary season are prohibited from fishing in the CRSCZ. The proposed harvest specifications and management measures would extend the area prohibition to vessels using midwater trawl gear to target rockfish, including widow rockfish and yellowtail rockfish, a reemerging fishery following the rebuilding of widow rockfish in 2012.

1.3.9 Catch Monitoring and Enforcement

NMFS fishery observers collect valuable fisheries data, including fishing effort and location, estimates of retained and discarded catch, species composition, biological data, and protected species interactions. The data inform fisheries managers and stock assessment scientists, as well as other fisheries researchers. Observer catch data inform the vessel accounting system used for quota management. Observer data from the trawl fishery is also used to estimate bycatch of eulachon on an annual basis.

The greatest amount of monitoring occurs in the trawl fisheries (Table 1-2). In the at-sea Pacific whiting sectors, catch composition is closely monitored through an on-board observer program on processing vessels and electronic monitoring (video) or observers on mothership sector catcher vessels.¹ Each processing vessel 125 feet and longer must carry two observers that subsample close to 100 percent of all hauls. Processing vessels under 125 feet must carry one observer. Currently, there are no processing vessels under 125 feet. Since 2011, each mothership catcher vessel has carried one observer to account for discards or has used electronic video monitoring to verify full retention of catch. Prior to 2011, mothership catcher vessels were not monitored. Observers on the processing vessels subsample the catch to collect data used to estimate catch composition. In addition, the observers collect biological data from groundfish, protected species, and prohibited species. Catch data by species, groundfish and non-groundfish, are generally available and will continue to be available into the future for use in management decisions within 24 hours during the season.

Implementation of the shorebased IFQ program included an increase in observer coverage for all vessels fishing on IFQ quota pounds. This was an increase in coverage from approximately 25 percent pre-IFQ to nearly 100 percent of all groundfish landings with IFQ. With on-board observers, close to 100 percent of the hauls are sampled, with discards being accounted for at the haul level. The exception is in the Pacific whiting shorebased IFQ fishery, where most vessels

¹ Preliminary investigations on the use of electronic monitoring have been conducted under EFPs. Regulations are expected to be available in 2018 to monitor mothership catcher vessels and Pacific whiting shorebased IFQ vessels in lieu of the 100 percent observer coverage requirement.

retain nearly all their catch and do not sort at sea. In the Pacific whiting shorebased IFQ fishery, observers primarily monitor catch retention. Catch composition data are gathered onshore by catch monitors. Pacific whiting vessels may voluntarily use electronic monitoring to monitor catch retention.

Shorebased IFQ vessels must land catch at IFQ first receivers, where the landed catch is sorted and weighed. Catch monitors are individuals who collect data to verify that the catch is correctly sorted, weighed, and reported. Landings data and at-sea discards are later combined for total catch estimation. Prohibited species catch data for the IFQ fishery have not been available to fishery participants inseason. Total catch data for groundfish species are available approximately 11 to 12 months following the end of the fishing year. Estimated catch of salmonids is available during the season.

Tribal-directed groundfish fisheries are subject to full rockfish retention. Shorebased sampling and observer coverage are used to monitor the fisheries. Information on current coverage levels and protocols were not available.

Table 1-2. Type and level of monitoring by fishery sector.

Fishing Sector	Time Area Monitoring	Catch and Discard Monitoring	
	VMS Coverage	Observer Coverage (2013)	Other Coverage
Trawl IFQ	Vessel registered to LE permits must operate VMS 24 hours a day throughout the fishing year.	One observer per harvesting vessel; one catch monitor at first receivers	2015—There is optional electronic monitoring under EFPs. 2018—The option is expected to be in regulation.
Trawl at-sea whiting		Two observers per processor 125 feet and over, one per processor under 125 feet One observer per mothership harvesting vessel	Mothership harvesting vessels 2015—There was optional electronic monitoring under EFPs. 2018—The option is expected to be in regulation.
Tribal	Monitoring is not required, unless vessel is registered to non-tribal groundfish permit.	Observer coverage and shore-based sampling of groundfish directed fishing	There is no other coverage.

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per ESA requirements, Federal action agencies consult with NMFS, and section 7(b)(3) requires that NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats upon completing consultation. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies its impact and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This Opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This Opinion relies on the definition of "destruction or adverse modification," which means "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation of critical habitat for eulachon uses the term "essential features." The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used to conduct a "destruction or adverse analysis," which is the same regardless of whether the original designation identified PBFs or essential features. In this Opinion, we use the term PBF to mean essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or to destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.

- Integrate and synthesize the above factors by performing the following actions:
 1. Review the status of the species and critical habitat.
 2. Add the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized, or critical habitat is adversely modified or destroyed.
- If necessary, suggest an RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion examines the status of eulachon that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species faces, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current reproduction, numbers, or distribution, as described in 50 CFR 402.02. The Opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help form that conservation value.

2.3 Southern Eulachon

Recent documents relative to eulachon for this consultation include, but are not necessarily limited to, those listed below:

- 2016 5-Year Review Summary and Evaluation of Eulachon, NMFS West Coast Region (NMFS 2016)
- 2016 Status Review Update of Eulachon (*Thaleichthys pacificus*) Listed Under the Endangered Species Act, Southern Distinct Population Segment, NMFS Northwest Fisheries Science Center, March 2016 (Gustafson et al. 2016)
- Recovery Plan for the Southern Distinct Population Segment of Eulachon (*Thaleichthys pacificus*), NMFS West Coast Region, Protected Resources Division, September 2017 (NMFS 2017b)

On March 16, 2010, NMFS listed the SDPS of eulachon as a threatened species (75 FR 13012). This DPS encompasses all populations within the states of Washington, Oregon, and California and extends from the Skeena River in British Columbia south to the Mad River in Northern California (inclusive).

In May of 2011, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) released its assessment and status report for eulachon in Canada. COSEWIC divided the

Canadian portion of the United States-designated SDPS into three designatable units (DUs): Nass/Skeena Rivers population, Central Pacific Coast population, and Fraser River population (COSEWIC 2011a). DUs are discrete evolutionarily significant units (ESUs), where “significant” means that the unit is important to the evolutionary legacy of the species as a whole and, if lost, would likely not be replaced through natural dispersion (COSEWIC 2009). Thus, DUs are biologically similar to ESU and DPS designations under ESA. In 2011, the Fraser River population (the closest Canadian population to the conterminous United States) was assessed as endangered by COSEWIC. In 2016, the Fraser River population was assessed under the Species at Risk Act (SARA) though no determination has been released (DFO 2016).

2.3.1 Description and Geographic Range

Eulachon are endemic to the northeastern Pacific Ocean; they range from northern California to southwest and southcentral Alaska and into the southeastern Bering Sea. Puget Sound lies between two of the larger eulachon spawning rivers (the Columbia and Fraser Rivers), but it lacks a regular eulachon run of its own (Gustafson et al. 2010). Within the conterminous United States, most eulachon production originates in the Columbia River basin, and the major and most consistent spawning runs return to the Columbia River mainstem and Cowlitz River. Adult eulachon have been found at several Washington and Oregon coastal locations, and they were previously common in Oregon’s Umpqua River and the Klamath River in northern California. Runs occasionally occur in many other rivers and streams, but often erratically, appearing in some years, but not in others, and only rarely in some river systems (Hay and McCarter 2000; Willson et al. 2006; Gustafson et al. 2010). Since 2005, eulachon in spawning condition have been observed nearly every year in the Elwha River by Lower Elwha Tribe fishery biologists (NMFS 2011e). The Elwha is the only river in the United States portion of Puget Sound and the Strait of Juan de Fuca that supports a consistent eulachon run.

Eulachon generally spawn in rivers fed by either glaciers or snowpack and that experience spring freshets. Because these freshets rapidly move eulachon eggs and larvae to estuaries, eulachon are believed to imprint and home to an estuary into which several rivers drain, rather than individual spawning rivers (Hay and McCarter 2000). From December to May, eulachon typically enter the Columbia River system, with peak entry and spawning during February and March (Gustafson et al. 2010). They spawn in the lower Columbia River mainstem and multiple tributaries of the lower Columbia River.

Eulachon eggs, averaging 0.04 inch (1 mm), are commonly found attached to sand or pea-sized gravel, though eggs have been found on a variety of substrates, including silt, gravel-to-cobble size rock, and organic detritus (Smith and Saalfeld 1955; Langer et al. 1977; Lewis et al. 2002). Eggs found in areas of silt or organic debris reportedly suffer much higher mortality than those found in sand or gravel (Langer et al. 1977). The duration of incubation ranges from about 28 days in 4 to 5° C waters to 21 to 25 days in 8° C waters. Upon hatching, stream currents rapidly carry the newly hatched larvae, 0.16-inch to 0.31-inch (4 to 8 mm) long, to the sea. Young larvae are first found in the estuaries of known spawning rivers and then disperse along the coast. After yolk sac depletion, eulachon larvae acquire characteristics to survive in oceanic conditions and move off into open marine environments as juveniles. Eulachon return to their spawning river at ages ranging from 2 to 5 years as a single age class. Prior to entering their spawning rivers, eulachon hold in brackish waters while their bodies undergo physiological

changes in preparation for fresh water, as well as to synchronize their runs. Eulachon then enter the rivers, move upstream, spawn, and die to complete their semelparous life cycle (spawn once and die) (COSEWIC 2011a).

Adult eulachon weigh an average of 1.41 ounces (40 g) each and are 6 to 8 inches (15 to 20 cm) long with a maximum recorded length of 11.8 inches (30 cm). They are an important link in the food chain between zooplankton and larger organisms. Small salmon, lingcod, white sturgeon, and other fish feed on small larvae near river mouths. As eulachon mature, a wide variety of predators consume them at high rates (Gustafson et al. 2010).

NMFS completed a recovery plan for the SDPS of eulachon in September 2017 (NMFS 2017b). The blueprint for recovery covers eulachon that spawn in rivers from British Columbia's Nass River south to the Mad River in California. The NMFS Biological Review Team (BRT) that examined the status of eulachon categorized climate change impacts on ocean conditions as the most serious threat facing all four subpopulations of eulachon: Klamath River, Columbia River, Fraser River, and British Columbia coastal rivers south of the Nass River. Climate change impacts on freshwater habitat and eulachon bycatch in offshore shrimp fisheries were also ranked in the top four threats in all subpopulations of the SDPS (NMFS 2017b). Dams and water diversions in the Klamath and Columbia Rivers and predation in the Fraser River and British Columbia coastal rivers filled out the last of the top four threats (Gustafson et al. 2010). These threats, together with large declines in abundance, indicated to the BRT that eulachon was at moderate risk of extinction throughout all of its range (Gustafson et al. 2010). The recovery plan outlines a combination of strategies to address each of the threats through an adaptive management framework. The framework relies on the best available scientific information to tailor the approaches as research reveals more about the species and the strategies.

2.3.2 Spatial Structure and Diversity

There are no distinct differences among eulachon throughout the range of the SDPS. Eulachon population structure has not been determined below the DPS level. However, the eulachon BRT did separate the DPS into four subpopulations: the Klamath River (including the Mad River and Redwood Creek), the Columbia River (including all of its tributaries), the Fraser River, and the British Columbia coastal rivers (north of the Fraser River up to, and including, the Skeena River). The COSEWIC assessed eulachon populations in Canada and designated them with the following statuses: Nass/Skeena Rivers population (threatened), Central Pacific population (endangered), and Fraser River population (endangered) (COSEWIC 2011a).

The SDPS of eulachon is distinguished from eulachon occurring north of the DPS range by numerous factors, including genetic characteristics. Significant microsatellite DNA variation in eulachon has been reported from the Columbia River to Cook Inlet, Alaska (Beacham et al. 2005). Within the range of the SDPS, Beacham et al. (2005) found genetic affinities among the populations in the Fraser, Columbia, and Cowlitz Rivers and also among the Kemano, Klinaklini, and Bella Coola Rivers along the central British Columbia coast. In particular, there was evidence of a genetic discontinuity north of the Fraser River, with Fraser and Columbia/Cowlitz samples diverging three to six times more from samples further to the north than they did from each other. Similar to the study of McLean et al. (1999), Beacham et al. (2005) found that genetic differentiation among populations was correlated with geographic

distances. The authors also suggested that the pattern of eulachon differentiation was similar to that typically found in studies of marine fish, but less than that observed in most salmon species.

The BRT was concerned about risks to eulachon diversity because of its semelparity and data suggesting that Columbia and Fraser River spawning stocks may be limited to a single age class. These characteristics likely increase their vulnerability to environmental catastrophes and perturbations and provide less of a buffer against year-class failure than species such as herring that spawn repeatedly and have variable ages at maturity (Gustafson et al. 2010).

2.3.3 Abundance and Productivity

Eulachon are a short-lived, high-fecundity, high mortality forage fish, and such species typically have extremely large population sizes. Fecundity estimates range from 7,000 to 60,000 eggs per female with egg-to-larvae survival likely less than 1 percent (Gustafson et al. 2010). Among such marine species, high fecundity and mortality conditions may lead to random “sweepstake recruitment” events where only a small minority of spawning individuals contribute to subsequent generations (Hedgecock 1994).

Prior to 2011, few direct estimates of eulachon abundance existed in the United States. Escapement counts and spawning stock biomass estimates are only available for a small number of systems. Catch statistics from commercial and First Nations fisheries are available for some systems in which no direct estimates of abundance are available. However, inferring population status or even trends from yearly catch statistic changes requires making certain assumptions that are difficult to corroborate (e.g., assuming that harvest effort and efficiency are similar from year to year, assuming a consistent relationship among the harvested and total stock portion, and certain statistical assumptions, such as random sampling). Unfortunately, these assumptions cannot be verified—few fishery-independent sources of eulachon abundance data exist. However, the combination of catch records and anecdotal information indicates that there were large eulachon runs in the past and that eulachon populations have severely declined (Gustafson et al. 2010). As a result, eulachon numbers are at, or near, historically low levels throughout the range of the SDPS. Beginning in 2011, eulachon monitoring programs began in the Columbia River and other nearby rivers that estimate eulachon egg and larvae production to close this data gap.

Similar abundance declines have occurred in the Fraser River and in other coastal British Columbia rivers (Hay and McCarter 2000, Moody 2008). Over a three-generation span of 10 years (1999 to 2009), the overall Fraser River eulachon population biomass has declined by nearly 97 percent (Gustafson et al. 2010). In 1999, the biomass estimates were 418 metric tons;² by 2010, this number had dropped to 4 metric tons (Table 2-1). Abundance information is lacking for many coastal British Columbia subpopulations, but Gustafson et al. (2010) found that eulachon runs were universally larger in the past. Furthermore, the BRT was concerned that four out of seven coastal British Columbia subpopulations may be at risk of extirpation because of

² The United States ton is equivalent to 2,000 pounds, and the metric ton is equivalent to 2,204 pounds.

small population concerns such as Allee³ effects and random genetic and demographic effects (Gustafson et al. 2010). Under the Species at Risk Act, Canada designated the Fraser River population as endangered in May 2011 due to a 98 percent decline in spawning stock biomass over the previous 10 years (COSEWIC 2011a). From 2013 through 2017, the Fraser River eulachon spawner population estimate is 1,968,688 adults (Table 2-1).

Table 2-1. SDPS eulachon spawning estimates for the lower Fraser River, British Columbia (data from <http://www.pac.dfo.mpo.gc.ca/science/species-especies/pelagic-pelagique/herring-hareng/herspawn/pages/river1-eng.html>).

Year	Biomass estimate (metric tons)	Estimated spawner population ^a
2006	29	716,061
2007	41	1,012,363
2008	10	246,918
2009	14	345,685
2010	4	98,767
2011	31	765,445
2012	120	2,963,013
2013	100	2,469,177
2014	66	1,629,657
2015	317	7,827,292
2016	44	1,086,438
2017	35	864,211
2013-2017^b	80	1,968,688

^a Estimated population numbers are calculated as 11.2 eulachon per pound.

^b Five-year geometric mean of eulachon biomass estimates (2013 to 2017).

The Columbia River and its tributaries support the largest known eulachon run in the SDPS. Although direct estimates of adult spawning stock abundance are limited, commercial fishery landing records begin in 1888 and continue as a nearly uninterrupted data set to 2010 (Gustafson et al. 2010). From approximately 1915 to 1992, historical commercial catch levels were typically more than 500 metric tons, occasionally exceeding 1,000 metric tons. In 1993, eulachon catch levels began to decline and averaged less than 5 metric tons from 2005 to 2008 (Gustafson et al. 2010). In 2007, eulachon were petitioned for ESA-listing and were listed as threatened in 2010.

Beginning in 2011, WDFW and ODFW began to estimate eulachon abundance for the Columbia River watershed. Adopting methods that CDFO has used since 1995 to estimate the Fraser River eulachon spawning runs, researchers began estimating eulachon spawning runs for the Columbia River watershed. From 2011 to 2014, eulachon minimum abundance estimates for the Columbia River increased fivefold from 17.86 million to 84.24 million and then decreased to 8.15 million by 2017 (Langness 2017). WDFW retroactively estimated eulachon numbers from 2000 through

³ The negative population growth observed at low population densities. Reproduction, particularly finding a mate for migratory species, can be increasingly difficult as the population density decreases.

2010 for the Columbia River watershed (Gustafson et al. 2016). From 2001 through 2003, eulachon abundance peaked. By 2005, however, eulachon abundance had dropped to fewer than 1 million spawners.

From 2013 through 2017, the average eulachon spawner estimate for the Columbia River and its tributaries is 32,968,415 eulachon spawning adults (Table 2-2).

Table 2-2. SDPS eulachon spawning estimates for the lower Columbia River and its tributaries (unpublished data, R. Gustafson, Northwest Fisheries Science Center [NWFSC], June 8, 2017; Langness 2017).

Year	Biomass Estimate (metric tons)	Estimated spawner population ^a
2011	723	17,860,400
2012	810	20,008,600
2013	1,845	45,546,700
2014	3,412	84,243,100
2015	2,330	57,525,700
2016	877	21,654,800
2017	330	8,148,600
2013-2017^b	1,598	32,968,415

^a Estimated population numbers are calculated as 11.2 eulachon per pound.

^b Five-year geometric mean of mean eulachon biomass estimates (2013 to 2017).

In Northern California, no long-term eulachon monitoring programs exist. In the Klamath River, large eulachon spawning aggregations once occurred regularly, but eulachon abundance has declined substantially (Fry 1979; Moyle et al; 1995, Larson and Belchik 1998; Hamilton et al. 2005). Recent reports from Yurok Tribe fisheries biologists have revealed small runs of adult eulachon ranging from 7 (2011) to ~1,000 (2014) individuals in presence/absence surveys using seines and dip nets (Gustafson et al. 2016).

Beacham et al. (2005) reported that marine sampling by trawl showed that eulachon from different rivers mix during their 2 to 3 years of pre-spawning life in offshore marine waters, but not thoroughly. Their samples from southern British Columbia comprised a mix of fish from multiple rivers, but they were dominated by fish from the Columbia and Fraser River populations. The combined spawner estimate from the Columbia and Fraser rivers is 34.94 million eulachon.

2.3.4 Limiting Factors

The sections below describe factors that limit eulachon numbers. The section includes commercial and recreational harvest, shrimp fishery bycatch, and other factors.

2.3.4.1 Commercial and Recreational Harvest

In the past, commercial and recreational harvests likely contributed to eulachon decline. The best available information for catches comes from the Columbia River, where landings from

1938 to 1993 have averaged almost 2 million pounds per year (approximately 24.6 million fish) and have been as high as 5.7 million pounds in a single year (approximately 70 million fish) (Wydoski and Whitney 2003, Gustafson et al. 2010). Catch from recreational eulachon fisheries was also high historically (Wydoski and Whitney 2003); and at its height in popularity, the fishery would draw thousands of participants annually. Between 1994 and 2010, no catch exceeded one million pounds (approximately 12.3 million fish) annually and the median catch was approximately 43,000 pounds (approximately 529,000 fish), which amounts to a 97.7 percent reduction in catch (WDFW and ODFW 2001, JCRMS 2011). These persistently low eulachon returns and landings in the Columbia River from 1993 to 2000 prompted the states of Oregon and Washington to adopt a Joint State Eulachon Management Plan (Washington Department of Fish and Wildlife [WDFW] and Oregon Department of Fish and Wildlife [ODFW] 2001). Commercial and recreational fisheries continued through the 2009-2010 season, and then were closed until 2014 (Gustafson et al. 2016). Beginning in 2014, ODFW and WDFW worked with NMFS to reopen their commercial and recreational eulachon fisheries (JCRMS 2014). Based upon their 2001 Eulachon Management Plan, both state agencies now manage their eulachon fisheries using scientific surveys to estimate spawner abundance and set fishery locations, dates, times, and limits by classifying their fisheries into one of three levels from most (level one) to least conservative (three) (WDFW and ODFW 2001). Since 2014, the combined commercial, recreational, and tribal eulachon fisheries have harvested 2.7 (2014), 3.5 (2015), and 1.6 (2016) million eulachon in the Columbia, Cowlitz, and Sandy rivers (Gustafson et al. 2016).

In British Columbia, historically, the Fraser River supported a commercial eulachon fishery that is within the range of the southern DPS. However, this fishery has essentially been closed since 1997, only opening briefly in 2002 and 2004 when only minor catches were landed (DFO 2008, Gustafson et al. 2016).

2.3.4.2 Shrimp Fishery Bycatch

Historically, bycatch of eulachon in the pink shrimp fishery along the U.S. and Canadian coasts has been very high (composing up to 28 percent of the total catch by weight; Hay and McCarter 2000, DFO 2008). Prior to the mandated use of bycatch-reduction devices (BRDs) in the pink shrimp fishery, 32 to 61 percent of the total catch in the pink shrimp fishery consisted of non-shrimp biomass, made up mostly of Pacific hake, various species of smelt including Pacific eulachon, yellowtail rockfish, sablefish, and lingcod (*Ophiodon elongatus*) (Hannah and Jones 2007). Reducing bycatch in this fishery has long been an active field of research (Hannah et al. 2003, Hannah and Jones 2007, Frimodig 2008) and great progress has been made in reducing bycatch. As of 2005, following required implementation of BRDs, the total bycatch by weight had been reduced to about 7.5 percent of the total catch and osmerid smelt bycatch was reduced to an estimated average of 0.73 percent of the total catch across all BRD types (Hannah and Jones 2007). From 2004 through 2011, eulachon bycatch in the California, Oregon, and Washington state shrimp fishery peaked at 1.0 million eulachon in 2010 (Al-Humaidhi et al. 2012). However, from 2012 through 2015, eulachon bycatch greatly increased ranging from 42.6 (2012) to 68.8 (2014) million eulachon annually (Gustafson et al. 2017). Although BRDs were being used, it is believed that they may operate at reduced efficiency when eulachon reach higher densities (Gustafson et al. 2017). Recent experimentation with using green LED lights on the trawl lines of shrimp trawl nets have shown a reduction in eulachon bycatch by 91 percent ($p=0.0001$) when compared to control nets (Hannah et al. 2015). In 2017, ODFW, in

collaboration with the Pacific States Marine Fisheries Commission (PSMFC), continued to test the use of green LEDs on shrimp trawls nets on reducing fish bycatch (Groth et al. 2017).

2.3.4.3 Other Factors

Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. Dredging activities during the eulachon spawning run may entrain and kill adult and larval fish and eggs. Eulachon carry high levels of pollutants – arsenic, lead, mercury, DDE, 9H-Fluorene, and Phenanthrene (EPA 2002), and although it has not been demonstrated that high contaminant loads in eulachon have increased mortality or reduced reproductive success, such effects have been shown in other fish species (Kime 1995). The negative effects of these factors on the species and its habitat contributed to the determination to list the SDPS of eulachon under the ESA.

2.3.5 Status Summary

Adult spawning abundance of the SDPS of eulachon has increased since the listing occurred in 2010 (Gustafson et al. 2016). The improvement in estimated abundance in the Columbia River, relative to the time of listing, reflects both changes in biological status and improved monitoring. The documentation of eulachon returning to the Naselle, Chehalis, Elwha, and Klamath Rivers over the 2011-to-2015 return years also likely reflects both changes in biological status and improved monitoring. Although eulachon abundance in monitored populations has generally improved, especially in the 2013 and 2014 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years (Gustafson et al. 2016). Since the 2014 Columbia River eulachon spawner peak, eulachon runs have decreased each year. The 2017 run was the smallest since the eulachon surveys began in 2011, though it was still greater than when eulachon were ESA-listed (R. Gustafson, pers. comm., June 8, 2017). Overall, it is too early to tell whether abundance for the SDPS of eulachon will follow the recent upturns (2011 to 2014) or downturns (2015 to 2017) and whether it will avoid a return to the severely depressed abundance years of the mid-late 1990s and late 2000s (Gustafson et al. 2016).

2.4 Action Area

“Action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the Pacific Coast Groundfish Fishery, the action area includes the Exclusive Economic Zone (EEZ) and state waters of the Pacific Ocean. The action area does not extend into freshwater where eulachon spawn. Although the state-managed groundfish fisheries are not interrelated to, or interdependent with, the proposed action, vessels participating in federally managed fisheries transit through state waters and land fish within the states. Thus, some effects of the federally managed groundfish fishery occur in state waters. Figure 1-1 shows the area where fishing has occurred, and where the direct effects on the ESA-listed species are most likely to occur. It is reasonable to expect that future fishing will occur in the same areas.

2.5 Environmental Baseline

The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.5.1 Climate Change

Climate change impacts on ocean habitat are the most serious threat to persistence of the SDPS of eulachon (Gustafson et al. 2010); thus, it will be discussed in greater detail in this section. Scientific evidence strongly suggests that global climate change is already altering marine ecosystems from the tropics to polar seas. Physical changes associated with warming include increases in ocean temperature, increased stratification of the water column, and changes in the intensity and timing of coastal upwelling. These changes will alter primary and secondary productivity and the structure of marine communities (ISAB 2007).

Although the precise changes in ocean conditions cannot be predicted, they present a potentially severe threat to eulachon survival and recovery. Increases in ocean temperatures have already occurred and will likely continue to impact eulachon and their habitats. In the marine environment, eulachon rely upon cool or cold ocean regions and the pelagic invertebrate communities therein (Willson et al. 2006). Warming ocean temperatures will likely alter these communities, making it more difficult for eulachon and their larvae to locate or capture prey (Roemmich and McGowan 1995, Zamon and Welch 2005). Warmer waters could also allow for the northward expansion of eulachon predator and competitor ranges, increasing the already high predation pressure on the species (Rexstad and Pikitch 1986, McFarlane et al. 2000, Phillips et al. 2007).

Climate change along the entire Pacific Coast is expected to affect fresh water as well. Changes in hydrologic patterns may pose challenges to eulachon spawning because of decreased snowpack, increased peak flows, decreased base flow, changes in the timing and intensity of stream flows, and increased water temperatures (Morrison et al. 2002). In most rivers, eulachon typically spawn well before the spring freshet, near the seasonal flow minimum. This strategy typically results in egg hatch coinciding with peak spring river discharge. The expected alteration in stream flow timing may cause eulachon to spawn earlier or be flushed out of spawning rivers at an earlier date. Early emigration may result in a mismatch between entry of larval eulachon into the ocean and coastal upwelling, which could have a negative impact on marine survival of eulachon during this critical transition period (Gustafson et al. 2010, NMFS 2017b).

2.5.2 Commercial and Recreational Harvest

In the past, commercial and recreational harvests likely contributed to eulachon decline. However, commercial and recreational harvests declined significantly, beginning in 1994 (see Section 2.3.3.1 for details). Since 2014, the combined commercial, recreational, and tribal eulachon fisheries have harvested 2.7 (2014), 3.5 (2015), and 1.6 (2016) million eulachon in the Columbia, Cowlitz, and Sandy Rivers (Gustafson et al. 2016).

2.5.3 Shrimp Fishery Bycatch

Eulachon are taken as bycatch in shrimp trawl fisheries off the coasts of Washington, Oregon, and California (NWFSC 2008, 2009, 2010). Offshore trawl fisheries for ocean shrimp (*Pandalus jordani*) extend from the west coast of Vancouver Island to the United States West Coast off Cape Mendocino, California (Hannah et al. 2003). For details on bycatch of eulachon in the pink shrimp fishery, see Section 2.3.4.2.

2.5.4 Eulachon Research

Although not identified as a factor for decline or a threat preventing recovery, scientific research and monitoring activities have the potential to affect the species' survival and recovery by killing eulachon. Since their ESA listing in 2010, NMFS has issued numerous ESA section 10(a)(1)(A) and state and tribal 4(d) scientific research permits and authorizations allowing lethal and non-lethal take of listed species. Although eulachon take is not prohibited, the permit applicants have to cooperate with NMFS on their take of the species. For 2018, NMFS authorized take of 36,473 juvenile and adult eulachon, 33,457 of which was lethal; and these numbers are expected to remain consistent.

2.6 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Eulachon bycatch in U.S. West Coast groundfish fisheries appears to be driven by both eulachon distribution and cyclic abundance. Evidence from some surveys (NWFSC-EW 2012) indicates that the latitudinal and longitudinal range of eulachon likely expands in years of high abundance, perhaps leading to an increase in bycatch. Eulachon abundance increased from the lows of the mid-2000s (when they were ESA-listed) and peaked in 2014, after which time eulachon abundance has dropped by more than 90 percent (see Section 2.3.2; Table 2-2). In addition, point estimates of bycatch might fluctuate due to a number of non-biological factors, including annual variation in observer coverage rates, trawl duration, trawl depth, trawl location, seasonality, and haul volume, coupled with trawl-net mesh size changes, described earlier in the document. Based on the very low amount of eulachon bycatch in United States West Coast groundfish fisheries, either there is limited interaction with eulachon in these fisheries or most eulachon encounters result in fish escaping trawl nets or avoiding trawl gear altogether. However, not all eulachon avoid the groundfish fishery's trawl nets and thus are observed as bycatch; and therefore, we will examine these impacts and their implications further.

The 2012 Opinion estimated the extent of take of eulachon in the groundfish fishery at 1,004 eulachon per year. Observed bycatch in three recent years has exceeded that level: 2011 (1,621 eulachon), 2013 (5,113 eulachon), and 2014 (3,075 eulachon (Table 2-3). It is likely that the exceedance of the take limit resulted from variations in the abundance of eulachon in the fishery area more than any changes in fishery effort or operation; and this, in turn, suggests that the

effects of the fishery on eulachon fluctuates with eulachon abundance and a static number is not an accurate representation of the impact on the species as a whole.

The proposed groundfish fisheries would result in the capture and mortality of juvenile and adult eulachon. Eulachon will enter groundfish trawl nets during fishing operations and will suffer one of two effect pathways. The first effect pathway is through eulachon being captured in trawl nets but ultimately escaping the nets. Some of those fish may suffer injury as a result of their capture and escape, but there is no way to ascertain whether or how many will suffer minor, sublethal, or lethal effects since those fish are not available for observation after their escape. The second effect pathway will involve eulachon being retained as bycatch in the groundfish trawl nets. All of these fish are expected to die due to crushing and descaling injuries.

Because it is impossible to quantify the number of eulachon that are injured or killed as a result of capture in and subsequent escape from the trawl nets, the total number of eulachon injured or killed as a result of the groundfish fishery is unknown. It is, however, possible to estimate the number of eulachon captured in the trawl nets that do not escape. The proportion of eulachon captured and retained likely varies considerably between individual fishing events (hauls). However, our assumptions are that (1) the retained bycatch represents a consistent proportion of the total eulachon captured in nets for the fishery within any season, and (2) the total eulachon captured in nets is well within the same order of magnitude as the retained bycatch estimate (thus not likely significantly larger than the bycatch estimate). As shown in Table 2-3, the bycatch in recent years ranged from zero to 5,113 fish.

Table 2-3. Estimated bycatch of eulachon (number of individual fish) in U.S. West Coast groundfish fisheries that are part of the Groundfish Opinion and that were observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A- SHOP) from 2002 to 2015 (Gustafson et al. 2017).

Year	Non-hake bottom and midwater groundfish fisheries ^{1,2}			Shoreside Pacific hake /rockfish	At-sea Pacific hake fisheries ²			Total bycatch estimate
	WA	OR	CA		Tribal Mothership	Non-Tribal Mothership	Catcher Processor	
2002	0	783	0	--	0	0	0	783
2003	0	52	0	--	0	0	0	52
2004	0	0	5	--	0	0	0	5
2005	0	0	0	--	0	0	0	0
2006	0	0	0	--	0	0	147	147
2007	0	72	0	--	0	4	6	82
2008	0	0	0	--	0	6	37	43
2009	0	67	0	--	32	6	30	135
2010	0	0	22	--	0	0	0	22
2011	12	127	0	0	160	54	1,268	1,621
2012	1	167	0	0	0	7	16	191
2013	137	521	0	4,139	na	277	39	5,113
2014	292	2,516	0	0	na	25	242	3,075
2015	0	641	2	0	na	0	56	699

¹Bycatch estimates in non-hake groundfish fisheries from 2002 to 2010 and 2015 in Washington, Oregon, and California are based on observations of the bottom trawl fishery only. Estimates from 2011 to 2014 are based on observations of a combination of the IFQ non-hake bottom and midwater trawl fisheries.

²Not all observed smelt (family Osmeridae) bycatch in the LE bottom trawl and at-sea Pacific hake fisheries have been identified to the species level due to sampling conditions and time constraints. In 2011, sampling protocols were adjusted to better identify eulachon to species, whenever possible.

The proposed fishery regulation changes in this Opinion (section 1.3.2.4) that would change mesh size, codends, chafing gear, and other regulations may have the unintended consequence of shifting the fate of more eulachon from the first to the second effect pathway – a more lethal result. We are unable to predict at this time to what degree lethal retention would change; our assumption is that it would not alter the total number of eulachon affected by the action, and that the increased removal of individuals from the population would still fall within the conservative estimate described above. Bycatch will continue to be monitored to determine whether this assumption is correct.

To assess the level of impact from the groundfish fishery relative to eulachon abundance, we compare eulachon bycatch in the groundfish fishery to the Columbia River eulachon spawning run. We are using the Columbia River eulachon spawning run for analyzing impacts on the entire SDPS because (1) it is the largest for the SDPS and (2) the only one consistently monitored in the United States. Since the Columbia River eulachon spawning run only makes up a fraction of the SDPS, this comparison gives us a conservative estimate of the level of impacts of the groundfish fishery. In addition, comparing those impacts to the Columbia River spawning run, as opposed to the overall Columbia River population, is conservative because the fish captured in

the proposed action would not be limited to spawners but would be from a variety of age classes: juveniles, subadults, and adults. Due to the high natural mortality rate for eulachon, a large proportion of the eulachon that would be captured by the fishery would not have naturally survived to become spawning adults. Even though the Columbia River eulachon spawning run is being used for analysis, this does not imply that that fishery would be solely impacting the Columbia River spawning run. This proposed action is expected to impact most or all eulachon spawning runs, but none disproportionately. Since there are no known distinct differences among eulachon throughout the SDPS, impacts on spatial structure and diversity are further ameliorated.

As noted above we do not have information on which to base an estimate of the number of eulachon captured in nets but not retained. However, even assuming for the purpose of analysis that the total number of eulachon captured in the nets is up to five, ten, or twenty times the number retained, this is not a large number relative to Columbia River eulachon spawner abundance (see section 2.3.3). In actuality, we believe the total number of eulachon captured in the nets is likely considerably less, but use of a conservative assumption is intended to thoroughly address the uncertainty associated with the number of eulachon that escape the net. Even using this conservative estimate of total capture, the overall impact of the groundfish fishery on the eulachon SDPS has consistently been low relative to Columbia River spawner abundance – at most 50,000 fish total captured in nets (based on 10 times the 5,113 fish retained in 2013) compared to a 5-year geometric mean of approximately 32 million Columbia River spawners from 2013-2017. The impacted fish would be 0.15% of the Columbia River spawner population – and again this is a conservative assessment because (1) it is unlikely that 10 times the number of fish retained are caught and escape from trawl nets, (2) not all fish that escape are likely injured or killed, (3) we are comparing this impact to the Columbia River spawner abundance which is not the entire SDPS.

We would expect to see retained bycatch levels similar to recent years, fluctuating in part due to eulachon abundance. However, as noted above there is some uncertainty around the factors that contribute to bycatch levels in addition to eulachon abundance, specifically fish density in areas where fishing is occurring and fishing practices. Therefore, while the highest level of bycatch (5,113 fish) seen in recent years is approximately 0.015% of the 2013-2017 five-year geometric mean of the Columbia River spawner estimate, it is reasonable to estimate that a five year geometric mean of retained bycatch levels could range up to 0.02% of that quantity assuming that all factors contributing to higher bycatch were at play in a given year or set of years. Given the historical levels of bycatch in the fishery, we would not expect to see a five-year geometric mean of bycatch that exceeded 0.02% of the five-year geometric mean of Columbia River spawner abundance.

This is still quite a small proportion of the Columbia River spawning population, which again is a limited proportion of overall eulachon abundance in the action area. Therefore, the detrimental effects on the SDPS of eulachon are expected to be minimal and those impacts would only be seen in terms of slight undetectable reductions in abundance and productivity. Because these reductions are so slight, the actions—even in combination—would have no appreciable effect on the species' diversity or distribution.

2.7 Cumulative Effects

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

For eulachon, the most likely non-Federal action affecting viability is bycatch in offshore trawl fisheries for ocean shrimp (Gustafson et al. 2010). These fisheries are operated by the states of Washington, Oregon, and California and are not subject to section 7 consultation under ESA. Details on the estimated bycatch of eulachon in these fisheries are provided in Sections 2.3.3.2 and 2.5.3 of this opinion and in the recovery plan for SDPS eulachon (NMFS 2017b).

It is not possible to predict the future intensity of specific non-Federal activities in the action area due to uncertainties about the decisions that influence such activities (e.g., shrimp market value). However, the adverse effects of non-Federal activities in the action area are expected to continue in the future. To the degree that actions undertaken to reduce the adverse effects of non-Federal activities are implemented in the future (e.g., fleet-wide implementation of light emitting diode lights, rigid grate bycatch reduction devices, and additional gear-type or operational modifications to further reduce bycatch of eulachon in the ocean shrimp trawl fisheries), the net adverse effect of non-Federal activities is likely to decline slowly over time. The net adverse effects of other non-Federal activities that have achieved less progress in the adoption of protective management practices is likely to remain flat.

2.8 Integration and Synthesis

This section is the final step of our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.6) to the environmental baseline (Section 2.5) and the cumulative effects (Section 2.7), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency’s Opinion as to whether the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution, or appreciably diminish the value of designated or proposed critical habitat for the conservation of the species. The term of this consultation is the foreseeable future.

Abundance for the SDPS of eulachon has declined greatly in the past 25 years, and the species has been extirpated (or nearly so) from several historical spawning areas (Gustafson et al. 2010). Eulachon face a number of threats throughout their range, including climate change-induced impacts on marine and freshwater habitat, bycatch in commercial fisheries, and freshwater habitat alteration. The impacts on eulachon from climate change and habitat alteration are difficult to quantify, though the impacts on productivity and spawning run size can be large (Gustafson et al. 2016). Three sources of impact are quantifiable, though: the state managed ocean shrimp fisheries, scientific research projects, and the groundfish fishery. Only the groundfish fishery is included in the proposed action of this Opinion, though all three sources are important to understanding anticipated total effects on eulachon and the result of adding the

impacts of the proposed action. Since all eulachon south of the Nass River, Canada (north of Vancouver Island), are exclusively SDPS, all eulachon captured in the contiguous United States (and, thus, considered in this Opinion) are expected to be, and have been analyzed as, SDPS.

The overwhelming majority of eulachon bycatch in fisheries occurs in the Pacific Coast ocean-shrimp trawl fisheries managed by the states of California, Oregon, and Washington. Eulachon bycatch in the shrimp trawl fisheries greatly increased from the hundreds of thousands (2004-2011) to the tens of millions after 2012 when overall eulachon abundance increased (Gustafson et al. 2017). Most of the eulachon bycatch occurs in the Oregon ocean shrimp fishery, with a low of 59.1 percent of the total West Coast eulachon bycatch in 2015 (Gustafson et al. 2017). In response to the amount of eulachon bycatch, Oregon state researchers began experimenting with green LED lights on trawl nets and lines resulting in a reduction of eulachon bycatch of 91% (Hannah et al. 2015). Though not a part of current fishing regulations, a majority of Oregon state shrimp trawlers have adopted using green LED lights on their shrimp trawl gear (Gustafson et al. 2017). Since the ocean shrimp fisheries are state-managed with no Federal nexus, NMFS has not analyzed the impact of the ocean shrimp fisheries upon the SDPS of eulachon under Section 7 of the ESA. However, the impacts were considered in the eulachon recovery plan (NMFS 2017b).

While the proposed activities of the Pacific Coast Groundfish Fishery would in fact have some negative effect on the SDPS of eulachon, their effect is considered a threat of very low severity (NMFS 2017b) – with retained bycatch of no more than 0.02% of one portion of total eulachon abundance. Even using a very conservative estimate of fish affected by the proposed action, this number is quite small compared to the largest eulachon spawning run in the SDPS (the Columbia River). Further, in no case would the proposed actions of the fishery exacerbate any of the negative cumulative effects to eulachon discussed above (climate change, ocean shrimp fisheries, research, etc.). Therefore, we expect the detrimental effects on eulachon to be minimal and those impacts would only be seen in terms of slight reductions in abundance and productivity. And because these reductions are so slight, the actions—even when added to the baseline and cumulative effects—would have no appreciable effect on the diversity or distribution of the SDPS of eulachon.

2.9 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the SDPS of eulachon. Critical habitat has been designated for this species, but none is within the action area, and so critical habitat would therefore not be affected by the action.

2.10 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. “Harm” is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly

impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this Incidental Take Statement.

2.10.1 Amount or Extent of Take

In this biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

The proposed groundfish fisheries would result in the capture, harm, and mortality of juvenile and adult eulachon. Eulachon will enter groundfish trawl nets during fishing operations and this can affect eulachon via one of two effect pathways. The first effect pathway is through eulachon being captured in trawl nets but ultimately escaping the nets. Some of those fish may suffer injury as a result of their capture and escape, but there is no way to ascertain whether or how many will suffer minor, sublethal, or lethal effects since those fish are available for observation after their escape. The second effect pathway involves the remaining eulachon being retained as bycatch in groundfish trawl nets, and these fish are expected to die due to crushing and descaling injuries. It is not possible to quantify or monitor the number of eulachon incidentally taken (lethally or otherwise) as a result of the proposed action because an unknown and varying percentage of the eulachon will pass through the trawl nets without detection (the first effect pathway). This percentage will (1) be unknown because the eulachon cannot be counted (the nets are underwater when the eulachon enter and leave the nets) and (2) vary due to gear and environmental variables (i.e. net design, how full the net is, density of fish at capture, fish behavior). Since the eulachon bycatch is the only eulachon take that can be quantified and monitored, this estimate will be used as a surrogate for the total eulachon take in the Pacific coast groundfish fishery. This is appropriate because the proportion of bycatch within the fishery is thought to be a consistent proportion of the total take. In other words, as the total take increases and decreases, the bycatch is assumed to equally change.

As described in the effects analysis, it appears that the bycatch of eulachon fluctuates with eulachon abundance. Thus, to connect take levels to abundance, we describe the extent of take as a proportion of the Columbia River spawner run, as an indicator of the overall abundance within the SDPS.

The SDPS of eulachon encompasses all populations within the states of Washington, Oregon, and California and extends from the Skeena River in British Columbia south to the Mad River in Northern California (inclusive). In the ocean, eulachon abundance is difficult to determine since they are dispersed widely along the West Coast; due to their anadromous life history, we can, however, measure their abundance as they migrate as larvae from their fresh water spawning beds to the ocean. There are only two populations where these surveys are currently done – the Columbia and Fraser Rivers. The Columbia River eulachon spawning run abundance data is appropriate to use as a representative of eulachon abundance in the groundfish fishery for the following reasons:

- (1) The Columbia River has the largest eulachon spawning run within the ESA-threatened SDPS range. A recent study (2002 to 2015) estimated that 66.8 percent of the eulachon captured off the west coast of Vancouver Island, north of grounds of the Pacific coast groundfish fishery, were of Columbia River origin (Gustafson et al. 2016).
- (2) The Pacific coast groundfish fishery is in closest proximity to the Columbia River spawning run. There are no current major eulachon runs south of the Columbia River, and the nearest major spawning run to the north would be in the Fraser River (which is north of the Pacific coast groundfish fishery) (Gustafson et al. 2010).
- (3) The Columbia River has a regular eulachon spawning run. No matter how low or high eulachon abundance is, the Columbia River has been observed to have a eulachon spawning run historically (Gustafson et al. 2010). Rivers with smaller eulachon spawning runs often do not occur annually when eulachon abundance is low (Gustafson et al. 2010).

For the above reasons, the minimum estimate for the Columbia River eulachon spawning run will be used as a proxy for the SDPS of eulachon in this Opinion.

To determine the appropriate proportion of the Columbia River spawning run to use as the extent of take, we considered a number of factors. First, we determined it would be best to compare five-year geometric means of the Columbia River spawning run estimates and estimated annual bycatch levels, rather than single year estimates. NMFS will provide annual updates of five-year geometric means from the most recent available data for both eulachon bycatch in the Pacific coast groundfish fishery and the minimum abundance estimate from the annual Columbia River eulachon run. A five-year time-frame will be used for the following reasons:

- (1) Eulachon can live up to five years, so this time-frame reasonably reflects one generation.
- (2) Longer data sets can more accurately depict abundance and bycatch trends, and provide for the opportunity to consider adjustments to the Pacific coast groundfish fishery, if necessary, in response to a robust data set.

On an annual basis, NMFS will recalculate the five-year geometric mean from the current year and the preceding four years of Columbia River minimum eulachon spawning run data (the proxy for the SDPS). From that number, two thresholds will be calculated – a precautionary (0.01 percent of a five-year geometric mean) and reinitiation (0.02 percent of a five-year geometric mean). For example, the 2016 bycatch thresholds would be (Table 2-4):

- Precautionary threshold = 3,946 eulachon (geometric mean of the Columbia River eulachon spawning run from 2012 to 2016)
- Reinitiation threshold = 7,891 eulachon (geometric mean of the Columbia River eulachon spawning run from 2012 to 2016)

Further, NMFS will combine the most recent year's groundfish fishery eulachon bycatch numbers (eulachon bycatch estimates from the Pacific coast groundfish fishery take approximately 9-12 months to obtain following each fishing season) with the bycatch estimates of the four preceding years to calculate a five-year geometric mean for estimated bycatch in the groundfish fishery.

- 2016 Pacific coast groundfish fishery bycatch = 1,277.5 eulachon (geometric mean of bycatch from 2011 to 2015)

For 2016, the Pacific coast groundfish fishery eulachon bycatch estimate (1,277.5 eulachon) was well below the bycatch thresholds described above (Table 2-4). When analyzing eulachon bycatch and abundance data from 2011 through 2016, the Pacific coast groundfish fishery bycatch was less than a third of the precautionary threshold and less than a sixth of the reinitiation threshold every year.

Table 2-4. Pacific Coast groundfish fishery (PCGF) eulachon bycatch totals and calculated thresholds (number of individual eulachon) from 2011 to 2017.

Year	Annual Eulachon Estimate Columbia River (minimum)	Annual PCGF Eulachon Bycatch	Five-year geometric means†			Calculated bycatch as a percentage of	
			Eulachon bycatch	Precautionary threshold 0.01%	Reinitiation threshold 0.02%	Precautionary threshold	Reinitiation threshold
2011	17,860,400	1,621	68.8	1,786	3,572	3.85%	1.93%
2012	20,008,600	191	111.2	1,890	3,781	5.88%	2.94%
2013	45,546,700	5,113	131.6	2,534	5,069	5.19%	2.60%
2014	84,243,100	3,075	342.3	3,422	6,844	10.00%	5.00%
2015	57,525,700	699	639.7	3,797	7,593	16.85%	8.42%
2016	21,654,800	--	1277.5	3,946	7,891	32.38%	16.19%
2017	8,148,600	--	--	3,297	6,594	--	--

† The first year of available data is 2011. Therefore, the 2011 “means” are the actual values for 2011. Each year thereafter, a geometric mean is calculated using values from 2011 through that given year until 2015, when an actual moving 5-year geometric mean begins.

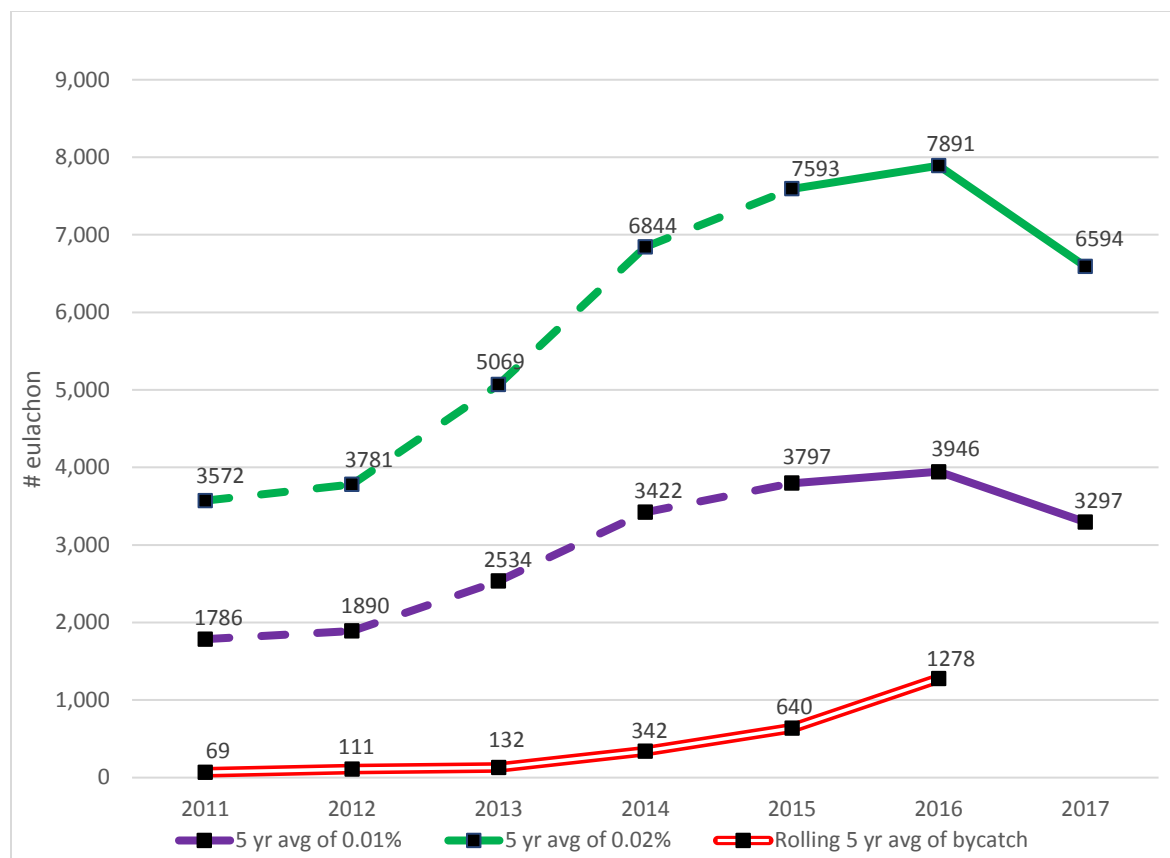


Figure 2-1. Proposed PCGF eulachon bycatch thresholds (0.01 and 0.02 percent) compared with the five-year geometric mean for PCGF eulachon bycatch (number of individuals).

In summary, the impacts on the SDPS of eulachon by the Pacific coast groundfish fishery will be assessed by using the eulachon retained in the trawl nets as a surrogate for the total take and the Columbia River eulachon spawning run as a proxy for SDPS eulachon abundance. Five-year geometric means for both of those datasets will be used to determine compliance with the analyses within this Opinion.

Two incidental take thresholds will be used:

1. The precautionary threshold is 0.01 percent of the five-year geometric mean of the minimum estimate for the Columbia River eulachon spawner run. This threshold will trigger Term and Condition #2.
2. The reinitiation threshold is 0.02 percent of the five-year geometric mean of the minimum estimate for the Columbia River eulachon spawner run; this is the maximum amount being analyzed for this Opinion. This threshold is based on the existing bycatch levels that have been determined not to jeopardize the persistence of the SDPS of eulachon. If eulachon bycatch (measured as a five-year geometric mean) exceeds 0.02 percent of the calculated minimum Columbia River eulachon spawner run abundance (also measured as a five-year geometric mean), then the take limit will be considered to have been exceeded and reinitiation will be triggered.

2.10.2 Effect of the Take

In the Opinion, NMFS determined that the amount or extent of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.10.3 Reasonable and Prudent Measures

“Reasonable and prudent measures” (RPM) are non-discretionary measures that are necessary or appropriate to minimize the amount or extent of incidental take (50 CFR 402.02). To the extent these RPMs and associated terms and conditions go beyond monitoring, they are voluntary until a 4(d) rule for eulachon goes into effect.

Section 4(d) of the ESA directs NMFS to issue regulations to conserve species listed as threatened. This applies particularly to “take,” which can include any act that kills or injures fish, and may include habitat modification. The ESA prohibits take of species listed as endangered, but some take of threatened species that does not interfere with survival and recovery may be allowed. To date, NMFS has not issued a 4(d) rule to prohibit eulachon take.

The RPMs described in the 2012 Biological Opinion (NMFS 2012) regarding Management Planning and Take Reporting remain appropriate and in effect, with the exception of those for eulachon. RPMs specific to eulachon are modified and updated here to reflect a new set of measures. These include the following reasonable and prudent measures to monitor and limit impact from the incidental take of eulachon associated with operation of the Pacific coast groundfish fishery.

- (1) NMFS shall regularly develop and modify protocols and implement biological sampling to assess the impacts of the Groundfish FMP actions upon eulachon.
- (2) NMFS shall ensure that the Pacific coast groundfish fishery is managed to minimize the take of eulachon to the maximum extent practicable, and to monitor, mitigate, and adjust the impacts of such taking.

2.10.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and NMFS must comply with them to implement the reasonable and prudent measures (50 CFR 402.14). NMFS has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(a)(2) will likely lapse.

Terms and conditions described in the 2012 Biological Opinion (NMFS 2012) remain appropriate and in effect, with the exception of eulachon. Terms and conditions specific to eulachon are modified and updated here to reflect a new set of measures.

- 1.a. NMFS shall continue to monitor and report eulachon bycatch numbers and estimate fleetwide mortality incidental to the Pacific coast groundfish fishery.

- 1.b. By early fall of each year, the West Coast Groundfish Observer Program shall analyze the most recent year's eulachon bycatch monitoring data and provide this analysis to NMFS Protected Resources Division, NMFS Sustainable Fisheries Division, and the Northwest Fisheries Science Center.
2. If Pacific coast groundfish fishery catch monitoring indicates eulachon bycatch amounts that surpass 0.01 percent of the calculated minimum Columbia River eulachon run, measured as a five-year geometric mean, the Council's ESA Work Group will address the issues at their next meeting. The ESA Work Group shall examine the Pacific coast groundfish fishery to determine possible reasons for these bycatch amounts, and consider whether possible modifications to the fishery to reduce eulachon bycatch may be necessary. Findings and recommendations of the ESA Work Group shall be reported to the Council.

2.11 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

Conservation recommendations included in the 2012 Biological Opinion (NMFS 2012) remain in effect for all species, with the exception of eulachon. For eulachon, the following conservation recommendations replace those in the 2012 Biological Opinion and would provide information for future consultations involving the operation of the Pacific coast groundfish fishery:

- (1) NMFS should support annual in-river spawning stock biomass surveys in the Columbia River. These surveys provide the Columbia River eulachon spawning run estimates that are used to justify and set the precautionary and reinitiation thresholds for this Opinion.
- (2) NMFS should continue operations for the NMFS Observer Program with a level of observation adequate to provide for annual estimates of eulachon bycatch in the groundfish trawl fishery.
- (3) NMFS should retain eulachon bycatch—retaining whole-body eulachon specimens—when retention would aid research furthering the understanding of the species. Eulachon marine life history is poorly understood; therefore, the impact of the Pacific Coast Groundfish Fishery Management Plan on eulachon is not well understood. Whole-body specimens can allow for stock identification (genetic samples), diet (stomach analysis), sex ratios (examination of gonads), age (Ba:Ca ratios in otoliths), presence (locations of captures), and general morphology measurements.
- (4) Eulachon sampling procedures for sample size, collection location and frequency, and archiving details should be determined by NMFS Protected Resources Division, Northwest Fisheries Science Center, and West Coast Groundfish Observer Programs.

2.12 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if the following occur: (1) the amount or extent of incidental take is exceeded (e.g., eulachon bycatch exceeds 0.02 percent of the calculated minimum Columbia River eulachon run, measured as a five-year geometric mean); (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

3 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion are the National Marine Fisheries Service. Other interested users could include the Council and others interested in the conservation of the affected ESUs/DPSs. Individual copies of this Opinion were provided to the Council. This Opinion will be posted on the Public Consultation Tracking System website (<https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts>). The format and naming adhere to conventional standards for style.

3.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, Security of Automated Information Resources, Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

3.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, *et seq.*, and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References Section. The analyses in this Opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

4 REFERENCES

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