



# AREA 2A PACIFIC HALIBUT FISHERY MANAGEMENT IN 2022 AND BEYOND

Environmental Assessment

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## 1 Introduction

NMFS is preparing this EA using the 2020 Council for Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020, and reviews begun after this date are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). NMFS began developing this EA on October 27, 2021 and accordingly proceeds under the 2020 regulations.

The Halibut Convention<sup>1</sup> creates the International Pacific Halibut Commission (IPHC), which has regulatory authority over all halibut fishing in the United States and Canada. The IPHC has divided the Convention waters into regulatory areas. Area 2A encompasses all waters off of the west coast of the United States, including Puget Sound and the Strait of Juan de Fuca. The IPHC is responsible for drafting annual regulations, conducting the annual halibut survey, and producing stock assessments. The stock assessment produces risk projections for a range of total constant exploitation yields (TCEYs), which are presented to the U.S. and Canadian Commissioners who, in consultation with members of the public, decide on the TCEY for each management area. The TCEYs are chosen after considering the long term sustainability of the coastwide halibut stock, using the best available information from the stock assessment. The TCEY includes commercial discards and bycatch estimates using a formula developed by the IPHC. Fisheries targeting halibut manage to a catch limit called a fishery constant exploitation yield (FCEY), which is the starting value for management in Area 2A under the Catch Sharing Plan (described in detail at Section 1.2.3.). Under the Northern Pacific Halibut Act of 1982 (Halibut Act) at 16 U.S.C. § 773, regulations developed by the IPHC are subject to acceptance by the Secretary of State with concurrence from the Secretary of Commerce. After acceptance, NMFS publishes the IPHC regulations in the Federal Register as annual management measures. 50 CFR § 300.62.

Under the Halibut Convention, the United States and Canada are allowed to develop domestic regulations, as long as those measures are more restrictive than the regulations developed by the IPHC. Consistent with the Halibut Convention, the federal governments of Canada and the United States (U.S.) adopt domestic regulations to manage the portions of the Pacific halibut fishery in their respective waters. In the U.S., the Northern Pacific Halibut Act of 1982 (Halibut Act) at 16 U.S.C. § 773c provides that the Secretary of Commerce (Secretary) shall have general responsibility to carry out the Halibut Convention between the U.S. and Canada and that the Secretary shall adopt such regulations as may be necessary to carry out the purposes and objectives of the Convention and the Halibut Act.

The respective federal governments may set domestic subarea allocations and consequent management measures. For the U.S. in Area 2A, NMFS West Coast Region is responsible for allocation and management with close coordination with the Pacific Fishery Management Council (Council) and the Washington, Oregon, and California state agencies (Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), and California Department of Fish and Wildlife (CDFW)). Section 773c(c) of the Halibut Act authorizes the regional fishery management council

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<sup>1</sup> Convention between Canada and the United States for the Preservation of the Halibut Fishery of the North Pacific Ocean and Bering Sea (Convention), signed at Ottawa, Ontario, on March 2, 1953, as amended by a Protocol Amending the Convention (signed at Washington, DC, on March 29, 1979).

having authority for the geographic area concerned to develop regulations governing the Pacific halibut catch in U.S. Convention waters that are in addition to, but not in conflict with, regulations of the IPHC. For Area 2A, the Council has exercised this authority by developing a “Catch Sharing Plan” that recommends a management framework, including dividing Area 2A into subareas for purposes of management, and outlines allocations for the Area 2A Pacific halibut tribal, non-tribal directed and incidental commercial fisheries, and recreational fisheries. NMFS reviews and approves the Catch Sharing Plan annually and promulgates annual regulations to implement management measures for the Area 2A fisheries consistent with the recommendations in the Catch Sharing Plan. Each year, the IPHC promulgates regulations setting forth the catch allocation for fisheries in all IPHC areas, including Area 2A. Within Area 2A, the IPHC sets specific allocations for subareas off of Washington, Oregon, and California based on recommendations from the Council. As discussed above, NMFS publishes an annual rule to implement the IPHC regulations for all U.S. IPHC regulatory areas, which include catch allocations for the various sectors and subareas within Area 2A. NMFS separately publishes annual management measures for Area 2A. NMFS currently implements annual management measures for Area 2A recreational fisheries and incidental-commercial fisheries. Between 2017 and 2019, NMFS, the IPHC, and the Council discussed transitioning specific management activities of the 2A fishery from IPHC to NMFS and the Council and in June 2019 agreed to move forward with this transition as expeditiously as possible, while maintaining the current process to minimize disruption. Specifically, these management activities include creating a permitting system for commercial and recreational charter fisheries in Area 2A, and establishing a regulatory framework for the directed commercial fishery in Area 2A. Starting in 2023, NMFS is proposing to also implement management measures for directed commercial fisheries in Area 2A, which are currently implemented by the IPHC. This would include issuing permits for vessels fishing in the directed fisheries and setting fishing dates for the directed commercial fishery.

Since 1988, the Council has developed Catch Sharing Plans in accordance with the Halibut Act which recommend allocation of the Pacific halibut catch between treaty tribal and non-tribal harvesters, and among non-tribal commercial and recreational fisheries in Area 2A. In 1995, NMFS implemented a Council-recommended long-term Catch Sharing Plan [60 FR 14651, March 20, 1995]. In each of the intervening years between 1995 and the present, minor revisions to the Catch Sharing Plan have been made to adjust for the changing needs of the fisheries, such as revisions to season length, the dates when each subarea is open for fishing, the number of open days per week, allocation percentages recommended by the Council and adopted by the IPHC, and bag limits. NMFS has been approving adjustments to the Area 2A Catch Sharing Plan based on Council recommendations each year to address the changing needs of these fisheries. The annual Catch Sharing Plan document can be found on the Council [website](#).

The proposed action is the continued implementation of annual management measures for Area 2A (Washington, Oregon, and California) Pacific halibut fisheries consistent with recommendations from the Council’s Catch Sharing Plan. This includes management measures for the recreational fisheries and the non-tribal commercial fisheries, including the incidental and directed fisheries. Additionally, the proposed action includes implementing of regulations recommended by the Council through the Catch Sharing Plan. As discussed above, allocations and regulations for the IPHC regulatory areas within the U.S., including sector and subarea allocations within Area 2A, are set by the IPHC and implemented by NMFS in a separate action.

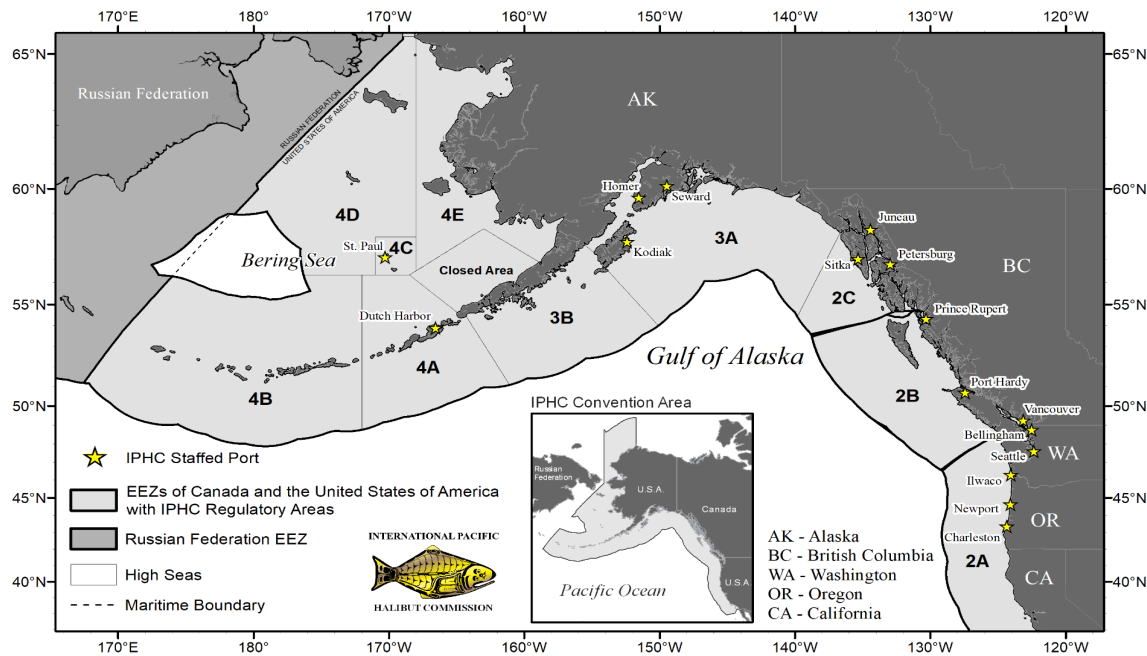


FIGURE 1 IPHC REGULATORY AREAS. SOURCE: IPHC

## 1.1 Purpose and Need

The purpose of and need for the action is to implement regulations authorizing and managing the harvesting privileges of Pacific halibut in Area 2A waters. These regulations are based on the IPHC's annual setting of catch limits, comply with the requirements of the Halibut Convention and Halibut Act, and are guided by the Council's Catch Sharing Plan.

If approved, this action will implement annual management measures for Area 2A fisheries, consistent with both IPHC regulations and recommendations from the Council made through the Catch Sharing Plan. These measures include dates in which the Area 2A fishery subareas are open as well as bag limits. This action will also implement regulations recommended by the Council through the Catch Sharing Plan, including area definitions for 2A subareas, the subarea allocation framework, areas closed to fishing, and gear restrictions not implemented through the IPHC. This action will address the changing needs of these fisheries that are guided by the allocation framework of the Catch Sharing Plan.

## 1.2 Explanations

### *Who is the IPHC?*

The IPHC was established by the Halibut Convention and has regulatory authority over all halibut fishing in the United States and Canada. The IPHC's objective is to develop the stocks of Pacific halibut in the Convention waters to those levels which will permit the optimum yield from the fishery and to maintain the stocks at those levels. The IPHC has yet to adopt a long-term harvest strategy policy, however it is

currently following a “30:20” control rule, where fishing intensity is decreased when the stock status is below 30 percent of the unfished spawning biomass, and no fishing when the stock status is below 20 percent of the unfished spawning biomass (IPHC 2020). Spawning biomass is the total weight of all adult (reproductively mature) female fish in a population. The IPHC, with input from the public, is responsible for drafting annual regulations, conducting the annual halibut survey, and producing stock assessments. The IPHC also has various research priorities to improve the knowledge of halibut and collect information on management issues.

*How are halibut fishery catch limits determined? How does this relate to the TCEY and FCEY?*

Halibut fishery catch limits are the result of the IPHC’s multi-step process, with input from U.S. and Canadian fishery management organizations. The IPHC performs an annual stock assessment using the most current fishery-independent and fishery-dependent data from the fishery independent setline survey, commercial and recreational landings, discard mortality, and biological specimens. These stock assessments then estimate distribution of the halibut stock among each of eight IPHC regulatory areas along the U.S./Canada Pacific Coast (Figure 1) which are presented by the IPHC Secretariat at the IPHC annual meeting each year, and provide the most in-depth and updated information on the status of Pacific halibut. The stock assessment is available on the IPHC website ([www.iphc.int](http://www.iphc.int)). The IPHC reports its stock assessment findings at an annual meeting of the IPHC, and includes a harvest decision table that provides a comparison of the relative risk of a decrease in stock biomass, status, or fishery metrics, for a range of alternative harvest levels each year. This range includes no fishing mortality (useful to evaluate the stock trend due solely to population processes); the mortality at which there is a 50% chance that the spawning biomass will be smaller in three years than in the year proposed (“3-year surplus”), the mortality consistent with repeating the TCEY set for the previous year (“status quo”); the mortality consistent with the current “Reference” SPR ( $F_{43\%}$ ) level; and a 60 million pound (~27,200 t) TCEY (IPHC 2021). The IPHC then generally comes to an agreement on harvest levels for each regulatory area, given the IPHC’s objective of maintaining sustainable harvest of the halibut stock.

The TCEY includes all sources of halibut mortality throughout all IPHC regulatory areas. The IPHC calculates FCEY by deducting the amount of discards and bycatch from the TCEY.

*What are the main sources of halibut data?*

Fishing-dependent information from commercial landings data from fish tickets, dock interviews for recreational fishing, and logbook information, and fishery-independent information from the IPHC set-line survey, and the West Coast Groundfish Observer Program ([WCGOP](#)). More information on and data from the set-line survey can be found on the IPHC’s [website](#). The set-line survey and the commercial halibut fisheries use similar gear and bait.

*When does the Area 2A fishery take place?*

All halibut fishing (with the exception of tribal ceremonial and subsistence fisheries that occur January 1 through December 31 each year) occurs within the IPHC’s overall season that is decided at the IPHC annual meeting and implemented in annual regulations NMFS publishes in the Federal Register. The overall season has historically occurred between March and December. The incidental salmon and sablefish fishery season dates are implemented in NMFS’s salmon and groundfish regulations, respectively, with halibut retention allowed only when the target fisheries are open and if the fishing occurs within the season set by the IPHC. Recreational fisheries take place in the spring, summer, and

fall, with season dates differing by subarea and amount of time it takes anglers to achieve the subarea quota.

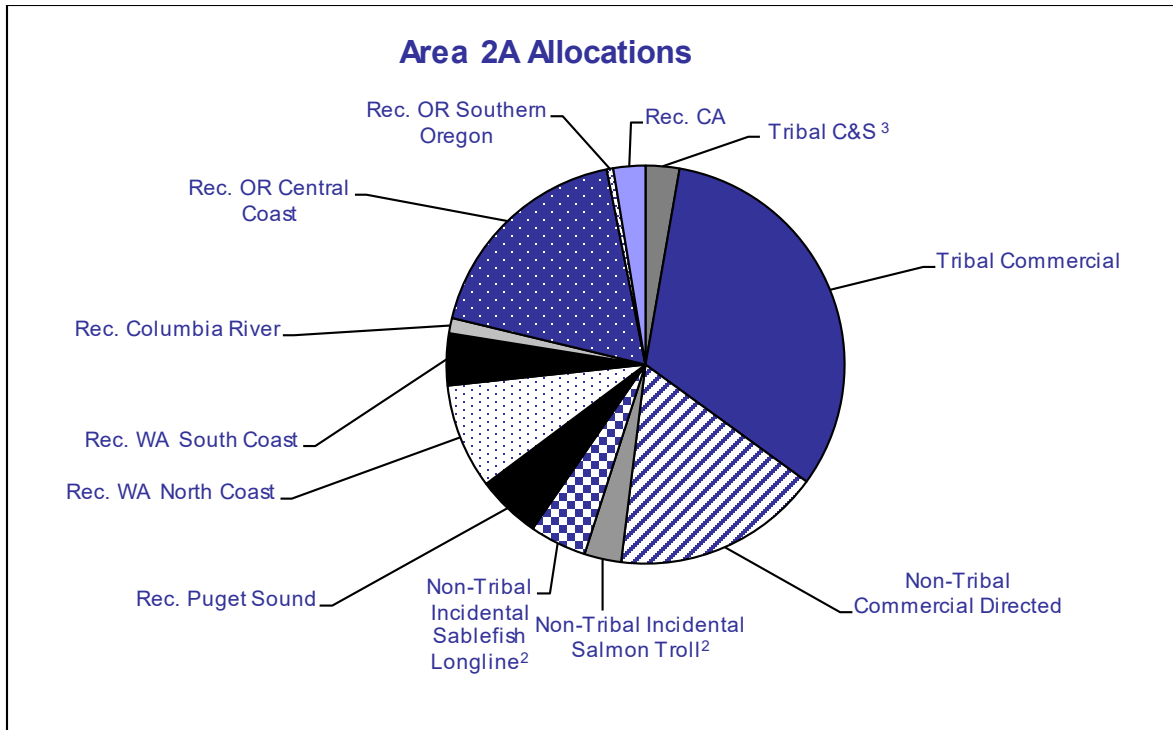
### 1.2.1 Overview of Pacific halibut in Area 2A

IPHC Regulatory Area 2A includes all waters off the states of Washington, Oregon, and California. Pacific halibut mostly occur in cooler waters off of Washington and Oregon, and northern California. Based on stock assessments over the years, the amount of halibut annually found in Area 2A accounts for around two percent of the coastwide biomass of Pacific halibut. This section describes the components of the Area 2A fishery, Pacific halibut that are caught as bycatch, gear used to catch halibut, participation, and depredation of halibut by marine mammals.

#### Sectors of the Area 2A Pacific halibut fishery:

The Area 2A halibut fishery includes tribal and non-tribal, as well as directed and incidental commercial and recreational fisheries. The Council recommended, and NMFS approved, an allocation framework (Figure 2) in the Catch Sharing Plan that divides the Area 2A catch allocation among the various sectors and subareas within Area 2A. The IPHC uses this framework in setting annual allocations through the IPHC regulations, which NMFS annually implements through a separate action.

All the shares described below are current as of 2021 but the Council may recommend revisions to allocation if new information becomes available that indicates a change is necessary and/or the Council takes action to reconsider its allocation recommendations. Regardless of any changes in the allocation percentages between the various sectors and subareas within Area 2A, the total harvest will remain within the overall Area 2A FCEY as set by the IPHC.



**FIGURE 2 VISUAL REPRESENTATION OF PACIFIC HALIBUT ALLOCATIONS**

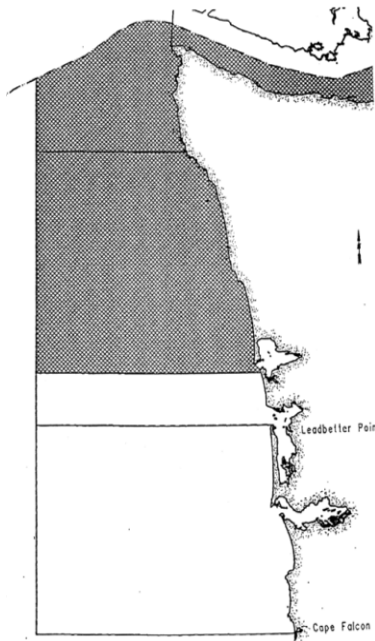
**Tribal Fisheries**

The IPHC regulations set the allocation recommended in the Catch Sharing Plan, currently of 35 percent of the Area 2A FCEY to the treaty tribes in subarea 2A-1, which is the portion of Area 2A north of Point Chehalis, WA (46°53.30' N. lat.)(Figure 3). Tribal allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence (C&S) component. The halibut caught by the C&S component is not sold. The C&S fishery may take place at any time during the year, and the commercial season generally takes place from March through June. The tribes manage their allocation jointly based on a management plan, and each tribe manages its fisheries through its own regulations and in compliance with any applicable court orders or court-approved agreements.

<sup>2</sup> For the incidental sablefish and salmon fisheries the Council recommends trip limit ratios. The amount of halibut allowed for retention on a trip is based on the amount of the target species (sablefish or salmon). The primary management responsibility of these fisheries is through the NMFS’s groundfish and salmon regulations.

<sup>3</sup> C&S halibut is managed by tribal regulations promulgated in season to meet the needs of specific ceremonial events. Halibut taken for C&S purposes may not be offered for sale or sold.





### Non-tribal Commercial Fisheries

The commercial fishery allocations in the Catch Sharing Plan are divided into two components: a directed fishery and incidental fisheries. The incidental fisheries include incidental halibut retention in the salmon troll fishery and incidental retention in the sablefish fishery north of Point Chehalis, WA. The salmon troll and directed commercial fisheries currently receive 30.7 percent of the non-tribal allocation. Incidental retention in this portion of the sablefish fishery is allowed when the Washington recreational halibut allocation is currently 214,110 lb or greater. A commercial fishery participant may participate in the directed commercial fishery and/or the sablefish fishery, or the salmon troll fishery.

#### *Directed Commercial Fishery*

The directed commercial fishery is a longline fishery occurring south of Point Chehalis, WA, and is currently allocated 85 percent of the Area 2A commercial allocation. This fishery requires a permit to participate, but there is no limit to the number of participants. Most of the landings in the directed commercial fishery occur off of Oregon, followed by Washington, and a small amount of directed commercial halibut is landed in California. The directed commercial fishery is managed through a series of fishing periods based on the directed commercial fishery allocation and vessel class limits (Table 1), which is the maximum amount of Pacific halibut that may be retained and landed by a vessel during one fishing period. Fishing period limits are based on vessel class and the number of permits issued to ensure the directed commercial fishery suballocation is not exceeded. These permitting and management activities for the directed commercial fishery in Area 2A are currently performed by the IPHC, however in future years NMFS expects to assume responsibility for issuing vessels permits to fish for Pacific halibut in commercial and recreational charter fisheries in Area 2A, and for issuing annual management measures for the directed commercial fishery. The specific operations and management framework of the directed fishery is not expected to change when NMFS assumes management.

This fishery takes place in the summer months with fishing periods occurring every few weeks, based on the ability to receive and analyze fish ticket data for fishing period limits, and notify the public.

Depending on the amount of available directed commercial quota and vessel limits, this fishery has historically had between two and five open fishing periods per season.

**TABLE 1 DIRECTED COMMERCIAL ALLOCATIONS, INITIAL FISHING PERIODS AND FISHING PERIOD LIMITS (LB) FOR 2017-2021.**

<i>Year</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>
Dir. Comm. allocation (lb)	225,591	201,845	254,426	254,426	256,122
Fishing period(s)	1: June 28 2: July 12	1: June 27 2: July 11	1: June 26 2: July 10	1: June 22-24	1: June 24-26 2: July 6-8 3: July 20-22
Fishing period limits (lbs) by vessel class (A-H)					
A	860	860	4,525	905	2263
B	1,075	1,075	4,525	905	2263
C	1,715	1,715	4,525	905	2263
D	4,735	4,735	6,820	1364	3410
E	5,090	5,090	6,820	1364	3410
F	6,095	6,095	9,090	1818	4545
G	6,800	6,800	9,090	1818	4545
H	10,225	10,225	10,225	2045	5113

*Incidental Salmon Troll*

Participants in the commercial salmon troll fishery may retain Pacific halibut caught incidentally, but are restricted by a landing ratio (i.e., number of halibut per salmon caught). Most landings occur in Washington, followed by Oregon and then California. Retention of halibut in the salmon fishery is based on a ratio of Chinook salmon to halibut, therefore halibut retention only occurs if Chinook salmon fishing is allowed. Inseason changes to increase or decrease the incidental ratios of Pacific halibut are discussed through the public Council process at its March and April meetings, and are set to allow maximum attainment of the incidental halibut allocation across the season. Table 2 presents a range of past ratios. Future ratios may differ from this range.

**TABLE 2 ALLOCATIONS, HARVEST, AND HALIBUT TO SALMON RATIOS BY YEAR.**

<i>Year</i>	<i>Incid. Salmon allocation (lb)</i>	<i>Total harvest (lbs)</i>	<i>Ratio of halibut per salmon</i>
2017	39,810	38,621	No more than one Pacific halibut per each three Chinook, except one Pacific halibut may be possessed or landed without meeting the ratio requirement, and no more than 35 halibut may be possessed or landed per trip (1 + 1 per each 3, 35)
2018	35,620	34,903	1 + 1 per each 2, 25
2019	44,899	43,417	1 + 1 per each 2, 35
2020	44,899	29,012	1 + 1 per each 2, 35
2021	45,198	18,562	1 + 1 per each 2, 35

### *Incidental Sablefish*

Fishery participants may retain halibut caught incidentally in the sablefish primary fishery north of Point Chehalis, WA, if they have a permit endorsed for halibut retention and are using longline gear. Fishery participants are allowed to retain a certain ratio of halibut when targeting sablefish. Halibut retention in the sablefish fishery has occurred each year between 2004 and 2021 with the exception of 2010 and 2011, due to low FCEYs. If the sablefish fishery is not provided a halibut allocation for incidental retention then any halibut caught incidentally to sablefish north of Pt. Chehalis, WA, must be discarded. Similarly, if the sablefish fishery were to attain its halibut allocation in any given year, than incidentally caught halibut would have to be discarded. Table 3 presents a range of past ratios. Future ratios may differ from this range.

**TABLE 3 ALLOCATIONS, HARVEST, AND HALIBUT TO SABLEFISH RATIOS BY YEAR.**

<i>Year</i>	<i>Incid. Sablefish allocation (lb)</i>	<i>Total harvest (lbs)</i>	<i>Ratio</i>
2017	70,000	35,866	April 1: 110 lb of halibut per 1,000 lb of sablefish and up to 2 additional halibut in excess of the landing limit ratio (2+110 lb per 1,000 lb) May 11: 2+140 lb per 1,000 lb
2018	50,000	43,716	April 1: 2+140 lb per 1,000 lb April 13: 2+160 lb per 1,000 lb October 9: 2+200 per 1,000 lbs
2019	70,000	79,360	April 1: 2+200 per 1,000 lbs August 2: 2+250 lb per 1,000 lb
2020	70,000	63,358	April 1: 2+200 per 1,000 lbs October 19: 2+250 lb per 1,000 lb
2021	70,000	69,081	April 1: 2+250 lb per 1,000 lb June 1: 2+225 lb per 1,000 lb

### *Recreational Fisheries*

The halibut recreational fisheries include individual anglers and charterboats. Recreational halibut fisheries occur off of Washington, Oregon, and California, with catches generally occurring in northern California, Oregon, and Washington. The days open for the recreational fisheries in the various Area 2A subareas off of the West Coast are recommended by the Council in the annual Catch Sharing Plan and implemented by NMFS through the annual management measures in the Federal Register. Fisheries remain open until the projected quota for the area is taken, the closure date described in the annual management measures has elapsed, or the overall season dates set by the IPHC have passed. Subarea allocations in all subareas are based on angler participation in each region, and although sub-allocations may be adjusted, this has not occurred since 2015. The various recreational sectors are summarized below, with a more detailed description of these fisheries in Section 1.3.2.3 of a 2018 biological opinion (NMFS 2018). The allocations for each subarea are annually set by the IPHC based on the framework in the Council’s Catch Sharing Plan.

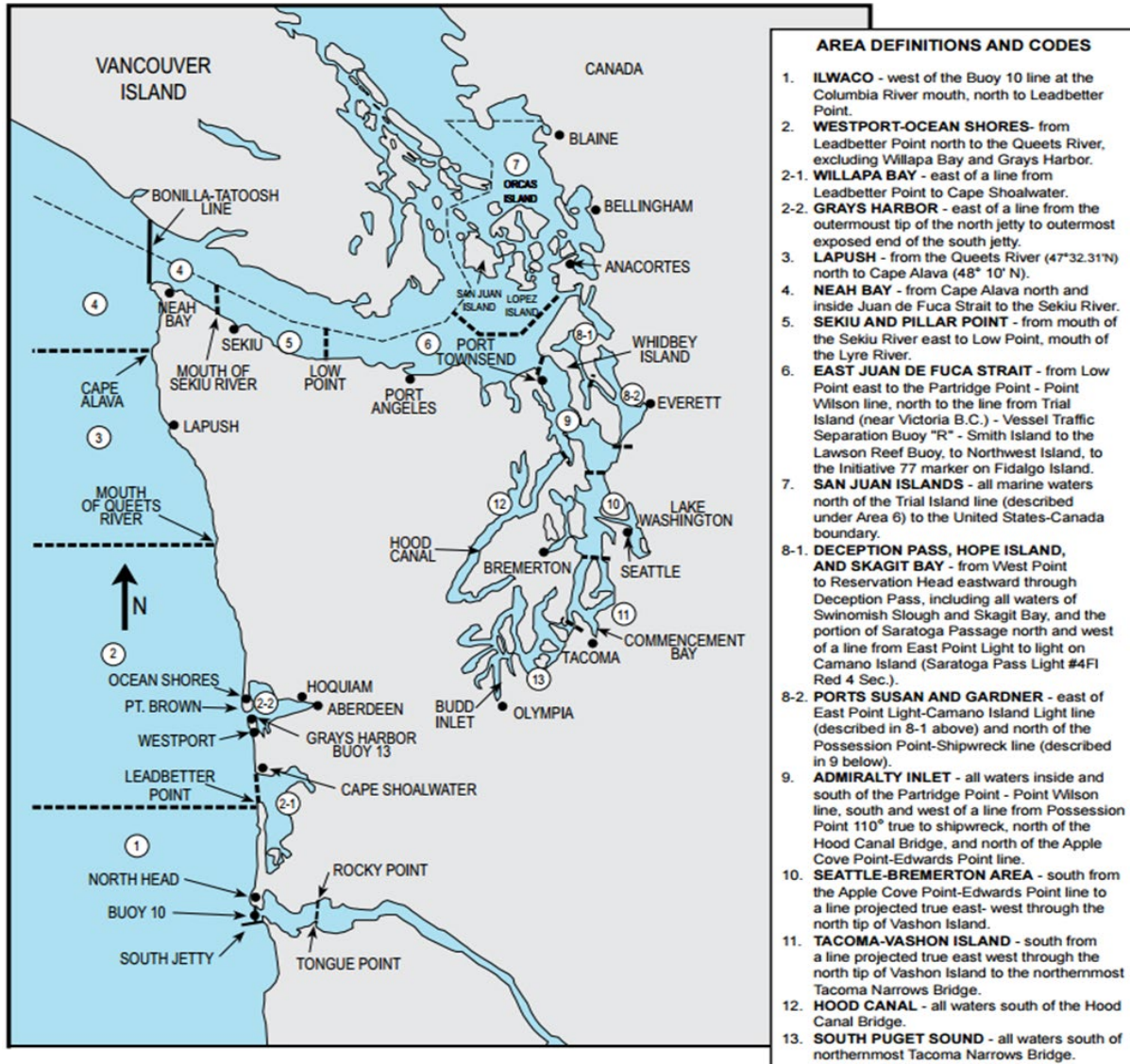


FIGURE 3 WDFW MARINE CATCH AREAS

Washington recreational fisheries receive about one-third of the total non-tribal Pacific halibut fishery allocation. This allocation is divided among four subareas for management and catch allocation purposes: WA Puget Sound subarea, WA North Coast subarea, WA South Coast subarea, and Columbia River subarea (which is shared with Oregon). The boundaries of these subareas correspond to WDFW marine catch areas (MCAs) (Figure 2). The WA Puget Sound Subarea includes all waters east of the Sekiu River mouth and includes Puget Sound, most of the Strait of Juan De Fuca, the San Juan Islands area, Hood Canal and Admiralty Inlet. The WA North Coast Subarea is the area west of the Sekiu River mouth and north of the Queets River. The WA South Coast Subarea lies to the south of Queets River and north of Leadbetter Point, WA. The Columbia River subarea lies between Leadbetter Point and Cape Falcon, Oregon, and is shared with Oregon. The allocations for this subarea are derived from both the Washington and Oregon recreational allocations. The Washington recreational fishing subareas have the same open dates statewide, spreading the effort across subareas. To provide more opportunity in areas with high effort, quota may be transferred from one subarea with low attainment to another, typically

later in the season when WDFW is reasonably sure the quota would otherwise go unharvested. Subareas typically open in mid-April and May, although NMFS annually sets dates and day-of-the-week openings based on the amount of allocation issued by the IPHC and stakeholder feedback.

#### *WA Puget Sound Subarea*

The Puget Sound subarea is allocated 23.5 percent of the first 130,845 pounds of the WA recreational fishery allocation, and an additional 32 percent of the next 130,845 to 224,110 pounds. In 2021, an average of 1,473 anglers participated in each of the weekends the fishery was open. Most of the Washington Puget Sound recreational catch of halibut is taken in the Strait of Juan de Fuca. From 2017-2021, the fishery was open between nine and 45 days.

#### *WA North Coast Subarea*

The North Coast subarea is allocated 62.2 percent of the first 130,845 pounds of the WA recreational fishery allocation, and an additional 32 percent of the next 130,845 to 224,110 pounds. In 2021, an average of 1,020 anglers participated each of the eight weekends the fishery was open. From 2017-2021, the fishery was open between nine and 34 days.

#### *WA South Coast Subarea*

The South Coast subarea is allocated 12.3 percent of the first 130,845 pounds of the WA recreational fishery allocation, and an additional 32 percent of the next 130,845 to 224,110 pounds. In 2021, an average of 1,074 anglers participated each of the five weekends the fishery was open. The south coast subarea (WA MCA 2) quota is initially allocated to the primary all-depth fishery, and a nearshore fishery opens if sufficient quota remains after the all-depth fishery closes. If quota remains in the South Coast allocation, the nearshore fishery opens the Saturday after the closure of the all-depth fishery and typically runs seven days per week until quota attainment. From 2017-2021, the fishery was open between five and 19 days.

#### *Columbia River Subarea Recreational Fishery*

The Columbia River subarea is allocated two percent of the first 130,845 pounds of the WA recreational fishery allocation and 2.3 percent of the OR recreational allocation. This subarea includes the area from Leadbetter Point, WA, to Cape Falcon, OR. Most of the recreational catch in this subarea is landed in Ilwaco, WA, and the majority of anglers are Washington residents. From 2017-2021, the fishery was open between eight and 19 days.

#### *Oregon Recreational Fishery*

Recreational fishing for halibut off of Oregon is divided among three subareas for management and catch allocation purposes: Columbia River subarea (described above, which is shared with Washington), Central Coast subarea, and the Southern Oregon subarea. The most popular fishing areas are located in the Central Coast subarea.

#### *Central Coast Subarea*

The Central Coast subarea receives 93.79 percent of the Oregon halibut recreational fishery allocation. The Central Coast subarea is divided into three components: spring, summer, and nearshore. The spring season opens in mid-May and typically closes in June or July for quota attainment. The summer season opens in early August and the nearshore season opens May 1. Both the summer and nearshore seasons remain open until October 31 or until the quota is caught. To provide more opportunity in areas with high effort, quota may be transferred from one subarea with low attainment to another, typically later in the season when ODFW is reasonably sure the quota would otherwise go unharvested.

### *Southern Oregon Subarea*

The Southern Oregon Subarea boundaries are Humbug Mountain to the Oregon/California border. The Southern Oregon Subarea receives 3.91 percent of the Oregon halibut recreational fishery allocation. It is open seven days a week from May 1 - October 31 or until quota is caught.

### California Recreational Fishery

The California subarea is defined as all waters off California and is allocated four percent of the Area 2A non-tribal recreational catch limit. The fishery opens May 1, and remains open seven days a week until the quota has been caught or November 15, whichever is earlier. To provide a longer season, CDFW has occasionally recommended periodic closures within the season.

### Pacific halibut as incidental catch

Halibut are caught incidentally in several fisheries and must be discarded, with the exception of the salmon troll fishery and the sablefish fishery north of Pt. Chehalis, WA, which, as described above, receive allocations as recommended in the Catch Sharing Plan. Each year, the Northwest Fisheries Science Center (NWFSC) publishes a report for the Council's September meeting that describes bycatch of Pacific halibut in West Coast groundfish fisheries. This report details what areas and which groundfish sectors caught the most halibut (that was then discarded). The expected incidental halibut catch in these fisheries is subtracted from the Area 2A TCEY at the start of the year with the remaining TCEY allocated to the other sectors. This incidental catch is then tracked via fisheries observers, fish tickets, and electronic monitoring footage (small amounts may be landed accidentally or accounted for from the Individual Fishing Quota (IFQ) midwater Pacific hake maximized-retention fishery) ([Jannot et al. 2021](#)). IFQ groundfish bottom trawl (a limited-entry fishery where each vessel has an allotted percentage of quota by species) vessels are allowed to catch, but not retain, a certain amount of halibut bycatch issued annually called Individual Bycatch Quota that is tracked against the amount of halibut discarded by the vessel. For IFQ groundfish bottom trawl, NMFS has implemented a limit that is 15 percent of the Area 2A TCEY for legal sized halibut (over 32 inches), with a cap of 100,000 lbs (net weight, legal sized) for the IFQ program, and IBQ are distributed to vessels not to exceed this cap. IFQ vessels are required to carry observers (except for those with electronic monitoring), who track halibut discards. For non-IFQ fisheries without 100 percent observer coverage, halibut bycatch data from observers is extrapolated to the fleet. These data sources provide a record of halibut bycatch that the NWFSC uses in its annual report, and the IPHC uses the report to determine the amount of halibut that will be deducted from the Area 2A TCEY to determine the FCEY for the following year. The amount deducted from the TCEY may vary from year to year, but is generally around 150,000 lb.

Although halibut incidentally caught and not retained in these fisheries are often discarded alive at sea, a certain level of mortality is expected to occur. A discard mortality rate (DMR) is applied to halibut bycatch to account for the probability that halibut may be alive when discarded. DMRs are estimates of the proportion of incidentally captured halibut that do not survive after being returned to the water. The mortality rate for trawl vessels is higher than hook-and-line fisheries, since trawl gear generally inflicts more injury to halibut due to compression in the cod-end of the trawl net, clogging the gills with substrate as the net is dragged along the seafloor, and injuries from spines or carapace from other species in the net ([IPHC](#)). Since IFQ bottom trawl has 100 percent observer coverage, observers classify halibut brought on board as excellent, poor, or dead; halibut brought on board with "excellent" viability

have a mortality rate of 0.2 (e.g., 20 percent of halibut with excellent viability do not survive after being returned to the water), “poor” viability have a mortality rate of 0.55, and “dead” have a mortality rate of 0.9 (Jannot et al. 2021). Fixed gear such as longline or pot generally result in fewer injuries to halibut, depending on the hook release method or halibut contact with other species in the same pot. According to IPHC regulations, only hook-and-line fisheries are allowed to target and retain halibut in Area 2A. The average DMR for Area 2A hook-and-line vessels is 0.16 (representing an average of DMRs over all years for the Bering Sea/Aleutian region longline fishery) (Jannot et al. 2021). DMRs may also be based on viability or injury assessments performed by observers. The discard mortality rates are used to account for bycatch in all commercial groundfish fisheries and is part of the annual TCEY, where the expected incidental halibut catch is subtracted from the TCEY at the start of the year before the FCEY is allocated according to the framework in the Catch Sharing Plan. Visual representation of the breakdown from TCEY to FCEY each year is available in the Council’s September briefing book.

### Gear

Commercial and recreational fishing for halibut in Area 2A is only permitted with hook-and-line gear, as specified in IPHC regulations. Hook-and-line gear includes rod and reel (no more than two hooks), hand line, longline, and troll. Gear restrictions are part of the IPHC regulations that NMFS publishes annually in the Federal Register. For directed commercial fishing, the typical gear configuration consists of a “skate,” which is made up of a mainline, gangions, and hooks (Figure 3). The gangions are approximately three to four feet long with a hook attached to the end. The typical gear is set up with a 1,800-foot skate with 100 size 16/0 hooks at an 18-foot spacing (IPHC 1998). Gear is left to soak for four to 48 hours, but the average soak for each skate is about 12 hours (IPHC 1998). In recreational fisheries, larger circle or “J” hooks are most commonly used when fishing for halibut. Barbless hooks must be used when fishing in Puget Sound.

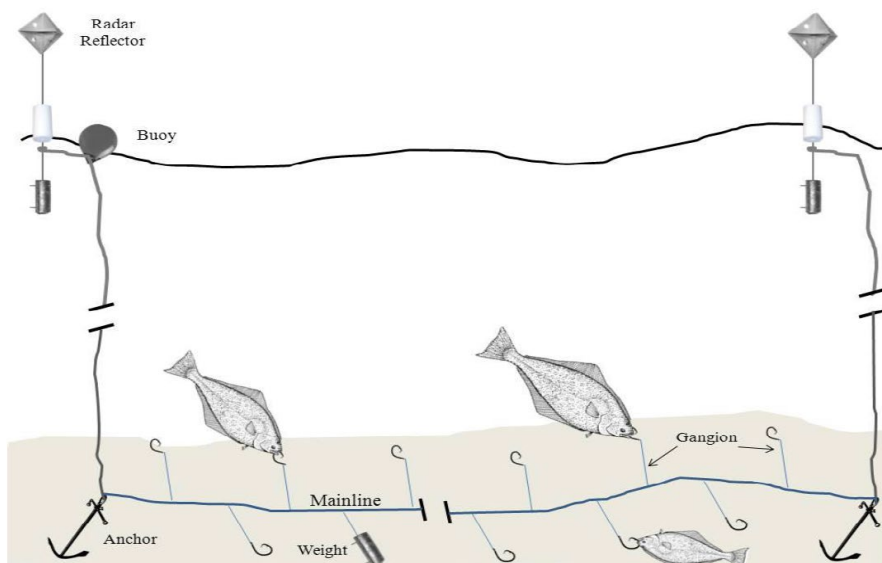


FIGURE 4 GEAR SCHEMATIC FOR LONGLINE HALIBUT FISHERIES.

## Participation

To participate in the directed and incidental commercial fisheries or operate as a recreational charter vessel, vessel owners must apply for and receive a permit from the IPHC each year. Recent permits issued by sector are shown in Table 4. Most recent estimates indicate that around 60 percent of permittees participate after receiving a permit. A permit is not required for private anglers, though a fishing license issued by the state where the anglers is fishing is required.

**TABLE 4 NUMBER OF PERMITS ISSUED BY SECTOR FOR 2017-2021**

<i>Fishery permit sector</i>	<i>Range of permits issued 2017-2021</i>	<i>Average number of permits 2017-2021</i>
Directed commercial	181-207	193
Incidental sablefish	24-44	32
Incidental salmon	189-228	213
Recreational charter <sup>4</sup>	80-93	86

## Depredation (removal of fish caught in fishing gear, usually hook-and-line)

Depredation of halibut by marine mammals, particularly toothed whales, is an issue in the Alaska Pacific halibut fishery, because halibut that would be harvested and accounted for under the FCEY are removed from the gear and must be deducted from the TCEY. Depredation rarely occurs in Area 2A, though reasons for this are unclear. Using the IPHC web tool of the fishery independent setline survey (FISS) data, since 1998 there have been five documented occasions of depredation of halibut by marine mammals off Area 2A in the annual setline survey. Off Oregon, there was one occasion of pinniped depredation, and off northern Washington, there were four occasions of depredation by sperm whales. Although some portions of Area 2A are not surveyed every year (for example, Puget Sound was sampled in 2011, 2014, 2017, and 2018. Northern California was sampled in 2013, 2014, and 2017), there has been no documented depredation in these areas. There are also no documented occasions of whale depredation in the recreational fisheries. While some depredation occurs off Area 2A (five occurrences over 23 years), because of this low occurrence during the survey, NMFS concludes that depredation is rare during the commercial halibut fisheries and any depredation that would occur is accounted for in the Area 2A TCEY.

## Closed Areas

Within Area 2A, the commercial and recreational halibut fisheries must follow non-trawl area closures in NMFS groundfish regulations. Area closures were designed to reduce and manage catch of overfished groundfish species under the Magnuson-Stevens Fishery Conservation and Management Act, and provide incidental habitat protections from fishing gear (Council, 2020). In response to many rockfish species being declared as overfished in the late 1990s and early 2000s, NMFS implemented large, depth-based area closures called Rockfish Conservation Areas (RCAs) along the coast to protect rockfish and habitat from incidental effects of fishing gear. Since then, all overfished species, with the exception of yelloweye rockfish, have recovered and are no longer overfished.

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<sup>4</sup> Permit numbers for recreational charter only available for 2019-2021



### 1.3 Public Involvement

The Draft EA was released on February 17, 2021, with a paragraph in the Addresses section of the Federal Register notice of the proposed rule ([87 FR 9021; February 17, 2022](#)), describing where the document could be viewed and how to comment. The public comment period closed March 4, 2022. There were no comments received on the Draft EA, and therefore there were no changes or updates resulting from the public comment period.

## 2 Alternatives

As noted in the 2020 NEPA Regulations Final Rule (85 Fed. Reg. at 43330, §1502.14), “The number of alternatives that is appropriate for an agency to consider will vary. For some actions, such as where the Federal agency’s authority to consider alternatives is limited by statute, the range of alternatives may be limited to the proposed action and the no action alternative.” NMFS has determined that this is one of those cases.

### 2.1 Alternative 1 (Preferred)

The preferred alternative is NMFS’ management of Area 2A Pacific halibut fisheries in 2022 and subsequent years according to the framework established in the Council’s Catch Sharing Plan and federal regulations. As discussed above, NMFS annually manages the Area 2A Pacific halibut fisheries in accordance with recommendations the Council makes in the Catch Sharing Plan. NMFS implements annual management measures including the days the fisheries are open and bag limits for the various subareas within Area 2A in order to achieve but not exceed the annual sector or subarea allocations as set by the IPHC through its annual process. NMFS also implements regulations in Area 2A consistent with recommendations from the Council through the Catch Sharing Plan, including area definitions for 2A subareas, the subarea allocation framework, areas closed to fishing, and gear restrictions not implemented through the IPHC.

### 2.2 No Action Alternative

NMFS does not implement management measures or regulations for the non-tribal commercial and recreational fisheries within Area 2A, and while the IPHC may continue to set Area 2A FCEYs, fishing for or retaining halibut would not be allowed within Area 2A. This includes the directed commercial fishery and recreational halibut fishery. The commercial salmon troll and sablefish fisheries would still occur, but no retention of halibut would be allowed. Groundfish fisheries that catch and are required to discard halibut are not affected by either alternative, as they will still encounter and incidentally catch halibut.

## 3 Affected Environment and Environmental Consequences

This section of the document describes the existing fishery and the resources that would be affected by the alternatives. The physical environment is discussed in Section 3.1, the biological characteristics of

Pacific halibut and stocks interacting with the Area 2A halibut fishery are discussed in Section 3.2, and the socio-economic or human environment is discussed in Section 3.3.

The No Action Alternative is based on the expected future condition of the current affected environment in the absence of the action (NOAA 2017).

### 3.1 Bottom Habitat

#### 3.1.1 Status/Affected Environment

In the area where Pacific halibut are fished, the hook-and-line gear used to fish for Pacific halibut is expected to interact with bottom habitat. Off of the West Coast, there are 35 unique benthic habitat types, based on a hierarchical system developed for the West Coast Essential Fish Habitat assessment methodology (PFMC 2005). These include higher level mega habitat (basin floor, continental slope and shelf, etc.), hard or soft substrate, meso/macrohabitat (canyon wall and floor, gully, exposure/bedrock, etc.), and modifiers such as bimodal pavement, outwash, and unconsolidated sediment. The West Coast is also home to structure-forming invertebrates, such as sponges, anemones, and corals, which are an important component of fish habitat. Pacific halibut are primarily found on the continental shelf in areas with sandy, muddy, or pebbly substrate.

#### 3.1.2 Effects of the Alternatives

Under Alternative 1, there is likely to be some negative impact to the benthic habitat for fisheries using longline gear, with a lower effect on sandy or muddy substrates and greater impact on rocky or coral reef habitats. Fishing gear generally impacts the physical structure of the benthic environment when it comes in contact with that environment. The only gear used in this fishery with impacts to the physical environment is longline gear, used in the non-tribal directed commercial and sablefish fisheries. Other gear is suspended from the surface and does not interact with bottom habitat. While initially thought to cause minimal effect on benthic habitat, new data suggests that longline gear may cause adverse impact, depending on the type of habitat, currents, and behavior of fish once hooked ([Gulf, 2021](#)). Longline gear may skim the bottom while deployed or during retrieval, displacing invertebrates and rocks ([Gulf, 2021](#)). Research in Grabowski et al. (2014), found that muddy and sandy habitat recovered from fixed-gear fishing impacts faster than rocky substrate, and areas with high energy (more currents) recovered slower than calmer areas. In the Pacific halibut fishery in Alaska, hooked halibut were observed via submersible dragging the groundline 15 to 20 feet across the bottom substrate ([High, 1998](#), p. 43). Fragile, hard corals were observed with segments broken off while flexible corals were generally unharmed, and scallops were clamped around the longline, indicating that the gear swept along the bottom before the scallops could close, and were brought to the surface. However, a different study directly observing longline gear in the Atlantic tilefish fishery found no evidence of gear movement along the bottom when anchors were deployed on either end of the longline ([Gulf, 2021](#)).

Because the directed commercial fishery has a relatively small number of participants, short fishing periods occurring every couple weeks, and must take place outside of closed areas, the impact on benthic habitat from longline gear used in the directed commercial fishery is not expected to be significant.

The commercial sablefish fishery is authorized through the groundfish biennial harvest specifications process (85 FR 79880; December 11, 2020). The environmental effects of the groundfish fishery, including the commercial sablefish fishery, were analyzed in a 2020 environmental assessment (NMFS 2020). Halibut caught incidentally in this fishery can be retained; however, the preferred alternative does not change the effort or effects of the sablefish fishery from that analyzed in the 2020 EA because the commercial sablefish fishery occurs irrespective of the preferred alternative. The commercial sablefish fishery will continue to incidentally catch Pacific halibut; the preferred alternative determines whether that halibut can be retained. Under the No Action alternative, no fisheries targeting halibut would be allowed to occur within Area 2A and thus there would be no impact to the benthic habitat from directed fishery longline gear.

A biological opinion (NMFS 2018) found the Pacific halibut fisheries would have adverse effects on Essential Fish Habitat (EFH), as a result of the alteration of benthic habitat during use of longlines, including long lines that become derelict. Gear used in commercial halibut fisheries could result in small adverse effects on some deepwater (greater than 98 feet (30 m)) areas. Alteration to bottom habitats from longline fisheries is likely minimal because the gear is limited in weight and area fished (Morgan and Chuenpagdee 2003). When hauling longlines, there is potential for the hooks to snag structural organisms such as sponges and thus move rocks and/or cause small areas of turbidity (Morgan and Chuenpagdee 2003).

Longline gear that is lost can result in longer-term habitat alterations, though these would be expected to decrease over time as sediments and biota cover the lines. Some longlines can be snagged and lost on the sea floor and thus have the potential to alter habitat in localized areas. However, only five longlines have been documented in the extensive derelict gear surveys or removal efforts in Puget Sound, though analogous data is not available for the rest of the West Coast, though it is likely that derelict halibut longlines are similarly rare in the rest of Area 2A.

As described above, recreational and incidental salmon troll fisheries are unlikely to impact bottom habitat, so neither alternative is expected to have a measureable difference.

## 3.2 Food Web Impacts

### 3.2.1 Status/Affected Environment

Adult halibut are not generally preyed upon by other species due to their large size, active nature, and bottom-dwelling habits (Best & St-Pierre, 1986). Pacific halibut are capable of moving long distances in search of prey and are opportunistic feeders, preying on fish, crab, octopus, and clams. Halibut are not a primary food source for any larger fish (Best & St-Pierre 1986). Due to their size and bottom-dwelling habitat, halibut are not generally preyed upon by marine mammals (Best & St-Pierre 1986), unless it is hooked by fishing gear (depredation, as discussed in Section 1.2.1.).

### 3.2.2 Effects of the Alternatives

Under either alternative, NMFS does not expect impacts to the food web either from removal of halibut as prey or as a predator.

## 3.3 Halibut Resource

### 3.3.1 Status/Affected Environment

Pacific halibut are large, diamond-shaped flatfish that range from Japan, Russia, and Alaska in the western and northern Pacific Ocean, and as far south as Santa Barbara, California. Adult halibut are demersal, living on or near the bottom. Most Pacific halibut spawning takes place in the Gulf of Alaska and Bering Sea. Larval halibut drift with the counterclockwise currents of the northeast Pacific Ocean. Halibut migrate long distances in a clockwise direction, with seasonal migration across the continental shelf to deeper depths in the winter and shallower depths in the summer to feed ([IPHC website](#)). The proportion of the total Pacific halibut abundance found in Area 2A is around two percent of the coastwide stock abundance. This very small percent consists primarily of adults who have migrated from more northern spawning and nursery grounds, based on the limited tagging data for fish tagged in Area 2A or tagged outside of but caught in Area 2A. Halibut tagged from as far as the Bering Sea were recovered in Area 2A although some halibut tagged in Area 2A were caught off of British Columbia (Webster et al. 2013) it does not appear that halibut regularly migrate back north after entering Area 2A. Additionally, there are no known spawning grounds in Area 2A, therefore halibut in Area 2A are unlikely providing much contribution to the overall spawning stock of Pacific halibut.

Recent stock assessments indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2012, largely as a result of decreasing size at a given age (size-at-age), higher harvest rates in early 2000s, as well as somewhat weaker recruitment strengths than those observed during the 1980s. The spawning biomass (SB) is estimated to have increased gradually to 2016, then declining to present levels. Pacific halibut recruitment occurring in the North Pacific, one of the primary drivers of Pacific halibut stock size, is estimated to be higher during positive Pacific Decadal Oscillation regimes ([IPHC stock assessment, 2021](#)); a widely recognized indicator of ecosystem productivity in the north Pacific (primarily the Gulf of Alaska). Historically, these regimes included positive conditions prior to 1947, poor conditions from 1947-77, positive conditions from 1978-2006, and poor conditions from 2007-13. Annual averages from 2014 through 2019 were positive, with 2020 and 2021 (through September) showing negative average conditions. Although strongly correlated with historical recruitments, it is unclear whether recent conditions are comparable to those observed in previous decades. It is also unclear if this trend will remain, given the intensity of marine heat waves occurring since 2014 ([IPHC stock assessment, 2021](#)).

Additionally, both large and small-scale climate patterns affect the food web, from primary productivity of phytoplankton to increasing or decreasing certain species of zooplankton or plankton biomass in general, causing a ripple effect for upper trophic level species such as halibut. These shifts in plankton may also affect species differently at different life stages (e.g., larval halibut from plankton and adult halibut from larger fish and crabs that feed on plankton and lower trophic species). In other words, some climate conditions may be beneficial to the survival of larvae of a particular species (halibut or prey) but may have no effect on an adult of that same species.

#### Climate Change

Each March meeting, NOAA provides a report to the Council on the status of the California Current Ecosystem (CCE) for the previous year, as derived from environmental, biological, economic and social

indicators. Climate patterns such as El Niño/ La Niña and the Pacific Decadal Oscillation (PDO) have a major impact on the CCE. Between 2014 and 2019, the PDO annual averages were positive, though in 2020 annual averages trended to negative PDO (Harvey et al. 2021, IPHC 2021). These large-scale climate regimes are defined by sea surface temperature anomalies in the north Pacific Ocean, where warmer sea surface temperature and lower productivity in the CCE is associated with a positive PDO (in the North Pacific Ocean, a positive PDO has anomalously low sea surface temperatures), and negative PDOs consist of lower sea surface temperature and higher productivity in the CCE (and higher sea surface temperatures in the North Pacific). Since 2014, the West Coast has experienced marine heat waves: the “Blob” from 2014-2016, another heat wave similar in size and intensity in mid to late 2019 (Harvey et al. 2020), and the second-largest heatwave after the Blob occurring in 2020. The CCE also experiences hypoxic areas (areas with low dissolved oxygen): in 2018, the hypoxic area off Newport, OR, lasted from June- September. In 2019, the hypoxic area was similar in intensity to 2018, but occurred in August. In 2020, the hypoxic area off Newport, OR lasted from June-August 2020 with similar intensity as 2018 and 2019 (Harvey et al. 2020, Harvey et al. 2021). Hypoxic areas are dependent on physical processes such as upwelling, currents, and sea-air exchange, and biological processes of primary production and respiration. Low dissolved oxygen can reduce habitat areas for halibut and cause die-offs of species that are unable to migrate away from these hypoxic areas, potentially impacting prey availability for halibut.

### Coastwide Stock status

The IPHC conducts annual stock assessments using data from the IPHC’s fishery independent setline survey (FISS), the commercial Pacific halibut and other fisheries, as well biological information from its research program. The assessment includes the Pacific halibut resource in the IPHC Convention Area, covering the Exclusive Economic Zones of Canada and the United States of America. Data sources are updated each year to reflect the most recent scientific information available for use in management decision making. Further background on these assessments and their data sources can be found on the IPHC’s website (<https://iphc.int/management/science-and-research/stock-assessment>.) The data and assessment models used by the IPHC are reviewed by the IPHC’s Scientific Review Board comprised of non-IPHC scientists who provide an independent scientific review of the stock assessment data and models and provide recommendations to IPHC staff and to the Commission. The IPHC’s data and assessments models constitute best available science on the status of the Pacific halibut resource.

The results of the 2021 stock assessment indicate that the spawning biomass of Pacific halibut continues to trend slightly downward, resulting in an estimated 191 million pounds at the beginning of 2022, down from 192 million pounds at the beginning of 2021. The 2021 assessment however reports less of a decline than previously projected, partly due to estimated mortality below that associated with limits set for 2021. These recent spawning biomass estimates from the 2021 stock assessment are very consistent with previous analyses dating back to 2012. All assessments since 2015 have indicated a decreasing spawning biomass in the terminal year. However, the 2021 assessment also notes that the 2012 year-class is now estimated to be stronger than any since 2005, and may have an important impact on near-term population levels.

Although the stock has declined in recent years, based on the IPHC’s current management framework, the stock is still above the level that it would be considered overfished. The IPHC’s interim management

procedure uses a relative spawning biomass of 30 percent as a trigger, below which the reference fishing intensity is reduced. At a spawning biomass limit of 20 percent, directed fishing is halted due to the critically low biomass condition (e.g., overfished). This calculation is based on recent biological conditions: current weight-at-age and estimated recruitments still influencing the stock. The relative spawning biomass in 2022 was estimated to be 33 percent, equal to the estimate from 2020, and greater than the values estimated for the previous decade.

The IPHC also strives to maintain the total mortality of halibut across its range from all sources based on a reference level of fishing intensity so that the Spawning Potential Ratio (SPR) is equal to 43 percent. SPR is the average maximum potential reproductive output of an individual (fecundity) over its lifetime when the stock is fished, divided by the average fecundity of an individual over its lifetime when the stock is unfished ([IPHC website](#)). The reference fishing intensity of  $F_{43\%}$  SPR seeks to allow a level of fishing intensity that is expected to result in approximately 43 percent of the spawning stock biomass per recruit compared to an unfished stock (*i.e.*, no fishing mortality). Lower values indicate higher fishing intensity. The 2021 fishing intensity is estimated to correspond to  $F_{46\%}$ , therefore slightly lower fishing intensity than the  $F_{43}$  reference level. Both 2020 and 2021 are estimated to be less than values estimated for the last 20+ years. This drop in fishing intensity corresponds both to reduced mortality limits (2020) and actual mortality below the limits (2020 and 2021). Comparing the relative spawning biomass and fishing intensity over the recent historical period shows that the relative spawning biomass decreased as fishing intensity increased through 2010, then increased as the fishing intensity decreased through 2016, and has been relatively stable since then.

### 3.3.2 Effects of the Alternatives

The primary impact to the halibut resource is the removal up to the TCEY, as this catch level is the maximum amount of mortality that can occur from the Area 2A fisheries. Stated above, this catch occurs through a variety of directed and incidental fisheries. Annual catch allocations are set by the IPHC and implemented annually by NMFS. The proposed action under Alternative 1 is the management measures for those halibut fisheries within Area 2A and is a separate action from the implementation of the IPHC's catch allocations and season structure.

The Area 2A management measures include the establishment of the number of fishing days per week and timing of the season, number of open hours per fishing period, and recreational bag limits. While the exact dates for the various sectors and subareas change from year to year, these management measures are intended to keep the fishery under the TCEY as well as to ensure the fishery operates accordance to the overall season set by the IPHC. There are no known differential impacts to the overall halibut stock related to when, within the overall season dates set by the IPHC, halibut are caught in Area 2A or as to where within Area 2A they caught or by what gear. This is likely primarily due to the general biology of the Pacific halibut stock and the overall season and size limits set by the IPHC. However, this may also be influenced by the fisheries with Area 2A not disproportionately targeting a specific portion of the halibut stock (e.g., only small or only large or only male or only female) that could potentially result in an impact to the overall halibut population. For these reasons, Alternative 1 is not expected to have a significant impact of the Pacific halibut stock.

Under the No Action alternative, if no non-tribal directed halibut fishing (commercial or recreational) is allowed to take place, the total coastwide fishing mortality across all IPHC areas would be less than

under Alternative 1. Some mortality in Area 2A would be expected since halibut would still be allowed to be caught incidentally in several fisheries as well in tribal fisheries, however the overall removals in Area 2A would be reduced by the proportion allocated to the fisheries targeting halibut accounted for under the FCEY. Although this lack of removals would have some beneficial effect to the halibut stock, the degree to which it would affect the halibut stock is largely unknown. Based on the current understanding of the biology, stock structure, migration and recruitment patterns, the potential benefits of reduced harvest in Area 2A may not be fully realized by the entire population. Based on these reasons, the No Action alternative is not expected to have a significant impact on the halibut resource.

### Climate Change Impacts

The greatest impact from climate change is to Pacific halibut recruitment in the Gulf of Alaska and the Bering Sea and therefore the coastwide population over time. Climate change may also impact the migration of halibut within Area 2A in the form of hypoxia, as halibut move to avoid areas of low-oxygen. This is unlikely to be an issue overall, since any halibut that migrate between areas in Area 2A and are caught are limited by the allocation for that area and once that allocation has been reached, the fishery is closed. Under Alternative 1, NMFS could implement management measures that could include a shift in allocations across sectors or subareas as a result of halibut population shifts. As long as the Area 2A TCEY is not exceeded, allocation shifts as a result of migration within Area 2A is not likely to have a significant impact on the halibut resource. Halibut are opportunistic feeders capable of moving long distances in search of prey, therefore NMFS does not expect a significant impact to prey species under either alternative. While it is unclear in the long term how climate change will affect the halibut stock, the IPHC survey and stock assessment track the abundance of halibut in a given year and make risk projections for a range of catch limits, to capture potential downstream impacts of a given coastwide TCEY. Therefore, although climate change is not a direct input in the stock assessment, effects from climate change are taken into effect when considering catch limits using the best available science.

### 3.4 Bycatch in halibut fisheries

This section discusses sablefish, yelloweye rockfish on the coast within Area 2A, listed Puget Sound rockfish, and salmon, because these are the species that have interactions with the halibut fisheries. This section also briefly discusses protected species, such as marine mammals, seabirds, and green sturgeon.

Although the Pacific halibut fishery in Area 2A overlaps with a variety of other species than those discussed in this section, due to the nature of the halibut fishery (gear, scope, location and timing), the most recent assessments show that the halibut fishery does not impact other species. For example, NMFS prepared a biological opinion evaluating the impact of the Area 2A fisheries on ESA listed marine mammals, sea turtles, salmon, rockfish, and green sturgeon (NMFS 2018), and determined that the fisheries are not likely to adversely affect any listed marine mammals or sea turtles or adversely modify critical habitat. NMFS also consulted with the U.S. Fish and Wildlife Service on the impacts of Area 2A Pacific halibut fisheries on ESA-listed seabirds, bull trout, and sea otters (NMFS 2017), and concluded that the proposed action is not likely to adversely affect short-tailed albatross, California least tern, marbled murrelet, bull trout, or southern sea otters. In 2014, NMFS analyzed the effect of Pacific halibut fisheries on listed eulachon (NMFS 2014). Because there have been no documented interactions with

sea turtles or eulachon and these species have little overlap with Pacific halibut, NMFS did not further discuss the impact of the proposed action on those species.

### 3.4.1 Groundfish - Affected Environment

Halibut in Area 2A is harvested coastwide in state and federal waters from Washington to California. Various federal and state closed areas are used in the recreational and non-tribal commercial fisheries to protect overfished species such as yelloweye rockfish. Because groundfish species are the primary bycatch in the halibut fishery, most of the closed areas for halibut fisheries are designed to minimize the catch of overfished groundfish species for vessels fishing halibut and groundfish. Additionally, there are some designated nearshore areas in the recreational halibut fisheries in the Washington, Oregon, and Columbia River subareas, with separate open days and quotas, restricting fishing to those areas.

#### Sablefish

Sablefish tend to co-occur with Pacific halibut, favoring similar depths and bottom habitat. Groundfish, including sablefish, are managed under the Pacific Coast Groundfish Fishery Management Plan to stay within harvest specifications established through the Council and analyzed in an environmental assessment. These harvest specifications are set on a biennial basis based on stock assessments and socio-economic conditions of the groundfish fishery, and each stock must remain under the estimated overfishing limit. Vessels fishing in the directed halibut fishery may retain sablefish, according to groundfish regulations and within the trip limits implemented in regulations at 50 CFR 660 (open access trip limits are located at 50 CFR 660.333). In the directed commercial fishery in 2020, 443,592 lb (201.21 mt) of sablefish was landed. From 2017-2021, an average of 62 vessels made halibut landings, and an average of 55 vessels landed both halibut and sablefish (Mattes, pers. comm., 2021). Sablefish landings are tracked via fish tickets, and the Council may revise the sablefish trip limits in season to keep sablefish catch within the harvest specifications.

#### Yelloweye rockfish (non-ESA listed)

Yelloweye rockfish (*Sebastes ruberrimus*) range from the Aleutian Islands, Alaska to northern Baja California; they are common from central California northward to the Gulf of Alaska (Eschmeyer et al. 1983, Hart 1973, Love 1991, Miller & Lea 1972, O'Connell & Funk 1986). Yelloweye rockfish occur in water 25-550 m deep. Yelloweye rockfish are bottom dwelling, generally solitary and sedentary, rocky reef fish, found either on or just over reefs (Eschmeyer et al. 1983, Love 1991, O'Connell & Funk 1986). Boulder areas in deep water (>180 m) are the most densely-populated habitat type, and juveniles prefer shallow-zone broken-rock habitat (O'Connell & Carlile 1993). They also reportedly occur around steep cliffs and offshore pinnacles (Rosenthal et al. 1982). The presence of refuge spaces is an important factor affecting their occurrence (O'Connell & Carlile 1993).

Yelloweye rockfish found off the coasts of Washington, Oregon and California are not listed under the ESA, but are currently managed as an overfished species with a rebuilding plan. The status of the stock has improved due to lower than expected catch and high recruitment (PFMC 2018). In the most recent catch report from 2015-2020 (PFMC 2021a), yelloweye rockfish mortality is estimated to be under the annual catch limits, and the probability of hitting the target rebuilding year with these catch limits is 67



percent. The annual catch limit in 2017 and 2018 was 20 metric tons (mt), and was increased to 48 mt in 2019 with gradual increases each year to 51 mt for 2022.

The Pacific halibut fishery commonly intercepts rockfish, including yelloweye, as they are found in similar habitat to Pacific halibut and are easily caught with hook-and-line gear. Yelloweye rockfish caught in the directed Pacific halibut fishery come out of what are called “off-the-top deductions” for the incidental open access groundfish fisheries in the groundfish harvest specifications (85 FR 79880; December 11, 2020). The set-aside for this deduction is based on the historical maximum catch averaged across years with observer data, starting with 2017. Projected impacts from the directed commercial halibut fishery are based on observer data and extrapolated to the fleet. Higher than anticipated amounts of mortality in the halibut directed commercial fishery can impact the harvest specification set at the start of the biennial specification process, if other fisheries are reaching or exceeding their yelloweye rockfish bycatch limits. Because observer data for the directed commercial fishery is available with one-year lag, there is no mechanism for managing yelloweye rockfish bycatch in the Pacific halibut directed commercial fishery inseason. As displayed in Table 5, yelloweye rockfish bycatch has varied over the years and does not appear dependent on the directed commercial allocation, number and length of openings, or the number of vessels participating in the fishery.

**TABLE 5 COMPARISON OF 2017-2020 NON-TRIBAL DIRECTED COMMERCIAL PACIFIC HALIBUT FISHERIES AND YELLOWEYE ROCKFISH BYCATCH.**

	2017	2018	2019	2020
Dir. Comm. catch limit (pounds)	225,591	201,845	254,426	254,426
Length of openers	10 hrs	10 hrs	10 hrs	58 hrs
Number of openers	3	3	3	5
Number of participants	86	66	102 <sup>a/</sup>	90 <sup>a/</sup>
Number of landings	184	130	223 <sup>a/</sup>	270 <sup>a/</sup>
Percent observer coverage	8	24	13	3
Estimated yelloweye bycatch (mt)	0.67	0.01	7.37	2.62

a/ These numbers are draft and may change in later reports.

The Pacific halibut recreational fishery also interacts with yelloweye rockfish at times, and NMFS and state agencies have taken measures to reduce impacts. For the recreational fishery, retention of yelloweye rockfish is prohibited coastwide (50 CFR 660.360(c)), and any incidentally caught yelloweye rockfish are required to be released at depth with descending devices according to state regulations in Washington and Oregon, and strongly encouraged in California. While retention is prohibited, mortality is still expected to occur, so each state is given a harvest guideline for recreational yelloweye rockfish in the harvest specification process, and mortality is estimated and reported inseason (PFMC 2021b, Appendix 1); therefore, any yelloweye caught and released while fishing for halibut will be tracked against its harvest specification.

## Puget Sound/Georgia Basin Yelloweye and Bocaccio Rockfish

Found in waters of Puget Sound, the Strait of Georgia, and the Strait of Juan de Fuca east of Victoria Sill, the Puget Sound/Georgia Basin DPS of yelloweye rockfish is listed under the ESA as threatened, and bocaccio are listed as endangered (75 FR 22276, April 28, 2010). Detailed assessments of ESA-listed yelloweye rockfish and bocaccio can be found in the recovery plan (NMFS 2017b) and the 5-year status review (Tonnes et al. 2016). Much of the life history and habitat use for these two species is similar. Subadult and adult yelloweye rockfish and bocaccio, such as those that may interact with Pacific halibut fisheries, typically utilize habitats with moderate to extreme steepness, complex bathymetry, and rock and boulder-cobble complexes (Love et al. 2002). Within Puget Sound proper, each species has been documented in areas of high relief rocky and non-rocky substrates such as sand, mud, and other unconsolidated sediments (Miller and Borton 1980; Washington 1977). Yelloweye rockfish remain near the bottom which makes them susceptible to longline baits and recreational gear with baited hooks suspended near the bottom, compared to some other rockfish species. Bocaccio are semi-pelagic rockfish, move long distances, and spend time suspended in the water column, making them less susceptible to baited hook-and-line (recreational and commercial longline) gear deployed at or near the bottom (Love et al. 2002).

ESA-Listed Puget Sound yelloweye and bocaccio rockfish are only affected by Pacific halibut fisheries occurring in Puget Sound, namely the recreational fisheries; these fishing activities are expected to interact with Puget Sound listed rockfish, since all three species co-occur

Halibut recreational fishing uses gear and bait that catch ESA-listed yelloweye and bocaccio rockfish incidentally. Even though retention is not allowed, some unintentional catch occurs. Anglers are required to have a descending device and return ESA-listed rockfish at depth, though there is an estimated mortality rate of 28 percent (NMFS 2018). Anglers in the Puget Sound subarea are required to fish with barbless hooks, reducing injury to listed rockfish. For recreational fisheries, WDFW provided estimates to NMFS of a projected annual take of zero to 82 yelloweye and zero bocaccio rockfish (NMFS 2018).

### Other Fish

The NWFSC provides an annual report on estimated catch and discard of groundfish species at the September Council meeting for the previous year. This report includes information from fish tickets (catch that is landed), observer data, logbooks, and recreational and research catch information (Somers et al. 2021). In the directed commercial halibut fishery, these other groundfish in addition to sablefish and overfished yelloweye are harvested in relatively small amounts (over 3 mt): big skate (15.17 mt), lingcod (8.32 mt), longnose skate (4.90 mt), redbanded rockfish (3.68 mt), rougheye/blackspotted rockfish (5.66 mt), and shortspine thornyhead (3.25 mt) (Somers et al. 2021).

Recreational groundfish catch is allowed according to NMFS regulations at 50 CFR 660.360 and state regulations, including bag limits and seasons. Bag limits and groundfish seasons may be adjusted inseason.

### 3.4.2 Groundfish - Effects of the Alternatives

Most vessels that participate in the directed commercial fishery retain incidentally caught groundfish; in Oregon, best estimates are an average of seven vessels between 2017 and 2021 retain halibut only (Mattes, pers. comm., 2021) out of the average of 62 vessels that made halibut landings off of Oregon, and similar rates are expected for Washington and California. As described above, groundfish are managed under the Pacific Coast Groundfish FMP, and fishery participants are allowed to land groundfish according to trip limits set by NMFS through the harvest specification process. In the commercial halibut fisheries (directed, and incidental salmon and sablefish), fish tickets are compiled weekly and provided to fishery managers allowing groundfish to be tracked to stay within harvest specifications, and inseason action may be taken to revise groundfish trip limits to stay within these allocations. If no halibut fishing occurred (No Action Alternative), impacts to sablefish and other groundfish could be less, because there would be fewer opportunities for groundfish to be caught incidentally with halibut. However, participants in the halibut fishery would be expected to switch to fishing for sablefish and other groundfish, but could only be able to retain up to the trip limit amount to stay within the annual catch limit determined through the harvest specification process. Under Alternative 1, halibut fisheries are likely to catch groundfish, but catch is expected to remain within the trip limits allowed in groundfish regulations at 50 CFR 660 Subpart F, which are reviewed regularly to remain within harvest specifications, and the impact to groundfish due to halibut fisheries is not expected to be significant. Similarly, for recreational fisheries, anglers targeting halibut retain incidentally-caught groundfish when allowed by groundfish regulations at 50 CFR 660.360 and in state regulations, and groundfish catch is not expected to be significant under Alternative 1. Under the No Action alternative, impacts to groundfish could be less because recreational halibut fisheries would not occur and fewer groundfish would be caught incidentally, or anglers that would have fished for halibut could switch to targeting groundfish and retain up to the bag limit amount.

For non-ESA listed yelloweye rockfish on the coast, incidental catch is expected to continue under Alternative 1. The directed commercial and recreational fisheries are expected to encounter yelloweye rockfish, and catch may vary widely from year to year. The harvest specifications process includes an estimate of the amount of yelloweye bycatch caught in the halibut fisheries based on the historical average, and builds that into the allowable limits. Under Alternative 1, NMFS anticipates setting management measures for the duration or frequency of directed fishery openings and setting recreational seasons, and does not expect an impact to yelloweye rockfish, because based on the information available, yelloweye rockfish bycatch does not appear to be dependent on these on the length of fishing periods or when the commercial and recreational fisheries are open. Under the No Action alternative, yelloweye rockfish impacts would be less than Alternative 1, because the directed commercial and recreational fisheries would not catch yelloweye incidentally. Even as the stock rebuilds and catch limits increase, yelloweye bycatch is accounted for each season across all fisheries and NMFS expects the actual catch to not exceed the allocation. Hence, NMFS does not expect a significant impact to yelloweye rockfish as a result of the continuation of Pacific halibut fisheries.

Some incidental catch of ESA-listed Puget Sound rockfish is expected in the recreational fisheries under Alternative 1. Changes to the days the various Area 2A subareas are open, within the overall season dates set annually by the IPHC, under Alternative 1 would have little effect on the ESA-listed yelloweye

and bocaccio rockfish populations, since these rockfish are long-lived, slow-growing fish and catch of these species in the halibut recreational fishery is estimated to be low. Under the No Action alternative, if no fishing were allowed to take place, no impact to Puget Sound rockfish from halibut fisheries would occur, because there would be no opportunity for these species to be caught incidentally; however, anglers that would have fished for halibut could switch to targeting groundfish that may impact ESA-listed yelloweye and bocaccio rockfish. Based on the low bycatch estimates for the two listed rockfish species described above (zero to 82 ESA-listed yelloweye and zero ESAS-listed bocaccio rockfish using estimates of rockfish caught in the Puget Sound recreational fishery in 2017 from WDFW), NMFS does not expect a significant impact to Puget Sound rockfish under either No Action or Alternative 1.

### 3.4.3 Salmon - Affected Environment

This section discusses all salmon caught in the Pacific halibut fisheries--both unlisted salmon stocks and those listed under the ESA--that are known to or can be expected to interact with directed commercial or recreational halibut fisheries.

Salmon are targeted with recreational hook and line and commercial troll gear off all three West Coast states, and may encounter halibut. There are five species of salmon off the Pacific coast: Chinook, coho, chum, pink, and sockeye. Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*) are most common off the West Coast, and in odd-numbered years, pink salmon (*O. gorbuscha*) occur primarily off Washington and Oregon. Chum and sockeye are rarely caught off the West Coast, although these stocks pass through Pacific Coast waters off Washington on their way to inshore areas. Pacific halibut fisheries are likely to pose low risk to ESA-listed salmon stocks. The four ESA-listed salmon Evolutionarily Significant Units (ESUs) that are expected to be affected by the Area 2A halibut fisheries are: Snake River fall Chinook salmon, Puget Sound Chinook salmon, Lower Columbia River Chinook salmon, and Lower Columbia River coho salmon. While fish from listed ESUs overlap in the areas where Pacific halibut fishing takes place, the listed ESUs are commingled with other non-listed ESUs, lowering the chance of a listed salmon being caught. Since catch of salmon in halibut fisheries is rare, NMFS does not expect much impact to salmon stocks, including those listed under the ESA.

### 3.4.4 Salmon - Effects of the Alternatives

Although salmon may be caught incidentally in halibut fisheries, these interactions are rare due to the difference in habitat depths (halibut are benthic-dwelling and salmon are generally pelagic) and gear type (halibut hooks are much larger than salmon hooks decreasing the likelihood of salmon being caught). Between 2017 and 2019 in the directed halibut commercial fishery (years with observer data), only one observed haul in 2019 encountered salmon (1.6 percent of observed hauls in 2019) ([NWFC 2020](#)). If extrapolated to the fleet, that would be eight fish and 0.01788 mt of salmon bycatch. The one salmon caught was a coho salmon. Salmon is a prohibited species for retention in the directed halibut commercial fishery (50 CFR 660.11), and must be discarded.

In the commercial salmon troll fishery, participants receive an allocation of halibut, implemented through an action separate from the proposed action. This allocation does not have an effect on any salmon stocks because changes in the allocation of halibut to this fishery do not affect fishing effort for salmon, only the amount of incidental halibut that may be retained.

For the recreational halibut fishery, between 2012 and 2016, only two salmon were caught incidental to the recreational halibut fishery when salmon were not targeted (NMFS 2018). When salmon and halibut fisheries occur at the same time, anglers must follow regulations for the fish they are targeting; for example, salmon may only be targeted with barbless hooks, and once a salmon is on board, no barbed hooks may be used, making targeting halibut more challenging. During times that salmon recreational fisheries are open, salmon caught in the coastal recreational halibut fishery off Washington, Oregon, and California count against the recreational salmon quota, or are otherwise taken into account as part of the coastal salmon recreational fishery. The salmon caught in those fisheries are managed under the Council's Pacific Coast Salmon Fishery Management Plan. Salmon retention is prohibited when the salmon recreational season is closed, and barbless hooks must be used when targeting salmon. Recreational salmon fisheries are managed by species and location, and at certain times, only salmon with a clipped adipose fin are allowed to be retained.

When halibut and salmon fisheries are not co-occurring (seasons vary each year), NMFS estimates an average of 20 Chinook and 10 coho encounters (presumed fatal) per year; NMFS assumes some of those salmon are from listed populations (4.3 fish from each ESA-listed Chinook stock and 3.0 ESA-listed coho), occurring mostly in recreational fisheries in Puget Sound and on the Washington Coast and Columbia River (NMFS 2018). The effects of the preferred alternative would result in an extremely small increase in the mortality of salmon when compared to the No Action alternative, because there are only around 30 salmon encounters when halibut and salmon fisheries are not co-occurring; when halibut and salmon fisheries are co-occurring, any salmon caught are presumed caught in the salmon fisheries against applicable salmon quotas. Under the No Action alternative, salmon impacts would be less than Alternative 1 because the halibut fisheries would not occur and thus would not catch salmon incidentally. Salmon bycatch is monitored each fishing year through observer data and reported each year to the Council, and NMFS expects the actual catch to not exceed the allowable amount based on the salmon stock projections for that year. Hence, NMFS does not expect a significant impact to salmon as a result of the continuation of Pacific halibut fisheries. Impacts to salmon species from the salmon troll fishery when retention of incidentally caught halibut is allowed would not be affected by NMFS management of Pacific halibut fisheries under Alternative 1, since any salmon that are caught in the salmon troll fishery are managed through the Council's salmon management process, and are covered under the biological opinions and other analyses for the salmon fishery. Shifting the timing of halibut season dates within the IPHC's coastwide season under Alternative 1 is not expected to have a measurable effect on listed or unlisted salmon, since incidental catch of salmon with halibut is low due to differences in habitat and gear type. Therefore, neither of the alternatives is expected to have a significant effect on salmon stocks.

#### 3.4.5 Marine Mammals - Affected Environment

The waters off Washington, Oregon, and California support a wide variety of marine mammals that are known to overlap in the same season and area as the Area 2A halibut fishery, however there are few documented interactions of marine mammals with the Area 2A halibut fisheries. Blue whales, fin whales, and humpback whales make seasonal migrations between high latitude feeding and lower latitude breeding locations, with their distribution often being linked to prey aggregation. These migrations pass along Washington, Oregon, and California in Area 2A. During the spring, summer, and fall, the range of Southern Resident killer whales includes the coastal and inland waterways of Washington, where recreational fisheries take place. Less is known about their winter range, and they

have been spotted as far south as central California during the winter months and as far north as Southeast Alaska (Marine Mammal Commission [website](#)). Populations of sperm whales exist in waters of the California Current Ecosystem throughout the year (Caretta et al., 2017), and are seen in Washington and Oregon waters every season except winter (Green et al. 1992). Acoustic detections of sperm whales in the offshore waters of the outer Washington coast occurred all months of the year, with peak occurrence April to August. Occurrence of Guadalupe fur seals, sei whales, and North Pacific right whales are rare off Washington, Oregon, and California (Allen and Angliss 2013, Carretta et al. 2013). In the most recent marine mammal bycatch report for West Coast groundfish fisheries (Jannot et al. 2018), most marine mammals, including pinnipeds and cetaceans, were caught in bottom and midwater trawl gear. This report only includes data through 2016, therefore it does not include years in which the halibut fishery was observed, however because those groundfish fisheries with somewhat similar gear as halibut fisheries (ie. fixed gear) have very low mammal interactions that is an indication that halibut fisheries likely also have very low interactions. Marine mammal reports may be found on the NOAA Fisheries [website](#).

Saez et al. (2013) suggested the directed commercial halibut fishery has a low entanglement risk to marine mammals because of the relatively little overlap between the whales' presence and the fishing effort, and ranked the entanglement risk for the Pacific halibut directed commercial fishery relatively low for blue whales, fin whales, humpback whales, and sperm whales (whales considered in their model).

Additionally, while marine mammal entanglement occurs off Washington, Oregon, and California, the majority of confirmed whale entanglement reports for all fisheries come from California (from 1982-2017, 366 confirmed reports and 85 percent of the total number), and halibut fishing occurs primarily off of Washington, Oregon, and north of Shelter Cove, California. The data on entanglements for all fisheries (including halibut) showed that off of California, there were the least number of confirmed entanglements in northern California (27). In 2021, 1.4 percent of the Pacific halibut caught in the directed commercial fishery was caught off the northern coast of California, and the California recreational fishery receives only four percent of the Area 2A non-tribal quota, thus halibut fishing off of California is lower than in Oregon and Washington. Across all fisheries, there were 29 confirmed reported entanglements off of Washington (7 percent of the total), and 25 entanglements off of Oregon (6 percent of the total). Between 1982 and 2017, there are no records of entanglements with recreational hook-and-line gear, and two entanglements in salmon troll gear (one in Central California, and the other unknown (Saez et al. 2021). Entanglement reports combined for all fisheries have been received in every month of the year, with highest numbers of entanglements in March and April (Saez et al. 2021). The halibut directed commercial fishery has historically taken place in late June through early August, with most participation occurring off the coast of Oregon. The incidental sablefish fishery occurs only north of Pt. Chehalis, WA, and begins April 1, and typically ends in late fall with lower participation early in the season. Due to the location, timing, and duration of the fishery and that there have not been any documented entanglements with marine mammals in the Area 2A halibut fisheries, this is a reflection of the low co-occurrence of the species and the fishing effort.

### 3.4.6 Marine Mammals - Effects of the Alternatives

Although marine mammals are found in Area 2A, NMFS expects the Pacific halibut fishery will have none to minimal impact on these species. The Area 2A commercial fishery is a Category III fishery under the

Marine Mammal Protection Act (MMPA), meaning that annual mortality and serious injury of a stock in the Pacific halibut fishery is less than or equal to 1 percent of the potential biological removal (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals). NMFS publishes its [List of Fisheries](#) as required by the Marine Mammal Protection Act on an annual basis, and the Pacific halibut fishery has remained Category III. There have been no reported entanglements of marine mammals in either commercial or recreational Pacific halibut fisheries. The proposed action under Alternative 1 is also not likely to have a significant impact on prey availability for marine mammals; due to their size and bottom-dwelling habitat, halibut are not generally preyed upon by marine mammals (Best & St-Pierre 1986), unless it is hooked by fishing gear (depredation, as discussed in Section 1.4.5.). For this reason, NMFS did not analyze the impacts of adult halibut removals as a food source. For other marine mammal prey potentially impacted by halibut fisheries (groundfish or salmon) under Alternative 1, retention would fall under allowable limits for those fisheries and be accounted for in those environmental analyses. Therefore, incidental groundfish and salmon catch under Alternative 1 would not impact prey availability for marine mammals, and is not analyzed here. In conclusion, neither alternative is expected to have a significant impact on marine mammals.

#### 3.4.7 Seabirds - Affected Environment

Over a hundred species of seabirds occur in waters off the West coast within the EEZ. These species include: loons, grebes, albatross, fulmars, petrels, shearwaters, storm-petrels, pelicans, cormorants, frigate birds, phalaropes, skuas, jaegers, gulls, kittiwakes, skimmers, terns, guillemots, murrelets, auklets, and puffins. The migratory range of these species includes commercial fishing areas; fishing also occurs near the breeding colonies of many of these species. ESA-listed endangered seabirds that co-occur in Area 2A include short-tailed albatross (*Phoebastria albatrus*), California least tern (*Sterna antillarum browni*), and marbled murrelet (*Brachyramphus marmoratus*), but of those, only short-tailed albatross is known to interact with fishing gear similar to that used in the directed commercial halibut fishery. No seabird interactions are expected with recreational gear.

There is limited direct data available on seabird interactions in the Area 2A halibut fishery, specifically—two years of observer data are available (2017 and 2018) for the non-tribal directed commercial fishery. From the 2017 observer data, with seven percent observer coverage, encounters with seven black-footed albatross and one shearwater were observed. Based on this data, Jannot et al. (2020) estimated that the total bycatch for this year might have been 48 black-footed albatross and 10 shearwaters. Despite black-footed albatross being the most frequently caught species in U.S. west coast fisheries, these 2017 estimates were relatively high compared to other fisheries that year. No bird bycatch was observed in 2018 with 25 percent observer coverage, so the fleet-wide estimates for the Area 2A halibut fisheries for these two species dropped in 2018 to 13 black-footed albatross and three shearwaters (Jannot et al. 2020). There were no takes of any ESA-listed seabird species.

Black-footed albatross and sooty shearwaters are two of the more commonly observed visiting species in the summer off the U.S. west coast. In 2011, as part of a review 12-Month Finding on a Petition To List the Black-footed Albatross as Endangered or Threatened ([76 FR 62504; October 7, 2011](#)), the USFWS' determined that the best available scientific data indicates that the world population of the black-footed albatross is currently stable or slightly increasing, although population growth is below its potential maximum, likely due to the impact of incidental bycatch in fishery operations (Wiese and

Smith 2003, p. 35; Niel and Lebreton 2005, p. 833; Arata et al. 2009, p. 46). This determination was based in part on the most recent counts for black-footed albatross showing that the world population may contain more than 67,000 nesting pairs, which then puts the estimated world population of black-footed albatrosses at well over 300,000 individuals. As part of this review by USFWS, specific fishery impact analysis were conducted including one of U.S. and Canadian Pacific halibut fisheries. That review concluded that the range-wide impact of the Pacific halibut fishery on the black-footed albatross was not specifically known, however estimates obtained from fishing effort data suggested that the number of black-footed albatross killed by U.S. and Canadian halibut fisheries remains relatively low. Recent formal population reviews do not exist for sooty shearwaters, however the population of sooty shearwaters is considered abundant with a recent estimate being around 20 million and they are considered as near-threatened by the International Union for Conservation of Nature, which is a category of lessor concern for the population.

The commercial halibut fisheries in Area 2A, similar to portions of the groundfish fishery, use longline gear. Trawl gear is not used in the halibut fishery. A biological opinion for the Pacific Coast groundfish fishery for species managed by U.S. Fish and Wildlife Service (USFWS) (USFWS 2017) estimated a yearly mortality average of one short-tailed albatross across all fisheries (groundfish and Pacific halibut). Given that actual levels of take are expected to vary from year to year, the average take was anticipated not to exceed two short-tailed over a two-year period. The commercial halibut fisheries use similar gear and operate in similar areas to the portions of the groundfish fishery that use longline gear. However, halibut gear has a shorter line and sinks quicker in comparison to groundfish longline gear, and the halibut fishery operates during a much shorter season than the groundfish fishery. For these reasons, NMFS concluded in a 2017 biological assessment that any impacts on albatross from the halibut fishery are most likely fewer than impacts from the groundfish fishery, and that halibut fisheries were not likely to adversely affect the short-tailed albatross. Additionally, in the 2017 biological assessment NMFS determined that the two other ESA-listed sea birds in the action area, California least tern and marbled murrelet, were also unlikely to be adversely impacted. This determination was because the fishing depth is substantially deeper and distance from shore is further than where these seabirds are likely to occur. USFWS concurred with NMFS determination on these three seabirds.

### 3.4.8 Seabirds - Effects of the Alternatives

The table below summarizes estimated seabird mortality (numbers of individuals) for each gear type for all West Coast fisheries in 2017 and 2018 (years that include directed commercial observer data) (Jannot 2020).

**TABLE 6 ESTIMATED SEABIRD MORTALITY FOR GEAR TYPES IN 2017 AND 2018**

	<b>2017</b>	<b>2018</b>
Hook-and-line	248.89	193.09
Trawl	140.87	174.88
Pot	9.65	17.41

To date, there have been no documented occurrences of interactions between ESA-listed seabirds and Pacific halibut fisheries. Additionally, as stated above, in 2017 NMFS determined and USFWS concurred



that although Pacific halibut fisheries may affect listed seabirds, they were unlikely adversely affect listed seabirds. The conditions and operations of the Pacific halibut fisheries leading to this determination have not changed and are unlikely to change in the future. Therefore, neither alternative is expected to have significant impacts on ESA-listed seabirds.

As stated above, observer data from the non-tribal directed commercial fishery show that this fishery has the potential to affect non-ESA listed seabirds. Although only one of the two years of data show encounters with seabirds, it can be reasonably expected that encounters may occur in the future in the Area 2A halibut fisheries. The two bird species encountered in the fishery to date represent two of the more abundant species of seabirds off the West Coast and the population status of these two species are currently not a levels of concern. Because of this reason and the fact that the directed fishery operates over a very short duration of time, thereby limiting the amount of potential for interactions between fishing gear and bird species, neither alternative is expected to have significant impacts on non-ESA-listed seabirds.

#### 3.4.9 Green Sturgeon - Affected Environment

Green sturgeon, both ESA-listed and non-listed, concentrate in coastal estuaries, particularly the San Francisco Bay estuary, Columbia River estuary, and coastal Washington estuaries during the late summer and early fall. There is no information about how much of the population is in these concentrations each year or whether this varies.

Retention of green sturgeon in halibut fisheries is prohibited coastwide, but some incidental catch has occurred in Pacific halibut fisheries. In the directed commercial fishery, there was one reported catch of green sturgeon in the available four years of observer data. There are occasional, but no recent, records of green sturgeon catch in the Washington and Oregon recreational fisheries; NMFS estimates that there are likely to be no more than three encounters per year, with no encounters occurring in most years. No data are available from the halibut fisheries off of California, but recent estimates of mortality estimate three to five green sturgeon per year (NMFS 2018).

#### 3.4.10 Green Sturgeon - Effects of the Alternatives

NMFS does not expect a significant impact to green sturgeon under either alternative. Based on the gear types used in the fisheries (e.g., longline, troll, hook-and-line), the limited spatial overlap with green sturgeon, the available data showing only one catch over a four-year period, and the fishing season timing, any bycatch of green sturgeon in these fisheries is expected to remain low.

### 3.5 Socioeconomics

This section is divided into subsections: non-tribal commercial, and recreational fisheries. Each of these subsections is described in detail in Section 1.2.3. The biggest driver for socioeconomic impact to the halibut fishery is the FCEY which is set annually by the IPHC and implemented by NMFS based on the allocation framework described in the Catch Sharing Plan. Lower FCEYs result in lower allocations, and lower allocations decrease the amount of economic opportunity for commercial fishery participants. Lower FCEYs also impact the recreational fisheries because there would likely be fewer fishing days

(though the resulting number of fishing days and intensity of fishing varies across subareas and with the amount of quota), fewer angler trips and lower income for fishing-related businesses.

### 3.5.1 Tribal Fisheries

Thirteen western Washington tribes possess and exercise treaty fishing rights to halibut: Hoh, Jamestown S'Klallam, Lower Elwha S'Klallam, Lummi, Makah, Nooksack, Port Gamble S'Klallam, Quileute, Quinault, Skokomish, Suquamish, Swinomish, and Tulalip. The majority of the tribes fish inside Puget Sound, with four tribes (Makah, Quileute, Quinault, and Hoh) fishing on the coast. The tribal fisheries include both commercial fisheries and ceremonial and subsistence fisheries.

As with all allocations in Area 2A, the tribal fishery allocation is annually set by the IPHC and implemented in domestic regulations through NMFS in an action separate from the proposed action considered in this environmental assessment. The Tribes independently manage their fisheries, consistent with the regulations promulgated by the IPHC. Therefore, impacts to tribal fisheries is beyond the scope of the proposed action.

### 3.5.2 Non-Tribal Commercial Fisheries

According to PacFIN data for 2021, commercial Pacific halibut off of Washington, Oregon, and California generated around \$4,573,445 with an average ex-vessel price-per-pound of \$5.55. By comparison, between 2013 and 2019, the non-nearshore fixed gear groundfish fishery average ex-vessel revenue (including Pacific halibut) was \$18,099,000. The entire West Coast groundfish ex-vessel revenue across all sectors but excluding shoreside whiting, averaged over 2013-2019, was \$57,171,000 ([NMFS 2020](#)).

Under Alternative 1, NMFS could implement management measures that could include changes to season length, starting or ending dates, fishing period length, quota, or retention ratios are expected under Alternative 1, but each of these changes are intended to maximize fishing opportunity while still remaining within the halibut subarea allocation.

For incidental commercial fisheries under Alternative 1, NMFS implements landing ratios so that incidental catch may continue for the whole season without exceeding the quota. If the sector allocation is low, ratios may be set lower and incidental catch may exceed the ratio and be discarded. NMFS could make changes to season dates for the incidental sablefish and salmon fisheries, and these changes could also impact Pacific halibut. Historically, the salmon and sablefish seasons have closed before the overall IPHC season. A change of season dates in these fisheries through salmon or groundfish regulations may have some economic benefit to participants, since it would provide more opportunity to achieve the halibut allocation during the coastwide season set by IPHC. However, the incidental fishery must remain within its quota and once the quota is attained, halibut retention is no longer allowed. The ratio may be raised or lowered to achieve the quota, depending on the amount remaining for the season.

Under the No Action alternative, non-tribal commercial fisheries would not occur. However, incidental catch of halibut is expected to occur, and any halibut caught incidentally would be prohibited from being retained. Prohibiting retention of halibut does not substantially decrease the catch of halibut in groundfish fisheries, particularly sablefish, because halibut are still encountered; it simply restricts the ability to land the halibut that are caught. However, participants that usually fish in the halibut fisheries could potentially switch to fishing for sablefish and other groundfish following open access trip limits

since the vessels use the same gear, thus it is expected that ex-vessel revenue that would decrease with no halibut fisheries would increase for the open access groundfish fishery. Incidental catch of halibut in salmon troll fisheries is rare due to the difference in habitat depths and gear type, as described above. Any changes to increase or decrease the incidental ratios of Pacific halibut are discussed through the public Council process and are set to allow maximum attainment of the quota across the season. Under the No Action alternative, a fishery participant would likely lose money by not being able to retain and sell the halibut it is catching incidental to the sablefish effort.

Under the No Action alternative, without the commercial fisheries, \$4.57 million in revenue would be unattained. While there could be localized impacts in ports where halibut is landed, ports with high halibut participation generally also have high participation in other fisheries. Therefore, compared to the West Coast groundfish fishery across the EEZ, no commercial halibut fisheries is not economically significant.

### 3.5.3 Recreational Fisheries

Recreational fisheries are an important part of fishery-related economic activity. However, it is more difficult to analyze the economic value of these fisheries because recreational catch is not sold. Recreational fisheries are broadly subdivided between anglers fishing on private boats and those fishing from charterboats which take paying passengers.

In 2021, there were an estimated 6,165 halibut angler trips on charterboats off of Washington and Oregon (halibut trip data was not available for California), and this level of participation is fairly consistent each year. For comparison, there were 560,489 angler trips on charterboats for all recreational fisheries on the West Coast in 2021. Across Washington and Oregon in 2021, there were 24,513 private angler trips for halibut, compared with 719,891 total private recreational boat trips on the West Coast in 2021 (RecFIN 2022).

Under Alternative 1, NMFS' continued management of the fishery, impacts to harvest and income opportunities for fishing-related businesses result mainly from the overall Area 2A allocation. Higher Area 2A allocations result in higher subarea allocations, providing more angler opportunity through longer fishing seasons or more participation. Longer seasons or more participation could mean greater income opportunities for fishing-related businesses and tourism businesses for visiting anglers, while lower Area 2A allocations are expected to provide less angler opportunity and lower income for businesses. Under Alternative 1, NMFS could implement management measures that could have a socioeconomic impact by shifting fishing opportunities and resulting spending to other regions, but the impact is not expected to be significant. Increasing or decreasing the number of fishing days per week is unlikely to have a socioeconomic impact because the amount of quota available would be the same, only different days would be open for fishing.

Under the No Action alternative when Pacific halibut recreational fishing would not be allowed, however, other recreational fishing is expected to continue. Recreational halibut fishing is a small portion of recreational ocean fishing. Using the RecFIN data from 2021, private angler trips for halibut was only three percent of the total number of private angler boat trips, and while this percentage only accounts for Washington and Oregon, halibut trips off of California is not estimated to change the percentage by much given that halibut generally occurs only in northern California. Although fishing and tourism-related businesses would likely experience some economic hardship if recreational halibut

fishing did not occur, it is unlikely to be significant, given the small percentage of halibut trips compared to other recreational boat fishing.

## 4 Lists

### 4.1 Persons and agencies consulted for this document

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### 4.2 References

Allen, B. M., and R. P. Angliss. 2013. Alaska marine mammal stock assessments, 2012. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC- 245, 282 p.

Arata, J.A., Sievert, P.R., and Naughton, M.B., 2009, Status assessment of Laysan and black-footed albatrosses, North Pacific Ocean, 1923–2005: U.S. Geological Survey Scientific Investigations Report 2009-5131, 80 p.

Best, E. A., St-Pierre, G., & International Pacific Halibut Commission. 1986. Pacific halibut as predator and prey.

Carretta et al. 2013. U.S. Pacific Marine Mammal Stock Assessments: 2012. NOAA-TM-NMFS-SWFSC-504. 384 p.

Carretta, J.V., K.A. Forney, E.M. Oleson, D.W. Weller, A.R. Lang, J. Baker, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, J.E. Moore, D. Lynch, L. Carswell, and R.L. Brownell Jr. 2017. U.S. Pacific Marine Mammal Stock Assessments: 2016. NOAA-TM-NMFS-SWFSC-577.

Eschmeyer, W.N., E.S. Herald, and H. Hammon. 1983. A field guide to Pacific Coast fishes of North America. Houghton Mifflin, Boston, Massachusetts. 336p.

Grabowski, J. H., M. Bachman, C. Demarest, S. Eayrs, B. P. Harris, V. Malkoski, D. Packer & D. Stevenson. 2014. Assessing the Vulnerability of Marine Benthos to Fishing Gear Impacts, Reviews in Fisheries Science & Aquaculture, 22:2, 142-155, DOI: [10.1080/10641262.2013.846292](https://doi.org/10.1080/10641262.2013.846292).

Green, G. A., J. J. Brueggeman, R. A. Grotefendt, C. E. Bowlby, M. L. Bonnell, K. C. Balcomb, III. 1992. Cetacean distribution and abundance off Oregon and Washington, 1989-1990. Ch. 1 In: J. J. Brueggeman (ed.). Oregon and Washington Marine Mammal and Seabird Surveys. Minerals Management Service Contract Report 14-12-0001-30426.

Gulf of Mexico Fishery Management Council. 2021. Amendment 53 to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico Revised Draft. April 27, 2021. 255 p.

Hart, J.L. 1973. Pacific Fishes of Canada. Bull. Fish. Res. Bd. Canada 180: 730p.

Harvey, C., T. Garfield, G. Williams, N. Tolimieri. 2020. California Current Integrated Ecosystem Assessment (CCIEA) California Current Ecosystem Status Report, 2020. March 2020.  
<https://www.pcouncil.org/documents/2020/02/g-1-a-iea-team-report-1.pdf/>

Harvey, C., T. Garfield, G. Williams, N. Tolimieri. 2021. California Current Integrated Ecosystem Assessment (CCIEA) California Current Ecosystem Status Report, 2021. March 2021.  
<https://www.pcouncil.org/documents/2021/02/i-1-a-iea-team-report-1.pdf/>

High, W. L. 1998. Observations of a Scientist/Diver on Fishing Technology and Fisheries Biology. Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, 7600 Sand Point Way NE, Seattle, WA 98115-0070. AFSC PROCESSED REPORT 98-01.

IPHC. 1998. The Pacific Halibut: Biology, Fishery and Management. IPHC Technical Report No. 40.

IPHC. 2020. Interim IPHC Harvest Strategy and Policy. February 2020.  
<https://www.iphc.int/uploads/pdf/hsp/iphc-2020-inthsp.pdf>

Jannot, J. E., K. A. Somers, V. Tuttle, J. McVeigh, J. V. Carretta, and V. Helker. 2018. Observed and Estimated Marine Mammal Bycatch in U.S. West Coast Groundfish Fisheries, 2002–16. U.S. Department of Commerce, NWFSC Processed Report 2018-03. <https://doi.org/10.25923/fk8-0x49>.

Jannot, J. E., A. Wuest, T. P. Good, K. A. Somers, V. Tuttle, K. E. Richerson, R. S. Shama, J. McVeigh. 2020. Seabird Bycatch in U.S. West Coast Fisheries (2002-2018). U.S. Department of Commerce, NOAA Technical Memorandum 2020-07-09.

Love, M.S. 1991. Probably more than you want to know about the fishes of the Pacific coast. Really Big Press, Santa Barbara, California. 215p.

Love, M. S., M. M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the Northeast Pacific. University of California Press, Berkeley, California.

Mattes, L. ODFW. November 23, 2021. Personal communication, via email to Kathryn Blair (NMFS), regarding commercial halibut and sablefish landings.

Miller, B.S. and S.F. Borton. 1980. Geographical distribution of Puget Sound fishes: Maps and data source sheets. Univ. of Washington Fisheries Research Institute, 3 vols.

Miller, D.J. and R.N. Lea. 1972. Guide to the coastal marine fishes of California. Calif. Dept. Fish and Game, Fish. Bull. 157: 249p.

Morgan, L.E. and R. Chuenpagdee. 2003. Shifting gears— addressing the collateral impacts of fishing methods in U.S. waters. Pew Science Series.

Niel, C., and Lebreton, J.D., 2005, Using demographic invariants to detect overharvested bird populations from incomplete data: Conservation Biology, v. 19, p. 826–835.

NMFS. 2014. Analysis of Effects on Pacific Eulachon (*Thaleichthys pacificus*) Through Continued Implementation of the Area 2A Pacific Halibut Catch Sharing Plan and Annual Management Measures for 2014-2016. March 12, 2014. File No. WCR-2014-403.

NMFS. 2017. Endangered Species Act Section 7 Consultation - Biological Assessment for Continued Implementation of the Area 2A Catch Sharing Plan for Pacific Halibut Fisheries [for California least tern, southern sea otter, bull trout, marbled murrelet, and short-tailed albatross]. NMFS, West Coast Region. December 2017.

NMFS. 2017b. Rockfish recovery plan for Puget Sound/Georgia Basin Yelloweye Rockfish (*Sebastes ruberrimus*) and Bocaccio (*Sebastes paucispinis*) Prepared by Office of Protected Resources, West Coast Regional Office, National Marine Fisheries Service. National Oceanic and Atmospheric Administration. October 13, 2017.

NMFS. 2018. National Marine Fisheries Service Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat (EFH) Consultation. Consultation on the implementation of the Area 2A (U.S. West Coast) Pacific halibut catch sharing plan. NMFS, West Coast Region. March 21, 2018. Consultation #: WCR-2017-8426. 208 pages.

NMFS. 2020. Amendment 29 to the Pacific Coast Groundfish Fishery Management Plan and 2021-22 Harvest Specifications and Management Measures, Environmental Assessment/ Regulatory Impact Review/ Regulatory Flexibility Analysis. December 2020.

O'Connell, V.M. and D.W. Carlile. 1993. Habitat-specific density of adult yelloweye rockfish *Sebastes ruberrimus* in the eastern Gulf of Alaska. *Fish. Bull.* 91: 304-309.

O'Connell, V.M. and F.C. Funk. 1986. Age and growth of yelloweye rockfish (*Sebastes ruberrimus*) landed in southeastern Alaska. In *Proc. Int. Rockfish Symposium*. Alaska Sea Grant College Pgm., Anchorage, Alaska. 87-2: 171-185.

PFMC. Pacific Fishery Management Council. 2018. Appendix B Consideration of Changes to the Yelloweye Rockfish Rebuilding Plan Pacific Coast Groundfish Fishery 2019–20 Harvest Specifications, Yelloweye Rebuilding Plan Revisions, and Management Measures.

[https://media.fisheries.noaa.gov/dam-migration/2019-20\\_gfspex\\_app\\_b\\_august\\_2018.pdf](https://media.fisheries.noaa.gov/dam-migration/2019-20_gfspex_app_b_august_2018.pdf)

PFMC. Pacific Fishery Management Council. 2005. APPENDIX B PART 1 ASSESSMENT METHODOLOGY FOR GROUND FISH ESSENTIAL FISH HABITAT. November 2005.

<https://www.pcouncil.org/documents/2005/11/groundfish-fmp-appendix-b-part-1-assessment-methodology-for-groundfish-essential-fish-habitat.pdf/>.

PFMC. Pacific Fishery Management Council. 2021a. Yelloweye Rockfish Catch Report for 2015-2020.

<https://www.pcouncil.org/documents/2021/08/c-6-attachment-13-yelloweye-rockfish-catch-report-for-2015-2020.pdf/>.

PFMC. Pacific Fishery Management Council. 2021b. Groundfish Management Team Report on Inseason Adjustments—Final Action. <https://www.pcouncil.org/documents/2021/09/c-7-a-supplemental-gmt-report-1-2.pdf/>

Richerson, K., K. A. Somers, J. E. Jannot, V. Tuttle, N. B. Riley, and J. McVeigh. 2021. Observed and Estimated Bycatch of Salmon in U.S. West Coast Fisheries, 2002–2020. *Fishery Resource Analysis and*

Monitoring Division Northwest Fisheries Science Center 2725 Montlake Boulevard East Seattle, Washington 98112.

Rosenthal, R.J., L. Haldorson, L.J. Field, V. Moran-O'Connell, M.G. LaRiviere, J. Underwood, and M.C. Murphy. 1982. Inshore and shallow offshore bottomfish resources in the southeastern Gulf of Alaska (1981-1982). Alaska Dept. Fish and Game. Juneau, Alaska. 166p.

Rosenthal, R.J., V. Moran-O'Connell, and M.C. Murphy. 1988. Feeding ecology of ten species of rockfishes (Scorpaenidae) from the Gulf of Alaska. Calif. Dept. Fish and Game 74: 16-36.

Saez, L., Lawson, D., and DeAngelis, M. L. 2021. *Large whale Entanglements off the U.S. West Coast, from 1982-2017*. Silver Spring, MD: United States Department of Commerce, 50.

Saez, L.E., D. Lawson, M.L. DeAngelis, E. Petras, S. Wilkin, and C. Fahy. 2013. Understanding the co-occurrence of large whales and commercial fixed gear fisheries off the west coast of the United States. National Oceanic and Atmospheric Administration's National Marine Fisheries Service, Southwest Regional Office. Technical Memorandum. NOAA-TM-NMFS-SWR-044.

Somers, K., J.E. Jannot, K.E. Richerson, V.J. Tuttle, J.T. McVeigh. 2021. Estimated Discard and Catch of Groundfish Species in the 2020 U.S. West Coast Fisheries. National Marine Fisheries Service, Seattle.

Tonnes, D., M. Bhuthimethee, J. Sawchuk, N. Tolimieri, K. Andrews, and K. Nichols. 2016. Yelloweye rockfish (*Sebastes ruberrimus*), canary rockfish (*Sebastes pinniger*), and bocaccio (*Sebastes paucispinis*) of the Puget Sound/Georgia Basin: 5-Year Review, Summary and Evaluation. National Marine Fisheries Service. 131 pages.

USFWS. 2012. Biological opinion regarding the effects of the continued operation of the Pacific coast groundfish fishery as governed by the Pacific coast groundfish fishery management plan and implementing regulations at 50 CFR part 660 by NMFS on California least tern, southern sea otter, bull trout, marbled murrelet, and short-tailed albatross. FWS 01E0FW00-2012-F-0086.

USFWS. 2017. Biological Opinion Regarding the Effects of the Continued Operation of the Pacific Coast Groundfish Fishery as Governed by the Pacific Coast Groundfish Fishery management Plan and Implementing Regulations at 50 C.F.R. Part 660 by NMFS. FWS Reference Number 01E0FW00-2017-F-0316. May 2, 2017.

Washington, P. 1977. Recreationally important marine fishes of Puget Sound, Washington. National Oceanic and Atmospheric Administration, Northwest and Alaska Fisheries Center.

Webster, R. A., Clark, W. G., Leaman, B.M., and Forsberg, J.E. 2013. Pacific halibut on the move: a renewed understanding of adult migration from a coastwide tagging study. Can. J. Fish. Aquat. Sci. 70(4): 642-653.

Wiese, F. K., and J. L. Smith. 2003. Mortality estimates and population effects of Canada in Pacific longline fisheries on Black-footed Albatross (*Phoebastria nigripes*): national and international implications. Pages 23-50 in DFO-CWS, editor. Status report and future directions towards the development of a national plan of action for the reduction of incidental catch of seabirds in domestic and foreign longline fisheries in Canadian waters. Canadian Technical Report of Fisheries and Aquatic Sciences 2471, Ottawa, ON. Appendices

## Acronyms and Abbreviations

<b>CCE</b>	California Current Ecosystem	<b>NWFSC</b>	Northwest Fisheries Science Center
<b>CDFW</b>	California Department of Fish and Wildlife	<b>ODFW</b>	Oregon Department of Fish and Wildlife
<b>CSP</b>	Catch Sharing Plan	<b>PDO</b>	Pacific Decadal Oscillation
<b>C&amp;S</b>	Ceremonial and subsistence	<b>PFMC</b>	Pacific Fishery Management Council
<b>DMR</b>	Discard mortality rate	<b>SB</b>	Spawning biomass
<b>DOC</b>	Department of Commerce	<b>SPR</b>	Spawning potential ratio
<b>DPS</b>	Distinct population segment	<b>TCEY</b>	Total constant exploitation yield
<b>EEZ</b>	Exclusive Economic Zone	<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>ESA</b>	Endangered Species Act	<b>WDFW</b>	Washington Department of Fish and Wildlife
<b>FCEY</b>	Fishery constant exploitation yield		
<b>FISS</b>	Fishery independent setline survey		
<b>IFQ</b>	Individual Fishing Quota		
<b>IPHC</b>	International Pacific Halibut Commission		
<b>MCAs</b>	Marine catch areas		
<b>Mt</b>	Metric tons		
<b>NMFS</b>	National Marine Fisheries Service		
<b>NOAA</b>	National Oceanic and Atmospheric Administration		



